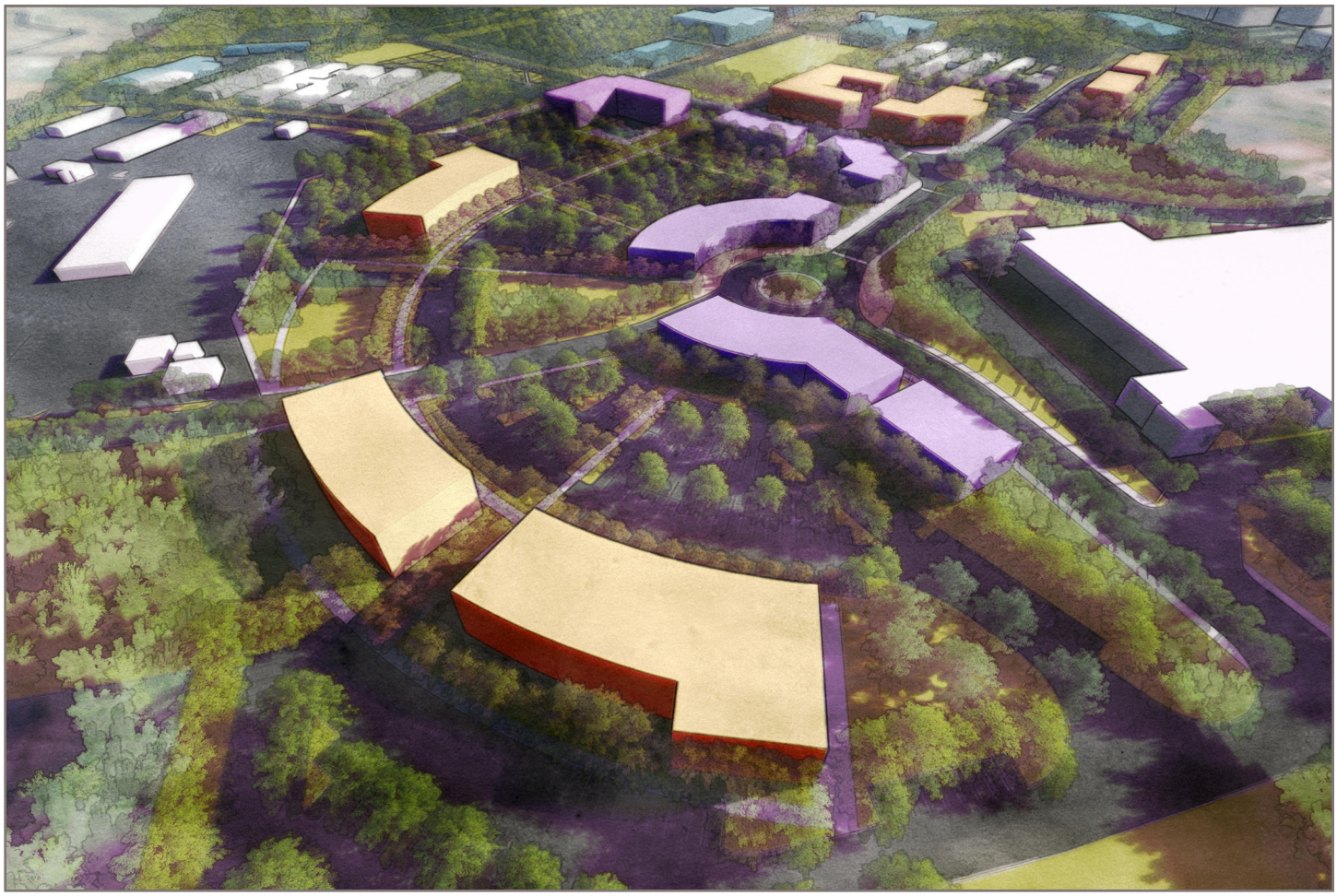
PLACER COUNTY GOVERNMENT CENTER MASTER PLAN UPDATE - APPENDICES

VOLUME 2

MAY 2019



COUNTY OF Placer

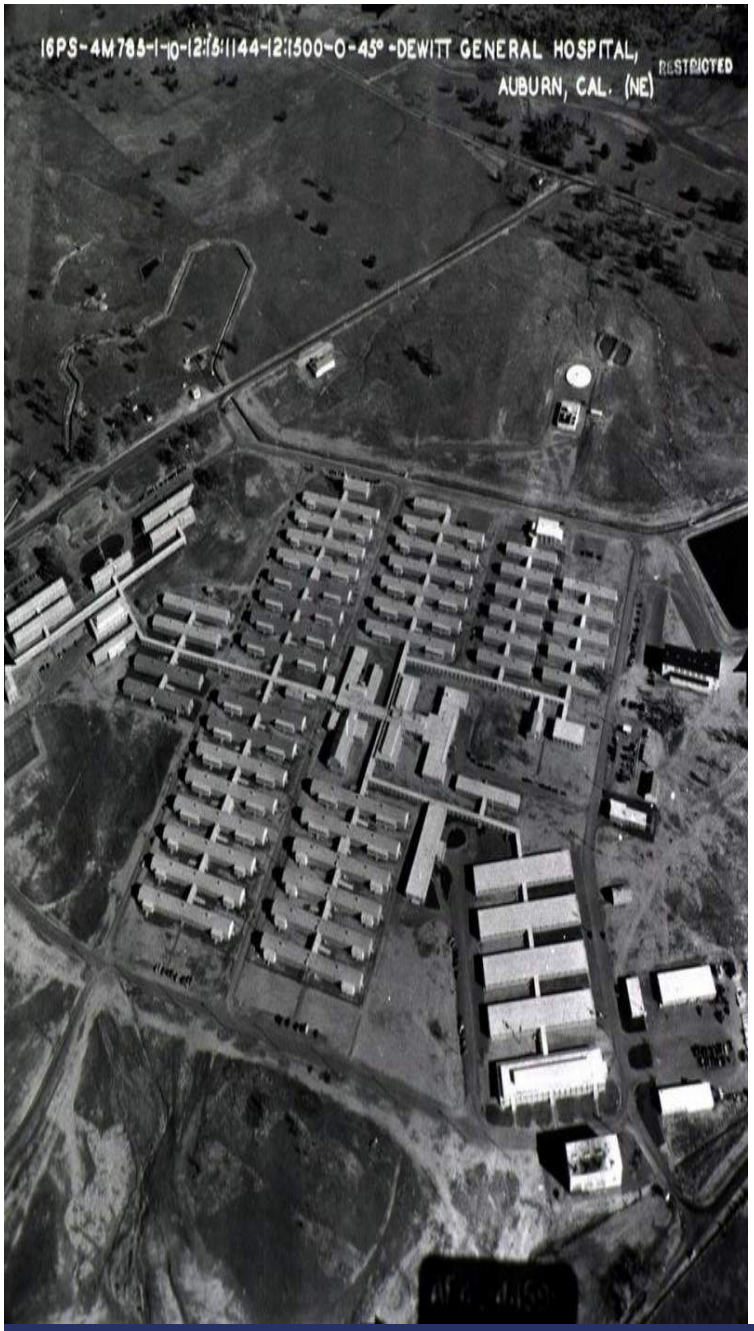
MP-A2

APPENDIX E: WET UTILITIES INFRASTRUCTURE ASSESSMENT

Williams + Paddon Architects + Planners Inc.
Master Plan Update – Wet Utility Infrastructure Assessment

PLACER COUNTY GOVERNMENT CENTER MASTER PLAN UPDATE

March 26, 2019



CARTWRIGHT

Table of Contents

INTRODUCTION 1
0.1 SUMMARY 1
0.2 EXISTING SITE DESCRIPTION AND HISTORY 4
0.3 CONTEXT OF SITE RELATIVE TO UTILITIES 5
SECTION 1: FINDINGS AND ASSESSMENT 7
1.1 METHODOLOGY 7
1.2 FINDINGS (ASCE 38-02) 10
1.3 ASSESSMENT 29
SECTION 2: DEVELOPMENT ALTERNATIVES 60
2.1 PHASE 2 BASELINE MODEL DEVELOPMENT 60
2.2 SUMMARY ANALYSIS AND INPUT - THREE OPTIONS 60
SECTION 3: MASTER PLANNING 69
3.1 MASTER PLAN UPDATE - FINDINGS AND ASSESSMENT OF FINAL OPTION 69
3.2 FINAL MASTER PLAN AND PHASED DEVELOPMENT 89
Appendix A – Water A-1
Appendix B – Irrigation B-1
Appendix C – Sanitary Sewer C-1
Appendix D – Master Drainage Report D-1

Table of Figures

FIGURE 1 VICINITY MAP AND CAMPUS BOUNDARY 3
FIGURE 2 PLACER COUNTY GOVERNMENT CENTER IN 1940'S 5

FIGURE W- 1 PLACER COUNTY GOVERNMENT CENTER OVERALL EXISTING WATER SYSTEM 13
FIGURE W- 2 ONSITE WATER SYSTEM 14
FIGURE W- 3 PCWA METERED CONNECTION 15
FIGURE W- 4 NID CONNECTION AT RICHARDSON AND BELL 16
FIGURE W- 5 NID CONNECTION AT 1ST AND ATWOOD 17
FIGURE W- 6 PCGC MASTER PLAN UPDATE EXISTING WATER PIPELINE (BASELINE MODEL VERSION) 73
FIGURE W- 7 PCGC MASTER PLAN UPDATE COUNTY PROPOSED WATER IMPROVEMENTS (PCWA) 74
FIGURE W- 8 PCGC MASTER PLAN UPDATE NID PROPOSED WATER IMPROVEMENTS (PRIVATE USES) 75
FIGURE W- 9 PCGC MASTER PLAN UPDATE AVAILABLE FIRE FLOW AT SYSTEM 20 PSI (COUNTY + NID) 76
FIGURE W-T1 PCGC MASTER PLAN UPDATE TIER 1 PROPOSED WATER IMPROVEMENTS 92
FIGURE W-T2 PCGC MASTER PLAN UPDATE TIER 2 PROPOSED WATER IMPROVEMENTS 93
FIGURE W-T3 PCGC MASTER PLAN UPDATE TIER 3 PROPOSED WATER IMPROVEMENTS 94
FIGURE W-T4 PCGC MASTER PLAN UPDATE TIER 4 PROPOSED WATER IMPROVEMENTS 95

FIGURE I- 1 PCGC MASTER PLAN UPDATE DRAFT RAW WATER IRRIGATION SYSTEM 78

FIGURE SS- 1 DEWITT TRUNK STUDY AREA OVERVIEW 20
FIGURE SS- 2 NORTH AUBURN HWY 49 TRUNK STUDY AREA OVERVIEW 21
FIGURE SS- 3 PLACER COUNTY GOVERNMENT CENTER OVERALL SEWER SYSTEM 22
FIGURE SS- 4 DEWITT TRUNK CONNECTION OF EXISTING SEWERSHEDS TO MODELED NETWORK 41
FIGURE SS- 5 NORTH AUBURN HWY 49 TRUNK MODELED CATCHMENTS 42
FIGURE SS- 6 AUBURN DEWITT TRUNK EXISTING LEVEL OF SERVICE 43
FIGURE SS- 7 AUBURN DEWITT TRUNK EXISTING + ENTITLED LEVEL OF SERVICE 44
FIGURE SS- 8 NORTH AUBURN HWY 49 TRUNK EXISTING LEVEL OF SERVICE 1: 10 YEAR 24 HR WWF 45
FIGURE SS- 9 NORTH AUBURN HWY 49 TRUNK EXISTING + ENTITLED LEVEL OF SERVICE 46
FIGURE SS- 10 PCGC MASTER PLAN UPDATE EXISTING SEWER PIPELINE (BASELINE MODEL) 82
FIGURE SS- 11 PCGC MASTER PLAN UPDATE PROPOSED SEWER IMPROVEMENTS (MODELED) 83
FIGURE SS- A PCGC MASTER PLAN UPDATE PROPOSED SEWER IMPROVEMENTS EXHIBIT A 84
FIGURE SS- T1 PCGC MASTER PLAN UPDATE TIER 1 PROPOSED SEWER IMPROVEMENTS 100
FIGURE SS- T2 PCGC MASTER PLAN UPDATE TIER 2 PROPOSED SEWER IMPROVEMENTS 101
FIGURE SS- T3 PCGC MASTER PLAN UPDATE TIER 3 PROPOSED SEWER IMPROVEMENTS 102
FIGURE SS- T4 PCGC MASTER PLAN UPDATE TIER 4 PROPOSED SEWER IMPROVEMENTS 103

FIGURE SD- 1 PLACER COUNTY GOVERNMENT CENTER OVERALL STORM DRAIN SYSTEM 26
FIGURE SD- 2 STORM DRAIN WATERSHED MAP 27
FIGURE SD- 3 LAND USE MAP 28
FIGURE SD- 4 DEVELOPMENT OPTION 1 MARKUP 67

FIGURE SD- 5 REGIONAL STORMWATER FACILITIES MARKUP 68
FIGURE SD- 6 PRELIMINARY STORMWATER SYSTEM DESIGN (FINAL OPTION) 88

List of Tables

TABLE 1 – SUMMARY OF WATERSHED AREAS 24
TABLE 2 – MANNING'S "N" INPUT VALUES 35
TABLE 3 – DEWITT TRUNK LINE LIFT STATION INFORMATION 36
TABLE 4 – HIGHWAY 49 TRUNK LINE LIFT STATION INFORMATION 36
TABLE 5 – SANITARY SEWER MODEL PARAMETERS 37
TABLE 6 – SANITARY SEWER CALIBRATION RESULTS 38
TABLE 7 – DEWITT TRUNK LINE PEAK FLOWS 39
TABLE 8 – HWY 49 TRUNK LINE PEAK FLOWS 40
TABLE 9 – SUMMARY OF BASELINE MODEL RESULTS FOR PEAK FLOW RATES AT OUTFALLS FROM PCGC 51
TABLE 10 – SUMMARY OF PHASE II SMALL MS4 PROVISIONS IMPACTING WATER QUALITY 52
TABLE 11 – POST CONSTRUCTION WATER QUALITY REQUIREMENTS FOR REGULATED PROJECTS 58
TABLE 12 – FINAL OPTION REGIONAL BASINS 86
TABLE 13 – COMPARISON OF OUTFALL PEAK FLOW RATES UNDER EXISTING AND BUILDOUT CONDITIONS 87

Master Plan Update
Wet Utility Infrastructure

INTRODUCTION

0.1 SUMMARY

The purpose of this report is to provide a comprehensive overview of the utility infrastructure within the approximate 200-acre campus boundaries of the Placer County Government Center located in North Auburn, Placer County, California (refer to Figure 1). This report, entitled Master Plan Update – Wet Utility Infrastructure, is written as a supplement to the Placer County Government Center (PCGC) Master Plan Update, a document intended to provide a detailed update to the *1993 Comprehensive Facilities Master Plan (CFMP)*, dated July 1993. The specific wet utilities addressed in this report include the following: domestic water supply and distribution, water supply and distribution for campus-wide fire suppression, water supply and distribution for campus-wide irrigation, sanitary sewer systems throughout the campus, and the storm system conveying storm runoff generated on the campus. For purposes of this report, the word "campus" will also be interchangeably referred to as the onsite system to draw a distinct difference, as applicable, to offsite areas and systems that are not within the boundaries of the PCGC campus. As such, this report will also address "outside" systems that either influence or impact the wet utility system within the campus. By the same token, the report also details, as applicable, how the onsite system impacts or influences offsite utilities.

With respect to the aforementioned wet utilities, this report will describe the existing utilities currently in place at the campus based on a compilation of data, maps, and documentation received by various sources referenced in this report in conjunction with numerous site visits to the site in an effort to aid in verifying or updating, wherever visibly possible, the collected data, maps, and documentation. This system of information collection and verification was performed in an effort to produce the most accurate picture possible relative to the specific and major water, irrigation, sewer, and storm systems that will have a material impact in evaluating and assessing these systems, integrating both existing facilities and a plan for future facilities consistent with the Master Plan. Pursuant to creating this picture, the evaluation and assessment of the system and its existing and proposed improvements is the second part of this report. The descriptions provided in this report and the associated collection and verification of information has also largely been supported by stakeholder meetings with key staff within the Placer County Department of Public Works and Facilities, Placer County Water Agency (PCWA), Nevada Irrigation District (NID), and with consultants who, on behalf of Placer County, have diligently provided mapping, modelling, and documentation either directly or indirectly associated with the PCGC.

It should be noted that while the *1993 Comprehensive Facilities Master Plan (CFMP)* provided cursory information relative to wet utilities, subsequent reports, and mapping efforts performed by various consultants on behalf of the County have provided valuable information as the basis for our

methodology within both the findings and assessment sections of this report. These documents have been referenced throughout the report. Since there has been some lag between the time that these documents were prepared and today, this report seeks to update the inventory of existing utilities, their current function, and our assessment of capacity of each system as they exist today as well as the ability for each system to accommodate uses proposed in the Placer County Government Center Master Plan Update (PCGC Master Plan Update).

This Wet Utility Infrastructure Report is divided into three primary sections: Section 1, which details the efforts related to finding and compiling existing utility system data and maps and assessing utility capacity based on this data; Section 2, which finalizes the development of existing baseline utility models used to assess capacity and provides a summary analysis and recommendations of development alternatives towards developing the proposed Master Plan Update based on impacts to utilities; Section 3, which establishes proposed analytical models to assess capacity and provide recommendations of existing and proposed utilities to accommodate the 20-year horizon of the Master Plan Update.

Drawn by: WY | Plot Date: 8/5/16 | Project #: 216056
File Name: U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-FIGURE1-Vicinity Map and Campus Boundary(11x17).dwg

CARTWRIGHT
ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

LEGEND: — — — PROJECT BOUNDARY

150 0 150 300
SCALE IN FEET

PLACER COUNTY GOVERNMENT CENTER VICINITY MAP AND CAMPUS BOUNDARY

FIGURE NO.
1

0.2 EXISTING SITE DESCRIPTION AND HISTORY

The central historic core of the Placer County Government Center is the area formerly known as the DeWitt General Hospital (see Figure 2 below, ref. militarymuseum.org). Prior to acquisition for the DeWitt General Hospital, the majority of the site was used as pasture. The general area was primarily a producer of deciduous shipping fruit until the 1930s. Within five years preceding the establishment of former DeWitt, a portion of the land was converted to permanent irrigated pasture for livestock. Small farm buildings were present on site when the land was acquired by the War Department in 1943. Formerly the DeWitt General Hospital and then the DeWitt State Hospital, the site cared for battle casualties during the last two years of World War II (1943-1945) and thousands of mental patients after the State of California took over the property in the post-war years. In late 1945, DeWitt was deactivated and closed as an Army installation. The State of California then acquired DeWitt from the War Assets Administration in 1946. DeWitt was activated as a California State Hospital in the early summer of 1946. The state transferred the land to Placer County in 1972 after closing the hospital and the site eventually became known as the DeWitt Government Center, the core employment center for Placer County Government. The site is also referred to as the Placer County Government Center.

Today, the Placer County Government Center houses many County facilities including the Community Development Resource Center (CDRC), the Finance Administration Building (FAB) and Assessor's office, Health and Human Services (HHS), Facility Services (FS), the Auburn Justice Center (AJC), the County Jail and Juvenile Detention Center (JDC), the Women's Center, the Corporation Yard and the Animal Services Center. These facilities are a mixture of relatively new buildings (CDRC, FAB, AJC, County Jail and JDC) that have been built within the last 10 years and old buildings (FS, DPW, HHS) with structures built as early as 1942 (Placer County Government Center Facility Condition Assessment, May 2013). A portion of the older buildings and the site which they reside (approximately 66 acres) that are part of the old hospital compound are listed in the National Register of Historic Places (Auburn Journal, March 16, 2016).

In addition to the Government Center Facilities, the campus also leases land to The Home Depot, located in the northeast corner of 1st Street and Willow Creek Drive. The Home Depot was built and opened in 2015. Since then, there has been additional interest from other commercial retailers to locate within the campus boundaries.

Figure 2: Placer County Government Center Site in 1940's

0.3 CONTEXT OF SITE RELATIVE TO UTILITIES

With a good number of the 1940s structures still intact, specifically along the east and central portion of the existing campus (bound by Richardson Drive to the west, 1st Street to the east, B Avenue to the north and F Avenue on the south), the underground utility infrastructure is also quite old. Much of the underground utilities were constructed to service the hospital facilities in the 1940's with a good number of the pipe material being a vintage iron (cast and ductile) for waste and water lines (domestic and irrigation) as well as copper for domestic water. From a storm water perspective, much of this

specific area, conveys runoff by way of surface flow with little to no underground storm pipes used to convey runoff. The site's surface topography lends itself to good drainage, but this area is likely subject to localized flooding where existing underground storm improvements do not exist to alleviate the flooding.

The newly developed areas of the site have been improved with a more current standard for underground utilities. This includes a combination of plastic and ductile iron as well as corrugated metal and concrete. That said, many of the new areas are still interspersed with locations where older existing underground utilities may exist and the system may be impacted from a capacity standpoint as a result. Storm runoff in the areas outside of the 1940s era facilities but also within a portion of the older areas (the 200 series buildings – Facility Services) is generally collected in underground pipes by way of drainage inlets and catch basins. Runoff is conveyed to the natural low areas of the campus where existing wet and dry basins collect and ultimately convey runoff downstream.

An existing raw water irrigation canal also exists within the campus and runs from south to north along the eastern side of 1st Street. The surface canal carries raw water and exits the campus at Bell Road to the north where it continues to flow towards and eventually into the Combie Ophir Canal. This system is owned and operated by the Nevada Irrigation District (NID) and appears to have been in use since the early 1940s for farming and irrigation purposes. There appears to be a metered gate provided to the County for prescriptive rights to use at the canal and along the north side of the campus. While there exists a right to an allocated use of the raw water, the County does not currently utilize raw water onsite. Its potential use within the campus is warranted and further detailed in this report.

While the context of this report is focused exclusively on establishing, with relative confidence, an inventory of existing wet utilities and determining capacity of major systems, a condition and operating assessment of existing utilities can be a critical component to ascertaining the mid to long-term viability of the system and is a vital component in accurately assessing and analyzing the life-cycle of existing utilities. Short of this detailed assessment, certain assumptions have been made throughout this report and in our analysis relative to the functionality of the system and its general condition. Where we believe it is appropriate, we have indicated within the utility findings and assessment portion of this report specific recommendations where a more in-depth assessment of utility condition is warranted beyond the scope of this report.

SECTION 1: FINDINGS AND ASSESSMENT

1.1 METHODOLOGY

As previously mentioned, this comprehensive overview of wet utility infrastructure involves two primary components:

1. Collection of existing wet utility information by way data compilation, review of maps and documents, and meetings with key utility stakeholders along with a visual verification of utilities, where possible, by way of a site survey. For purposes of this report, this component will be referred to as the **Findings** phase of this report.

2. The **Assessment** phase of this report provides an overview of existing system capacities based on our independent review of the most current reports (as available), associated analyses, and modelling followed by our own verification, where applicable, of each system by conducting our own analysis or modelling and calibration of the system.

1.1.1 FINDINGS METHODOLOGY

For the Findings section of this report, we have applied the American Society of Civil Engineers (ASCE) Standard 38-02 (CI/ASCE 38-02), the "*Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.*" For this report, ASCE 38-02 applies to our methods to collect and depict existing underground water, sewer, and storm systems along with our collection and depiction of the NID canal along 1st Street. ASCE 38-02 defines four different Quality Level Attributes that pertain to the levels of depicted accuracy of the existing utilities from the least level of accuracy (Quality Level D) to the most accurate level of accuracy (Quality Level A). A brief description of each level (from least to most) is as follows:

- **Quality Level D:** Existing utilities are depicted on a map, drawing or plan based on the engineer's collection of utility record information, as-builts, service, and facility maps. This data can also be verified or provided verbally by a utility owner with first-hand knowledge of the location of the owned utility and documented on the map as information provided directly by an owner without the benefit of an existing record map.

- **Quality Level C:** The engineer further verifies Quality Level D data and mapping by visually verifying surface appurtenances of existing subsurface utilities by reviewing a topographic plan and ground surface or by performing a site survey to collect the surface appurtenances. Once collected and mapped, these surface appurtenances are correlated against utility records collected during Quality Level D and resolving, as applicable, any potential differences. The correlation may also verify and further refine the connection of utility lines from surface feature to surface feature (i.e. water valve to hydrant, manhole to manhole, catch basin to manhole).

- **Quality Level B:** In conjunction with Quality Levels D and C, engineer utilizes a suite of surface geophysical methods to search for utilities by detecting a trace of the utility and

marking the trace in the field to be surveyed. The surveyed markings are to the accuracy and precision dictated by the project's survey control. Once surveyed, the 'designated' utilities are depicted on a map with line work distinguished as to the type of utility. Any utilities depicted through Quality Level B supersede, by virtue of accuracy level, the line work established on the maps determined through Levels C and D.

- Quality Level A: Where the specific horizontal and vertical position of a utility requires a precise determination in design and in an effort to resolve conflicts, Quality Level A is employed. The current practice to perform Level A is by physically exposing the underground utility at the location needed by way of excavation through minimally intrusive means. Once the specific location is exposed, a survey to determine the precise horizontal and vertical position of the utility (top and/or bottom) is performed with the project survey datum established to determine horizontal/vertical position, elevation of the existing ground above the utility, the outside diameter, or dimensioned details related to the utility.

Quality Levels A and B are typically performed during the development of precise design level documents when a project is ready to be permitted for construction. These levels are generally not warranted during the planning or Master Planning phase of a project. For the Placer County Government Center and for the evaluations necessary to perform an assessment of the existing system as well as an analysis of a combined system of existing and proposed utilities towards the establishment of a Master Plan, Quality Level D and limited (described in detail below) Quality Level C is more than sufficient.

The primary maps utilized during the Quality Level D process were the County provided Water, Sanitary Sewer and Storm Drain Plans as well as the composite Utility Plan provided as part of Addendum 2 to the Request for Proposals, as prepared in November of 2010 by West Yost Associates Consulting Engineers. It is understood that these plans involved the latest utility mapping exercise related to the overall campus and the CAD drawing information reflects the survey work that went into preparing these maps to a control system approved by the County and correlated with the site's latest topographic survey provided by the County and prepared by Andregg Geomatics as Aerial Mapping with Photography dated June 26, 2015 at a scale of 1"=100'. These maps are a compilation of record data obtained by West Yost. Since these maps were prepared in late 2010, Cartwright also requested a review of the maps by County staff as well as other utility purveyors (PCWA and NID) to provide further update and revision based on utility improvements that may have occurred subsequent to November of 2010 or based on information gathered and confirmed on the existing utility systems that takes the place of how they were depicted in the West Yost Plans.

The aforementioned topographic aerial map prepared in June of 2015 by Andregg along with initial site visits formed the basis for a limited Quality Level C assessment. The limited Quality Level C process includes verification of the wet utility systems by our review of surface appurtenances that are shown on the Andregg map followed by our initial site visits conducted in late July and early August intended to further verify the presence of utility surface features to further confirm the depiction of utilities as shown on the West Yost plans. This report and associated maps document

field and map review findings and identify any discrepancies or updates to the West Yost plans with a recommendation where needed to resolve any potential discrepancies. If site visits identified utility surface features that were previously not shown on the West Yost Plans or the Andregg topographic survey those surface features, collected data (horizontal and vertical by general field tape measurements as accessible), have been noted in these findings. Since this exercise is focused on developing an update to the Master Plan, a more accurate survey of these surface features based on the project's datum and surveyed control is not provided herein as this level of accuracy is not warranted at this time. Should this become necessary during the development of alternatives towards a Master Plan where more accurate information is necessary, coordination of those elements will be done at that phase of the project. This is the reason for the limited Quality Level C exercise at this point.

Based on the methodology associated with the findings, it is possible to depict the system and develop the basis for performing the assessments and analysis of system capacities for water, fire, irrigation, sanitary sewer, and storm.

1.1.2 ASSESSMENT METHODOLOGY

Once the utilities are defined as described in the Findings section, a transition to the methodology for assessing the applicable utility system and associated capacities is made. As mentioned, the assessment entails a two-step phased approach:

- Phase 1: Review existing reports and associated models and analysis and report on the review of system capacities and potential deficiencies as detailed in these reports.
- Phase 2: Develop assessments and analysis of each utility system utilizing the reports gathered in Phase 1 above as the baseline. In addition to referencing the previous reports as a baseline and recognizing that engineering standards, guidelines and agency requirements have potentially evolved since the preparation of the referenced reports, each modelled and calibrated system will take that into account. If new data has become available from respective agencies as an update to the referenced report, this new data will also be utilized as a replacement to any older data used in prior analyses. Section 1 of this report currently documents our assessment based on Phase 1. Phase 2 is documented within Sections 2 (Development Alternatives) and 3 (Master Plan) and a baseline analytical model has been developed for each applicable utility and for existing conditions as the basis for the Phase 2 assessments within Sections 2 and 3.

For Phase 1 above, the following reports were gathered, reviewed and referenced as part of the assessment methodology:

Water (fire and domestic):

1. Technical Memorandum of the Placer County DeWitt Center Fire Flow Evaluation, June 25, 2012, West Yost Associates, Consulting Engineers

A copy of this memorandum can be found in Appendix A of this report.

Sanitary Sewer:

2. North Auburn DeWitt Trunk Sewer Capacity Evaluation Report, March 6, 2015, Stantec Consulting Services, Inc. prepared for Western Care Construction, Inc.
3. Auburn Creekside Project Specific Report, June 10, 2015, Stantec Consulting Services, Inc. prepared for Auburn Pacific Properties, LLC

A copy of both reports can be found in Appendix C of this report.

Storm:

Pursuant to a meeting held August 1, 2016 with key staff members of Placer County Department of Public Works and Facilities, specifically Mary Keller, Placer County Stormwater and Floodplain Program Coordinator and Dennis Hughes, Assistant Building Maintenance Superintendent, the campus has not developed an overall Master Drainage Report detailing system capacities and describing a storm water management plan with criteria for collection, conveyance, treatment, and attenuation. The Placer County Flood Control and Water Conservation District Storm Water Management Manual (SWMM, February 1994) will be referenced where applicable to the storm water system design. In addition, the West Placer County Storm Water Quality Design Manual will be the referencing manual and methodology for assessing and planning the storm systems with regard to current general permit requirements for storm water management.

While the Placer County Government Center currently lacks a campus-wide study, a number of local projects within the PCGC have prepared drainage reports and analyses as part of the development of that specific project. A number of those reports have been provided by the County as well as the plans and as-builts designed and built based on the drainage reports. These documents are too numerous to list in this section of the report. A thorough and complete list of documents and reports is listed in Section 2.1 of the Master Drainage Report included in the Appendix (D) of this report.

Lastly, information provided by utility stakeholders in meetings relative to existing utility capacities and deficiencies must also be considered, especially in situations where the campus is dependent on a supply from outside sources. This is especially applicable to the campus' water system and its ability to meet fire suppression needs and peak demands from an outside supply source.

1.2 FINDINGS (ASCE 38-02)

1.2.1 WATER

Figure W-1 of this section provides an overview of the County's existing campus water distribution system in conjunction with the surrounding and influencing water lines owned and operated by PCWA and NID. A majority of the onsite system has been previously confirmed and depicted in the referenced West Yost Water Plan (November 2010). A series of unconfirmed lines have also been depicted as Quality Level D information (ASCE 38-02) and are denoted on Figure W-1. Our initial site visit and observation on August 1, 2016 of above ground water facilities including fire hydrants, valves, and fire department connections have aided in verifying the presence of underground waterlines both on the confirmed and unconfirmed lines (limited Quality Level C) but at this point

the information is not sufficient enough to be able to change the designation of the unconfirmed lines.

An initial site observation was conducted on August 1, 2016 and counted approximately 65 fire hydrants throughout the campus. However, at the time of the visit, access was not available to secure portions of the campus (Jail, Women's Center), which may alter the number of actual hydrants. In addition, a request was made for updated hydrant flow data. As a result, updated flow tests for hydrants throughout the Government Center were received in February 2018 and incorporated into the updated (calibrated) water model. An inventory of onsite water pipes, line sizes and fire hydrants is shown in Figure W-2 of this section. Much of this data has been obtained from the West Yost Technical Memorandum for the Placer County DeWitt Center Fire Flow Evaluation (June 25, 2102) and further confirmed by Placer County staff. The West Yost model was updated to include the new information gathered by County Staff as well as information about connections to PCWA and NID. This is the basis for the model which was calibrated to the fire flow tests performed in 2018 (See Section 1.3).

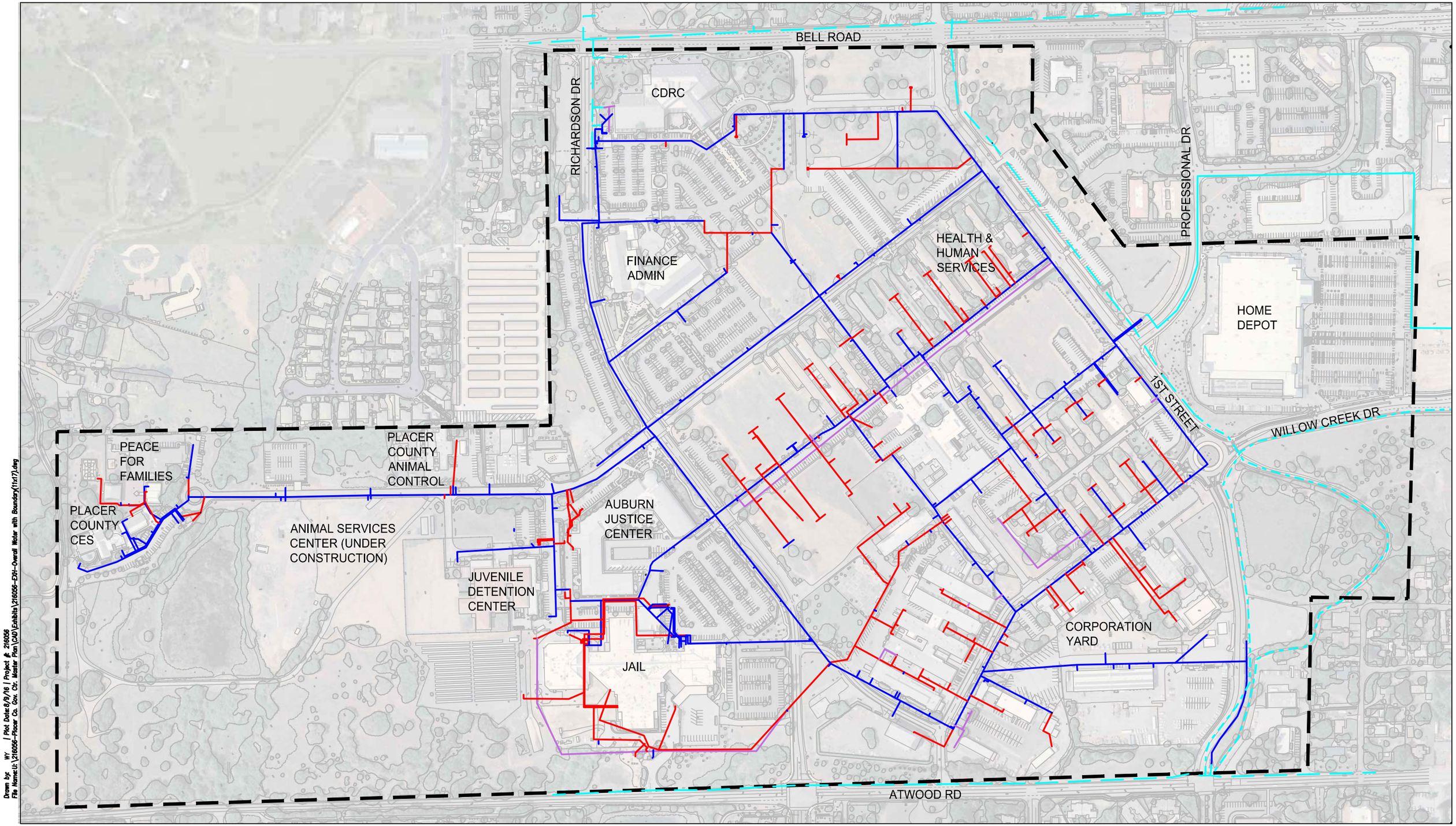
The Placer County Government Center receives water from PCWA through a single metered connection located on the east side of 1st Street and immediately north of Professional Drive. This connection includes two reduced pressure detector assemblies in parallel (AMES 5000 CIV) and one turbo meter (Recordall Turbo 3500 Meter). The metered connection and the two RP assemblies are shown in Figure W-3. One exception to the single metered connection involves water service to the Community Development Resources Center located in the southeast corner of Richardson Drive and Bell Road. It is currently understood that NID provides both domestic and fire service to the CDRC.

Notably absent from a number of County facilities were the presence of Double Detector Check Assemblies or Reduced Pressure Detector Assemblies. While the connection to the PCWA system is protected by backflow prevention devices, the campus system is not protected by the potential for cross contamination. This report is focused on flow capacity and does not address system protection and state health standards imposed on water purveyors to protect the public with safe drinking water. If the campus water system is to be owned and operated by either PCWA or NID, the installation of backflow prevention devices will be required and flow with the associated pressure and head loss parameters at each protected facility must be applied to the model when analyzing fire suppression.

Based on our review of the West Yost Technical Memorandum, the PCGC has two emergency connections to the Nevada Irrigation District (NID). The first connection is located at Richardson Drive and Bell Road (see Figure W-4) and the second connection is located at 1st Street and Atwood Road (see Figure W-5). These connections have been further verified by provided NID Facility Maps, the West Yost Water Maps (November 2010), and the NID Willow Creek & 1st Street Transmission Main Plans. According to the West Yost Technical Memo, the connections to NID are for emergency conditions only and are normally closed valves that must be opened manually. It was determined that without an automatic opening valve the NID system could not be reliably depended on during a fire event, even if the connection is occasionally left open. However, recent

discussions with NID indicate their willingness to investigate the feasibility of implementing an automated system to allow valves to fully open during a fire event.

Aside from the current Animal Control Building no other onsite County facilities are individually metered. Consequently, actual demand data cannot be determined for each specific County building. The West Yost Technical Memorandum has established demands based on data received from PCWA at the metered connection to the campus as well as actual metered flows at the Animal Control Building. Estimated demands at the Juvenile Detention Center and Jail have been applied based on a factor associated with the number of beds occupied. These demands were referenced as part of the assessment in section 1.3 below. This report further establishes planning level demands under a peak day scenario which is used to update Master Plan demands as part of the analysis detailed in sections 2 and 3.



Drawn by WY | Plot Date:8/8/16 | Project #: 216056
File Name:U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Overall Water with Boundary(11x17).dwg

CARTWRIGHT
ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

LEGEND:

- UNCONFIRMED WATER LINE
- PCWA LINE
- COUNTY WATER LINE
- NID LINE (INCLUDING NID CANAL)
- IRRIGATION LINE
- PROJECT BOUNDARY

150 0 150 300
SCALE IN FEET

PLACER COUNTY GOVERNMENT CENTER
OVERALL WATER SYSTEM

FIGURE NO.
W-1

NOTE:

1. POTENTIAL CLOSED/BROKEN VALVE LOCATIONS BASED ON INFORMATION PROVIDED BY PLACER COUNTY STAFF.
2. FIRE HYDRANT LOCATION DISCREPANCIES BETWEEN THE JUNE 25, 2012 TECHNICAL MEMO AND THE NOVEMBER 2010 WATER PLAN HAVE BEEN ASTERISKED. FINAL SITE VERIFICATION OF FIRE HYDRANTS IS WARRANTED.

BELL ROAD
RICHARDSON DR
CDRC
FINANCE ADMIN
HEALTH & HUMAN SERVICES
PROFESSIONAL DR
HOME DEPOT
PCWA CONNECTION
PCWA WATER METER
(2) PCWA DOUBLE CHECK DETECTOR ASSEMBLY
1ST STREET
WILLOW CREEK DR
NID CANAL
PEACE FOR FAMILIES
PLACER COUNTY ANIMAL CONTROL
PLACER COUNTY CES
ANIMAL SERVICES CENTER (UNDER CONSTRUCTION)
AUBURN JUSTICE CENTER
JUVENILE DETENTION CENTER
JAIL
CORPORATION YARD
ATWOOD RD

Drawn by:
File Name:U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Overall Water Existing System(11x17).dwg | Plot Date:8/9/16 | Project #: 216056

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

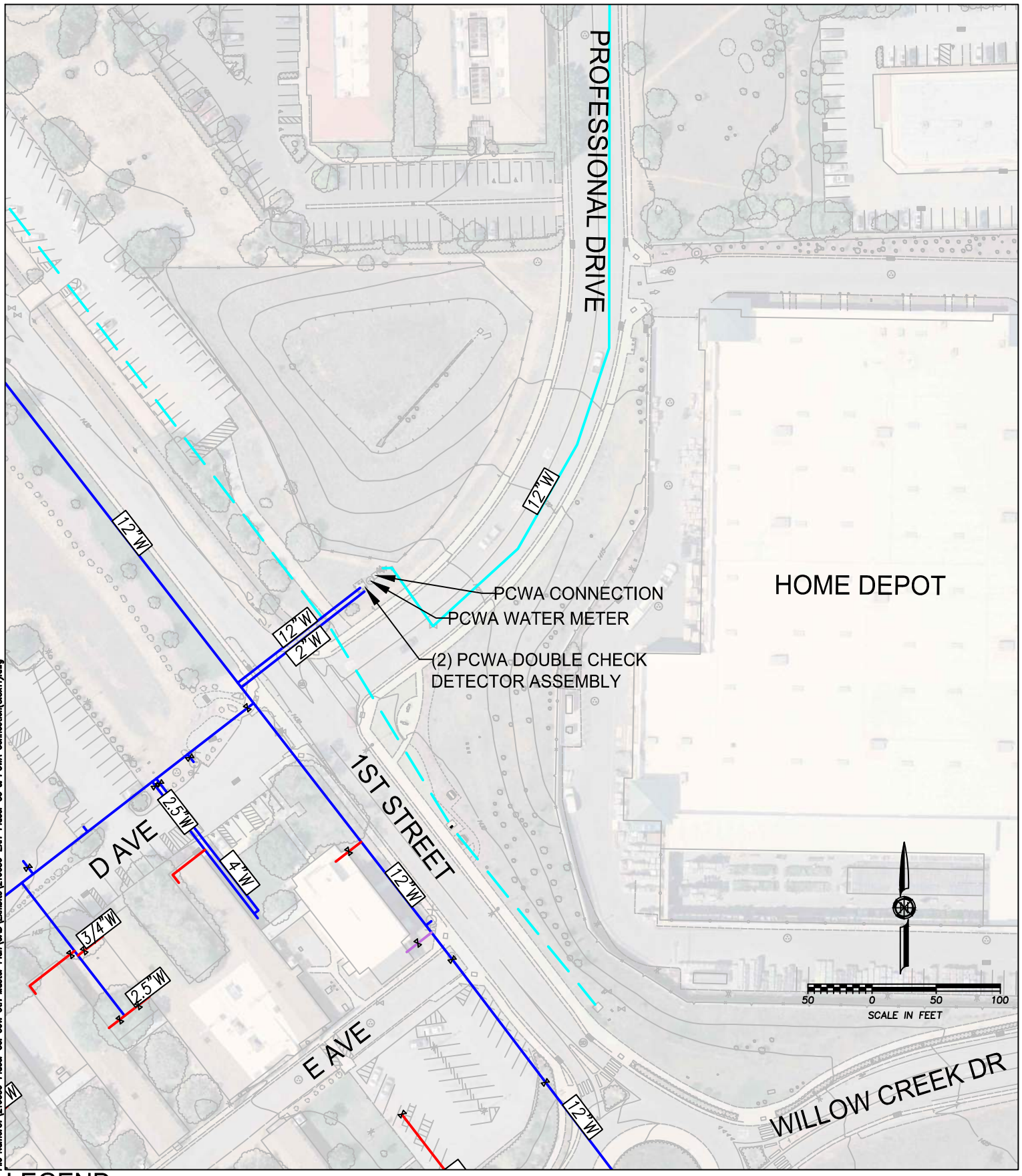
LEGEND:

- 4" DIAMETER AND LESS
- 6" DIAMETER
- 8" DIAMETER
- 10" DIAMETER
- 12" DIAMETER
- POTENTIAL CLOSED/ BROKEN VALVE
- FIRE HYDRANT
- 16" DIAMETER (NID)

150 0 150 300
SCALE IN FEET

PLACER COUNTY GOVERNMENT CENTER ON-SITE WATER SYSTEM

FIGURE NO.
W-2



Drawn by: WY | Plot Date:8/9/16 | Project #: 216056
File Name:U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Placer Co. & PCWA Connection(8.5x11).dwg

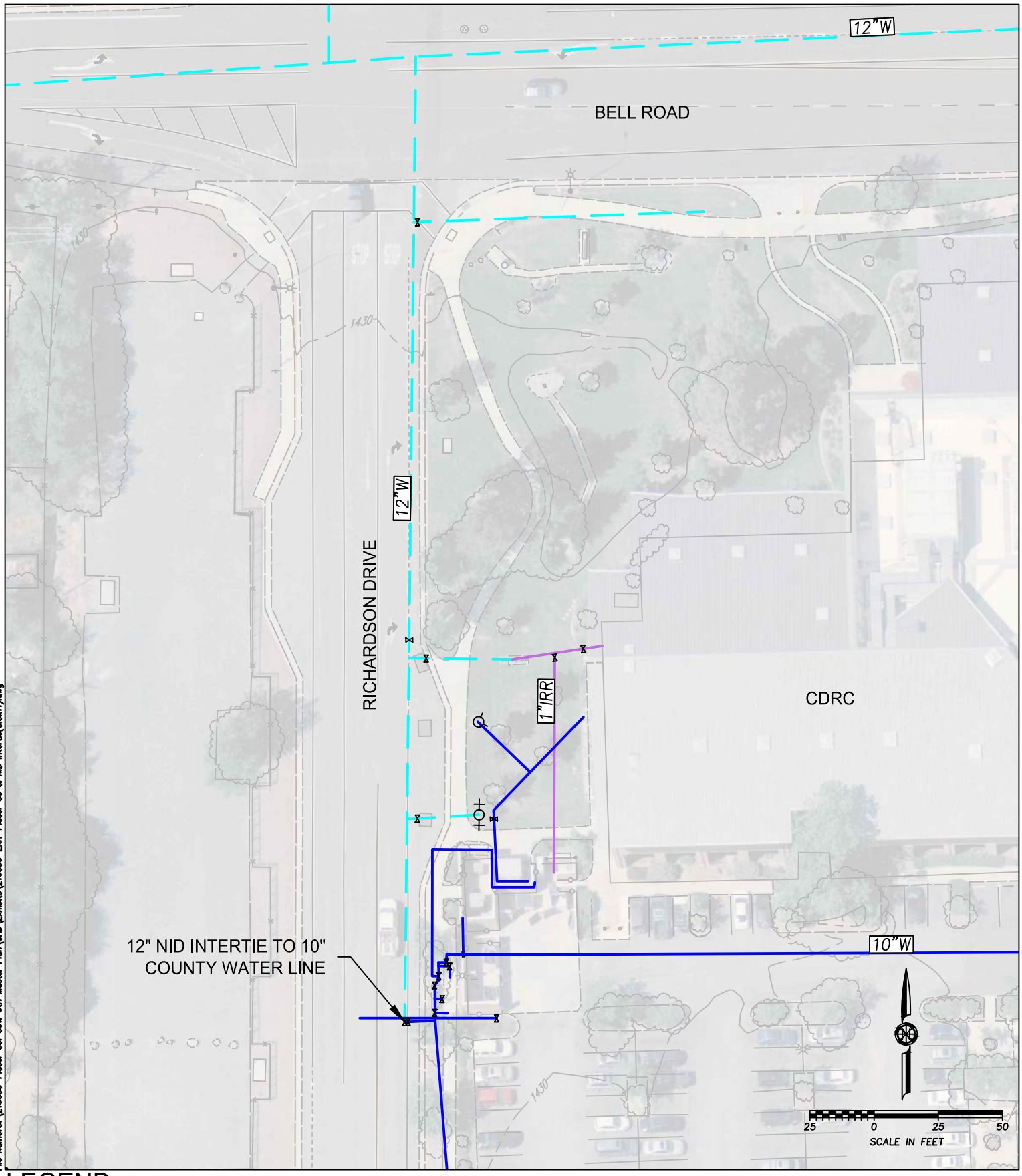
LEGEND:

- UNCONFIRMED WATER LINE
- PCWA LINE
- COUNTY WATER LINE
- NID LINE
- IRRIGATION LINE

CARTWRIGHT
ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY
GOVERNMENT CENTER
PCWA METERED CONNECTION

FIGURE NO.
W-3



LEGEND:

COUNTY WATER LINE

IRRIGATION LINE

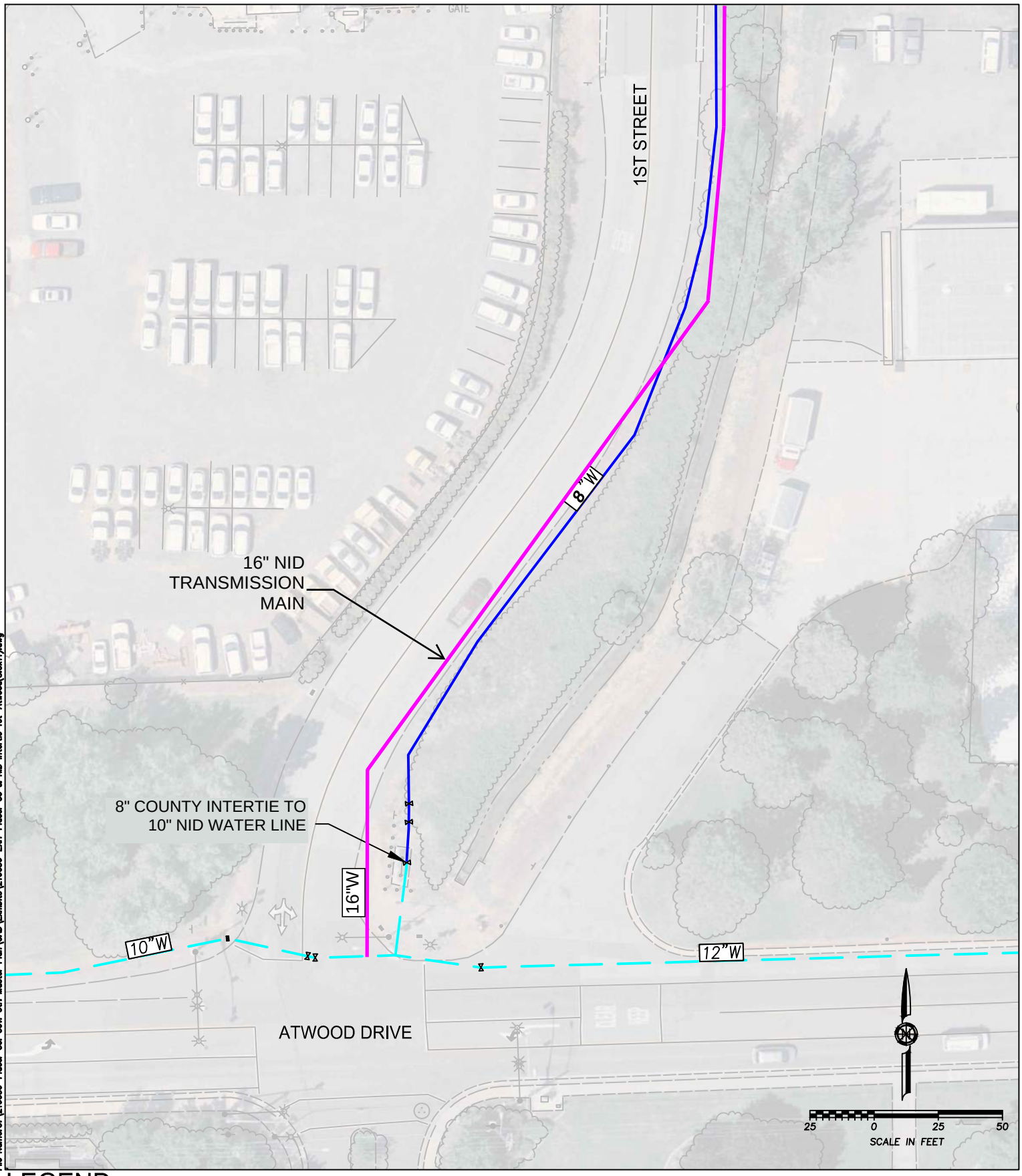
NID LINE

CARTWRIGHT
ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY
GOVERNMENT CENTER
NID CONNECTION AT
RICHARDSON AND BELL

FIGURE NO.
W-4

Drawn by: WY | Plot Date:8/10/16 | Project #: 216056
File Name:U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Placer Co. & NID Intertie(8.5x11).dwg



Drawn by: WY | Plot Date:8/10/16 | Project #: 216056
File Name:U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Placer Co & NID Intertie 1st-Atwood(8.5x11).dwg

LEGEND:

COUNTY WATER LINE

NID TRANSMISSION MAIN

NID LINE

CARTWRIGHT
ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY
GOVERNMENT CENTER
NID CONNECTION AT
1ST AND ATWOOD

FIGURE NO.
W-5

1.2.2 IRRIGATION

Figure W-1 illustrates the existing onsite irrigation system based on the limited field reconnaissance by Cartwright (August 2016), the Placer County Dewitt Center Water Lines & Water Services Map (Jan. 84, Feb. 86, July 86, Nov. 86; refer to Appendix B), and the survey and mapping performed by West Yost (November 2010). The DeWitt Center irrigation system has largely been installed off of individual building domestic water services and are not separate irrigation systems, a majority of which are absent backflow prevention devices. This practice was very common during the operation of the facilities from the 40's – 80's where these facilities were irrigated utilizing manual sprinklers and hoses; to the 80's – late 90's where installation of underground sprinkler systems were tied into building water supplies. The County Facilities and Grounds Department has begun installing reduced pressure principal (RP's) back flow protection as new improvements or system repairs take place to prevent backflow contamination to domestic water services.

It is also understood that the campus has prescriptive rights to raw water from the NID canal that runs along the east side of 1st Street. The current allocation of raw water from NID is up to 12 miner's inches or approximately 135 gallons per minute (GPM). Raw water can be drawn from the existing canal by way of a metered structure. Also, based on initial discussions with the County and a cursory site visit on August 1, 2016, this structure is located along the existing canal on the east side of 1st Street just north of its intersection with B Avenue. The details regarding the structure are beyond the scope of this report. Further information on the raw water irrigation system can be found in section 1.3.2 Irrigation.

1.2.3 SANITARY SEWER

The sewer facilities on the PCGC site are within the Sewer Maintenance District 1 (SMD 1). The collection system in this area consists of two main sewer trunks, the DeWitt trunk and the Highway 49 trunk. These trunks convey flows from the southern portions of the SMD 1 service area to the County Wastewater Treatment Plant located on Joeger Road west of Highway 49 and north of Dry Creek Road in the unincorporated area north of the City of Auburn. The majority of the sewer catchment areas on the PCGC site flow into the DeWitt trunk, but the eastern portion of the PCGC flows into the Highway 49 trunk. An overview of the DeWitt trunk and Highway 49 trunk lines showing pipe trunk lines and catchments are shown in Figure SS-01 and Figure SS-02, respectively, located at the end of this section.

In order to provide an accurate assessment of the sanitary sewer system, the existing infrastructure required identification and mapping. The first step in determining the existing sewer infrastructure was obtaining existing maps and as-builts (ASCE 38-02 Quality Level D). The County supplied sanitary sewer maps from several sources including maps prepared by West Yost and Associates dated November 2010, maps and reports prepared by Stantec Consulting Services finalized in 2015 and 2016, and construction documents from recent developments in the area. Also utilized were Sewer Inflow Improvement Plans, dated June 1979, for the Dewitt Center prepared by Falconi and Associates as well as improvement plans for the Auburn Office Complex, dated July 2002, prepared by Warren-Green Engineering. Additionally, the County provided an aerial topographic map showing surface features performed by Andregg Geomatics dated June 26, 2015.

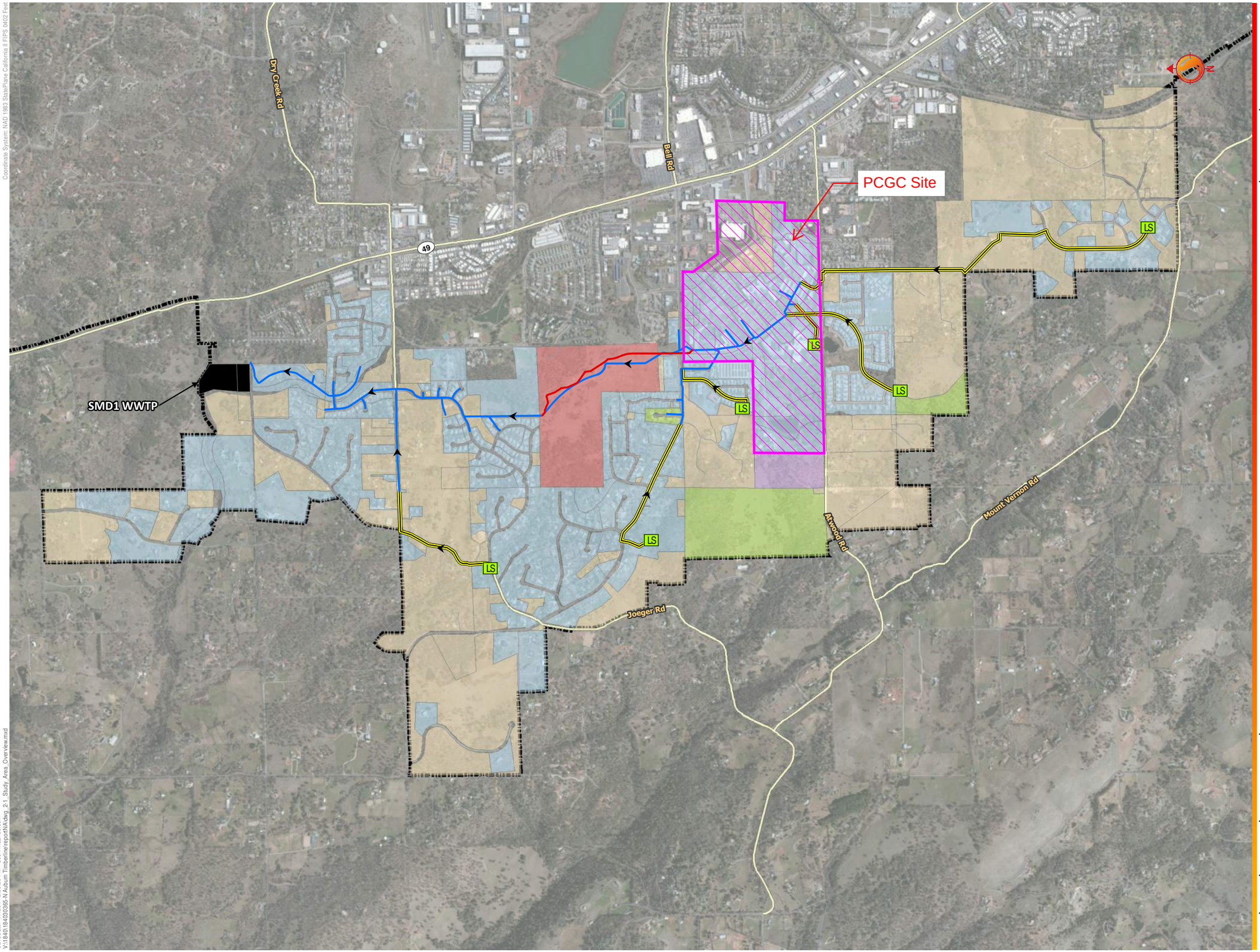
A comprehensive review of these provided maps and as-built plans was performed. After review and comparison of the current topographic survey to the West Yost Associates maps, it was found that there have been significant changes since 2010 when the West Yost maps were prepared that required further investigation. After assessing the maps for discrepancies, areas requiring verification and more information or clarification were identified, resulting in a site visit to perform the verification and gather additional information (Limited ASCE 38-02 Quality Level C).

The sanitary sewer site visit was performed on August 2, 2016 for the purpose of verifying the provided maps, obtaining additional information, and for clarifying discrepancies identified in our desktop review and found the majority of the West Yost Associates 2010 maps to be correct with a few variances. The variances consisted of some new manholes, some removed manholes, and a few locations where the connections shown on the maps were different in the field.

The Andregg topographic survey identified manhole information not included on the West Yost Associates maps, primarily in and around the Placer County Jail and in the area at the west end of B Avenue. While access to the Jail was possible to identify manholes, pipe sizes, and flow directions for inclusion in this report. Access was not available to the secured west end of B Avenue to perform site investigations. This is important since there is a lift station in this area and future development both north and south of the area could rely on the current unverified/unidentified pipe network. Verification was made of the outfall location and pipe size of the force main associated with this lift station as a manhole in B Avenue just south of the Placer County Animal Control building.

The most significant update to the West Yost maps identified were the sewer lines on the south end of the Placer County Auburn Jail and the newly renovated lift station with its associated inflow pipes and force main. A map of the areas updated or modified is included as Figure SS-03. See section 1.3.3 for a complete assessment of these findings.

In addition to maps provided by the County, topographic survey, and site visits, the County provided several sewer capacity evaluation reports prepared by Stantec Consulting Services which have been reviewed and incorporated into this report. These reports are specifically referenced in Section 1.1.2 of this report and a complete copy of the reports are also included in Appendix C.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/7/2014 2:28:20 PM User: maanderson
V:\1840\184030365-N Auburn Timberline\report\NA\dwg_2-1_Study_Area_Overview.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Sanitary Sewer
- Proposed New Sewer Alignment
- Forcemain

Scenario

- Existing Catchments
- Existing Catchments with Internal Growth
- Entitled Catchments
- Full Buildout Catchments
- Timberline Development Lands
- SMD1 WWTP
- SMD1 Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

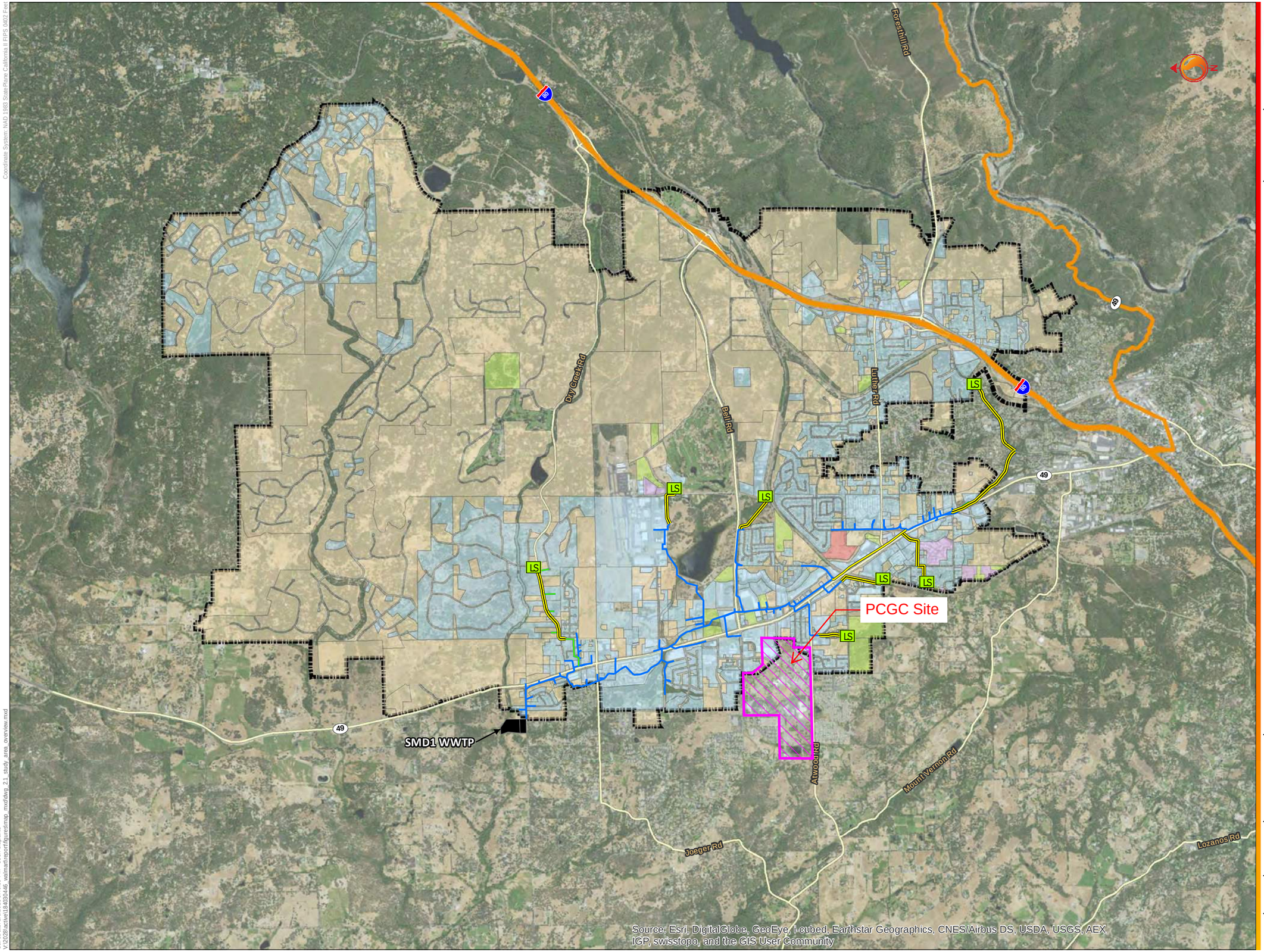
Study Area Overview

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
SS-01

Issue/Revision
A/



Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

Save date: 1/9/2015 9:46:55 PM User: blaplante
V:\2028\active\184030446_walmartreport\figures\map_mxd\dwg_2-1_study_area_overview.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Sanitary Sewer
- Siphon
- Forcemain
- Low Pressure Sewer
- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Walmart Development Lands
- Full Buildout Catchments
- Hwy49 Buildout Boundary
- LS Lift Stations

Client/Project

RSC ENGINEERING, INC.
SEWER CAPACITY EVALUATION - WALMART
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

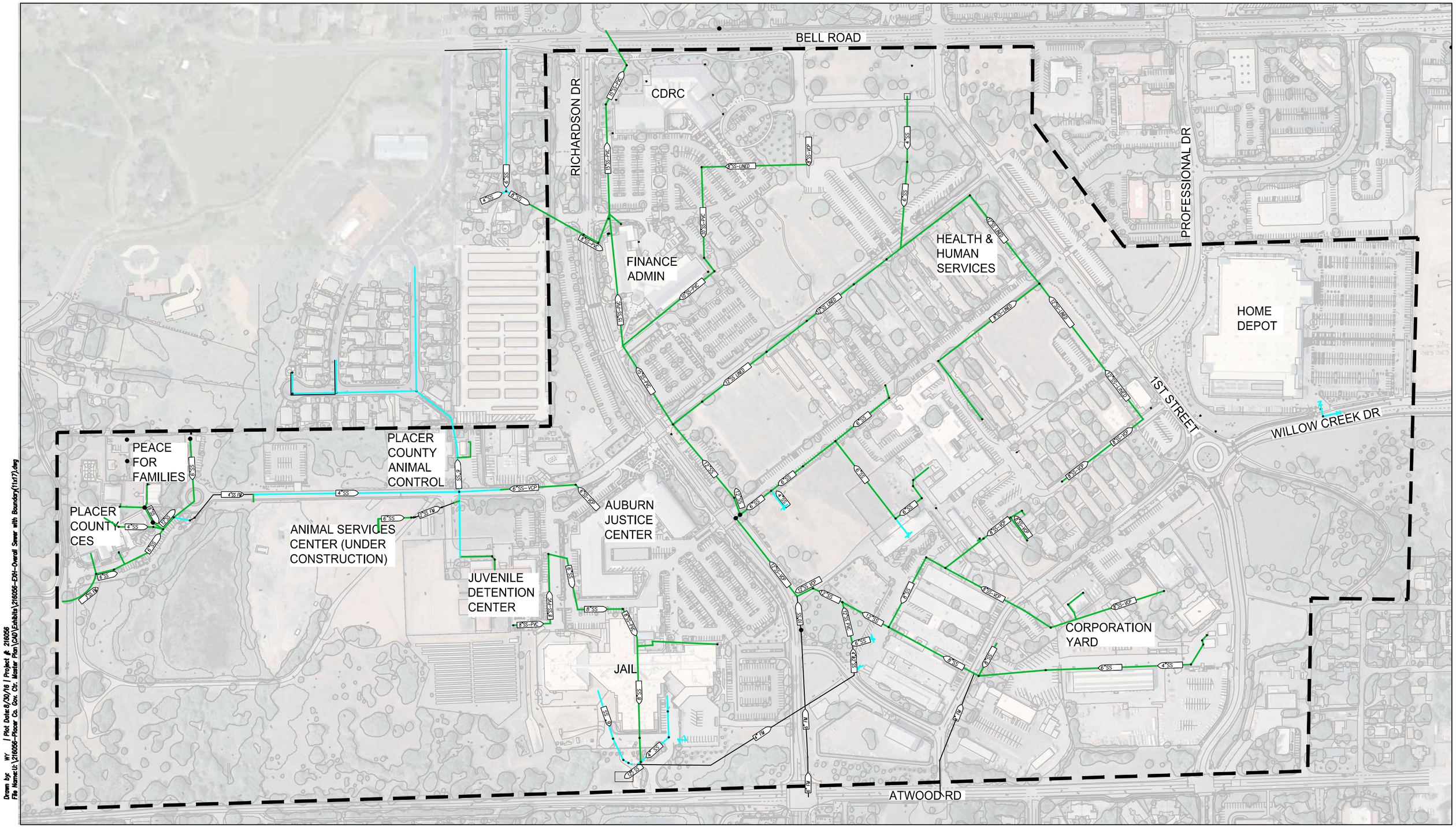
Study Area Overview

Project No. **184030446**

Scale 0 0.2 0.4 0.6 0.8 Miles

Figure No. SS-02

Issue/Revision A/



Drawn by: WY | Plot Date: 8/30/16 | Project #: 216056
File Name: U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Overall Sewer with Boundary(11x17).dwg

CARTWRIGHT
ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

LEGEND:

- SEWER LINE
- FIELD VERIFIED SEWER LINE
- PROJECT BOUNDARY

150 0 150 300
SCALE IN FEET

PLACER COUNTY GOVERNMENT CENTER
OVERALL SANITARY SEWER SYSTEM

FIGURE NO.
SS-03

1.2.4 STORM DRAIN

In order to approach the findings of the entire storm water system it was necessary to separate the findings into several sections. Those sections are: storm drainage pipe network, watersheds, and storm water quality.

1.2.4.1 STORM DRAINAGE PIPE NETWORK

To provide an accurate assessment of the storm drainage system, the existing infrastructure required identification and mapping. The first step was obtaining existing maps and as-builts. The County supplied storm sewer maps prepared by West Yost and Associates dated November 2010 and construction documents from recent developments in the area. These recent developments were the Home Depot, the Willow Creek Shopping Center, the Auburn Justice Center, Placer County Main Jail Housing Unit 4, the Financial Administration Building, the Dewitt Center (CDRC), and the Animal Services Center. Additionally, the County provided an aerial topographic map performed by Andregg Geomatics dated June 26, 2015.

A comprehensive review of these provided maps and as-built plans was performed. After review and comparison of the current topographic survey to the West Yost Associates maps, it was found that there have been significant changes since 2010 when the West Yost maps were prepared which required further investigation. After assessing the maps for discrepancies, Areas for verification and areas requiring more information or clarification, finally planning a site visit to perform the verification and gather additional information.

The site visit was performed on August 3rd and 4th, 2016 and found the majority of the West Yost Associates 2010 maps to be correct with a few variances. The variances consisted of some new manholes and inlets not previously identified, some inlets and manholes which have been removed, and a few locations where links between structures were found to be different than shown on the maps.

The Andregg topographic survey identified manhole and inlet information not included on the West Yost Associates maps, primarily in and around the Placer County Jail, B and C Avenues, and in the area at the secured west end of B Avenue. While it was not possible to access the County Jail to identify manholes, inlets, some pipe sizes, and flow directions for inclusion in this report. Access was possible to the secured west end of B Avenue to perform site investigations. Accessing this area will be important since there are several ponds in this area and the potential for future development both north and south of the area could rely on the current unverified and unidentified pipe network. The most significant update to the West Yost map identified was along 1st Street between B & C Avenues. Additionally, the area along Ian Lane to the northwest of the PCGC was not part of the West Yost study but was identified as contributing to on-site drainage. A map showing the areas updated or modified is included as Figure SD-01 at the end of Section 1.2.4. See section 1.3.4 for a complete assessment of these findings.

1.2.4.2 WATERSHEDS

The Andregg Geomatics aerial survey data was used to determine the watersheds within the PCGC and was supplemented with the USGS topographical maps where necessary. The PCGC

consists of six (6) separate overall watersheds. Figure SD-02 shows the watershed delineations. The figure also identifies the outfall points where concentrated flow leaves the PCGC site limits. The table below shows the total catchment areas, pervious areas, and percent impervious for each catchment basin.

Table 1 – Summary of Watershed Areas

Catchment	Watershed Area, A (ACRE)	Pervious Area, Ap (ACRE)	Percent Impervious (%)
1	88.50	59.30	33.0%
2	41.40	20.24	51.1%
3	12.80	4.74	63.0%
4	12.70	7.84	38.3%
5	29.90	12.98	56.6%
6	45.80	15.48	66.2%

The existing land uses within these watersheds were determined from data that was provided by the County and is shown for all watersheds in Figure SD-03. The primary land use type is commercial with some low density residential, rural, open space, and mixed-use types within the drainage watersheds. All roadways were considered paved. Soil type is important in the calculation of water quality treatment measures as well as in determining runoff. No soil reports were provided but according to the Natural Resources Conservation Service Hydrologic Soils Maps, the soil in the entire PCGC site area is Type C.

A detailed baseline model was developed and is described in subsequent sections of this report, and the above hydrologic parameters were further refined and adjusted to meet the applicable design standards and criteria (current Placer County Manuals). In addition, each overall catchment was subdivided into sub-catchments to further define the path of travel and route of storm water to the ultimate catchment outfall.

1.2.4.3 STORM WATER QUALITY

No water quality infrastructure was identified on the maps or in the information provided by the County. The site visits found the existing storm water quality infrastructure is minimal within the project boundaries and the catchment areas of which the PCGC is a part. The catchment areas are shown in Figure SD-02. The PCGC spans a topographic high point, with the western portion of the site (roughly 80% of the total area) draining south into the North Auburn Ravine watershed and the eastern portion draining north into the Rock Creek Watershed. While portions of the watersheds are outside of the PCGC and existing infrastructure is currently without treatment and fall outside of the water quality requirements for the County, any new development will need to incorporate treatment methods. Based on these field visits, there were a total of four (4) possible storm drain inlet mechanical filters located within the existing government center. These were located in the County's corporation yard and facility

services area, as well as along the Professional Drive frontage by the Home Depot. See Figure SD-01 for an overall existing storm drain system map that shows the few locations where mechanical water quality devices were noted. It is known that the existing Home Depot development was designed for a certain level of water quality treatment based on their Drainage Report, dated 3/26/2007. Additional water quality measures are a recommendation of this report for the campus and as each individual project within the PCGC comes online. It is anticipated that a project-specific report, in conjunction with the more comprehensive Master Drainage Report included herein (Appendix D) will be the defining standard for the development of project-based water quality measures that meet the criteria established in the West Placer Stormwater Quality Design Manual (April 2016).

Drawn by: WY | Plot Date:8/30/16 | Project #: 216056
File Name:U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Overall Storm with Boundary(11x17).dwg

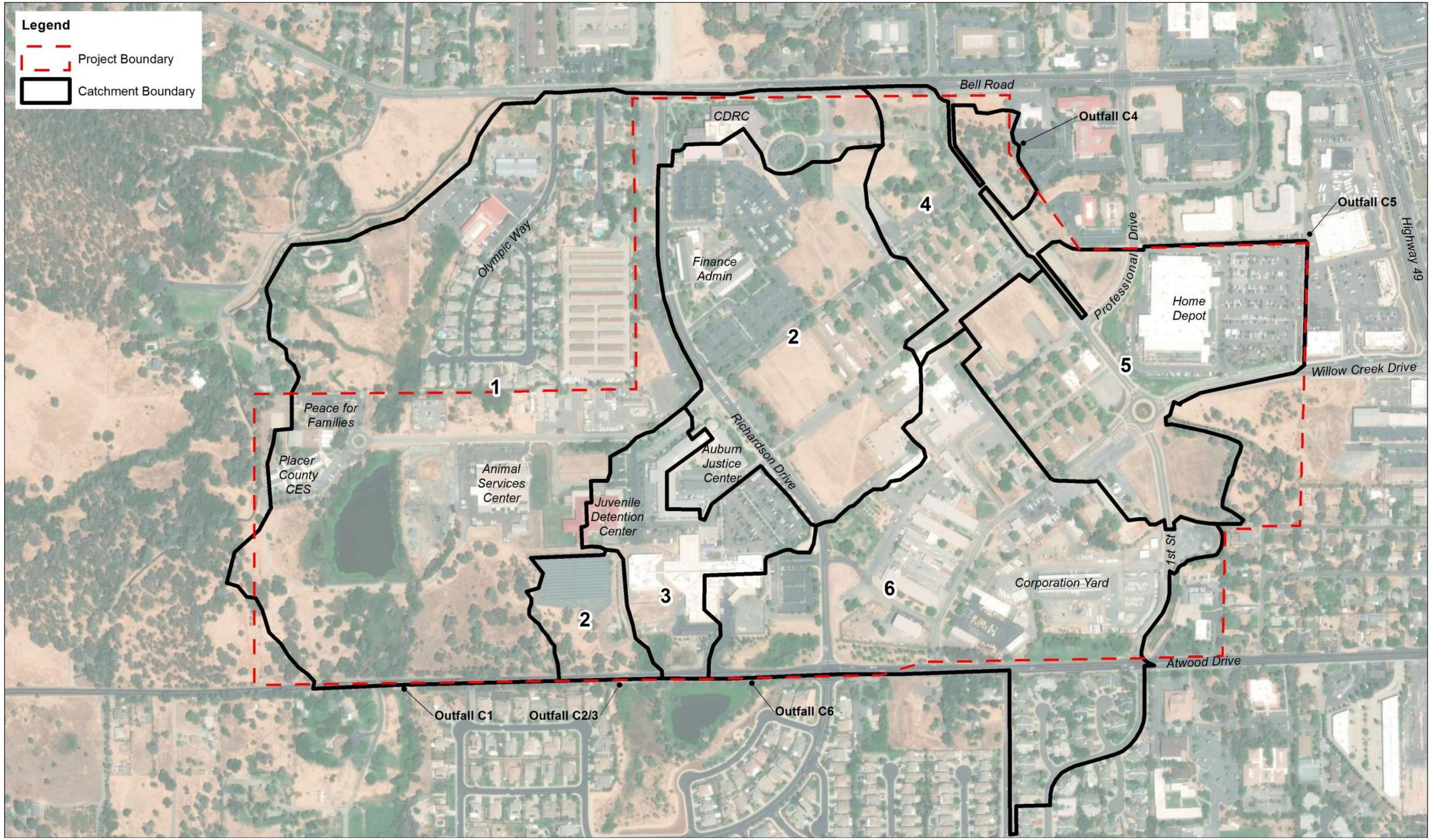
CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

LEGEND: — — — PROJECT BOUNDARY

150 0 150 300
SCALE IN FEET

PLACER COUNTY GOVERNMENT CENTER
OVERALL STORM DRAIN SYSTEM

FIGURE NO.
SD-01

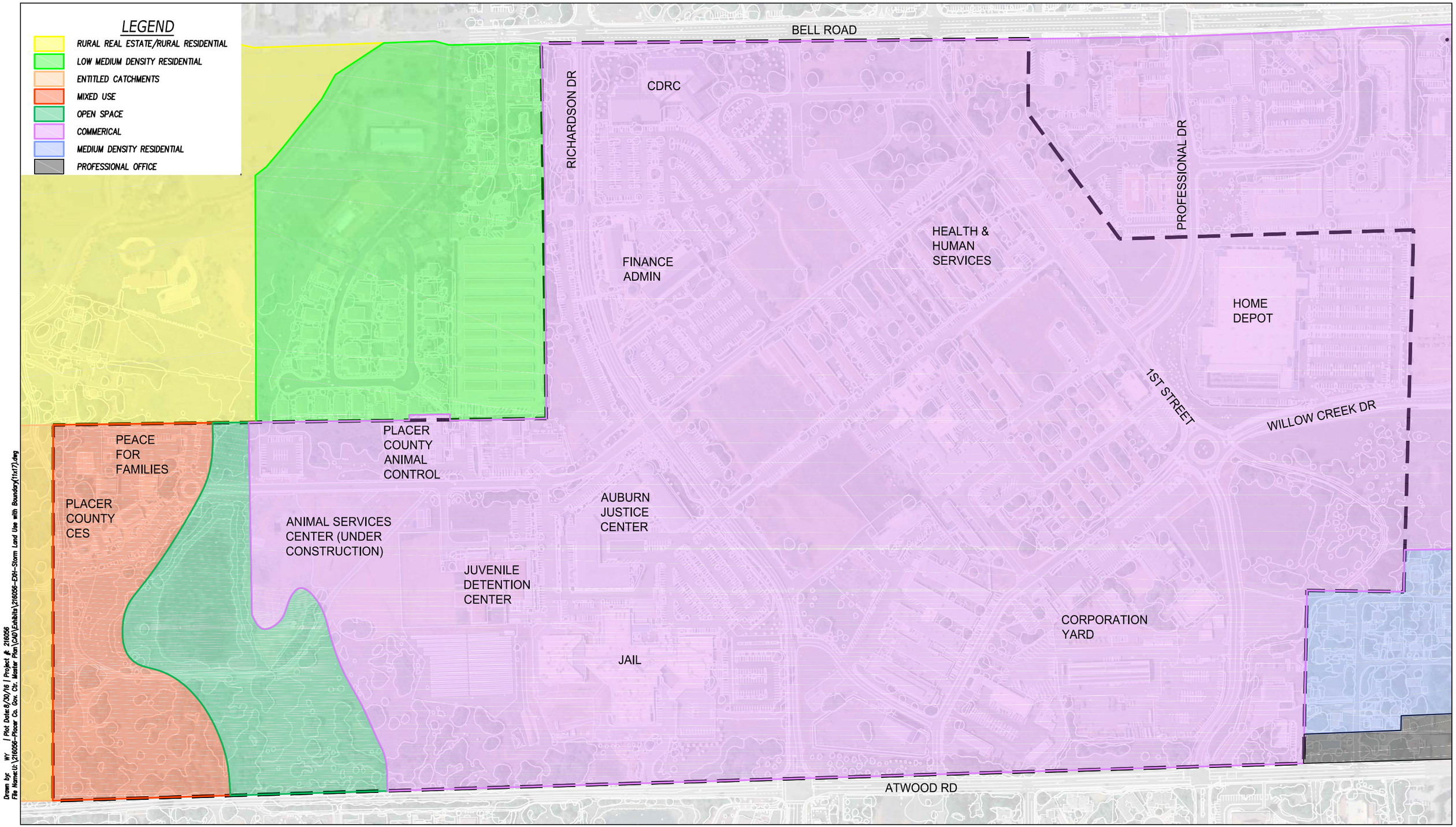


CARTWRIGHT
ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

150 0 150 300
SCALE IN FEET

PLACER COUNTY GOVERNMENT CENTER
STORM DRAIN WATERSHED MAP

FIGURE NO.
SD-02



Drawn by: WY | Plot Date:8/30/16 | Project #: 216056
File Name:U:\216056-Placer Co. Gov. Ctr. Master Plan\CAD\Exhibits\216056-EXH-Storm Land Use with Boundary(11x17).dwg

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

LEGEND: PROJECT BOUNDARY

150 0 150 300
SCALE IN FEET

PLACER COUNTY GOVERNMENT CENTER
LAND USE MAP

FIGURE NO.
SD-03

1.3 ASSESSMENT

As previously mentioned under the methodology section of this document, the assessment is based on the two phases previously described: review of existing data and documentation (Phase 1) and the development of analytical models (Phase 2) using the existing reports and models in conjunction with current agency standards as the baseline for establishing both existing and proposed conditions towards developing the PCGC Master Plan. Equally critical to this process, each of these 2 phased elements are also supplemented and/or updated based on information gathered from key County and Utility agency stakeholders and other consultants throughout the duration of the project and by way of information exchange via e-mail or during meetings.

The baseline analytical models developed as part of the second phase have been calibrated and vetted against existing models or created as new guidelines (in the case of drainage) for the existing system. These models were then used and revised to reflect planning layout alternatives and refined to the final PCGC Master Plan Update.

1.3.1 WATER

The initial **Phase 1** assessment of the water system includes three integrated processes with a consistent inquiry of data and information, primarily with County and Water agency staff, along the way. The inquiry helped to further clarify any findings and assessment related issues discovered while conducting the three processes. The three primary processes involved (1) a thorough review of the Technical Memorandum of the Placer County DeWitt Center Fire Flow Evaluation (June 25, 2012 by West Yost Associates Consulting Engineers -see Appendix A) in concert with a review of the West Yost Water Plans (November 2010), (2) a compilation and review of information and meeting notes gathered at the first County and Utility stakeholder and existing infrastructure meeting held on July 13, 2016 with applicable follow-up coordination, and (3) a validation of data from (1) and (2) by conducting an initial water infrastructure site visit on August 1, 2016. It should be noted that no particular order or process took precedence over the other. For the most part, each process was conducted during the same general timeframe in an effort to provide a clear description of our assessment of the existing water system based on the latest received information.

1.3.1.1 PROCESS 1

The West Yost technical memo identified base background information and assumptions after conducting their own extensive site survey, record drawing and map research, and input from County staff, PCWA and NID. This included an inventory of water lines, associated sizes, material type, and relative age. The various pipeline materials and relative age was utilized to establish Hazen-Williams Roughness Coefficients (C Factors) with a C of 100 for ductile iron pipe installed in the 1940's and a C of 130 for newer pipeline (PVC or DIP). West Yost also conducted an extensive site survey, verified by County staff, of existing onsite fire hydrants and documented and analyzed upwards of 65 fire hydrants. Based on County conducted hydrant flow tests, data was used as a guide relative to current available fire flow. Hydraulic losses through the two reduced pressure detector assemblies at the PCWA metered connection at 1st Street and Professional Drive were obtained by each assemblies' head loss curves provided in the specifications. Hydraulic boundary conditions were estimated at the PCWA connection

based on PCWA monitored flow and pressures both upstream and downstream of the connection. This was conducted during normal operating conditions as well as the application of hydrant flow tests on a specific date to evaluate the pressure drop. This helped to establish a hydraulic grade line (HGL) used as the basis for building the DeWitt Center water model. The modelling software used by West Yost was a GIS based program known as InfoWater. The model was obtained from West Yost and converted into H2ONET Suite 12 (developed as part of Phase 2) and confirmed to match the results presented in the West Yost Technical Memorandum.

As previously mentioned, the West Yost technical memo indicates that the two NID emergency connections are "for emergency conditions only and are normally closed valves that must be opened manually." As such, it is assumed that the initial model was set up with these lines being closed. The memo states that pressure monitoring occurred at these two inter-tie locations to establish boundary conditions for normal operating conditions and that the boundary conditions "do not reflect potential limitations within the NID system for conveying large amounts of water for fire flows." Furthermore, based on review of as-built plans provided for the CDRC, is it assumed that the CDRC building draws water from the NID system for both domestic use (separate meter directly connected to NID 12" water on Richardson) and for fire flow as needed. While the plans show a system of valves and a 10" Reduced Pressure Backflow Device with Detector Check, there is no indication that this connection is closed and every indication that the connection in fact supplies fire flows to CDRC. A second model scenario was created to show the effect of an open NID connection at this location as well as the location at Atwood and 1st Street.

The West Yost Technical memo establishes a daily demand for the DeWitt Center based on flow data and metered demands supplied by PCWA (October 21, 201 to November 1, 2011). In addition to flow data at the PCWA meter, actual demands were extracted from the existing meter at the Animal Control Building and a calculated demand was established for the Juvenile Detention Center and the County Jail based on a factor related to the beds occupied at each facility. The daily demand for the DeWitt Center was estimated and modelled at 312 gallons per minute (gpm), which is a minor demand compared to the upper limit of required fire flows for sprinklered buildings of 4,000 gpm. As a result, fire flow is the governing factor for evaluating system capacity. As previously mentioned, updated flow and demand data was provided by PCWA at the PCWA DeWitt meter on July 15, 2016 and on February 28, 2018 fire hydrant flow tests were provided at approximately 57 onsite locations. This data was used to update the model for existing baseline conditions. A system calibration scenario was created to determine the Hazen-Williams roughness coefficients which would result in the model conditions matching field measured flows. Through an iterative process it was determined that the Hazen-Williams roughness coefficients needed to be altered to achieve a closer relationship between the model and tested fire flows (C values of 100 and 90 were used for existing pipes). The PCWA connection was also modified to achieve system calibration. Once calibrated, the existing model was used to create a developed conditions model to be contemplated as part of Sections 2 and 3 of this report. The technical memo does not look at applying peaking factors to the daily demand to include maximum day or peak hour. In addition, it does not assess the

potential for instantaneous flows or anomalies in the system causing spiked demands. Again, the the assumption is that the overriding factor related to demands and associated system capacity relates to fire demand due to the much larger demand a fire presents to the system.

The technical memo correctly addresses requirements for fire flow as the basis for both evaluating the existing system and potential upsizing or other system changes to the water infrastructure to meet today's code requirements for fire demand. Based on coordination with the fire department, the 2010 California Fire Code (CFC) has been used as the governing document for fire flow and it was confirmed that the department does allow a 50% reduction of the CFC fire flow demand for buildings with an approved fire sprinkler system, a mandate for all new buildings. By making prudent future development assumptions regarding buildings, associated range of square footage (30,000 s.f. to 200,000 s.f.) and building construction type (Type V assumed and a conservative assumption relative to fire flows), an upper limit of fire flow demand of 4,000 gpm (a 50% reduction to a sprinklered building in excess of 100,000 s.f.) was established as the basis for evaluating flow and pressures modelled at each building within the system. Each hydrant was evaluated at producing the highest rate of flow while maintaining a minimum residual pressure of 20 psi with the conservative goal of achieving 4,000 gpm in the system at each hydrant location to cover the anticipated maximum range of building size, although a lower flow can be provided at some locations which will still achieve fire protection. Appendix A of this report contains a copy of the technical memorandum for reference as it is the basis of the analysis performed in this report.

The West Yost Memorandum comes to the following conclusions to increase system capacity during a fire:

- A closer look at evaluating valves that were previously modelled as closed to ascertain if they can be opened or repaired and opened for operational use.
- Upsize several existing undersized pipes with new ones
- Complete system looping by adding new pipelines

These improvements were modelled in the memo and are graphically illustrated in Figure 3 of the West Yost technical memo. This modelled change of basic system improvements delivered an increase in overall fire flow of an average of 18% or approximately 519 gpm across all hydrants. Table 2 of the memo summarizes a hydrant by hydrant comparison of the existing system to the Pipeline and Valve Improved system.

Lastly, the memo utilizes the Pipeline and Valve Improvements model as a baseline for evaluating and recommending 4 additional scenarios for significantly improving and increasing fire flows while maintaining a minimum residual pressure of 20 psi:

1. Connect NID as a service provider or convert the emergency connections to automatically open for fire flows when system pressures drop to a critical level.
2. Construct a bypass pipeline around the PWCA double detector checks to minimize the typical losses through the detector checks. The bypass line would

open for fire flows when system pressures drop to a critical level.
3. Install an in-line booster pump station with back-up power at the PCWA connection to boost pressures during fire flow demands.
4. Construct a campus on-site storage tank and booster pump station to meet campus-wide fire flow demands.

The technical memo in Appendix A concludes by providing the following recommendations, which are further validated by this report and established the basis of the model update presented in this report:

- Perform additional flow tests during the higher demand periods in PCWA service area
- Create and perform a valve exercise program to identify any closed or partially closed valves or any valves that may need repair.
- Calibrate the hydraulic model
- Design and construct new pipeline to improve system looping to the southeast area of the DeWitt Center.
- Replace existing undersized pipelines for any proposed future development.

These recommendations were followed to establish a new calibrated model. While a valve exercise program was not implemented, the flow tests were robust enough to develop an updated calibrated baseline existing conditions model.

Both the West Yost memo and this report acknowledges that the largest constraint resulting in fire flow limitations that impact the DeWitt Center are attributed to the single service connection and the limited supply that can be provided by PCWA as the sole provider of water supply to the PCGC. The results from the PCWA sole source model demonstrate that fire suppression flows cannot be achieved without the delivery of additional supply.

The findings herein generally concur with the technical memorandum with the few exceptions noted above.

1.3.1.2 PROCESS 2

On July 13, 2016, a meeting was held at the Placer County CDRC with key staff of the Placer County Department of Public Works and Facilities, the Placer County Water Agency, and the Nevada Irrigation District. The meeting focused on a discussion about the existing water and sanitary sewer systems within the campus. With regard to the water, the meeting was also an overview of the County water system and its current interaction with the PCWA and NID water systems immediately surrounding the DeWitt Center. A summary of key elements discussed is as follows:

PCWA

- PCWA provides treated water delivery through the noted single point of connection.
- Supply is provided via the Bowman WTP which treats 7 MGD and has 11 MG of storage.

- The DeWitt Center resides within PCWA Zone 1 and is within the Channel Hill Pressure Zone.
- The PCWA system is protected and separated from the Placer County system by the above noted two reduced pressure detector assemblies.
- The County should consider an internal cross connection control program that installs individual building and facility backflow prevention devices. Should Placer County continue to be its own water purveyor, or should decisions be made about inclusion of the campus system as part of either the PCWA or NID system or split between the two districts. State health standards should be adhered to in an effort to protect the system from cross contamination.
- The Home Depot provides its own supply for fire flow with a 1M gallon underground storage tank and booster pump station.
- Given the current configuration of the PCWA distribution system, the existing 12" waterline that provides water supply to the DeWitt Center has a present capacity of 2400 gpm, well short of the 4,000 gpm fire flow needed for larger facilities. The dead-end line and limited supply availability for fire is a significant constraint.
- One option as a capital improvement that would increase supply would be to extend a 16" waterline on Bell Road from New Airport Road to State Highway 49 to complete a loop to the 12" waterline.
- PCWA's design criteria for treated water systems require that pipeline velocities not exceed 7 feet per second

NID

- NID's current service within the Government Center is to provide both manual back-up supply to the campus and domestic and fire suppression to CDRC while County owns and operates an in-line booster pump to pressurize flows to the CDRC building.
- NID also has jurisdiction over the Ophir canal along 1st Street. An allocation to the County exists and is paid for monthly by the County. It is a resource that could be used possibly for irrigation purposes throughout the campus.
- Data was provided by NID from their simulated water model for the two emergency intertie connections. This has been utilized to calibrate the baseline model in this report.

1.3.1.3 PROCESS 3

Where feasible, each of the above processes were further verified by a field visit (8/1). The existing NID/PCWA intertie connections were located and the manual operation was confirmed. The single PCWA metered location and the dual double detector check assemblies were noted.

As mentioned, the **Phase 2** assessment of the water system with a calibrated water model was updated and detailed within Sections 2 and 3 below. The model developed at this phase is the baseline for all proposed modeling scenarios, including the evaluation of Master Plan options (See Section 2) and the refinement of these options into a Final Master Plan (See Section 3).

1.3.2 IRRIGATION

The existing water system throughout the core of the campus is aged and failing. Many of the pipes in the historical core (existing Dewitt Buildings) were originally installed in the late 1940's and have leaks, reduced flow capacity due to rust, calcification and mineral deposition incising within the pipe. These aged facilities have reduced the available water demand supply and pressure to successfully irrigate this area of the campus during the most efficient watering times of the day. When irrigation is upgraded or repaired there is always risk that the immediate repair will place further stress on the system and cause the next weakest portion to fail causing more work and added expense to the County's maintenance budget.

As newer portions of the campus have been developed and constructed the irrigation systems have required the installation of pumps and multiple zones to accommodate the reduced pressure and availability. The aged water infrastructure, until fully upgraded, will require future development to rely on costly upgrades to pumps and multiple zone watering which may force irrigation to occur during peak transpiration and evaporation times of the day and reduce efficiency and water conservation. A full upgrade of the dated water system, including pipeline replacements and upsizing, will significantly improve water supply for irrigation. An upgrade could also implement separate irrigation services to isolate irrigation uses from domestic uses and would allow for the installation of backflow prevention devices to prevent cross contamination.

Another resource that could significantly improve supply and reduce the consumption of domestic water for irrigation purposes includes the use of raw water from the NID Ophir Canal. Based on discussions with Placer County, the NID raw water canal is currently an unused resource that the County pays to keep a monthly account inactive that enables the County to reserve the right to use up to 12 miner's inches as necessary. Given this allocation, an onsite raw water system is an opportunity to offset the peak irrigation demands of the Placer County Government Center. A system would include a supply line to extract raw water from the canal, an onsite storage reservoir to provide the volume necessary to supply irrigation to landscaped areas under a specified duration and during the peak summer months, and a pressurized distribution system to deliver the irrigation supply. Since the allocation is dedicated to the County, this system would only be for the government services portion of the campus which would also include common space, community gathering areas, and points of entry. The private, mixed-use areas would still rely on potable water supplied by PCWA but could also explore opportunities of individual taps to the NID canal. For the government uses, a current irrigation demand of 410 gpm (Maximum Day Demand, MDD) has been estimated. This represents approximately 45% of the total MDD estimated for the campus. This demand has been used as the basis for analyzing the onsite system. Section 3 of this report provides details regarding the development of an onsite raw water irrigation model for the government side of the Master Plan.

1.3.3 SANITARY SEWER

It is important to note that the information provided in the assessment below is exclusively based on our findings as described above. In subsequent sections and as part of the Phase 2 portion of the assessment, a model has been developed to provide more specific system related data. This model provides a more detailed analysis and output flow rates for the campus and it has been

developed to correspond with and correlate to the methodology utilized by the Stantec reports as sewer flows from the Government Center impacts the main trunk sewer system detailed in these documents and these reports have been deemed the approved and acceptable standard for evaluating sewer system capacities in Placer County. As a result, the assessment information described in this section of the report provides the necessary framework for developing the campus model.

The assessment as described in this section and the development of the campus sewer model relies on two capacity evaluation reports (referenced above) provided by Placer County and prepared by Stantec Consulting Services, Inc. The methodology evaluation criteria, and capacity analysis from those reports is discussed in this section. These reports were reviewed for accuracy and relevance to the PCGC Master Plan Update. For clarity the assessment section discusses each impacted trunk line under separate headings.

1.3.3.1 METHODOLOGY

The Stantec model used MIKE Urban 2011, Service Pack 7 software developed by HDI. The physical sanitary sewer collection system information including pipe lengths, diameters, inverts, manhole depths, etc. were imported to the model from GIS database files provided by Placer County. The Manning's roughness coefficients assigned to gravity sewer pipes were:

Table 2 – Manning's "n" Input Values

Material	Manning's "n" value
Asbestos Cement	0.013
Ductile Iron	0.0145
PVC	0.012
Tranzite	0.013
Unidentified	0.013
Vitrified Clay Pipe	0.0145

A universal loss coefficient (Km) value of 0.10 was applied which the software then automatically modified based upon calculated total losses through each manhole. The modification factors include losses for entry/exit, flow angles, plunging manholes, and drop elevations as well as others. Stantec found a number of issues once the GIS source data was imported into the model such as connectivity issues, incomplete data, invert pipe slope inconsistency, and pipe size inconsistencies. These various issues were resolved through discussions with County staff, making appropriate assumptions to maintain connectivity and positive flow.

Network manholes and pipes were identified by the County and were generally defined as any sewer trunks tributary to and including the DeWitt trunk or the Highway 49 trunk downstream of all active lift stations. Lift stations were included to facilitate the start/stop effects of the force mains on the system. Below is a table of data provided by the County used for determining the actual discharge capacity of the force mains for the DeWitt and Highway 49

trunk lines:

Table 3 – DeWitt Trunk Line Lift Station Information

Lift Station	Model ID No.	Lead Pump Start Level (ft)	Lag Pump Start Level (ft)	Lead Pump Modeled Flow Rate (gpm)	Lag Pump Modeled Flow Rate (gpm)
Vineyards Lift Station	AA3-LS01	1195.5	1196.0	90	21
Joeger Road Lift Station	AE1-LS34	1266.0	1266.5	146	132
County Jail Lift Station	AC3-LS21	1395.6	1395.9	167	90
Olympic Village Lift Station	AD2-LS87	1379.7	1379.9	243	14
Atwood 3 Lift Station	AC2-LS35	1312.7	1313.2	90	83

Table 4 – Highway 49 Trunk Line Lift Station Information

Lift Station	Model ID No.	Lead Pump Start Level (ft)	Lag Pump Start Level (ft)	Lead Pump Modeled Flow Rate (gpm)[a]	Lag Pump Modeled Flow Rate (gpm)[a]
Airport Lift Station	AD5-LS42	1446.4	1446.9	181	21
Alpine Lift Station	AB4-LS57	1341.0	1341.5	97	14
Edgewood Lift Station	AB4-LS20	1349.0	1350.0	299	125
Golf Course Lift Station	AE5-LS17	1467.0	1468.0	153	21
Kemper Lift Station	AC3-LS61	1382.5	1446.9	188	21
Saddleback Lift Station	AG4-LS38	1309.0	1309.5	179	21
Auburn Ravine Lift Station	Modeled as Pressurized Sewer				

Sub-catchments were used to represent the combined land area and population contributing to flows within parts of the system and are typically upstream of a manhole or lift station. A diagram of the sub-catchments is included as Figure SS-04 for the DeWitt trunk line and Figure SS-05 for the Highway 49 trunk line.

Design storms contribute to the wet weather operational conditions of the sanitary sewer system. They are included for assessing the potential of surcharging the system. Placer County Facility Services directed the use of a 10-year, 24-hour design storm and the Placer County Flood Control and Water Conservation District Storm Water Management Manual was used to create the design storm. The design storm total rainfall over a 24-hour period at an elevation of 1400 feet was 4.59 inches with a peak intensity of 0.90 in/hr occurring at the mid-way point of the storm event.

To establish a baseline, the model created by Stantec was first calibrated to Dry Weather Flow (DWF) conditions which is the most consistent metric available. DWF condition data was collected, compiled and modeled and the results were compared against actual measured flows

for average, peak and minimum flows. Some anomalies were detected in the data but were considered by Stantec to be "abnormal and not representative of typical flow".

Once the model was calibrated to DWF conditions, it was used as the basis for expanding the model to Wet Weather Flow (WWF). The following WWF rainfall dependent infiltration and inflow (RDII) Equation Parameters were used by Stantec in the MIKE Urban software model for both the DeWitt and Highway 49 trunk line models

Table 5 – Sanitary Sewer Model Parameters

Model A Parameters	
Impervious Area [%]	1.1
Reduction Factor [1/1]	0.7
Initial Loss [inch]	0.03
Time of Concentration [min]	120
RDI Parameters	
RDI Area [%]	14
Umax [inch]	2
Lmax [inch)	40
Cqof [1/1]	0.3
Carea [1/1]	1
Ck [h]	8
Ckif [h]	300
Ckbf [h]	500
Tof [1/1]	0
Tif [1/1]	0
Tg [1/1]	0
InitU [inch]	0
InitL [inch]	20
InitGwl [ft]	32.808
InitOf [in/h]	0
InitIf [in/h]	0
GwSy [1/1]	0.3
GwLmin [ft]	0
GWLbf0 [ft]	32.808
GWLfl1 [ft]	0

The following calibration results were summarized in the table below from the Stantec report for both the DeWitt and Highway 49 trunk lines:

Table 6 – Sanitary Sewer Calibration Results

Calibration Results for WWTP Flows	Dec 16 – 21, 2010		Mar 13 – 18, 2011		March 23 – 28, 2011		Nov 28 – Dec 5, 2012	
	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]
Modeled Flow	9.55	24.66	10.69	21.73	10.33	27.73	11.32	28.99
Measured Flow	9.98	23.72	10.42	20.80	9.85	24.97	10.43	29.06
% Error	(4.33%)	3.96	2.56%	4.48%	4.85%	11.02%	8.55%	(0.23%)

1.3.3.2 EVALUATION CRITERIA

Both reports for the DeWitt Trunk Sewer Capacity Evaluation Report and the Auburn Creekside Project Specific Report used criteria supplied by Placer County for the evaluation of the system. The evaluation criteria included values for:

- Level of Service/Freeboard
- Velocity
- Pipe Capacity

Level of Service/Freeboard

The criteria for level of service placed limits on the distance between the elevation of the hydraulic grade line (HGL) and a manhole rim elevation called freeboard. A surcharge occurs when the HGL exceeds the top of pipe. In existing manholes deficiencies were determined to occur when:

1. There is a surcharge and the manhole rim is less than or equal to 8-feet from the top of pipe.
2. There is less than 8-feet of freeboard or a surcharge greater than or equal to 1-foot.

Velocity

Gravity sewers to have a minimum flow velocity of 2.5 ft/s and maximum of 7 ft/s and Force mains to have a minimum of 2 ft/s and maximum of 7 ft/s.

Pipe Capacity

Under design storm conditions sewer pipes shall have a maximum d/D of:

- 70% for pipes less than or equal to 24 inches
- 100% for pipes greater than 24 inches

1.3.3.3 SANITARY SEWER CAPACITY

The sections below are broken into two portions: the DeWitt Trunk line and the Highway 49 trunk line.

1.3.3.3.1 DEWITT TRUNKLINE

The majority of the PCGC sewer catchments flow into the DeWitt trunk line. There are four points where force mains contribute flow into the PCGC sanitary sewer system. These force mains can be seen on Figure SS-03. Many of the sewer lines on PCGC that contribute to the DeWitt trunk line were constructed in the 1940's and therefore infiltration and inflow are

anticipated to be large contributors to the peak flows.

System Capacity

For the purposes of this section of the report, data from the North Auburn DeWitt Trunk Sewer Capacity Evaluation Report prepared by Stantec Consulting Services, Inc. was used. A thorough review of the report was performed and two existing models were selected for inclusion and relevance to the PCGC Master Plan Update. The two models from the DeWitt Trunk System Capacity Evaluation which correspond to the existing system are the Existing System model and the Existing System + Entitled model. The average DWF, Peak DWF, and Peak WWF values for the Existing Conditions Model, and the Existing + Entitled model are summarized in the table below and discussed in separate sections below:

Table 7 – DeWitt Trunk Line Peak Flows

Model	Average DWF [mgd]	Peak DWF [mgd]	Peak WWF [mgd]
Existing Conditions	0.282	0.518	2.909
Existing + Entitled	0.309	0.557	2.917

Capacity – Existing System WWF Condition

The Stantec model peak flow of 2.909 mgd was predicted to cause surcharging in several reaches along the DeWitt Trunk Sewer as well as lateral sewers downstream of several of the lift stations. Figure SS-06 shows the segments within the PCGC that exceed capacity under the peak flow for this condition. These segments were identified as the segment coming from Bell Road, running down Wilson Drive and connecting to the DeWitt trunk line at the Financial Administrative Building (FAB) and a portion of the DeWitt trunk line from A Avenue to Bell Road. It should be noted that since the preparation of the Stantec North Auburn Dewitt Trunk Sewer Capacity Evaluation Report, the existing sewer line from the FAB facility to Bell Road has been upsized from a 15” pipe to an 18” sewer line to meet the upsizing recommendations described and illustrated in the report. This is further detailed in Figure SS-10 of this report.

Capacity – Existing System + Entitled WWF Condition

The Stantec model peak flow of 2.917 mgd was predicted to cause slightly more surcharging in the same reaches that are affected under the Existing System WWF condition. No new reaches were seen to be impacted by the additional flow for this condition. Figure SS-07 shows the segments within the PCGC that exceed capacity under the peak flow for this condition. It should be noted that since the preparation of the Stantec North Auburn Dewitt Trunk Sewer Capacity Evaluation Report, the existing sewer line from the FAB facility to Bell Road has been upsized from a 15” pipe to an 18” sewer line to meet the upsizing recommendations described and illustrated in the report. This is further detailed in Figure SS-10 of this report.

1.3.3.3.2 HIGHWAY 49 TRUNKLINE

System Capacity

The information and results of both the Auburn Creekside Project Specific Report and the Timberline Project Specific Report (North Auburn Dewitt Trunk Sewer Capacity Evaluation Report) were used for information pertaining to the North Auburn Highway 49 Trunk. Both sewer Capacity Evaluation Reports were prepared by Stantec Consulting Services, Inc. A thorough review of the reports was performed and information from the Auburn Creekside report was selected for inclusion here. The report contained several model conditions of which two models were identified for inclusion and relevance to the current PCGC Master Plan Update. The two models from the Highway 49 Trunk System Capacity Evaluation which correspond to the existing system are the Existing System model and the Existing System + Entitled model. The average DWF, Peak DWF, and Peak WWF values for the Existing Conditions Model, and the Existing + Entitled model are summarized in the table below and discussed separate sections below:

Table 8 – Hwy 49 Trunk Line Peak Flows

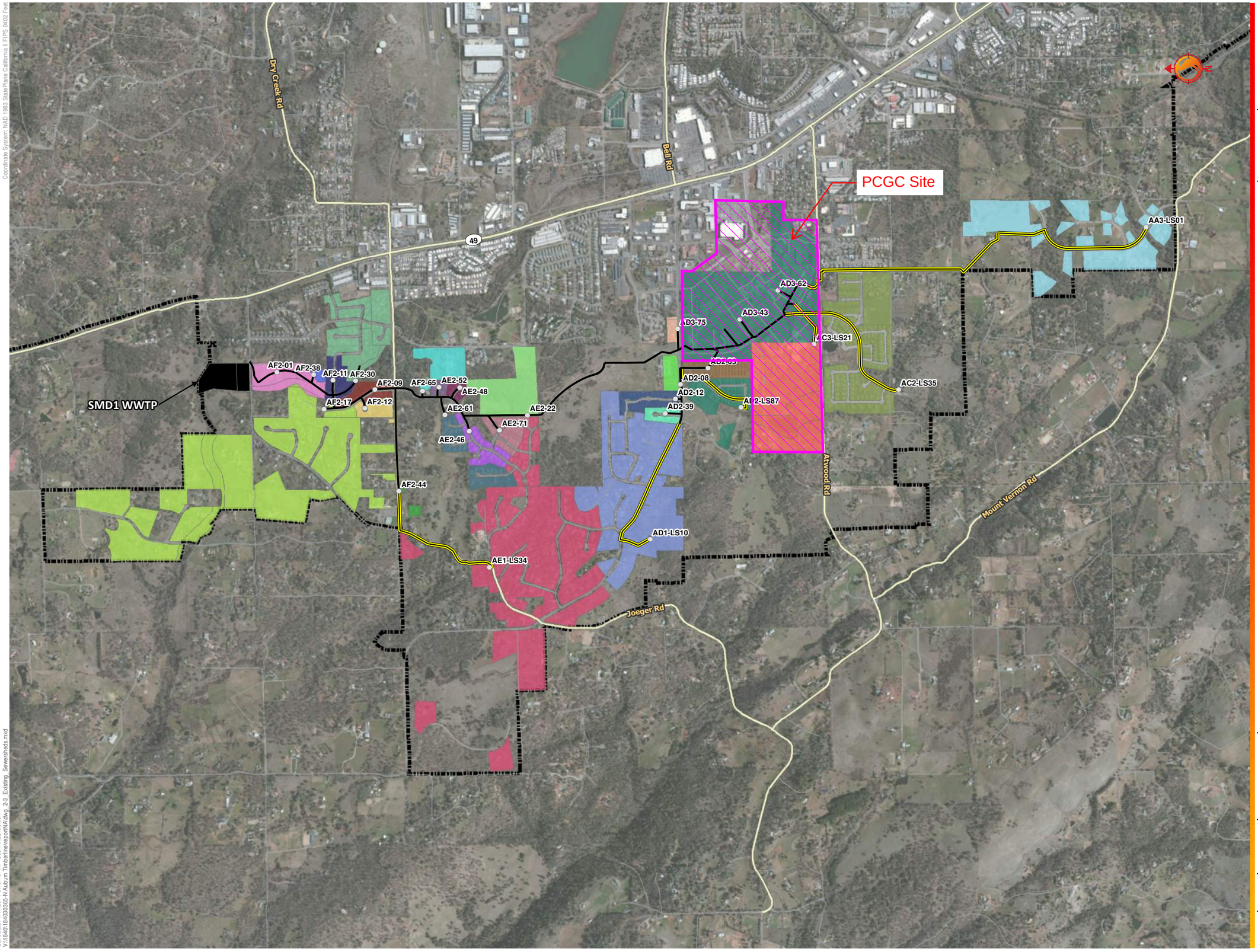
Model	Average DWF [mgd]	Peak DWF [mgd]	Peak WWF [mgd]
Existing Conditions	1.573	2.643	11.489
Existing + Entitled	1.690	2.784	11.534

Existing System WWF Condition

The Stantec model peak flow of 11.489 mgd was predicted to cause surcharging in several reaches along the Highway 49 Trunk Sewer as well as lateral sewers downstream of several of the lift stations. While many of these impacted reaches are located in the trunk line downstream of the PCGC site, the reaches immediately downstream of the PCGC are within capacity. Figure SS-08 shows the segments that exceed capacity under the peak flow for this condition.

Existing System + Entitled WWF Condition

The Stantec model peak flow of 11.489 mgd was predicted to cause slightly more surcharging in the same reaches that are affected under the Existing System WWF condition along the Highway 49 Trunk Sewer. No new reaches were seen to be impacted by the additional flow for this condition. Figure SS-09 shows the segments that exceed capacity under the peak flow for this condition.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/11/2014 8:48:46 AM User: maanderson
V:\1840\184030365-N Auburn Timberline\reports\NA\dwg_2-3_Existing_Sewersheds.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Sewer Connection
- AA3-LS01
- AC2-LS35
- AC3-LS21
- AD1-LS10
- AD2-03
- AD2-08
- AD2-12
- AD2-39
- AD2-LS87
- AD3-75
- AE1-LS34
- AE2-22
- AE2-46
- AE2-48
- AE2-52
- AE2-61
- AE2-71
- AF2-01
- AF2-09
- AF2-11
- AF2-12
- AF2-17
- AF2-30
- AF2-38
- AF2-44
- AF2-65

Modeled Nodes
SMD1 WWTP
SMD1 Buildout Boundary
Sanitary Sewer
Forcemain

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

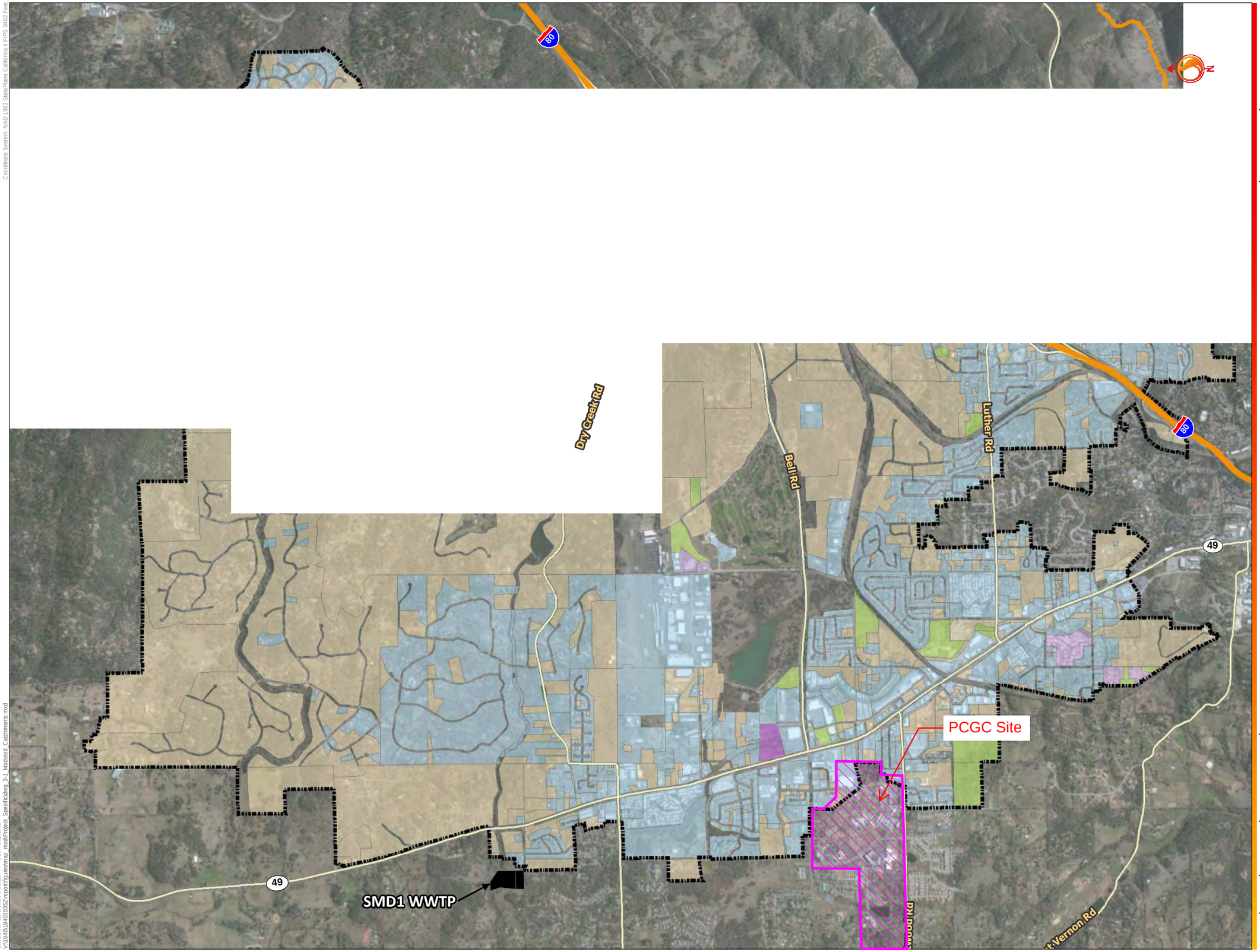
Connection of Existing Sewersheds to Modeled Network

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
SS-04

Issue/Revision
A/



Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Hwy49 Buildout Boundary
- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- Full Buildout Catchments
- SMD1 WWTP

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Highway 49
Modeled Catchments

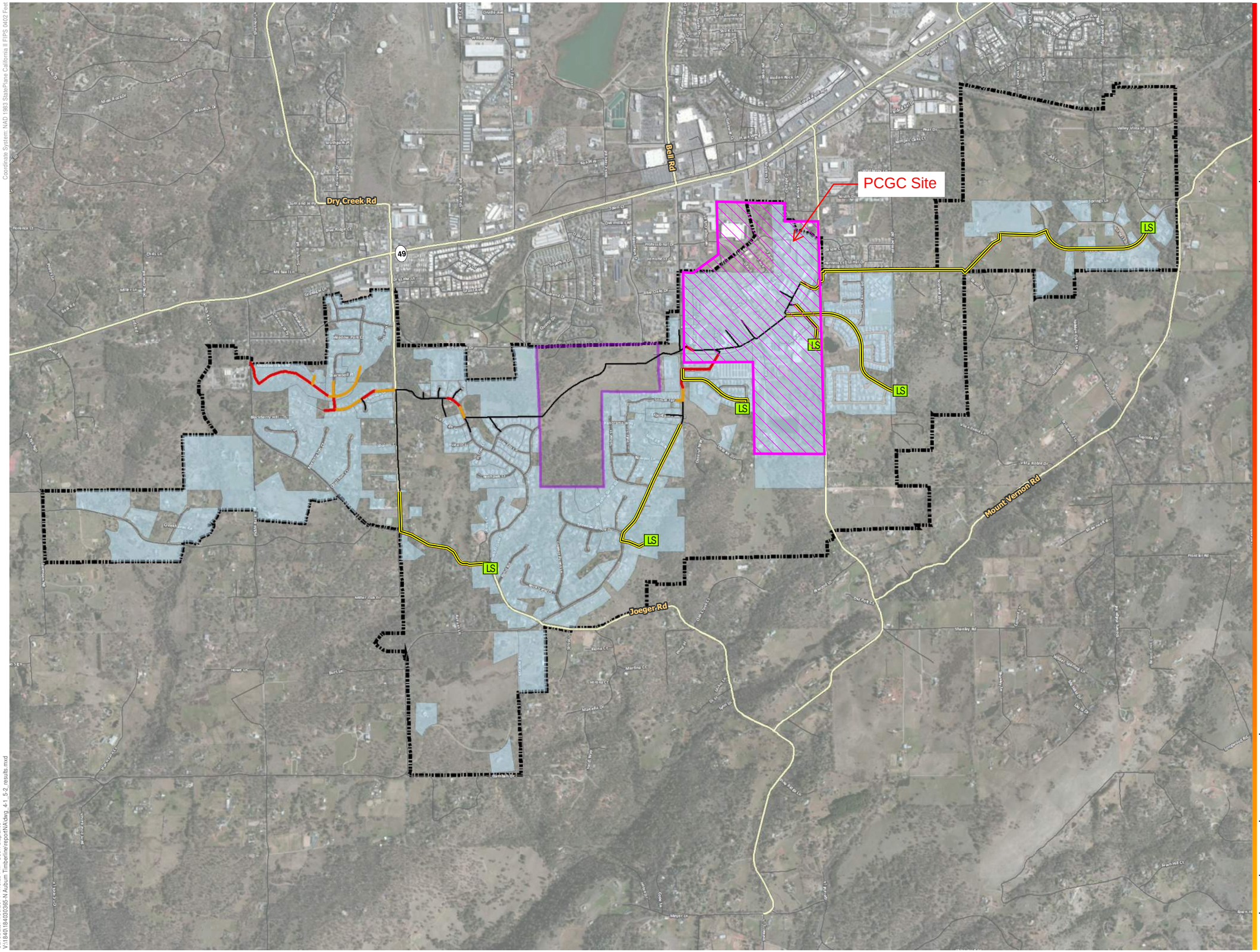
Project No. 184030352

Scale 0 0.2 0.4 0.6 Miles

Figure No. SS-05

Issue/Revision A/

Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet
SaveDate: 12/6/2013 3:52:12 PM User: Nlaplante
V:\1840\184030352\report\figures\map mxd\Project Specific\dwg 3-1 Modeled Catchments.mxd



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/30/2014 4:13:20 PM User: blaplante
V:\1840\184030365-N Auburn Timberline\report\NA\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall
- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain

Scenario
- Existing Catchments
- Timberline Development Lands
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

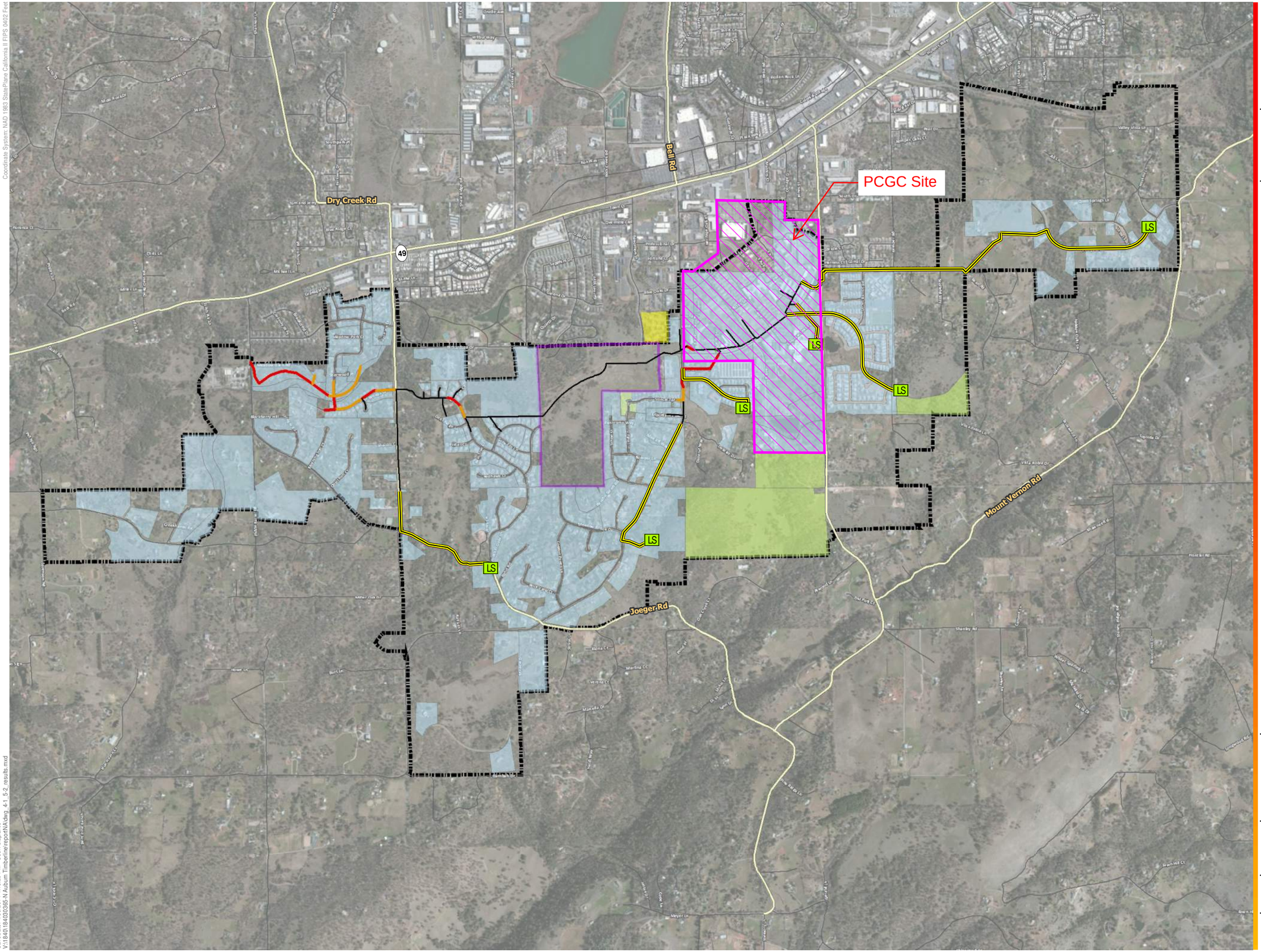
Title
Existing Level of Service

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
SS-06

Issue/Revision
A/



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/30/2014 4:13:20 PM User: blaplante
V:\1840\184030365-N Auburn Timberline\report\NA\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall
- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain

Scenario
- Existing Catchments
- Entitled Catchments
- Timberline Development Lands
- Offsite Catchments
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

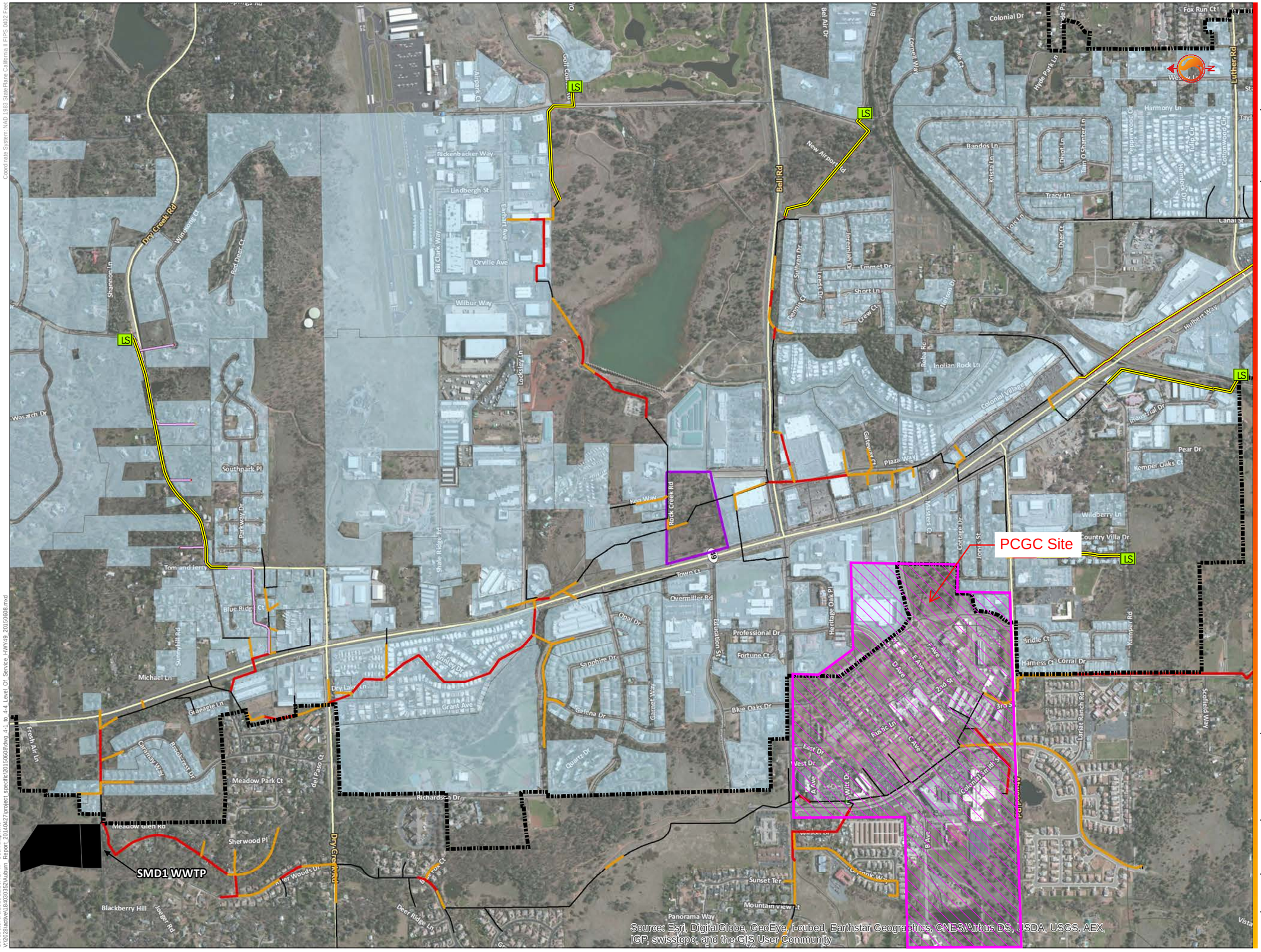
Existing + Entitled Level of Service

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
SS-07

Issue/Revision
A/



Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

Save date: 6/8/2015 12:56:42 PM User: bilapliante
V:\2028\active\184030352\Auburn_Report_20140427\project_specific\20150608\dwg_4-1_to_4-4_Level_Of_Service_HWY49_20150608.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Siphon
- Forcemain
- Low Pressure Sewer
- Existing Catchments
- Auburn Creekside Development Lands
- SMD1 WWTP
- Hwy49 Buildout Boundary
- LS Lift Stations

Note: Sewers identified as "Throttled with allowable freeboard" have surcharged as a result of a localized capacity restraint, though the degree of surcharging meet the County's design standard. Sewers identified as "Throttled without allowable freeboard" have surcharged as a result of a localized capacity restraint and do not meet the County's design standard.

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

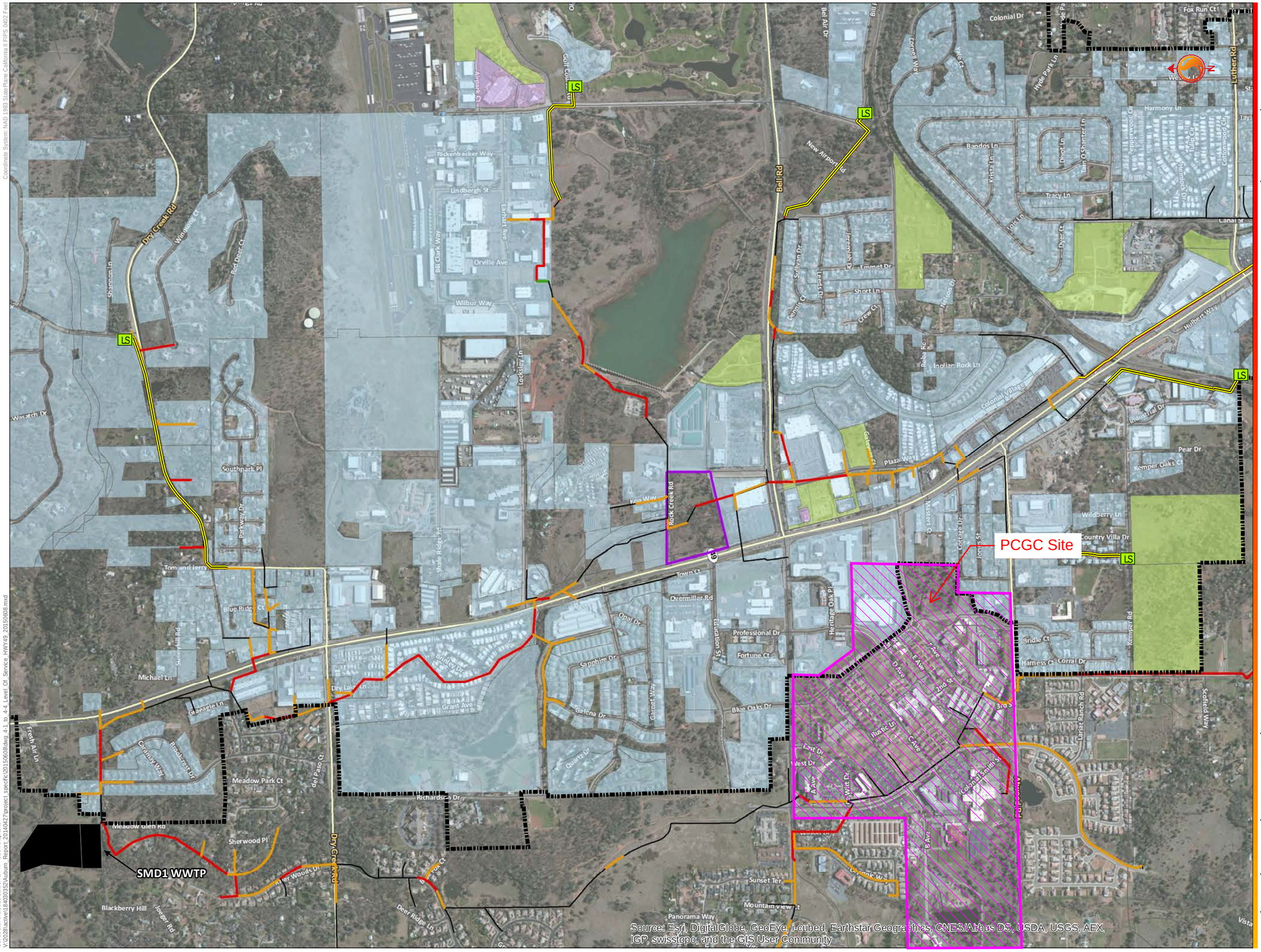
Title
Existing
Level of Service
1:10 Year 24hr WWF

Project No. **184030352**

Scale 0 0.05 0.1 0.15 0.2 Miles

Figure No. SS-08

Issue/Revision A/



Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

Save date: 6/8/2015 12:56:42 PM User: bilapliante
V:\2028\active\184030352\Auburn_Report_20140427\project_specific\20150608\dwg_4-1_to_4-4_Level_Of_Service_HWY49_20150608.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Siphon
- Forcemain

Scenario

- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- SMD1 WWTP
- Hwy49 Buildout Boundary
- LS Lift Stations

Note: Sewers identified as "Throttled with allowable freeboard" have surcharged as a result of a localized capacity restraint, though the degree of surcharging meet the County's design standard. Sewers identified as "Throttled without allowable freeboard" have surcharged as a result of a localized capacity restraint and do not meet the County's design standard.

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title
Existing + Entitled
Level of Service
1:10 Year 24hr WWF

Project No. **184030352**

Scale 0 0.05 0.1 0.15 0.2 Miles

Figure No. SS-09

Issue/Revision A/

1.3.4 STORM DRAIN

The hydrology and storm drain hydraulics of PCGC were modeled using the XPSTORM software package (XP Solutions, 2016). XPSTORM integrates hydrologic and hydraulic computations into a single model thereby streamlining the modeling process. The model includes multiple hydrologic parameterization methods which allow the rainfall-to-runoff calculations to conform to the prevailing engineering standards. Lastly, XPSTORM is well-suited for modeling complex urban watersheds because it is capable of simulating a variety of features including pipes, manholes, ponds, weirs, and overland flow. The model development described herein is consistent with the methods described in Section V.3 of the Placer County Flood Control and Water Conservation District Stormwater Management Manual (SWMM) for HEC-1 models, which are required for master planning models. XPSTORM has the ability to parameterize a hydrologic model in an identical manner as HEC-1.

1.3.4.1 METHODOLOGY

Mean annual precipitation at the PCGC is on the order of 36 inches. Precipitation is almost entirely rainfall, with the winter months typically being the wettest time of year, although intense rainfall during summer thunderstorms is also common. Rainfall depths for the 2-, 10-, and 100-year, 24-hour storms were estimated from the Design Storm Procedures presented in Appendix V-B of the SWMM as 2.78, 4.53, and 6.73 inches, respectively. The depths were adjusted for the average elevation of PCGC, approximately 1,400 feet (NAVD88). Design storm hyetographs were generated for each storm using the depth-duration-frequency coefficients in Appendix V-A of the SWMM.

The runoff routing of the catchments was modeled using the Kinematic wave method for overland flow. The required data for this method includes area (acres), percent impervious, subcatchment width (feet), and slope (feet/feet). Rainfall abstractions were represented as an initial loss of zero and a constant infiltration rate of 0.16 inches/hour.

1.3.4.2 WATERSHEDS

The following paragraphs provide a description of the individual catchments and the general layout of the storm drain network within each catchment. See Plate 1 in Appendix D of the Master Drainage Report for a general map of the PCGC and the names of nodes and links used in the XPSTORM baseline model. Catchments and subcatchments are shown in Plate 2.

Catchment 1. Catchment 1 (C1) is located on the western edge of the PCGC and is bounded by Bell Road and the Combie Canal to the north and Atwood Drive to the south. C1 has an area of 88.5 acres and drains to the North Auburn Ravine watershed. Subcatchment 1J is the highest portion of C1 and includes the northern portion of the Community Development Resources Center. Flows from 1J are detained in a 0.3-acre-foot detention basin (1J/Storage1) at the southeast corner of the intersection of Bell Road and Richardson Drive. Flows leaving the detention basin flow west along Bell Road in a combination of pipes and open channels to the intersection of Bell Road and Olympic Way. Flow crosses Olympic Way through a 24-inch culvert and drains southwest in a natural channel. The natural channel continues until it enters a 0.05-acre-foot on-line detention basin (Node 1I/Storage1) located to the west of the Olympic

Residential Development. The outflow from the detention basin is controlled by an 18-inch pipe and overflow spillway. The flow continues down the natural channel toward B Avenue. On the upstream side of B Avenue, a small amount of flow ponds (Node 1E/Storage2) before entering three parallel box culverts (each 5.2-feet wide by 3.7-feet high) under B Avenue. Runoff from Sub-catchments 1F and 1G also flows into Node E1/Storage upstream of B Avenue. Flow passing under B Avenue then enters the large southwest pond (Node 1B/Storage1, capacity 13.4 acre-feet). Runoff from sub-catchment 1D is collected by a series of inlets along B Avenue and piped through an 18-inch pipe into the northeastern end of this pond. Flows from the Animal Services Center (Subcatchment 1C) also flow into Node 1B/Storage1 on the southern end, after being collected and detained by a 0.33-acre-foot detention basin (Node 1C/Storage1). Flows out of Node 1B/Storage are controlled by a weir box at the southern end and flow through a 48-inch diameter pipe to a natural channel. Flow is constricted at an old 6-foot wide concrete structure represented by Link 122. The southernmost storage (Node 1A/Storage1) is a natural depression, created from the natural topography and the Atwood Drive road embankment. The outfall from C1 is a 48-inch culvert under Atwood Drive with open channel downstream.

Catchment 2. Catchment 2 (C2) has an area of 41.4 acres. C2 spans the central portion of the PCGC and drains to the south towards the North Auburn Ravine watershed. The upstream extent of C2 is the southern portion of the Community Development Resources Center, Finance Administration Building, Auburn Justice Center, and associated parking lots. A series of inlets collects runoff from Subcatchments 2B through 2F and conveys flow under Catchment 3 (the Jail complex) and to a 3-acre-foot detention basin (Node 2A/Storage1) located to the west of Jail House #4. Outflow from the detention basin is metered by an outlet control structure (Node 2A Control Structure: a combination orifice, v-notch weir and overflow weir); this feature was modeled in XPSTORM by a stage-discharge table. Flow leaves through a 42-inch pipe to a natural channel and storage pond (Node 2A/Storage2) located just north of Atwood Road. Flow from Catchment 3, and overflow from Catchment 6 combine at the Node 2A/Storage2 pond. Two culverts (one 30- and one 15-inch pipe) convey flows under Atwood Drive to an existing pond south of Atwood Road (not modeled), with the inflow to the pond designated as Outfall C2/C3.

Catchment 3. Catchment 3 (C3) has an area of 12.8 acres located in the south-central portion of the PCGC and drains to the North Auburn Ravine watershed. Catchment 3 drains the Jail and Juvenile Detention Center. Runoff is collected by the parking lots and drains through a 42-inch diameter pipe to the southern end of the Jail Complex and into the natural pond (Node 2A/Storage2).

Catchment 4. Catchment 4 (C4) has an area of 12.7 acres located in the northeast corner of the PCGC and drains to the Rock Creek watershed. The Ophir Canal traverses C4, but is not part of the storm drain system and only receives direct precipitation. C4 collects runoff from the existing Health and Human Services buildings and parts of 1st Street, with flow directed beneath the Ophir Canal in a pipe. Flow travels north to an inlet at the eastern boundary of the PCGC, then is conveyed offsite via a 24-inch pipe directed east toward Professional Drive.

Catchment 5. Catchment 5 (C5) has an area of 29.9 acres located on the eastern boundary of the PCGC and drains to the Rock Creek Watershed. C5 includes the Home Depot development and the 1st Street and Professional Drive stormwater basins. Runoff from the southern end of C5 (Subcatchment 5C) drains to the 1.03-acre-foot 1st Street detention basin (Node 5C/Storage1) where the outflow is controlled by an orifice outlet. Outflow from the 1st Street detention basin combines with runoff from Subcatchment 5E and is piped along Willow Creek Drive and under the Home Depot parking lot. Runoff from the west end of C5 (Subcatchment 5D) drains to the 2.00-acre-feet Professional Drive detention basin (Node 5D/Storage1) where the outflow is controlled by an orifice outlet. Flow is then piped along the northern edge of Home Depot and routed to the 30-inch outlet pipe (Outlet C5) located at the northeast corner of the C5. On-site runoff from Home Depot is collected and detained in an underground storage facility (Node 5A/Storage1) beneath the parking lot. Flows are controlled by multiple orifices before entering the 30-inch outfall pipe.

Catchment 6. Catchment 6 (C6) drains the southeastern 45.8-acre portion of the PCGC and drains to the North Auburn Ravine watershed. C6 includes the County Government offices, the Corporation Yard, and the Atwood Ranch 1 development (Subcatchment 6I). The C6 storm drain system appeared to contain some of the oldest storm drain infrastructure of the PCGC. All runoff in C6 drains toward an open channel along the north side of Atwood Drive. Many of the collector storm pipes were not incorporated into the XPSTORM baseline model as they are less than 10 inches in diameter. The model simplified the feeder drain layout by selecting a main point of concentration for each of the subcatchments. Runoff from the northern Subcatchments 6E, 6F, 6G and 6H are piped to a common junction at Richardson Drive. Runoff from Subcatchments 6B, 6C and 6D are piped towards Atwood Drive where they daylight into the open channel along Atwood Drive. Flows then converge at Richardson Drive and flow west under the road through a 36-inch culvert. After the culvert a natural channel routes flow to the west to a junction and culvert along Atwood Drive. A 22-inch culvert goes under Atwood Drive as Outfall C6. At that junction (Node 6A/6) an overflow weir allows flows in excess of the capacity of the 22-inch culvert to overflow to the east along an open channel to the Node 3A/Storage1 pond, and leave the site through Outfall C2/C3

Two irrigation canals traverse the PCGC: the Combie Canal runs along the western boundary and the Ophir Canal runs parallel to 1st Street though the eastern portion of the site. Neither canal is known to be managed as part of the storm drain system, although it is possible they receive small amounts of runoff during extreme storm events.

1.3.4.3 STORM DRAINAGE PIPE NETWORK

The drainage facilities on the PCGC site consist of open channels, ditches, storm drainage pipe networks, culverts, and ponds. The geometry of the storm drain system was assimilated into the model based on the background information for pipe sizes, lengths, alignments, materials, and elevations. Manning's roughness values were applied based on the pipe material or assumed to be 0.014 if no material was known. The storm system was simplified for the modeling, and smaller (less than 10-inch) lateral pipes were generally excluded from the model.

The sections of the storm drain system with open channel flow were modeled as either an irregular or a trapezoidal channel shape, as appropriate. The roughness for the channels was approximated during the site visits and averaged over the channel length.

In instances where the amount of flow was greater than the capacity of the storm drain system, the baseline model was configured to show temporary surface flooding at the model nodes. When flooding occurred at a node, water was stored above ground at the respective node until there is sufficient hydraulic capacity within the system for it to reenter the network. This method allows areas to be identified where the storm drain system is inadequately sized to convey flood flows and where shallow surface flooding would be expected.

The baseline PCGC model included 13 storage basins which represented the existing stormwater detention basins or natural depressions that attenuate stormwater runoff. Storage in the basins was modeled using stage-storage tables generated from the background information or from survey data.

As discussed previously, PCGC has five outfall locations, with three along Atwood Drive (C1, C2/C3, and C6), one on Professional Drive (C4), and one between Highway 49 and Heritage Oaks Circle (C5). All outfalls were set with a free outfall boundary condition, with the depth set equal to the minimum of the normal or critical depth for the flow in the outfall conduit. The three outfalls along Atwood Road are all free outfalls because the 100-year flood level in the pond in the Atwood Ranch development (A.R. Associates, 2008) is lower than the invert of the outfall pipe. For the other two outfalls the 10- and 100-year events are completely contained within the pipes. No previous studies were found that suggested there is a tailwater condition that would violate the assumption of a free outfall boundary condition, and this study assumed that the downstream pipe system was designed to convey the 10- and 100-year events.

The detention ponds along Atwood Drive were modeled by A.R. Associates (2000) for the addition of Unit 4 to the Placer County Main Jail House. A wetland area located south of the jail was slated to be used as a detention pond (approximate location of Node 3A/Storage1), however, the wetland designation prompted relocating the detention pond to the west (location of Node 2A/Storage2). Based on an October 2016 site visit it is clear the wetland area receives stormwater runoff from Atwood Drive. The culvert along Atwood Drive (Link 136) was partially blocked with sediment at the time of the site visit (the Manning's roughness was set to 0.1 to account for the loss of capacity), which causes water to overflow into the wetland. For this reason, the wetland was modeled as a shallow storage facility in the baseline model.

The precise alignment of a storm drain pipe along Atwood Drive between 1st Street and F Avenue (Link 16 in Subcatchment 6B) could not be confirmed through the background information or field verification. This pipe connects the northern Corporation Yard to an open channel along Atwood Drive. The pipe size for this link was assumed to be the same as the upstream pipe size leaving the Corporation Yard, and its length was estimated from an assumed alignment.

Sunset Terrace Estates was assumed to drain to the north and away from the PCGC stormwater catchments. The Sunset Terrace Estates are located to the northwest of the Bell Road and Richardson Drive intersection. The drainage report for Sunset Terrace Estates (Western Planning and Engineering, 1990) showed all on-site stormwater draining to an 18-inch pipe located near a low point on the north side of Bell Road. The 18-inch pipe is not believed to turn south and drain through Catchment 1 because (1) it would require crossing the Combie Canal, and (2) no storm drain outlet was found in this location during field investigation. For these reasons, runoff from Sunset Terrace Estates was assumed to drain north.

Table 9 – Summary of baseline model results for peak flow rates at outfalls from PCGC

Outfall Location by Catchment	Peak Flow Rate (cfs)		
	2-yr	10-yr	100-yr
C1	17.8	43.8	84.8
C2/3	23.5	41.4	67.0
C4	9.0	17.7	29.4
C5	9.2	20.1	34.2
C6	22.8	32.1	37.7

1.3.4.4 STORM WATER QUALITY

The 1972 Clean Water Act set the framework for storm water regulations where pollutants are discharged to waters of the United States. Within the project area, these regulations are defined in the State Water Resources Control Board Water Quality Order No. 2013-001-DWQ National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000004 Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (Phase II MS4 Permit), as regulated by the State Water Resources Control Board. As a discharge permittee, Placer County must comply with the Phase II Small MS4 Permit. Below is a brief summary of the provisions sections of the Phase II MS4 Permit that require implementation by the County. The permit went into effect on July 1, 2013 and at the time of this Master Plan Update, the County is in year five of the permit. Refer to the permit document for additional information.

Table 9 – Summary of Phase II Small MS4 Provisions Impacting Water Quality

MS4 Provisions	Sub Tasks	Summary / Task Description
E.6 – Program Management Element		Permittee shall have an overarching storm water management program to implement a coordinated storm water program.
	E.6.a – Legal Authority	Within the second year of the effective date of the permit, the Permittee shall review and revise relevant ordinances or other regulatory mechanisms, or adopt any new ordinances or other regulatory mechanisms, to obtain adequate legal authority, to the extent allowable under state or local law, to control pollutant discharges into and from, as applicable, its MS4, and to meet the requirements of this Order.
	E.6.b – Certification	Within the second year of the effective date of the permit, the Permittee shall certify by its Principal Executive Officer, Ranking Elected Official, or Duly Authorized Representative as described in 40 Code of Federal Regulations section 122.22(b) that the Permittee has and will maintain full legal authority to implement and enforce each of the requirements contained in this Order.
	E.6.c – Enforcement Measures and Tracking	Within the third year of the effective date of the permit, the Permittee shall develop and implement an Enforcement Response Plan. The Enforcement Response Plan shall contain enforcement procedures and actions and identify the Permittee's responses to violations and describe how the Permittee will address repeat and continuing violations by implementing progressively stricter responses as needed to achieve compliance.
E.7 – Education and Outreach Program		Traditional Small MS4 Permittees may be required to implement Community-Based Social Marketing (CBSM) requirements (upon determination by a Regional Board Executive Officer).
	E.7.a - Public Education and Outreach	Within the first year of the effective date of the permit, all Permittees shall select one or more Public Education and Outreach programs defined in the permit documents. Within the second year of the effective date of the permit, the Permittee shall develop and implement a comprehensive storm water public education and outreach program. The public education and outreach program shall be designed to reduce pollutant discharges in storm water runoff and non-storm water discharges to the MS4 through increased storm water knowledge and awareness in target communities.
	E.7.b.1 - Illicit Discharge Detection and Elimination Training	Within the third year of the effective date of the permit, the Permittee shall develop and implement a training program for all Permittee staff who, as part of their normal job responsibilities, may be notified of, come into contact with, or otherwise observe an illicit discharge or illegal connection to the storm drain system.
	E.7.b.2 - Construction Outreach and Education	Within the second year of the effective date of the permit, the Permittee shall ensure that all staff implementing the construction site storm water runoff control program are adequately trained. Within the third year of the effective date of the permit, the Permittee shall develop and distribute educational materials to construction site operators.
	E.7.b.3 - Pollution Prevention and Good Housekeeping Staff Training	Within the second year of the effective date of the permit, the Permittee shall develop a biennial employee training program for appropriate employees involved in implementing pollution prevention and good housekeeping practices as specified in Section E.11. Pollution

		Prevention/Good Housekeeping for Permittee Operations of this Order.
E.8. – Public Involvement and Participation Program		Within the second year of the effective date of the permit, the Permittee shall involve the public in the development and implementation of activities related to the program. The public participation and involvement program shall encourage volunteerism, public comment and input on policy, and activism in the community. The Permittee shall also be involved in their Integrated Regional Water Management Plan (IRWMP) or other watershed-level planning effort, if applicable
E.9. Illicit Discharge Detection and Elimination		The Permittee shall develop an Illicit Discharge Detection and Elimination program to detect, investigate, and eliminate illicit discharges, including illegal dumping, into its system, to the extent allowable under law.
	E.9.a. - Outfall Mapping	Within the second year of the effective date of the permit, the Permittee shall create and maintain an up-to-date and accurate outfall map.
	E.9.b. - Illicit Discharge Source/Facility Inventory	Within the second year of the effective date of the permit, the Permittee shall maintain an inventory of all industrial/ commercial facilities/ sources within the Permittee's jurisdiction (regardless of ownership) that could discharge pollutants in storm water to the MS4. The Permittee shall utilize the inventory to identify facilities for inspections of potential illicit discharges.
	E.9.c. - Field Sampling to Detect Illicit Discharges	Within the second year of the effective date of the permit, the Permittee shall sample any outfalls that are flowing or ponding more than 72 hours after the last rain event. The Permittee shall also conduct dry weather sampling of outfalls annually identified as priority areas.
	E.9.d. - Illicit Discharge Detection and Elimination Source Investigations and Corrective Actions	Within the second year of the effective date of the permit, the Permittee shall develop written procedures for conducting investigations into the source of all non-storm water discharges suspected to be illicit discharges, including approaches to requiring such discharges to be eliminated, and procedures to implement corrective actions (e.g., BMPs).
	E.9.e. - Spill Response Plan	Within the first year of the effective date of the permit, the Permittee shall develop and implement a spill response plan.
E.10 - Construction Site Storm Water Runoff Control Program		The Permittee shall develop, implement, and enforce a program to prevent construction site discharges of pollutants and impacts on beneficial uses of receiving waters. The program shall include the development of an enforceable construction site storm water runoff control ordinance for all projects that disturb less than one acre of soil.
	E.10.a. - Construction Site Inventory	Within the first year of the effective date of the permit, the Permittee shall maintain an inventory of all projects subject to the local construction site storm water runoff control ordinance within its jurisdiction.
	E.10.b. - Construction Plan Review and Approval Procedures	Within the first year of the effective date of the permit, the Permittee shall develop procedures to review and approve relevant construction plan documents.
	E.10.c. - Construction Site Inspection and Enforcement	Within the second year of the effective date of the permit, the Permittee shall use legal authority to implement procedures for inspecting public and private construction projects and conduct enforcement if necessary. The Permittee may leverage existing inspection procedures and personnel to conduct construction site inspections and enforcement.
E.11 – Pollution		The Permittee shall develop and implement a program to prevent or reduce

Prevention/ Good Housekeeping For Permittee Operations Program		the amount of pollutant runoff from Permittee operations. The Permittee shall implement appropriate BMPs for preventing or reducing the amount of storm water pollution generated by Permittee operations.
	E.11.a. - Inventory of Permittee-Owned and Operated Facilities	Within the second year of the effective date of the permit, the Permittee shall develop and maintain an inventory of Permittee-owned or operated facilities within their jurisdiction that are a threat to water quality, if applicable.
	E.11.b. - Map of Permittee-Owned or Operated Facilities	Within the second year of the effective date of the permit, submit a map of the area within the permit boundary and identify where the inventoried Permittee-owned or operated facilities are located.
	E.11.c. - Facility Assessment	Within the third year of the effective date of the permit, for all the inventoried Permittee-owned or operated facilities, the Permittee shall conduct a comprehensive inspection and assessment of pollutant discharge potential and identification of pollutant hotspots using the Center for Watershed Protection's (CWP) guide on Urban Subwatershed and Site Reconnaissance, or equivalent.
	E.11.d. - Storm Water Pollution Prevention Plans	Within the fourth year of the effective date of the permit, the Permittee shall develop and implement SWPPPs for pollutant hotspots. If a Permittee has an existing document such as Hazardous Materials Business Plan, Spill Prevention Plan, or other equivalent document the Permittee is not required to develop a SWPPP.
	E.11.e. - Inspections, Visual Monitoring and Remedial Action	Within the fifth year of the effective date of the Permit, the Permittee shall conduct regular inspections of Permittee-owned and operated facilities.
	E.11.f. Storm Drain System Assessment and Prioritization	Within the second year of the effective date of the permit, the Permittee shall develop and implement procedures to assess and prioritize MS4 storm drain system maintenance, including but not limited to, catch basins, pipe and pump infrastructure, above-ground conveyances, including receiving water bodies within the Permittee's urbanized area and detention basins.
	E.11.g. Maintenance of Storm Drain System	Within the third year of the effective date of the permit, the Permittee shall begin maintenance of all high priority storm drain systems on an ongoing schedule.
	E.11.h. Permittee Operations and Maintenance Activities (O&M)	Within the third year of the effective date of the permit, the Permittee shall assess their O&M activities for potential to discharge pollutants in storm water and inspect all O&M BMPs on a quarterly basis.
	E.11.i. Incorporation of Water Quality and Habitat Enhancement Features in New Flood Management Facilities	Within the third year of the effective date of the permit, the Permittee shall develop and implement a process for incorporating water quality and habitat enhancement features into new and rehabilitated flood management facilities.
	E.11.j. Landscape Design and Maintenance	Within the second year of the effective date of the permit, the Permittee shall implement a landscape design and maintenance program to reduce the amount of water, pesticides, herbicides and fertilizers used during Permittee operations and activities.
E.12. - Post Construction Storm Water Management		[REFER TO WEST PLACER STORM WATER QUALITY DESIGN MANUAL FOR HOW THE APPLICABLE PROVISIONS THAT PLACER COUTNY HAS INCORPORATED TO ADDRESS THIS SECTION OF THE PHASE II SMALL MS4 PERMIT]

Program		
	E.12.a. Post-Construction Measures	Permittees shall regulate development to comply with the following provision sections; Site Design Measures, Regulated Projects, Source Control Measures, Low Impact Development (LID) Design Standards, Hydromodification Measures, Enforceable Mechanisms, Operation and Maintenance of Storm Water Control Measures, Post-Construction Best Management Practice Condition Assessment, Planning and Development Review Process, Post-Construction Storm Water Management Requirements Based on Assessment and Maintenance of Watershed Processes, and Alternative Post-Construction Storm Water Management Program
	E.12.b. Site Design Measures	Within the second year of the effective date of the permit, the Permittee shall require implementation of site design measures for all projects that create and/or replace (including projects with no net increase in impervious footprint) between 2,500 square feet and 5,000 square feet of impervious surface, including detached single family homes that create and/or replace 2,500 square feet or more of impervious surface and are not part of a larger plan of development. Site design measures as specified in this section are not applicable to linear underground/overhead projects (LUPs).
	E.12.c. Regulated Projects	Within the second year of the effective date of the permit, the Permittee shall implement standards to effectively reduce runoff and pollutants associated with runoff from Regulated Projects as defined below.
	E.12.d. Source Control Measures	Regulated Projects with pollutant-generating activities and sources shall be required to implement standard permanent and/or operation source control measures as applicable.
	E.12.e. Low Impact Development (LID) Design Standards	The Permittee shall require all Regulated Projects to implement low impact development (LID) standards designed to reduce runoff, treat storm water, and provide baseline hydromodification management to the extent feasible, to meet the Numeric Sizing Criteria for Storm Water Retention and Treatment.
	E.12.f. Hydromodification Management	Within the third year of the effective date of the permit, the Permittee shall develop and implement Hydromodification Management procedures. Hydromodification management projects are Regulated Projects that create and/or replace one acre or more of impervious surface. A project that does not increase impervious surface area over the pre-project condition is not a hydromodification management project.
	E.12.g. Enforceable Mechanisms	Within the third year of the effective date of the permit, the Permittee shall develop and/or modify enforceable mechanisms that will Effectively implement the requirements.
	E.12.h. Operation and Maintenance of Post-Construction Storm Water Management Measures	Within the second year of the effective date of the permit, the Permittee shall implement an O&M Verification Program for storm water treatment and baseline hydromodification management structural control measures. Storm Water Treatment Measures and Baseline Hydromodification Management Measures on all Regulated Projects.
	E.12.i. Post-Construction Best Management Practice Condition Assessment	Within the third year of the effective date of the permit, the Permittee shall inventory and assess the maintenance condition of structural post-construction BMPs (including BMPs used for flood control) within the Permittee's jurisdiction.
E.13. WATER QUALITY MONITORING		Traditional Small MS4 Permittees that are required to conduct monitoring of discharges to ASBS, TMDL, or 303(d) impaired water bodies, are not required to perform additional monitoring as specified in this Section.
	E.13.a. ASBS	All Permittees that discharge to an ASBS and are covered by an Ocean Plan

	Monitoring	exception shall comply with the monitoring requirements described in the terms, prohibitions and special conditions.
	E.13.b. TMDL Monitoring	All Permittees that are assigned a wasteload allocation or identified as a responsible party in a TMDL approved by the U.S. EPA where urban runoff is listed as the source, shall comply with the monitoring requirements included in Attachment G and consult with the Regional Water Board within one year of the effective date of the permit to determine the monitoring study design and a monitoring implementation schedule.
	E.13.c. 303(d) Monitoring	All Permittees that discharge to waterbodies listed as impaired on the 303(d)28 list where urban runoff is listed as the source, shall consult with the Regional Water Board within one year of the effective date of the permit to assess whether monitoring is necessary and if so, determine the monitoring study design and a monitoring implementation schedule. Permittees shall implement monitoring of 303(d) impaired water bodies as specified by the Regional Water Board Executive Officer.
	E.13.d. Receiving Water Monitoring and Special Studies	Traditional Small MS4 Permittees with a population greater than 50,000 listed in Attachment A that are not already conducting ASBS, TMDL or 303(d) monitoring efforts shall participate in one of the following monitoring programs, subject to Regional Water Board Executive Officer approval: Receiving Water Monitoring & Special Studies.
	E.13.d.1. Receiving Water Monitoring	Within the second year of the effective date of the permit, the Permittee shall develop and implement a receiving water monitoring program to (1) Monitor receiving water quality at upstream location in an area undergoing development and evaluate changes in receiving water quality over time, and (2) Monitor receiving water quality at a downstream location in an urban area and evaluate changes in receiving water quality over time.
	E.13.d.2. Special Studies	Within the first year of the effective date of the permit, the Permittee, as an alternative to Section E.13.d.1. Receiving Water Monitoring, may develop and implement a special study monitoring program to assess and evaluate the effectiveness of water quality projects or storm water program elements designed to reduce specific water quality pollutants that are causing or contributing to beneficial use impairment. The special studies must demonstrate the nexus between storm water program implementation, water quality protection and pollutant reduction effectiveness.
E.14. PROGRAM EFFECTIVENESS ASSESSMENT AND IMPROVEMENT		
	E.14.a. Program Effectiveness Assessment and improvement Plan	The Permittee shall develop and implement a Program Effectiveness Assessment and Improvement Plan that tracks annual and long-term effectiveness of the storm water program. The Program Effectiveness Assessment and Improvement Plan will assist the Permittee to document compliance with permit conditions and to adaptively manage its storm water program and make necessary modifications to the program to improve program effectiveness at reducing pollutants of concern, achieving the MEP standard, and protecting water quality.
	E.14.b. Storm Water Program Modifications	The Permittee shall modify BMPs and/or the program as a whole to improve compliance with permit conditions and improve program effectiveness at reducing pollutant loads, achieving the MEP standard, and protecting water

		quality. The Permittee shall use information gained through effectiveness assessment and MS4 discharge and receiving water monitoring to identify priority areas for program improvement.
E.15. TOTAL MAXIMUM DAILY LOADS COMPLIANCE REQUIREMENTS		a) The Permittee shall comply with all applicable TMDLs approved pursuant to 40 Code of Federal Regulations section 130.7 that assign a Waste Load Allocation to the Permittee. b) Compliance dates that exceed the term of this Order are included for reference and become enforceable in the event that this Order is administratively extended. c) The Regional Water Boards are directed to review, within one year of the effective date of this Order, the TMDL-specific permit requirements contained in Attachment G and to develop or propose revisions, as appropriate, to TMDL specific permit requirements to the State Water Board after consultation with the Permittees and State Water Board staff. d) The Permittee shall complete and report the status of their implementation of the specific TMDL implementation requirements that have been incorporated into the permit with each Annual Report via SMARTS. e) The Permittee shall comply with implementation requirements specified in Category 4b demonstrations associated with Clean Water Act Sections 303d, 306b, and 314 Integrated Reporting and Listing Decisions.
E.16. ANNUAL REPORTING PROGRAM		a) The Permittee shall use State Water Board SMARTS to submit a summary of the past year activities for each program element and certify compliance with all requirements of this permit. b) Permittees shall complete and retain all Annual Report information on the previous fiscal year beginning July 1 and ending June 30. c) The Permittee shall submit when requested by the Executive Officer of the applicable Regional Water Board a detailed written online annual report or in person presentation of the annual report that addresses the activities described in Provision E. d) Permittees involved in regional programs may coordinate with the members to identify reporting responsibility.

Section E.11 of the Phase II Small MS4 Permit will play a large role in improving storm water quality throughout the project area because the Master Plan Update area contains numerous existing government building and facility operations, which are required to assess storm water pollution hotspots and upgrade storm water quality elements of their existing facilities and storm water infrastructure. Existing government facilities and roadways make up more than half of the project area.

To comply with the Post Construction Storm Water Management Program section of the permit (section E.12), specifically the section setting the minimum treatment standard as “reducing the discharge of pollutants from their MS4s to waters of the U.S. to the maximum extent practicable”, the County assisted in preparing and has since adopted the West Placer Storm Water Quality Design Manual, dated April 2016. This manual along with the Phase II Small MS4 Permit is the basis of the storm water quality design measures assessment discussed below. None of the existing developments within the Master Plan area were permitted when these regulations were in place and therefore none of the existing storm drain facilities meet these current requirements. These requirements are intended to apply to new and/or

redevelopment areas and are not retroactively enforced on existing storm drain infrastructure. The existing government owned and operated facilities as well as the County storm drain infrastructure will be addressed from a water quality standpoint as part of other sections of the Phase II Small MS4 Permit as noted above.

Based on conversations with County Staff, they plan on requiring each new development within the Master Plan Update area to be responsible for providing water quality treatment and hydromodification that meet the current standards at the time of their development. These water quality features will need to be a part of the early design plans for any new development so that the site will be design and area allotted to meet these requirements. The West Placer Storm Water Quality Design Manual is the current standard as of July 2016 and requires that all new development projects meeting the regulated project criteria comply with the following:

Table 10 – Post Construction Water Quality Requirements for Regulated Projects

Project Category	Definition	Post-Construction Requirements
Regulated Redevelopment Projects	Any land-disturbing activity that results in the creation, addition, or replacement of 5,000 square feet or more exterior impervious surface area on a site on which some past development has occurred.	• Where a redevelopment project results in an increase equal to or greater than 50 percent of the impervious surface of a previously existing development, runoff from the entire project, consisting of all existing, new, and/or replaced impervious surfaces, must be treated per the requirements for Regulated Projects to the extent feasible. • Where a redevelopment project results in an increase of less than 50 percent of the impervious surface of a previously existing development, only runoff from the new and/or replaced impervious surface, must be treated per the requirements for Regulated Projects.
Regulated Road Projects and Regulated Linear Underground/ Overhead Projects (LUPs)	Any of the following types of projects that create 5,000 square feet or more of newly constructed contiguous impervious surface and that are public road projects and/or fall under the building and planning authority of a Permittee: 1. New streets or roads, including sidewalks and bicycle lanes built as part of the new streets or roads. 2. Widening of existing streets or roads with additional traffic lanes. 3. LUPs	• Infiltrate impervious surface runoff onsite from the post-construction 85th percentile 24-hour storm event. • Treatment of runoff that cannot be infiltrated onsite shall follow U.S. EPA guidance regarding green infrastructure to the extent feasible (EPA, 2008). • Where the addition of traffic lanes results in an alteration of equal to or greater than 50 percent of the impervious surface of an existing street or road, runoff from the entire project, consisting of all existing, new, and/or replaced impervious surfaces, must be included in the treatment system design. • Where the addition of traffic lanes results in an alteration of less than 50 percent of the impervious surface of an existing street

		or road, only runoff from the new, and/or replaced impervious surface must be included in the treatment system design.
Hydromodification Management Projects	Regulated Projects that create and/or replace one acre or more of impervious surface. Projects that do not increase impervious surface area over the pre-project condition are not Hydromodification Management Projects.	Same as for Regulated Projects plus: • Post project runoff shall not exceed estimated pre-project flow rate for the 2year,24-hour storm.

It is assumed that the current undeveloped project areas will be developed in portions consisting of more than one (1) acre of impervious surface and create a net increase in impervious area. Developments surpassing this impervious area threshold will be required to implement hydromodification control measures to maintain the post-project runoff at or below pre-project flow rates for the 2-year, 24-hour storm event. Three existing stormwater basins will be retrofitted and seven new stormwater basins will be implemented as new projects come online to provide hydromodification controls (the same set of basins have been designed to meet County requirements for flood control). It is important to note, however, that the basins were designed for an assumed amount of future impervious area. As such, final designs for new projects will need to be verified with the stormwater model to ensure the hydromodification controls are adequate.

Based on discussions with the County, they are in the process of complying with Section E.11 of the Small MS4 General Permit. This section of the permit covers pollution prevention and good housekeeping for existing sites that the permittee jurisdiction owns and operates. The County expects to have their facility assessments completed by October 2016 and have their BMP plans in place by the following year. These items will provide the County with specific actions to improve storm water quality throughout their government buildings and storm drain infrastructure that is within the Master Plan Update area. Also discussed with County Staff was the possibility of regional water quality treatment and/or hydromodification facilities. The County is not opposed to considering these, but have no current or future regional water quality treatment projects identified at this time.

SECTION 2: DEVELOPMENT ALTERNATIVES

Subsequent to efforts described in Section 1 of this report and the overall findings and assessment of the team relative to the existing site, there is a substantial amount of data to begin to effectively inform decisions around the development of site layout alternatives. The overall assessment coupled with ongoing County, stakeholder, and community meetings has resulted in the development of three options that propose a mix of County and Private Use areas. In this section, the establishment of the analytical baseline models and criteria developed for the onsite water system, sanitary sewer system, and storm drain system based on data developed in Section 1 is described. This information is then followed by input and assessment of each of the three options relative to the major water, sewer and storm systems onsite including recommendations for modifications to each existing system in order to accommodate each plan.

2.1 PHASE 2 BASELINE MODEL DEVELOPMENT

As indicated in Section 1, Phase 2 entails the development of assessments and analysis of each utility system utilizing the reports and utility data gathered during the Phase 1 process as the baseline for our analysis. In addition to referencing the previous reports and utility data, current engineering standards, guidelines and agency requirements to establish each baseline model have been implemented. Lastly, as new data has become available from respective agencies as an update to the referenced reports, this new data has been utilized as a replacement to any older data used in prior analyses. With each major wet utility (water, sewer, storm), where applicable, a baseline analytical model has been calibrated with an attempt to establish results that coincide with that of previous reports as the basis for then beginning to update each model. Once calibrated to coincide with or produce similar results to past reports, we then updated each model as applicable to reflect current standards and agency requirements as well as new data received from applicable utility stakeholders or determined based on our own site visits and data collection efforts. Below is a summary with respect to the water, sanitary sewer and storm systems.

2.1.1 WATER

A baseline model was established utilizing Innovyze H2ONET Suite 12.0. This is an effective modeling application for water distribution systems widely accepted and used by a multitude of utility agencies, municipalities, and engineering firms. The water distribution system was initially laid out and calibrated to achieve the results similar to that detailed in the West Yost Technical Memorandum, dated June 25, 2012 for the Placer County Dewitt Center Fire Flow Evaluation. This included the main pipe system, designated elevations at ground surface, designations for junction labels to match the fire hydrants modeled in the West Yost memo, the connection point to the PCWA system (with a supply curve matching PCWAs supply and check valve to mimic the reduced pressure detector assemblies), an average daily demand applied across the entire system of 312 gpm, and a roughness value consistent with the existing pipes and with that used in the West Yost model.

Once calibrated to achieve results that were within acceptable levels of each other, the model was modified as a new scenario to reflect more recent data including PCWA data of direct flows extracted from the PCWA metered connection, updated onsite fire hydrant flow tests (February 2018), NID model output for the two NID emergency connections, and additional information

gathered by our field verification as well as from the County, PCWA, and NID. This model was used as the basis for evaluating the three options noted above and for providing initial input and recommendations for system upgrades. These recommendations are provided in sub-section 2.2 below. A copy of the baseline models is included in Appendix A. A model of the current final option has been developed and included in the Appendix of this report. Final models to reflect phasing of the Master Plan will also be added as needed and as part of the preparation of Section 3.2 (FINAL MASTER PLAN AND PHASED DEVELOPMENT) of this report.

It should be noted that the existing conditions baseline model was developed based on the elements defined in the findings section of this report along with the maps provided in the West Yost Technical Memorandum. In addition to these maps and the West Yost memo, the NID Willow Creek & 1st Street Water Transmission plans (Draft Revision June 2015, County approved June 3, 4, 2015) were also received. When the baseline model was prepared it was assumed that this transmission line would not be a part of the campus network as it is a separate NID system. Therefore, it was not analyzed as part of the existing (current) system model. However, we understand that this transmission line will serve as the baseline for supply of water to the PCGC for projects that are intended to be developed as private uses (i.e. retail, commercial, residential uses). This would be a separate water system built to NID standards and intended to serve private development within the Master Plan. Consequently, the proposed modelling scenarios used to evaluate system capacity for the Master Plan options incorporates the use of the 16” NID line and models a proposed NID system. The addition of the 16” line is integral to our assessment of capacity for a future NID system to service the proposed private uses of the PCGC.

2.1.2 SANITARY SEWER

No prior overall campus-wide sewer system model had been established specifically for the Placer County Government Center. As currently understood, each system was developed on a project by project basis or as new facilities came online. Therefore, the assessment developed a new model for the onsite campus-wide system that is then compared to and combined with the data and analysis detailed in the Stantec Reports for the Dewitt Trunk (North Auburn Dewitt Trunk Sewer Capacity Evaluation Report) and the Highway 49 Trunk Auburn Creekside Project Specific Report) systems. An onsite baseline model was established utilizing Bentley Systems SewerCAD. This is an effective software application for sewer modeling that is widely used by a multitude of utility agencies, municipalities, and engineering firms. The onsite sewer system was initially laid out based on the West Yost sanitary sewer maps dated November 2010. Where there were gaps or noted corrections based on our field verification or on receipt of additional information from the County, the layout was revised accordingly. Additionally, several as-built drawings were used to develop the model. These include: the Dewit Center as-builts by Falconi & Associates dated 10/28/80, the Auburn Office Complex as-builts by Warren Green Engineering dated 5/28/03, and the Timberline Phase 1 Improvement Plans by Wood Rodgers dated 4/1/16. This layout was used as the basis for developing a new onsite model to evaluate the existing system. It was then used to evaluate both the existing and proposed sewer system based on a derivation of wastewater flows established for all existing and proposed onsite facilities. This model was used as the basis for evaluating the three options noted above and for providing initial input and recommendations for system upgrades. These recommendations are provided in sub-section 2.2 below. A copy of the baseline model is

included in Appendix C. A model of the current final option has been developed and included in the Appendix of this report. Final models to reflect phasing of the Master Plan will also be added as needed and as part of the preparation of Section 3.2 (FINAL MASTER PLAN AND PHASED DEVELOPMENT) of this report.

2.1.3 STORM DRAIN

The existing storm drain system of the campus had been previously evaluated on a project by project basis. A number of separate but individual drainage reports were provided by the County for each of these projects. Each project's storm system was designed based on the established agency criteria at the time of development with a connection to the next downstream system. Consequently, no prior campus-wide baseline models had been established for the Placer County Government Center.

The absence of an established drainage plan for the Placer County Government Center created an opportunity for the project team to work with the County and with the Community to achieve the vision and goals set forth in this Master Plan that contemplates a system that provides the basis for ensuring the implementation of "regional" measures to effectively mitigate flood impacts during high event storms while also developing systems that address current standards for stormwater quality and quantity (including hydromodification) and encourages practices such as low impact development, dispersed runoff, filtration achieved through the use of site specific vegetation, bioswales, biobasins, and other biofiltration systems.

To that end, as part of this Utility Infrastructure Assessment, a Placer County Government Center Master Drainage Report was prepared that provides a greater level of technical detail and documentation necessary to establish the baseline criteria for campus-wide drainage that effectively addresses Federal, State and local requirements for conveyance and stormwater routing, storage, and treatment including hydromodification. The Master Drainage Report utilized the XP STORM software package (XP Solutions 2016) to evaluate both the hydrology and storm drain hydraulics of the PCGC and is included in Appendix D of this report. Sub-section 2.2 below provides a cursory summary of recommendations based on the overall analysis performed and detailed in the Master Drainage Report.

2.2 SUMMARY ANALYSIS AND INPUT – THREE OPTIONS

The baseline analytical models established and updated to reflect recent data were then run to analyze and provide input and recommendations for the three options developed over the course of the assessment. The three options and associated land use areas can be referenced from the Placer County Government Center Master Plan Update as well as the March 21, 2017 presentation to the County Board of Supervisors. The conceptual (sketched) version of these options were used to provide the input and recommendations and the impact of each option on the utility.

Below is a summary of our analysis and input by utility with respect to each of the three provided conceptual alternatives.

2.2.1 WATER

The analysis was made by overlaying the existing water distribution system onto the three alternative sketches of the proposed development options. The baseline model was then amended to create three scenarios to reflect each of the three alternative layouts. In addition, pipes that were in conflict which would require removal and pipes that should be considered for replacement to serve the new developments were identified. Initial quantities of system upgrades for each of the three conceptual alternatives based on model runs were provided. As a summary, generally noted are the impacts associated with each option and rated each option accordingly (i.e. from least impact to most impact). This rating was based solely on the extent of existing pipe impacts and the quantity of new utility pipe needed to accommodate the option. This provided a minimum overall assessment of impacts associated with the implementation of each option as it pertained to the water system and provided one of the many components to consider in evaluating each option which served to enable the team to make an informed decision about the development of a final configuration of a land plan.

Referencing the 3 concept Master Plan options (sketches), provided below are cursory thoughts relative to the NID Willow Creek & 1st Street Transmission plans and the proposed 16" waterline and its impact on these options:

<u>Alignment</u>

- Option 1 appears to maintain the alignment of 1st Street which would provide sufficient access to the corresponding alignment of the proposed NID transmission line for operation and maintenance. There does not appear to be provision for a roadside easement on the NID plans that covers the proposed waterline and it cannot be ascertained where the existing right-of-way is on either 1st or Willow Creek.
- Options 2 and 3 propose the termination of 1st Street at the existing roundabout which will limit access to the proposed NID line. However, this does not necessarily preclude the implementation on a Master Plan option of a smaller roadway corridor and public easement for both the proposed 16" transmission line and the existing 10" waterline. The same would apply to other utilities that currently run along this stretch of 1st Street.
- With Options 2 and 3, there should be adequate spacing between proposed buildings to accommodate a corridor and easement sufficient for access and maintenance. Typical NID easement widths range from 25-30 feet. Additional width may be required between multi-story buildings to meet code requirements.

<u>Service to Campus</u>

- There is an existing tee with a 16" end cap on the NID plans located at the southern end of the roundabout. This is an opportunity to extend the 16" transmission line north on 1st Street to the existing NID waterline on Bell Road. This provides a water corridor along 1st Street for NID to provide supply and service to the proposed private uses of the Master Plan.
- All 3 options illustrate a mix of residential, retail, and hotel uses along the 1st Street alignment and south of Willow Creek Drive. This area could easily be serviced by the NID transmission line under a separate agreement with NID.

- An NID system would require installation in accordance with current NID requirements and standards.
- Any new buildings that connect to the NID transmission line would likely meet fire flow demands with adequate capacity and pressures.

2.2.2 SANITARY SEWER

Similar to the water distribution system, an analysis was made by overlaying the existing system onto the three alternative sketches of the proposed development options. The baseline SewerCAD model was then amended to create layouts for each of the three alternative layouts. In addition, pipes that were in direct conflict with new facilities which would require 1940 and pipes that should be considered for replacement to serve the new developments were identified. Initial quantities of system upgrades for each of the three conceptual alternatives based on our model runs were provided. In addition, existing system deficiencies were identified. In summary, the impacts associated with each option are noted and each option is rated accordingly (i.e. from least impact to most impact). This rating was based solely on the extent of existing pipe impacts and the quantity of new utility pipe needed to accommodate the option. This provided a minimum overall assessment of impacts associated with the implementation of each option as it pertained to the water system and provided one of the many components to consider in evaluating each option which served to enable the team to make an informed decision about the development of a final configuration of a land plan.

The analysis summarized that Option 3 presented the greatest degree of impact relative to both water and sewer pipe replacements and upgrades with Option 2 having the least impacts. However, the quantities did not result in a substantial difference between the three alternatives to necessarily negate the consideration of one option over the other. It is likely that recommendations based on the analysis of a proposed water and sewer system for each of the options was not a major decision factor in determining a viable alternative for development of an updated Master Plan.

2.2.3 STORM DRAIN

During this stage of the evaluation of conceptual options, there were no simulations of the alternatives with the hydrologic-hydraulic model. Consequently, input and suggestions were purely conceptual but provided a great deal of invaluable insight relative to an effective overall Stormwater Management Plan for the Placer County Government Center. What was learned from the baseline conditions model has been applied to highlight areas where proposed development coincides with existing problem flooding areas. For purposes of the Section 2 analysis, Option 1 of the site alternatives was reviewed to help communicate input on the stormwater system; only Option 1 was marked but the same generally applies to all three options. An initial mark-up of the considerations is illustrated in **Figure SD- 4**. A list of considerations to be evaluated are indicated as follows:

<u>Locations of Existing Stormwater Detention Basins:</u>

- The 1st Street Stormwater Detention Basin is located to the southwest of the roundabout

between 1st Street and F Ave. All three options propose development that would impact this detention basin. The detention basin is part of the off-site improvements for Home Depot. Any alteration of the 1st Street Stormwater Detention Basin will require that the stormwater management system for Home Depot and the surrounding area be evaluated in detail.

- The Professional Drive Stormwater Detention Basin is located at the corner of Professional Drive and 1st Street. Options 1 and 3 propose development that has the potential to impact this detention basin. Option 2, although currently proposed as green space, will still need to account for this basin. The detention basin is part of off-site improvements for Home Depot. Any alteration of the Professional Drive Stormwater Detention Basin will require that the stormwater management system for Home Depot and the surrounding area be evaluated in detail.
- The stormwater basin to the southeast of the intersection of Richardson and Bell and located adjacent to the CDRC building is included in the XPSTORM model. Plate 1 of the Master Drainage Report in Appendix D of the WUR shows the locations of all storage areas accounted for in the modeling.

Existing Stormwater Problem Areas:

- The baseline model suggests that the area bound by C Avenue, Richardson Drive, F Avenue, and 2nd Street floods in the 10-year storm event. Any development that increases the impervious area within this area would exacerbate existing flooding problems. The storm drains in this area appear to be constructed as part of the original DeWitt Center, and would require upgrades extending down to Atwood Drive at the jail maintenance access driveway (approximately 1,600 linear feet) to comply with current Placer County design standards.
- Field efforts thus far have not been conclusive in mapping stormwater infrastructure in the vicinity of proposed Building I (Administrative Services Warehouse); it is likely that key manholes and/or drain inlets have been buried or overgrown with vegetation. Any development in this area will either require (1) subsurface investigations to conclusively locate existing stormwater infrastructure or (2) treating the area as new development building an entirely new stormwater system.
- The baseline model suggests that the area of the proposed Buildings D & L (Clerk Recorder Facility and CDRC Growth and Consolidation) floods in the 100-year storm event. Development of this area may require stormwater detention facilities to meet current Placer County design standards and should focus on minimizing additional impervious area.

Other Notable Input:

- Building H (Fire Station Expansion) is outside of the baseline stormwater model, and we cannot speak to existing flooding problems, if any. This area is not hydrologically connected to one of the five primary outfalls described in the MDR and is a topographically isolated segment of the Placer County Government Center from a drainage perspective.
- The NID irrigation canal is located along the eastern boundary between Willow Creek Drive and 1st Street and runs north along the east side of 1st Street. Any development in this area

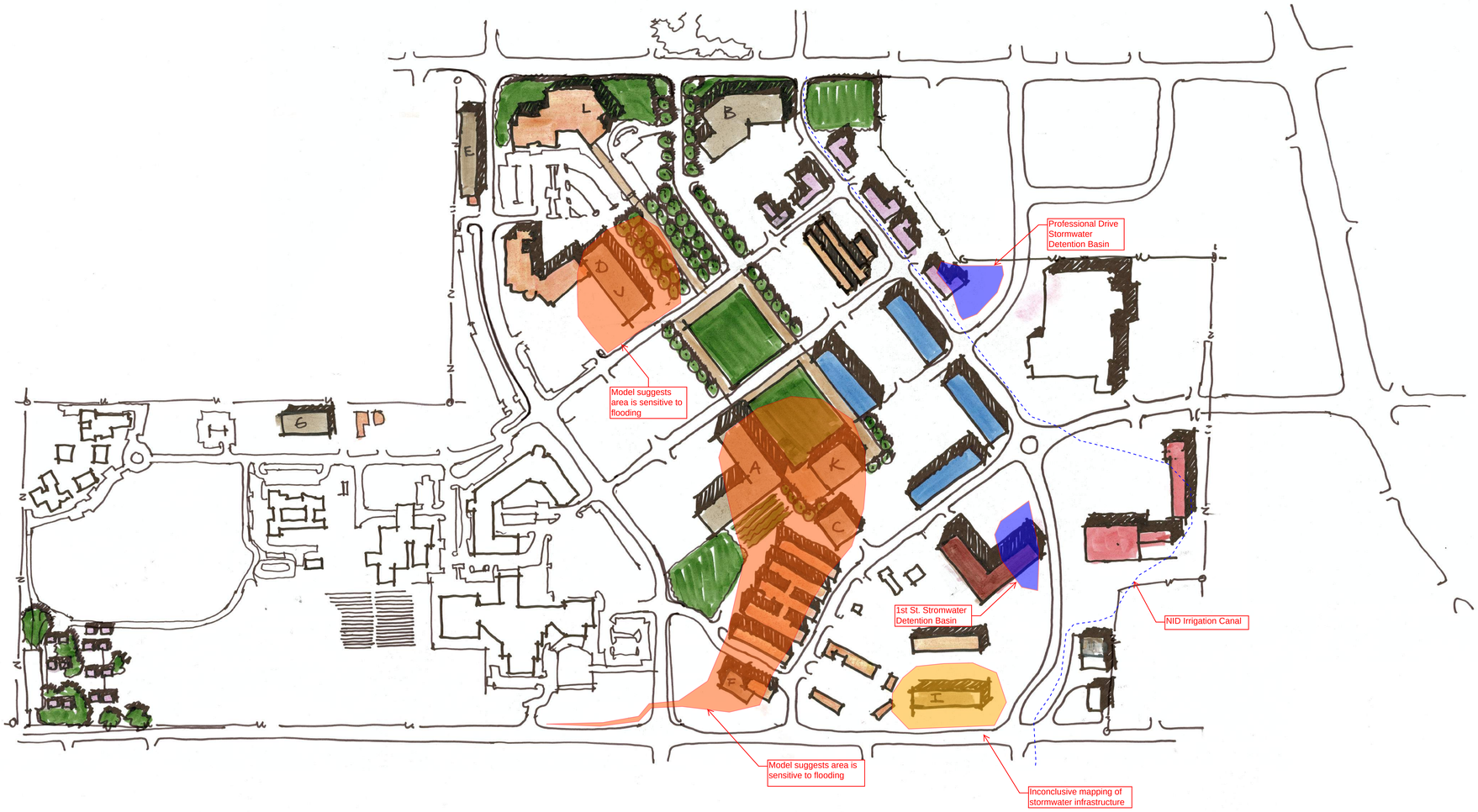
would need to take the canal into consideration and design.

- The development will be required to provide water quality and hydromodification controls for runoff originating from the project site per the requirements of the West Placer Storm Water Quality Design Manual.

Stormwater Management – Campus-wide and Project Basis Approach

Based on preparation of the Master Drainage Report along with careful consideration of each of the three options, an approach considered to be a viable policy to be adopted in conjunction with the Master Plan is presented. The approach is a way to share the development responsibility by requiring individual projects within the Placer County Government Center boundary to address and implement water quality while having regional or campus-wide facilities regulate the 2-year (for hydromodification), 10-year and 100-year storm event flows. An initial markup of the regional stormwater facilities based on review of the 3 land plans is presented in **Figure SD- 5** (Regional Stormwater Facilities Markup) below. This will be used as the basis for finalizing an overall plan as presented in Section 3 below. In terms of space requirements for water quality features versus flood control features, this would amount to an approximate 25%-75% split and would fulfill the County's requirement for dispersed water quality treatment features.

This report also recommends setting aside approximately 10% of each sub-catchment area (or each project) for water quality features, which is a reasonable assumption at this stage. The new 2016 West Placer Storm Water Quality Design Manual (WPSWQDM) requires that regulated projects incorporate site design measures (i.e. dispersed treatment features instead of a single basin in some corner of a project site). Each individual project within the PCGC will likely need to adhere to the WPSWQDM.



LEGEND

A	HEALTH AND HUMAN SERVICES
B	COUNTY ADMINISTRATIVE CENTER
C	AGRICULTURAL COMMISSIONER AND FARM ADVISOR FACILITY
D	CLERK RECORDER ELECTIONS TRAINING/ WAREHOUSE FACILITY
E	MUSEUM WAREHOUSE FACILITY
F	CORPORATION YARD ADMINISTRATION AND TRAINING CENTER
G	SHERIFF AND PROBATION SUPPORT FACILITY
H	FIRE STATION 180 EXPANSION
I	ADMINISTRATION SERVICES IT/TELECOM/ WAREHOUSE
J	FINANCE ADMINISTRATION BUILDING ANNEX
K	COMMUNITY BUILDING
L	CDRC GROWTH AND CONSOLIDATION

- NEW COUNTY BUILDINGS
- RESIDENTIAL
- HOTEL
- FLEX SPACE/ MIXED-USE
- RETAIL

FIGURE NO. SD-04

OPTION 1 MARKUP

PLACER COUNTY GOVERNMENT CENTER
AUBURN, CALIFORNIA

0 200 800
100 400

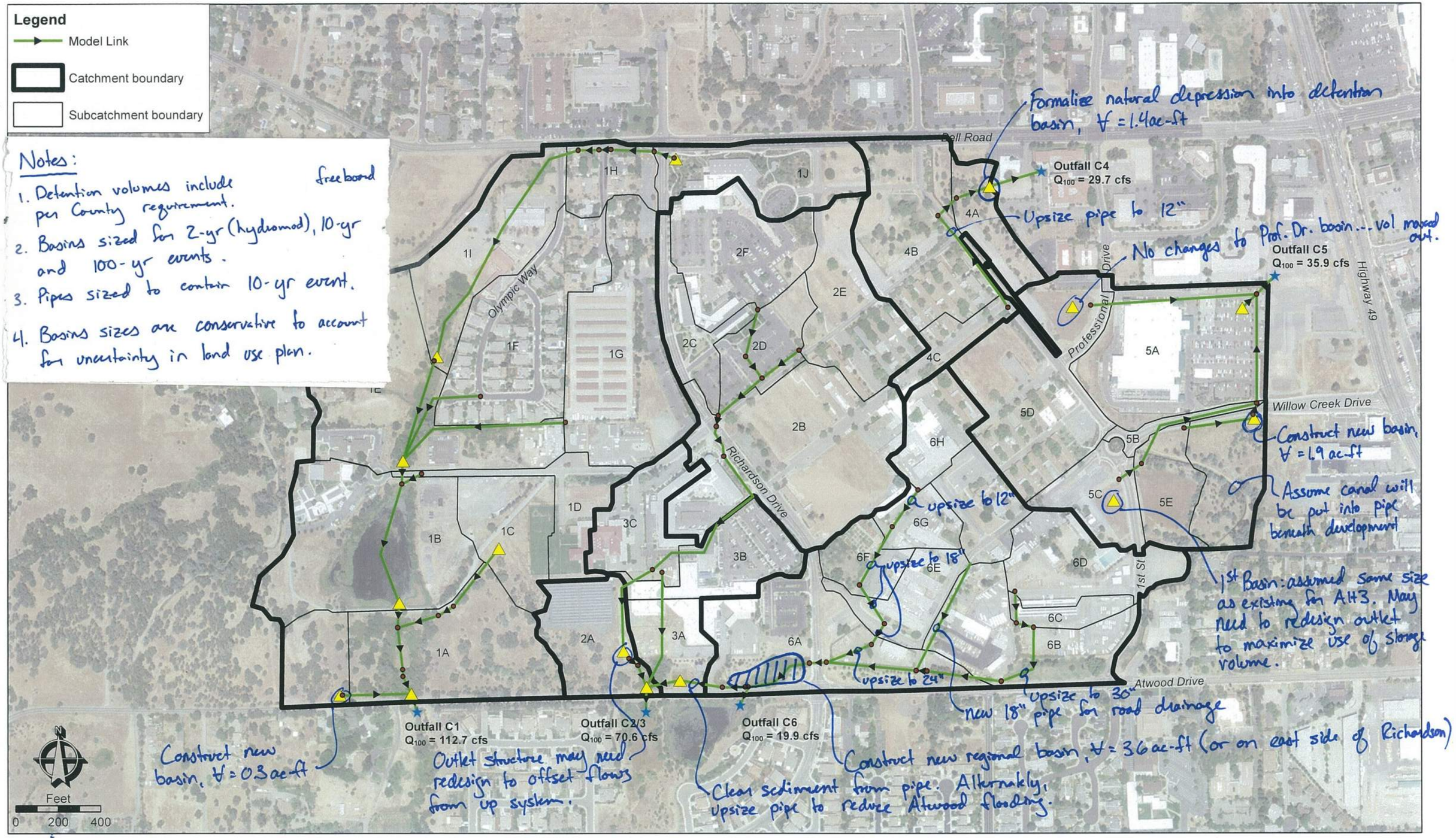


FIGURE NO. SD-05

REGIONAL STORMWATER FACILITIES MARKUP

SECTION 3: MASTER PLANNING

The input and recommendations provided in Section 2 of this report include an essential portion of the critical elements evaluated towards the evolution of the development alternatives into one final option called the proposed **Placer County Government Center (PCGC) Campus Master Plan**. The **PCGC Campus Master Plan** integrates a Community input based mix of land uses that achieves the vision of the campus to implement a series of districts to include a County Services District, a Centralized Green Space for community gathering, a core Dewitt Heritage District that sustains and memorializes the history of the campus, and a residential and commercial multi-use district with a range of residential densities and uses as well as commercial and retail uses.

The final **PCGC Campus Master Plan** option will be utilized to concisely summarize assessment findings towards developing final recommendations which are detailed in Section 3.1 below. Pursuant to the finalization of the Master Plan that incorporates any final recommendations, Section 3.2 will focus on the planning level documentation necessary to detail future PCGC utility improvements (water, irrigation, sanitary sewer, storm) to be implemented on a phased basis to include campus backbone utility infrastructure as well as localized (project based) improvements or associated requirements driven by the guidelines established in the Master Plan Update. In addition to providing detailed planning elements to each major wet utility, some level of input and consideration will also be included in this section to describe the potential for resource conservation related elements to reduce impacts to both the existing utility system (onsite and offsite downstream areas) as well as the environment.

3.1 MASTER PLAN UPDATE – FINDINGS AND ASSESSMENT OF FINAL OPTION

Efforts in this section are focused on providing further refined input and recommendations based on assessment of the final **PCGC Campus Master Plan** option while carefully considering the site and building data included as part of the Master Plan Update and Appendices (Williams + Paddon August, October 2018 versions). The tabulated data within the Master Plan Update provides critical site and facility information such as site acreages, building(s) square footages, number of stories and building types projected over a 20-year horizon. This information is used to establish demand and flow criteria necessary to apply to each of the analytical models contained within each respective Appendix of this report as well as establish the base hydrologic and hydraulic information necessary to complete the drainage analysis and the Master Drainage Report. The findings and assessment and associated recommendations are included within each of the below sub-sections that pertain to each of the major campus utilities (water, sewer, storm). Each section is written with concise recommendations or input given our specific review of the **PCGC Campus Master Plan** Final Option (dated October 2018 as provided by Williams + Paddon).

3.1.1 WATER

The water model and associated pipe network has been updated to incorporate a layout that accommodates the final option. **Figure W-6** illustrates the baseline model calibrated to match existing conditions based on efforts described in Sections 1 and 2 of this report. An existing conditions aerial has been overlaid as reference. **Figure W-7** details the proposed onsite 'County Facilities' water system improvements to accommodate the updated **PCGC Campus Master Plan**. **Figure W-8** details the proposed onsite 'Private Uses' base water system improvements, served by

NID, to accommodate the updated PCGC Campus Master Plan. Figure W-9 illustrates a detailed summary of available fire flows throughout each proposed water system: (1) the County system primarily supplied by PCWA with NID Emergency Intertie connections and (2) the Private Development system served by NID. The fire flow model assumes that a minimum pressure of 20 psi is to be maintained throughout each system onsite. Each hydrant node is simulated to produce the highest available fire flow until a residual pressure of 20 psi is calculated in the system. Where proposed facilities border the two service area (i.e. County served by PCWA and Private served by NID), it is assumed that site hydrants nearest each facility could be used to meet fire flow requirements regardless of the service area. The baseline existing conditions model and the modeled final options and associated demand scenarios are included in Appendix A of this report. Below is a concise summary of input of the proposed water system:

Demands

As previously mentioned, two systems are proposed as a part of the Master Plan development. The NID system, which will serve the private development areas and the PCWA system which will serve the County buildings. The total potable demand under a maximum day scenario for the private and public buildings at buildout of the government center is 401 gpm. The total demand including irrigation is 908 gpm. The 908 gpm was input in the model at nodes located at proposed building locations. Since the pipe sizing for the system is primarily based on fire flow requirements, the distribution of the demands can change without causing significant impact to the system. A system demand table, with domestic, irrigation and fire demands estimated for each facility (existing and proposed) within the Master Plan, is provided in Appendix A.

Water Line Upgrades

Figure W-7 shows areas within the PCWA supplied County system where pipes require upgrading or are added to meet the required fire flow demands, along with areas of pipeline to remove or abandon due to new construction. Pursuant to discussions with the County in February 2018, the ultimate plan for the Placer County Government Center is to fully replace the water system within the government center. This is necessary due to the age of the current system (1940's system). As it is currently understood, the plan is to phase the replacement of the old pipe over the course of development of the Master Plan but to replace the applicable lines based on the implementation of specific facilities and their associated sites. Phasing of the project is covered in Section 3.2 of this report.

Figures W-8 and W-9 shows private areas to be served by NID where pipes are proposed to be added to provide service and meet the required fire flow demands. These figures illustrate a base system of main waterlines. It is anticipated that additional distribution lines of equal or lesser size will branch off the illustrated main lines to serve each private building accordingly. These secondary lines have not been modelled and are not shown as part of this assessment. Discussions were held with the County along with follow-up discussions with NID in early 2018 regarding the addition of a separate NID system to provide water for domestic use and fire suppression to the campus. These discussions evolved into an NID served system to meet the needs of the private, mixed-use and residential areas of the Master Plan. This provides further relief to the County, PCWA supplied water system which is presently over capacity to meet fire demands without the NID intertie

connections. The specific recommendation is to extend the 16" transmission line from an existing stub at the intersection (roundabout) of Willow Creek Drive and 1ST Street north on 1st Street to the existing 12" waterline on Bell Road and to install a 10" primary loop to serve the mixed-use facilities in the southeast corner of the Master Plan.

County System Upgrades

Total approximate quantities of pipeline upgrades needed are as follows:
8275 LF - 10 inch
6725 LF - 12 inch

Total approximate quantities of pipeline to abandon or remove are as follows:
220 LF - 6 inch
720 LF - 8 inch
7020 LF - 10 inch
6340 LF - 12 inch

NID System - Baseline Improvements

Total approximate quantities of new pipeline for a base backbone system (does not include internal projects) are as follows:
1000 LF - 10 inch
1800 LF - 16 inch

Valves (County System only)

As previously indicated in this report, prior investigations have determined that there are many valves that can only partially open or not open at all. The existing conditions model Hazen-Williams C values were modified based on field calibration tests to account for the partially closed valves. Using the modified C values, modeling efforts have currently assumed all lines to be open. For the proposed conditions model a C value for new pipes of 130 was used. Valves are all assumed operational and open since they will be a part of the new construction.

Water Source (County System)

As detailed in Section 1 of the report, currently one regular water source exists at the east edge of the campus from PCWA (Dewitt Master Meter). This is located behind the existing Home Depot and at the intersection of Professional Drive and 1st Street. This connection incorporates two pressure detector assemblies in parallel along with a flow meter. During times of high demand, the pressure drop is substantial. In the event of a fire, the available fire flow is below the required amounts. To calibrate the baseline model and to reflect the hydrant flow test data received in February 2018, one water model scenario was created to determine the results of a single connection to PCWA. The results of these models can be found in Appendix A.

Valves at the north end and south end of the property can be manually opened in the event of an emergency, providing additional water from NID (Nevada Irrigation District). A second model scenario was created to show how the system would operate with these connections available. Without these connections to NID, the PCGC water system cannot meet the required fire flows.

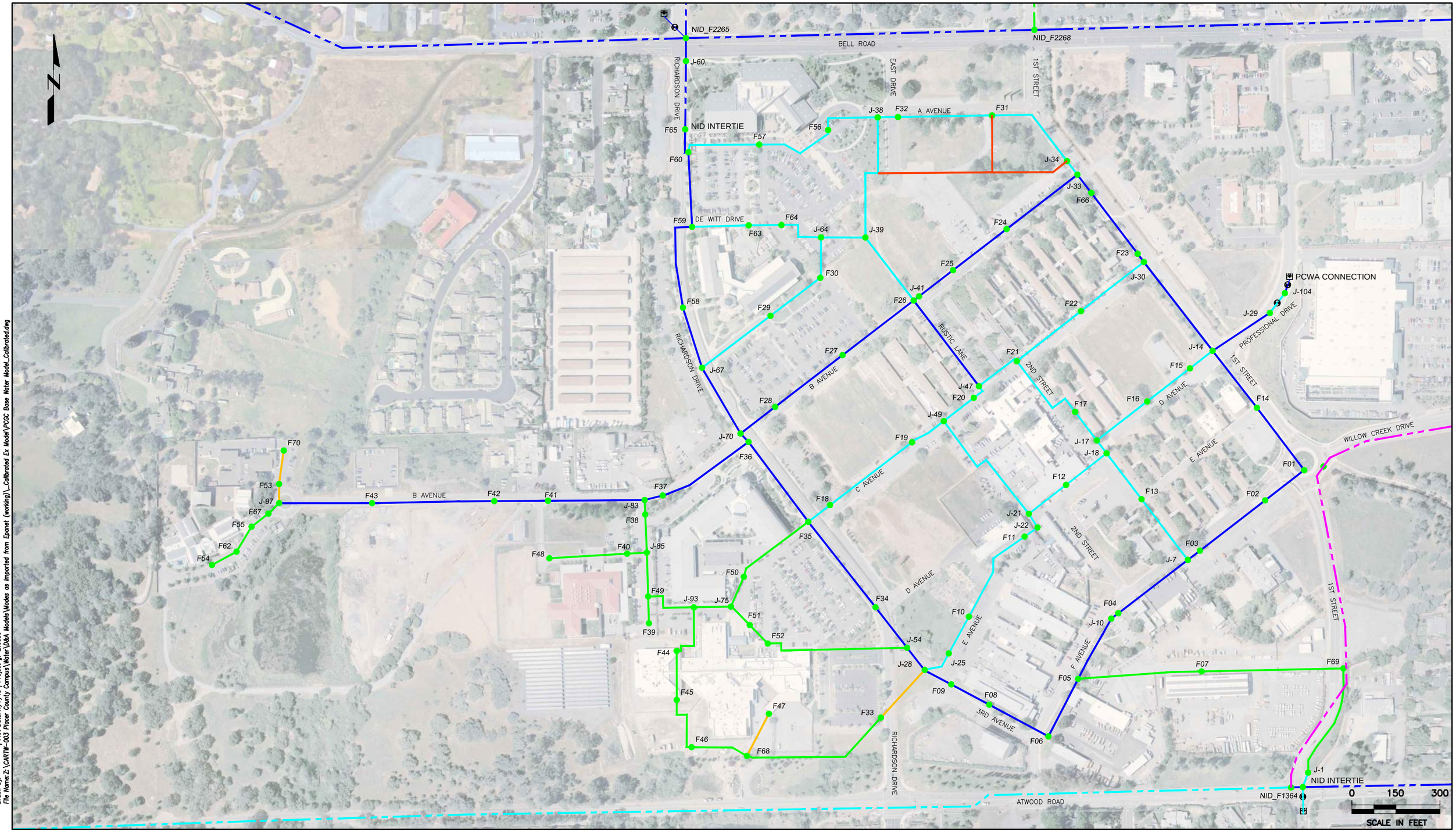
Model Results (County System)

Steps should be taken to reach an agreement with NID to allow permanent connections with an automatic valving system that allows water flow at the two intertie connections in the event of an emergency fire (i.e., a pressure drop). With such a system in place and with the wholesale upgrade of the old County water lines, the model results indicate that the proposed improvements can meet the full buildout demands and fire flow requirements of the Master Plan. Without the NID connection, the PCGC cannot be adequately served for fire protection without substantial improvements to the PCWA system.

The full buildout model for the County system also relies on the wholesale replacement of the old 1940s era pipeline which will further serve to greatly increase capacity and minimize system losses. This includes a majority of the main lines that exist through the heart of the Dewitt campus and bound by Richardson Drive to the west, 1st Street to the east, F Avenue to the south, and A Avenue to the north (excluding the water line in front of the CDRC Building). These lines have been previously identified by Placer County Department of Public Works and Facilities as requiring removal and replacement due to the aged system and the deteriorating conditions of the water system. Section 3.2 below will address and provide detail regarding the phasing of the campus water system to remove and replace segments of water lines in 5-year increments. Water models for each 5-year Tier will be developed to ensure the system meets interim demand and fire flow conditions.

Model Results (NID System)

The model results indicate that the proposed improvements can meet the full buildout demands and fire flow requirements of the private uses shown on the Master Plan. The extension of a proposed 16” transmission main along the alignment of 1st Street to the 12” line on Bell Road serves as the spine for the NID system and connects to the existing 16” water main at the existing roundabout that marks the intersection of Willow Creek Drive and 1st Street. This allows for three primary points of connection to the NID system where supply can be provided to the private uses of the Placer County Government Center: Highway 49, Atwood Road, and Bell Road. This greatly increases the supply that can be delivered by the NID water system. Section 3.2 below will address and provide detail regarding the phasing of the campus NID water system in 5-year increments.



Drawn by: | Plot Date:11/7/18 | Project #: 216056
File Name:Z:\CARTW-003 Placer County Campus\Water\Q&A Models\Models as Imported from Epanet (working)_Calibrated Ex Model\PCGC Base Water Model_Calibrated.dwg

NODE LEGEND

J## - JUNCTION

F## - FIRE HYDRANT

EX COUNTY	EX NID	
		4-INCH DIAMETER
		6-INCH DIAMETER
		8-INCH DIAMETER
		10-INCH DIAMETER
		12-INCH DIAMETER
		16-INCH DIAMETER

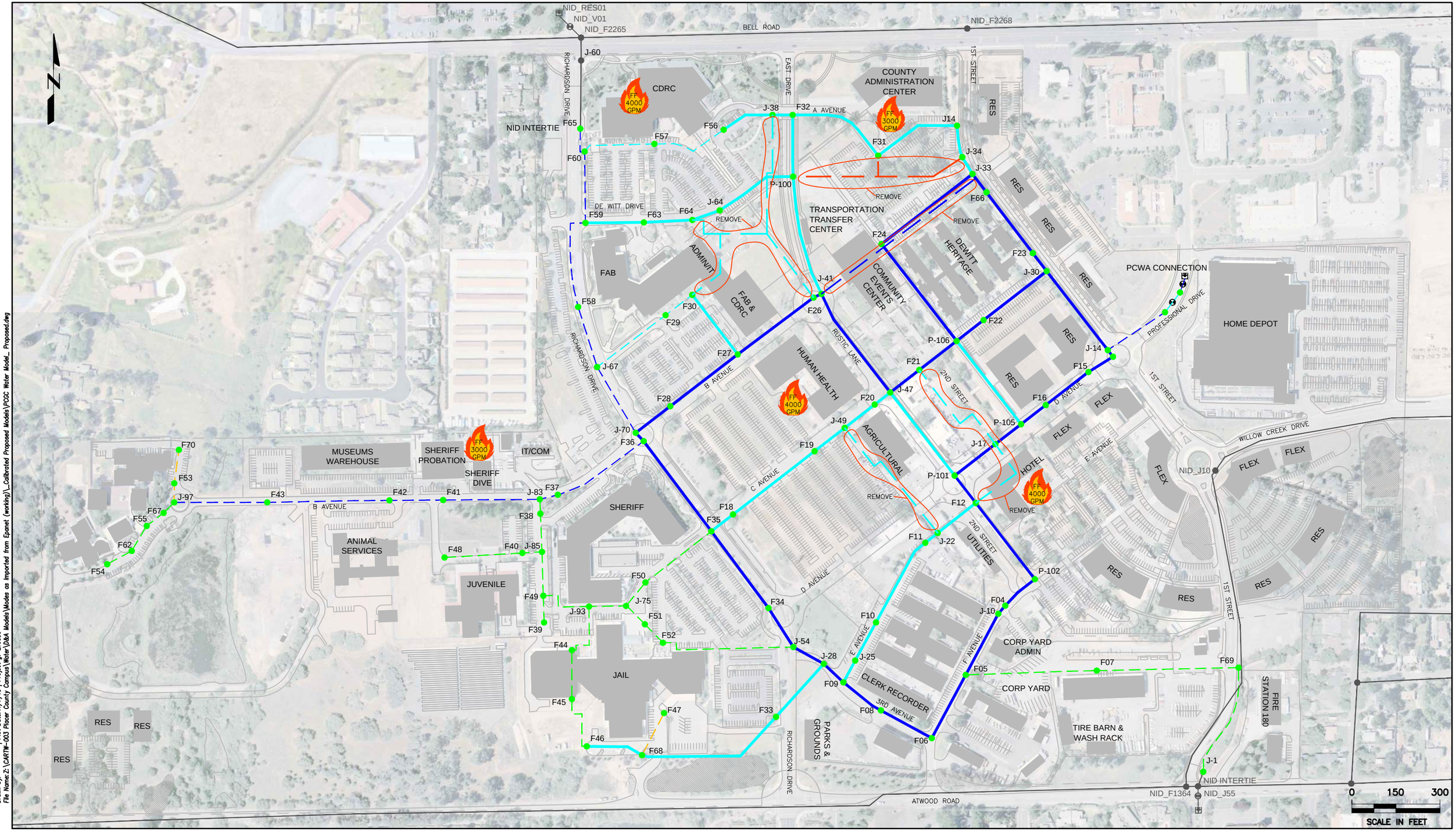
DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Suite 115
El Dorado Hills, CA 95762
Ph: (916) 933-1997
Fax: (916) 933-4778

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY GOVERNMENT CENTER
EXISTING WATER PIPELINE

FIGURE NO.

W-6



Drawn by:
File Name:Z:\CARTW-003 Placer County Campus\Water\J&A Models\Modes as Imported from Epanet (working)_Calibrated Proposed Models\PCGC Water Model_ Proposed.dwg | Plot Date:11/7/18 | Project #: 216056

LEGEND

● Node / Number

FF 4000 GPM
Required Fire Flow
Note: Minimum Required FF 2375 gpm in all areas highlighted

LINE TYPE & WIDTH
- EX PCWA PIPE
- PROPOSED PCWA PIPE
- EX NID PIPE

J## - JUNCTION
F## - FIRE HYDRANT

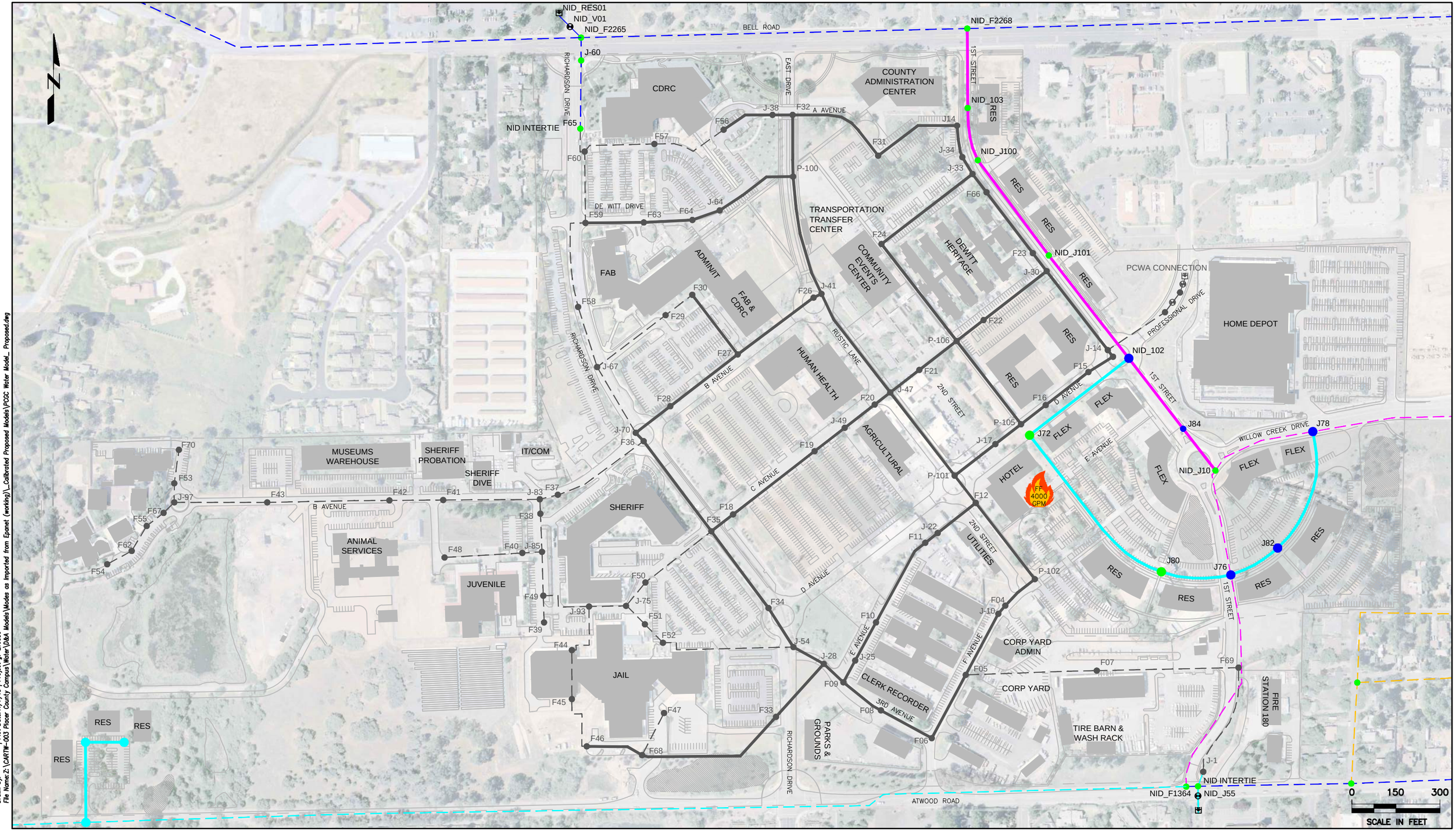
PIPE COLOR
- 4-INCH DIAMETER
- 6-INCH DIAMETER
- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- 16-INCH DIAMETER

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Suite 115
El Dorado Hills, CA 95762
Ph: (916) 933-1997
Fax: (916) 933-4778

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY GOVERNMENT CENTER MASTER PLAN 2018
COUNTY PROPOSED WATER IMPROVEMENTS

FIGURE NO.
W-7



Drawn by:
File Name:Z:\CARTW-003 Placer County Campus\Water\J&A Models\Modes as Imported from Epanet (working)_Calibrated Proposed Models\PCGC Water Model_ Proposed.dwg | Plot Date:11/7/18 | Project #: 216056

LEGEND

● Node / Number

FF 4000 GPM — Required Fire Flow

Note: Minimum Required FF 2375 gpm in all areas highlighted

LINE TYPE & WIDTH
- EX NID PIPE
- PROPOSED NID PIPE
- EX COUNTY PIPE
- PROPOSED COUNTY PIPE

J## - JUNCTION
F## - FIRE HYDRANT

PIPE COLOR
- 4-INCH DIAMETER
- 6-INCH DIAMETER
- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- 16-INCH DIAMETER

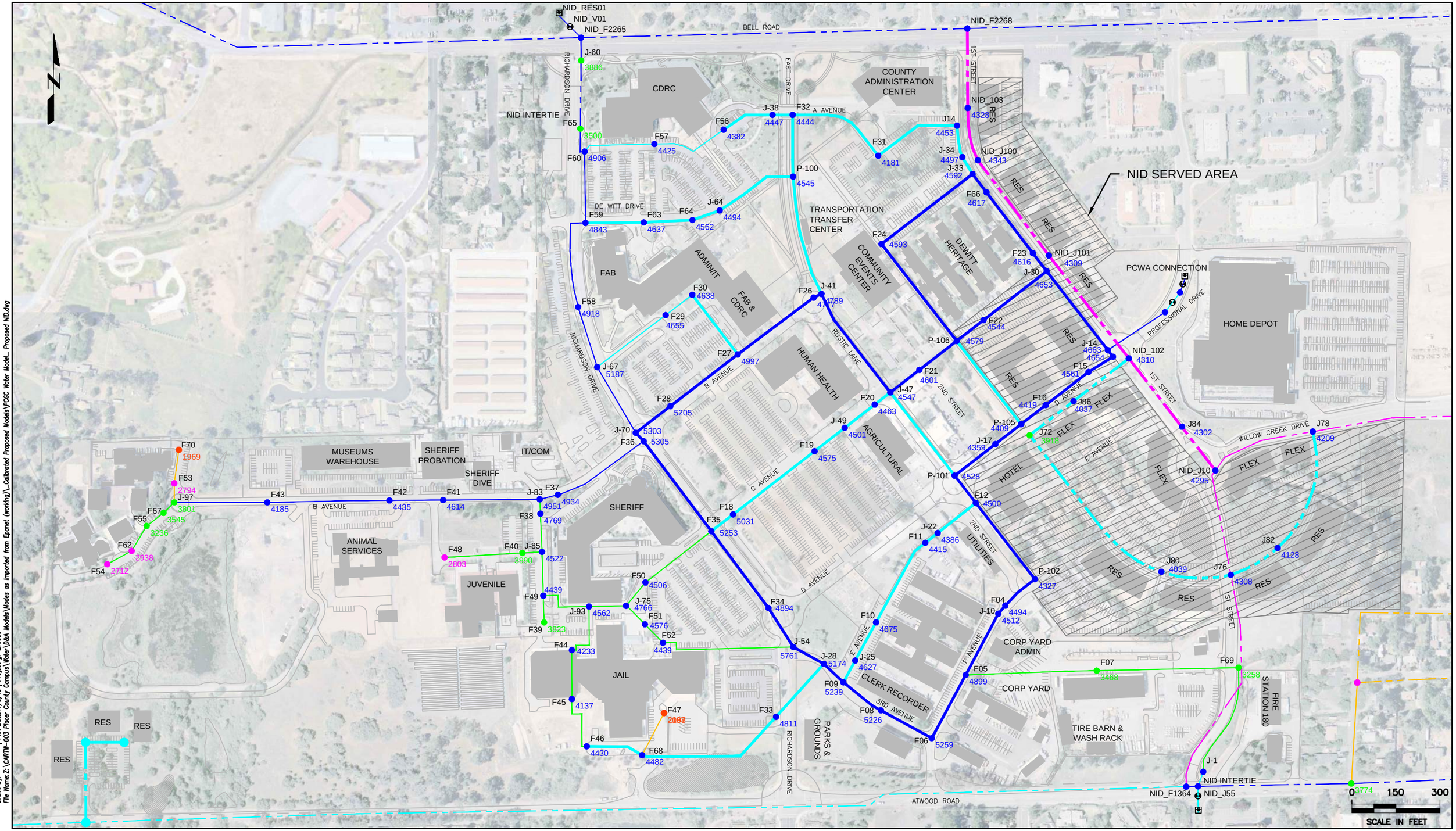
DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Suite 115
El Dorado Hills, CA 95762
Ph: (916) 933-1997
Fax: (916) 933-4778

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY GOVERNMENT CENTER MASTER PLAN 2018
NID PROPOSED WATER IMPROVEMENTS

FIGURE NO.

W-8



Drawn by: | Plot Date:11/8/18 | Project #: 216056
File Name: Z:\CARTW-003 Placer County Campus\Water\J&A Models\Modes as Imported from Epanet (working)_Calibrated Proposed Models\PCGC Water Model_ Proposed NID.dwg

LEGEND

EX PCWA PIPE	
PROPOSED PCWA PIPE	
EX NID PIPE	
PROPOSED NID PIPE	
J## - JUNCTION	
F## - FIRE HYDRANT	

PIPE COLOR

- 4-INCH DIAMETER
- 6-INCH DIAMETER
- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- 16-INCH DIAMETER

AVAILABLE FIRE FLOW

- <2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Suite 115
El Dorado Hills, CA 95762
Ph: (916) 933-1997
Fax: (916) 933-4778

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY GOVERNMENT CENTER
PROPOSED SYSTEM-PCWA SUPPLY & NID INTERTIE
AVAILABLE FIRE FLOW AT SYSTEM 20PSI

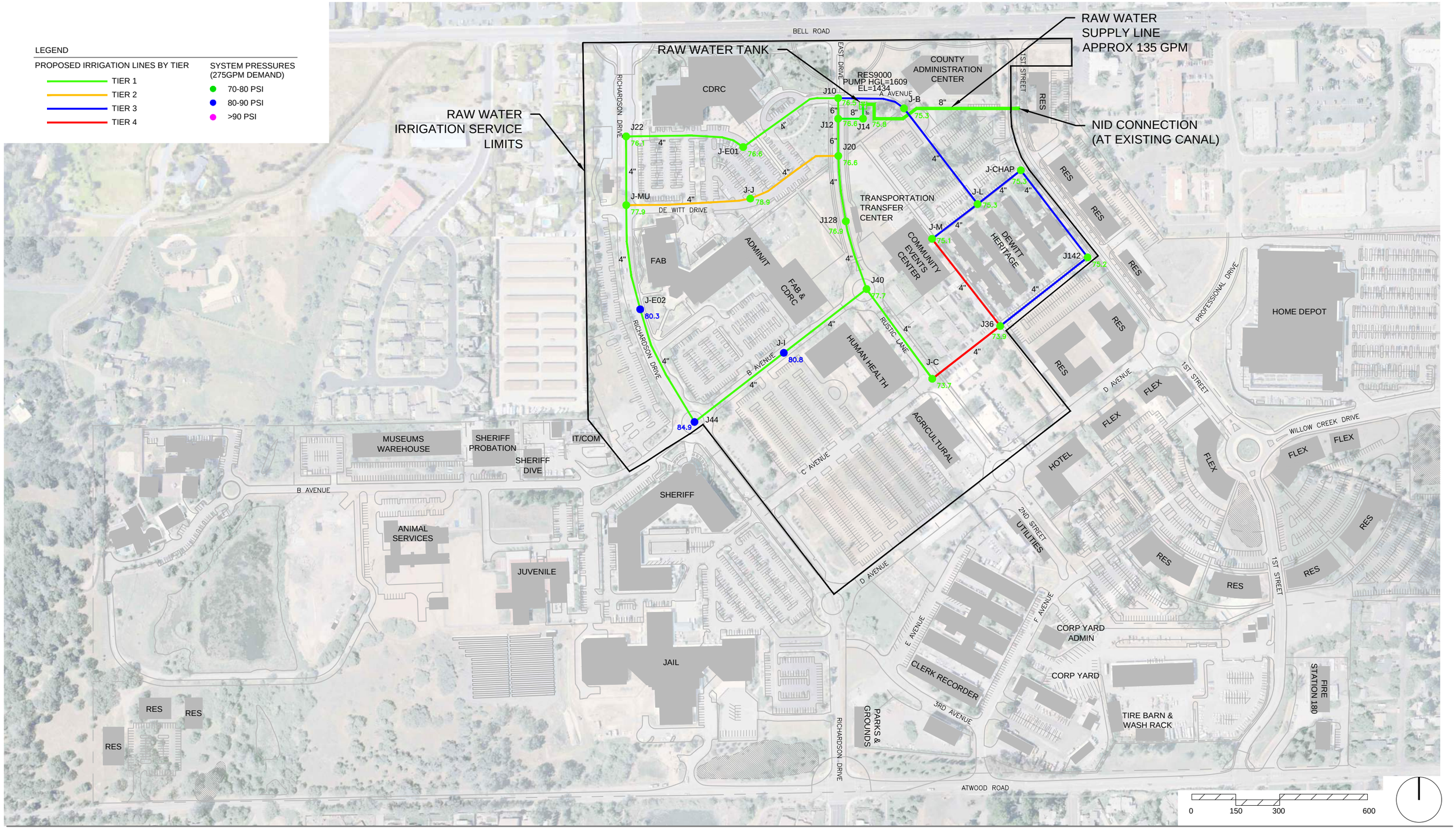
FIGURE NO.
W-9

3.1.2 RAW WATER FOR IRRIGATION

A new raw water model and associated pipe network have been created to depict a raw water irrigation system for the Master Plan. **Figure I-1** below illustrates the modelled condition of an onsite supply and distribution system used to deliver raw water for irrigation purposes throughout the applicable portions of the Master Plan campus. As previously mentioned this system is planned to provide irrigation service to the landscape uses only for the County facilities, the limits of which are as shown on **Figure I-1**. In developing the raw water model depicted in the figure, certain parameters were established for the analysis. These parameters are based on discussions with the County and with an irrigation specialist with experience in developing large-scale irrigation systems. The parameters are as follows:

- A pressurized supply line would extract raw water from the existing NID canal at a location along 1st Street to fill the onsite storage facility (See Raw Water Tank, **Figure I-1)**
- The storage facility is located at one of the highest points on the campus to minimize the pressure head needed to deliver irrigation throughout the campus.
- The storage facility has been preliminarily and conservatively sized at 33,000 gallons to provide enough volume to deliver the peak irrigation demand to County facilities. This demand is approximately 275 gpm and represents a maximum day irrigation demand (refer to Appendix A for the raw water irrigation demand estimate associated with County uses). This represents delivery of 275 gpm for a 2-hour duration. Again, this is a conservative estimate since such a delivery would not occur simultaneously throughout the campus County facilities as the distribution system would likely be designed to supply irrigation in separate timed zones.
- Although a simulated storage and draw down analysis has not been performed with this report, it provides a general idea of the size of an onsite storage reservoir to deliver raw water for irrigation.
- Pipes were sized to maintain a pressure range at a peak flow of 275 gpm distributed throughout the illustrated limits of the campus. The model used a minimum pressure of 70 psi and an upper limit of 90 psi to account for an acceptable delivery range to remote sprinkler heads. The predominant pipe size throughout the system is 4-inches with a few 6-inch and 8-inch segments at the reservoir which are needed to maintain maximum allowable velocities while minimizing head losses.
- Approximately 175’ of head or 76 psi of pressure is required at the storage reservoir to deliver flows within the pressure range. Refer to Appendix B for the current raw water irrigation model.

The current results of the raw water irrigation model demonstrate that an onsite system can be developed to significantly offset the peak demand (roughly 30% of the Master Plan Maximum Day Demand) while utilizing an allocated resource that has not been used to date. This significantly reduces the burden on an aged system and reduces consumption of potable water that can be used for domestic purposes.



COUNTY OF Placer

PLACER COUNTY GOVERNMENT CENTER MASTER PLAN 2018

RAW WATER IRRIGATION SYSTEM – FIGURE 1-1

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste.115 Ph: (916)933-1997
El Dorado Hills, CA 95762 Fax: (916)933-4778

3.1.3 SANITARY SEWER

The SewerCAD model and associated pipe network has been updated to incorporate a layout that accommodates the final option. **Figure SS-10** illustrates the baseline model analyzed to match existing conditions (pre PCGC Master Plan Update Option) based on efforts described in Sections 1 and 2 of this report. An existing conditions aerial has been overlaid as reference. **Figure SS-11** details the proposed onsite sewer system improvements to accommodate the updated **PCGC Campus Master Plan**. Both upstream and downstream contributing watersheds that either impact the PCGC Master Plan Update or to which the campus may have an impact have been evaluated accordingly. The baseline existing conditions model and the modeled final option and associated wastewater flow scenarios are included in Appendix C of this report. Below is a concise summary of input of proposed sewer system changes:

Sewer Line Rerouting

Figure SS-11 shows areas where sewer pipe rerouting is required due to proposed planned facilities.

Dewitt Trunk Line Upsizing

Based on the study completed by Stantec and referenced herein, *North Auburn Dewitt Trunk Sewer Capacity Evaluation Report*, the main trunk lines that run along Richardson Drive have been recommended for upsizing. Based on information recently received from the County a number of these lines have already been upsized (AD2-45 to AD2-44 upsized from 15” to 18” and AD2-44 to AD3-78 upsized from 12” to 15”). **Figures SS-10 and SS-11** reflect the increased sizes and the baseline and Master Plan models have been updated to account for the upsizing. The modelling for the Master Plan further substantiates the need for the upsizing detailed in the Stantec Report.

Sewer Line Upgrades

Figure SS-11 shows areas where lines need to be upgraded or added along with areas of pipeline to be removed or abandoned due to new planned facilities. The following approximate quantities are based on the assumptions made in **Figure SS-11**.

Total quantities of pipeline upgrades needed are as follows:
6100 LF - 6 inch
670 LF - 8 inch
1380 LF - 10 inch
360 LF - 12 inch
1400 LF – 15 inch

Total quantities of pipeline to abandon or remove are as follows:
260 LF - 6 inch
1180 LF - 8 inch
260 LF - 10 inch
2260 LF - 12 inch

Parallel Sewer Systems and Low-Pressure System

Figure SS-11 and Figure SS-A show one area on Atwood Road where the existing topography cannot be accommodated with gravity sewer in order to service the planned residential development in the southwest corner of the Master Plan. Consequently, a 3" low-pressure system for a minor segment along Atwood Road is proposed to convey sewer flows to a higher elevation on Atwood where it could then gravity sewer into the Atwood Ranch III subdivision, connect to existing gravity sewer lines on Caballo Circle and flow towards the existing Atwood Ranch Unit III Sewage Lift Station. The County has indicated that this offsite lift station has sufficient capacity to accommodate the additional flows from the planned residential units.

In the Corporation Yard, a planned Tire Barn and Wash Rack appears to be in an area that lacks gravity sewer lines of sufficient size and depth to serve the planned facilities. Figure SS-11 illustrates the installation of a minor sewer lift station for the Tire Barn and Wash Rack located in the Corporation Yard. Throughout the course of this utility assessment, it could not be determined, nor could information be provided regarding the presence of existing gravity lines and associated sizes. Consequently, a determination of sufficient capacity to serve this planned facility could not be made. This is the basis for proposing a minor lift station for this planned area. The preliminary sizing of a lift station and associated force main sizes has not been determined as part of this report as it is beyond the scope of this assessment.

In addition, a parallel 6-inch sewer line will need to be constructed for the area just north of Atwood Road and east of Richardson Drive (for the planned Parks & Grounds Facility). The existing grades in this area are approximately 10' lower than the area to the north where a connection to the existing sewer system would otherwise be made. As a result, a parallel line would run north along Richardson Drive for approximately 2110' until the sewer system is deep enough to tie into at C Avenue.

New Development Area Summaries

The summary that follows outlines recommendations to provide sewer service for each of the new proposed construction areas:

SR1, SR2, SR3 – Small Residential Units (SW corner)

- Gravity sewer to Caballo Circle in Atwood Ranch Unit III Subdivision (with segment of 3" low pressure main)

R1 & R2 – Residential Units (NE corner)

- Option 1 – Gravity sewer through site of existing office buildings to the east and tie into public sewer on Professional Drive and Heritage Oak Place. This is the modelled option.
- Option 2 – Pressure system to MH AD3-47 on B Avenue at 1st Street

I, K2, K3, K4 – Parks, Utilities, Corporation Yard, Tire Barn (South)

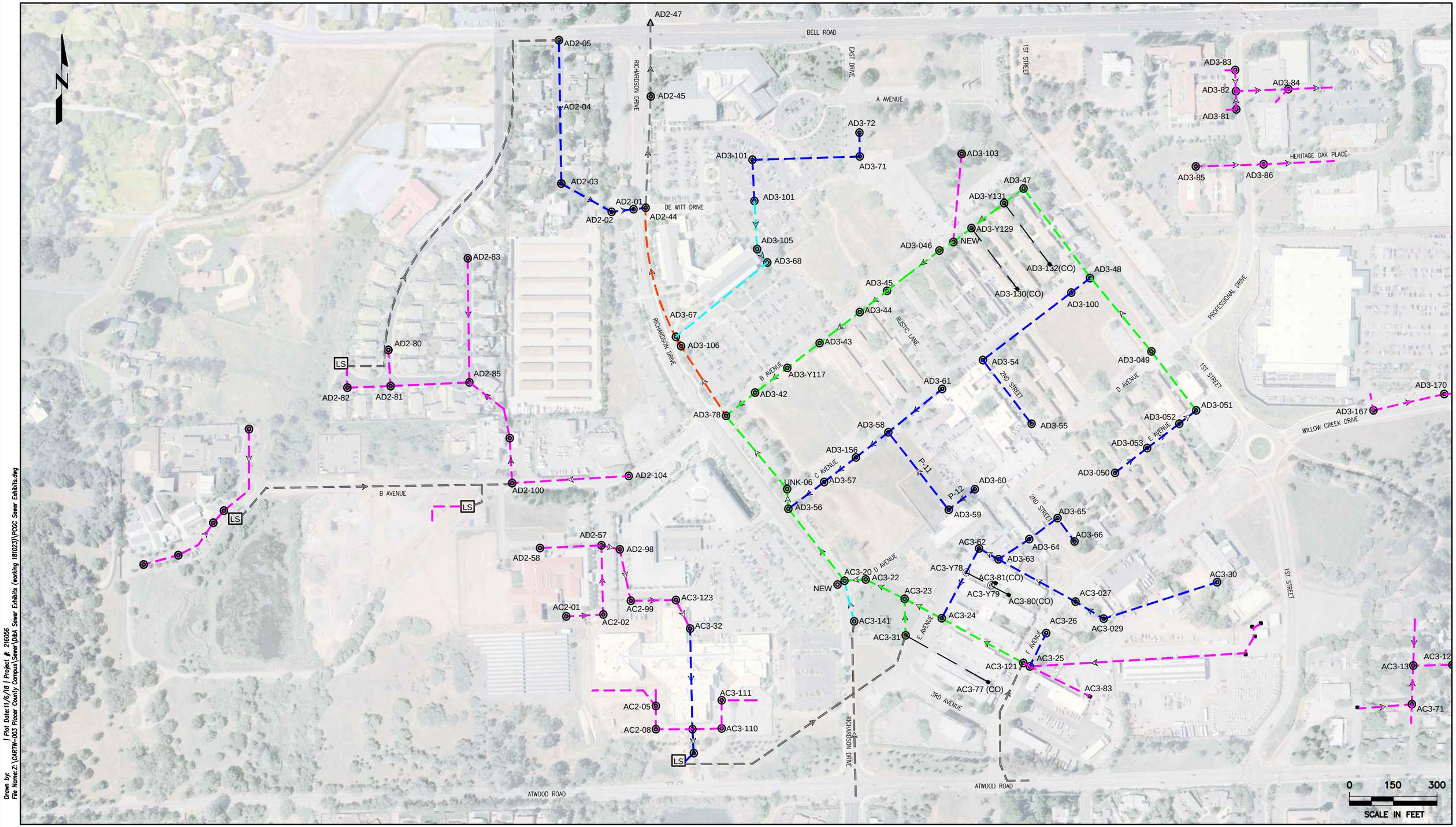
- Option 1 – Gravity sewer north, parallel line along Richardson to MH AD3-78 (B Avenue). This is the modelled option.
- Option 2 – Pressurized system to MH AC3-31

R7, R8, F5, F6 – Residential and Flex Units (SE corner)

- Gravity to manhole by Home Depot on Willow Creek Drive (MH3-167).

B – Community Admin Center (NE corner)

- Option 1 – Gravity to manhole AD3-103 (assumed to still be in service). This is the current modelled system.
- Option 2 – Gravity to manhole AD3-72 (to the west)
- Option 3 - Gravity to manhole AD3-47 (to the southeast)



Drawn by:
File Name:Z:\CARTW-003 Placer County Campus\Sewer\D&A Sewer Exhibits (working 181023)\PCGC Sewer Exhibits.dwg | Plot Date:11/6/18 | Project #: 216056

- MANHOLE
- SEWER CLEANOUT
- LS SEWER LIFT STATION
- SEWER FORCEMAIN

EXISTING SEWERLINES
- LATERAL
- 6-INCH DIAMETER
- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- 15-INCH DIAMETER
- 18-INCH DIAMETER

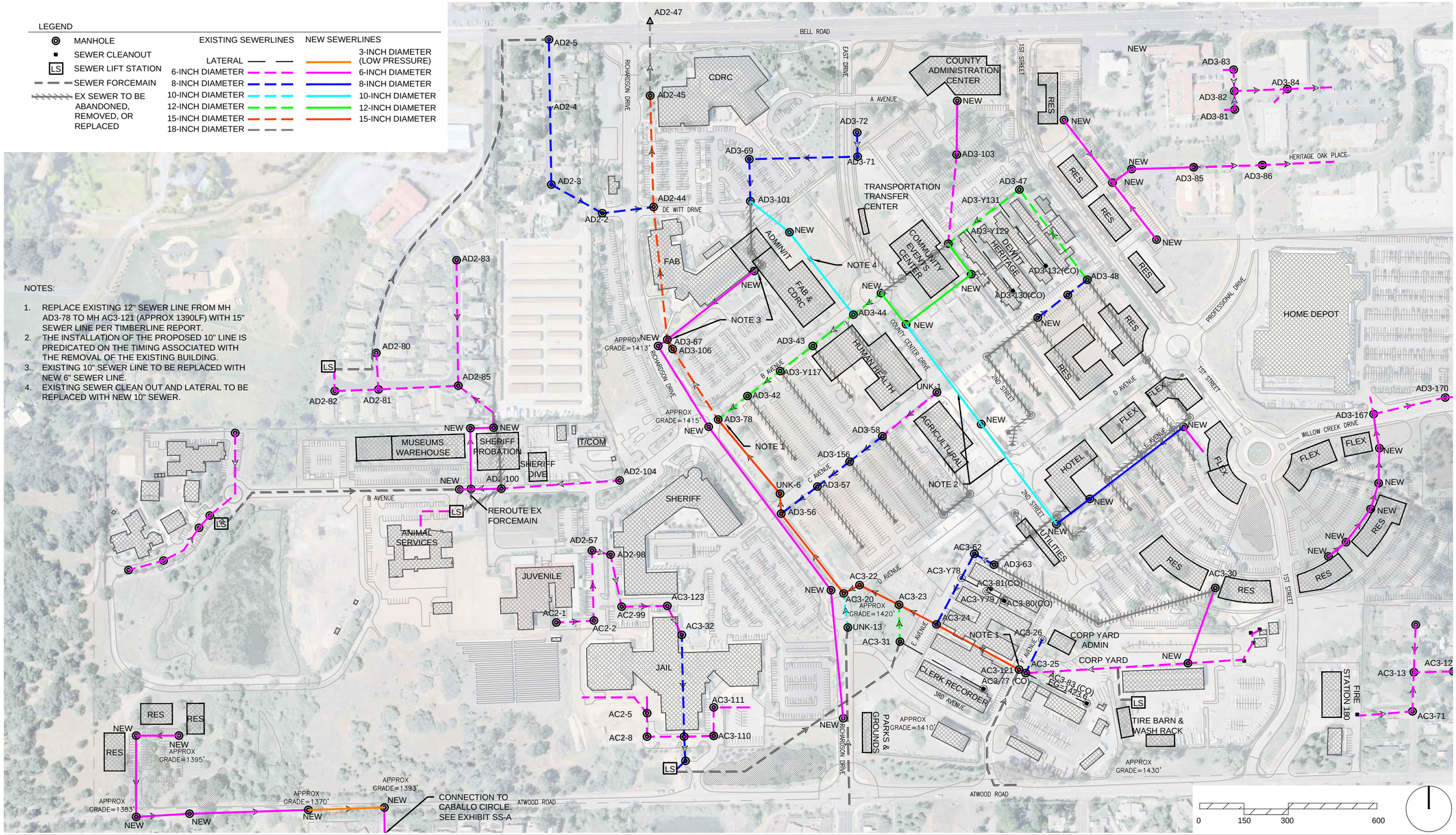
DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Suite 115
El Dorado Hills, CA 95762
Ph: (916) 933-1997
Fax: (916) 933-4778

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

PLACER COUNTY GOVERNMENT CENTER MASTER PLAN 2018
EXISTING SEWER PIPELINE

FIGURE NO.

SS-10



COUNTY OF Placer

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019

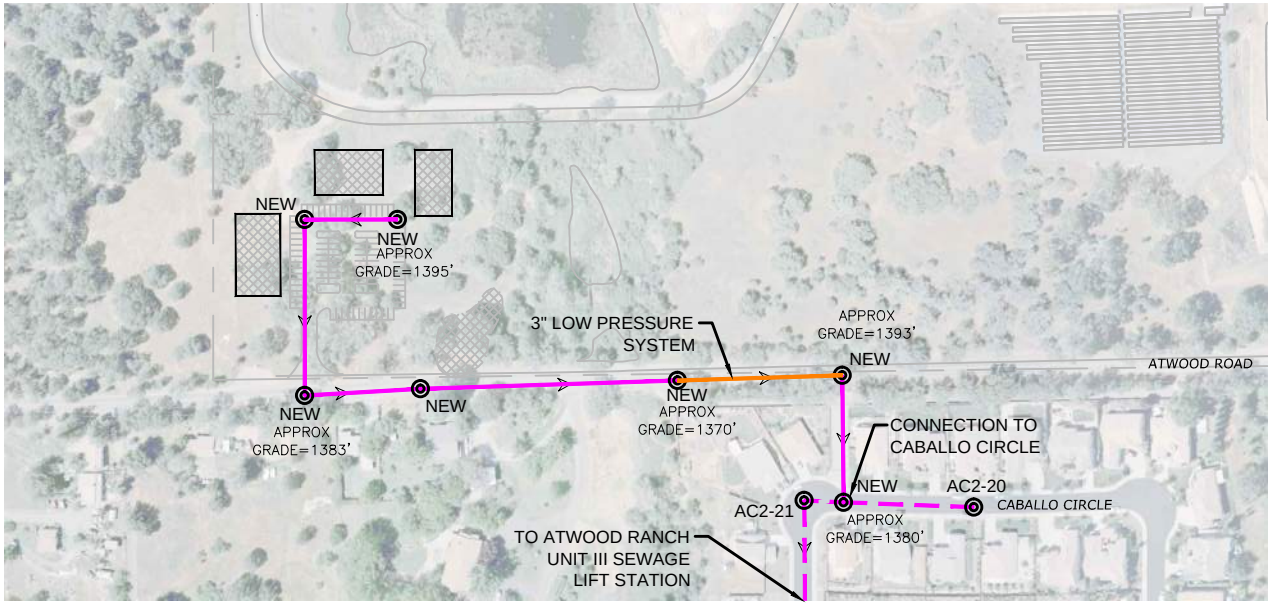
PROPOSED SEWER IMPROVEMENTS – FIGURE SS–11

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste. 115 Ph: (916) 933–1997
El Dorado Hills, CA 95762 Fax: (916) 933–4778

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2018

PROPOSED SEWER IMPROVEMENTS
EXHIBIT A - CABALLO CIRCLE CONNECTION



0 150 300
SCALE IN FEET

Drawn by:
File Name: Z:\CARTW-003 Placer County Campus\Sewer\D&A Sewer Exhibits (working 181023)\PCGC Sewer Exhibits.dwg | Plot Date: 10/27/18 | Project #: 216056

MANHOLE
SEWER CLEANOUT
LS SEWER LIFT STATION
SEWER FORCEMAIN

EXISTING SEWERLINES
6-INCH DIAMETER
8-INCH DIAMETER
10-INCH DIAMETER
12-INCH DIAMETER
15-INCH DIAMETER
18-INCH DIAMETER

NEW SEWERLINES
3-INCH DIAMETER (LOW PRESSURE)
6-INCH DIAMETER
8-INCH DIAMETER
10-INCH DIAMETER
12-INCH DIAMETER

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Suite 115
El Dorado Hills, CA 95762
Ph: (916) 933-1997
Fax: (916) 933-4778

CARTWRIGHT ENGINEERS
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

FIGURE NO.
SS-A

3.1.4 STORM DRAIN

This section details an update to the three-conceptual options relative to stormwater planning considerations for the Placer County Government Center (PCGC) Master Plan Update. A coupled hydrologic-hydraulic model to simulate stormwater dynamics for the entire PCGC campus, plus offsite areas that contribute run-on has been developed. The development of the existing conditions model is detailed in the PCGC Master Drainage Report included in Appendix D (dated March 20, 2019). Williams +Paddon provided a land plan (dated October 10, 2018), which is understood to be the final PCGC Master Plan option ('Final Option). At this point, this land plan has been assimilated into the model to test it against the anticipated stormwater infrastructure improvements required to comply with Placer County design standards. The design team along with the County has agreed on a strategy of meeting flood control and hydromodification requirements with several regional (campus) stormwater basins while leaving water quality treatment requirements to individual projects as they come online.

The proposed stormwater basins and their dimensions are summarized below. Refer to Figure SD-6 below for the locations of stormwater basins.

- Basin 1K: A new small basin to control runoff from the proposed residential development in the southwest corner of the project site.

- Basin 1L: A new small basin to control runoff from Subcatchments 1G and 1L.

- Basin 2A: A large existing basin to control runoff from Catchment 2. A study by A.R. Associates (2000) indicated this basin is sized to accommodate a complete buildout condition, however, their study assumed different ultimate watershed conditions than the current land plan. The model indicated that the volume of Basin 2A will need to be increased to accommodate the additional runoff. The modelling assumed the basin could be expanded into the open space south of the solar farm. The footprint of the basin would need to be increased by roughly 8,700 square feet (a 34 percent increase).

- Basin 4A: A new small basin located in the northeast corner of the project site to control runoff from the north portion of the Multi-family Housing site (Subcatchment 4A). The basin is proposed for dual use for flood control and water-quality treatment for the north portion of the Multi-family Housing project.

- Basin 4B: A new small basin to control runoff from Subcatchment 4B.

- Basin 5C (1st Street Basin): An existing basin, the volume of which is not fully utilized under existing conditions. The land plan impinges on the footprint of the existing basin, and it will need to be slightly regraded to be compatible with the Final Option. The outlet structure will need to be reconfigured to control flow rates in a way that enhances utilization of the storage volume.

- Basin 5D (Professional Drive Basin): An existing basin that controls runoff from

Subcatchment 5D and 5F (the south portion of the Affordable Housing project). The only change to Basin 5D is minor regrading of the emergency overflow outlet to raise its elevation by a minimum of 0.4 feet so the basin will comply with the County freeboard criteria. The basin top can be regraded to raise the elevation by 1.0 foot to allow for added flexibility in freeboard.

- Basin 5E: A new medium-sized basin to control runoff from Subcatchment 5E. While the footprint of this basin fits within the current land plan, it may be possible to reduce its size by grading a portion of Subcatchment 5E to drain to Basin 5C, thereby using the extra volume in Basin 5C to control flows from a portion of Subcatchment 5E.

- Basin 6A: A new large basin to control runoff from Catchment 6. There appears to be additional open space areas in Catchment 6 (for instance, the landscaped area along Atwood Drive) that could be utilized to meet the total storage volume requirement.

- Basin 6F: A new medium-sized basin to control runoff from Subcatchments 6G and 6F. The footprint of Basin 6A was maximized within the open space south of the jail building, and Basin 6F is needed to provide supplemental storage to alleviate flooding that the baseline model showed to occur along Atwood Drive.

The stormwater basin geometry is summarized in the table below. Depths and volumes are inclusive of the one foot of freeboard required by County standards. For basins that are proposed to be regraded (e.g. 2A and 5C) the figures are for the total new basin size, not the incremental increase.

Table 11 – Final Option Regional Basins

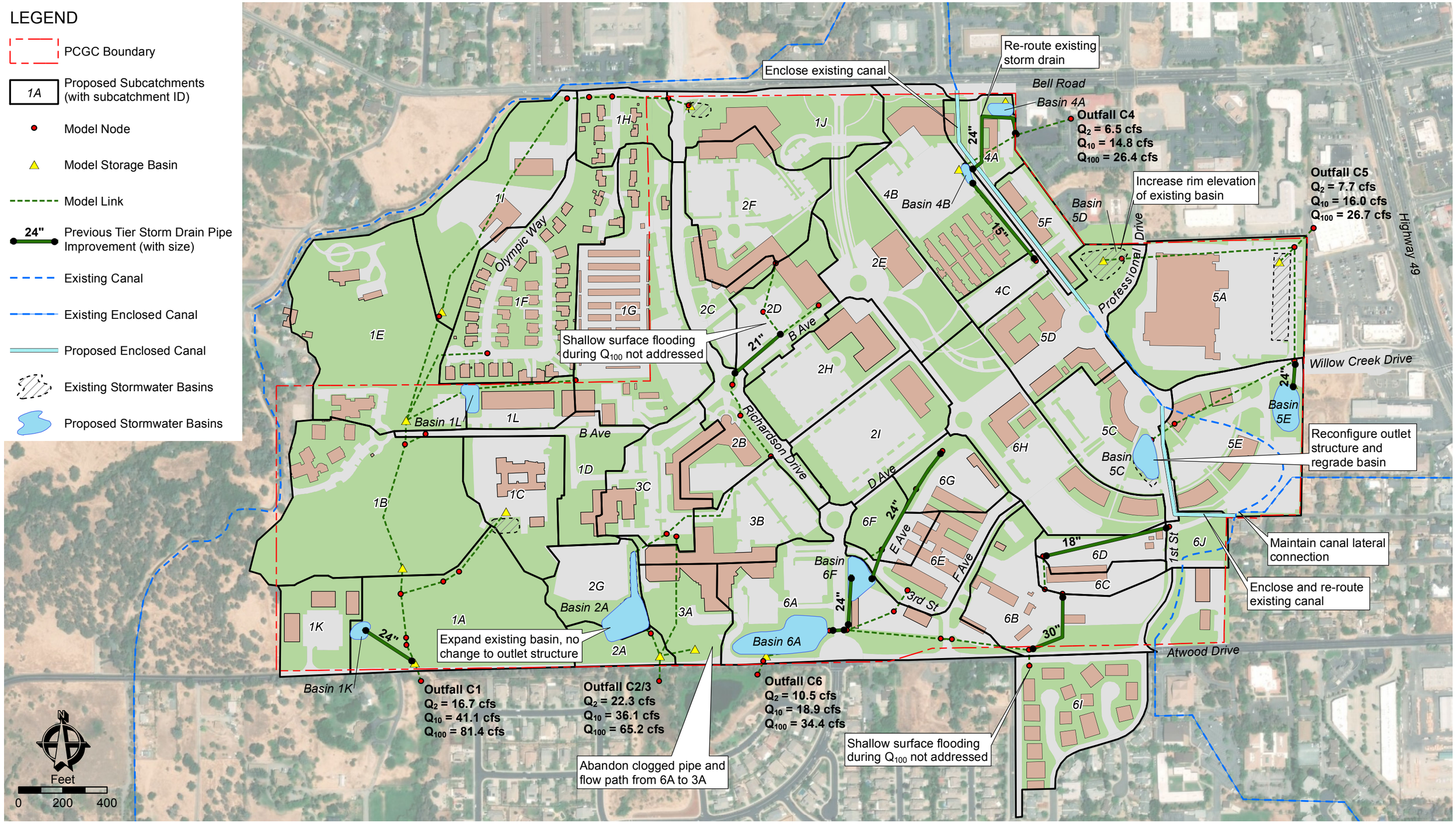
Basin	Basin Geometry				Outlet Structure Geometry		
	Bottom Area (ft^2)	Top Area (ft^2)	Depth (ft)	Total Volume (ac-ft)	Orifice Diameter (in)	Weir Width (ft)	Weir Stage (ft)
1K	1,665	5,588	6	0.48	6	4	4.25
1L	2,600	8,244	6	0.72	15	5	3.75
2A	14,939	35,720	6.5	3.81	same as existing		
4A	3,320	5,760	3.5	0.31	12	3	1.5
4B	572	2,783	6	0.15	12	4	4
5C	6,975	16,207	7	1.83	6”x6”	4	6
5D	923	20,015	7	2.00	same as existing		
5E	9,705	21,156	8	2.78	4	5	6
6A	32,015	49,549	6	5.59	2.5' x 2.5'	4	4.75
6F	8,303	16,678	7	1.70	9	4	6

1. Basin geometry is inclusive of the required 1 foot of freeboard for storage basins.
2.With the exception of Basin 4A, aAll orifices were designed at stage = 0.0 ft (at basin floor). The orifice invert for Basin 4A is 1.0 ft above the basin floor because it is proposed for dual use for flood control and water quality treatment.
3. For basins proposed to be regraded (e.g. 2A and 5C) the figures are for the total new size.

Aside from stormwater basin locations and sizes, additional improvements to the stormwater system and other considerations are annotated on **Figure SD-6**. The model showed that the stormwater basins are effective in limiting peak flow rates at each of the five outfalls from PCGC to be no greater than the existing peak flow rates. Table 13 below compares peak flow rates under existing conditions to the Final Option.

Table 12 – Comparison of outfall peak flow rates under existing and the Final Option

Outfall	2-yr Event			10-yr Event			100-yr Event		
	Baseline	Final Option	Change	Baseline	Final Option	Change	Baseline	Final Option	Change
C1	17.8	16.7	-1.1	44.2	41.1	-3.1	85.3	81.4	-3.9
C2/3	23.6	22.3	-1.3	41.3	36.1	-5.2	66.5	65.2	-1.3
C4	9.3	6.5	-2.8	18.2	14.8	-3.4	29.6	26.4	-3.2
C5	9.2	7.7	-1.5	20.1	16.0	-4.1	34.2	26.7	-7.5
C6	22.8	10.5	-12.3	32.1	18.9	-13.2	37.7	34.4	-3.3



COUNTY OF Placer

FIGURE NO. SD-06 - PRELIMINARY STORMWATER SYSTEM DESIGN

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.

3.2 FINAL MASTER PLAN AND PHASED DEVELOPMENT

This section is focused on finalizing planning recommendations for the Master Plan which includes details associated with the implementation of utility infrastructure improvements based on a phasing program broken out by 4, 5-year increments (Tiers) over a 20-year horizon. This section addresses the planned utility infrastructure improvements associated with each 5-year Tier to accommodate new development or to address existing capacity issues. For the stormwater plan, this section also addresses the recommended stormwater infrastructure needed to meet current regulatory requirements for flow controls for each tier until the Final Option or the 4th Tier.

3.2.1 WATER

The water system tiers are designed to provide domestic service and improved fire flows to existing buildings and meet fire flow standards for new buildings as they are constructed in each tier. As previously discussed, the new water system will replace the old 1940s era pipes with the full replacement to occur over the course of the 4 Tiers.

To meet fire flow standards at new buildings two emergency interties to the NID system are required. Without these connections the system is unable to meet fire suppression flows due to the restriction at the single PCWA service connection. Currently these interties are manually operated. One is near Richardson Drive and Bell Road and the second near First Street and Atwood Road. To provide critical fire flows and ensure these connections will be open during a fire suppression event, these interties need to be replaced with automated valving. Automated valving will be needed for fire suppression flow prior to the construction of buildings in the first Tier of development.

The site currently has 1940s era pipes that are to be fully replaced with the final buildout of this project. As each Tier develops, the new water system shall be installed in such a manner as to be isolated from the existing 1940s era water pipe as it is phased out. This will be accomplished through strategically located backflow assemblies installed along key portions of the 1940s pipeline. It is important to note that while the new system will be isolated from the 1940s era pipe, it will not be isolated from the rest of the newer existing system through use of backflow preventers. The newer existing system is generally located on the west side of the PCGC campus, west of Richardson Drive and along the northern portion of Richardson Drive from B Avenue to Bell Road. There is also a newer existing 8” pipeline that runs through the existing corporation yard of the campus. These systems have been previously comingled with the 1940s era pipe without backflow prevention assemblies. It will be imperative that each new section of pipe be required to pass pressure and water quality testing before being tied into the active water system.

The campus water system is currently a private system. Ultimately, it’s the objective that the Tier 4 or final redeveloped campus water system be developed and accepted by a water agency or district such as PCWA or NID.

Tier 1

The Tier 1 water system will begin with replacing the two manual NID emergency intertie connections with automated valving. This is essential for providing on demand fire protection

within the system. The extent of piping for Tier 1 will provide a 12-inch and 10-inch backbone loop for fire supply around the Health and Human Services building and in between the NID and PCWA water sources. These lines are necessary for the initial tier and will provide a basis to serve subsequent tiers. The new system will make connections to water sources where there are sections of existing newer competent pipe, avoiding areas with 1940s era pipe. The three primary connection locations are the main PCWA supply at Professional Drive and First Street, a second connection to a newer existing 8-inch water in the corporation yard that extends to First Street and to the emergency NID intertie at Atwood Road, and a third connection to existing 12-inch waterlines near B Avenue and Richardson Drive. Backflows will be installed near these locations and oriented such that the supply source will feed the new system however water that enters the 1940's era pipe system cannot reverse and enter the new system. At no point will water that is within 1940s era pipe be permitted to enter the new system. There are three additional internal locations where backflows will need to be installed on areas of the existing pipe to prohibit water from 1940s era pipes to enter areas of new and competent pipes. As Tier 1 is constructed some areas of existing pipes can be abandoned, removed or replaced. Ultimately, most of the backflow prevention devices will be removed from the system as the 1940s era pipe is retired. The locations of the two automated valves, five backflows, areas of existing pipe to be abandoned, removed or replaced and associated new piping are shown on Figure W-T1. Output from the County Tier 1 water model is located in Appendix A.

The Tier 1 proposed water system also includes the installation of a 16" NID water line along the First Street corridor from the existing Willow Creek Drive and First Street roundabout to Bell Road. This water main will provide domestic and fire service to the proposed Tier 1 multi-family housing project located in the northeast portion of the campus. As mentioned in section 3.1.1, the extension of a proposed 16" transmission main allows for three primary points of connection to the NID system where supply can be provided to the private uses of the Placer County Government Center: Highway 49, Atwood Road, and Bell Road. This Tier 1 improvement is a separate water system from the County system and forms the backbone of NID service to the private uses of the campus. This new 16" transmission main is shown on Figure W-T1. Output from the NID Tier 1 model is located in Appendix A.

Tier 2

The Tier 2 water system will be extended out from the Tier 1 water system improvements to serve additional buildings including the Admin/IT/Fab, Agricultural, and multiple residential and flex buildings. Two residential buildings and two flex buildings are in the NID service area and will be supplied by a 10-inch line served from the existing 16-inch NID line installed on First Street as part of the Tier 1 improvements. The NID system does not have the concern of the 1940s era pipe as the onsite campus system does and therefore backflow isolation is not required. The improvements of Tier 2 allow removal of one of the backflows installed during Tier 1, this is near Richardson Drive north of B Avenue adjacent to the FAB building. This location and the location of associated new piping and areas of existing pipe to be abandoned, removed or replaced are shown in Figure W-T2. Output from the Tier 2 water model is located in Appendix A.

Tier 3

The Tier 3 water system will serve the County Administration Center, the Dewitt Heritage Reuse

facilities, the Tire Barn within the the corporation yard, the 2nd Street Utilities Department, Clerk Recorder's Office, and Parks and Grounds Facility. This tier also includes tie-in to the systems built in Tier 1 and 2, further looping the system. The NID water system is also further expanded to provide a 10" waterline loop to serve additional residences, hotel and flex space to be built out radially from the Willow Creek Drive and First Street roundabout. he Tier 3 system represents full buildout of the new distribution system. Once the third Tier is completed and all required and existing buildings are served by the new system, all of the remaining isolation backflows installed during Tier 1 can be removed. At this point all of the 1940s era pipe will be out of service and its abandonment and/or removal can begin. The locations of backflows to be removed, new piping and areas of existing pipe to be abandoned, removed or replaced are shown in Figure W-T3. Output from the Tier 3 water model is located in Appendix A.

Tier 4

The Tier 4 water system does not have any improvements or new pipe associated with it. Any remaining tasks such as pipe removal and abandonment are to be completed. This tier represents the full buildout of the campus. See Figure W-T4. As there are no improvements within Tier 4, the model output is the same as Tier 3 and the ultimate conditions overall model. The model output for the Tier 3/4/ultimate conditions model is located in Appendix A.

Additionally, improvements to the existing system to further supplement fire flows are recommended on the south side of the jail. The existing loop around the jail is comprised of 8-inch and 6-inch piping. Available fire flows south of the jail are well below 4000gpm. A 10-inch line from 3rd Avenue to the south of the jail will eliminate the existing 6-inch line and increase capacity to the jail to meet 4000 gpm. This improvement is not tier specific and could be made at any time within the 20-year span of the Master Plan.

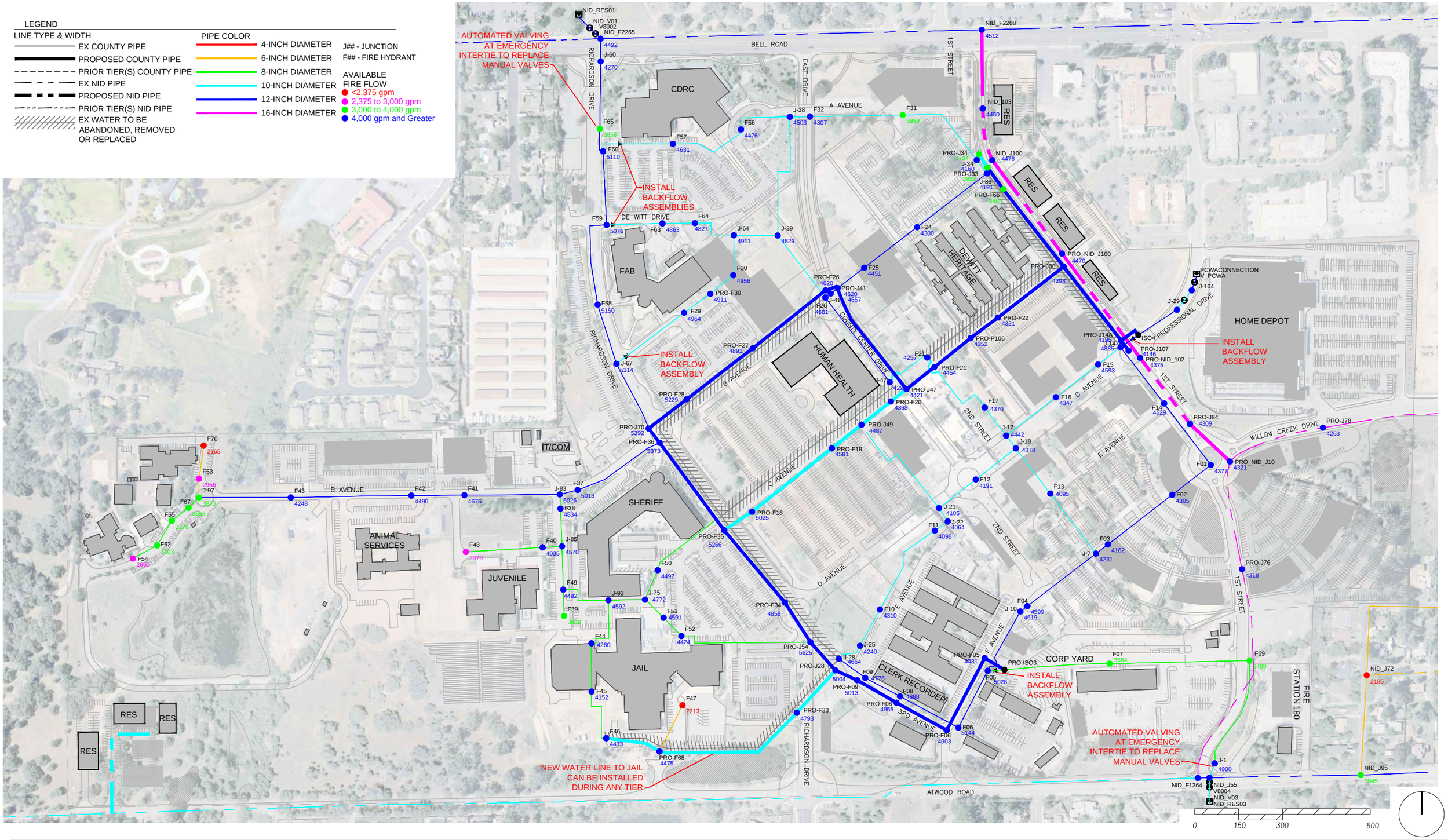
LEGEND

LINE TYPE & WIDTH
- EX COUNTY PIPE
- PROPOSED COUNTY PIPE
- PRIOR TIER(S) COUNTY PIPE
- EX NID PIPE
- PROPOSED NID PIPE
- PRIOR TIER(S) NID PIPE
- EX WATER TO BE ABANDONED, REMOVED OR REPLACED

PIPE COLOR
- 4-INCH DIAMETER
- 6-INCH DIAMETER
- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- 16-INCH DIAMETER

J## - JUNCTION
F## - FIRE HYDRANT

AVAILABLE FIRE FLOW
- <2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater



COUNTY OF Placer

KEY PLAN

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 1

PROPOSED WATER IMPROVEMENTS – FIGURE W–T1

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste.115
El Dorado Hills, CA 95762
Ph: (916) 933–1997
Fax: (916) 933–4778

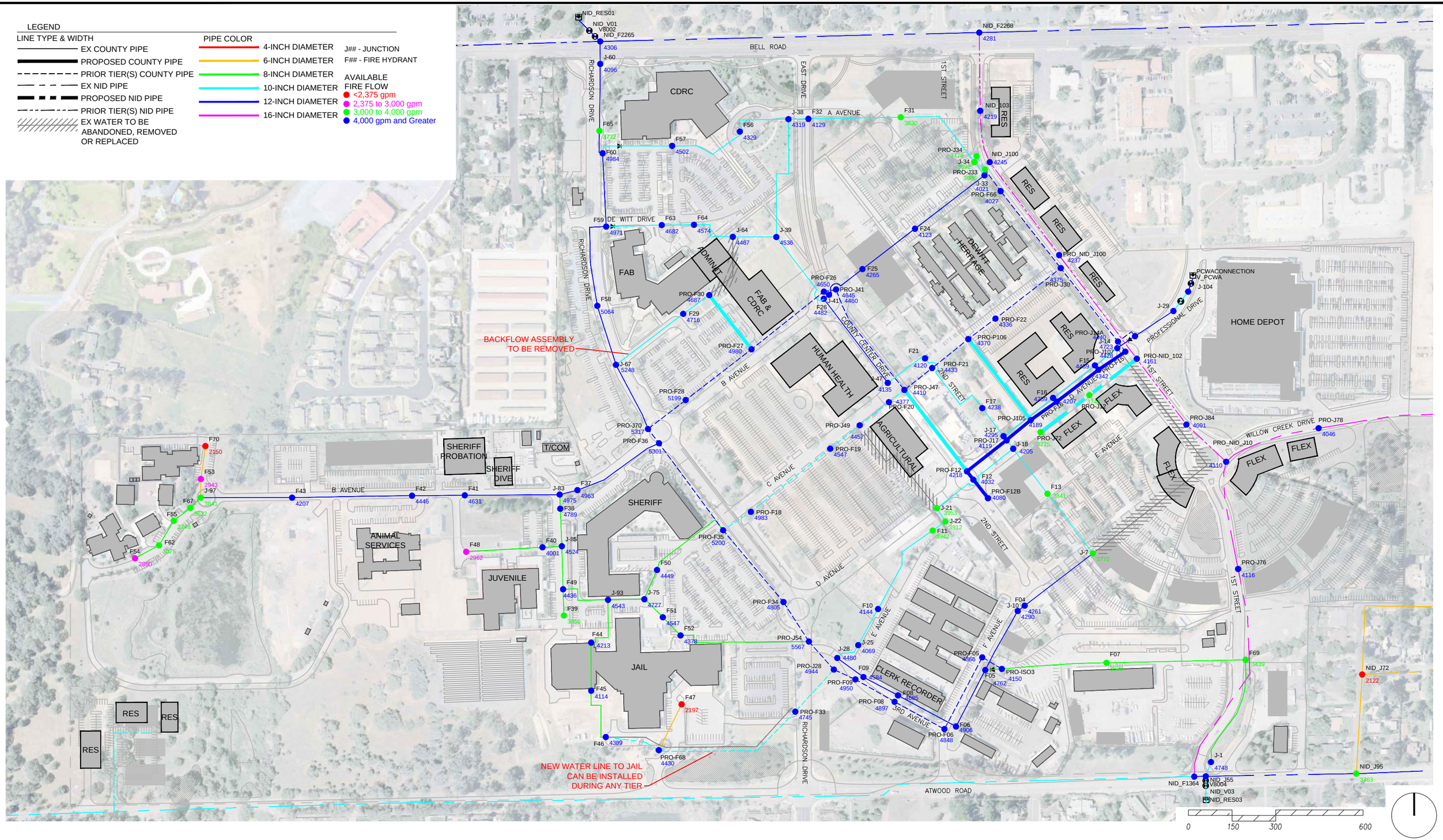
LEGEND

LINE TYPE & WIDTH
- EX COUNTY PIPE
- PROPOSED COUNTY PIPE
- PRIOR TIER(S) COUNTY PIPE
- EX NID PIPE
- PROPOSED NID PIPE
- PRIOR TIER(S) NID PIPE
- EX WATER TO BE ABANDONED, REMOVED OR REPLACED

PIPE COLOR
- 4-INCH DIAMETER
- 6-INCH DIAMETER
- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- 16-INCH DIAMETER

J## - JUNCTION
F## - FIRE HYDRANT

AVAILABLE FIRE FLOW
- <2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater



PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 2

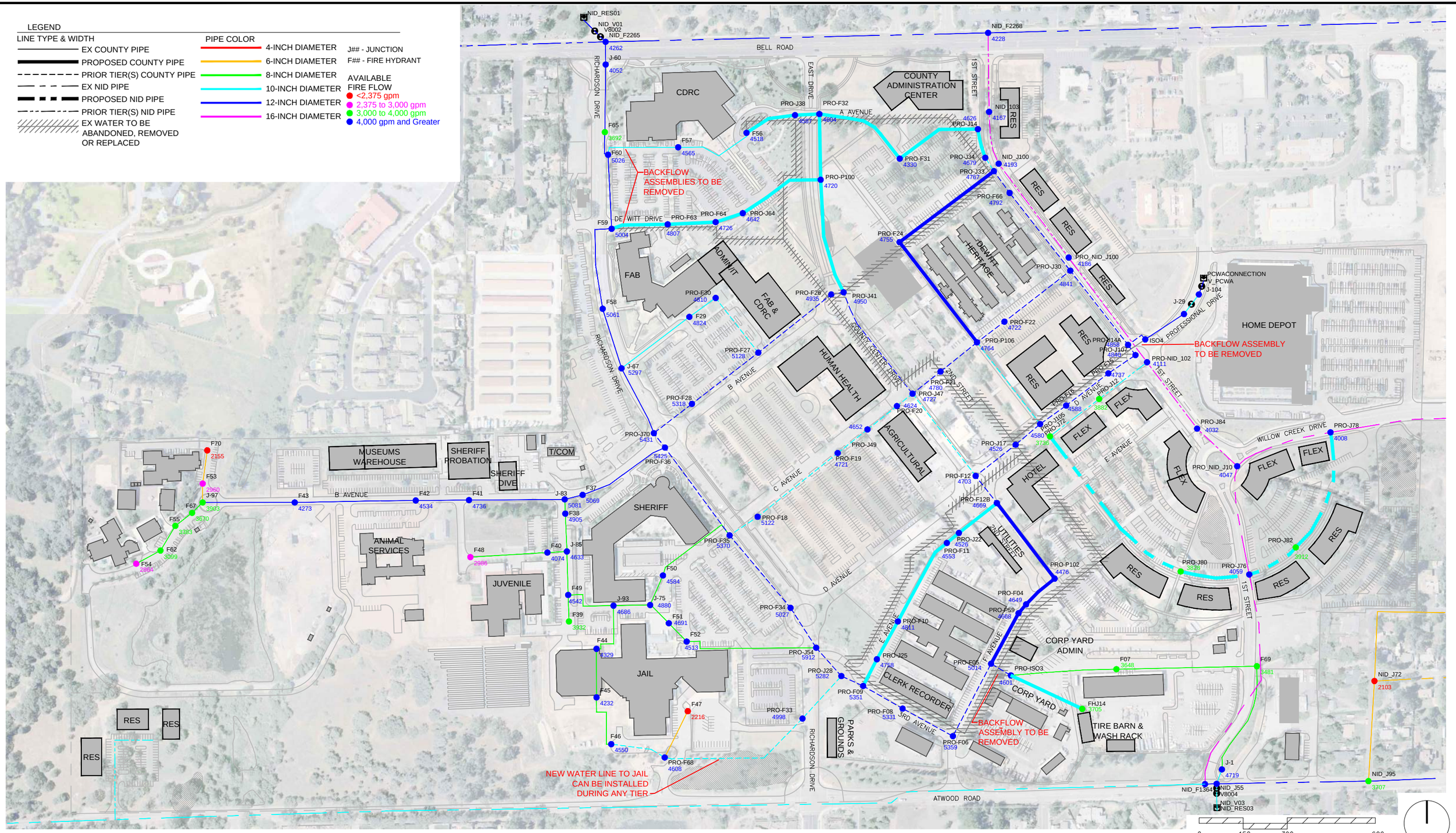
PROPOSED WATER IMPROVEMENTS – FIGURE W–T2

COUNTY OF Placer

KEY PLAN

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste.115
El Dorado Hills, CA 95762
Ph: (916) 933–1997
Fax: (916) 933–4778



COUNTY OF Placer

KEY PLAN

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 3

PROPOSED WATER IMPROVEMENTS – FIGURE W–T3

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste.115 Ph: (916) 933–1997
El Dorado Hills, CA 95762 Fax: (916) 933–4778

LEGEND

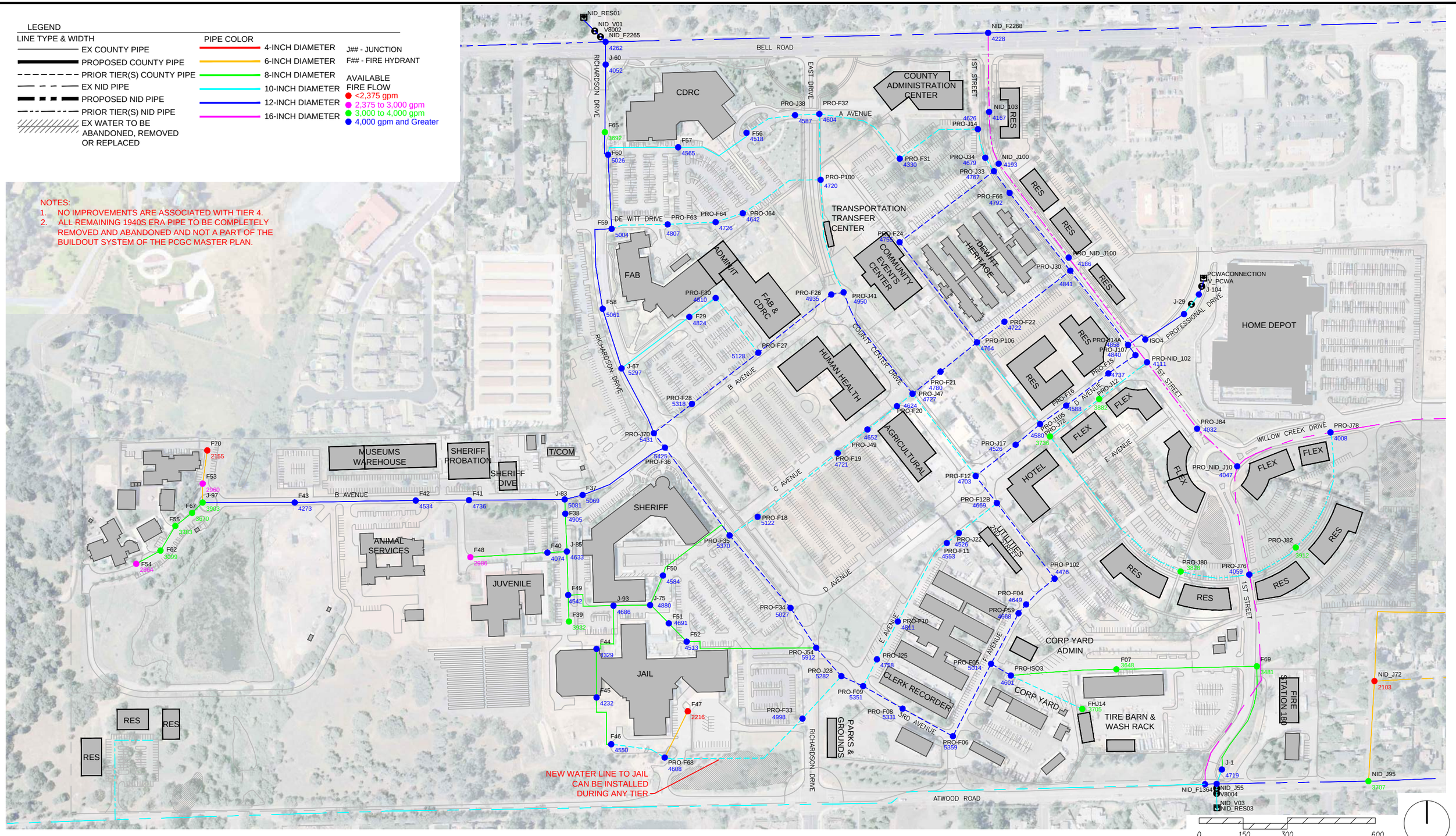
LINE TYPE & WIDTH
- EX COUNTY PIPE
- PROPOSED COUNTY PIPE
- PRIOR TIER(S) COUNTY PIPE
- EX NID PIPE
- PROPOSED NID PIPE
- PRIOR TIER(S) NID PIPE
- EX WATER TO BE ABANDONED, REMOVED OR REPLACED

PIPE COLOR
- 4-INCH DIAMETER
- 6-INCH DIAMETER
- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- 16-INCH DIAMETER

J## - JUNCTION
F## - FIRE HYDRANT

AVAILABLE FIRE FLOW
- <2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater

NOTES:
1. NO IMPROVEMENTS ARE ASSOCIATED WITH TIER 4.
2. ALL REMAINING 1940S ERA PIPE TO BE COMPLETELY REMOVED AND ABANDONED AND NOT A PART OF THE BUILDOUT SYSTEM OF THE PCGC MASTER PLAN.



COUNTY OF Placer

KEY PLAN

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 4

PROPOSED WATER IMPROVEMENTS – FIGURE W–T4

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste.115 Ph: (916) 933–1997
El Dorado Hills, CA 95762 Fax: (916) 933–4778

3.2.2 RAW WATER FOR IRRIGATION

The raw water irrigation system is comprised of new waterline construction throughout four distinct tiers and requires a pump and elevated tank near County Center Drive south of Bell Road, near A Avenue. The raw water irrigation system originates at a connection to the NID Ophir system on First Street south of Bell Road. The ultimate system demand is 275 gpm and will irrigate the County facilities (only) within the central area of the campus. County Center Drive will serve as the initial spine of the raw water irrigation system and subsequent tiers will branch off from there.

Tier 1

The Tier 1 raw water irrigation system will construct a connection to the NID canal, 8-inch raw water supply line, pump station, storage tank and a looped 4, 6 and 8-inch water system on County Center Drive, Richardson Drive and B Avenue. It is anticipated that the Tier 1 raw water irrigation system will be the primary feeder to smaller irrigation systems that will serve the Central Green area of the campus as well as landscape corridors along County Center Drive.

Tier 2

The Tier 2 raw water irrigation system adds a 4-inch line on De Witt Drive creating an additional loop between Richardson Drive and County Center Drive.

Tier 3

The Tier 3 raw water irrigation system adds a 4-inch line from County Center Drive along A Avenue east and south to the Dewitt Heritage Reuse facilities and Community Events Center.

Tier 4

The Tier 4 raw water irrigation system adds a 4-inch line between the Community Events Center and Agricultural building creating the final loop within the system. This system will also provide additional service for irrigation to the Central Green area of the PCGC campus.

The irrigation system and all improvements per tier are identified in **Figure I-1** presented earlier in this report. The raw water irrigation model output is located in Appendix B of this report.

3.2.3 SANITARY SEWER

The sewer system utilizes the existing sewer infrastructure and modifies it by tier with the addition of new sewer lines/manholes and abandonment or removal of existing sewer lines/manholes. The majority of the system is central to the campus and utilizes an existing trunk line in Richardson Drive that flows north to Bell Road. There are three areas of the ultimate sewer system that are not a part of the main trunk line in Richardson Drive which flow out to areas on the peripheral of the campus. Two of these areas flow east towards the Highway 49 trunk sewer system. One area in the southwest corner of the campus flows south into the Atwood Ranch III subdivision.

Tier 1

The Tier 1 sewer area includes improvements at two locations on the peripheral of the project and multiple improvements in Richardson Drive. Work during this tier also includes abandonment of existing sewer lines and cleanouts. See **Figure SS-T1** for all associated sewer work identified for Tier

1.

Tier 1 work within Richardson Drive includes upsizing a 12-inch trunk line to a 15-inch line as specified in the North Auburn Dewitt Trunk Sewer Capacity Evaluation Report. In roughly the same location along Richardson Drive a new 6-inch parallel line will be constructed as part of Tier 1 to support future Tier 3 improvements. This line will then be further extended south on Richardson Drive as part of Tier 3 to provide sewer service for the Parks & Grounds building which is located in a depressed area of the project. The 6-inch line extension parallel to the 15-inch trunk sewer line is required to be able to provide sufficient depth to gravity sewer flows from the Parks & Grounds building. At this time, the parallel 6-inch line solution is the proposed alternative to serve the Parks and Grounds building but there are other potential alternatives to installing a parallel 6-inch line that could include a small lift station or a gravity line to the jail lift station from the Parks & Grounds site. Neither alternative is analyzed in detail as a part of this report and if either alternative is preferred in the future, an analysis would be required to prove the viability of these potential improvements.

In the northeast corner of the project there are four planned multi-family residential buildings that are a part of Tier 1 development. Our analysis recommends that they be served through new 6-inch piping and manholes that convey flows east, to an existing 6-inch sewer manhole (AD3-85 per Sewer Maintenance District 1 Map Page AD3) and pipeline located in a public easement within the existing medical office site west of the intersection of Heritage Oak Place and Professional Drive. Flows from this planned multi-family development will be conveyed east and into the Highway 49 trunk sewer system.

In the southwest corner of the PCGC there are three planned residential buildings that are a part of Tier 1 development. They are geographically isolated from the onsite system and located near a low area in Atwood Road. As a result, sewer flows from these buildings are to be conveyed by gravity to the east along Atwood Road and then utilize a pressure system at the low point in Atwood Road to lift flows to a manhole and gravity system that will connect to the existing system at Caballo Circle. The Caballo Circle connection is depicted in Exhibit SS-A.

Tier 2

See Figure SS-T2 for all associated sewer work identified for Tier 2. The Tier 2 sewer system requires that multiple existing sewer lines be removed and replaced to resolve conflicts for planned buildings in Tier 2.

The Sheriff Probation building on B Avenue is in conflict with an existing 6-inch sewer line. The sewer line will be removed and replaced adjacent to the building and will also require rerouting of an existing force main from the Animal Services facility to a new manhole in B Avenue.

The Admin/IT/FAB&CDRC building to be constructed in Tier 2 as an expansion to the existing FAB building is in conflict with an existing 10-inch sewer line. The line will be removed and replaced adjacent to the building. A remaining short 10-inch stub segment will be replaced with a new 6-inch segment for the Admin/IT/FAB&CDRC building.

The Tier 2 system constructs 12-inch and 10-inch sewers and manholes in County Center Drive and extends new 8-inch and 6-inch sewers to the planned flex buildings on E Avenue and 1st Street. Tier 2 also constructs 6-inch sewer and manholes for two flex buildings located at Willow Creek Drive and 1st Street and tie-in to existing sewer on Willow Creek Drive. This line will convey sewer flows east on Willow Creek Drive to the Highway 49 trunk sewer system.

The various work within the tier will require several existing sewer lines, manholes and cleanouts be removed or abandoned.

Tier 3

See Figure SS-T3 for all associated sewer work identified for Tier 3. The Tier 3 sewer system requires upsizing a portion of the existing trunk line per the offsite Timberline project (North Auburn Dewitt Trunk Sewer Capacity Evaluation Report). It also requires several new segments to serve planned buildings such as the County Administration Center, Residential buildings, Flex buildings and a Hotel.

The offsite Timberline project report requires that an existing 12-inch sewer line from D Avenue to the Corporation Yard be upsized to 15-inch. This is the final segment of the trunk line to be upsized, the first segment was upsized in Tier 1.

Segments needed to serve new buildings include a new 6-inch sewer and manhole to service the County Administration Building and new 6-inch sewer and manholes to service the Parks & Grounds building. The Parks & Grounds building will tie-in to an existing 6-inch sewer in Richardson Drive constructed in Tier 1.

New 6-inch sewer pipes and manholes will also be needed to service the residential buildings adjacent to 1st Street. One line will tie-in to the 6-inch sewer system in the Corp Yard, a second line will tie-in to a 6-inch line constructed in Tier 2 and flows to Willow Creek Drive and eventually east to the Highway 49 trunk sewer.

This tier also includes the installation of a sewer lift station for the Tire Barn and Wash Rack located in the Corporation Yard. Throughout the course of this utility assessment, it could not be determined, nor could information be provided regarding the presence of existing gravity lines and associated sizes. Consequently, a determination of sufficient capacity to serve this planned facility could not be made. This is the basis for proposing a minor lift station for this planned area.

A planned Museum warehouse on the north side of B Avenue is also part of this tier. This facility will be serviced by the 6-inch sewer line planned as part of the Tier 2 improvements.

The various work within this tier will require several existing sewer lines, manholes and cleanouts be removed or abandoned as required.

Tier 4

See **Figure SS-T4** for all associated sewer work identified for Tier 4. The Tier 4 sewer system has a single improvement and abandonment at the planned Community Events Center. An existing 12-inch sewer line is in conflict with the new building and will be replaced adjacent to it.

The Tier 4 expansion of the existing Fire Station on First Street, just north of Atwood Road, does not warrant upsizing of the existing sewer system that services the existing facility as any added sewer flows are anticipated to be fairly nominal.

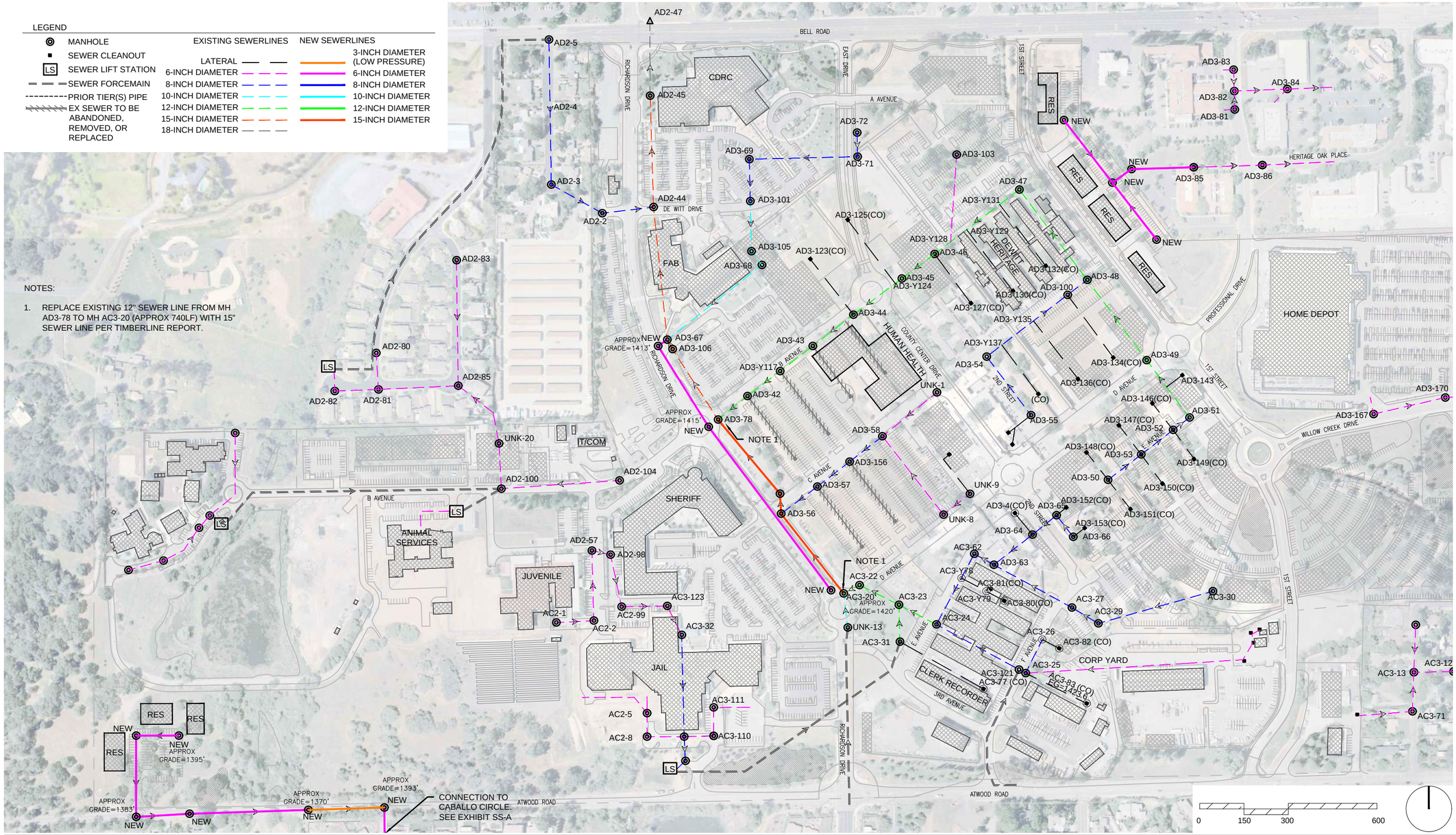
The remaining existing sewer lines, manholes and cleanouts located in the tier 4 park area are to be removed/abandoned as required.

LEGEND

	EXISTING SEWERLINES	NEW SEWERLINES
MANHOLE	LATERAL	3-INCH DIAMETER (LOW PRESSURE)
SEWER CLEANOUT	6-INCH DIAMETER	6-INCH DIAMETER
SEWER LIFT STATION	8-INCH DIAMETER	8-INCH DIAMETER
SEWER FORCEMAIN	10-INCH DIAMETER	10-INCH DIAMETER
PRIOR TIER(S) PIPE	12-INCH DIAMETER	12-INCH DIAMETER
EX SEWER TO BE ABANDONED, REMOVED, OR REPLACED	15-INCH DIAMETER	15-INCH DIAMETER
	18-INCH DIAMETER	

NOTES:

1. REPLACE EXISTING 12" SEWER LINE FROM MH AD3-78 TO MH AC3-20 (APPROX 740LF) WITH 15" SEWER LINE PER TIMBERLINE REPORT.



COUNTY OF Placer

KEY PLAN

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 1

PROPOSED SEWER IMPROVEMENTS – FIGURE SS–T1

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

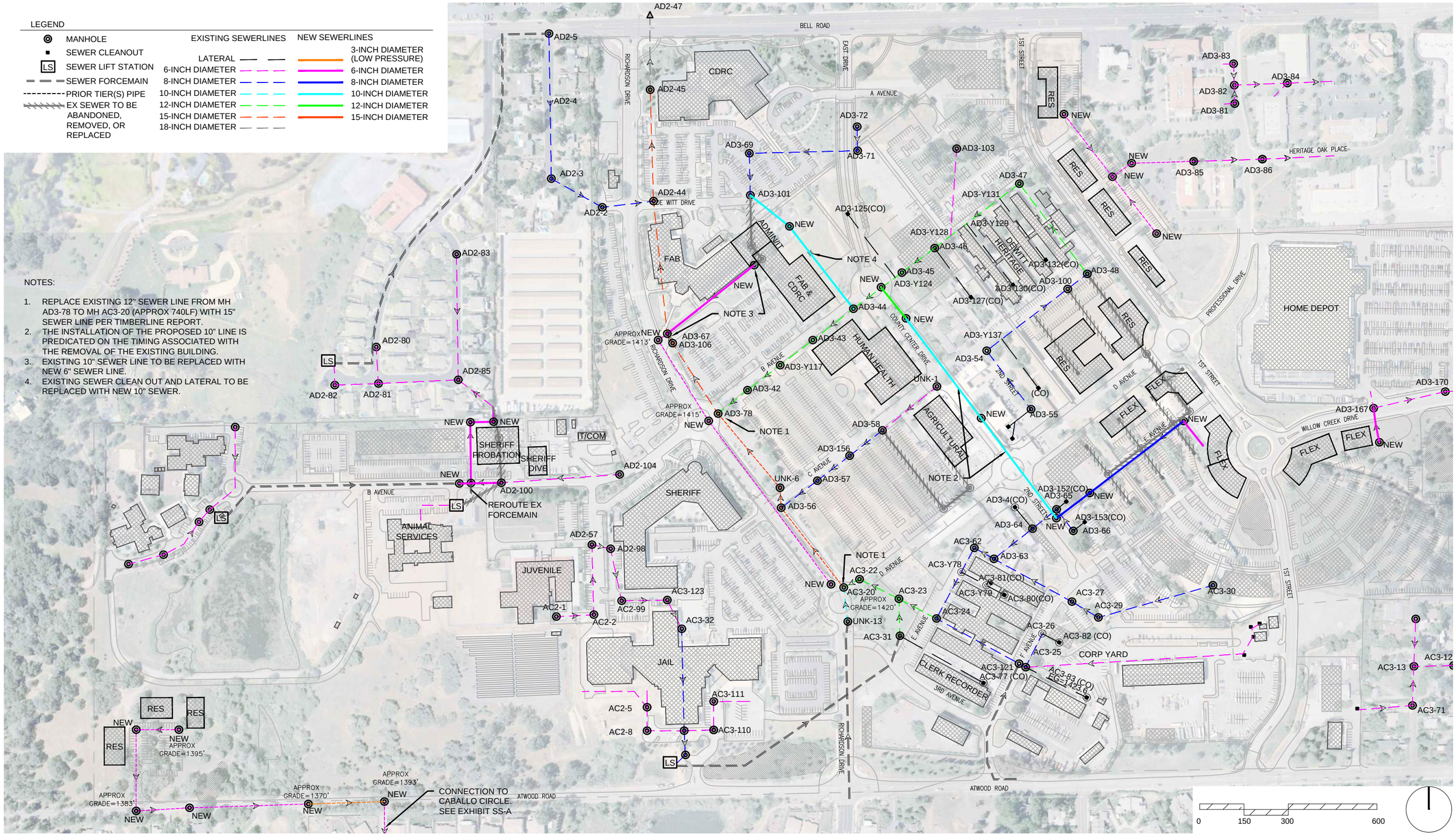
DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste. 115 Ph: (916) 933–1997
El Dorado Hills, CA 95762 Fax: (916) 933–4778

LEGEND

		EXISTING SEWERLINES	NEW SEWERLINES
MANHOLE		LATERAL	3-INCH DIAMETER (LOW PRESSURE)
SEWER CLEANOUT		6-INCH DIAMETER	6-INCH DIAMETER
SEWER LIFT STATION		8-INCH DIAMETER	8-INCH DIAMETER
SEWER FORCEMAIN		10-INCH DIAMETER	10-INCH DIAMETER
PRIOR TIER(S) PIPE		12-INCH DIAMETER	12-INCH DIAMETER
EX SEWER TO BE ABANDONED, REMOVED, OR REPLACED		15-INCH DIAMETER	15-INCH DIAMETER
		18-INCH DIAMETER	

NOTES:

1. REPLACE EXISTING 12" SEWER LINE FROM MH AD3-78 TO MH AC3-20 (APPROX 740LF) WITH 15" SEWER LINE PER TIMBERLINE REPORT.
2. THE INSTALLATION OF THE PROPOSED 10" LINE IS PREDICATED ON THE TIMING ASSOCIATED WITH THE REMOVAL OF THE EXISTING BUILDING.
3. EXISTING 10" SEWER LINE TO BE REPLACED WITH NEW 6" SEWER LINE.
4. EXISTING SEWER CLEAN OUT AND LATERAL TO BE REPLACED WITH NEW 10" SEWER.



COUNTY OF Placer

KEY PLAN

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 2

PROPOSED SEWER IMPROVEMENTS – FIGURE SS–T2

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

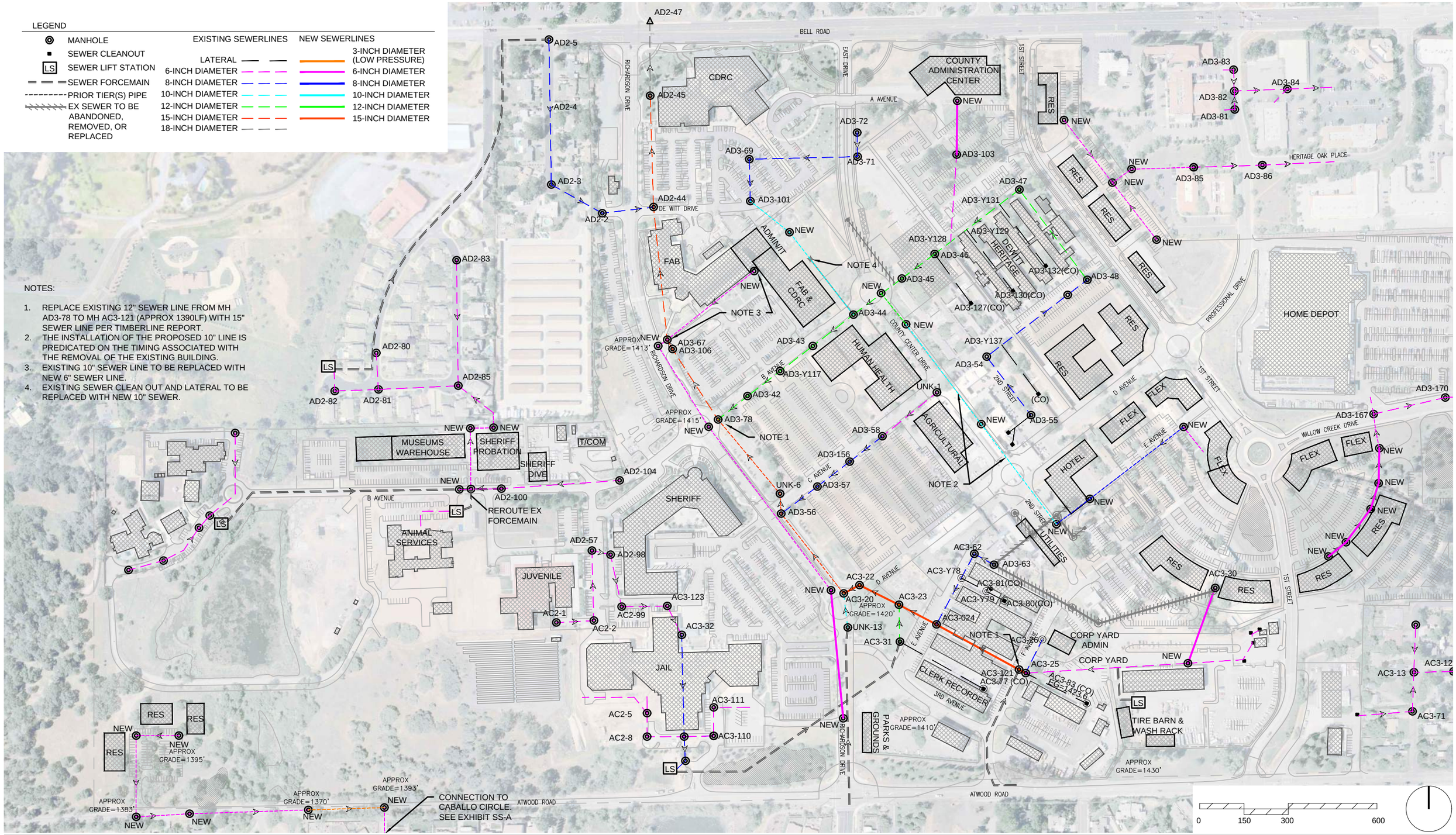
DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste. 115 Ph: (916) 933–1997
El Dorado Hills, CA 95762 Fax: (916) 933–4778

LEGEND

	EXISTING SEWERLINES	NEW SEWERLINES
MANHOLE	LATERAL	3-INCH DIAMETER (LOW PRESSURE)
SEWER CLEANOUT	6-INCH DIAMETER	6-INCH DIAMETER
SEWER LIFT STATION	8-INCH DIAMETER	8-INCH DIAMETER
SEWER FORCEMAIN	10-INCH DIAMETER	10-INCH DIAMETER
PRIOR TIER(S) PIPE	12-INCH DIAMETER	12-INCH DIAMETER
EX SEWER TO BE ABANDONED, REMOVED, OR REPLACED	15-INCH DIAMETER	15-INCH DIAMETER
	18-INCH DIAMETER	

NOTES:

1. REPLACE EXISTING 12" SEWER LINE FROM MH AD3-78 TO MH AC3-121 (APPROX 1390LF) WITH 15" SEWER LINE PER TIMBERLINE REPORT.
2. THE INSTALLATION OF THE PROPOSED 10" LINE IS PREDICATED ON THE TIMING ASSOCIATED WITH THE REMOVAL OF THE EXISTING BUILDING.
3. EXISTING 10" SEWER LINE TO BE REPLACED WITH NEW 6" SEWER LINE.
4. EXISTING SEWER CLEAN OUT AND LATERAL TO BE REPLACED WITH NEW 10" SEWER.



COUNTY OF Placer

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 3

PROPOSED SEWER IMPROVEMENTS – FIGURE SS–T3

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste. 115 Ph: (916) 933–1997
El Dorado Hills, CA 95762 Fax: (916) 933–4778

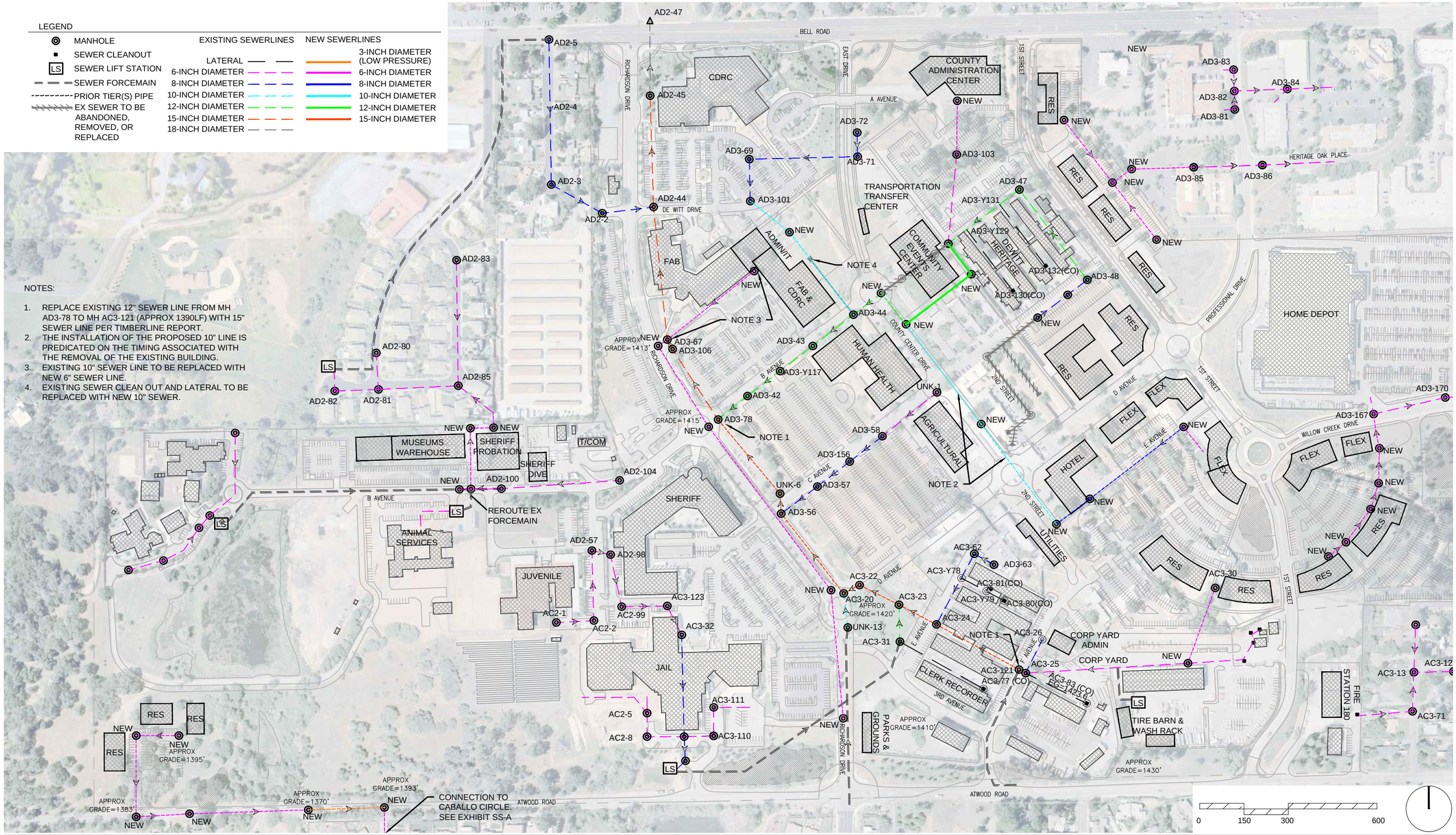
LEGEND

- MANHOLE
- SEWER CLEANOUT
- LS SEWER LIFT STATION
- SEWER FORCEMAIN
- PRIOR TIER(S) PIPE
- EX SEWER TO BE ABANDONED, REMOVED, OR REPLACED

EXISTING SEWERLINES	NEW SEWERLINES
LATERAL	3-INCH DIAMETER (LOW PRESSURE)
6-INCH DIAMETER	6-INCH DIAMETER
8-INCH DIAMETER	8-INCH DIAMETER
10-INCH DIAMETER	10-INCH DIAMETER
12-INCH DIAMETER	12-INCH DIAMETER
15-INCH DIAMETER	15-INCH DIAMETER
18-INCH DIAMETER	

NOTES:

1. REPLACE EXISTING 12" SEWER LINE FROM MH AD3-78 TO MH AC3-121 (APPROX 1390LF) WITH 15" SEWER LINE PER TIMBERLINE REPORT.
2. THE INSTALLATION OF THE PROPOSED 10" LINE IS PREDICATED ON THE TIMING ASSOCIATED WITH THE REMOVAL OF THE EXISTING BUILDING.
3. EXISTING 10" SEWER LINE TO BE REPLACED WITH NEW 6" SEWER LINE.
4. EXISTING SEWER CLEAN OUT AND LATERAL TO BE REPLACED WITH NEW 10" SEWER.



COUNTY OF Placer

KEY PLAN

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN 2019 - TIER 4

PROPOSED SEWER IMPROVEMENTS – FIGURE SS-T4

CARTWRIGHT NOR CAL
4180 Douglas Blvd, Suite 200
Granite Bay, California 95746
T (916) 978-4001

DOMENICHELLI & ASSOCIATES
1101 Investment Blvd. Ste. 115 Ph: (916) 933-1997
El Dorado Hills, CA 95762 Fax: (916) 933-4778

3.2.4 STORM DRAIN

The model results for the tiering analysis showed that at no point during the 20-year build-out horizon that peak flow rates at the five outfalls would be greater than baseline conditions. Peak flow rates at the outfalls are summarized in the Master Drainage Report included in Appendix D.

The tiering analysis modeling results are only valid if certain elements of the storm drain system are implemented with each tier. In some cases, temporary grading or orifice plates on stormwater basin outlet structures are needed to achieve the modeled flow rates. These temporary features are being recommended on a value engineering basis; that is, to defer construction of non-critical stormwater improvements to future tiers whenever possible. The stormwater infrastructure elements required for each tier are summarized as follows:

Tier 1

- Construct Basin 4A. Basin 4A will control flows from the north portion of the affordable housing project and part of realigned First Street (Subcatchment 4A).
- Construct Basin 4B. Basin 4B will control flows from the remaining part of realigned First Street and for future development during Tier 3 in Subcatchment 4B.
- Reconfigure Basin 5C and Basin 5D. The model showed the maximum 100-year water surface elevation in Basin 5D and flow rates at Outfall C5 to exceed baseline conditions without mitigation for the Tier 1 improvements. The increase in flow rates can be offset with a temporary orifice plate (a 6-inch square plate fixed on to the existing 9-inch square plate) on the First Street Basin (Basin 5C), which the baseline model showed to be underutilized. The increase in the maximum water surface elevation in Basin 5D can be addressed by placing fill to raise a low point along the basin rim by approximately 0.9 feet. As future tiers come online, the maximum water surface elevation will decrease, and the fill will no longer be critical to maintaining the required amount of freeboard in Basin 5D.
- Enclose NID canal – North Segment. The existing NID canal along First Street will need to be enclosed for roughly 900 feet from the north end of the Professional Drive roundabout to 250 feet south of Bell Road. The canal enclosure is not part of the stormwater management strategy and is not represented in the XPSTORM model, however, it is needed to accommodate Tier 1 improvements.
- Reconfigure Basin 2A. The model showed that the peak water surface elevation during the 100-year event in Basin 2A would increase by 0.5 feet once Tier 1 is implemented (without altering the basin to increase its volume), which would leave roughly 0.3 feet of freeboard. Basin 2A should be regraded to increase its volume by 1.2 acre-feet. Regrading should include increasing the basin footprint by roughly 8,700 square feet to increase the storage volume in lower elevation bands of the basin. Doing so will allow Basin 2A to control flows to no greater than pre-project conditions with no alterations to the current outlet structure. The Health and Human Services project represents the largest increase in impervious area within Catchment 2 for the entire PCGC Master Plan Update, and is driving the Basin 2A reconfiguration.
- Improve First Street storm drain. The model showed undersized pipe to cause surface flooding. The storm drain improvements will increase pipe capacity to conform with County criteria for freeboard during the 10-year event.
- Improve B Avenue storm drain. Without mitigation, the hydraulic grade line does not meet

County criteria for freeboard during the 10-year event. The model showed that replacing existing storm drain pipes with smooth-walled HDPE pipe would increase the capacity of the storm drain and provide sufficient freeboard.

- Construct Basin 1K. Basin 1K will control flows from the new impervious area in residential development (Subcatchment 1K).

Tier 2

- Construct Basin 5E. Basin 5E will control flows from the east portion of the first phase of the commercial center.
- Reconfigure Basin 5C. Basin 5C will control flows from the west portion of the first phase of the commercial center. The reconfigured Basin 5C is of similar size as existing Basin 5C, and the regrading is needed to accommodate the basin within the planned Tier 2 improvements. A permanent 6-inch square orifice should be included in the outlet structure for Basin 5C near the floor of the basin.
- Enclose NID canal – South Segment. The existing NID canal along First Street will need to be enclosed for roughly 780 feet from an existing lateral connection to the north of the Atwood Fire Station to the Willow Creek roundabout. The enclosed canal will need to be carefully designed to maintain the performance of the lateral connection. The canal enclosure is not part of the stormwater management strategy and is not represented in the XPSTORM model, however, it is needed to accommodate Tier 2 improvements.
- Improve E Avenue storm drain. The baseline model identified several undersized storm drain pipes along E Avenue. The Williams + Paddon plans showed demolition and realignment of a portion of E Avenue during Tier 2 which would be a logical time to address deficiencies in the storm drain system. The new 24-inch diameter pipe is significant not only to collecting runoff from E Avenue, but also for conveying runoff from Tier 3 and 4 improvements in Subcatchment 6H.
- Construct Basin 6F. Basin 6F will control runoff from Tier 3 and Tier 4 improvements within Subcatchment 6H. Until Basin 6A is constructed during Tier 3, a temporary 3-inch diameter orifice plate is required to control peak flow rates at Outfall C6. Construction of Basin 6F will also require an outlet pipe that daylights in the ditch upstream of Richardson Drive.
- Improve Subcatchment 6J storm drain. Although minimal improvements are proposed for Subcatchment 6J, runoff will need to be safely routed across First Street and into the storm drain system. An 18-inch pipe is proposed to route runoff from Subcatchment 6J to the storm drain system near the west end of the corporation yard.
- Improve Subcatchment 6B storm drain. During field investigations it was noted that a 30-inch pipe flows into a 24-inch pipe. The model showed that the constriction would cause flooding in the open space to the south of the corporation yard (Node 6B/1). A 30-inch pipe is proposed to replace a 24-inch pipe in the same location.

Tier 3

- Replace Basin 6F orifice plate. The temporary 3-inch diameter orifice plate on the outlet structure for Basin 6F will be replaced with a 9-inch diameter plate. This work must be done concurrently with construction of Basin 6A.

- Construct Basin 6A. Basin 6A will control runoff from the commercial center in Subcatchment 6H. Basin 6F is in series with Basin 6A and the two basins work together to provide flow controls. Basin 6A will control flows leaving Outlet C6 to the point that Atwood Road is not overtopped in large storm events and the clogged pipe leading to Subcatchment 3A may be abandoned. It is possible to construct Basin 6A during Tier 2 which would preclude the need to install a temporary orifice plate on Basin 6F in Tier 2 and subsequently replace the orifice plate in Tier 3. Since Basin 6A will alleviate flooding on Atwood Road, it may be desirable to implement the Basin sooner.
- Replace Richardson Drive culvert. The model showed minor ponding on the upstream side of the 3-foot diameter culvert under Richardson Drive (just north of Atwood Road intersection). A 4-foot by 3-foot box culvert is proposed to increase the capacity and to eliminate the ponding. It is possible to replace the culvert during Tier 2 without adversely affecting other elements of the storm drain system.
- Construct Basin 1L. Basin 1L will control runoff for projects along B Avenue.
- Enclose NID Canal – North Segment Extension. The NID canal enclosure completed during Tier 1 will need to be extended to the north for roughly 300 feet to Bell Road to accommodate Tier 3 improvements.

Tier 4:

No new improvements to the storm drain are required for Tier 4. The stormwater facilities in place at the end of Tier 3 are adequate to manage the small changes in land use that will occur between Tier 3 and Tier 4.

Refer to Plates 5 through 8 of the Master Drainage Report in Appendix D for a detailed illustration of Tier based storm related improvements.

Appendix A – Water

WEST YOST ASSOCIATES
Consulting Engineers

TECHNICAL MEMORANDUM

DATE: June 25, 2012 Project No.: 330-00-10-05

TO: Hope Bostic, Placer County Facility Services

FROM: Brenda Estrada, R.C.E. #67062

REVIEWED BY: Charles Duncan, R.C.E. #55498

SUBJECT: Placer County DeWitt Center Fire Flow Evaluation

The purpose of this Technical Memorandum is to document the hydraulic model analysis performed for the Placer County DeWitt Center. A hydraulic model was developed based on available information. The developed hydraulic model was used to evaluate the ability of the existing DeWitt system to meet minimum fire flow requirements for future development and provide system improvement alternatives to meet requirements. West Yost Associates (West Yost) did not perform any field verification or calibration of the hydraulic model as part of this project. Additional constraints or limitations of the Placer County Water Agency's (PCWA's) system were not addressed in this analysis. A brief discussion of potential constraints within the PCWA system is included in the Conclusion section.

BACKGROUND AND ASSUMPTIONS

The Placer County DeWitt Center is located northwest of Auburn city limits between Bell Road on the north and Atwood Road on the south. Much of the eastern side of the DeWitt Center is composed of government and commercial land uses, housed within a complex of buildings originally constructed between 1943 and 1945 as a military hospital. In addition to the original buildings, the west side of the site includes newer buildings such as the County Animal Shelter, Juvenile Hall, Main County Jail, Children's Emergency Shelter, and a Women's Center.

Placer County plans on demolishing several of the older buildings which require high maintenance and constructing several new buildings to house the County government services as well as potential office and commercial tenants. As part of the planning, Placer County contracted West Yost to develop a hydraulic model of the existing water system and evaluate the ability of the system to meet fire flow requirements.

The water distribution system was developed based on a site survey performed for the DeWitt Center utilities and information provided by Placer County. The existing water system is composed of 2½-inch diameter to 12-inch diameter pipelines. The main loop around the DeWitt Center is a 12-inch diameter pipeline. A majority of the pipelines on the east side of the DeWitt center are ductile iron constructed in the 1940's. Hydrant locations were provided by the site survey performed by West Yost and confirmed by Placer County staff as being representative of their actual locations, see Figure 1.

In discussion with Placer County, it was indicated to West Yost that there were several locations in the older portions of the water system where pipelines may have closed or partially closed valves. Based on operational experience with the system, Placer County staff provided a figure to show where they suspect valves may be closed. These potential closed valve locations were incorporated into the hydraulic model for the existing system simulation.

The DeWitt Center receives water from PCWA through a single metered connection located on the east side near the intersection of First Street and Professional Drive. This connection includes two reduced pressure detector assemblies in parallel (AMES 5000 CIV) and one turbo meter (Recordall Turbo 3500 Meter). The specifications for each facility were provided so West Yost could develop the head loss curves to use in the hydraulic model, see attached specifications. To determine boundary conditions for the model, PCWA monitored flow and upstream/downstream pressures at the DeWitt Center connection from October 21, 2011 to November 1, 2011. During this time period, Placer County conducted hydrant flow tests on October 28, 2011. The information collected by PCWA and Placer County was used to establish the hydraulic grade line (HGL) for the PCWA connection to the DeWitt Center system. The HGL was established for average day conditions and for high flow condition based on when the hydrants were flowing within the DeWitt Center. The HGLs established are approximate and may not represent actual boundary conditions for fire flow volumes over the amount recorded during the monitoring period.

The DeWitt Center also has two emergency connections to the Nevada Irrigation District (NID). The first connection is located at First Street and Atwood Road and the second connection is located at Richardson Drive and Bell Road. The connections to NID are for emergency conditions only and are normally closed valves that must be opened manually. NID does provide domestic and fire flow to the Community Development Resources Agency (CDRA) building located in the northwest corner of the DeWitt center at Bell Road and Richards Drive. NID conducted pressure monitoring at the upstream connection locations to the DeWitt Center from November 1, 2011 to November 7, 2011. This monitoring was performed so West Yost could develop boundary conditions for the NID inter-tie locations. The boundary conditions are for normal operating conditions and do not reflect potential limitations within the NID system for conveying large amount of water for fire flows.

Because the Animal Control building is the only metered facility within the DeWitt Center service area, developing and allocating demands accurately in the model for the DeWitt Center is not possible at this time without significant cost to Placer County. However, total demand going into the DeWitt Center is metered at the PCWA connection. The PCWA metered demands were used to develop overall demands for the hydraulic model. Demands for the Animal Control building were developed based on available meter data provided by Placer County. Demands for the Juvenile Detention Center and County Jail were calculated based on a demand factor for the number of beds occupied at each facility. The remainder of demands within the DeWitt Center were evenly allocated to demand junctions within the model. While it is not possible to allocate demands more accurately at this time for the DeWitt Center, for the hydraulic evaluation performed, the daily demands (approximately 312 gallons per minute (gpm)) are minor when compared to the required fire flow (4,000 gpm).

The fire flow requirements for future development are the controlling factor when it comes to sizing water system infrastructure for the DeWitt Center. Based on a meeting with the Fire Department, fire flow requirements for future development are based on the 2010 California Fire Code (CFC), Appendix B. The Fire Department does allow for a 50 percent reduction of the required CFC fire flow demand for buildings with approved fire sprinkler systems which will be required for any new buildings constructed. Detailed information on future development plans have not been established by Placer County at this time. However, based on the future development assumptions provided by Placer County, proposed building square footage ranges between 30,000 square feet (sf) to 200,000 sf per building. Assuming building Type V, per Placer County and Fire Department direction, Table 1 shows non-sprinklered and sprinklered building fire flow requirements. These fire flow requirements are based on maintaining a 20 pounds per square inch (psi) residual within the DeWitt Center. It should be noted the building Type V assumption results in conservative fire flow estimation. Determination of actual fire flow requirements will be made on a site or building specific basis as more information becomes available.

Table 1. Recommended Fire Flow Requirements[a,b]

Potential Building Square Footage	Non-Sprinklered			Sprinklered[c,d]		
	Fire Flow, gpm	Duration, hours	Recommended Storage, MG	Fire Flow, gpm	Duration, hours	Recommended Storage, MG
30,000 sf	4,750	4	1.14	2,375	2	0.29
50,000 sf	6,000	4	1.44	3,000	3	0.54
100,000 > sf	8,000	4	1.92	4,000	4	0.96

(a) Construction type and fire area are not generally known during the development of a master plan; consequently, fire flow requirements set forth in this table are based on building size estimates provided by Placer County.
(b) Unique projects or projects with alternate materials may require higher fire flows and will be reviewed by the Fire Marshal on a case-by-case basis.
(c) The Fire Marshal allows up to a 50 percent reduction in fire flows if a building is sprinklered. However, the Fire Code also requires that no fire flow be less than 1,500 gpm for all building types other than residential.
(d) Specific fire flows were determined from Table B105.1 of the 2010 CFC, and depend on construction type and fire area. These fire flow requirements are based on new buildings being fully sprinklered.

Placer County conducts annual hydrant flow tests on all hydrants within the DeWitt Center service area. The pitot pressure is recorded at the flowing hydrant and a residual pressure collected. The approximate flow through the hydrant is calculated based on the flowing hydrant nozzle diameter and pressure readings. The collected data for testing performed in March 2011 and February 2012 was provided to use as a guide on the current available fire flow.

EXISTING SYSTEM FIRE FLOW RESULTS

The hydraulic model was developed using the following assumptions based on the above information and data:

- DeWitt Center demand equal to 312 gpm
- Hazen-William C Factor for 1940's ductile iron pipeline = 100
- Hazen-William C Factor for newer pipeline = 130

- Average demand conditions (approximately 312 gpm):
  - PCWA connection upstream HGL = 1,554 ft (elevation = 1,428 ft plus 55 psi).
  - Check detector valve head loss = 27.6 ft (12 psi) at 156 gpm (assume average flow of 321 gpm is split evenly through each valve)
  - Meter head loss = 0 ft
- Hydrant flowing conditions (approximately 950 gpm):
  - PCWA connection upstream HGL = 1531 ft (elevation = 1,428 ft plus 45 psi)
  - Check detector valve head loss = 25.4 ft (11 psi) at 475 gpm (assume flow of 950 gpm is split evenly through each valve)
  - Meter head loss = 0.7 ft

Fire flow demands were simulated at all hydrant locations within the DeWitt Center to determine the available fire flow at minimum residual pressure of 20 psi. Using hydraulic model's "Available Fire Flow Analysis" option, the available fire flow at a minimum residual pressure of 20 psi within the existing system was simulated. Figure 2 illustrates the available fire flow at a minimum 20 psi at each fire hydrant location within the DeWitt Center. As shown in Figure 2, results indicate that only a few locations within the system are capable of meeting a 4,000 gpm fire flow demand at 20 psi residual. Several locations indicate they would be capable of meeting a 3,000 gpm or greater fire flow at 20 psi residual. Table 2 displays the existing system available fire flow at 20 psi residual.

It should be noted that the PCWA connection HGL is based off the data collected in October and November of 2011. Determining the actual HGL during the summertime or during higher fire flow demands for PCWA was beyond the scope of this project. Pressure measured during the data collection period indicate the initial PCWA HGL for serving the DeWitt Center does drop significantly as the flow demand increases. The long term cumulative effect on the PCWA system to the higher demands is beyond the scope of this project.

FIRE FLOW RESULTS WITH SYSTEM IMPROVEMENTS

A second scenario for the existing system was analyzed assuming all the previously suspected closed valves within the system are opened, several undersized pipeline diameters were increased, and new pipelines added to complete system looping, see Figure 3. The fire flow results assuming the proposed system configuration improvements indicate how overall system fire flows could be improved by performing a valve exercise program and updating key pipeline segments, see Figure 4. This program would assist in identifying any locations where valves are currently closed or partially closed and in need of repair.

Table 2 shows the available fire flow for the system improvements and compares the available fire flow to the existing system available fire flow. Overall available fire flow was increased by an average of 18 percent or approximately 519 gpm.

Table 2. Fire Flow Results and Comparisons

	Approximate Fire Flow Available (gpm) @ 20 psi Residual										
Model ID	Existing System	Pipeline and Valve Improvements	Percent Increase/ Decrease from Existing System	NID Connection	Percent Increase/ Decrease from Existing System	Double Check Assemblies By-Pass	Percent Increase/ Decrease from Existing System	PCWA Connection In-line Booster Pump	Percent Increase/ Decrease from Existing System	PCWA Connection Storage Tank	Percent Increase/ Decrease from Existing System
F01	3,290	3,357	2%	4,752	44%	5,848	78%	5,131	56%	5,165	57%
F02	2,817	2,837	1%	4,193	49%	5,266	87%	4,807	71%	4,911	74%
F03	2,681	2,703	1%	4,089	53%	5,203	94%	4,763	78%	4,878	82%
F04	3,501	3,600	3%	4,866	39%	5,915	69%	5,203	49%	5,220	49%
F05	3,936	4,166	6%	5,337	36%	6,286	60%	5,470	39%	5,430	38%
F06	4,378	4,618	5%	5,697	30%	6,563	50%	5,691	30%	5,607	28%
F07	1,442	2,380	65%	3,062	112%	3,390	135%	3,572	148%	3,772	162%
F08	4,422	4,672	6%	5,763	30%	6,594	49%	5,718	29%	5,629	27%
F09	4,334	4,610	6%	5,765	33%	6,597	52%	5,700	32%	5,614	30%
F10	3,663	3,778	3%	4,784	31%	5,480	50%	5,045	38%	5,088	39%
F11	3,437	3,509	2%	4,669	36%	5,539	61%	5,027	46%	5,078	48%
F12	3,193	3,249	2%	4,403	38%	5,387	69%	4,917	54%	4,993	56%
F13	2,531	2,558	1%	3,732	47%	4,707	86%	4,503	78%	4,661	84%
F14	3,950	3,979	1%	4,803	22%	6,819	73%	5,597	42%	5,520	40%
F15	4,066	4,073	0%	4,660	15%	7,051	73%	5,686	40%	5,586	37%
F16	3,215	3,237	1%	4,121	28%	5,581	74%	5,002	56%	5,063	57%
F17	3,089	3,159	2%	4,267	38%	5,341	73%	4,883	58%	4,966	61%
F18	2,485	4,345	75%	5,586	125%	6,215	150%	5,488	121%	5,447	119%
F19	2,867	3,648	27%	4,810	68%	5,494	92%	5,029	75%	5,078	77%
F20	2,919	3,335	14%	4,701	61%	5,548	90%	5,002	71%	5,062	73%
F21	3,117	3,307	6%	4,581	47%	5,655	81%	5,044	62%	5,096	64%
F22	3,127	3,165	1%	4,233	35%	5,181	66%	4,806	54%	4,901	57%
F23	3,855	3,938	2%	5,095	32%	6,576	71%	5,512	43%	5,458	42%
F24	3,192	3,502	10%	4,989	56%	5,605	76%	5,055	58%	5,102	60%
F25	3,097	3,496	13%	5,013	62%	5,615	81%	5,058	63%	5,105	65%
F26	3,200	3,849	20%	5,514	72%	6,145	92%	5,343	67%	5,329	67%
F27	3,453	4,078	18%	5,607	62%	6,072	76%	5,367	55%	5,349	55%
F28	3,844	4,539	18%	6,143	60%	6,538	70%	5,659	47%	5,581	45%
F29	3,077	3,604	17%	5,126	67%	5,150	67%	4,847	58%	4,922	60%
F30	2,974	3,518	18%	5,108	72%	5,146	73%	4,833	63%	4,913	65%
F31	1,387	3,193	130%	4,827	248%	5,339	285%	4,886	252%	4,968	258%
F32	1,182	2,893	145%	4,234	258%	4,607	290%	4,466	278%	4,612	290%
F33	1,587	3,935	148%	4,763	200%	5,274	232%	4,965	213%	5,016	216%
F34	3,665	4,056	11%	5,326	45%	6,047	65%	5,352	46%	5,337	46%
F35	3,684	4,193	14%	5,367	46%	5,903	60%	5,324	45%	5,316	44%
F36	3,931	4,608	17%	6,163	57%	6,578	67%	5,693	45%	5,608	43%
F37	3,666	4,139	13%	5,298	44%	5,670	55%	5,206	42%	5,220	42%
F38	3,519	3,876	10%	4,799	36%	5,128	46%	4,874	38%	4,936	40%
F39	2,545	2,661	5%	3,140	23%	3,363	32%	3,504	38%	3,662	44%
F40	2,724	2,875	6%	3,425	26%	3,666	35%	3,765	38%	3,918	44%
F41	3,483	3,810	9%	4,642	33%	4,929	42%	4,745	36%	4,821	38%
F42	3,250	3,502	8%	4,192	29%	4,444	37%	4,388	35%	4,497	38%
F43	3,220	3,432	7%	4,013	25%	4,230	31%	4,222	31%	4,335	35%
F44	1,935	1,989	3%	2,289	18%	2,458	27%	2,665	38%	2,810	45%
F46	1,261	2,800	122%	3,244	157%	3,503	178%	3,620	187%	3,770	199%
F48	1,932	1,990	3%	2,289	18%	2,452	27%	2,658	38%	2,801	45%
F49	2,943	3,133	6%	3,799	29%	4,088	39%	4,110	40%	4,250	44%
F50	3,143	3,379	8%	4,158	32%	4,510	44%	4,431	41%	4,549	45%
F51	3,278	3,497	7%	4,236	29%	4,569	39%	4,478	37%	4,585	40%
F52	3,124	3,300	6%	3,964	27%	4,274	37%	4,255	36%	4,381	40%
F54	1,768	1,809	2%	2,028	15%	2,152	22%	2,335	32%	2,450	39%
F55	2,376	2,463	4%	2,802	18%	2,960	25%	3,116	31%	3,255	37%
F56	1,650	2,988	81%	4,689	184%	4,615	180%	4,476	171%	4,616	180%
F57	3,076	3,250	6%	3,756	22%	3,952	29%	3,994	30%	4,116	34%
F58	3,086	3,761	22%	5,868	90%	5,579	81%	5,089	65%	5,126	66%
F59	2,676	3,344	25%	6,029	125%	5,161	93%	4,818	80%	4,906	83%
F60	1,259	2,948	134%	6,233	395%	4,654	270%	4,497	257%	4,637	268%
F62	2,697	2,828	5%	3,273	21%	3,461	28%	3,575	33%	3,716	38%
F63	2,721	3,269	20%	5,122	88%	4,911	80%	4,676	72%	4,784	76%
F64	1,454	2,876	98%	4,824	232%	4,395	202%	4,331	198%	4,488	209%
F65	1,245	2,769	122%	7,117	472%	4,317	247%	4,277	243%	4,444	257%
F66	3,478	3,738	7%	5,197	49%	6,084	75%	5,296	52%	5,293	52%
F67	2,015	2,075	3%	2,346	16%	2,489	24%	2,674	33%	2,806	39%
F68	1,370	3,099	126%	3,608	163%	3,904	185%	3,958	189%	4,096	199%
F69	874	2,792	219%	4,654	432%	4,496	414%	4,392	402%	4,550	420%

FIRE FLOW RESULTS WITH SERVICE CONNECTION AND SUPPLY IMPROVEMENT

Several alternatives were evaluated for Placer County's consideration to improve the available fire flow for future developments. All alternatives evaluated include the system pipeline and valve improvements discussed previously and listed below:

- Recommendation of a valve exercise program to identify any closed or partially closed valves or any valves that may need repair.
- Construction of new pipeline to improve system looping to the southeast area of the DeWitt Center.
- Replacement of existing pipelines which are undersized for the proposed future development fire flow needs.

The alternatives evaluated also include improvements or changes to the service connection locations as well as on-site storage. Each alternative should be further analyzed to determine additional feasibility issues such as meeting with PCWA and NID to negotiate any service connection updates or changes. The scenarios evaluated are listed below:

1. Connection NID as a service provider or conversion of the emergency connection to NID to automatically open for fire flow purposes when pressures drop to a critical level within the DeWitt Center.
    - NID currently has two emergency tie-in locations to the DeWitt Center which are opened manually when needed. Conversion of the service provider to NID or updates to the tie-in locations to operate automatically depending on system pressure within the DeWitt Center for emergency purposes would provide a redundant system. The current DeWitt Center relies on a single tie-in to PCWA which limits the reliability of the system during emergency conditions. However, this alternative requires negotiation between Placer County, NID, and PCWA to determine the feasibility of changing water service providers. In addition, further analysis is needed to determine improvements required at each NID connection location to ensure available fire flows meet system requirements.
    - The model scenario is limited in the ability to fully evaluate the NID system option due to limited data on the NID system response to fire flow conditions. NID did provide boundary conditions at the two tie-in locations based on average system conditions in November 2011. For the model scenario, it was assumed available pressure from the NID system would decrease by approximately 20 psi from the average system conditions provided.
    - See Figure 5 for the model results of available fire flow and Table 2 for a comparison to existing system available fire flow.

2. Construct a bypass pipeline around the double detector checks at the PCWA connection to open for fire flow purposes when pressure drops to a critical level within the DeWitt Center.

   - The current PCWA connection includes the parallel detector check valve assemblies as well as system meter. The water served to the DeWitt Center on an average basis is minor and results in minimal head loss through each of the facilities. However, during fire flow conditions, the higher flow rates result in increased head loss through the facilities. Approximately 15 psi would be lost through the detector check assemblies and meter during a 4,000 gpm fire flow (based on specifications provided by Placer County and PCWA and assumes flow is evenly distributed between the two detector check valves). Installation of a bypass facility would minimize the 15 psi loss in pressure and result in additional water and pressure being available for fire flows. This scenario requires further discussion with PCWA to determine if it is possible to bypass the meter and double check valve assemblies during an emergency fire flow condition.

   - The model scenario assumes a 16-inch bypass line is installed which conveys water from PCWA directly into the DeWitt Center for fire flow purposes. See Figure 6 for the model results of available fire flow and Table 2 for a comparison to existing system available fire flow.

3. Installation of an in-line booster pump station with back-up power at the PCWA connection to compensate for the pressure drop created during fire flow conditions.

   - As discussed in Scenario 2, the current connection facilities between PCWA and Placer County's DeWitt Center results in approximately 15 psi loss across the facilities during a fire flow demand of 4,000 gpm (assumes flow is evenly distributed between the two detector check valves). An alternative to constructing the bypass facility is to construct an in-line booster pump station to compensate for the pressure loss. This facility would need to meet minimal standards to be considered a reliable alternative. These standards would include having redundant pumping capacity and standby power availability. This scenario requires further discussion with PCWA and consultation with the Fire Marshall to ensure facilities meet requirements.

   - The model scenario assumes the system in-line booster pump has a design point of 4,000 gpm at 15 psi. Additional analysis would be required to determine the actual facility capacity and operational parameters. See Figure 7 for the model results of available fire flow and Table 2 for a comparison to existing system available fire flow.

4. Construction of an on-site storage tank and booster pump station to meet fire flow requirements within the DeWitt Center is another alternative.

   - One method of providing fire flow within a water system is the installation of storage and booster pump stations. For the DeWitt Center, the storage tank would need to be sized to contain an adequate volume of water to meet fire flow requirements. The largest fire flow within the DeWitt Center is 4,000 gpm for a four-hour duration. The total volume of water needed to meet this fire flow requirement is approximately 1.0 million gallons (MG). However, not all of the fire flow required would need to be located in the storage tank. PCWA could provide a portion of the required fire flow concurrently through the existing connection. This assumption results in a reduction in the required volume of water needed for on-site storage. Review of the results based on the scenario

with system valve and pipeline improvements indicates PCWA would be capable of reliably supplying approximately 2,000 gpm to most locations. Based on the assumption PCWA is capable of providing this amount of fire flow to the DeWitt Center, the required on-site fire flow storage is reduced to approximately 0.5 MG.

- The model scenario assumes the storage tank would be located at the existing PCWA connection location. This location would allow the tank to be designed as a flow through tank to prevent stagnation due to low turnover. Additional feasibility studies would need to be performed to determine the best on-site location, actual tank volume required, and operational parameters for the tank. See Figure 8 for the model results of available fire flow and Table 2 for a comparison to existing system available fire flow.

CONCLUSIONS

The hydraulic model developed for the DeWitt Center is based on the best available data for the DeWitt distribution system. The model results indicate the existing system has limitations on meeting fire flow demands. A factor in the fire flow limitations involves uncertainty regarding valve status in the older part of the water distribution system and several undersized pipelines or lack of pipeline looping. The following recommendations to improve delivery of fire flow within the DeWitt distribution system should be initiated by Placer County to address current fire flow issues:

- Perform additional flow tests during the higher demand periods in PCWA service area
- Create and perform a valve exercise program to identify any closed or partially closed valves or any valves that may need repair.
- Calibrate the hydraulic model
- Design and construct new pipeline to improve system looping to the southeast area of the DeWitt Center.
- Replace existing undersized pipelines for any proposed future development.

Based on the results shown in Table 2, performing the above listed recommendations would result in improved fire flow availability throughout the DeWitt Center. Areas to the southeast and northwest which currently are the most limited in supplying the required fire flow and would see the largest benefits.

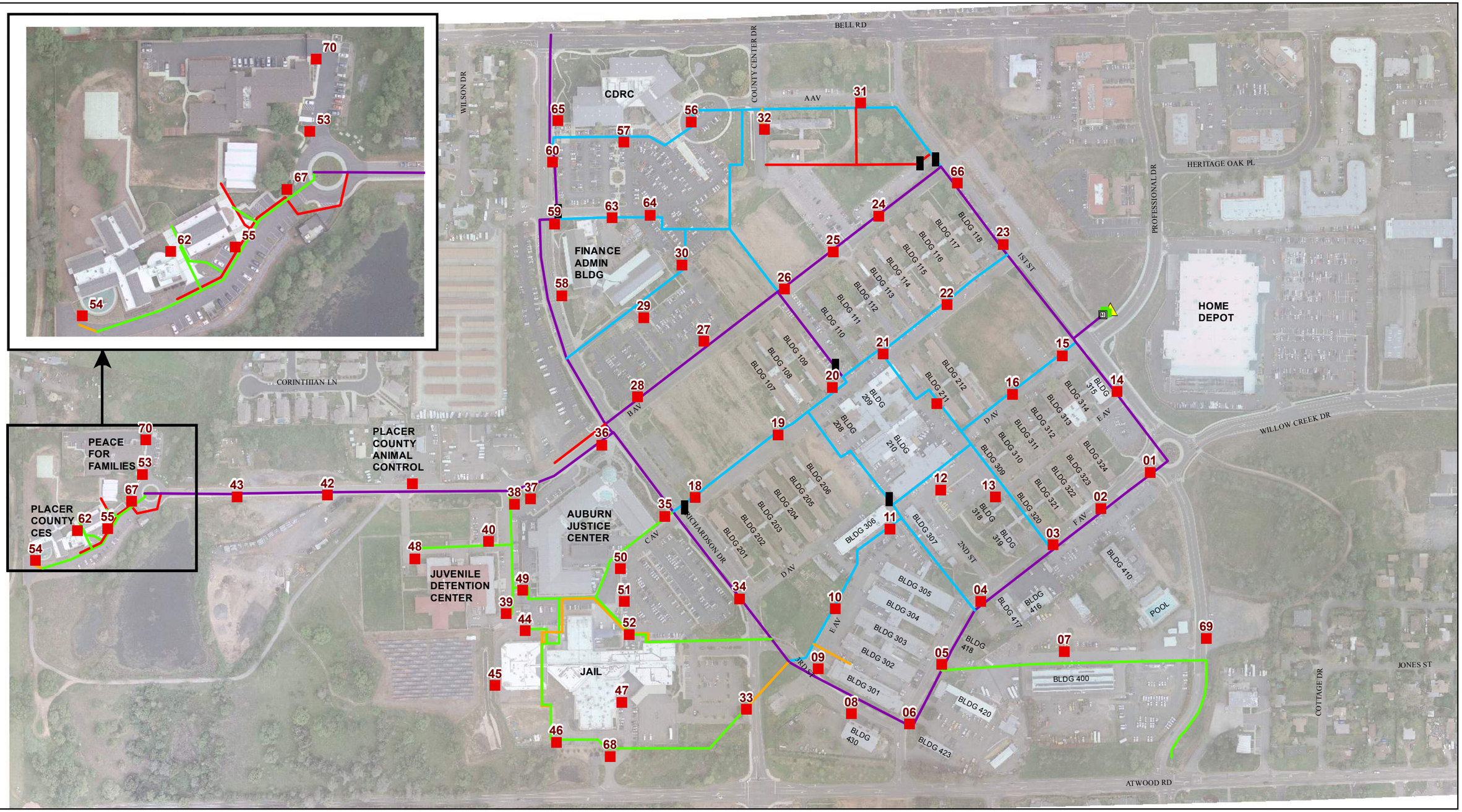
The major contributor to the fire flow limitations within the DeWitt Center are based on the single service connection to PCWA and the amount of head loss from PCWA's system to the DeWitt Center at this connection. The four scenarios evaluated with the hydraulic model incorporate the above system pipeline and valve recommendations. However, limitations within the PCWA and NID systems for supplying fire flow to the DeWitt Center were outside the scope of this TM. Each of the scenarios evaluated using the hydraulic model indicates significant fire flow improvement could be achieved. However, each of the scenarios requires further evaluation or discussions with the water service provider to determine the feasibility of implementing the improvements.

Known constraints or limitations associated with the PCWA system for delivering adequate water at required pressure need to be determined at the tie-in location to the DeWitt Center. The DeWitt Center is located at the end of the PCWA system and has limited transmission and distribution pipelines serving the area. The known limitations within the PCWA system are listed below and shown in Figure 9:

- Maximum velocity allowed in pipelines is 5 feet per second
- DeWitt served from Rock Creek PRV station. The largest diameter pipeline for this service area is 12 inch.
- Rock Creek PRV station fed by a 12-inch pipeline. Largest diameter pipeline upstream is 16-inch diameter located at intersection of Bell Road and New Airport Road
- A single 12-inch diameter pipeline feeds the entire Rock Creek service area west of Highway 49 which includes the DeWitt Center.

Of the scenarios evaluated, constructing a bypass pipeline for emergency purposes at the NID connections is the least disruptive and least cost involved alternative. Placer County, PCWA, and NID need to determine the feasibility of installing automatic valves to open when pressures within the DeWitt Center drop to a critical value.

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig1_DeWitt_Exist_System.mxd 6/26/2012



Fire Hydrant
PCWA Detector Assemblies
PCWA Meter
PCWA Connection
Potential closed/broken valve

4 inch diameter and less
6 inch diameter
8 inch diameter
10 inch diameter
12 inch diameter

Note:
- The potential closed/broken valve locations based on information provided by Placer County staff.

N

0 160 320
Scale in Feet

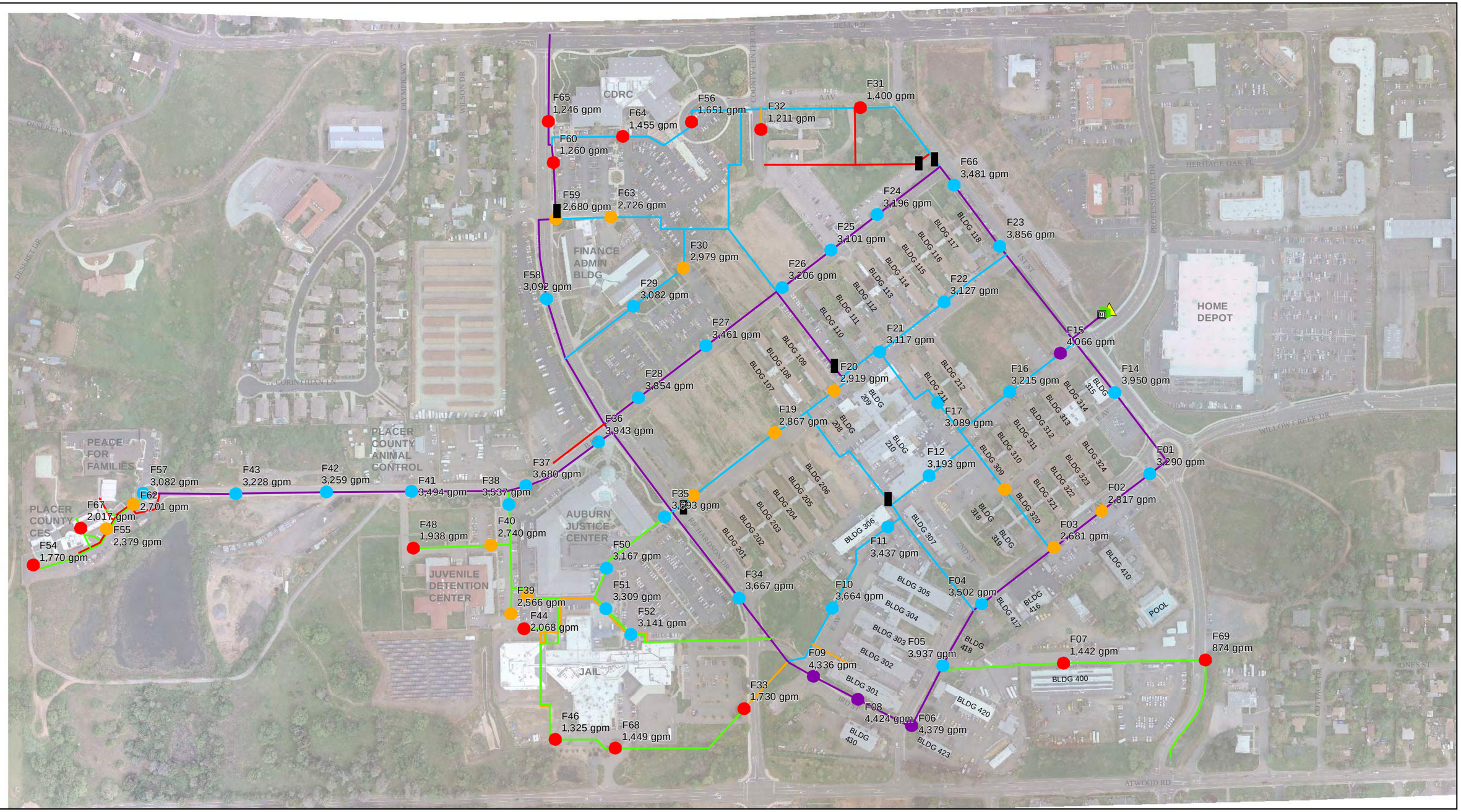
FIGURE 1

Placer County
DeWitt Center Hydraulic Analysis

EXISTING SYSTEM

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig2_DeWitt_Ex_Avail_FF.mxd 6/25/2012



- PCWA Detector Assemblies
- PCWA Meter
- PCWA Connection
- 4 inch diameter and less
- 6 inch diameter
- 8 inch diameter
- 10 inch diameter
- 12 inch diameter
- Potential closed/broken valve

Available Fire Flow

- Less than 2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater

Note:
- The potential closed/broken valve locations based on information provided by Placer County staff.
- Available fire flow shown based on 20 psi residual.
- Boundary conditions do not account for PCWA system constrictions/limitation for flow greater than 2,000 gpm.

N

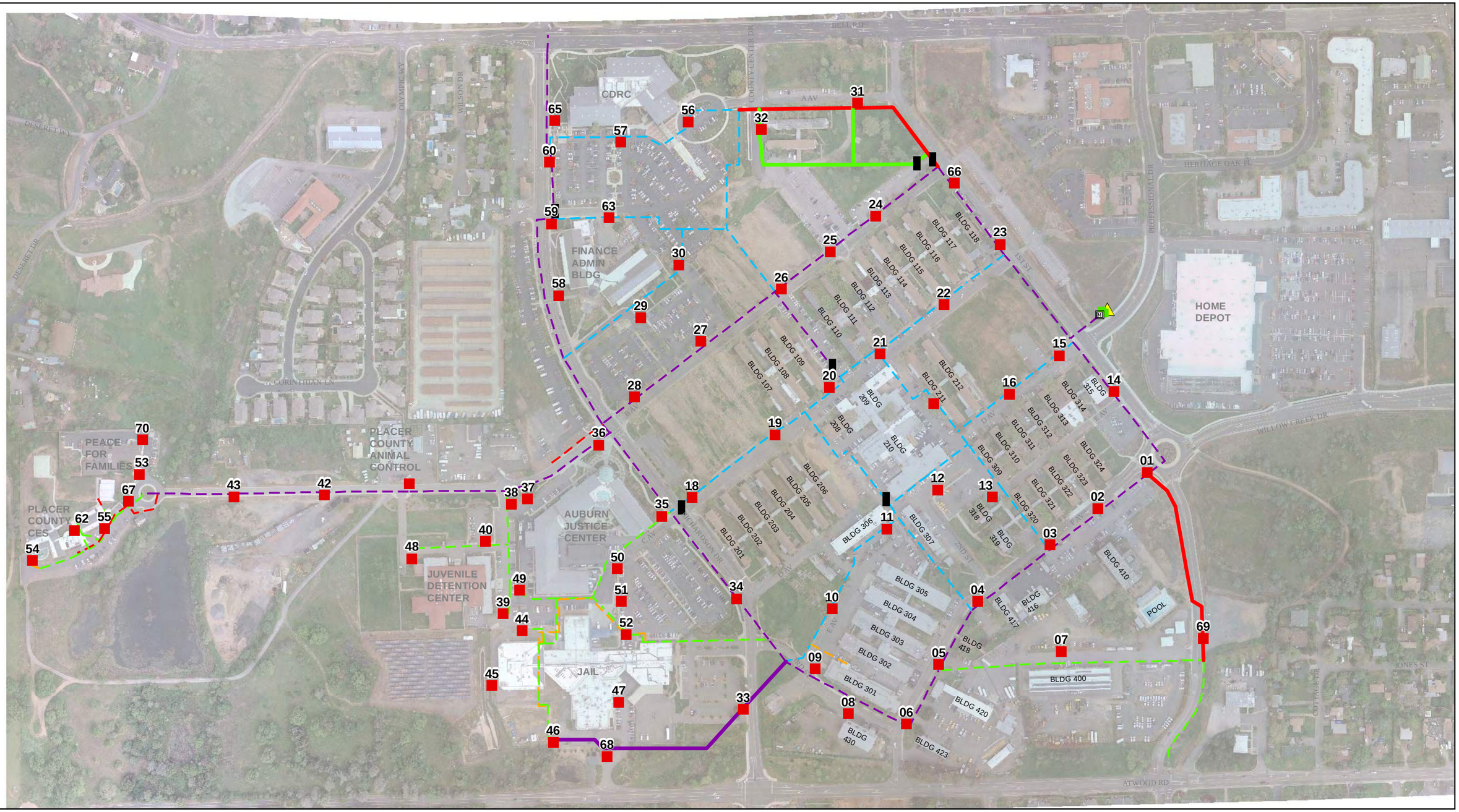
0 160 320
Scale in Feet

FIGURE 2

Placer County
DeWitt Center Hydraulic Analysis
EXISTING SYSTEM
AVAILABLE FIRE FLOW

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig3_DeWitt_Pipe_Improve.mxd 6/25/2012



- Fire Hydrant
- PCWA Detector Assemblies
- PCWA Meter
- PCWA Connection
- Potential closed/broken valve

Existing Pipelines
- 4 inch diameter
- 6 inch diameter
- 8 inch diameter
- 10 inch diameter
- 12 inch diameter

New or Upsized Pipelines
- 8 inch diameter
- 10 inch diameter
- 12 inch diameter

Note:
- The potential closed/broken valve locations based on information provided by Placer County staff.
- All valves located in older areas of the system should be high priority in a valve excercise plan.

N

0 160 320
Scale in Feet

FIGURE 3

Placer County
DeWitt Center Hydraulic Analysis

PIPELINE IMPROVEMENTS

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig4_DeWitt_Imp_Avail_FF.mxd 6/25/2012

PCWA Detector Assemblies
PCWA Meter
PCWA Connection
4 inch diameter
6 inch diameter
8 inch diameter
10 inch diameter
12 inch diameter

Available Fire Flow
- Less than 2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater

Note:
- Available fire flow shown based on 20 psi residual.
- Available fire flow shown based on hydraulic model results. Actual hydrant testing required to confirm available flow at specific locations.
- Boundary conditions do not account for PCWA system constrictions/limitation for flow greater than 2,000 gpm.

N

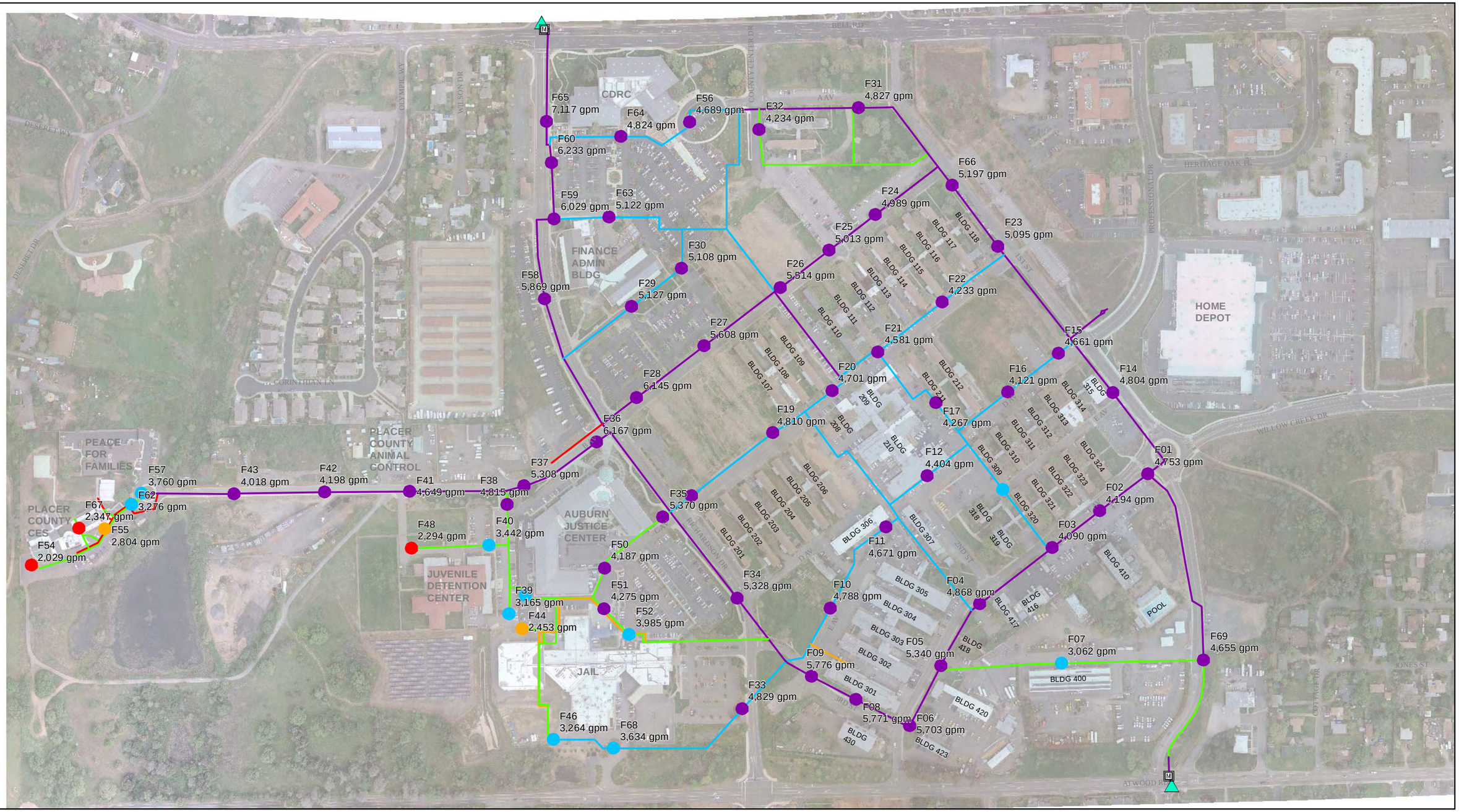
0 160 320
Scale in Feet

FIGURE 4

Placer County
DeWitt Center Hydraulic Analysis
PIPELINE IMPROVEMENTS
AVAILABLE FIRE FLOW

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig5_DeWitt_NID_Avail_FF.mxd 6/25/2012



Meter
NID Connection
4 inch diameter
6 inch diameter
8 inch diameter
10 inch diameter
12 inch diameter

Available Fire Flow
- Less than 2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater

Note:
- Available fire flow shown based on 20 psi residual.
- Available fire flow shown based on hydraulic model results. Actual hydrant testing required to confirm available flow at specific locations.
- Boundary conditions do not account for PCWA system constrictions/limitation for flow greater than 2,000 gpm.

N

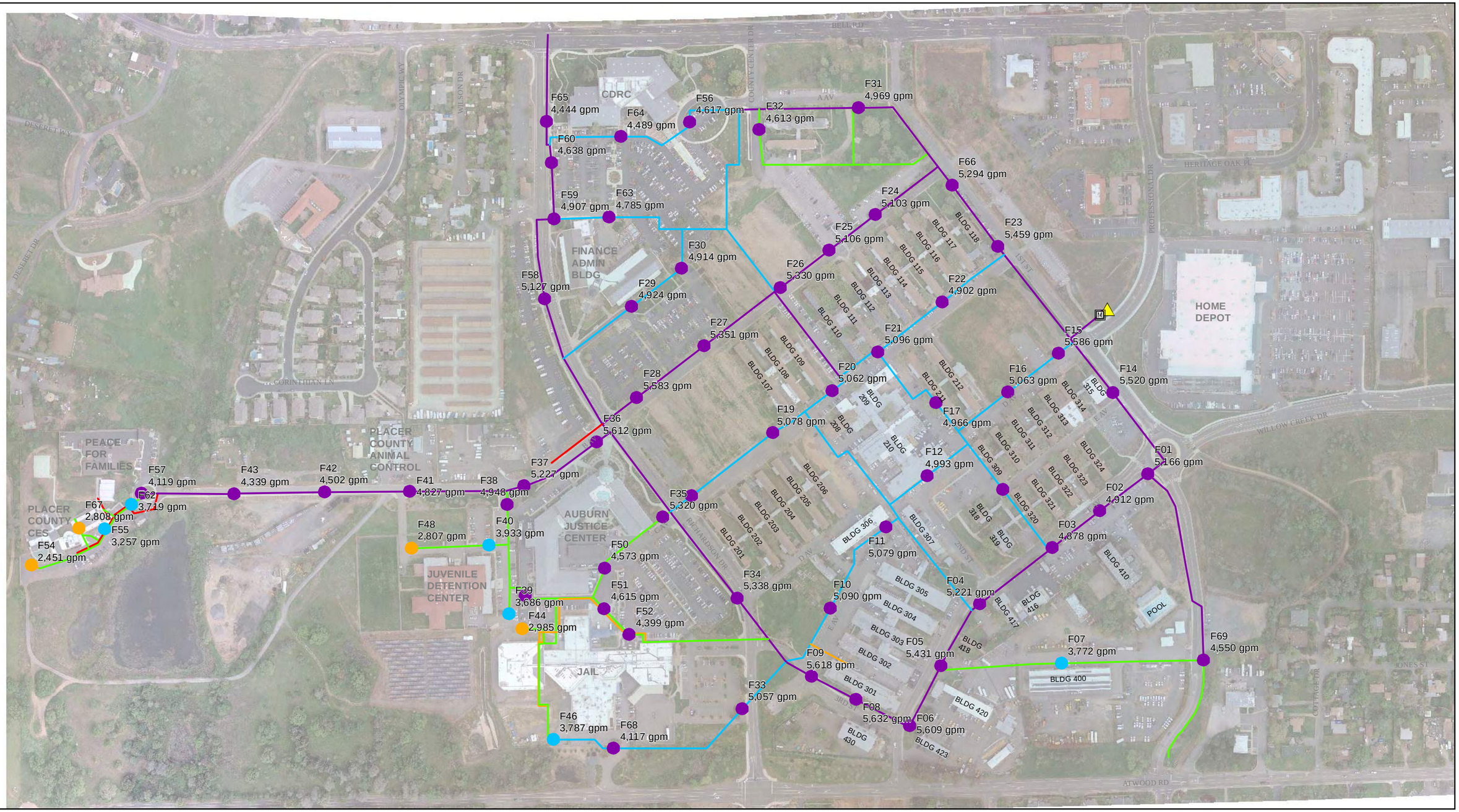
0 160 320
Scale in Feet

FIGURE 5

Placer County
DeWitt Center Hydraulic Analysis
NID SERVICE CONNECTION AVAILABLE FIRE FLOW

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig6_DeWitt_PCWA_ByPass_Avail_FF.mxd 6/25/2012



PCWA Meter
PCWA Connection
4 inch diameter
6 inch diameter
8 inch diameter
10 inch diameter
12 inch diameter

Available Fire Flow
- Less than 2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater

Note:
- Available fire flow shown based on 20 psi residual.
- Available fire flow shown based on hydraulic model results. Actual hydrant testing required to confirm available flow at specific locations.
- Boundary conditions do not account for PCWA system constrictions/limitation for flow greater than 2,000 gpm.

N

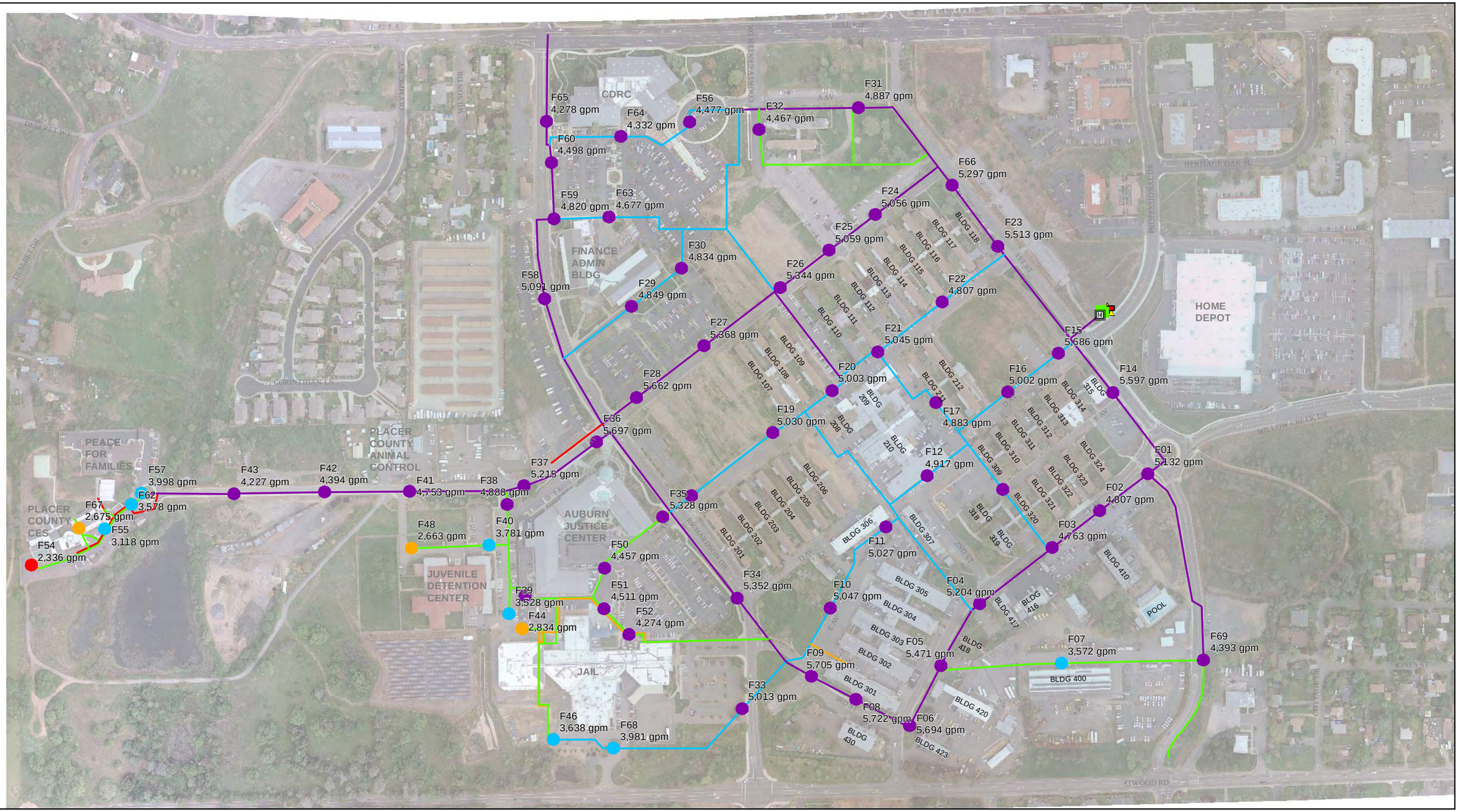
0 160 320
Scale in Feet

FIGURE 6

Placer County
DeWitt Center Hydraulic Analysis
PCWA EMERGENCY BYPASS AVAILABLE FIRE FLOW

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig7_DeWitt_PCWA_InLineBP_Avail_FF.mxd 6/25/2012



PCWA Detector Assemblies
PCWA Meter
PCWA Connection
4 inch diameter
6 inch diameter
8 inch diameter
10 inch diameter
12 inch diameter

In-Line Booster Pump

Available Fire Flow

Less than 2,375 gpm
2,375 to 3,000 gpm
3,000 to 4,000 gpm
4,000 gpm and Greater

Note:
- Available fire flow shown based on 20 psi residual.
- Available fire flow shown based on hydraulic model results. Actual hydrant testing required to confirm available flow at specific locations.
- Boundary conditions do not account for PCWA system constrictions/limitation for flow greater than 2,000 gpm.

N

0 160 320
Scale in Feet

FIGURE 7

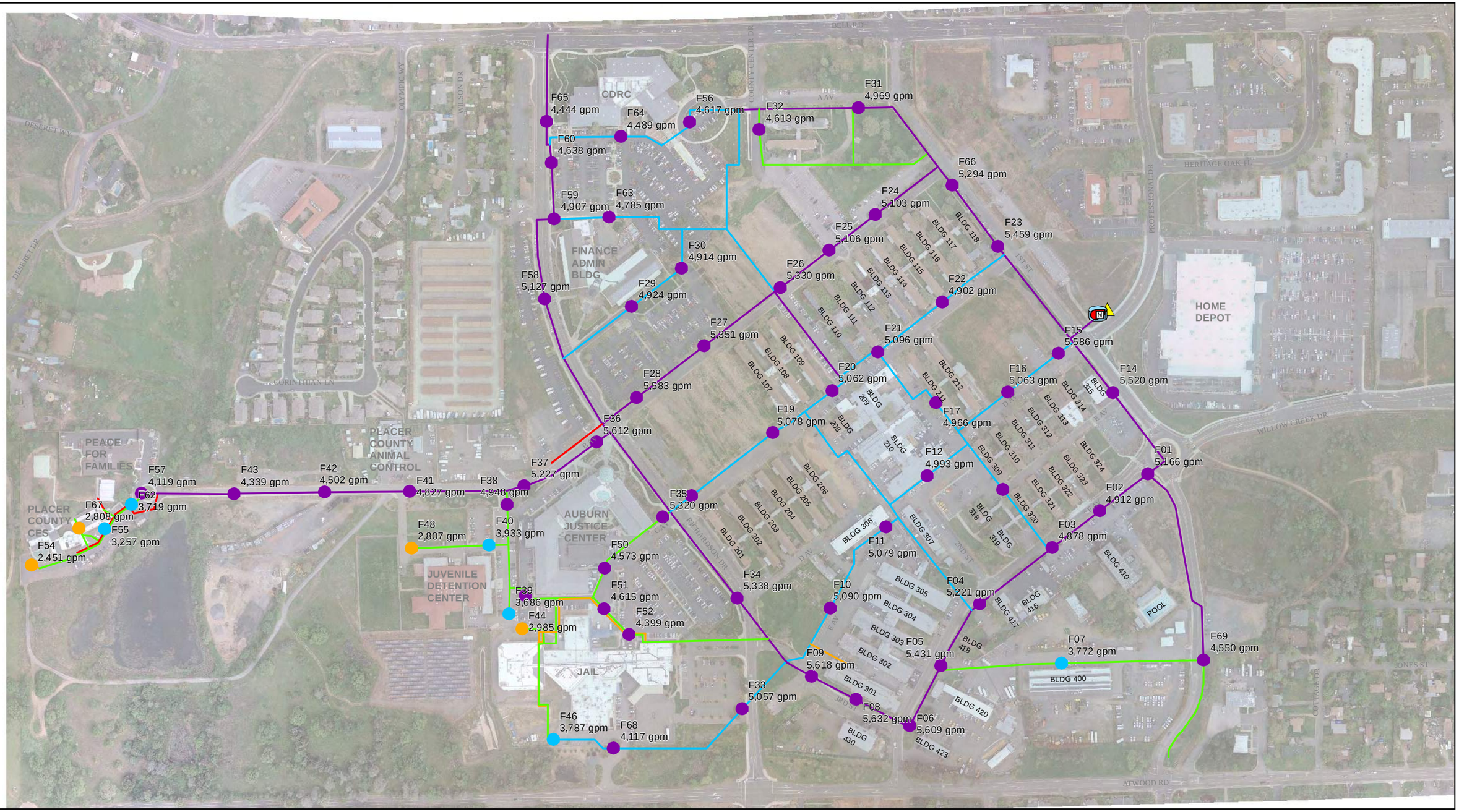
Placer County

DeWitt Center Hydraulic Analysis

PCWA IN-LINE BOOSTER PUMP AVAILABLE FIRE FLOW

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig8_DeWitt_PCWA_Tank_Avail_FF.mxd 6/25/2012



PCWA Meter
PCWA Connection
4 inch diameter
6 inch diameter
8 inch diameter
10 inch diameter
12 inch diameter

Booster Pump
Storage Tank

Available Fire Flow

- Less than 2,375 gpm
- 2,375 to 3,000 gpm
- 3,000 to 4,000 gpm
- 4,000 gpm and Greater

Note:
- Available fire flow shown based on 20 psi residual.
- Available fire flow shown based on hydraulic model results. Actual hydrant testing required to confirm available flow at specific locations.
- Boundary conditions do not account for PCWA system constrictions/limitation for flow greater than 2,000 gpm.

N

0 160 320
Scale in Feet

FIGURE 8

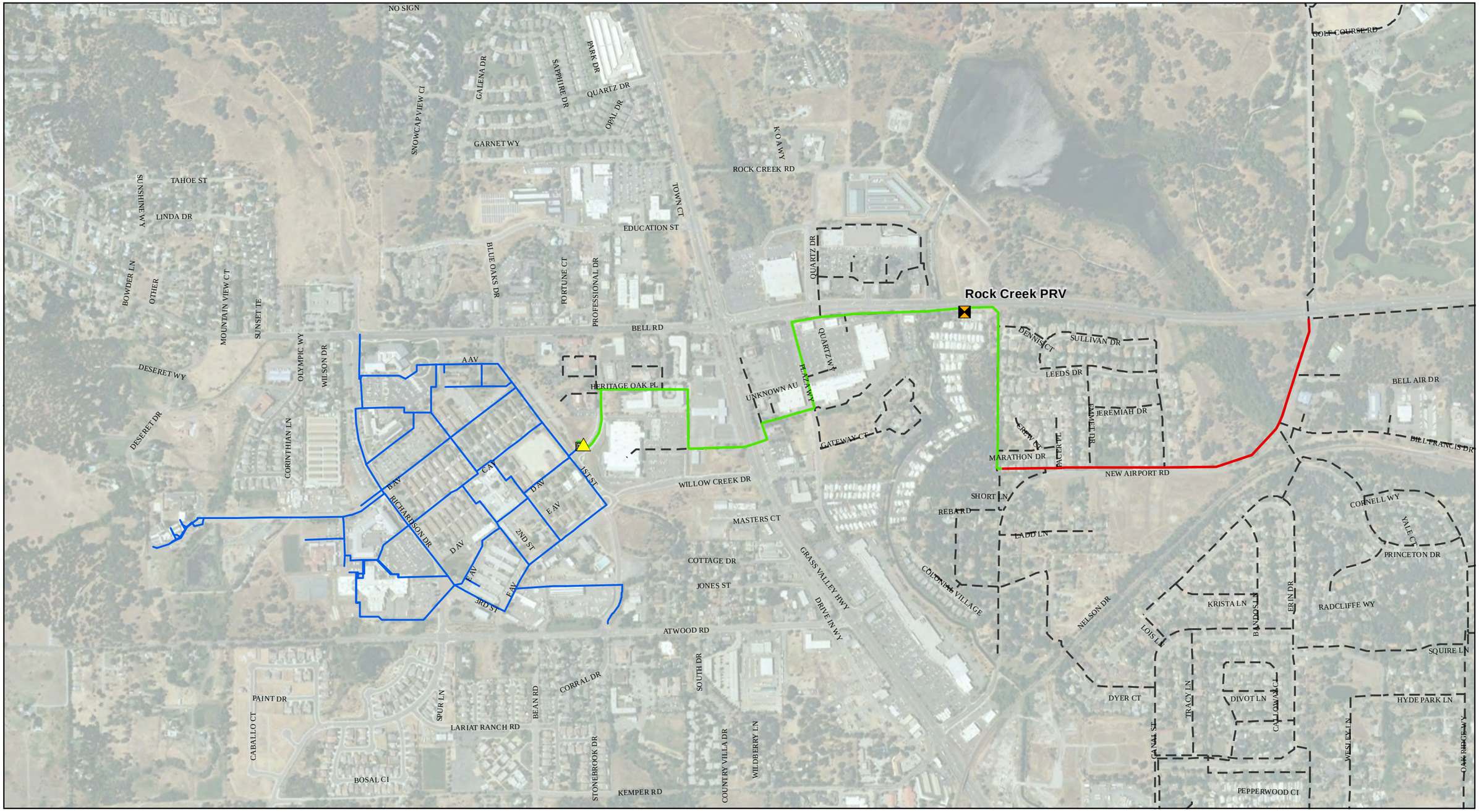
Placer County

DeWitt Center Hydraulic Analysis

PCWA TANK AND BOOSTER PUMP AVAILABLE FIRE FLOW

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\330 Placer County\00-10-05 PC Goverment CUI Survey\GIS\Figures\Fig9_PCWA_DeWitt_Exist_System.mxd 6/25/2012



PCWA Detector Assemblies
PCWA Meter
PCWA Connection
DeWitt Distribution System
PCWA Distribution System

PCWA Transmission System
12 inch diameter
14 inch diameter

Note:
- PCWA transmission pipeline shown based on available information. Transmission pipelines highlighted are the main feed for the DeWitt Center and result in constraints for delivery of water for fire flow purposes.

N

0 400 800
Scale in Feet

FIGURE 9

Placer County
DeWitt Center Hydraulic Analysis

PCWA SYSTEM

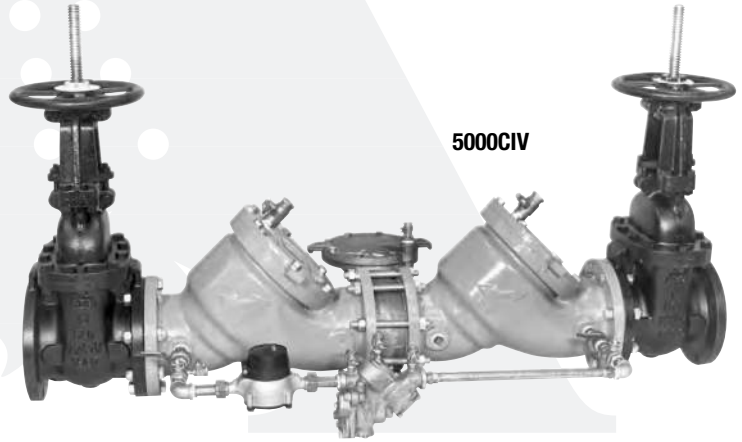
WEST YOST ASSOCIATES
Consulting Engineers

Series 5000CIV

AMES
FIRE & WATERWORKS

Reduced Pressure Detector Assemblies

Sizes: 2½" – 10" (65 – 250mm)



Features

- Body construction fused epoxy coated cast iron
- Replaceable bronze seats
- Maximum flow at low pressure drop
- Compact for economy combined with performance
- Design simplicity for easy maintenance
- Furnished with a CFM or GPM ⅝" x ¾" (16 x 19mm) recordall meter Model 25, bronze
- No special tools required

Series 5000CIV Reduced Pressure Detector Assemblies are used in health hazard applications and are designed exclusively for use in accordance with water utility authority containment requirements. It is mandatory to prevent the reverse flow of fire protection system substances, i.e., glycerin wetting agents, stagnant water and water of non-potable quality from being pumped or siphoned into the potable water line. The Series 5000CIV is ideal for fire protection systems to detect leaks or unauthorized use of water.

Modular check design concept facilitates maintenance and assembly access. All sizes are standardly equipped with AWWA epoxy coated, UL/FM listed OSY resilient seated gate valves, CFM (cubic feet per minute) or GPM (gallon per minute) meter and ball type test cocks. A pressure differential relief valve is located in a zone between the check valves.

Specifications

A Reduced Pressure Detector Assembly shall be installed on fire protection systems when connected to a public water supply. Degree of hazard present is determined by the local authority having jurisdiction. The unit shall be a complete assembly including UL listed OSY shutoff valves with FM approval. Including an auxiliary line consisting of an approved backflow preventer and water meter. The assembly shall meet the requirements of AWWA C511-92; UL Classified File No. EX3185; CSA B64 and USC Manual 8th. Edition. Assembly shall be an Ames Company Series 5000CIV.

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

Ames product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Ames Technical Service. Ames reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Ames products previously or subsequently sold.

Materials

Epoxy coated cast iron body, bronze seat and disc holder; stainless steel trim and durable, tight-seating rubber check valve discs.

All sizes furnished with bronze body ball valve test cocks. Furnished with outside stem and yoke (OSY) gate valves UL/FM listed. Series 5000CIV bypass line unit consists of an approved Reduced Pressure Zone Assembly and CFM or GPM ⅝ x ¾ (16 x 19mm) water meter.

Available Models

Suffix:

- LG – less gates
- OSY – UL/FM outside stem and yoke resilient seated gate valves

¾" Bypass Line Meter:

- CFM – cubic feet per minute meter
- GPM – gallons per minute meter
- LM – less meter

Note: The installation of a drain line is recommended. When installing a drain line, an air gap is necessary.

Pressure – Temperature

Temperature Range: 33˚F – 140˚F (5˚C – 60˚C)
Maximum Working Pressure: 175psi (12.06 bar)

Standards

AWWA C511-92; CSA B64
USC Manual for Cross-connection Control, 8th Edition

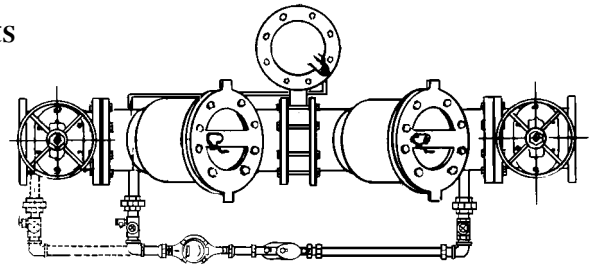
Approvals

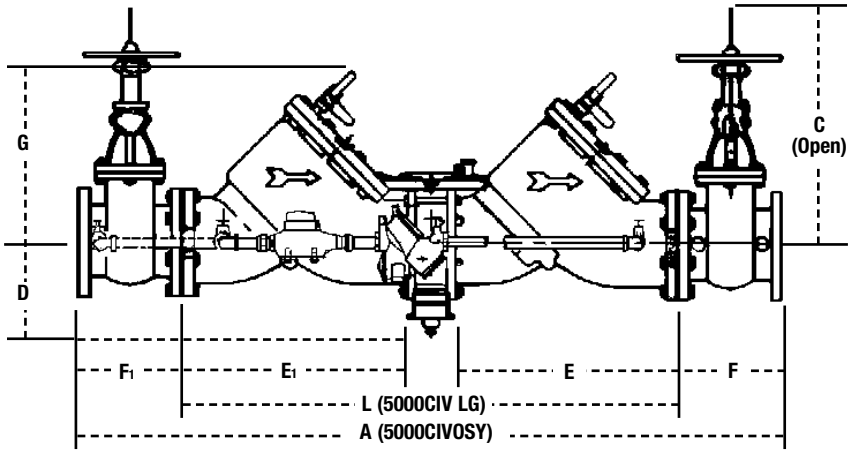
ASSE 1047 · CLASSIFIED C UL US · FM Approved

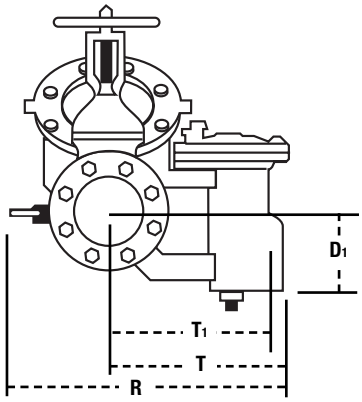
***IMPORTANT:** INQUIRE WITH GOVERNING AUTHORITIES FOR LOCAL INSTALLATION REQUIREMENTS*

NOTE: Piping for 3" 5000CIV will start from #1 gate valve and connect at #2 check valve.

Dimensions — Weights







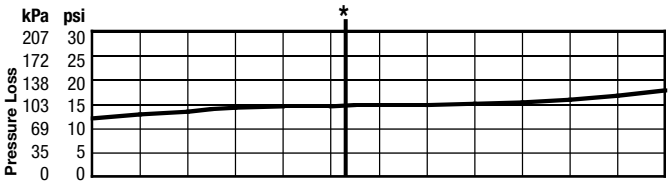
SIZE (DN)		DIMENSIONS																						WEIGHT	
		A		C (OSY)		D		D1		E, E1		F, F1		G		L		R		T		T1			
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.
2½	65	42⅛	1070	16⅜	416	5¼	133	4¼	114	12	305	8	203	7	178	26⅛	664	14	356	9	229	7⅝	194	230	104
3	80	42⅛	1070	18⅞	479	5¼	133	4¼	114	12	305	8	203	7	178	26⅛	664	14	356	9	229	7⅝	194	230	104
4	100	55⅛	1400	22¾	578	6	152	5⅞	149	17	432	9	229	9½	241	37	940	15	381	13⅝	346	11¾	299	470	213
6	150	65½	1664	30⅛	765	6	152	6	152	20¾	527	10½	267	14½	368	44½	1130	16	406	13⅝	346	11¾	299	798	362
8	200	78½	1994	37¾	959	9¾	248	8⅝	219	26	660	11½	292	18½	470	55¼	1403	17	432	18½	470	16⅜	416	1456	660
10	250	93⅝	2378	45¾	1162	9¾	248	8⅝	219	32	813	13	330	21½	546	67½	1715	18	457	18½	470	16⅜	416	2230	1012

Capacity

As compiled from documented Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California lab tests.

*Typical maximum flow rate (7.5 feet/sec.) (including shutoffs)

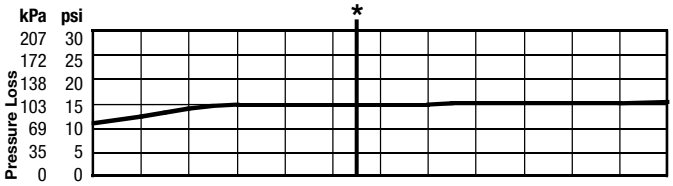
2½" (65mm)



	0	20	40	60	80	100	120	140	160	180	200	220	240	gpm
ΔP	0	76	152	228	304	380	456	532	608	684	760	836	912	lpm
				6			7.5		10				15	fps
				1.8			2.3		3.0				4.6	mps

Flow Rate

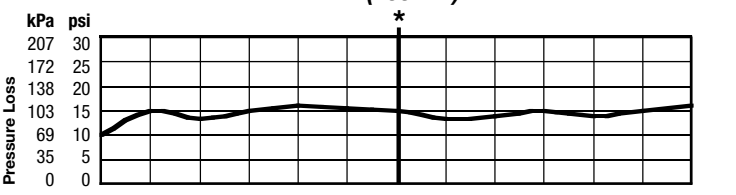
3" (80mm)



	0	30	60	90	120	150	180	210	240	270	300	330	360	gpm
ΔP	0	114	228	342	456	570	684	798	912	1026	1140	1254	1368	lpm
				5		7.5		10				15		fps
				1.5		2.3		3.0				4.6		mps

Flow Rate

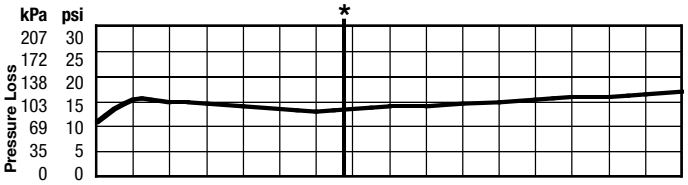
4" (100mm)



	0	50	100	150	200	250	300	350	400	450	500	550	600	gpm
ΔP	0	190	380	50	760	950	1140	1330	1520	1710	1900	2090	2280	lpm
				5			7.5		10				15	fps
				1.5			2.3		3.0				4.6	mps

Flow Rate

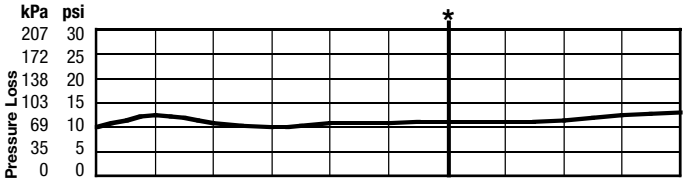
6" (150mm)



	0	200	400	600	800	1000	1200	1400	1600	gpm
ΔP	0	700	1520	2280	3040	3800	4560	5320	6080	lpm
			5	7.5	10		15			fps
			1.5	2.3	3.0		4.6			mps

Flow Rate

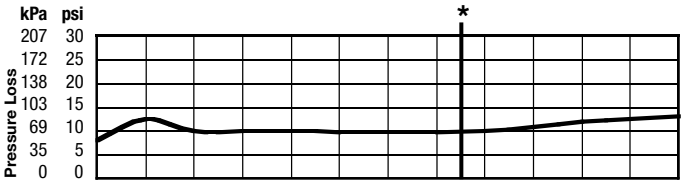
8" (200mm)



	0	200	400	600	800	1000	1200	1400	1600	1800	2000	gpm
ΔP	0	760	1520	2280	3040	3800	4560	5320	6080	6840	7600	lpm
				5			7.5	10			15	fps
				1.5			2.3	3.0			4.6	mps

Flow Rate

10" (250mm)



	0	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	gpm
ΔP	0	950	1900	2850	3800	4750	5700	6650	7600	8550	9500	10450	11400	lpm
			6						7.5		10			fps
			1.8						2.3		3.0			mps

Flow Rate

PLACER COUNTY GOVERNMENT CENTER
MASTER PLAN
WATER DEMAND DATA TABLE
DOMESTIC, IRRIGATION AND FIRE FLOW DEMANDS

PCGC Estimated Water Demands

Parcel	Description	Landscape Zone	GSF	Acerage	Qty	Unit	MDD per unit	Fire Flow (gpm)	Potable: Ave. Day Flow (gpd)	Potable: Max Day Peaking Factor	Potable: Max Day Flow (gpd)	Potable: Max Day Flow (gpm)	MDD Irrigation Demand (gal/acre)	Irrigation: Max Day Irrig Acreage	Irrigation: Max Day Flow (gpd)	Potable + Irrigation: Max Day Flow (gpd)	Potable + Irrigation: Max Day Flow (gpm)
FUTURE COUNTY SPACE																	
A	Health and Human Services - Auburn Service Area and Administration	5	135,700	5.6	584	pers	15	4,000	4,380	2.0	8,760	6	8,800	0.833	7,330	16,090	11.2
B	County Administrative Center	3	64,800	3.0	183	pers	15	3,000	1,373	2.0	2,745	2	17,500	3.920	68,600	71,345	49.5
C	Agricultural Commissioner and Farm Advisor	5	22,200	1.3	57	pers	15	2,375	428	2.0	855	1	8,800	0.833	7,330	8,185	5.7
D	County Warehouse	5	9,700	0.4	3	pers	15	2,375	23	2.0	45	0	8,800	0.833	7,330	7,375	5.1
E	Museums Warehouse	5	19,700	0.6	7	pers	15	2,375	53	2.0	105	0	8,800	0.833	7,330	7,435	5.2
F	Corporation Yard Administration and Training Center	5	7,500	0.4	5	pers	25	2,375	63	2.0	125	0	8,800	0.833	7,330	7,455	5.2
G	Sheriff and Probation Support	5	35,000	0.7	50	pers	25	3,000	625	2.0	1,250	1	8,800	0.833	7,330	8,580	6.0
H	Fire Station and Fire Station 180 Expansion	5	3,300	0.2	16	pers	70	2,375	560	2.0	1,120	1	8,800	0.833	7,330	8,450	5.9
I	Administrative Services IT/Telecom/Warehouse	5	64,800	1.2	10	pers	15	3,000	75	2.0	150	0	8,800	0.833	7,330	7,480	5.2
J	FAB & CDRC Annex	5	19,200	0.9	109	pers	15	2,375	818	2.0	1,635	1	8,800	0.833	7,330	8,965	6.2
K	K1 - Sheriff's Dive Unit	5	5,760	0.3	2	pers	25	2,375	25	2.0	50	0	8,800	0.833	7,330	7,380	5.1
K	K2 - Utilities Department	5	9,400	0.3				2,375	0	2.0	0	0	8,800	0.833	7,330	7,330	5.1
K	K3 - Parks and Grounds	5	5,300	0.1				2,375	0	2.0	0	0	8,800	0.833	7,330	7,330	5.1
K	K4 - Tire Barn	5	3,840	0.1				2,375	0	2.0	0	0	8,800	0.833	7,330	7,330	5.1
	Urban Street	4											8,800	8.770	77,176	77,176	53.6
FUTURE COMMUNITY SPACE																	
L	Dewitt Heritage/Adaptive Reuse	5	47,900	1.4	245	pers	15	2,375	1,838	2.0	3,675	3	8,800	0.833	7,330	11,005	7.6
M	Community Events Center	2	30,000	4.1	810	pers	15	3,000	6,075	2.0	12,150	8	28,219	3.548	100,121	112,271	78.0
N	Central Green	2	0	3.4					0	2.0	0	0	28,219	3.548	100,121	100,121	69.5
POTENTIAL NON-COUNTY SPACE																	
R1	Residential	5	43,900	1.7	44	DU	800	2,375	17,600	2.0	35,200	24	8,800	0.833	7,330	42,530	29.5
R2	Residential	5	40,200	1.3	36	DU	800	2,375	14,400	2.0	28,800	20	8,800	0.833	7,330	36,130	25.1
R3	Residential	5	73,000	4.3	73	DU	800	3,000	29,200	2.0	58,400	41	8,800	0.833	7,330	65,730	45.6
R4	Residential	5	54,600	4.3	55	DU	800	3,000	22,000	2.0	44,000	31	8,800	0.833	7,330	51,330	35.6
R5	Residential	5	54,100	3.6	54	DU	800	3,000	21,600	2.0	43,200	30	8,800	0.833	7,330	50,530	35.1
R6	Residential	5	38,200	2.0		DU	800	2,375	0	2.0	0	0	8,800	0.833	7,330	7,330	5.1
R7	Residential	5	38,000	1.5	38	DU	800	2,375	15,200	2.0	30,400	21	8,800	0.833	7,330	37,730	26.2
R8	Residential	5	50,300	3.4	50	DU	800	3,000	20,000	2.0	40,000	28	8,800	0.833	7,330	47,330	32.9
SR1	Small Residential	5	18,900	1.2	18	DU	800	2,375	7,200	2.0	14,400	10	8,800	0.833	7,330	21,730	15.1
SR2	Small Residential	5	11,600	0.8	12	DU	800	2,375	4,800	2.0	9,600	7	8,800	0.833	7,330	16,930	11.8
SR3	Small Residential	5	15,400	1.0	15	DU	800	2,375	6,000	2.0	12,000	8	8,800	0.833	7,330	19,330	13.4
HO	Hotel	5	60,500	3.9	225	pers	150	4,000	16,875	2.0	33,750	23	8,800	0.833	7,330	41,080	28.5
F1	Flex	5	18,900	0.8	190	pers	100	2,375	9,500	2.0	19,000	13	8,800	0.833	7,330	26,330	18.3
F2	Flex	5	23,800	1.7	238	pers	100	2,375	11,900	2.0	23,800	17	8,800	0.833	7,330	31,130	21.6
F3	Flex	5	19,500	1.1	196	pers	100	2,375	9,800	2.0	19,600	14	8,800	0.833	7,330	26,930	18.7
F4	Flex	5	18,300	1.6	184	pers	100	2,375	9,200	2.0	18,400	13	8,800	0.833	7,330	25,730	17.9
F5	Flex	5	29,400	1.3	294	pers	100	2,375	14,700	2.0	29,400	20	8,800	0.833	7,330	36,730	25.5
F6	Flex	5	12,400	0.6	124	pers	100	2,375	6,200	2.0	12,400	9	8,800	0.833	7,330	19,730	13.7
OS	Open Space	5		2.7					0	2.0	0	0	8,800	0.833	7,330	7,330	5.1
EXISTING COUNTY SPACE																	
E01	Existing CDRC (3091 County Center Drive)	3	122,500		259	pers	15	4,000	1,943	2.0	3,885	3	17,500	3.920	68,600	72,485	50.3
E02	Existing FAB (2950 Richardson Drive)	5	90,500		253	pers	15	3,000	1,898	2.0	3,795	3	8,800	0.833	7,330	11,125	7.7
	DeWitt Museum (2985 Richardson Drive) (staff + visitors)	5			32	pers	10	2,375	160	2.0	320	0	8,800	0.833	7,330	7,650	5.3
	Chapel (2945 First St.) (staff + visitors)	5			77	pers	3	3,000	116	2.0	231	0	8,800	0.833	7,330	7,561	5.3
	Corporation Yard	5			176	pers	15	3,000	1,320	2.0	2,640	2	8,800	0.833	7,330	9,970	6.9
	Women's Shelter - Peace for Families	5	14,508		30	pers	100	2,375	1,500	2.0	3,000	2	8,800	0.833	7,330	10,330	7.2
	Residential Facility (11084 B. Ave) (formerly CES)	5	19,113		30	pers	100	2,375	1,500	2.0	3,000	2	8,800	0.833	7,330	10,330	7.2
	Juvenile Detention Center (11260 B. Ave.)	5	43,526		35	pers	100	2,375	1,750	2.0	3,500	2	8,800	0.833	7,330	10,830	7.5
	Auburn Justice Center (2929 Richardson Drive)	5	110,200		406	pers	15	4,000	3,045	2.0	6,090	4	8,800	0.833	7,330	13,420	9.3
	Auburn Jail (2275/2775 Richardson Drive)	5	119,910		455	pers	100	4,000	22,750	2.0	45,500	32	8,800	0.833	7,330	52,830	36.7
	Animal Services Center (11232 B. Ave.)	5			15	pers	15	2,375			225	0	8,800	0.833	7,330	7,555	5.2
			TOTALS	**63**	**5,695**			**4,000 gpm min.**	**290,000**		**580,000**	**401**		**59.53**	**730,000**	**1,310,000**	**908**

Total Raw Water Irrigation Demand - County/Community Space: 396,085 gpd
275.06 gpm

	Total Acres	% L/S	Acre Irrig	Qty	Per Qty
Landscape Zone 1	29.21	90%	0.00	0	NA
Landscape Zone 2	8.87	80%	7.10	2	3.548
Landscape Zone 3	15.68	50%	7.84	2	3.92
Landscape Zone 4	11.69	75%	8.77	1	8.7675
Landscape Zone 5	119.39	30%	35.82	43	0.8330
			59.52		
	12.41	30%	3.72	**Home Depot (Not currently included in the above tabulatior**	

4,000 Maximum Fire Flow Requirement for Sprinklered Facility as authorized by local authority

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITHOUT NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITHOUT NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F01	3.63	43.96	1,537.67	1,079.98	20
F02	3.63	43.1	1,537.66	1,059.27	20
F03	3.63	40.5	1,537.64	1,000.25	20
F04	3.63	46.11	1,537.63	1,122.08	20
F05	3.63	50.65	1,537.63	1,224.61	20
F06	3.63	56.05	1,537.62	1,366.03	20
F07	3.63	47.41	1,537.63	1,052.08	20
F08	3.63	55.19	1,537.62	1,344.64	20
F09	3.63	54.75	1,537.62	1,335.14	20
F10	3.63	50.65	1,537.62	1,218.55	20
F11	3.63	46.97	1,537.62	1,137.28	20
F12	3.63	44.81	1,537.63	1,093.29	20
F13	3.63	41.36	1,537.64	1,016.63	20
F14	4.63	46.13	1,537.68	1,133.58	20
F15	4.63	45.7	1,537.68	1,124.28	20
F16	3.63	43.96	1,537.66	1,079.30	20
F17	3.63	44.39	1,537.64	1,085.47	20
F18	3.63	53.46	1,537.62	1,297.77	20
F19	3.63	49.13	1,537.62	1,185.44	20
F20	3.63	45.03	1,537.63	1,099.52	20
F21	3.63	44.82	1,537.64	1,096.79	20
F22	3.63	45.47	1,537.64	1,107.47	20
F23	3.63	46.55	1,537.65	1,139.10	20
F24	3.63	46.54	1,537.63	1,132.02	20
F25	3.63	46.76	1,537.62	1,137.54	20
F26	3.63	47.84	1,537.62	1,163.87	20
F27	3.63	50.86	1,537.62	1,231.62	20
F28	3.63	53.89	1,537.62	1,312.13	20
F29	3.63	50.64	1,537.62	1,215.36	20
F30	3.63	50	1,537.62	1,200.05	20
F31	3.63	44.38	1,537.62	1,074.22	20
F32	3.63	44.81	1,537.62	1,085.09	20
F33	3.63	56.48	1,537.61	1,266.96	20
F34	3.63	50.86	1,537.62	1,231.38	20
F35	3.63	54.54	1,537.62	1,331.77	20
F36	3.63	54.75	1,537.61	1,337.38	20
F37	3.63	55.62	1,537.61	1,346.29	20
F38	3.63	57.34	1,537.61	1,380.37	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITHOUT NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F39	3.63	58.21	1,537.61	1,347.91	20
F40	3.63	57.34	1,537.61	1,339.83	20
F41	3.63	59.51	1,537.61	1,421.27	20
F42	3.63	60.37	1,537.61	1,430.15	20
F43	3.63	64.26	1,537.60	1,495.01	20
F44	3.63	57.34	1,537.61	1,334.26	20
F45	3.63	57.34	1,537.61	1,313.49	20
F46	3.63	60.37	1,537.61	1,365.23	20
F47	3.63	57.56	1,537.61	1,127.70	20
F48	3.63	57.78	1,537.61	1,258.58	20
F49	3.63	57.56	1,537.61	1,368.46	20
F50	3.63	54.97	1,537.61	1,314.79	20
F51	3.63	58.21	1,537.61	1,391.34	20
F52	3.63	57.56	1,537.61	1,368.84	20
F53	3.63	62.1	1,537.60	1,325.83	20
F54	3.63	62.96	1,537.60	1,326.62	20
F55	3.63	62.53	1,537.60	1,383.99	20
F56	3.63	46.1	1,537.62	1,110.07	20
F57	3.63	46.1	1,537.62	1,109.44	20
F58	3.63	50	1,537.62	1,204.65	20
F59	3.63	47.4	1,537.62	1,145.50	20
F60	3.63	46.1	1,537.62	1,113.40	20
F62	3.63	62.96	1,537.60	1,357.80	20
F63	3.63	48.27	1,537.62	1,160.42	20
F64	3.63	48.27	1,537.62	1,160.80	20
F65	3.63	45.24	1,537.62	1,091.23	20
F66	3.63	46.98	1,537.64	1,144.90	20
F67	3.63	62.53	1,537.60	1,412.19	20
F68	3.63	59.51	1,537.61	1,335.54	20
F69	3.63	43.51	1,537.62	904.82	20
F70	3.63	60.8	1,537.60	1,178.32	20
J-1	3.63	45.24	1,537.62	885.35	20
J-10	3.63	46.33	1,537.63	1,126.58	20
J-104	0.63	57.93	1,560.97	1,484.92	20
J-14	21.63	46.57	1,537.70	1,167.94	20
J-17	3.63	43.09	1,537.64	1,060.26	20
J-18	3.63	42.66	1,537.64	1,049.83	20
J-21	3.63	46.11	1,537.63	1,122.02	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITHOUT NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
J-22	3.63	46.11	1,537.63	1,119.79	20
J-25	3.63	48.48	1,537.62	1,171.18	20
J-28	3.63	53.89	1,537.62	1,314.19	20
J-29	0.63	47.92	1,537.82	1,193.52	20
J-30	4.63	46.55	1,537.65	1,140.96	20
J-33	3.63	46.54	1,537.63	1,134.73	20
J-34	3.63	46.54	1,537.63	1,131.17	20
J-38	3.63	45.67	1,537.62	1,105.73	20
J-39	3.63	47.4	1,537.62	1,148.44	20
J-41	3.63	47.84	1,537.62	1,163.48	20
J-47	3.63	44.6	1,537.63	1,091.72	20
J-49	3.63	47.19	1,537.62	1,146.78	20
J-54	3.63	62.97	1,537.62	1,551.84	20
J-60	3.63	46.97	1,537.62	1,120.41	20
J-64	3.63	47.4	1,537.62	1,146.53	20
J-67	3.63	53.02	1,537.62	1,288.08	20
J-7	3.63	40.93	1,537.64	1,010.04	20
J-70	3.63	54.54	1,537.62	1,331.96	20
J-75	3.63	56.7	1,537.61	1,364.33	20
J-83	3.63	56.7	1,537.61	1,372.23	20
J-85	3.63	57.99	1,537.61	1,383.15	20
J-93	3.63	54.53	1,537.61	1,303.27	20
J-97	3.63	62.1	1,537.60	1,423.24	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITH NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITH NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F01	3.63	55.67	1,564.73	4,479.38	20
F02	3.63	54.8	1,564.73	4,411.78	20
F03	3.63	52.21	1,564.73	4,288.02	20
F04	3.63	57.83	1,564.74	4,711.39	20
F05	3.63	62.37	1,564.74	5,126.87	20
F06	3.63	67.78	1,564.74	5,448.23	20
F07	3.63	59.17	1,564.83	3,806.60	20
F08	3.63	66.91	1,564.74	5,397.70	20
F09	3.63	66.48	1,564.73	5,418.66	20
F10	3.63	62.37	1,564.73	4,746.43	20
F11	3.63	58.7	1,564.73	4,554.02	20
F12	3.63	56.53	1,564.73	4,508.34	20
F13	3.63	53.07	1,564.73	4,226.50	20
F14	4.63	57.83	1,564.73	4,731.58	20
F15	4.63	57.4	1,564.73	4,686.03	20
F16	3.63	55.67	1,564.73	4,431.91	20
F17	3.63	56.1	1,564.73	4,497.52	20
F18	3.63	65.18	1,564.73	5,200.94	20
F19	3.63	60.86	1,564.73	4,780.87	20
F20	3.63	56.75	1,564.73	4,698.15	20
F21	3.63	56.53	1,564.73	4,672.39	20
F22	3.63	57.18	1,564.73	4,497.39	20
F23	3.63	58.26	1,564.74	4,884.68	20
F24	3.63	58.27	1,564.74	4,782.01	20
F25	3.63	58.48	1,564.74	4,871.41	20
F26	3.63	59.56	1,564.74	5,117.14	20
F27	3.63	62.59	1,564.74	5,165.67	20
F28	3.63	65.62	1,564.74	5,457.55	20
F29	3.63	62.38	1,564.76	4,945.89	20
F30	3.63	61.73	1,564.76	4,950.43	20
F31	3.63	56.11	1,564.75	4,279.20	20
F32	3.63	56.54	1,564.76	4,477.01	20
F33	3.63	68.21	1,564.73	3,349.58	20
F34	3.63	62.59	1,564.73	5,086.96	20
F35	3.63	66.26	1,564.73	5,519.04	20
F36	3.63	66.48	1,564.74	5,617.95	20
F37	3.63	67.34	1,564.73	5,192.75	20
F38	3.63	69.07	1,564.73	4,995.33	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITH NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F39	3.63	69.94	1,564.73	3,977.55	20
F40	3.63	69.07	1,564.73	4,150.60	20
F41	3.63	71.23	1,564.73	4,814.44	20
F42	3.63	72.1	1,564.73	4,613.90	20
F43	3.63	75.99	1,564.72	4,347.99	20
F44	3.63	69.07	1,564.73	4,044.01	20
F45	3.63	69.07	1,564.73	3,727.61	20
F46	3.63	72.1	1,564.73	3,634.90	20
F47	3.63	69.29	1,564.73	2,093.77	20
F48	3.63	69.5	1,564.73	3,022.70	20
F49	3.63	69.29	1,564.73	4,586.68	20
F50	3.63	66.69	1,564.73	4,676.43	20
F51	3.63	69.94	1,564.73	4,741.54	20
F52	3.63	69.29	1,564.73	4,566.90	20
F53	3.63	73.83	1,564.72	2,997.16	20
F54	3.63	74.69	1,564.72	2,899.73	20
F55	3.63	74.26	1,564.72	3,445.18	20
F56	3.63	57.85	1,564.78	4,547.56	20
F57	3.63	57.86	1,564.80	4,652.74	20
F58	3.63	61.74	1,564.77	5,227.11	20
F59	3.63	59.15	1,564.78	5,152.46	20
F60	3.63	57.87	1,564.82	5,188.69	20
F62	3.63	74.69	1,564.72	3,147.67	20
F63	3.63	60.01	1,564.77	4,849.40	20
F64	3.63	60.01	1,564.77	4,822.55	20
F65	3.63	57.01	1,564.84	3,604.45	20
F66	3.63	58.7	1,564.74	4,873.31	20
F67	3.63	74.26	1,564.72	3,734.70	20
F68	3.63	71.23	1,564.73	3,484.93	20
F69	3.63	55.33	1,564.95	3,619.99	20
F70	3.63	72.53	1,564.72	2,186.07	20
J-1	3.63	57.1	1,565.05	5,055.97	20
J-10	3.63	58.05	1,564.74	4,729.80	20
J-104	0.63	58.38	1,562.00	1,858.67	20
J-14	21.63	58.26	1,564.73	5,004.45	20
J-17	3.63	54.8	1,564.73	4,555.72	20
J-18	3.63	54.37	1,564.73	4,521.03	20
J-21	3.63	57.83	1,564.73	4,647.91	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
EXISTING COUNTY SYSTEM (WITH NID INTERTIE)
AVAILABLE FIRE FLOW
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
J-22	3.63	57.83	1,564.73	4,556.32	20
J-25	3.63	60.21	1,564.73	4,746.43	20
J-28	3.63	65.61	1,564.73	5,418.76	20
J-29	0.63	59.56	1,564.73	4,923.08	20
J-30	4.63	58.26	1,564.73	4,904.83	20
J-33	3.63	58.27	1,564.74	4,855.55	20
J-34	3.63	58.27	1,564.74	4,717.95	20
J-38	3.63	57.41	1,564.76	4,651.27	20
J-39	3.63	59.14	1,564.75	4,962.50	20
J-41	3.63	59.56	1,564.74	5,087.25	20
J-47	3.63	56.32	1,564.74	4,755.38	20
J-49	3.63	58.91	1,564.73	4,823.92	20
J-54	3.63	74.7	1,564.73	6,012.54	20
J-60	3.63	58.77	1,564.91	3,930.43	20
J-64	3.63	59.14	1,564.76	4,930.37	20
J-67	3.63	64.76	1,564.75	5,512.28	20
J-7	3.63	52.64	1,564.73	4,351.40	20
J-70	3.63	66.27	1,564.74	5,630.99	20
J-75	3.63	68.42	1,564.73	4,930.51	20
J-83	3.63	68.42	1,564.73	5,203.51	20
J-85	3.63	69.72	1,564.73	4,699.29	20
J-93	3.63	66.26	1,564.73	4,657.29	20
J-97	3.63	73.83	1,564.72	3,969.37	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
PROPOSED COUNTY SYSTEM (WITH NID INTERTIE) - PCWA SUPPLY
AVAILABLE FIRE FLOW AT SYSTEM 20PSI
MAXIMUM DAY

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
PROPOSED SYSTEM-PCWA SUPPLY & NID INTERTIE
AVAILABLE FIRE FLOW AT SYSTEM 20PSI (COUNTY SYSTEM)
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F04	0.49	57.01	1,562.85	4,493.59	20
F05	0.49	61.56	1,562.85	4,898.54	20
F06	0.49	66.96	1,562.85	5,258.89	20
F07	12.49	58.38	1,562.99	3,467.55	20
F08	5.59	66.09	1,562.84	5,225.94	20
F09	0.49	65.66	1,562.84	5,239.18	20
F10	6.39	61.55	1,562.84	4,675.24	20
F11	0.49	57.88	1,562.84	4,414.52	20
F12	0.49	55.71	1,562.84	4,500.38	20
F15	0.49	56.58	1,562.84	4,560.84	20
F16	0.49	54.85	1,562.84	4,418.96	20
F18	0.49	64.36	1,562.84	5,030.54	20
F19	0.49	60.04	1,562.84	4,574.81	20
F20	6.19	55.93	1,562.84	4,462.66	20
F21	69.99	55.71	1,562.83	4,600.62	20
F22	0.49	56.36	1,562.83	4,543.59	20
F23	0.49	57.44	1,562.83	4,616.38	20
F24	78.49	57.44	1,562.83	4,592.82	20
F26	0.49	58.75	1,562.85	4,777.20	20
F27	5.69	61.77	1,562.85	4,997.25	20
F28	0.49	64.8	1,562.85	5,205.33	20
F29	0.49	61.56	1,562.85	4,655.29	20
F30	6.69	60.91	1,562.85	4,638.10	20
F31	0.49	55.29	1,562.85	4,181.26	20
F32	0.49	55.73	1,562.87	4,443.57	20
F33	5.59	67.39	1,562.84	4,810.75	20
F34	0.49	61.77	1,562.84	4,894.07	20
F35	0.49	65.45	1,562.84	5,252.64	20
F36	0.49	65.66	1,562.85	5,305.15	20
F37	0.49	66.53	1,562.84	4,933.96	20
F38	0.49	68.25	1,562.84	4,768.78	20
F39	0.49	69.12	1,562.84	3,823.32	20
F40	0.49	68.25	1,562.84	3,989.66	20
F41	11.59	70.42	1,562.83	4,614.13	20
F42	15.99	71.28	1,562.83	4,434.70	20
F43	0.49	75.17	1,562.83	4,185.43	20
F44	0.49	68.25	1,562.84	4,232.61	20
F45	0.49	68.25	1,562.84	4,137.28	20
F46	0.49	71.28	1,562.84	4,429.82	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
PROPOSED SYSTEM-PCWA SUPPLY & NID INTERTIE
AVAILABLE FIRE FLOW AT SYSTEM 20PSI (COUNTY SYSTEM)
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F47	0.49	68.47	1,562.84	2,096.55	20
F48	0.49	68.69	1,562.84	2,802.72	20
F49	7.99	68.47	1,562.84	4,438.65	20
F50	0.49	65.88	1,562.84	4,505.73	20
F51	0.49	69.12	1,562.84	4,576.18	20
F52	37.19	68.47	1,562.83	4,438.77	20
F53	0.49	73.01	1,562.83	2,794.07	20
F54	4.09	73.87	1,562.83	2,711.62	20
F55	0.49	73.44	1,562.83	3,235.51	20
F56	0.49	57.03	1,562.89	4,382.08	20
F57	0.49	57.05	1,562.92	4,425.26	20
F58	5.69	60.92	1,562.87	4,917.68	20
F59	0.49	58.34	1,562.90	4,843.35	20
F60	50.79	57.06	1,562.94	4,905.77	20
F62	0.49	73.87	1,562.83	2,938.44	20
F63	0.49	59.2	1,562.89	4,637.38	20
F64	0.49	59.19	1,562.89	4,561.74	20
F65	0.49	56.21	1,562.99	3,500.41	20
F66	5.79	57.87	1,562.83	4,616.87	20
F67	0.49	73.44	1,562.83	3,544.98	20
F68	0.49	70.42	1,562.84	4,481.55	20
F69	0.49	54.57	1,563.19	3,257.89	20
F70	4.09	71.71	1,562.83	1,968.70	20
J-1	0.49	56.37	1,563.35	4,687.76	20
J-10	0.49	57.23	1,562.85	4,511.76	20
J-104	0.49	48.39	1,538.90	1,575.84	20
J-14	0.49	57.44	1,562.84	4,663.11	20
J-17	0.49	53.98	1,562.84	4,359.44	20
J-22	0.49	57.01	1,562.84	4,385.52	20
J-25	0.49	59.39	1,562.84	4,626.56	20
J-28	0.49	64.8	1,562.84	5,173.66	20
J-29	0.49	58.74	1,562.84	4,606.83	20
J-30	0.49	57.44	1,562.83	4,652.61	20
J-33	8.09	57.44	1,562.83	4,591.88	20
J-34	0.49	57.44	1,562.83	4,497.03	20
J-38	0.49	56.6	1,562.88	4,446.53	20
J-41	0.49	58.75	1,562.85	4,789.29	20
J-47	0.49	55.5	1,562.84	4,546.91	20
J-49	11.69	58.09	1,562.84	4,501.35	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
PROPOSED SYSTEM-PCWA SUPPLY & NID INTERTIE
AVAILABLE FIRE FLOW AT SYSTEM 20PSI (COUNTY SYSTEM)
MAXIMUM DAY

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
J-54	0.49	73.88	1,562.84	5,761.11	20
J-60	0.49	57.99	1,563.10	3,885.56	20
J-64	0.49	58.33	1,562.88	4,493.72	20
J-67	13.49	63.94	1,562.86	5,186.55	20
J-70	0.49	65.45	1,562.85	5,302.66	20
J-75	0.49	67.61	1,562.84	4,766.25	20
J-83	0.49	67.61	1,562.84	4,951.34	20
J-85	9.79	68.9	1,562.84	4,522.27	20
J-93	0.49	65.44	1,562.84	4,561.64	20
J-97	7.69	73.01	1,562.83	3,800.58	20
J14	49.99	57.44	1,562.84	4,452.62	20
J76	0.49	55.07	1,563.35	4,136.61	20
J78	0.49	55.07	1,563.34	4,107.79	20
NID_F1364	0.49	58.96	1,563.35	4,444.75	20
NID_F2265	0.49	60.17	1,563.14	4,136.00	20
NID_F2268	0.49	58.47	1,563.22	4,095.34	20
NID_J10	0.49	55.07	1,563.34	4,115.89	20
NID_J30	0.49	79.71	1,563.32	5,027.21	20
NID_J31	0.49	72.79	1,563.33	4,855.91	20
NID_J55	0.49	58.96	1,563.36	4,466.83	20
NID_J70	0.49	74.52	1,563.34	4,755.00	20
NID_J71	0.49	80.14	1,563.32	5,027.21	20
NID_J72	0.49	55.93	1,563.34	2,532.51	20
NID_J75	0.49	72.36	1,563.34	4,691.99	20
NID_J80	0.49	70.63	1,563.34	4,565.29	20
NID_J95	0.49	53.34	1,563.35	3,773.89	20
P-100	0.49	56.59	1,562.87	4,545.23	20
P-101	0.49	55.71	1,562.84	4,528.20	20
P-102	0.49	54.85	1,562.84	4,327.41	20
P-105	0.49	54.42	1,562.84	4,408.92	20
P-106	0.49	56.14	1,562.83	4,578.69	20
P-107	0.49	57.44	1,562.84	4,653.65	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
PROPOSED NID SYSTEM (PRIVATE)
AVAILABLE FIRE FLOW AT SYSTEM 20PSI
MAXIMUM DAY

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
PROPOSED NID SYSTEM (PRIVATE)
AVAILABLE FIRE FLOW AT SYSTEM 20PSI (NID SYSTEM)
MAXIMUM DAY

ID	Static Demand	Static Pressure (psi)	Static Head (ft)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
J72	33.6	55.02	1,564.24	3,919.85	20
J76	31.3	55.46	1,564.25	4,315.84	20
J78	13.7	55.46	1,564.25	4,208.80	20
J80	35.1	55.46	1,564.25	4,039.07	20
J82	32.9	55.46	1,564.25	4,128.36	20
J84	36.6	55.46	1,564.25	4,305.50	20
J86	63.9	55.02	1,564.24	4,036.87	20
NID_102	57.2	58.06	1,564.25	4,507.00	20
NID_103	0	58.07	1,564.28	4,450.98	20
NID_F1364	0	59.37	1,564.28	4,588.44	20
NID_F2268	0	58.94	1,564.29	4,510.95	20
NID_J10	25.5	55.46	1,564.25	4,294.58	20
NID_J100	29.5	58.06	1,564.27	4,479.44	20
NID_J101	25.1	58.06	1,564.26	4,474.16	20
NID_J31	0	73.19	1,564.25	4,790.94	20
NID_J55	40.3	59.37	1,564.29	4,636.49	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 WATER SYSTEM
MAXIMUM DAY
JUNCTION/PIPE/RESERVOIR REPORTS WITHOUT NID CONNECTIONS
FIRE REPORT WITH NID CONNECTIONS

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
F01	3.6	1,436.00	1,536.60	43.5
F02	3.6	1,438.00	1,536.60	42.6
F03	3.6	1,444.00	1,536.60	40
F04	3.6	1,431.00	1,536.60	45.7
F05	3.6	1,420.50	1,536.60	50.2
F06	3.6	1,408.00	1,536.60	55.6
F07	3.6	1,428.00	1,536.40	46.9
F08	3.6	1,410.00	1,536.60	54.7
F09	3.6	1,411.00	1,536.60	54.3
F10	3.6	1,420.50	1,536.60	50.2
F11	3.6	1,429.00	1,536.60	46.5
F12	3.6	1,434.00	1,536.60	44.4
F13	3.6	1,442.00	1,536.60	40.9
F14	4.6	1,431.00	1,536.60	45.7
F15	4.6	1,432.00	1,536.60	45.2
F16	3.6	1,436.00	1,536.60	43.5
F17	3.6	1,435.00	1,536.60	43.9
F21	3.6	1,434.00	1,536.50	44.3
F24	3.6	1,430.00	1,536.50	46.1
F25	3.6	1,429.50	1,536.50	46.3
F26	3.6	1,427.00	1,536.50	47.4
F29	3.6	1,420.50	1,536.50	50.2
F30	3.6	1,422.00	1,536.50	49.5
F31	3.6	1,435.00	1,536.50	43.9
F32	3.6	1,434.00	1,536.50	44.3
F37	3.6	1,409.00	1,536.40	55.1
F38	3.6	1,405.00	1,536.40	56.8
F39	3.6	1,403.00	1,536.40	57.7
F40	3.6	1,405.00	1,536.40	56.8
F41	3.6	1,400.00	1,536.40	59
F42	3.6	1,398.00	1,536.40	59.9
F43	3.6	1,389.00	1,536.40	63.8
F44	3.6	1,405.00	1,536.40	56.8
F45	3.6	1,405.00	1,536.40	56.8
F46	3.6	1,398.00	1,536.40	59.9
F47	3.6	1,404.50	1,536.40	57.1
F48	3.6	1,404.00	1,536.40	57.3
F49	3.6	1,404.50	1,536.40	57.1
F50	3.6	1,410.50	1,536.40	54.5
F51	3.6	1,403.00	1,536.40	57.7

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
F52	3.6	1,404.50	1,536.40	57.1
F53	3.6	1,394.00	1,536.40	61.6
F54	3.6	1,392.00	1,536.40	62.5
F55	3.6	1,393.00	1,536.40	62
F56	3.6	1,431.00	1,536.50	45.6
F57	3.6	1,431.00	1,536.50	45.6
F58	3.6	1,422.00	1,536.40	49.5
F59	3.6	1,428.00	1,536.40	46.9
F60	3.6	1,431.00	1,536.40	45.6
F62	3.6	1,392.00	1,536.40	62.5
F63	3.6	1,426.00	1,536.50	47.8
F64	3.6	1,426.00	1,536.50	47.8
F65	3.6	1,433.00	1,570.00	59.2
F67	3.6	1,393.00	1,536.40	62
F69	3.6	1,437.00	1,536.40	43
F70	3.6	1,397.00	1,536.40	60.3
ISO4	0	1,430.00	1,536.60	46.1
J-1	3.6	1,433.00	1,536.40	44.7
J-10	3.6	1,430.50	1,536.60	45.9
J-104	0.6	1,427.00	1,536.80	47.5
J-14	21.6	1,430.00	1,536.60	46.1
J-17	3.6	1,438.00	1,536.60	42.6
J-18	3.6	1,439.00	1,536.60	42.2
J-21	3.6	1,431.00	1,536.60	45.7
J-22	3.6	1,431.00	1,536.60	45.7
J-25	3.6	1,425.50	1,536.60	48
J-28	3.6	1,413.00	1,536.60	53.4
J-29	0.6	1,427.00	1,536.70	47.5
J-33	3.6	1,430.00	1,536.50	46.1
J-34	3.6	1,430.00	1,536.50	46.1
J-38	3.6	1,432.00	1,536.50	45.2
J-39	3.6	1,428.00	1,536.50	46.9
J-41	3.6	1,427.00	1,536.50	47.4
J-47	3.6	1,434.50	1,536.50	44.1
J-49	3.6	1,428.50	1,536.60	46.7
J-60	3.6	1,429.00	1,570.00	61
J-64	3.6	1,428.00	1,536.50	46.9
J-67	3.6	1,415.00	1,536.40	52.5
J-7	3.6	1,443.00	1,536.60	40.5
J-75	3.6	1,406.50	1,536.40	56.2

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-83	3.6	1,406.50	1,536.40	56.2
J-85	3.6	1,403.50	1,536.40	57.5
J-93	3.6	1,411.50	1,536.40	54
J-97	3.6	1,394.00	1,536.40	61.6
NID_103	0	1,430.00	1,569.90	60.5
NID_F1364	0	1,427.00	1,569.90	61.8
NID_F2265	0	1,424.00	1,570.00	63.1
NID_F2268	0	1,428.00	1,569.90	61.4
NID_J100	30	1,430.00	1,569.90	60.5
NID_J30	0	1,379.00	1,569.90	82.6
NID_J31	0	1,395.00	1,569.90	75.6
NID_J55	0	1,427.00	1,569.90	61.8
NID_J70	0	1,391.00	1,569.90	77.4
NID_J71	0	1,378.00	1,569.90	83
NID_J72	0	1,434.00	1,569.90	58.8
NID_J75	0	1,396.00	1,569.90	75.2
NID_J80	0	1,400.00	1,569.90	73.5
NID_J95	0	1,440.00	1,569.90	56.2
PRO-F05	0	1,420.50	1,536.40	50.1
PRO-F06	0	1,408.00	1,536.40	55.5
PRO-F08	5.1	1,410.00	1,536.40	54.7
PRO-F09	0	1,411.00	1,536.40	54.2
PRO-F18	0	1,414.00	1,536.40	52.9
PRO-F19	0	1,424.00	1,536.50	48.6
PRO-F20	5.7	1,433.50	1,536.50	44.5
PRO-F21	69.5	1,434.00	1,536.50	44.3
PRO-F22	0	1,432.50	1,536.50	45
PRO-F26	0	1,427.00	1,536.50	47.3
PRO-F27	5.2	1,420.00	1,536.40	50.4
PRO-F28	0	1,413.00	1,536.40	53.4
PRO-F30	6.2	1,422.00	1,536.50	49.5
PRO-F33	0	1,407.00	1,536.40	56
PRO-F34	0	1,420.00	1,536.40	50.4
PRO-F35	0	1,411.50	1,536.40	54
PRO-F36	0	1,411.00	1,536.40	54.2
PRO-F66	5.3	1,429.00	1,536.60	46.5
PRO-F68	0	1,400.00	1,536.40	59
PRO-ISO3	0	1,420.50	1,536.40	50.1
PRO-J107	0	1,430.00	1,536.60	46.1
PRO-J14A	0	1,430.00	1,536.60	46.1

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
PRO-J28	0	1,413.00	1,536.40	53.4
PRO-J30	0	1,430.00	1,536.60	46.1
PRO-J33	7.6	1,430.00	1,536.60	46.1
PRO-J34	0	1,430.00	1,536.60	46.1
PRO-J41	0	1,427.00	1,536.50	47.3
PRO-J47	0	1,434.50	1,536.50	44.1
PRO-J49	11.2	1,428.50	1,536.50	46.7
PRO-J54	0	1,392.00	1,536.40	62.5
PRO-J70	0	1,411.50	1,536.40	54
PRO-J76	0	1,436.00	1,569.90	57.9
PRO-J78	0	1,436.00	1,569.90	57.9
PRO-J84	0	1,436.00	1,569.90	57.9
PRO-NID_102	0	1,433.00	1,569.90	59.2
PRO-P106	0	1,433.00	1,536.50	44.8
PRO_NID_J10	0	1,436.00	1,569.90	57.9
PRO_NID_J100	25	1,430.00	1,569.90	60.5

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
ISO4	ISO4	J-14	74.4	12.6	100	189.6	0.5	0	0.1
ISO5	PRO-ISO3	PRO-F05	79.1	8.5	100	-10.9	0.1	0	0
ISO55	PRO-ISO3	F05	57.6	8.5	100	0	0	0	0
NID_54	NID_J31	PRO-J78	897.1	16	100	6.3	0	0	0
NID_55	NID_F1364	PRO-J76	781	16	100	8.9	0	0	0
NID_P100	NID_103	NID_F2268	271.4	16	130	-39.7	0.1	0	0
NID_P101	NID_J100	NID_103	183.1	16	130	-39.7	0.1	0	0
NID_P102	NID_J100	PRO_NID_J100	402.5	16	130	9.7	0	0	0
NID_P103	PRO_NID_J100	PRO-NID_102	449.5	16	130	-15.3	0	0	0
NID_P19	NID_F2265	NID_F2268	1,315.90	12.6	100	45	0.1	0	0
NID_P200	PRO-J78	PRO_NID_J10	346.10	16	100	6.3	0	0	0
NID_P201	PRO-J76	PRO_NID_J10	377.4	16	100	8.9	0	0	0
NID_P23	NID_RES01	NID_V01	20	12.6	100	52.3	0.1	0	0
NID_P33	NID_F2268	NID_J30	1,726.40	12.6	100	5.3	0	0	0
NID_P34	NID_J30	NID_J31	1,396.70	16	100	5.1	0	0	0
NID_P51	NID_V01	V8002	28.10	12.6	100	52.3	0.1	0	0
NID_P57	NID_J55	NID_F1364	40.2	12.6	100	8.9	0	0	0
NID_P58	NID_V03	V8004	17.5	10	100	10	0	0	0
NID_P70	NID_J30	NID_J71	101.2	12.6	100	0.2	0	0	0
NID_P71	NID_J71	NID_J70	2,259.50	12.6	100	0.2	0	0	0
NID_P75	NID_J31	NID_J70	772.10	8	100	-1.3	0	0	0
NID_P76	NID_J70	NID_J75	250.9	12.6	100	-1	0	0	0
NID_P77	NID_J75	NID_J80	343.2	12.6	100	-0.8	0	0	0
NID_P85	NID_J70	NID_J72	1,323.10	6	100	-0.1	0	0	0
NID_P86	NID_J75	NID_J72	1,223.00	6	100	-0.1	0	0	0
NID_P94	NID_J72	NID_J95	344.50	6	100	-0.2	0	0	0
NID_P95	NID_J80	NID_J95	1,406.30	12.6	100	-0.8	0	0	0
NID_P96	NID_J95	NID_J55	522.10	12.6	100	-1.1	0	0	0
P-1	J-1	F69	387.9	8.5	100	-3.6	0	0	0
P-10	J-10	F05	234	12.6	90	29	0.1	0	0
P-100	J-85	F40	67.1	8.5	100	7.3	0	0	0
P-101	F40	F48	265.3	8.5	100	3.6	0	0	0
P-102	J-83	F41	329.2	12.6	100	36.3	0.1	0	0
P-103	F41	F42	183.1	12.6	100	32.7	0.1	0	0
P-104	F42	F43	416.3	12.6	100	29	0.1	0	0
P-106	J-85	F49	149.4	8.5	100	-1.9	0	0	0
P-107	F49	F39	91.1	8.5	100	3.6	0	0	0
P-108	F49	J-93	194.8	8.5	100	-9.1	0.1	0	0
P-109	J-93	J-75	126.1	8.5	100	-13.3	0.1	0	0
P-11	F05	F06	220.8	12.6	90	25.3	0.1	0	0
P-110	J-93	F44	207.6	8.5	100	0.6	0	0	0
P-111	F44	F45	166.8	8.5	100	-3.1	0	0	0
P-112	F45	F46	211.6	8.5	100	-6.7	0	0	0
P-113	F47	PRO-F68	177.9	6.4	100	-3.6	0	0	0
P-114	F43	J-97	316.7	12.6	100	25.4	0.1	0	0
P-115	J-97	F53	64.9	6.4	100	7.3	0.1	0	0
P-116	F53	F70	115.1	6.4	100	3.6	0	0	0
P-117	J-97	F67	50.9	8.5	100	14.5	0.1	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
P-118	F67	F55	72.9	8.5	100	10.9	0.1	0	0
P-119	F55	F62	99.1	8.5	100	7.3	0	0	0
P-12	F01	F14	266.6	12.6	90	-80.2	0.2	0	0
P-120	F62	F54	95	8.5	100	3.6	0	0	0
P-122	V_PCWA	J-104	20	12.6	100	423.8	1.1	0	0.7
P-13	F14	J-14	245.7	12.6	90	-84.8	0.2	0	0
P-14	J-14	F15	97.9	10.6	90	83.1	0.3	0	0.1
P-15	F15	F16	184	10.6	90	78.5	0.3	0	0.1
P-16	F16	J-17	217.1	10.6	90	74.8	0.3	0	0.1
P-17	J-17	J-18	55.2	10.6	90	-7.6	0	0	0
P-18	J-18	F13	196.3	10.6	90	-25.8	0.1	0	0
P-19	F13	J-7	260.1	10.6	90	-29.4	0.1	0	0
P-2	F69	F07	483	8.5	100	-7.3	0	0	0
P-20	J-18	F12	175.1	10.6	90	14.6	0.1	0	0
P-21	F12	J-21	160.5	10.6	90	11	0	0	0
P-22	J-21	J-22	55.3	10.6	90	3.7	0	0	0
P-23	J-22	F11	54	10.6	90	0.1	0	0	0
P-24	F11	F10	349.2	10.6	90	-3.6	0	0	0
P-25	F10	J-25	142.7	10.6	90	-7.2	0	0	0
P-27	F09	F08	135.8	12.6	90	-18.1	0	0	0
P-28	F08	F06	228.4	12.6	90	-21.7	0.1	0	0
P-29	J-28	J-25	94	10.6	90	10.8	0	0	0
P-3	F07	PRO-ISO3	363.7	8.5	100	-10.9	0.1	0	0
P-30	J-28	F09	112.5	12.6	90	-14.5	0	0	0
P-31	J-29	ISO4	159.3	12.6	100	422.6	1.1	0.1	0.6
P-36	J-34	J-33	58.3	10.6	90	-17	0.1	0	0
P-37	J-34	F31	333.2	10.6	90	13.4	0	0	0
P-4	F01	F02	168.1	12.6	90	76.6	0.2	0	0
P-40	F31	F32	320.5	10.6	90	9.8	0	0	0
P-41	F32	J-38	69.3	10.6	90	6.1	0	0	0
P-42	J-38	J-39	453	10.6	90	-4.8	0	0	0
P-43	J-39	F26	270.3	10.6	90	-32.7	0.1	0	0
P-44	F26	J-41	23	12.6	90	31.5	0.1	0	0
P-45	J-41	F25	146.2	12.6	90	27.9	0.1	0	0
P-46	F25	F24	229.9	12.6	90	24.3	0.1	0	0
P-47	F24	J-33	304.1	12.6	90	20.7	0.1	0	0
P-5	F02	F03	280.5	12.6	90	72.9	0.2	0	0
P-50	F21	F17	311	10.6	90	-75.2	0.3	0	0.1
P-51	F17	J-17	122.1	10.6	90	-78.8	0.3	0	0.1
P-52	F21	J-47	164.9	10.6	90	71.5	0.3	0	0.1
P-53	J-47	F26	366.8	12.6	90	67.9	0.2	0	0
P-57	J-21	J-49	465	10.6	90	3.6	0	0	0
P-6	F03	J-7	52	12.6	90	69.3	0.2	0	0
P-65	J-38	F56	209	10.6	90	7.3	0	0	0
P-66	F56	F57	276.4	10.6	100	3.6	0	0	0
P-67	F60	F57	261.9	10.6	100	0	0	0	0
P-69	F65	J-60	232.4	12.6	100	-3.6	0	0	0
P-7	J-7	F04	298.1	12.6	90	36.2	0.1	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
P-70	F60	F59	254.8	12.6	100	-3.6	0	0	0
P-71	F59	F63	193	10.6	90	0	0	0	0
P-72	F63	F64	111.7	10.6	90	-3.6	0	0	0
P-73	F64	J-64	174.5	10.6	90	-7.3	0	0	0
P-74	J-64	F30	138.4	10.6	100	13.5	0	0	0
P-75	F30	PRO-F30	102.3	10.6	100	9.8	0	0	0
P-76	J-67	F29	292.6	10.6	100	0	0	0	0
P-78	J-39	J-64	151.1	10.6	90	24.4	0.1	0	0
P-79	F59	F58	331.6	12.6	100	-7.3	0	0	0
P-8	F04	J-10	30.2	12.6	90	32.6	0.1	0	0
P-80	F58	J-67	214.8	12.6	100	-10.9	0	0	0
P-81	J-67	PRO-J70	249.2	12.6	100	-14.5	0	0	0
P-87	PRO-F35	F50	317	8.5	100	18.3	0.1	0	0
P-88	F50	J-75	110.8	8.5	100	14.7	0.1	0	0
P-89	J-75	F51	90.5	8.5	100	-2.3	0	0	0
P-90	F51	F52	87.9	8.5	100	-5.9	0	0	0
P-91	F52	PRO-J54	469.9	8.5	100	-9.5	0.1	0	0
P-96	PRO-F36	F37	329.2	12.6	100	56.2	0.1	0	0
P-97	F37	J-83	63.4	12.6	100	52.6	0.1	0	0
P-98	J-83	F38	49.2	8.5	100	12.6	0.1	0	0
P-99	F38	J-85	130.1	8.5	100	9	0.1	0	0
P11	V8004	NID_J55	15.4	10	100	10	0	0	0
P15	PCWACONNECTION	V_PCWA	20	12.6	100	423.8	1.1	0	0.7
P19	J-104	J-29	20	10	100	423.2	1.7	0	2
P25	PRO-F30	F29	111.5	10.6	100	3.6	0	0	0
P3	NID_F2265	J-60	77.9	12.6	100	7.3	0	0	0
P5	NID_RES03	NID_V03	20	10	100	10	0	0	0
P9	V8002	NID_F2265	24.6	12.6	100	52.3	0.1	0	0
PR0-P63	PRO-F06	PRO-F05	281.4	12	130	10.9	0	0	0
PRO-ISO4	ISO4	PRO-J14A	77.3	12.6	100	233	0.6	0	0.2
PRO-P105	PRO-J30	PRO-F66	339.1	12	130	12.9	0	0	0
PRO-P107	PRO-J33	PRO-F66	92.2	12	130	-7.6	0	0	0
PRO-P11	PRO-F36	PRO-F35	374.8	12	130	1.1	0	0	0
PRO-P13	PRO-F34	PRO-F35	325.4	12	130	-39.5	0.1	0	0
PRO-P135	PRO-J70	PRO-F28	165	12	130	-71.9	0.2	0	0
PRO-P137	PRO-F28	PRO-F27	288.4	12	130	-71.9	0.2	0	0
PRO-P141	PRO-F27	PRO-F26	320.9	12	130	-77.1	0.2	0	0
PRO-P143	PRO-F26	PRO-J41	43.1	12	130	-77.1	0.2	0	0
PRO-P145	PRO-J28	PRO-F09	82.3	12	130	16	0	0	0
PRO-P149	PRO-J28	PRO-J54	130.3	12	130	-29.9	0.1	0	0
PRO-P151	PRO-J54	PRO-F34	163.1	12	130	-39.5	0.1	0	0
PRO-P183	PRO-NID_102	PRO-J84	285.8	16	130	-15.3	0	0	0
PRO-P19	PRO-F35	PRO-F18	115.6	10	130	-56.7	0.2	0	0
PRO-P23	PRO-F18	PRO-F19	351.8	10	130	-56.7	0.2	0	0
PRO-P25	PRO-F19	PRO-J49	130.8	10	130	-56.7	0.2	0	0
PRO-P27	PRO-J49	PRO-F20	129.3	10	130	-67.9	0.3	0	0
PRO-P29	PRO-F20	PRO-J47	68.6	10	130	-73.6	0.3	0	0
PRO-P31	PRO-J47	PRO-F21	122.7	12	130	-150.6	0.4	0	0.1

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
PRO-P33	PRO-F21	PRO-P106	160.7	12	130	-220.1	0.6	0	0.2
PRO-P35	PRO-P106	PRO-F22	118	12	130	-220.1	0.6	0	0.2
PRO-P37	PRO-F22	PRO-J30	286.5	12	130	-220.1	0.6	0	0.2
PRO-P39	PRO-J14A	PRO-J30	323.2	12	130	233	0.7	0.1	0.2
PRO-P41	PRO-J107	PRO-J14A	43.3	12	130	0	0	0	0
PRO-P65B	PRO-F08	PRO-F06	197.3	12	130	10.9	0	0	0
PRO-P67	PRO-F09	PRO-F08	156.4	12	130	16	0	0	0
PRO-P75	PRO-J47	PRO-J41	424.5	12	130	77.1	0.2	0	0
PRO-P9	PRO-F36	PRO-J70	62.7	12	130	-57.3	0.2	0	0
PRO-P92	PRO-J28	PRO-F33	197.9	10	130	14	0.1	0	0
PRO-P93	PRO-F68	PRO-F33	531.3	10	130	-14	0.1	0	0
PRO-P94	PRO-F68	F46	192.8	10	130	10.3	0	0	0
PRO-P97	PRO-J34	PRO-J33	54.9	10	130	0	0	0	0
PRO_P181	PRO-J84	PRO_NID_J10	188.8	16	130	-15.3	0	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITHOUT NID SUPPLY
RESERVOIR REPORT

ID	Flow (gpm)	Head (ft)
NID_RES01	-52.3	1,571.80
NID_RES03	-10	1,570.20
PCWACONNECTION	-423.8	1,538.90

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F01	3.6	49.5	1,550.40	3,000.00	34.8	4,376.60	20
F02	3.6	48.6	1,550.40	3,000.00	33.8	4,305.40	20
F03	3.6	46	1,550.40	3,000.00	31.7	4,162.30	20
F04	3.6	51.7	1,550.40	3,000.00	37.1	4,599.40	20
F05	3.6	56.2	1,550.40	3,000.00	42	5,027.80	20
F06	3.6	61.6	1,550.40	3,000.00	46	5,143.70	20
F07	3.6	53	1,550.60	3,000.00	28.3	3,584.10	20
F08	3.6	60.7	1,550.40	3,000.00	44	4,888.40	20
F09	3.6	60.3	1,550.40	3,000.00	43	4,776.00	20
F10	3.6	56.2	1,550.40	3,000.00	37.4	4,310.10	20
F11	3.6	52.5	1,550.40	3,000.00	34	4,095.60	20
F12	3.6	50.4	1,550.40	3,000.00	33.7	4,191.10	20
F13	3.6	46.9	1,550.40	3,000.00	31.6	4,094.60	20
F14	4.6	51.7	1,550.40	3,000.00	37.5	4,628.90	20
F15	4.6	51.2	1,550.40	3,000.00	37.1	4,593.20	20
F16	3.6	49.5	1,550.40	3,000.00	34.5	4,347.10	20
F17	3.6	49.9	1,550.50	3,000.00	34.7	4,370.40	20
F21	3.6	50.4	1,550.50	3,000.00	34	4,257.40	20
F24	3.6	52.1	1,550.60	3,000.00	35.1	4,300.00	20
F25	3.6	52.4	1,550.60	3,000.00	36.3	4,450.90	20
F26	3.6	53.4	1,550.60	3,000.00	38.3	4,680.80	20
F29	3.6	56.3	1,550.60	3,000.00	41.5	4,964.20	20
F30	3.6	55.6	1,550.60	3,000.00	41	4,955.60	20
F31	3.6	50	1,550.60	3,000.00	31.7	3,988.70	20
F32	3.6	50.4	1,550.70	3,000.00	34.2	4,306.60	20
F37	3.6	60.8	1,549.50	3,000.00	45	5,012.50	20
F38	3.6	62.5	1,549.50	3,000.00	44.9	4,834.20	20
F39	3.6	63.3	1,549.50	3,000.00	36.5	3,889.40	20
F40	3.6	62.5	1,549.50	3,000.00	37.8	4,035.20	20
F41	3.6	64.6	1,549.50	3,000.00	44.9	4,675.50	20
F42	3.6	65.5	1,549.50	3,000.00	43.8	4,490.20	20
F43	3.6	69.4	1,549.50	3,000.00	43.2	4,247.60	20
F44	3.6	62.5	1,549.50	3,000.00	40.1	4,259.60	20
F45	3.6	62.5	1,549.50	3,000.00	39	4,151.80	20
F46	3.6	65.5	1,549.50	3,000.00	43.3	4,433.30	20
F47	3.6	62.7	1,549.50	3,000.00	-10.6	2,213.30	20
F48	3.6	62.9	1,549.50	3,000.00	19.4	2,978.60	20
F49	3.6	62.7	1,549.50	3,000.00	42.3	4,481.90	20
F50	3.6	60.1	1,549.50	3,000.00	41.1	4,496.60	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F51	3.6	63.3	1,549.50	3,000.00	43.6	4,591.00	20
F52	3.6	62.7	1,549.50	3,000.00	41.8	4,423.50	20
F53	3.6	67.2	1,549.50	3,000.00	18.7	2,956.50	20
F54	3.6	68.1	1,549.50	3,000.00	15.8	2,862.80	20
F55	3.6	67.7	1,549.50	3,000.00	29.2	3,378.50	20
F56	3.6	51.8	1,550.70	3,000.00	36	4,476.30	20
F57	3.6	51.8	1,550.80	3,000.00	36.9	4,631.00	20
F58	3.6	55.4	1,550.10	3,000.00	41.9	5,150.30	20
F59	3.6	53	1,550.60	3,000.00	39.9	5,076.10	20
F60	3.6	51.9	1,550.90	3,000.00	39.1	5,109.50	20
F62	3.6	68.1	1,549.50	3,000.00	22.6	3,102.80	20
F63	3.6	53.9	1,550.60	3,000.00	39.5	4,863.20	20
F64	3.6	53.9	1,550.60	3,000.00	39.3	4,827.20	20
F65	3.6	51.1	1,551.10	3,000.00	32.3	3,858.20	20
F67	3.6	67.7	1,549.50	3,000.00	34.5	3,652.90	20
F69	3.6	49.5	1,551.60	3,000.00	26.4	3,499.30	20
F70	3.6	65.9	1,549.50	3,000.00	-16.2	2,165.00	20
J-1	3.6	51.6	1,552.40	3,000.00	37.1	4,899.90	20
J-10	3.6	51.9	1,550.40	3,000.00	37.3	4,618.80	20
J-104	0.6	51.9	1,546.90	3,000.00	35.7	4,188.30	20
J-14	21.6	52.1	1,550.40	3,000.00	39.1	4,885.20	20
J-17	3.6	48.6	1,550.50	3,000.00	34.6	4,441.60	20
J-18	3.6	48.2	1,550.40	3,000.00	34	4,378.00	20
J-21	3.6	51.7	1,550.40	3,000.00	33.7	4,105.30	20
J-22	3.6	51.7	1,550.40	3,000.00	33.4	4,064.40	20
J-25	3.6	54	1,550.40	3,000.00	35.8	4,239.60	20
J-28	3.6	59.4	1,550.40	3,000.00	41.8	4,664.50	20
J-29	0.6	51.9	1,547.00	3,000.00	35.8	4,207.70	20
J-33	3.6	52.2	1,550.60	3,000.00	34.2	4,190.90	20
J-34	3.6	52.2	1,550.60	3,000.00	34	4,159.70	20
J-38	3.6	51.3	1,550.70	3,000.00	36	4,503.00	20
J-39	3.6	53	1,550.60	3,000.00	38.8	4,828.90	20
J-41	3.6	53.4	1,550.60	3,000.00	38.1	4,656.70	20
J-47	3.6	50.2	1,550.60	3,000.00	34.1	4,292.00	20
J-49	3.6	52.7	1,550.40	3,000.00	20.5	3,033.50	20
J-60	3.6	53	1,551.70	3,000.00	36.5	4,269.80	20
J-64	3.6	53	1,550.60	3,000.00	39.2	4,910.80	20
J-67	3.6	58.3	1,549.80	3,000.00	44.8	5,314.00	20
J-7	3.6	46.5	1,550.40	3,000.00	32.3	4,231.40	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
J-75	3.6	61.8	1,549.50	3,000.00	44.1	4,771.80	20
J-83	3.6	61.8	1,549.50	3,000.00	45.7	5,025.60	20
J-85	3.6	63.1	1,549.50	3,000.00	43.3	4,569.70	20
J-93	3.6	59.7	1,549.50	3,000.00	41.6	4,591.80	20
J-97	3.6	67.2	1,549.50	3,000.00	37.7	3,872.60	20
NID_103	0	52.9	1,552.20	3,000.00	37.3	4,450.40	20
NID_F1364	0	54.2	1,552.40	3,000.00	39.2	4,610.30	20
NID_F2265	0	55.3	1,551.80	3,000.00	39.5	4,492.40	20
NID_F2268	0	53.7	1,552.20	3,000.00	38.2	4,511.60	20
NID_J100	30	52.9	1,552.30	3,000.00	37.2	4,476.50	20
NID_J30	0	74.9	1,552.30	3,000.00	57.9	4,970.70	20
NID_J31	0	68	1,552.30	3,000.00	51.5	4,970.70	20
NID_J55	0	54.2	1,552.40	3,000.00	37.6	4,399.80	20
NID_J70	0	69.8	1,552.30	3,000.00	50.6	4,847.10	20
NID_J71	0	75.4	1,552.30	3,000.00	57.8	4,970.70	20
NID_J72	0	51.2	1,552.40	3,000.00	-4.3	2,186.50	20
NID_J75	0	67.6	1,552.40	3,000.00	48.2	4,779.40	20
NID_J80	0	65.9	1,552.40	3,000.00	46	4,658.90	20
NID_J95	0	48.6	1,552.40	3,000.00	30.7	3,945.00	20
PRO-F05	0	55.9	1,549.70	3,000.00	38	4,430.80	20
PRO-F06	0	61.2	1,549.60	3,000.00	44.4	4,903.10	20
PRO-F08	5.1	60.4	1,549.60	3,000.00	44.2	4,955.20	20
PRO-F09	0	59.9	1,549.60	3,000.00	44.3	5,012.60	20
PRO-F18	0	58.5	1,549.40	3,000.00	43.8	5,025.30	20
PRO-F19	0	54.1	1,549.10	3,000.00	38.9	4,581.30	20
PRO-F20	5.7	49.9	1,548.80	3,000.00	35.6	4,398.00	20
PRO-F21	69.5	49.6	1,548.60	3,000.00	35.4	4,454.00	20
PRO-F22	0	50	1,548.20	3,000.00	35.4	4,320.50	20
PRO-F26	0	52.8	1,549.10	3,000.00	38.5	4,620.30	20
PRO-F27	5.2	55.9	1,549.20	3,000.00	41.6	4,890.90	20
PRO-F28	0	59	1,549.40	3,000.00	45.1	5,229.10	20
PRO-F30	6.2	55.6	1,550.60	3,000.00	40.8	4,911.30	20
PRO-F33	0	61.6	1,549.50	3,000.00	44	4,792.80	20
PRO-F34	0	56	1,549.50	3,000.00	41.2	4,857.50	20
PRO-F35	0	59.7	1,549.50	3,000.00	45.7	5,266.30	20
PRO-F36	0	59.9	1,549.50	3,000.00	46.4	5,373.30	20
PRO-F66	5.3	51.4	1,547.80	3,000.00	33.4	3,963.60	20
PRO-F68	0	64.7	1,549.50	3,000.00	43.2	4,474.60	20
PRO-J107	0	50.8	1,547.40	3,000.00	34.8	4,145.60	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 1 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
PRO-J14A	0	50.8	1,547.40	3,000.00	35.1	4,194.80	20
PRO-J28	0	59	1,549.50	3,000.00	43.8	5,004.10	20
PRO-J30	0	51	1,547.80	3,000.00	35.8	4,297.90	20
PRO-J33	7.6	51	1,547.80	3,000.00	32.2	3,853.10	20
PRO-J34	0	51	1,547.80	3,000.00	31.1	3,734.40	20
PRO-J41	0	52.8	1,549.00	3,000.00	38.5	4,619.70	20
PRO-J47	0	49.4	1,548.80	3,000.00	35.6	4,420.80	20
PRO-J49	11.2	52.1	1,548.90	3,000.00	37.3	4,486.80	20
PRO-J54	0	68.1	1,549.50	3,000.00	53.1	5,625.40	20
PRO-J70	0	59.7	1,549.50	3,000.00	46.3	5,392.40	20
PRO-J76	0	50.3	1,552.30	3,000.00	34.9	4,318.10	20
PRO-J78	0	50.3	1,552.30	3,000.00	34.4	4,262.60	20
PRO-J84	0	50.3	1,552.30	3,000.00	34.8	4,309.40	20
PRO-NID_102	0	51.6	1,552.30	3,000.00	36	4,375.40	20
PRO-P106	0	49.9	1,548.40	3,000.00	35.5	4,351.80	20
PRO_NID_J10	0	50.3	1,552.30	3,000.00	34.9	4,321.00	20
PRO_NID_J100	25	52.9	1,552.30	3,000.00	37.2	4,469.60	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 WATER SYSTEM
MAXIMUM DAY
JUNCTION/PIPE/RESERVOIR REPORTS WITHOUT NID CONNECTIONS
FIRE REPORT WITH NID CONNECTIONS

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
F04	3.6	1,431.00	1,537.10	45.9
F05	3.6	1,420.50	1,537.10	50.4
F06	3.6	1,408.00	1,537.10	55.8
F07	3.6	1,428.00	1,537.00	47.2
F08	3.6	1,410.00	1,537.10	54.9
F09	3.6	1,411.00	1,537.10	54.5
F10	3.6	1,420.50	1,537.10	50.4
F11	3.6	1,429.00	1,537.10	46.7
F12	3.6	1,434.00	1,537.10	44.6
F13	3.6	1,442.00	1,537.10	41.1
F15	4.6	1,432.00	1,537.10	45.5
F16	3.6	1,436.00	1,537.10	43.7
F17	3.6	1,435.00	1,537.10	44.1
F21	3.6	1,434.00	1,537.10	44.6
F24	3.6	1,430.00	1,537.00	46.3
F25	3.6	1,429.50	1,537.00	46.5
F26	3.6	1,427.00	1,537.00	47.6
F29	3.6	1,420.50	1,537.00	50.4
F31	3.6	1,435.00	1,537.00	44.1
F32	3.6	1,434.00	1,537.00	44.6
F37	3.6	1,409.00	1,537.00	55.4
F38	3.6	1,405.00	1,537.00	57.1
F39	3.6	1,403.00	1,537.00	58
F40	3.6	1,405.00	1,537.00	57.1
F41	3.6	1,400.00	1,537.00	59.3
F42	3.6	1,398.00	1,537.00	60.1
F43	3.6	1,389.00	1,537.00	64
F44	3.6	1,405.00	1,537.00	57.1
F45	3.6	1,405.00	1,537.00	57.1
F46	3.6	1,398.00	1,537.00	60.1
F47	3.6	1,404.50	1,537.00	57.3
F48	3.6	1,404.00	1,537.00	57.5
F49	3.6	1,404.50	1,537.00	57.3
F50	3.6	1,410.50	1,537.00	54.7
F51	3.6	1,403.00	1,537.00	58
F52	3.6	1,404.50	1,537.00	57.3
F53	3.6	1,394.00	1,537.00	61.9
F54	3.6	1,392.00	1,537.00	62.7
F55	3.6	1,393.00	1,537.00	62.3
F56	3.6	1,431.00	1,537.00	45.9

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
F57	3.6	1,431.00	1,537.00	45.9
F58	3.6	1,422.00	1,537.00	49.7
F59	3.6	1,428.00	1,537.00	47.2
F60	3.6	1,431.00	1,537.00	45.9
F62	3.6	1,392.00	1,537.00	62.7
F63	3.6	1,426.00	1,537.00	48
F64	3.6	1,426.00	1,537.00	48
F65	3.6	1,433.00	1,566.20	57.6
F67	3.6	1,393.00	1,537.00	62.3
F69	3.6	1,437.00	1,537.00	43.3
F70	3.6	1,397.00	1,537.00	60.6
ISO4	0	1,430.00	1,537.20	46.3
J-1	3.6	1,433.00	1,537.00	45
J-10	3.6	1,430.50	1,537.10	46.1
J-104	0.6	1,427.00	1,537.30	47.7
J-14	21.6	1,430.00	1,537.10	46.3
J-17	3.6	1,438.00	1,537.10	42.8
J-18	3.6	1,439.00	1,537.10	42.4
J-21	3.6	1,431.00	1,537.10	45.9
J-22	3.6	1,431.00	1,537.10	45.9
J-25	3.6	1,425.50	1,537.10	48.2
J-28	3.6	1,413.00	1,537.10	53.6
J-29	0.6	1,427.00	1,537.20	47.7
J-33	3.6	1,430.00	1,537.00	46.3
J-34	3.6	1,430.00	1,537.00	46.3
J-38	3.6	1,432.00	1,537.00	45.4
J-39	3.6	1,428.00	1,537.00	47.2
J-41	3.6	1,427.00	1,537.00	47.6
J-47	3.6	1,434.50	1,537.00	44.3
J-60	3.6	1,429.00	1,566.20	59.3
J-64	3.6	1,428.00	1,537.00	47.2
J-67	3.6	1,415.00	1,537.00	52.8
J-7	3.6	1,443.00	1,537.10	40.7
J-75	3.6	1,406.50	1,537.00	56.4
J-83	3.6	1,406.50	1,537.00	56.4
J-85	3.6	1,403.50	1,537.00	57.7
J-93	3.6	1,411.50	1,537.00	54.3
J-97	3.6	1,394.00	1,537.00	61.9
NID_103	0	1,430.00	1,566.10	58.9
NID_F1364	0	1,427.00	1,566.10	60.2

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
NID_F2265	0	1,424.00	1,566.20	61.5
NID_F2268	0	1,428.00	1,566.10	59.7
NID_J100	30	1,430.00	1,566.10	58.9
NID_J30	0	1,379.00	1,566.10	80.9
NID_J31	0	1,395.00	1,566.10	74
NID_J55	0	1,427.00	1,566.10	60.2
NID_J70	0	1,391.00	1,566.10	75.7
NID_J71	0	1,378.00	1,566.10	81.3
NID_J72	0	1,434.00	1,566.10	57.1
NID_J75	0	1,396.00	1,566.10	73.6
NID_J80	0	1,400.00	1,566.10	71.8
NID_J95	0	1,440.00	1,566.10	54.5
PRO-F05	0	1,420.50	1,537.00	50.4
PRO-F06	0	1,408.00	1,537.00	55.8
PRO-F08	5.1	1,410.00	1,537.00	54.9
PRO-F09	0	1,411.00	1,537.00	54.5
PRO-F12	0	1,434.00	1,537.10	44.6
PRO-F12B	0	1,434.00	1,537.10	44.6
PRO-F15	0	1,432.00	1,537.10	45.5
PRO-F16	0	1,436.00	1,537.10	43.7
PRO-F18	0	1,414.00	1,537.00	53.2
PRO-F19	0	1,424.00	1,537.10	48.9
PRO-F20	5.7	1,433.50	1,537.10	44.8
PRO-F21	69.5	1,434.00	1,537.10	44.6
PRO-F22	0	1,432.50	1,537.10	45.2
PRO-F26	0	1,427.00	1,537.10	47.6
PRO-F27	5.2	1,420.00	1,537.10	50.6
PRO-F28	0	1,413.00	1,537.00	53.6
PRO-F30	6.2	1,422.00	1,537.00	49.8
PRO-F33	0	1,407.00	1,537.00	56.2
PRO-F34	0	1,420.00	1,537.00	50.6
PRO-F35	0	1,411.50	1,537.00	54.3
PRO-F36	0	1,411.00	1,537.00	54.5
PRO-F66	5.3	1,429.00	1,537.10	46.8
PRO-F68	0	1,400.00	1,537.00	59.3
PRO-ISO3	0	1,420.50	1,537.00	50.4
PRO-J105	0	1,437.00	1,537.10	43.3
PRO-J107	0	1,430.00	1,537.10	46.3
PRO-J12	81.2	1,436.00	1,566.10	56.2
PRO-J14A	0	1,430.00	1,537.10	46.3

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
PRO-J17	0	1,438.00	1,537.10	42.9
PRO-J28	0	1,413.00	1,537.00	53.6
PRO-J30	0	1,430.00	1,537.10	46.3
PRO-J33	7.6	1,430.00	1,537.10	46.3
PRO-J34	0	1,430.00	1,537.10	46.3
PRO-J41	0	1,427.00	1,537.10	47.6
PRO-J47	0	1,434.50	1,537.10	44.4
PRO-J49	11.2	1,428.50	1,537.10	46.9
PRO-J54	0	1,392.00	1,537.00	62.7
PRO-J70	0	1,411.50	1,537.00	54.3
PRO-J72	46.8	1,437.00	1,566.10	55.8
PRO-J76	31.3	1,436.00	1,566.10	56.3
PRO-J78	13.7	1,436.00	1,566.10	56.3
PRO-J84	17.9	1,436.00	1,566.10	56.3
PRO-NID_102	21.6	1,433.00	1,566.10	57.6
PRO-P106	0	1,433.00	1,537.10	45
PRO_NID_J10	25.5	1,436.00	1,566.10	56.3
PRO_NID_J100	25	1,430.00	1,566.10	58.9

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
ISO4	ISO4	J-14	74.4	12.6	100	140.3	0.4	0	0.1
ISO5	PRO-ISO3	PRO-F05	79.1	8.5	100	-10.9	0.1	0	0
ISO55	PRO-ISO3	F05	57.6	8.5	100	0	0	0	0
NID_54	NID_J31	PRO-J78	897.1	16	100	47.6	0.1	0	0
NID_55	NID_F1364	PRO-J76	781	16	100	114.6	0.2	0	0
NID_P100	NID_103	NID_F2268	271.4	16	130	-130.8	0.2	0	0
NID_P101	NID_J100	NID_103	183.1	16	130	-130.8	0.2	0	0
NID_P102	NID_J100	PRO_NID_J100	402.5	16	130	100.8	0.2	0	0
NID_P103	PRO_NID_J100	PRO-NID_102	449.5	16	130	75.8	0.1	0	0
NID_P19	NID_F2265	NID_F2268	1,315.90	12.6	100	147.8	0.4	0.1	0.1
NID_P200	PRO-J78	PRO_NID_J10	346.10	16	100	33.9	0.1	0	0
NID_P201	PRO-J76	PRO_NID_J10	377.4	16	100	83.3	0.1	0	0
NID_P23	NID_RES01	NID_V01	20	12.6	100	155.1	0.4	0	0.1
NID_P33	NID_F2268	NID_J30	1,726.40	12.6	100	17.1	0	0	0
NID_P34	NID_J30	NID_J31	1,396.70	16	100	34.8	0.1	0	0
NID_P51	NID_V01	V8002	28.10	12.6	100	155.1	0.4	0	0.1
NID_P57	NID_J55	NID_F1364	40.2	12.6	100	114.6	0.3	0	0.1
NID_P58	NID_V03	V8004	17.5	10	100	145.2	0.6	0	0.3
NID_P70	NID_J30	NID_J71	101.2	12.6	100	-17.7	0	0	0
NID_P71	NID_J71	NID_J70	2,259.50	12.6	100	-17.7	0	0	0
NID_P75	NID_J31	NID_J70	772.10	8	100	-12.8	0.1	0	0
NID_P76	NID_J70	NID_J75	250.9	12.6	100	-27.4	0.1	0	0
NID_P77	NID_J75	NID_J80	343.2	12.6	100	-24.6	0.1	0	0
NID_P85	NID_J70	NID_J72	1,323.10	6	100	-3.2	0	0	0
NID_P86	NID_J75	NID_J72	1,223.00	6	100	-2.8	0	0	0
NID_P94	NID_J72	NID_J95	344.50	6	100	-5.9	0.1	0	0
NID_P95	NID_J80	NID_J95	1,406.30	12.6	100	-24.6	0.1	0	0
NID_P96	NID_J95	NID_J55	522.10	12.6	100	-30.5	0.1	0	0
P-1	J-1	F69	387.9	8.5	100	-3.6	0	0	0
P-10	J-10	F05	234	12.6	90	12.1	0	0	0
P-100	J-85	F40	67.1	8.5	100	7.3	0	0	0
P-101	F40	F48	265.3	8.5	100	3.6	0	0	0
P-102	J-83	F41	329.2	12.6	100	36.3	0.1	0	0
P-103	F41	F42	183.1	12.6	100	32.7	0.1	0	0
P-104	F42	F43	416.3	12.6	100	29	0.1	0	0
P-106	J-85	F49	149.4	8.5	100	-2	0	0	0
P-107	F49	F39	91.1	8.5	100	3.6	0	0	0
P-108	F49	J-93	194.8	8.5	100	-9.2	0.1	0	0
P-109	J-93	J-75	126.1	8.5	100	-13.4	0.1	0	0
P-11	F05	F06	220.8	12.6	90	8.5	0	0	0
P-110	J-93	F44	207.6	8.5	100	0.5	0	0	0
P-111	F44	F45	166.8	8.5	100	-3.1	0	0	0
P-112	F45	F46	211.6	8.5	100	-6.7	0	0	0
P-113	F47	PRO-F68	177.9	6.4	100	-3.6	0	0	0
P-114	F43	J-97	316.7	12.6	100	25.4	0.1	0	0
P-115	J-97	F53	64.9	6.4	100	7.3	0.1	0	0
P-116	F53	F70	115.1	6.4	100	3.6	0	0	0
P-117	J-97	F67	50.9	8.5	100	14.5	0.1	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
P-118	F67	F55	72.9	8.5	100	10.9	0.1	0	0
P-119	F55	F62	99.1	8.5	100	7.3	0	0	0
P-120	F62	F54	95	8.5	100	3.6	0	0	0
P-122	V_PCWA	J-104	20	12.6	100	401.1	1	0	0.6
P-14	J-14	F15	97.9	10.6	90	118.6	0.4	0	0.2
P-15	F15	F16	184	10.6	90	114	0.4	0	0.2
P-16	F16	J-17	217.1	10.6	90	110.4	0.4	0	0.2
P-17	J-17	J-18	55.2	10.6	90	58.1	0.2	0	0
P-18	J-18	F13	196.3	10.6	90	26.6	0.1	0	0
P-19	F13	J-7	260.1	10.6	90	23	0.1	0	0
P-2	F69	F07	483	8.5	100	-7.3	0	0	0
P-20	J-18	F12	175.1	10.6	90	27.8	0.1	0	0
P-21	F12	J-21	160.5	10.6	90	24.2	0.1	0	0
P-22	J-21	J-22	55.3	10.6	90	20.6	0.1	0	0
P-23	J-22	F11	54	10.6	90	16.9	0.1	0	0
P-24	F11	F10	349.2	10.6	90	13.3	0	0	0
P-25	F10	J-25	142.7	10.6	90	9.7	0	0	0
P-27	F09	F08	135.8	12.6	90	-1.2	0	0	0
P-28	F08	F06	228.4	12.6	90	-4.8	0	0	0
P-29	J-28	J-25	94	10.6	90	-6	0	0	0
P-3	F07	PRO-ISO3	363.7	8.5	100	-10.9	0.1	0	0
P-30	J-28	F09	112.5	12.6	90	2.4	0	0	0
P-31	J-29	ISO4	159.3	12.6	100	399.8	1	0.1	0.6
P-36	J-34	J-33	58.3	10.6	90	-7	0	0	0
P-37	J-34	F31	333.2	10.6	90	3.4	0	0	0
P-40	F31	F32	320.5	10.6	90	-0.3	0	0	0
P-41	F32	J-38	69.3	10.6	90	-3.9	0	0	0
P-42	J-38	J-39	453	10.6	90	-6.3	0	0	0
P-43	J-39	F26	270.3	10.6	90	-12.6	0	0	0
P-44	F26	J-41	23	12.6	90	21.5	0.1	0	0
P-45	J-41	F25	146.2	12.6	90	17.9	0	0	0
P-46	F25	F24	229.9	12.6	90	14.2	0	0	0
P-47	F24	J-33	304.1	12.6	90	10.6	0	0	0
P-50	F21	F17	311	10.6	90	-45	0.2	0	0
P-51	F17	J-17	122.1	10.6	90	-48.7	0.2	0	0
P-52	F21	J-47	164.9	10.6	90	41.4	0.2	0	0
P-53	J-47	F26	366.8	12.6	90	37.8	0.1	0	0
P-65	J-38	F56	209	10.6	90	-1.2	0	0	0
P-66	F56	F57	276.4	10.6	100	-4.8	0	0	0
P-67	F60	F57	261.9	10.6	100	8.5	0	0	0
P-69	F65	J-60	232.4	12.6	100	-3.6	0	0	0
P-7	J-7	F04	298.1	12.6	90	19.4	0	0	0
P-70	F60	F59	254.8	12.6	100	-12.1	0	0	0
P-71	F59	F63	193	10.6	90	8.2	0	0	0
P-72	F63	F64	111.7	10.6	90	4.6	0	0	0
P-73	F64	J-64	174.5	10.6	90	1	0	0	0
P-76	J-67	F29	292.6	10.6	100	-23.7	0.1	0	0
P-78	J-39	J-64	151.1	10.6	90	2.7	0	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
P-79	F59	F58	331.6	12.6	100	-23.9	0.1	0	0
P-8	F04	J-10	30.2	12.6	90	15.7	0	0	0
P-80	F58	J-67	214.8	12.6	100	-27.6	0.1	0	0
P-81	J-67	PRO-J70	249.2	12.6	100	-7.5	0	0	0
P-87	PRO-F35	F50	317	8.5	100	18.4	0.1	0	0
P-88	F50	J-75	110.8	8.5	100	14.7	0.1	0	0
P-89	J-75	F51	90.5	8.5	100	-2.3	0	0	0
P-90	F51	F52	87.9	8.5	100	-5.9	0	0	0
P-91	F52	PRO-J54	469.9	8.5	100	-9.5	0.1	0	0
P-96	PRO-F36	F37	329.2	12.6	100	56.1	0.1	0	0
P-97	F37	J-83	63.4	12.6	100	52.5	0.1	0	0
P-98	J-83	F38	49.2	8.5	100	12.6	0.1	0	0
P-99	F38	J-85	130.1	8.5	100	8.9	0	0	0
P11	V8004	NID_J55	15.4	10	100	145.2	0.6	0	0.3
P15	PCWACONNECTION	V_PCWA	20	12.6	100	401.1	1	0	0.6
P19	J-104	J-29	20	10	100	400.4	1.6	0	1.8
P25	PRO-F30	F29	111.5	10.6	100	27.3	0.1	0	0
P3	NID_F2265	J-60	77.9	12.6	100	7.3	0	0	0
P5	NID_RES03	NID_V03	20	10	100	145.2	0.6	0	0.3
P9	V8002	NID_F2265	24.6	12.6	100	155.1	0.4	0	0.1
PR0-P63	PRO-F06	PRO-F05	281.4	12	130	10.9	0	0	0
PRO-ISO4	ISO4	PRO-J14A	77.3	12.6	100	259.5	0.7	0	0.3
PRO-P105	PRO-J30	PRO-F66	339.1	12	130	12.9	0	0	0
PRO-P107	PRO-J33	PRO-F66	92.2	12	130	-7.6	0	0	0
PRO-P109	PRO-F12	PRO-J17	174.6	12	130	-81	0.2	0	0
PRO-P11	PRO-F36	PRO-F35	374.8	12	130	-5.7	0	0	0
PRO-P111	PRO-J17	PRO-J105	110	12	130	-81	0.2	0	0
PRO-P113	PRO-J105	PRO-P106	354.8	10	130	51.9	0.2	0	0
PRO-P115	PRO-J105	PRO-F16	109.8	12	130	-132.9	0.4	0	0.1
PRO-P117	PRO-F16	PRO-F15	182.5	12	130	-132.9	0.4	0	0.1
PRO-P119	PRO-F15	PRO-J107	112.4	12	130	-132.9	0.4	0	0.1
PRO-P13	PRO-F34	PRO-F35	325.4	12	130	-39.5	0.1	0	0
PRO-P135	PRO-J70	PRO-F28	165	12	130	-58	0.2	0	0
PRO-P137	PRO-F28	PRO-F27	288.4	12	130	-58	0.2	0	0
PRO-P139	PRO-F27	PRO-F30	238.4	10	130	33.5	0.1	0	0
PRO-P141	PRO-F27	PRO-F26	320.9	12	130	-96.7	0.3	0	0
PRO-P143	PRO-F26	PRO-J41	43.1	12	130	-96.7	0.3	0	0
PRO-P145	PRO-J28	PRO-F09	82.3	12	130	16	0	0	0
PRO-P149	PRO-J28	PRO-J54	130.3	12	130	-30	0.1	0	0
PRO-P151	PRO-J54	PRO-F34	163.1	12	130	-39.5	0.1	0	0
PRO-P165	PRO-NID_102	PRO-J12	207.4	10	130	128	0.5	0	0.1
PRO-P183	PRO-NID_102	PRO-J84	285.8	16	130	-73.8	0.1	0	0
PRO-P19	PRO-F35	PRO-F18	115.6	10	130	-63.5	0.3	0	0
PRO-P23	PRO-F18	PRO-F19	351.8	10	130	-63.5	0.3	0	0
PRO-P25	PRO-F19	PRO-J49	130.8	10	130	-63.5	0.3	0	0
PRO-P27	PRO-J49	PRO-F20	129.3	10	130	-74.7	0.3	0	0.1
PRO-P29	PRO-F20	PRO-J47	68.6	10	130	-80.4	0.3	0	0.1
PRO-P31	PRO-J47	PRO-F21	122.7	12	130	-96.1	0.3	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
PRO-P33	PRO-F21	PRO-P106	160.7	12	130	-165.6	0.5	0	0.1
PRO-P333	PRO-J12	PRO-J72	212.6	10	130	46.8	0.2	0	0
PRO-P35	PRO-P106	PRO-F22	118	12	130	-113.8	0.3	0	0
PRO-P37	PRO-F22	PRO-J30	286.5	12	130	-113.8	0.3	0	0
PRO-P39	PRO-J14A	PRO-J30	323.2	12	130	126.7	0.4	0	0.1
PRO-P41	PRO-J107	PRO-J14A	43.3	12	130	-132.9	0.4	0	0.1
PRO-P65B	PRO-F08	PRO-F06	197.3	12	130	10.9	0	0	0
PRO-P67	PRO-F09	PRO-F08	156.4	12	130	16	0	0	0
PRO-P71	PRO-F12	PRO-F12B	118.5	12	130	0	0	0	0
PRO-P73	PRO-J47	PRO-F12	356.4	10	130	-81	0.3	0	0.1
PRO-P75	PRO-J47	PRO-J41	424.5	12	130	96.7	0.3	0	0
PRO-P9	PRO-F36	PRO-J70	62.7	12	130	-50.5	0.1	0	0
PRO-P92	PRO-J28	PRO-F33	197.9	10	130	14	0.1	0	0
PRO-P93	PRO-F68	PRO-F33	531.3	10	130	-14	0.1	0	0
PRO-P94	PRO-F68	F46	192.8	10	130	10.4	0	0	0
PRO-P97	PRO-J34	PRO-J33	54.9	10	130	0	0	0	0
PRO_P181	PRO-J84	PRO_NID_J10	188.8	16	130	-91.7	0.1	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITHOUT NID SUPPLY
RESERVOIR REPORT

ID	Flow (gpm)	Head (ft)
NID_RES01	-155.1	1,571.80
NID_RES03	-145.2	1,570.20
PCWACONNECTION	-401.1	1,538.90

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F04	3.6	50.6	1,548.10	3,000.00	34.7	4,261.00	20
F05	3.6	55.2	1,548.10	3,000.00	40.2	4,761.60	20
F06	3.6	60.6	1,548.10	3,000.00	44.3	4,906.20	20
F07	3.6	51.9	1,548.10	3,000.00	27.6	3,519.80	20
F08	3.6	59.7	1,548.10	3,000.00	42.4	4,685.00	20
F09	3.6	59.3	1,548.10	3,000.00	41.4	4,583.60	20
F10	3.6	55.2	1,548.10	3,000.00	35.8	4,144.00	20
F11	3.6	51.5	1,548.10	3,000.00	32.5	3,942.40	20
F12	3.6	49.3	1,548.10	3,000.00	32.3	4,032.30	20
F13	3.6	45.9	1,548.10	3,000.00	29.5	3,841.10	20
F15	4.6	50.2	1,548.10	3,000.00	36	4,489.10	20
F16	3.6	48.5	1,548.10	3,000.00	33.7	4,259.00	20
F17	3.6	48.9	1,548.10	3,000.00	33.7	4,237.70	20
F21	3.6	49.4	1,548.10	3,000.00	33	4,119.70	20
F24	3.6	51.1	1,548.20	3,000.00	33.7	4,122.90	20
F25	3.6	51.3	1,548.20	3,000.00	34.9	4,264.80	20
F26	3.6	52.4	1,548.20	3,000.00	36.9	4,481.80	20
F29	3.6	54.8	1,547.20	3,000.00	40.1	4,716.10	20
F31	3.6	49	1,548.20	3,000.00	30.3	3,829.80	20
F32	3.6	49.4	1,548.20	3,000.00	32.9	4,129.50	20
F37	3.6	59.8	1,547.20	3,000.00	44.4	4,962.80	20
F38	3.6	61.5	1,547.20	3,000.00	44.4	4,788.50	20
F39	3.6	62.4	1,547.20	3,000.00	35.9	3,855.80	20
F40	3.6	61.5	1,547.20	3,000.00	37.3	4,000.90	20
F41	3.6	63.7	1,547.20	3,000.00	44.4	4,631.30	20
F42	3.6	64.5	1,547.20	3,000.00	43.3	4,446.40	20
F43	3.6	68.4	1,547.20	3,000.00	42.7	4,207.20	20
F44	3.6	61.5	1,547.20	3,000.00	39.6	4,213.40	20
F45	3.6	61.5	1,547.20	3,000.00	38.6	4,113.60	20
F46	3.6	64.5	1,547.20	3,000.00	42.8	4,389.50	20
F47	3.6	61.7	1,547.20	3,000.00	-11.1	2,196.80	20
F48	3.6	61.9	1,547.20	3,000.00	18.9	2,962.00	20
F49	3.6	61.7	1,547.20	3,000.00	41.8	4,435.80	20
F50	3.6	59.1	1,547.20	3,000.00	40.6	4,449.30	20
F51	3.6	62.4	1,547.20	3,000.00	43.1	4,546.60	20
F52	3.6	61.7	1,547.20	3,000.00	41.3	4,378.00	20
F53	3.6	66.2	1,547.20	3,000.00	18.2	2,943.40	20
F54	3.6	67.1	1,547.20	3,000.00	15.3	2,850.00	20
F55	3.6	66.7	1,547.20	3,000.00	28.7	3,347.80	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F56	3.6	50.7	1,548.30	3,000.00	34.9	4,329.40	20
F57	3.6	50.8	1,548.40	3,000.00	36	4,502.00	20
F58	3.6	54.3	1,547.60	3,000.00	41.6	5,063.50	20
F59	3.6	51.9	1,548.10	3,000.00	39.4	4,970.70	20
F60	3.6	50.8	1,548.40	3,000.00	38.5	4,983.50	20
F62	3.6	67.1	1,547.20	3,000.00	22.1	3,075.00	20
F63	3.6	52.8	1,548.20	3,000.00	38.3	4,681.90	20
F64	3.6	52.8	1,548.20	3,000.00	37.7	4,574.20	20
F65	3.6	50	1,548.60	3,000.00	30.5	3,721.80	20
F67	3.6	66.7	1,547.20	3,000.00	33.9	3,622.00	20
F69	3.6	48.4	1,548.90	3,000.00	25.5	3,438.90	20
F70	3.6	65	1,547.20	3,000.00	-16.7	2,150.10	20
ISO4	0	50.2	1,546.20	3,000.00	36	4,404.50	20
J-1	3.6	50.4	1,549.60	3,000.00	36.2	4,748.10	20
J-10	3.6	50.8	1,548.10	3,000.00	35	4,290.30	20
J-104	0.6	51.4	1,545.90	3,000.00	36.7	4,409.50	20
J-14	21.6	51.1	1,548.10	3,000.00	37.7	4,723.30	20
J-17	3.6	47.6	1,548.10	3,000.00	33.5	4,295.50	20
J-18	3.6	47.2	1,548.10	3,000.00	32.7	4,205.50	20
J-21	3.6	50.6	1,548.10	3,000.00	32.2	3,952.70	20
J-22	3.6	50.6	1,548.10	3,000.00	31.9	3,912.00	20
J-25	3.6	53	1,548.10	3,000.00	34.2	4,069.00	20
J-28	3.6	58.4	1,548.10	3,000.00	40.2	4,479.80	20
J-29	0.6	51.4	1,546.00	3,000.00	36.9	4,433.80	20
J-33	3.6	51.1	1,548.20	3,000.00	32.8	4,021.10	20
J-34	3.6	51.1	1,548.20	3,000.00	32.5	3,992.20	20
J-38	3.6	50.3	1,548.20	3,000.00	34.7	4,318.70	20
J-39	3.6	52	1,548.20	3,000.00	37	4,536.10	20
J-41	3.6	52.4	1,548.20	3,000.00	36.8	4,459.70	20
J-47	3.6	49.2	1,548.20	3,000.00	32.9	4,134.50	20
J-60	3.6	51.9	1,549.10	3,000.00	34.7	4,095.60	20
J-64	3.6	52	1,548.20	3,000.00	36.6	4,466.60	20
J-67	3.6	57.2	1,547.40	3,000.00	44.5	5,247.80	20
J-7	3.6	45.4	1,548.10	3,000.00	28.8	3,771.60	20
J-75	3.6	60.8	1,547.20	3,000.00	43.6	4,726.70	20
J-83	3.6	60.8	1,547.20	3,000.00	45.2	4,975.20	20
J-85	3.6	62.1	1,547.20	3,000.00	42.8	4,524.00	20
J-93	3.6	58.7	1,547.20	3,000.00	41.1	4,543.00	20
J-97	3.6	66.2	1,547.20	3,000.00	37.1	3,841.50	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
NID_103	0	51.6	1,549.40	3,000.00	35.3	4,219.40	20
NID_F1364	0	53	1,549.60	3,000.00	37.3	4,378.60	20
NID_F2265	0	54.2	1,549.20	3,000.00	37.7	4,306.30	20
NID_F2268	0	52.5	1,549.40	3,000.00	36.3	4,281.30	20
NID_J100	30	51.6	1,549.40	3,000.00	35.3	4,245.10	20
NID_J30	0	73.7	1,549.50	3,000.00	55.9	4,732.70	20
NID_J31	0	66.8	1,549.50	3,000.00	49.5	4,732.70	20
NID_J55	0	53	1,549.60	3,000.00	36.1	4,215.40	20
NID_J70	0	68.5	1,549.50	3,000.00	48.7	4,631.60	20
NID_J71	0	74.1	1,549.50	3,000.00	55.9	4,732.70	20
NID_J72	0	50	1,549.60	3,000.00	-6.2	2,122.40	20
NID_J75	0	66.4	1,549.50	3,000.00	46.3	4,565.20	20
NID_J80	0	64.7	1,549.50	3,000.00	44.1	4,474.70	20
NID_J95	0	47.4	1,549.60	3,000.00	29	3,762.60	20
PRO-F05	0	54.9	1,547.40	3,000.00	37.6	4,366.20	20
PRO-F06	0	60.3	1,547.30	3,000.00	43.9	4,848.10	20
PRO-F08	5.1	59.4	1,547.30	3,000.00	43.8	4,897.40	20
PRO-F09	0	58.9	1,547.30	3,000.00	43.9	4,949.60	20
PRO-F12	0	48.7	1,546.50	3,000.00	33.9	4,218.20	20
PRO-F12B	0	48.7	1,546.50	3,000.00	32.9	4,080.40	20
PRO-F15	0	49.5	1,546.40	3,000.00	35.2	4,342.40	20
PRO-F16	0	47.8	1,546.40	3,000.00	33.4	4,207.30	20
PRO-F18	0	57.6	1,547.10	3,000.00	43.3	4,982.60	20
PRO-F19	0	53.1	1,546.90	3,000.00	38.3	4,546.80	20
PRO-F20	5.7	49	1,546.70	3,000.00	35	4,376.90	20
PRO-F21	69.5	48.7	1,546.60	3,000.00	34.8	4,433.30	20
PRO-F22	0	49.3	1,546.50	3,000.00	35	4,335.90	20
PRO-F26	0	51.9	1,546.90	3,000.00	38.2	4,650.10	20
PRO-F27	5.2	55	1,547.10	3,000.00	41.7	4,979.90	20
PRO-F28	0	58	1,547.20	3,000.00	44.8	5,198.60	20
PRO-F30	6.2	54.1	1,547.20	3,000.00	39.6	4,687.50	20
PRO-F33	0	60.6	1,547.20	3,000.00	43.6	4,745.00	20
PRO-F34	0	55	1,547.20	3,000.00	40.7	4,805.20	20
PRO-F35	0	58.7	1,547.20	3,000.00	45.2	5,199.80	20
PRO-F36	0	58.9	1,547.20	3,000.00	45.9	5,300.80	20
PRO-F66	5.3	50.8	1,546.40	3,000.00	33.4	4,026.50	20
PRO-F68	0	63.7	1,547.20	3,000.00	42.8	4,429.90	20
PRO-ISO3	0	54.9	1,547.50	3,000.00	35.6	4,149.80	20
PRO-J105	0	47.3	1,546.50	3,000.00	33.1	4,188.60	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 2 MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
PRO-J107	0	50.3	1,546.30	3,000.00	36.2	4,427.90	20
PRO-J12	81.2	49	1,549.40	3,000.00	28.1	3,741.80	20
PRO-J14A	0	50.3	1,546.30	3,000.00	36.2	4,439.60	20
PRO-J17	0	46.9	1,546.50	3,000.00	32.4	4,118.70	20
PRO-J28	0	58.1	1,547.30	3,000.00	43.3	4,943.90	20
PRO-J30	0	50.3	1,546.40	3,000.00	35.8	4,374.70	20
PRO-J33	7.6	50.3	1,546.40	3,000.00	32.2	3,906.40	20
PRO-J34	0	50.3	1,546.40	3,000.00	31	3,778.20	20
PRO-J41	0	51.9	1,546.90	3,000.00	38.2	4,645.50	20
PRO-J47	0	48.5	1,546.70	3,000.00	35	4,409.80	20
PRO-J49	11.2	51.2	1,546.80	3,000.00	36.6	4,457.30	20
PRO-J54	0	67.1	1,547.20	3,000.00	52.7	5,566.80	20
PRO-J70	0	58.7	1,547.20	3,000.00	45.8	5,317.20	20
PRO-J72	46.8	48.6	1,549.40	3,000.00	23.2	3,275.10	20
PRO-J76	31.3	49.1	1,549.50	3,000.00	32.9	4,115.80	20
PRO-J78	13.7	49.1	1,549.50	3,000.00	32.4	4,046.20	20
PRO-J84	17.9	49.1	1,549.40	3,000.00	32.8	4,091.10	20
PRO-NID_102	21.6	50.3	1,549.40	3,000.00	34	4,161.00	20
PRO-P106	0	49.1	1,546.50	3,000.00	35.1	4,370.20	20
PRO_NID_J10	25.5	49.1	1,549.50	3,000.00	32.9	4,110.10	20
PRO_NID_J100	25	51.6	1,549.40	3,000.00	35.2	4,236.60	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE WATER SYSTEM
MAXIMUM DAY
JUNCTION/PIPE/RESERVOIR REPORTS WITHOUT NID CONNECTIONS
FIRE REPORT WITH NID CONNECTIONS

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
F07	3.6	1,428.00	1,537.10	47.2
F29	3.6	1,420.50	1,537.10	50.4
F37	3.6	1,409.00	1,537.10	55.4
F38	3.6	1,405.00	1,537.10	57.1
F39	3.6	1,403.00	1,537.10	58
F40	3.6	1,405.00	1,537.10	57.1
F41	3.6	1,400.00	1,537.10	59.3
F42	3.6	1,398.00	1,537.10	60.1
F43	3.6	1,389.00	1,537.10	64
F44	3.6	1,405.00	1,537.10	57.1
F45	3.6	1,405.00	1,537.10	57.1
F46	3.6	1,398.00	1,537.10	60.2
F47	3.6	1,404.50	1,537.10	57.3
F48	3.6	1,404.00	1,537.10	57.6
F49	3.6	1,404.50	1,537.10	57.3
F50	3.6	1,410.50	1,537.10	54.7
F51	3.6	1,403.00	1,537.10	58
F52	3.6	1,404.50	1,537.10	57.3
F53	3.6	1,394.00	1,537.10	61.9
F54	3.6	1,392.00	1,537.10	62.7
F55	3.6	1,393.00	1,537.10	62.3
F56	3.6	1,431.00	1,537.10	45.9
F57	3.6	1,431.00	1,537.10	45.9
F58	3.6	1,422.00	1,537.10	49.8
F59	3.6	1,428.00	1,537.10	47.2
F60	3.6	1,431.00	1,537.10	45.9
F62	3.6	1,392.00	1,537.10	62.7
F65	3.6	1,433.00	1,565.20	57.2
F67	3.6	1,393.00	1,537.10	62.3
F69	3.6	1,437.00	1,537.10	43.3
F70	3.6	1,397.00	1,537.10	60.6
FHJ14	0	1,428.00	1,537.10	47.2
ISO4	0	1,430.00	1,537.20	46.4
J-1	3.6	1,433.00	1,537.10	45
J-104	0.6	1,427.00	1,537.40	47.7
J-29	0.6	1,427.00	1,537.30	47.7
J-60	3.6	1,429.00	1,565.20	58.9
J-67	3.6	1,415.00	1,537.10	52.8
J-75	3.6	1,406.50	1,537.10	56.5
J-83	3.6	1,406.50	1,537.10	56.5

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-85	3.6	1,403.50	1,537.10	57.8
J-93	3.6	1,411.50	1,537.10	54.3
J-97	3.6	1,394.00	1,537.10	61.9
NID_103	0	1,430.00	1,565.00	58.4
NID_F1364	0	1,427.00	1,565.00	59.7
NID_F2265	0	1,424.00	1,565.20	61.1
NID_F2268	0	1,428.00	1,565.00	59.2
NID_J100	30	1,430.00	1,565.00	58.4
NID_J30	0	1,379.00	1,565.00	80.4
NID_J31	0	1,395.00	1,565.00	73.5
NID_J55	0	1,427.00	1,565.00	59.7
NID_J70	0	1,391.00	1,565.00	75.2
NID_J71	0	1,378.00	1,565.00	80.9
NID_J72	0	1,434.00	1,565.00	56.7
NID_J75	0	1,396.00	1,565.00	73.1
NID_J80	0	1,400.00	1,565.00	71.4
NID_J95	0	1,440.00	1,565.00	54.1
PRO-F04	0	1,431.00	1,537.10	45.9
PRO-F05	0	1,420.50	1,537.10	50.4
PRO-F06	0	1,408.00	1,537.10	55.8
PRO-F08	5.1	1,410.00	1,537.10	55
PRO-F09	0	1,411.00	1,537.10	54.5
PRO-F10	5.9	1,420.50	1,537.10	50.4
PRO-F11	0	1,429.00	1,537.10	46.8
PRO-F12	0	1,434.00	1,537.10	44.6
PRO-F12B	0	1,434.00	1,537.10	44.6
PRO-F15	0	1,432.00	1,537.20	45.5
PRO-F16	0	1,436.00	1,537.10	43.7
PRO-F18	0	1,414.00	1,537.10	53.2
PRO-F19	0	1,424.00	1,537.10	48.9
PRO-F20	5.7	1,433.50	1,537.10	44.8
PRO-F21	69.5	1,434.00	1,537.10	44.6
PRO-F22	0	1,432.50	1,537.10	45.2
PRO-F24	78	1,430.00	1,537.10	46.3
PRO-F26	0	1,427.00	1,537.10	47.6
PRO-F27	5.2	1,420.00	1,537.10	50.6
PRO-F28	0	1,413.00	1,537.10	53.7
PRO-F30	6.2	1,422.00	1,537.10	49.8
PRO-F31	0	1,435.00	1,537.10	44.2
PRO-F32	0	1,434.00	1,537.10	44.6

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
PRO-F33	0	1,407.00	1,537.10	56.3
PRO-F34	0	1,420.00	1,537.10	50.6
PRO-F35	0	1,411.50	1,537.10	54.3
PRO-F36	0	1,411.00	1,537.10	54.5
PRO-F63	0	1,426.00	1,537.10	48
PRO-F64	9	1,426.00	1,537.10	48
PRO-F66	5.3	1,429.00	1,537.10	46.8
PRO-F68	0	1,400.00	1,537.10	59.3
PRO-ISO3	0	1,420.50	1,537.10	50.4
PRO-J105	0	1,437.00	1,537.10	43.3
PRO-J107	0	1,430.00	1,537.20	46.3
PRO-J12	81.2	1,436.00	1,565.00	55.8
PRO-J14	49.5	1,430.00	1,537.10	46.3
PRO-J14A	0	1,430.00	1,537.20	46.3
PRO-J17	0	1,438.00	1,537.10	42.9
PRO-J22	0	1,431.00	1,537.10	45.9
PRO-J25	0	1,425.50	1,537.10	48.3
PRO-J28	0	1,413.00	1,537.10	53.7
PRO-J30	0	1,430.00	1,537.10	46.3
PRO-J33	7.6	1,430.00	1,537.10	46.3
PRO-J34	0	1,430.00	1,537.10	46.3
PRO-J38	0	1,432.00	1,537.10	45.5
PRO-J41	0	1,427.00	1,537.10	47.6
PRO-J47	0	1,434.50	1,537.10	44.4
PRO-J49	11.2	1,428.50	1,537.10	47
PRO-J54	0	1,392.00	1,537.10	62.7
PRO-J64	0	1,428.00	1,537.10	47.2
PRO-J70	0	1,411.50	1,537.10	54.3
PRO-J72	46.8	1,437.00	1,565.00	55.3
PRO-J76	31.3	1,436.00	1,565.00	55.8
PRO-J78	13.7	1,436.00	1,565.00	55.8
PRO-J80	35.1	1,436.00	1,565.00	55.8
PRO-J82	32.9	1,436.00	1,565.00	55.8
PRO-J84	17.9	1,436.00	1,565.00	55.8
PRO-NID_102	21.6	1,433.00	1,565.00	57.1
PRO-P100	4	1,432.00	1,537.10	45.5
PRO-P102	0	1,436.00	1,537.10	43.7
PRO-P106	0	1,433.00	1,537.10	45
PRO-P59	0	1,430.50	1,537.10	46.1
PRO_NID_J10	25.5	1,436.00	1,565.00	55.8

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
PRO_NID_J100	25	1,430.00	1,565.00	58.4

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
ISO5	PRO-ISO3	PRO-F05	79.1	8.5	100	-10.9	0.1	0	0
NID_54	NID_J31	PRO-J78	897.1	16	100	60.8	0.1	0	0
NID_55	NID_F1364	PRO-J76	781	16	100	149.2	0.2	0	0
NID_P100	NID_103	NID_F2268	271.4	16	130	-151	0.2	0	0
NID_P101	NID_J100	NID_103	183.1	16	130	-151	0.2	0	0
NID_P102	NID_J100	PRO_NID_J100	402.5	16	130	121	0.2	0	0
NID_P103	PRO_NID_J100	PRO-NID_102	449.5	16	130	96	0.2	0	0
NID_P19	NID_F2265	NID_F2268	1,315.90	12.6	100	177	0.5	0.2	0.1
NID_P200	PRO-J78	PRO_NID_J10	346.1	16	100	33.9	0.1	0	0
NID_P201	PRO-J76	PRO_NID_J10	377.4	16	100	29.8	0	0	0
NID_P23	NID_RES01	NID_V01	20.00	12.6	100	184.2	0.5	0	0.1
NID_P33	NID_F2268	NID_J30	1,726.40	12.6	100	26	0.1	0	0
NID_P34	NID_J30	NID_J31	1,396.70	16	100	45.6	0.1	0	0
NID_P51	NID_V01	V8002	28.1	12.6	100	184.2	0.5	0	0.1
NID_P57	NID_J55	NID_F1364	40.20	12.6	100	149.2	0.4	0	0.1
NID_P58	NID_V03	V8004	17.50	10	100	184	0.8	0	0.4
NID_P70	NID_J30	NID_J71	101.2	12.6	100	-19.6	0.1	0	0
NID_P71	NID_J71	NID_J70	2,259.50	12.6	100	-19.6	0.1	0	0
NID_P75	NID_J31	NID_J70	772.1	8	100	-15.2	0.1	0	0
NID_P76	NID_J70	NID_J75	250.9	12.6	100	-31.2	0.1	0	0
NID_P77	NID_J75	NID_J80	343.20	12.6	100	-28.1	0.1	0	0
NID_P85	NID_J70	NID_J72	1,323.10	6	100	-3.6	0	0	0
NID_P86	NID_J75	NID_J72	1,223.00	6	100	-3.2	0	0	0
NID_P94	NID_J72	NID_J95	344.5	6	100	-6.8	0.1	0	0
NID_P95	NID_J80	NID_J95	1,406.30	12.6	100	-28.1	0.1	0	0
NID_P96	NID_J95	NID_J55	522.10	12.6	100	-34.8	0.1	0	0
P-1	J-1	F69	387.9	8.5	100	-3.6	0	0	0
P-100	J-85	F40	67.10	8.5	100	7.3	0	0	0
P-101	F40	F48	265.3	8.5	100	3.6	0	0	0
P-102	J-83	F41	329.2	12.6	100	36.3	0.1	0	0
P-103	F41	F42	183.1	12.6	100	32.7	0.1	0	0
P-104	F42	F43	416.3	12.6	100	29	0.1	0	0
P-106	J-85	F49	149.4	8.5	100	-7.7	0	0	0
P-107	F49	F39	91.1	8.5	100	3.6	0	0	0
P-108	F49	J-93	194.8	8.5	100	-15	0.1	0	0
P-109	J-93	J-75	126.1	8.5	100	-13.6	0.1	0	0
P-110	J-93	F44	207.6	8.5	100	-5	0	0	0
P-111	F44	F45	166.8	8.5	100	-8.6	0	0	0
P-112	F45	F46	211.6	8.5	100	-12.3	0.1	0	0
P-113	F47	PRO-F68	177.9	6.4	100	-3.6	0	0	0
P-114	F43	J-97	316.7	12.6	100	25.4	0.1	0	0
P-115	J-97	F53	64.9	6.4	100	7.3	0.1	0	0
P-116	F53	F70	115.1	6.4	100	3.6	0	0	0
P-117	J-97	F67	50.9	8.5	100	14.5	0.1	0	0
P-118	F67	F55	72.9	8.5	100	10.9	0.1	0	0
P-119	F55	F62	99.1	8.5	100	7.3	0	0	0
P-120	F62	F54	95	8.5	100	3.6	0	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
P-122	V_PCWA	J-104	20	12.6	100	397.8	1	0	0.6
P-2	F69	F07	483	8.5	100	-7.3	0	0	0
P-3	F07	PRO-ISO3	363.7	8.5	100	-10.9	0.1	0	0
P-31	J-29	ISO4	159.3	12.6	100	396.5	1	0.1	0.6
P-66	F56	F57	276.4	10.6	100	11.7	0	0	0
P-67	F60	F57	261.9	10.6	100	-8.1	0	0	0
P-69	F65	J-60	232.4	12.6	100	-3.6	0	0	0
P-70	F60	F59	254.8	12.6	100	4.4	0	0	0
P-76	J-67	F29	292.6	10.6	100	-3.3	0	0	0
P-79	F59	F58	331.6	12.6	100	8.2	0	0	0
P-80	F58	J-67	214.8	12.6	100	4.5	0	0	0
P-81	J-67	PRO-J70	249.2	12.6	100	4.3	0	0	0
P-87	PRO-F35	F50	317	8.5	100	14.5	0.1	0	0
P-88	F50	J-75	110.8	8.5	100	10.8	0.1	0	0
P-89	J-75	F51	90.5	8.5	100	-6.4	0	0	0
P-90	F51	F52	87.9	8.5	100	-10.1	0.1	0	0
P-91	F52	PRO-J54	469.9	8.5	100	-13.7	0.1	0	0
P-96	PRO-F36	F37	329.2	12.6	100	50.3	0.1	0	0
P-97	F37	J-83	63.4	12.6	100	46.7	0.1	0	0
P-98	J-83	F38	49.2	8.5	100	6.8	0	0	0
P-99	F38	J-85	130.1	8.5	100	3.1	0	0	0
P11	V8004	NID_J55	15.4	10	100	184	0.8	0	0.4
P15	PCWACONNECTION	V_PCWA	20	12.6	100	397.8	1	0	0.6
P19	J-104	J-29	20	10	100	397.1	1.6	0	1.8
P25	PRO-F30	F29	111.5	10.6	100	7	0	0	0
P3	NID_F2265	J-60	77.9	12.6	100	7.3	0	0	0
P5	NID_RES03	NID_V03	20	10	100	184	0.8	0	0.4
P9	V8002	NID_F2265	24.6	12.6	100	184.2	0.5	0	0.1
PR0-P63	PRO-F06	PRO-F05	281.4	12	130	-32.1	0.1	0	0
PRO-FH37	PRO-ISO3	FHJ14	275.8	10	130	0	0	0	0
PRO-ISO4	ISO4	PRO-J14A	77.3	12.6	100	396.5	1	0	0.6
PRO-P101	PRO-P106	PRO-F24	435.4	12	130	50.9	0.1	0	0
PRO-P105	PRO-J30	PRO-F66	339.1	12	130	110.8	0.3	0	0
PRO-P107	PRO-J33	PRO-F66	92.2	12	130	-105.5	0.3	0	0
PRO-P109	PRO-F12	PRO-J17	174.6	12	130	-120.4	0.3	0	0.1
PRO-P11	PRO-F36	PRO-F35	374.8	12	130	-28.3	0.1	0	0
PRO-P111	PRO-J17	PRO-J105	110	12	130	-120.4	0.3	0	0.1
PRO-P113	PRO-J105	PRO-P106	354.8	10	130	62.8	0.3	0	0
PRO-P115	PRO-J105	PRO-F16	109.8	12	130	-183.2	0.5	0	0.1
PRO-P117	PRO-F16	PRO-F15	182.5	12	130	-183.2	0.5	0	0.1
PRO-P119	PRO-F15	PRO-J107	112.4	12	130	-183.2	0.5	0	0.1
PRO-P123	PRO-F12B	PRO-J22	166.1	10	130	32.6	0.1	0	0
PRO-P125	PRO-J22	PRO-F11	53.9	10	130	32.6	0.1	0	0
PRO-P127	PRO-F10	PRO-F11	321.4	10	130	-32.6	0.1	0	0
PRO-P129	PRO-J25	PRO-F10	148.7	10	130	-26.7	0.1	0	0
PRO-P13	PRO-F34	PRO-F35	325.4	12	130	20.4	0.1	0	0
PRO-P135	PRO-J70	PRO-F28	165	12	130	-17.8	0.1	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
PRO-P137	PRO-F28	PRO-F27	288.4	12	130	-17.8	0.1	0	0
PRO-P139	PRO-F27	PRO-F30	238.4	10	130	13.2	0.1	0	0
PRO-P141	PRO-F27	PRO-F26	320.9	12	130	-36.2	0.1	0	0
PRO-P143	PRO-F26	PRO-J41	43.1	12	130	-36.2	0.1	0	0
PRO-P145	PRO-J28	PRO-F09	82.3	12	130	-53.6	0.2	0	0
PRO-P149	PRO-J28	PRO-J54	130.3	12	130	34.1	0.1	0	0
PRO-P151	PRO-J54	PRO-F34	163.1	12	130	20.4	0.1	0	0
PRO-P153	PRO-F09	PRO-J25	103.1	10	130	-26.7	0.1	0	0
PRO-P159	PRO-F31	PRO-J14	301.8	10	130	-21.3	0.1	0	0
PRO-P165	PRO-NID_102	PRO-J12	207.4	10	130	94.7	0.4	0	0.1
PRO-P167	PRO-J72	PRO-J80	655.6	10	130	-33.3	0.1	0	0
PRO-P169	PRO-J80	PRO-J76	238.9	10	130	-68.4	0.3	0	0
PRO-P171	PRO-J76	PRO-J82	187.5	10	130	19.7	0.1	0	0
PRO-P173	PRO-J82	PRO-J78	434.5	10	130	-13.2	0.1	0	0
PRO-P183	PRO-NID_102	PRO-J84	285.8	16	130	-20.3	0	0	0
PRO-P19	PRO-F35	PRO-F18	115.6	10	130	-22.3	0.1	0	0
PRO-P23	PRO-F18	PRO-F19	351.8	10	130	-22.3	0.1	0	0
PRO-P25	PRO-F19	PRO-J49	130.8	10	130	-22.3	0.1	0	0
PRO-P27	PRO-J49	PRO-F20	129.3	10	130	-33.5	0.1	0	0
PRO-P29	PRO-F20	PRO-J47	68.6	10	130	-39.2	0.2	0	0
PRO-P31	PRO-J47	PRO-F21	122.7	12	130	-44.9	0.1	0	0
PRO-P33	PRO-F21	PRO-P106	160.7	12	130	-114.4	0.3	0	0
PRO-P333	PRO-J12	PRO-J72	212.6	10	130	13.5	0.1	0	0
PRO-P35	PRO-P106	PRO-F22	118	12	130	-102.5	0.3	0	0
PRO-P37	PRO-F22	PRO-J30	286.5	12	130	-102.5	0.3	0	0
PRO-P39	PRO-J14A	PRO-J30	323.2	12	130	213.3	0.6	0	0.1
PRO-P41	PRO-J107	PRO-J14A	43.3	12	130	-183.2	0.5	0	0.1
PRO-P57	PRO-P102	PRO-F04	132.5	12	130	43	0.1	0	0
PRO-P59	PRO-P59	PRO-F04	40.1	12	130	-43	0.1	0	0
PRO-P61	PRO-F05	PRO-P59	197.5	12	130	-43	0.1	0	0
PRO-P65	PRO-J38	F56	182	10	130	15.3	0.1	0	0
PRO-P65B	PRO-F08	PRO-F06	197.3	12	130	-32.1	0.1	0	0
PRO-P67	PRO-F09	PRO-F08	156.4	12	130	-27	0.1	0	0
PRO-P69	PRO-P102	PRO-F12B	326.8	12	130	-43	0.1	0	0
PRO-P71	PRO-F12	PRO-F12B	118.5	12	130	75.5	0.2	0	0
PRO-P73	PRO-J47	PRO-F12	356.4	10	130	-44.9	0.2	0	0
PRO-P75	PRO-J47	PRO-J41	424.5	12	130	50.5	0.1	0	0
PRO-P77	PRO-J41	PRO-P100	399.7	10	130	14.4	0.1	0	0
PRO-P79	PRO-P100	PRO-F32	226.1	10	130	-6	0	0	0
PRO-P81	PRO-F63	F59	194.9	10	130	7.4	0	0	0
PRO-P83	PRO-F64	PRO-F63	165	10	130	7.4	0	0	0
PRO-P85	PRO-J64	PRO-F64	98.3	10	130	16.4	0.1	0	0
PRO-P87	PRO-P100	PRO-J64	303.9	10	130	16.4	0.1	0	0
PRO-P9	PRO-F36	PRO-J70	62.7	12	130	-22	0.1	0	0
PRO-P91	PRO-F32	PRO-J38	83.7	10	130	15.3	0.1	0	0
PRO-P92	PRO-J28	PRO-F33	197.9	10	130	19.5	0.1	0	0
PRO-P93	PRO-F68	PRO-F33	531.3	10	130	-19.5	0.1	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
PRO-P93B	PRO-F32	PRO-F31	335.9	10	130	-21.3	0.1	0	0
PRO-P94	PRO-F68	F46	192.8	10	130	15.9	0.1	0	0
PRO-P95	PRO-J14	PRO-J34	101.7	10	130	-70.8	0.3	0	0
PRO-P97	PRO-J34	PRO-J33	54.9	10	130	-70.8	0.3	0	0
PRO-P99	PRO-F24	PRO-J33	406.1	12	130	-27.1	0.1	0	0
PRO_P181	PRO-J84	PRO_NID_J10	188.8	16	130	-38.2	0.1	0	0

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITHOUT NID SUPPLY
RESERVOIR REPORT

ID	Flow (gpm)	Head (ft)
NID_RES01	-184.2	1,571.80
NID_RES03	-184	1,570.20
PCWACONNECTION	-397.8	1,538.90

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
F07	3.6	51.6	1,547.30	3,000.00	29.1	3,647.70	20
F29	3.6	54.6	1,546.70	3,000.00	40.5	4,824.30	20
F37	3.6	59.5	1,546.70	3,000.00	45	5,068.90	20
F38	3.6	61.3	1,546.70	3,000.00	45	4,904.70	20
F39	3.6	62.1	1,546.70	3,000.00	36.7	3,931.90	20
F40	3.6	61.3	1,546.70	3,000.00	38	4,074.20	20
F41	3.6	63.4	1,546.70	3,000.00	45	4,735.70	20
F42	3.6	64.3	1,546.70	3,000.00	43.9	4,534.20	20
F43	3.6	68.2	1,546.70	3,000.00	43.3	4,272.50	20
F44	3.6	61.3	1,546.70	3,000.00	40.6	4,329.20	20
F45	3.6	61.3	1,546.70	3,000.00	39.7	4,231.60	20
F46	3.6	64.3	1,546.70	3,000.00	44.1	4,550.40	20
F47	3.6	61.5	1,546.70	3,000.00	-9.7	2,215.90	20
F48	3.6	61.7	1,546.70	3,000.00	19.6	2,986.20	20
F49	3.6	61.5	1,546.70	3,000.00	42.5	4,542.20	20
F50	3.6	58.9	1,546.70	3,000.00	41.5	4,583.60	20
F51	3.6	62.1	1,546.70	3,000.00	44	4,691.10	20
F52	3.6	61.5	1,546.70	3,000.00	42.3	4,512.60	20
F53	3.6	66	1,546.70	3,000.00	18.8	2,959.60	20
F54	3.6	66.9	1,546.70	3,000.00	15.9	2,863.50	20
F55	3.6	66.5	1,546.70	3,000.00	29.3	3,382.80	20
F56	3.6	50.1	1,547.00	3,000.00	36.2	4,517.60	20
F57	3.6	50.2	1,547.10	3,000.00	36.4	4,565.40	20
F58	3.6	54	1,546.90	3,000.00	41.5	5,060.90	20
F59	3.6	51.5	1,547.00	3,000.00	39.6	5,004.20	20
F60	3.6	50.3	1,547.30	3,000.00	38.8	5,026.40	20
F62	3.6	66.9	1,546.70	3,000.00	22.7	3,098.80	20
F65	3.6	49.5	1,547.50	3,000.00	30	3,692.40	20
F67	3.6	66.5	1,546.70	3,000.00	34.5	3,670.50	20
F69	3.6	48	1,547.90	3,000.00	25.9	3,480.90	20
F70	3.6	64.7	1,546.70	3,000.00	-16.1	2,154.60	20
FHJ14	0	51.4	1,546.80	3,000.00	30.2	3,705.50	20
ISO4	0	50.3	1,546.30	3,000.00	38.1	4,799.80	20
J-1	3.6	49.9	1,548.50	3,000.00	36	4,719.40	20
J-104	0.6	51.4	1,546.00	3,000.00	38.7	4,762.50	20
J-29	0.6	51.5	1,546.00	3,000.00	38.9	4,801.40	20
J-60	3.6	51.5	1,548.00	3,000.00	34.2	4,051.80	20
J-67	3.6	57	1,546.80	3,000.00	44.7	5,296.70	20
J-75	3.6	60.6	1,546.70	3,000.00	44.5	4,880.10	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
J-83	3.6	60.6	1,546.70	3,000.00	45.8	5,081.20	20
J-85	3.6	61.9	1,546.70	3,000.00	43.5	4,632.90	20
J-93	3.6	58.5	1,546.70	3,000.00	41.9	4,686.50	20
J-97	3.6	66	1,546.70	3,000.00	37.8	3,903.40	20
NID_103	0	51.2	1,548.30	3,000.00	34.9	4,166.90	20
NID_F1364	0	52.5	1,548.50	3,000.00	36.8	4,315.80	20
NID_F2265	0	53.7	1,548.20	3,000.00	37.2	4,261.90	20
NID_F2268	0	52	1,548.30	3,000.00	35.8	4,228.40	20
NID_J100	30	51.2	1,548.30	3,000.00	34.9	4,192.90	20
NID_J30	0	73.2	1,548.30	3,000.00	55.5	4,664.70	20
NID_J31	0	66.3	1,548.30	3,000.00	49.1	4,664.70	20
NID_J55	0	52.6	1,548.50	3,000.00	35.7	4,162.50	20
NID_J70	0	68.1	1,548.40	3,000.00	48.2	4,570.30	20
NID_J71	0	73.7	1,548.40	3,000.00	55.4	4,664.70	20
NID_J72	0	49.5	1,548.50	3,000.00	-6.7	2,102.70	20
NID_J75	0	65.9	1,548.40	3,000.00	45.7	4,504.20	20
NID_J80	0	64.2	1,548.40	3,000.00	43.6	4,423.40	20
NID_J95	0	46.9	1,548.50	3,000.00	28.5	3,707.10	20
PRO-F04	0	50	1,546.70	3,000.00	37	4,649.30	20
PRO-F05	0	54.6	1,546.70	3,000.00	41.7	5,014.10	20
PRO-F06	0	60	1,546.70	3,000.00	47	5,358.80	20
PRO-F08	5.1	59.1	1,546.70	3,000.00	46.2	5,330.50	20
PRO-F09	0	58.7	1,546.70	3,000.00	46	5,350.50	20
PRO-F10	5.9	54.6	1,546.70	3,000.00	40.4	4,811.10	20
PRO-F11	0	50.9	1,546.60	3,000.00	37	4,552.70	20
PRO-F12	0	48.7	1,546.60	3,000.00	36.6	4,703.00	20
PRO-F12B	0	48.7	1,546.60	3,000.00	36.4	4,668.70	20
PRO-F15	0	49.5	1,546.40	3,000.00	37.3	4,736.60	20
PRO-F16	0	47.8	1,546.50	3,000.00	35.5	4,587.50	20
PRO-F18	0	57.4	1,546.70	3,000.00	44.1	5,121.90	20
PRO-F19	0	53	1,546.60	3,000.00	39.1	4,720.80	20
PRO-F20	5.7	48.9	1,546.60	3,000.00	36.3	4,624.40	20
PRO-F21	69.5	48.7	1,546.60	3,000.00	36.6	4,780.10	20
PRO-F22	0	49.3	1,546.50	3,000.00	37	4,721.60	20
PRO-F24	78	50.4	1,546.50	3,000.00	37.4	4,755.30	20
PRO-F26	0	51.8	1,546.70	3,000.00	39.6	4,934.50	20
PRO-F27	5.2	54.8	1,546.70	3,000.00	42.4	5,127.70	20
PRO-F28	0	57.8	1,546.70	3,000.00	45.4	5,317.90	20
PRO-F30	6.2	53.9	1,546.70	3,000.00	40.1	4,809.90	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

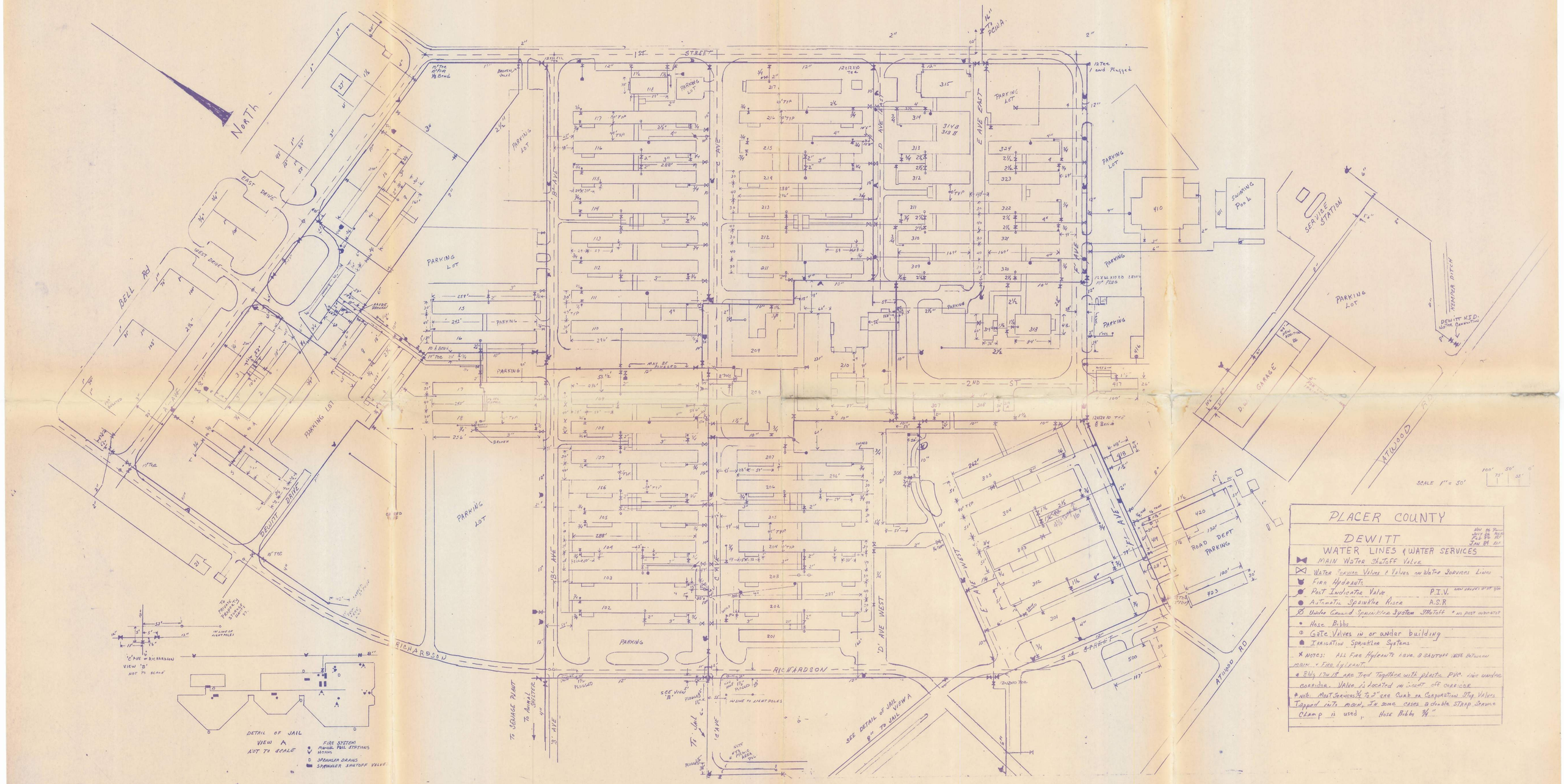
ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
PRO-F31	0	48.3	1,546.70	3,000.00	34.3	4,330.30	20
PRO-F32	0	48.8	1,546.80	3,000.00	36.1	4,604.30	20
PRO-F33	0	60.4	1,546.70	3,000.00	45.2	4,998.20	20
PRO-F34	0	54.8	1,546.70	3,000.00	41.9	5,026.60	20
PRO-F35	0	58.5	1,546.70	3,000.00	46	5,370.40	20
PRO-F36	0	58.7	1,546.70	3,000.00	46.4	5,424.90	20
PRO-F63	0	52.3	1,547.00	3,000.00	39	4,806.70	20
PRO-F64	9	52.3	1,546.90	3,000.00	38.6	4,725.70	20
PRO-F66	5.3	50.8	1,546.50	3,000.00	38.2	4,792.30	20
PRO-F68	0	63.4	1,546.70	3,000.00	44.1	4,607.70	20
PRO-ISO3	0	54.6	1,546.80	3,000.00	39	4,601.30	20
PRO-J105	0	47.4	1,546.50	3,000.00	35.3	4,579.90	20
PRO-J107	0	50.3	1,546.40	3,000.00	38.3	4,839.80	20
PRO-J12	81.2	48.6	1,548.30	3,000.00	30.1	3,882.30	20
PRO-J14	49.5	50.4	1,546.60	3,000.00	36.9	4,625.90	20
PRO-J14A	0	50.3	1,546.40	3,000.00	38.4	4,857.50	20
PRO-J17	0	46.9	1,546.50	3,000.00	34.7	4,525.60	20
PRO-J22	0	50	1,546.60	3,000.00	36.3	4,526.20	20
PRO-J25	0	52.4	1,546.70	3,000.00	38.9	4,757.70	20
PRO-J28	0	57.8	1,546.70	3,000.00	45.2	5,281.50	20
PRO-J30	0	50.4	1,546.50	3,000.00	38.2	4,841.00	20
PRO-J33	7.6	50.4	1,546.50	3,000.00	37.8	4,767.50	20
PRO-J34	0	50.4	1,546.50	3,000.00	37.4	4,679.10	20
PRO-J38	0	49.7	1,546.90	3,000.00	36.4	4,586.50	20
PRO-J41	0	51.8	1,546.70	3,000.00	39.7	4,950.40	20
PRO-J47	0	48.5	1,546.60	3,000.00	36.6	4,727.40	20
PRO-J49	11.2	51.1	1,546.60	3,000.00	37.6	4,652.20	20
PRO-J54	0	66.9	1,546.70	3,000.00	54.1	5,912.10	20
PRO-J64	0	51.4	1,546.90	3,000.00	37.7	4,642.00	20
PRO-J70	0	58.5	1,546.70	3,000.00	46.3	5,430.50	20
PRO-J72	46.8	48.1	1,548.30	3,000.00	28.6	3,736.50	20
PRO-J76	31.3	48.6	1,548.40	3,000.00	32.5	4,059.40	20
PRO-J78	13.7	48.6	1,548.30	3,000.00	32.1	4,008.00	20
PRO-J80	35.1	48.6	1,548.30	3,000.00	30	3,827.80	20
PRO-J82	32.9	48.6	1,548.40	3,000.00	31	3,911.90	20
PRO-J84	17.9	48.6	1,548.30	3,000.00	32.3	4,032.40	20
PRO-NID_102	21.6	49.9	1,548.30	3,000.00	33.6	4,111.40	20
PRO-P100	4	49.7	1,546.80	3,000.00	37.1	4,720.00	20
PRO-P102	0	47.8	1,546.60	3,000.00	34.9	4,476.40	20

PLACER COUNTY GOVERNMENT CENTER

WATER MODEL OUTPUT
TIER 3 & 4 & ULTIMATE MAXIMUM DAY WITH NID SUPPLY
FIRE REPORT

ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
PRO-P106	0	49.1	1,546.50	3,000.00	37.1	4,763.60	20
PRO-P59	0	50.2	1,546.70	3,000.00	37.2	4,668.20	20
PRO_NID_J10	25.5	48.6	1,548.30	3,000.00	32.4	4,047.30	20
PRO_NID_J100	25	51.2	1,548.30	3,000.00	34.8	4,185.60	20

Appendix B – Irrigation


North
BELL Rd
EAST DRIVE
WEST DRIVE
DEWITT DRIVE
PARKING LOT
1ST STREET
2ND ST
RICHARDSON
B AVE
C AVE
D AVE
E AVE
D AVE WEST
E AVE WEST
SERVICE STATION
SWIMMING POOL
GARAGE
ROAD DEPT PARKING
ATWOOD RD
TEMPLE DITCH
DEWITT N.I.D.
SCALE 1" = 50'
DETAIL OF JAIL
VIEW A
NOT TO SCALE
FIRE SYSTEM
MANUAL PULL STATIONS
HORNS
SPRINKLER DRAINS
SPRINKLER SHUTOFF VALVE
TO SEWAGE PLANT
TO ANIMAL SHELTER
SEE DETAIL OF JAIL
SEE VIEW 'B'
PLACER COUNTY
DEWITT
WATER LINES & WATER SERVICES
MAIN WATER SHUTOFF VALVE
WATER SERVICE VALVES & VALVES ON WATER SERVICES LINES
FIRE HYDRANTS
POST INDICATOR VALVE P.I.V.
AUTOMATIC SPRINKLER RISER A.S.R.
UNDER GROUND SPRINKLER SYSTEM SHUTOFF
HOSE BIBBS
GATE VALVES IN OR UNDER BUILDING
IRRIGATION SPRINKLER SYSTEMS
NOTES: ALL FIRE HYDRANTS HAVE 3 SHUTOFF VALVE BETWEEN MAIN & FIRE HYDRANT.
BLDG 17 & 18 ARE TIED TOGETHER WITH PLASTIC PVC. LINE UNDER CORRIDOR. VALVE IS LOCATED IN CLOSET OFF CORRIDOR.
NOTE: MOST SERVICES 3/4" TO 2" ARE TAPPED ON CORPORATION STOP VALVES. IN SOME CASES A DOUBLE STRAP SERVICE CLAMP IS USED. HOSE BIBBS 3/4"

PLACER COUNTY GOVERNMENT CENTER

RAW WATER IRRIGATION MODEL OUTPUT
JUNCTION/PIPE/RESERVOIR REPORTS

COUNTY FACILITIES ONLY

REFERENCE FIG. I-1 FOR LIMITS

REFERENCE APPENDIX A FOR
RAW WATER IRRIGATION
DEMANDS

PLACER COUNTY GOVERNMENT CENTER

RAW WATER IRRIGATION MODEL OUTPUT
JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-B	47.6	1,432.00	1,605.80	75.3
J-C	5.1	1,434.50	1,604.70	73.7
J-CHAP	5.1	1,430.00	1,603.70	75.3
J-E01	47.6	1,431.00	1,607.70	76.6
J-E02	5.1	1,422.00	1,607.30	80.3
J-I	5.1	1,420.00	1,606.60	80.8
J-J	5.1	1,426.00	1,608.20	78.9
J-L	5.1	1,430.00	1,603.80	75.3
J-M	69.5	1,430.00	1,603.40	75.1
J-MU	5.1	1,428.00	1,607.70	77.9
J10	0	1,432.00	1,608.60	76.5
J12	0	1,432.00	1,608.80	76.6
J128	0	1,430.00	1,607.50	76.9
J14	0	1,434.00	1,608.90	75.8
J142	0	1,430.00	1,603.60	75.2
J20	0	1,432.00	1,608.70	76.6
J22	0	1,432.00	1,607.70	76.1
J36	69.5	1,433.00	1,603.50	73.9
J40	5.1	1,427.00	1,606.40	77.7
J44	0	1,411.00	1,606.90	84.9

PLACER COUNTY GOVERNMENT CENTER

RAW WATER IRRIGATION MODEL OUTPUT
PIPE REPORT

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)
P129	J40	J-C	379.5	4	130	75.6	1.9	1.7	4.5
P145	J-C	J36	293.5	4	130	70.5	1.8	1.2	3.9
P157	J20	J128	467.2	4	130	54.8	1.4	1.2	2.5
P185	J-L	J-CHAP	187.5	4	130	22.3	0.6	0.1	0.5
P187	J-CHAP	J142	374.6	4	130	17.2	0.4	0.1	0.3
P189	J142	J36	379.5	4	130	17.2	0.4	0.1	0.3
P19	RES9000	J14	40.4	8	130	275	1.8	0.1	1.7
P21	J14	J12	85.1	8	130	275	1.8	0.1	1.7
P23	J12	J10	70.2	6	130	179.1	2	0.2	3.1
P25	J10	J-B	238.9	4	130	126.3	3.2	2.8	11.6
P27	J-B	J-L	411.9	4	130	78.7	2	2	4.8
P39	J-L	J-M	195.3	4	130	51.3	1.3	0.4	2.2
P41	J-M	J36	377.8	4	130	-18.2	0.5	0.1	0.3
P43	J10	J-E01	377	4	130	52.8	1.3	0.9	2.3
P45	J-E01	J22	408.4	4	130	5.2	0.1	0	0
P47	J22	J-MU	234.7	4	130	5.2	0.1	0	0
P49	J12	J20	126.8	6	130	95.9	1.1	0.1	1
P51	J20	J-J	344.7	4	130	41.1	1	0.5	1.4
P53	J-J	J-MU	424.7	4	130	36	0.9	0.5	1.1
P55	J-MU	J-E02	360.6	4	130	36	0.9	0.4	1.1
P57	J-E02	J44	429	4	130	30.9	0.8	0.4	0.9
P59	J128	J40	467.2	4	130	54.8	1.4	1.2	2.5
P61	J40	J-I	356.8	4	130	-25.8	0.7	0.2	0.6
P63	J-I	J44	385.5	4	130	-30.9	0.8	0.3	0.9

PLACER COUNTY GOVERNMENT CENTER

RAW WATER IRRIGATION MODEL OUTPUT
RESERVOIR REPORT

ID	Flow (gpm)	Head (ft)
RES9000	-275	1,609.00

Appendix C – Sanitary Sewer

Auburn Creekside Project
Specific Report

Revised Final Report

Prepared for:
Auburn Pacific Properties, LLC

Prepared by:
Stantec Consulting Services Inc.

June 10, 2015

Revision Record							
Revision	Description	Prepared By		Checked By		Approved By	
A	Draft Report	BL	2014/04/26			DP	2014/04/27
B	Final Report	BL	2015/04/30			DP	2015/04/30
C	Revised Final Report	BL	2015/06/10			DP	2015/06/10

Sign-off Sheet

This document entitled Auburn Creekside Project Specific Report was prepared by Stantec Consulting Services Inc. for the account of Auburn Pacific Properties, LLC. The material in it reflects Stantec's best judgement in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

Prepared by _____

Brett Laplante, E.I.T.

Reviewed by

David Price, P.E.

6/10/2015

Table of Contents

1.0 INTRODUCTION 1.1
1.1 PURPOSE 1.1
1.2 BACKGROUND 1.1

2.0 PROJECT CHARACTERISTICS 2.1
2.1 PURPOSE 2.1
2.2 PROJECT LOCATION 2.1
2.3 LAND USE DATA 2.3
2.4 FUTURE WASTEWATER FLOWS 2.10

3.0 OVERVIEW OF HYDRAULIC MODEL 3.1
3.1 PURPOSE 3.1
3.2 MODELING SOFTWARE 3.1
3.3 MODEL INPUTS AND CONSTRUCTION 3.1
3.3.1 Sewer Pipes and Manholes 3.2
3.3.2 Lift Stations 3.2
3.3.3 Subcatchments 3.3
3.3.4 Design Storms 3.5
3.4 MODEL CALIBRATION 3.5
3.4.1 Dry Weather Flow Calibration 3.6
3.4.2 Wet Weather Flow Calibration 3.7

4.0 WASTEWATER COLLECTION SYSTEM CAPACITY EVALUATION 4.1
4.1 PURPOSE 4.1
4.2 RECOMMENDED CAPACITY EVALUATION CRITERIA 4.1
4.2.1 Level of Service Criteria 4.1
4.2.2 Velocity 4.2
4.2.3 Pipe Capacity 4.2
4.3 MODEL RESULTS 4.2
4.3.1 Existing System – Design Storm Event 4.2
4.3.2 Existing System + Entitled Developments – Design Storm Event 4.5
4.3.3 Existing System + Entitled Developments + Auburn Creekside – Design Storm Event 4.7
4.3.4 Full Build-out 4.9

5.0 RECOMMENDED CAPITAL IMPROVEMENT PROJECTS 5.1
5.1 PURPOSE 5.1
5.2 RECOMMENDED IMPROVEMENT TO EXISTING TRUNK SYSTEM TO ACCOMMODATE EXISTING AND NEAR-TERM (EXISTING + ENTITLED, EXISTING + ENTITLED + AUBURN CREEKSIDE) DEFICIENCIES 5.1
5.3 RECOMMENDED IMPROVEMENTS TO EXISTING TRUNK SYSTEM TO ACCOMMODATE ULTIMATE BUILD-OUT OF SYSTEM 5.4
5.4 AUBURN CREEKSIDE PROJECT SPECIFIC IMPACTS TO HIGHWAY 49 TRUNK 5.6

5.4.1 Auburn Creekside Frontage Improvements.....5.7

LIST OF TABLES

Table 2-1 Existing Land Use Summary[a] 2.3
Table 2-2 Future Land Use Projection.....2.9
Table 2-3 Population Density Summary 2.10
Table 2-4 Future Flow and Infiltration Allowance Summary.....2.10
Table 3-1 Sewer Roughness Values 3.1
Table 3-2 Sewer Maintenance District 1 (SMD 1) – Highway 49 Trunk Lift Station Information 3.3
Table 3-3 DWF Calibration Results 3.6
Table 3-4 RDII Equation Parameters 3.7
Table 3-5 WWF Calibration Results.....3.8
Table 4-1 Design Event Flow Summary at Joeger Road WWTP.....4.2
Table 5-1 Recommended Sewer Upgrades For Near-Term Developments 5.2
Table 5-2 Recommended Sewer Upgrades For Full-Buildout 5.4
Table 5-3 WWTP Flow Summary - Build-out Conditions Pre/Post Capital Improvements .5.6
Table 5-4 Relative Growth Increase 5.7

LIST OF FIGURES

Figure 2-1 SMD 1 Study Area.....2.2
Figure 2-2 Highway 49 Serviced Area Existing System Land Use 2.4
Figure 2-3 Highway 49 Serviced Area Existing Sewershed Connections 2.5
Figure 2-4 Highway 49 Serviced Area Full Build-out Projected Land Use 2.7
Figure 2-5 Highway 49 Serviced Area Future Sewershed Connections.....2.8
Figure 3-1 Highway 49 Modeled Catchments 3.4
Figure 3-2 10-year, 24-hour Design Storm Hyetograph 3.5
Figure 3-3 DWF Calibration Plot.....3.6
Figure 3-4 December 16th – 21st, 2010 Calibration Results 3.8
Figure 3-5 March 13th – 18th, 2011 Calibration Results.....3.9
Figure 3-6 March 23rd – 28th, 2011 Calibration Results.....3.9
Figure 3-7 November 28th – December 5th, 2012 Calibration Results 3.10
Figure 4-1 Highway 49 Existing System Level of Service Results 4.3
Figure 4-2 Highway 49 Existing System With Entitled Projects Level of Service Results.....4.6
Figure 4-3 Highway 49 Existing System With Entitled / Proposed Auburn Creekside Development Level of Service Results.....4.8
Figure 4-4 Highway 49 Projected Full Build-out Level of Service Results 4.10
Figure 5-1 Highway 49 Near-Term Developments 5.3
Figure 5-2 Highway 49 Projected Full Build-out.....5.5

LIST OF APPENDICES

Appendix A – Highway 49 Entitled Projects

Appendix B – Hydraulic Gradeline Profiles

Figure B-1 HGL Profile Keyplan
Figure B-2 Existing System Results - 1:10 Year Design Rainfall HGL Profile 1
Figure B-3 Existing System Results - 1:10 Year Design Rainfall HGL Profile 2
Figure B-4 Existing System Results - 1:10 Year Design Rainfall HGL Profile 3
Figure B-5 Existing System Results - 1:10 Year Design Rainfall HGL Profile 4
Figure B-6 Upgrade Impact Upon Existing System HGL Profile 1
Figure B-7 Upgrade Impact Upon Existing System HGL Profile 2
Figure B-8 Upgrade Impact Upon Existing System HGL Profile 3
Figure B-9 Upgrade Impact Upon Existing System HGL Profile 4

Appendix C – Auburn Creekside Proposed Sewer Re-Alignment

Figure C-1 Auburn Creekside Proposed Sewer Re-Alignment with Assumed Inverts

Appendix D – Necessary Highway 49 Trunk Upgrades by Scenario

1.0 Introduction

Along the Highway 49 trunk, Auburn Pacific Properties, LLC have proposed a development located east of Highway 49 and south of Rock Creek Road known as the Auburn Creekside project.

1.1 PURPOSE

Placer County (County) owns and operates the wastewater collection system within Sewer Maintenance District 1 (SMD 1), which is located north of the City of Auburn in western Placer County. The collection system consists of two main sewer trunks, the Hghway 49 trunk and the DeWitt trunk. These trunks convey flows from the southern portion of the SMD 1 service area to the County's wastewater treatment plant (WWTP) located on Joeger Road, west of Highway 49 and north of Dry Creek Road in the unincorporated area north of the City of Auburn (herein referred to as North Auburn).

The purpose of this study is to assess the capacity of the Highway 49 trunk to convey existing flows, the impact of the proposed Auburn Creekside project upon the capacity of the system, and to determine any upgrades that may be required to the gravity sewer system as a result.

1.2 BACKGROUND

The proposed Auburn Creekside project is a commercial retail center on a 13.2-acre parcel that is expected to generate wastewater equivalent to 32 equivalent dwelling units (EDUs, which is similar to 32 single family residences). The project parcel is located east of Highway 49, immediately north of the Target store in North Auburn. The proposed development areas are situated on the east and west sides of a tributary to Rock Creek, which traverses the site from south to north. The development will be phased, ultimately consisting of approximately 93,100 square feet of new retail space.

The project is currently completing the entitlement process through the Placer County Community Development Resource Agency (CDRA). This includes preparation of a CEQA document which is to identify all potential impacts resulting from the development of the project and any mitigation measures proposed to reduce those impacts to a less than significant level.

This report was required by the Placer County Facility Services Department (Facility Services), which has responsibility for managing the SMD 1 collection, treatment and disposal facilities, to assess the impact of the project on the SMD 1 wastewater collection system. In addition to this report, specific to the potential project impacts on the sewer collection system, Auburn Pacific Properties has prepared an overall capacity evaluation of the Highway 49 trunk sewer, also required by Facility Services. The model developed for the overall Highway 49 trunk sewer capacity evaluation was also used to assess the impact of the Auburn Creekside project on the SMD 1 collection system.

2.0 Project Characteristics

Information as to the characteristics of existing serviced parcels, the proposed Auburn Creekside project and future development within the Highway 49 trunk sewer shed is necessary to estimate wastewater flows and assess system capacity.

2.1 PURPOSE

The purpose of this chapter is to describe the County's existing wastewater collection system and future flow projections.

This chapter is divided into the following sections:

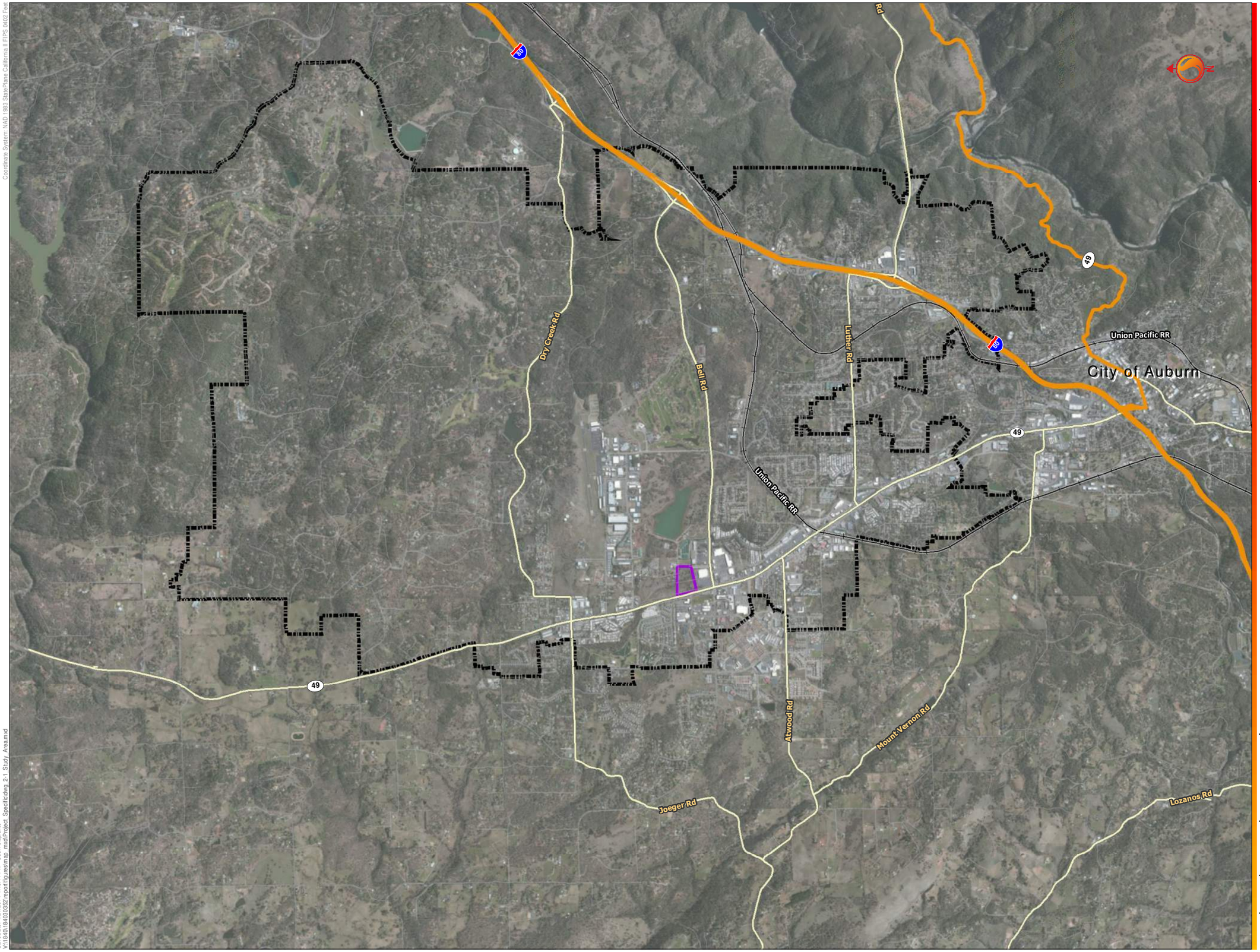
- Project Location
- Land Use Data
- Future Wastewater Flows

2.2 PROJECT LOCATION

Figure 2-1 shows the location of the proposed Auburn Creekside development in relation to the SMD 1 wastewater collection system for the North Auburn Highway 49 Trunk Sewer Evaluation. The Study area (portion of SMD 1) is defined as the wastewater subcatchments that contribute flows to the Joeger Road WWTP serviced by the Highway 49 trunk. The Auburn Creekside development is located east of Highway 49 and immediately south of Rock Creek Road, and will add approximately 13.6 acres of serviced land to the existing Highway 49 sewershed.

The portion of the SMD 1 service area which discharges into the Highway 49 trunk covers an area of approximately 2,740 acres and currently serves approximately 6,413 EDUs. The wastewater generated by these users is collected and conveyed to the County's SMD 1 WWTP, located west of Highway 49 just north of Joeger Road, via a network of gravity trunk mains, force mains, and lift stations. Tributary to the Highway 49 trunk, the County owns, operates, and maintains this network of over 92 of pipelines (ranging in size from 2 to 30 inches in diameter) and a number of lift stations.

The Highway 49 trunk generally follows California State Route 49 from the City of Auburn, north to the treatment plant on Joeger Road. This trunk collects flows from commercial, industrial and residential developments along the Highway 49 corridor and developments to the east. To account for the foothill terrain in the service area, lift stations convey flows from lower areas to system gravity collectors or the Highway 49 trunk itself.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/27/2014 4:43:14 PM User: blaplante
V:\1840\184030352\report\figures\map_mxd\Project_Specific\dwg_2-1_Study_Area.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Auburn Creekside Development Lands
- Hwy49 Buildout Boundary

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Sewer Maintenance District 1

Project No.
184030352

Scale
0 0.2 0.4 0.6 Miles

Figure No.
2-1

Issue/Revision
A/

2.3 LAND USE DATA

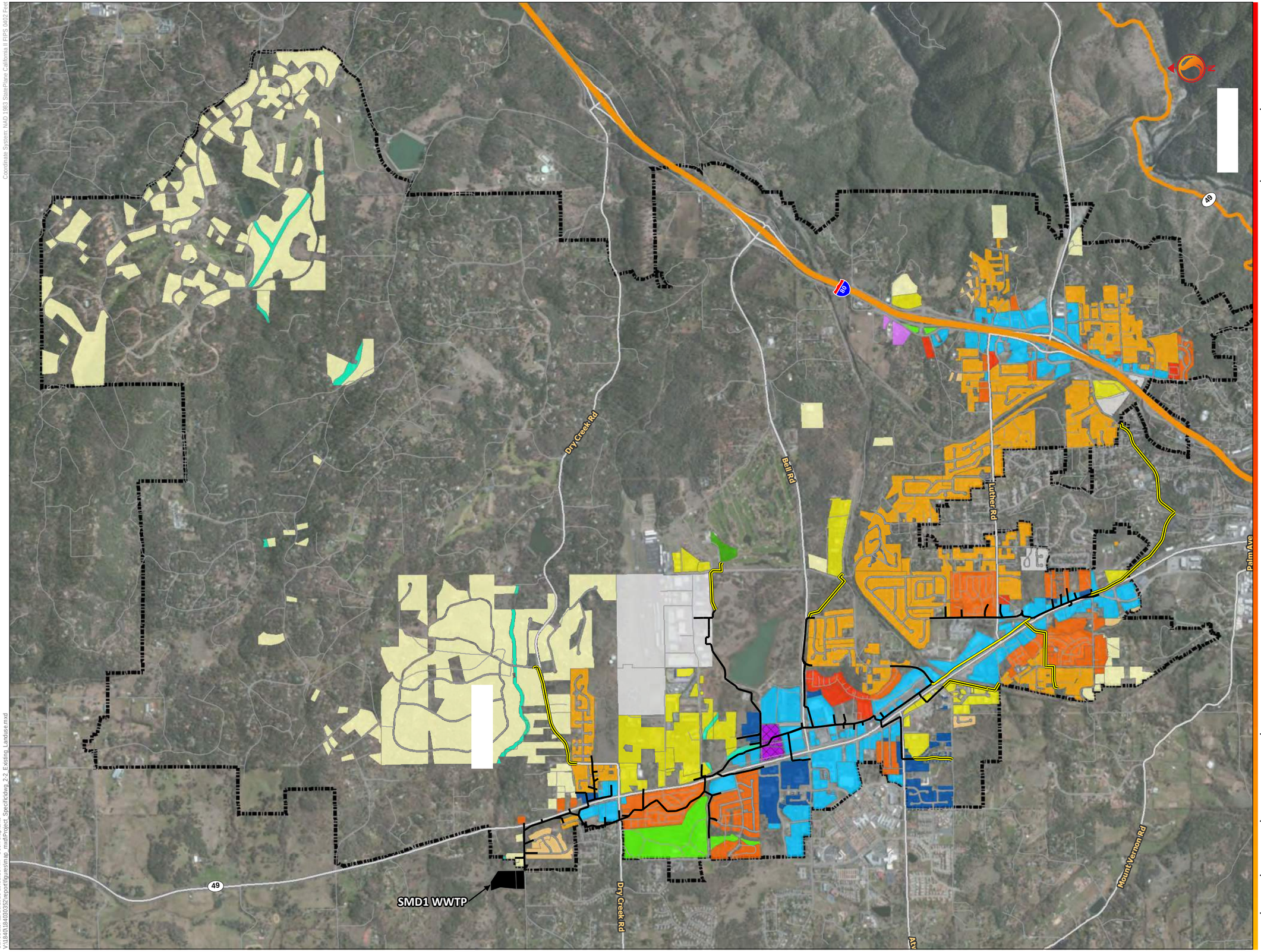
The proposed Auburn Creekside development is located east of Highway 49 and immediately south of Rock Creek Road. Sewage generated on the project site will drain to the Highway 49 trunk system and will contain 32 EDUs.

The existing land use and parcel data for the Highway 49 trunk sewer shed was provided by the County in GIS format. Total EDUs were provided by the County. Land uses for existing developments are shown in **Figure 2-2** and **Figure 2-3** and summarized along with the estimated number of EDUs associated with each land use, in **Table 2-1**. A detailed list of the APNs entitled, but not yet connected within the Highway 49 sewershed is included in Appendix A (a CD containing all APNs which contribute to existing flow is included as well).

Table 2-1 Existing Land Use Summary[(a)]

	SMD 1		Highway 49 Sewershed	
Land Use Designation	Total Acreage (Acres)	Total Population (EDUs)	Total Acreage (Acres)	Total Population (EDUs)
City of Auburn	150	135	150	135
Commercial	251	976	245	966
Industrial	145	332	25	143
Mixed Use	17	98	145	332
Open Space	58	28	27	73
Open Space / Business Park	6	21	617	1928
Professional Office	55	226	250	1312
Riparian Drainage	206	164	17	98
Rural Estate 2.3 - 10 Ac. Min.	244	194	57	26
Rural Estate 4.6 - 10 Ac. Min.	24	17	6	21
Rural Low Density Residential	285	575	55	226
Rural Residential 1 - 2.3 Ac. Min.	10	5	162	120
Rural Residential 2.3 - 4.6 Ac. Min.	654	631	244	194
Low Density Residential	139	231	15	10
Low Medium Density Residential	999	2727	89	233
Medium Density Residential	310	1441	10	5
High Density Residential	25	143	626	591
Total	**3578**	**7944**	**2740**	**6413**

(a) Provided by Placer County.



Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

SaveDate: 11/20/2013 10:32:18 AM User: bilapiante
V:\184\0184030352\report\figures\map_mxd\Project_Specific\dwg_2-2_Existing_Landuse.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Land Use

- City of Auburn
- Commercial
- Professional Office
- Industrial
- High Density Residential 10 - 15 DU/Ac.
- Medium Density Residential 5 - 10 DU./Ac.
- Low Medium Density Residential 2 - 5 DU/Ac.
- Low Density Residential 0.4 - 0.9 Ac. Min.
- Mixed Use
- Open Space
- Open Space / Business Park
- Riparian Drainage
- Rural Real Estate/Rural Residential
- Auburn Creekside Development Lands

Sanitary Sewer

- Sanitary Sewer
- Siphon
- Forcemain
- SMD1 WWTP

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

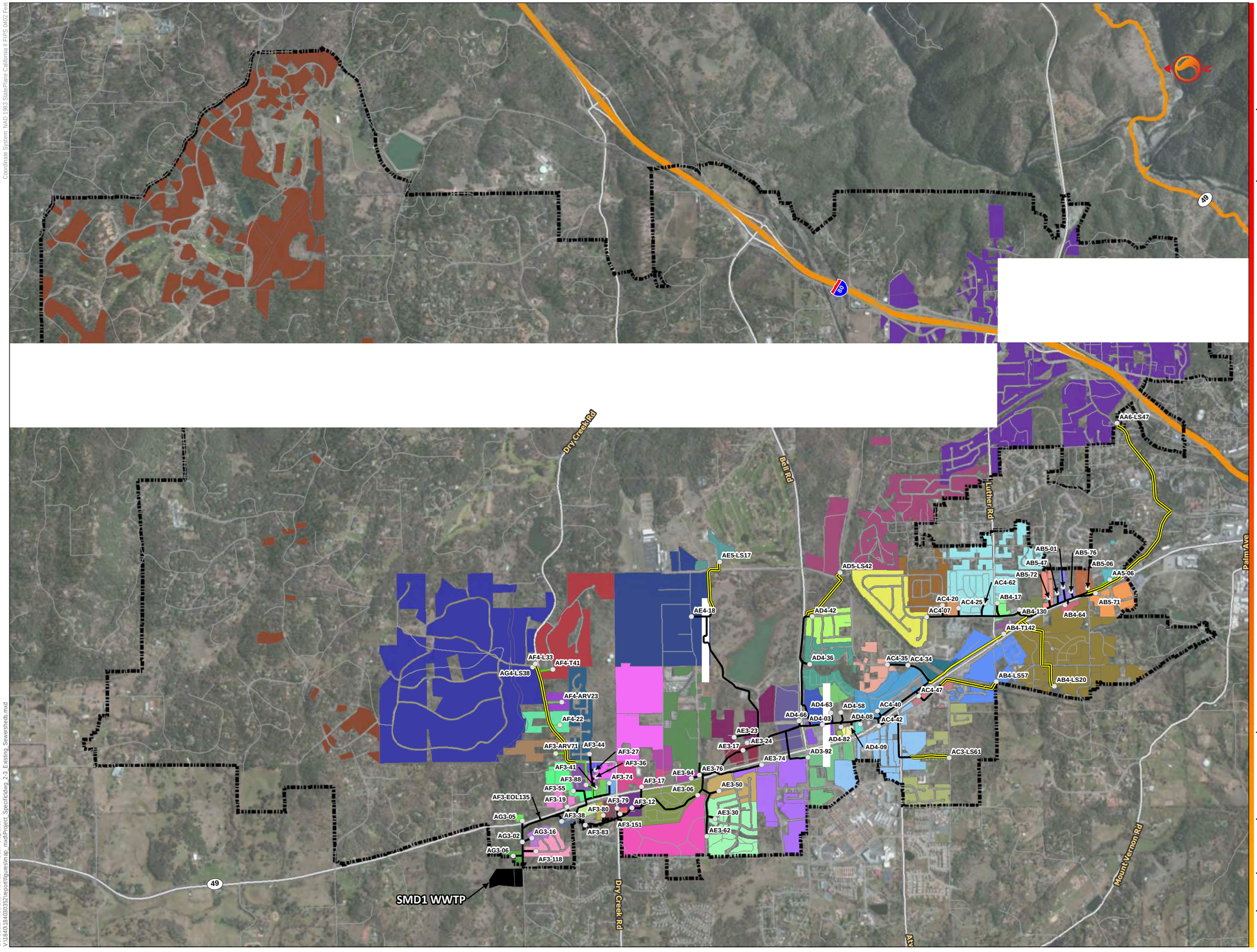
Existing Land Use

Project No.
184030352

Scale
0 0.125 0.25 0.375 0.5 Miles

Figure No.
2-2

Issue/Revision
A/



Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Sewer Connection

- AA5-06
- AA6-LS47
- AB4-130
- AB4-17
- AB4-64
- AB4-LS20
- AB4-LS57
- AB4-T142
- AB5-01
- AB5-06
- AB5-47
- AB5-71
- AB5-72
- AB5-76
- AC3-LS61
- AC4-07
- AC4-20
- AC4-25
- AC4-34
- AC4-35
- AC4-40
- AC4-42
- AC4-47
- AC4-62
- AD3-92
- AD4-03
- AD4-08
- AD4-09
- AD4-36
- AD4-42
- AD4-58
- AD4-63
- AD4-66
- AD4-82
- AD5-LS42
- AE3-06
- AE3-17
- AE3-23
- AE3-24
- AE3-30
- AE3-50
- AE3-62
- AE3-74
- AE3-76
- AE3-94
- AE4-18
- AE5-LS17
- AF3-118
- AF3-12
- AF3-151
- AF3-17
- AF3-19
- AF3-27
- AF3-36
- AF3-38
- AF3-41
- AF3-44
- AF3-55
- AF3-74
- AF3-79
- AF3-80
- AF3-83
- AF3-88
- AF3-ARV71
- AF4-22
- AF4-ARV23
- AF4-L33
- AF4-T41
- AG3-02
- AG3-05
- AG3-06
- AG3-16
- AG4-LS38

Sanitary Sewer

- Sanitary Sewer
- Low Pressure Sewer
- Siphon
- Forcemain
- Modeled Nodes
- Hwy49 Buildout Boundary
- SMD1 WWTP

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Connection of Existing Sewersheds to Modeled Network

Project No.
184030352

Scale
0 0.125 0.25 0.375 0.5 Miles

Figure No.
2-3

Issue/Revision
A/

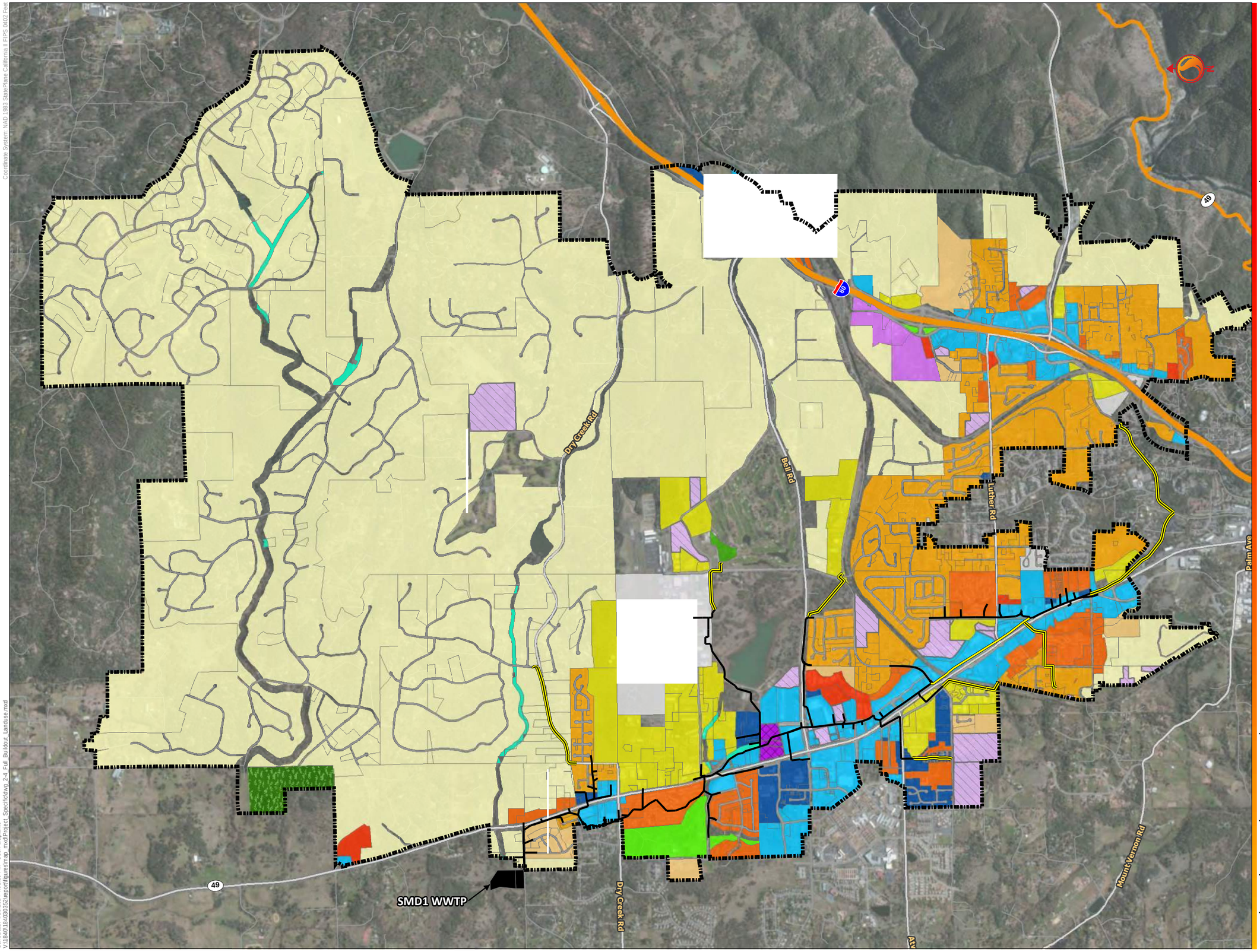
Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet
SaveDate: 4/10/2014 4:05:59 PM User: blaplante
V:\1840\184030352\report\figures\map_mxd\Project_Specific\dwg_2-3_Existing_Sewersheds.mxd

In addition to the existing APN connections, there are currently 18 entitled development projects that are planned to be served by the Highway 49 trunk sewer but which are not currently connected. In total, these developments represent approximately 412 EDUs. A detailed list of these developments is included in **Appendix A**.

Furthermore, Placer County Facility Services provided information for the land use designations and EDU counts of the expected growth in population and associated land uses within the SMD 1 service area by means of two shapefiles (complete with description):

- **"SMD1Basins_20130603.shp"** – Future service area build-out extents with projected population and land area, organized by manhole.
- **"SMD1ParcelsWithBasinAndLanduse_20130603.shp"** – Future build-out extents with project population (EDUs) and land area, broken down by parcels and landuse designations. This file is imilar to the preceding shapefile, though with slightly less effective land area and population.

The information contained within these shapefiles was intended to represent the ultimate build-out of SMD 1 and is independent of the existing land use data discussed prior. Through discussion with the County, it was decided that a combination of the two shapefiles was to be used. The population estimate within the "SMD1Basins" shapefile was deemed a more accurate prediction of future populations by the County. However, the "SMD1ParcelsWithBasinAndLanduse" shapefile provided the information regarding serviced and non-serviced area. As explained in further detail in Section 2.4, Future Flow Estimation, the non-serviced area will not contribute to I&I within the sewer system and is not included within the hydraulic model. The future build-out land use is shown in **Figure 2-4** and **Figure 2-5** and summarized in **Table 2-2**. A detailed list of the APN's which contribute to the future system is include on a CD.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/10/2014 4:03:10 PM User: blaplante
V:\184\184030352\report\figures\map_mxd\Project_Specific\dwg_2-4_Full_Buildout_Landuse.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Hwy49 Buildout Boundary

Land Use

- City of Auburn
- Commercial
- Professional Office
- Industrial
- High Density Residential 10 - 15 DU/Ac.
- Medium Density Residential 5 - 10 DU./Ac.
- Low Medium Density Residential 2 - 5 DU/Ac.
- Low Density Residential 0.4 - 0.9 Ac. Min.
- Mixed Use
- Open Space
- Open Space / Business Park
- Agricultural 10 - 80 Ac. Min.
- Riparian Drainage
- Rural Real Estate/Rural Residential
- Entitled Catchments
- Auburn Creekside Development Lands

Sanitary Sewer

- Sanitary Sewer
- Siphon
- Forcemain
- SMD1 WWTP

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

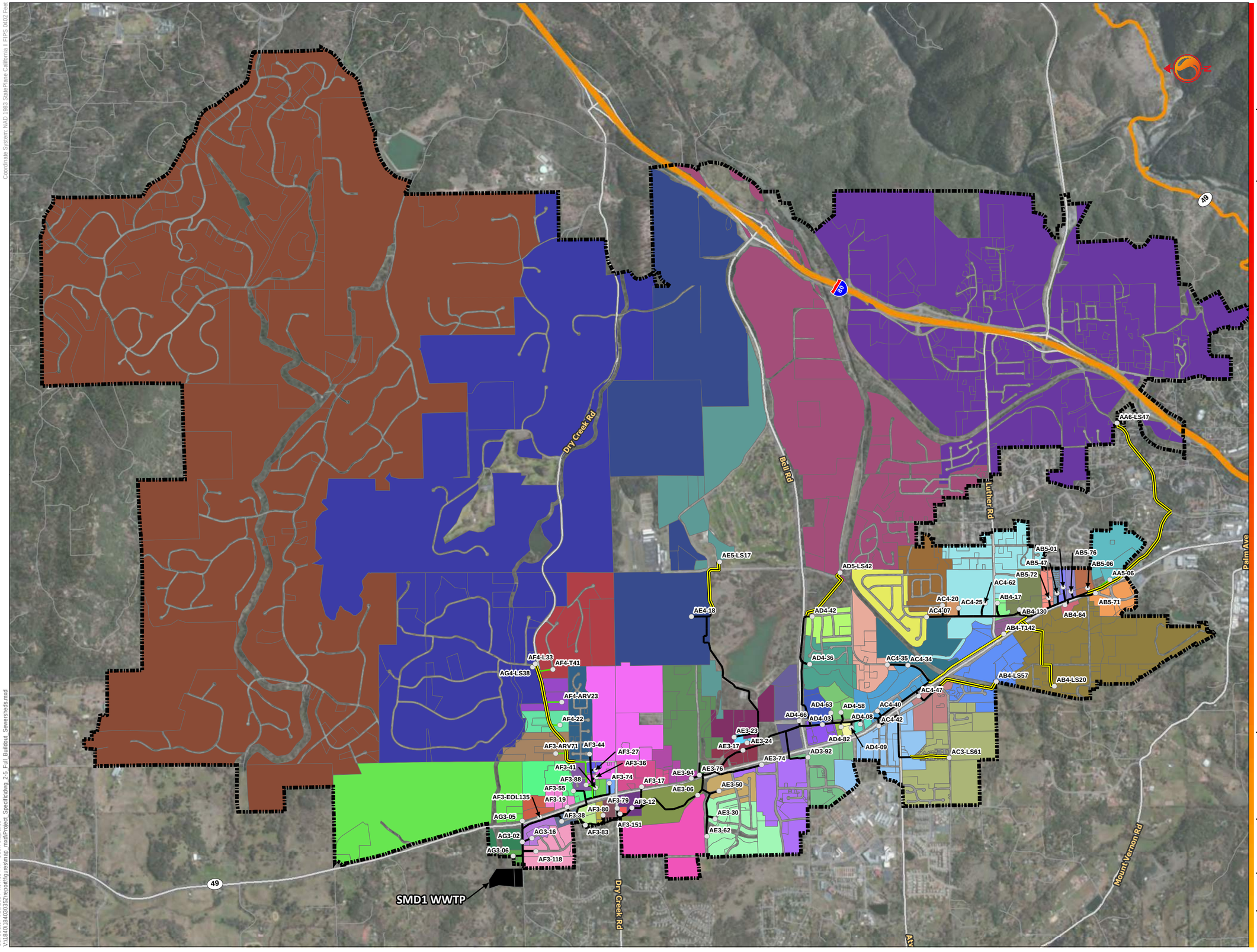
Full Build-Out Land Use

Project No.
184030352

Scale
0 0.125 0.25 0.375 0.5 Miles

Figure No.
2-4

Issue/Revision
A/



Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

AssetName

AA5-06
AA6-LS47
AB4-130
AB4-17
AB4-64
AB4-LS20
AB4-LS57
AB4-T142
AB5-01
AB5-06
AB5-47
AB5-71
AB5-72
AB5-76
AC3-LS61
AC4-07
AC4-20
AC4-25
AC4-34
AC4-35
AC4-40
AC4-42
AC4-47
AC4-62
AD3-92
AD4-03
AD4-08
AD4-09
AD4-36
AD4-42
AD4-58
AD4-63
AD4-66
AD4-82
AD5-LS42
AE3-06
AE3-17
AE3-23
AE3-24
AE3-30
AE3-50
AE3-62
AE3-74
AE3-76
AE3-94
AE4-18
AE5-LS17
AF3-118
AF3-12
AF3-151
AF3-17
AF3-19
AF3-27
AF3-36
AF3-38
AF3-41
AF3-44
AF3-55
AF3-74
AF3-79
AF3-80
AF3-83
AF3-88
AF3-ARV71
AF3-EOL135
AF4-22
AF4-ARV23
AF4-L33
AF4-T41
AG3-02
AG3-05
AG3-06
AG3-16
AG4-LS38

Sanitary Sewer
Low Pressure Sewer
Siphon
Forcemain
auburn_buildout_nodes
SMD1 WWTP
Hwy49 Buildout Boundary

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Connection of Future Sewersheds to Modeled Network

Project No.
184030352

Scale
0 0.125 0.25 0.375 0.5 Miles

Figure No.
2-5

Issue/Revision
A/

Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/10/2014 4:07:35 PM User: blaplante
V:\1840\184030352\report\figures\map_mxd\Project_Specific\dwg_2-5_Full_Buildout_Sewersheds.mxd

Table 2-2 Future Land Use Projection

	SMD 1		Highway 49 Sewershed	
Landuse Designation	Total Acreage (Acres)	Total Population (EDUs)	Total Acreage (Acres)	Total Population (EDUs)
Agricultural	52	26	52	26
City of Auburn	315	0	315	0
Commercial	679	2957	479	1778
Industrial	454	694	454	694
Mixed Use	66	268	53	182
Open Space	467	0	418	0
Open Space / Business Park	166	0	166	0
Professional Office	92	297	92	297
Riparian Drainage	220	0	197	0
Rural Estate 2.3 - 10 Ac. Min.	1012	591	1012	591
Rural Estate 4.6 - 10 Ac. Min.	827	519	734	469
Rural Low Density Residential	1409	1997	477	930
Rural Residential 1 - 2.3 Ac. Min.	0	0	0	0
Rural Residential 2.3 - 4.6 Ac. Min.	4769	3144	4500	2952
Low Density Residential	253	708	160	431
Low Medium Density Residential	1027	3820	872	3206
Medium Density Residential	372	2537	327	2233
High Density Residential	75	424	53	270
Total	**12255**	**17982**	**10361**	**14059**

2.4 FUTURE WASTEWATER FLOWS

The estimates for future (build-out) system flow were derived from a combination of existing system information, per the Placer County Design Guidelines, and through discussions with County Staff. The following provides a brief summary of the wastewater loading characteristics:

- **GWI** (groundwater infiltration) = 100 gpd / ac
  - Extrapolated from existing system performance

- **Average DWF** (dry weather flow) = 200 gpd / edu
  - Extrapolated from existing system performance
  - Diurnal loading assumed to be identical to existing system

- **RDII** (rainfall dependent infiltration and inflow) **Allowance** – 1338 gpd / ac
  - This value was derived from a technical memorandum issued by RMC entitled *South Placer Regional Wastewater & Recycled Water Systems Evaluation Project*, May, 2005 (RMC TM3a). In the report, a peak WWF (wet weather flow) of 1368 gpd/edu and a peak DWF of 380 gpd/edu are recommended. This approximates to 1000 gpd/edu infiltration. Note that the RDII allowance parameter is presented as an acreage basis rather than an EDU basis as recommended within the RMC report. As discussed later in Section 3.4.2, the hydraulic model derives the I&I based upon land area. **Table 2-3** and **Table 2-4** provide a summary of the RDII Allowance considerations.

Table 2-3 Population Density Summary

Rainfall Event	Contributing Area (ac)	Contributing EDUs	Density (edu/ac)
Existing System Model (Design Event)	3583	7944	2.22
Future Catchments Only(a)	7503	10039	1.338

a) Landuse designations that contain no population is considered to not be serviced, and therefore not included as contributing area or EDU count. These designations are: City of Auburn, Open Space, Open Space / Business Park, and Riparian Drainage.

Table 2-4 Future Flow and Infiltration Allowance Summary

Rainfall Event	Peak DWF [mgd]	Peak WWF [mgd]	Peak I&I [mgd]	RDII [gpd/ac]	RDII [gpd/edu]	PWWF [gpd/edu]
Existing System Model (Design Event)	2.67	11.5	8.8	2464	1112	1448
Future Catchments Only	4.97	15.0	10.0	1338	1000	1495

3.0 Overview of Hydraulic Model

A computer model was developed by Stantec to assess the impact of the Auburn Creekside development on the Highway 49 sewer trunk system.

3.1 PURPOSE

The purpose of this chapter is to present an overview of the development and calibration of the hydraulic model of the Highway 49 sewer trunk system located in SMD 1 of Placer County.

This chapter is divided into the follow sections:

- Modeling Software
- Model Inputs and Construction
- Model Calibration

3.2 MODELING SOFTWARE

The wastewater collection system capacity was evaluated using a hydrodynamic routing model, Mike Urban 2011, Service Pack 7, by DHI.

3.3 MODEL INPUTS AND CONSTRUCTION

The GIS database files containing the physical collection system information (pipe lengths, diameters, inverts, manhole depths, etc.) were imported into the modeling software. The data import resulted in an initial model build containing the necessary information for pipes and junctions. A Manning "n" roughness coefficient was assigned to gravity sewer based upon the identified pipe material, as per **Table 3-1**.

Table 3-1 Sewer Roughness Values

Material	Manning's "n" value
Asbestos Cement	0.013
Ductile Iron	0.0145
PVC	0.012
Tranzite	0.013
Unidentified	0.013
Vitrified Clay Pipe	0.0145

Mike Urban also uses manhole loss coefficients to further determine the total resistance to flow within the network. An universal "Km" value of 0.10 was applied using the "MOUSE Mean Energy Approach" equations to calculate the resistance to the flow. Mike Urban calculates the total loss through a manhole

by applying additional modifiers to the "Km" value automatically. These additional modifiers represent factors such as, but not exclusively:

- Manhole entry and exit loss coefficients
- Flow angle
- Plunging manholes
- Drop elevation

These factors are calculated within the MOUSE module, and are not user determined. The "Km" value was determined to be most appropriate through discussions with DHI staff.

Once imported into the model, a number of technical issues were found in the GIS source data, needed resolution in order to allow creation of a useable hydraulic model:

- Connectivity errors. These errors were most common, and were addressed either by revisiting the as-built data or through discussions with County staff.

- Incomplete data. Assumptions were made to complete the model database connectivity, pipe sizes, and elevations, where data was incomplete.

- Invert and pipe slope and size inconsistency. In many cases, GIS data indicates pipes with negative slopes. These pipes were adjusted to have positive slopes in the model. Negative slopes are generally mistakes in the GIS database, and likely do not represent actual negative slopes in the wastewater system pipes.

The model is comprised of a network of data elements called *nodes* and *links*. The *nodes* and *links* represent the components of a typical wastewater collection system.

- A *node* is a point in the network having an X and Y coordinate. *Nodes* can represent manholes, wet wells, chamber, or outfalls.

- *Links* convey flow between nodes. They are connected at one end to a *start node* and the other end to an *end node*. *Links* can represent gravity sewers, force mains or pumps.

3.3.1 Sewer Pipes and Manholes

The sewers to be modeled were identified by the County prior to the initiation of this project. They are generally defined as any sewer trunks tributary to and including the Highway 49 trunk downstream of all active lift stations. In general, the collection system upstream of lift stations was not included in the model.

3.3.2 Lift Stations

Lift stations were included within the model to facilitate the start/stop effects of the forcemains upon the downstream collection system. Note that the performance and the capacity of the lift stations were not assessed within this study.

The lift stations to be included in the model were identified by the County prior to the initiation of this project. The modeled lift stations include:

- Airport Lift Station
- Alpine Lift Station
- Auburn Ravine Lift Station
- Edgewood Lift Station
- Golf Course Lift Station
- Kemper Lift Station
- Saddleback Lift Station

ISCO Pumplink data was used as the basis for determining the actual discharge capacity of the forcemains. This data was provided by the County. However, it was identified that the Auburn Ravine Lift Station operates with a VFD with a peak capacity of 1200 gpm. This lift station was modeled as pressurized sewer. **Table 3-2** summarizes the parameters used within the model.

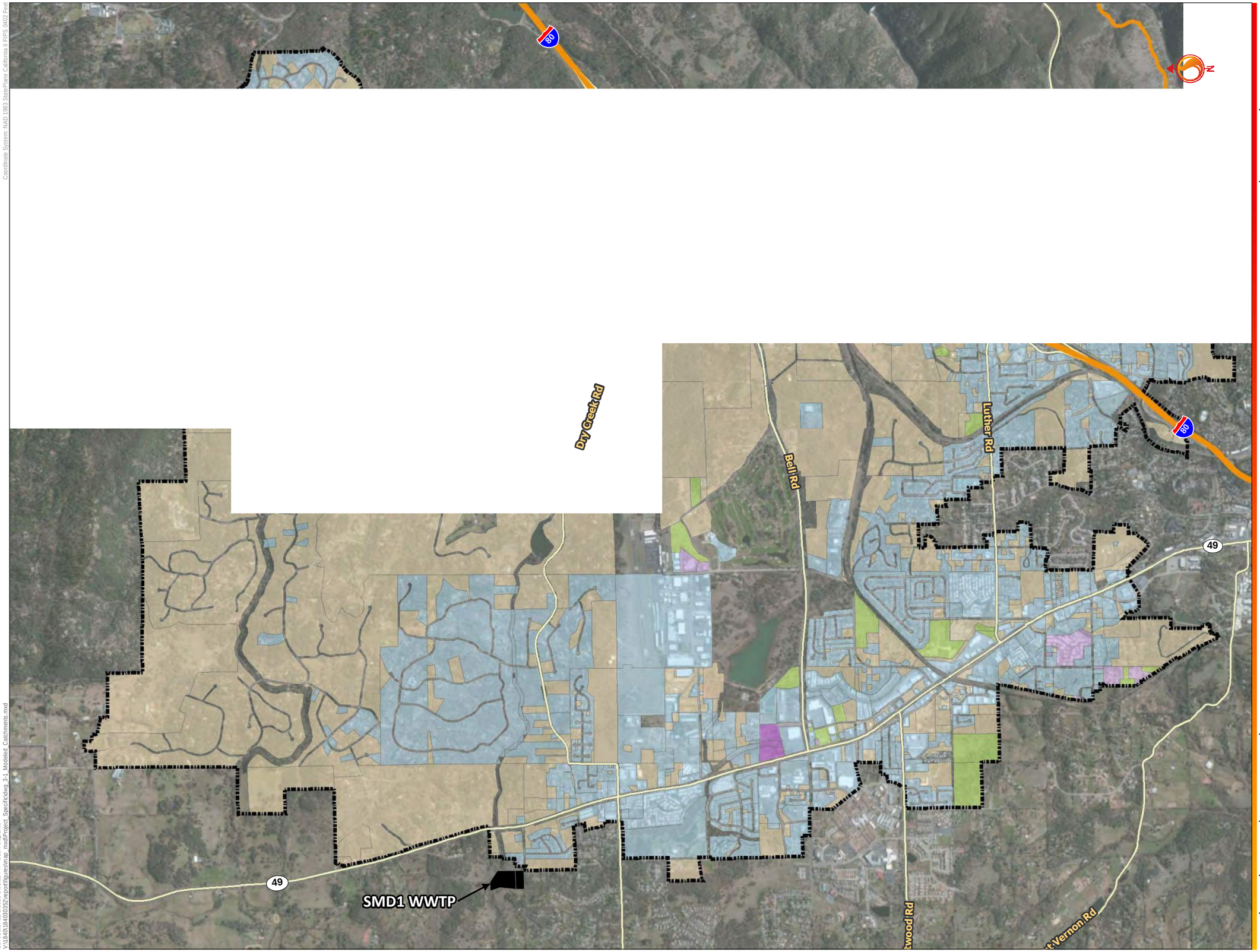
Table 3-2 Sewer Maintenance District 1 (SMD 1) – Highway 49 Trunk Lift Station Information

Lift Station	Model ID No.	Lead Pump Start Level (ft)	Lag Pump Start Level (ft)	Lead Pump Modeled Flow Rate (gpm)[(a)]	Lag Pump Modeled Flow Rate (gpm)[(a)]
Airport Lift Station	AD5-LS42	1446.4	1446.9	181	21
Alpine Lift Station	AB4-LS57	1341.0	1341.5	97	14
Edgewood Lift Station	AB4-LS20	1349.0	1350.0	299	125
Golf Course Lift Station	AE5-LS17	1467.0	1468.0	153	21
Kemper Lift Station	AC3-LS61	1382.5	1446.9	188	21
Saddleback Lift Station	AG4-LS38	1309.0	1309.5	179	21
Auburn Ravine Lift Station	Modeled as Pressurized Sewer				

(a) The flow rates listed are the modeled flow discharged from the modeled wet well after water level reaches the lead/lag START levels. The lag pump flow rate is additive to the lead pump flow rate.

3.3.3 Subcatchments

Subcatchments are used within hydrodynamic models to represent the combined land area and population that contribute to wastewater flows in a particular part of the system. Often these subcatchments are the areas upstream of a particular manhole, or lift station. The overall service area of the Highway 49 Trunk shown on **Figure 3-1** is made up of a number of subcatchments. The County provided the population and extents of the subcatchments for the Highway 49 Trunk within the landuse information provided in the file "SMD1ParcelsWithBasinAndLanduse_20130603.shp" discussed in section 2.3.



Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Hwy49 Buildout Boundary
- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- Full Buildout Catchments
- SMD1 WWTP

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Highway 49
Modeled Catchments

Project No. 184030352

Scale 0 0.2 0.4 0.6 Miles

Figure No. 3-1

Issue/Revision A/

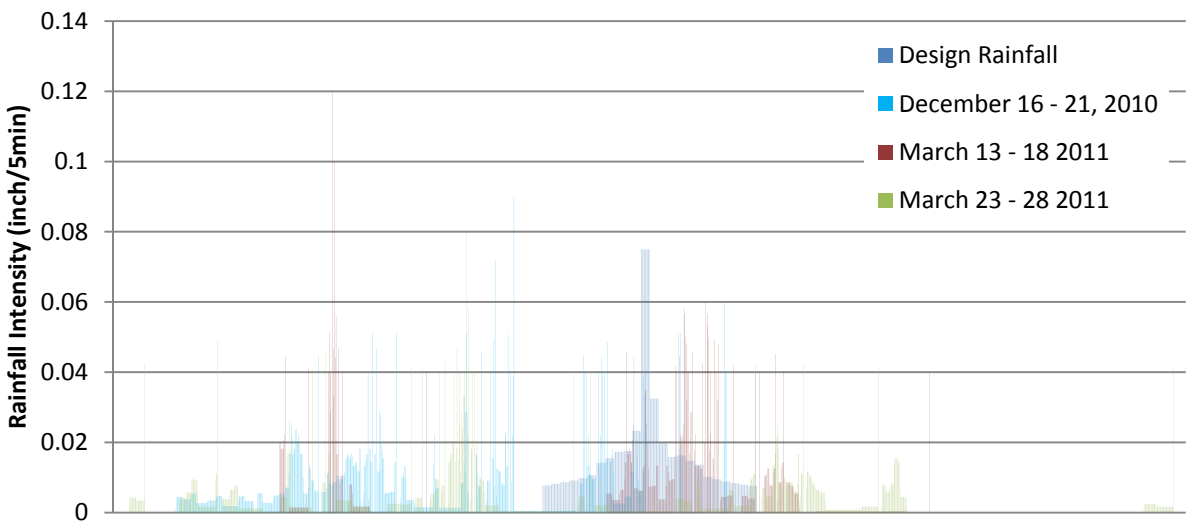
Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet
SaveDate: 12/6/2013 3:52:12 PM User: Niaplante
V:\1840\184030352\report\figures\map mxd\Project Specific\dwg 3-1 Modeled Catchments.mxd

3.3.4 Design Storms

Design storms are usually simulated in the hydraulic model to assess the capacity of the sewer system being studied under wet weather conditions. This is typically done with the goal of assessing potential risk of surcharging the system and experiencing SSOs. For the SMD 1 collection system, Placer County Facility Services directed the use of a 10-year, 24-hour design storm to assess the capacity of the wastewater collection system.

The procedure outlined in the "Placer County Flood Control and Water Conservation District Stormwater Management Manual" was used as the basis for creating the design storm. The design storm total rainfall over a 24 hour period at 1400 feet elevation was 4.59 inches, distributed such that the peak intensity (0.90 inches/hour) occurred at the mid-way point of the storm event (as prescribed in the Placer County Flood Control and Water Conservation District Stormwater Management Manual). The hyetographs from the 10-year, 24-hour theoretical design storm, as well as three other, representative storms that occurred in the area during 2010 – 2012 are shown in **Figure 3-2**. Further explanation of how these design storms are used in the modeling and capacity assessment is provided in the model calibration section of this chapter.

Figure 3-2 10-year, 24-hour Design Storm Hyetograph



3.4 MODEL CALIBRATION

The calibration process is required to ensure the accuracy of the model at predicting the system performance under varying flow conditions. Using the flow monitoring data provided, the model was calibrated using actual dry weather and wet weather conditions (both flow monitoring and precipitation data). The calibrated model was then used to assess system performance under design storm conditions.

3.4.1 Dry Weather Flow Calibration

To establish a baseline for the results, the model was calibrated to DWF conditions. It should be noted that the DWF will remain unaffected regardless of the amount of rainfall that occurs, and therefore is the most consistent metric available. The model was calibrated against sixteen (16) weeks of data collected from the Joeger Road WWTP Influent Flow Meter (June 12, 2011 through October 2, 2011) and against over three (3) weeks of data collected from the Dewitt Flow Meter (November 25, 2008 through December 20, 2008). A rainfall event occurred on June 28th that produced a WWF response within the network. As per County standards, the flow data gathered on June 28th and the following subsequent five (5) days were not considered for the DWF calibration.

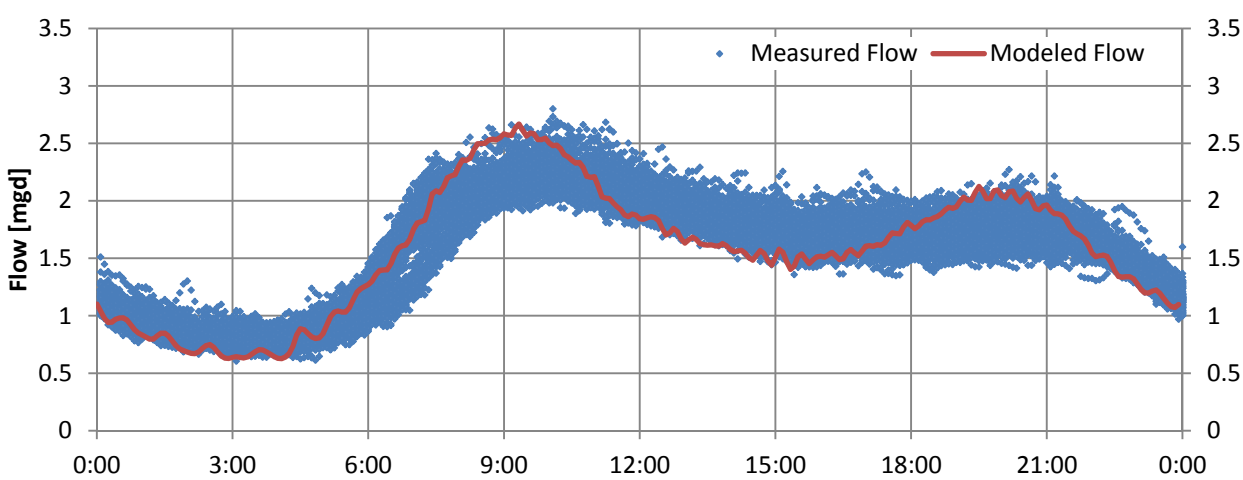
The process for calibration included the establishment of a DWF diurnal pattern. The values of the GWI, the ADWF and the DWF peaking factors (within the diurnal pattern) were adjusted based upon the calibration criteria. The accuracy of each calibration iteration was determined qualitatively by a visual inspection of the plots of measured and modeled flows and quantitatively through an analysis of the minimum, maximum, and average flows for the period. The comparison of these statistics is shown in **Table 3-3**.

Table 3-3 DWF Calibration Results

Calibration Results for WWTP Flows	Average DWF [mgd]	Peak DWF [mgd]	Minimum DWF [mgd]
Modeled Flow	**1.573**	**2.668**	**0.627**
Measured Flow	1.576	2.799	0.605
% Error	**-0.18%**	**-4.69%**	**3.61%**

Figure 3-3 shows the comparison of the "Measured" and "Modeled" DWF at the WWTP.

Figure 3-3 DWF Calibration Plot



3.4.2 Wet Weather Flow Calibration

The calibrated DWF model was used as the basis for expanding the model to include WWF. The four rainfall events established in Section 3.3.4 of this report were used for the calibration.

The Mike Urban software utilizes two sets of calculation engines to model the RDII response in the network during WWF. The RDII response is simulated through the use of the "RDI" and the "Model A" equations.

The "RDI" equations characterize how the network responds to the long duration infiltration of water into the network through seepage or cracks in the sewers (the slow response). The "Model A" equations characterize how the network responds to the direct inflow of water into the network through manholes, cross-connections, roof leaders or other openings (the fast response).

A summary of the WWF finalized calibration parameters used by Mike Urban is shown in **Table 3-4.**

Table 3-4 RDII Equation Parameters

Model A Parameters	
Impervious Area [%]	1.1
Reduction Factor [1/1]	0.7
Initial Loss [inch]	0.03
Time of Concentration [min]	120
RDI Parameters	
RDI Area [%]	14
Umax [inch]	2
Lmax [inch)	40
Cqof [1/1]	0.3
Carea [1/1]	1
Ck [h]	8
Ckif [h]	300
Ckbf [h]	500
Tof [1/1]	0
Tif [1/1]	0
Tg [1/1]	0
InitU [inch]	0
InitL [inch]	20
InitGwl [ft]	32.808
InitOf [in/h]	0
InitIf [in/h]	0
GwSy [1/1]	0.3
GwLmin [ft]	0
GWLbf0 [ft]	32.808
GWLfl1 [ft]	0

The WWF model results for the rain events were plotted against the flow monitoring data. **Figure 3-4** through **3-6** show the comparison of the "Measured" and "Modeled" WWF. Results are also summarized in **Table 3-5**.

Table 3-5 WWF Calibration Results

Calibration Results for WWTP Flows	Dec 16 – 21, 2010		Mar 13 – 18, 2011		March 23 – 28, 2011		Nov 28 – Dec 5, 2012	
	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]
Modeled Flow	9.55	24.66	10.69	21.73	10.33	27.73	11.32	28.99
Measured Flow	9.98	23.72	10.42	20.80	9.85	24.97	10.43	29.06
% Error	**(4.33%)**	**3.96**	**2.56%**	**4.48%**	**4.85%**	**11.02%**	**8.55%**	**(0.23%)**

Figure 3-4 December 16th – 21st, 2010 Calibration Results

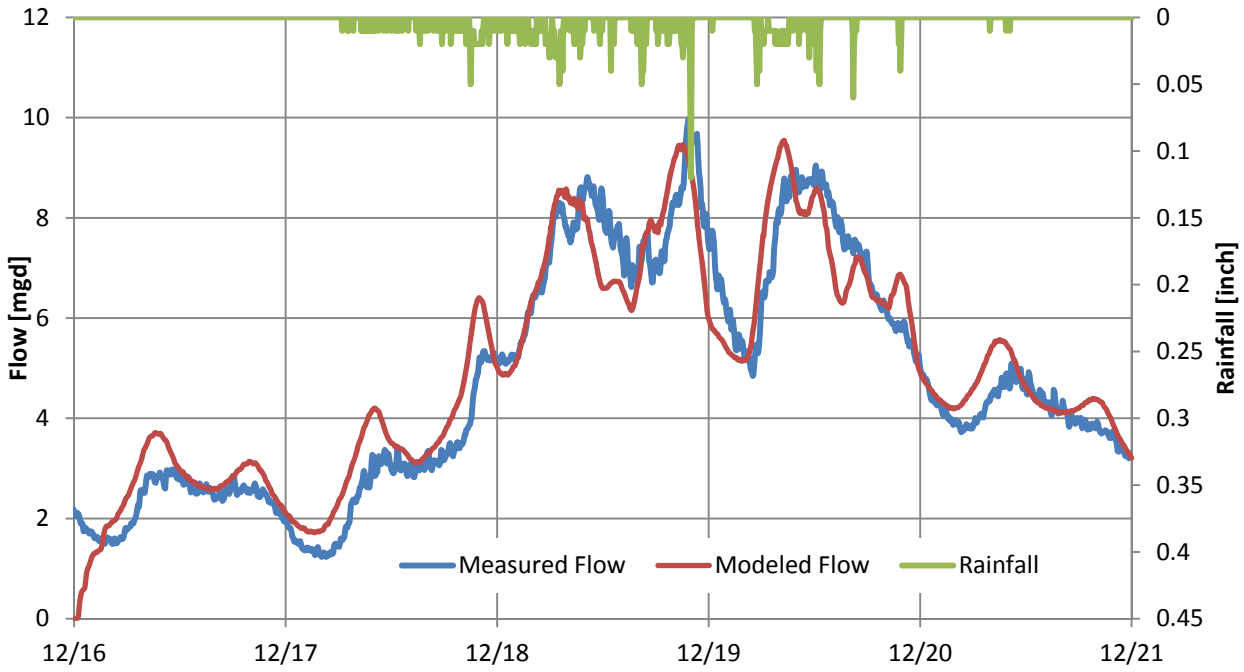


Figure 3-5 March 13th – 18th, 2011 Calibration Results

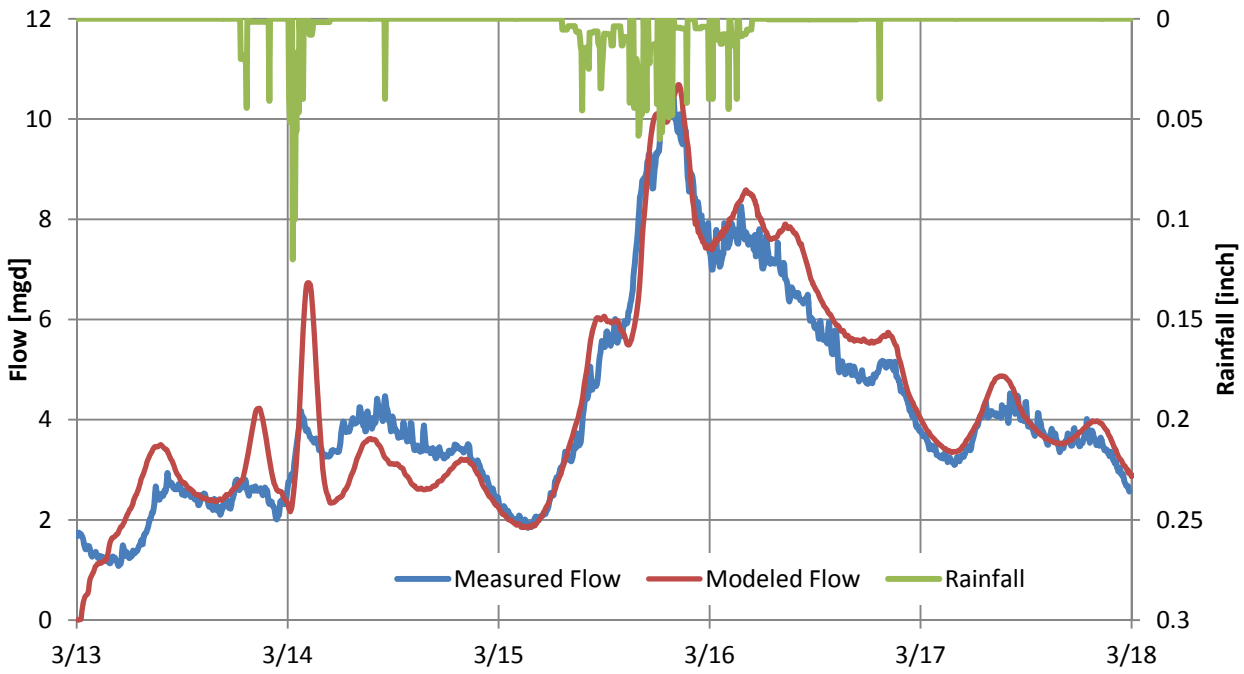


Figure 3-6 March 23rd – 28th, 2011 Calibration Results

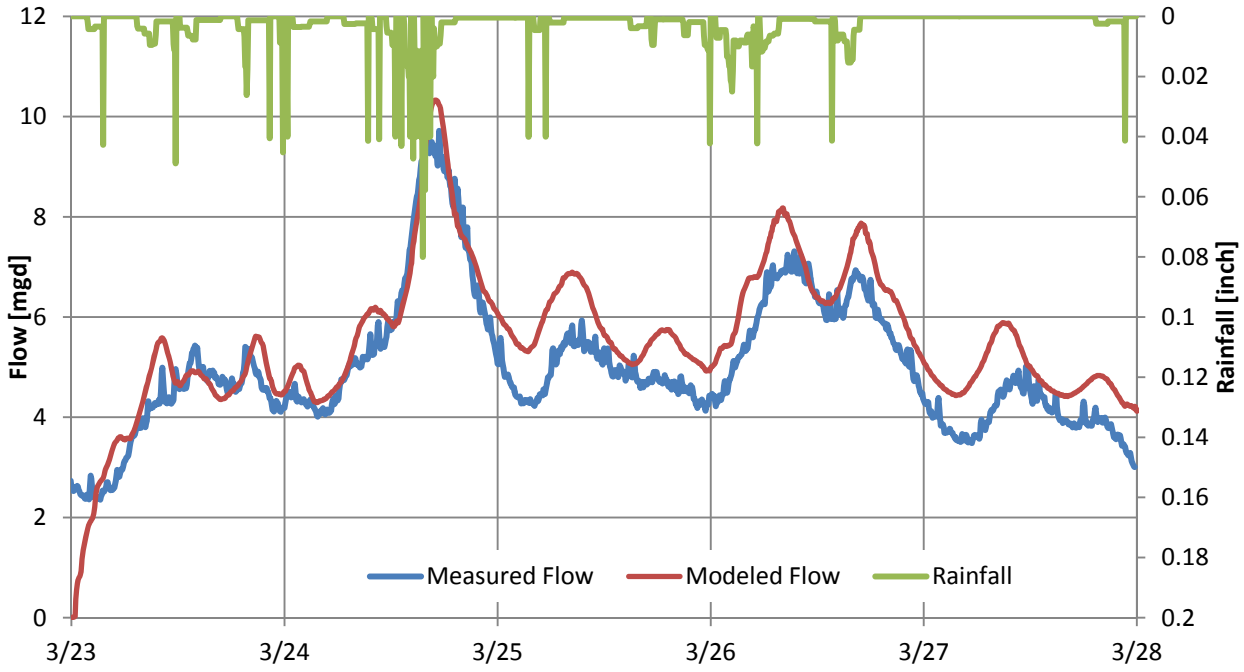
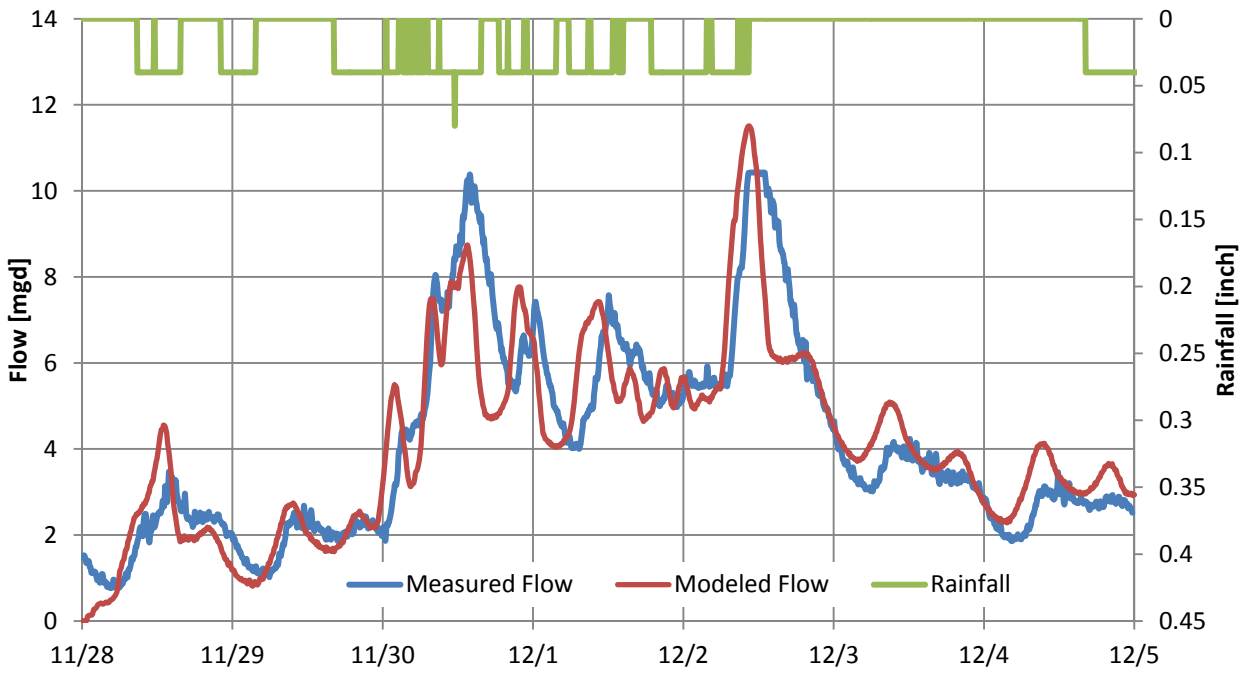


Figure 3-7 November 28th – December 5th, 2012 Calibration Results



4.0 Wastewater Collection System Capacity Evaluation

The DHI model described in Chapter 3.0 was exercised to evaluate performance of the Highway 49 trunk sewer under various scenarios.

4.1 PURPOSE

The purpose of this chapter is to provide a summary of the results of the level of service (LOS) performance of the Highway 49 Trunk Sewer applying the 1:10-year, 24-hour design storm design event upon the various growth scenarios.

This chapter is divided into the following sections:

- Recommended Capacity Evaluation Criteria
- Modeled Scenarios
- Model Results:
    - Existing System
    - Existing System + Entitled
    - Existing System + Entitled + Auburn Creekside Development
    - Build-out of System

4.2 RECOMMENDED CAPACITY EVALUATION CRITERIA

The design rainfall event was applied to the Mike Urban model to evaluate the LOS performance in meeting the following primary criteria, which were defined by Placer County Facility Services:

- Freeboard
- Velocity
- Pipe capacity

4.2.1 Level of Service Criteria

Freeboard in a manhole is defined as the distance between the rim elevation and the hydraulic grade line (HGL). The manhole is considered to be surcharged when the HGL exceeds the pipe crown.

For freeboard in existing manholes, there are two deficiency criteria for this analysis:

1. When the rim elevation is less than or equal to 8-feet above the pipe crown:

   a. No surcharging is allowed.
2. When the rim elevation is more than 8-feet above the pipe crown:
   a. A pipeline is hydraulically deficient if there is less than 8-feet of freeboard or the surcharging is equal to or greater than 1-foot above the pipe crown.

For new improvements to the Hwy 49 trunk system, no hydraulic surcharging is allowed in manholes.

4.2.2 Velocity

Gravity sewer shall allow a minimum flow velocity of 2.5 ft/s and a maximum of 7 ft/s. All sewers that have a velocity outside of these criteria shall be identified.

Force mains shall allow a minimum flow velocity of 2 ft/s and a maximum of 7 ft/s. All force mains that have a velocity outside of these criteria shall be identified.

4.2.3 Pipe Capacity

Sewer pipes shall conform to the following capacity criteria under design storm conditions, where d = depth of flow and D = pipe diameter.

- d/D shall be a maximum of 70% for pipe less than or equal to 24 inch
- d/D shall be a maximum of 100% for pipe greater than 24 inch

4.3 MODEL RESULTS

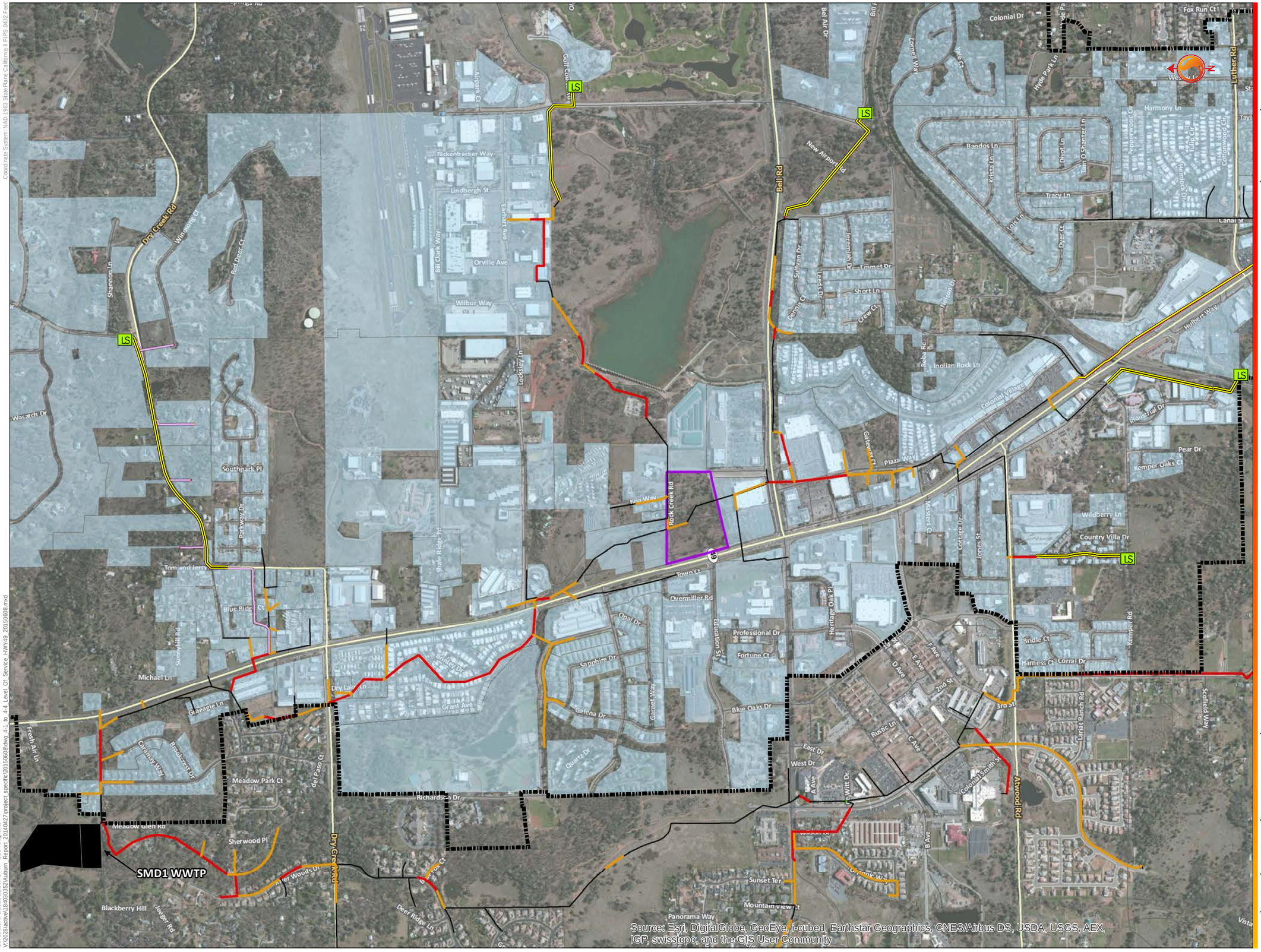
The average DWF and peak WWF model results for the Highway 49 trunk system are summarized in **Table 4-1** and described in more detail in the following sections.

Table 4-1 Design Event Flow Summary at Joeger Road WWTP

	Average DWF [mgd]	Peak DWF [mgd]	Peak WWF [mgd]
Existing Conditions	1.573	2.643	11.489
Existing + Entitled	1.690	2.784	11.534
Existing + Entitled + Auburn Creekside	1.699	2.798	11.609
Ultimate Build-out	3.986	6.358	13.684

4.3.1 Existing System – Design Storm Event

Under existing conditions, a 10-year, 24-hour design storm event is predicted to generate a peak flow of 11.3 mgd at the WWTP. This storm event is predicted to cause surcharging in several reaches along the Highway 49 Trunk sewer as well as in lateral sewers downstream of several of the lift stations. Model simulation results for the existing system during peak WWF conditions are presented in **Figure 4-1**, which indicate the following:



Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

Save date: 6/8/2015 12:56:42 PM User: bilapliante
V:\2028\active\184030352\Auburn_Report_20140427\project_specific\20150608\dwg_4-1_to_4-4_Level_Of_Service_HWY49_20150608.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Siphon
- Forcemain
- Low Pressure Sewer
- Existing Catchments
- Auburn Creekside Development Lands
- SMD1 WWTP
- Hwy49 Buildout Boundary
- LS Lift Stations

Note: Sewers identified as "Throttled with allowable freeboard" have surcharged as a result of a localized capacity restraint, though the degree of surcharging meet the County's design standard. Sewers identified as "Throttled without allowable freeboard" have surcharged as a result of a localized capacity restraint and do not meet the County's design standard.

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title
Existing
Level of Service
1:10 Year 24hr WWF

Project No. **184030352**

Scale 0 0.05 0.1 0.15 0.2 Miles

Figure No. **4-1**

Issue/Revision A/

- Sewers shown as black lines are not predicted to have capacity issues.
- Sewers shown in green are identified as sewers that are surcharged due to downstream conditions though have sufficient freeboard to meet the County's Level of Service (LOS) criteria.
- Sewers shown in blue are identified as sewers that are surcharged due to insufficient capacity though have sufficient freeboard to meet the County's LOS criteria.
- Sewers shown in orange and red are sewers that are surcharged to an extent such that they do not meet the County's LOS criteria, and are resultant from downstream conditions and insufficient capacity, respectively.

To help identify the extent of surcharging within the existing network, hydraulic grade line (HGL) profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Highway 49 Trunk. Note that these profiles also include the results for the other growth scenarios (Existing + Entitled, etc.), to be discussed in the following sections.

The following provides a summary of the Existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: severe surcharging in approximately 1600 ft of 15 inch and 18 inch sewer along Plaza Way, with expected surcharging to surface near Gateway Ct. The surcharging is a result of insufficient capacity.
- **Figure B-3**: minor surcharging (<1ft) in the first manhole upstream of the proposed Auburn Creekside development. The predicted HGL freeboard is greater than 8 ft and therefore meets the County's LOS criteria. There is also major surcharging shown near the downstream portion of Profile 2. This surcharging is a result of insufficient capacity, primarily in Profile 3.
- **Figure B-4**: severe surcharging along the Highway 49 sanitary sewer trunk starting approximately 400ft upstream of where it crosses under Hwy49 near Locksley Lane and ends near Rock Creek Circle, approximately 900ft upstream of Dry Creek Rd. In total, approximately 1050 linear feet of 24-inch sewer and 1500 linear feet of 21-inch sewer is affected. The surcharging is expected to result in a sanitary sewer overflow (surface flooding) near Hwy49.
- **Figure B-5**: minor surcharging (<1ft) along Highway 49 and Joeger road affecting 600 linear feet of 18-inch sewer and 400 linear feet of 21-inch sewer. The surcharging is expected to have just less than 8 feet of HGL freeboard, and therefore does not meet the County's Level of Service criteria.

4.3.2 Existing System + Entitled Developments – Design Storm Event

It is predicted that should every property that is currently entitled to wastewater service proceed through full development, a peak flow of 11.4 mgd will be experienced at the WWTP. This scenario is predicted to cause very minor amounts of surcharging over and above what was experienced for the Existing system analysis. Model simulation results for the existing system and entitled projects during peak WWF conditions are shown in **Figure 4-2**.

To help identify the extent of surcharging within the existing network when the known entitled developments are added, HGL profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Highway 49 Sanitary Sewer Trunk for this scenario.

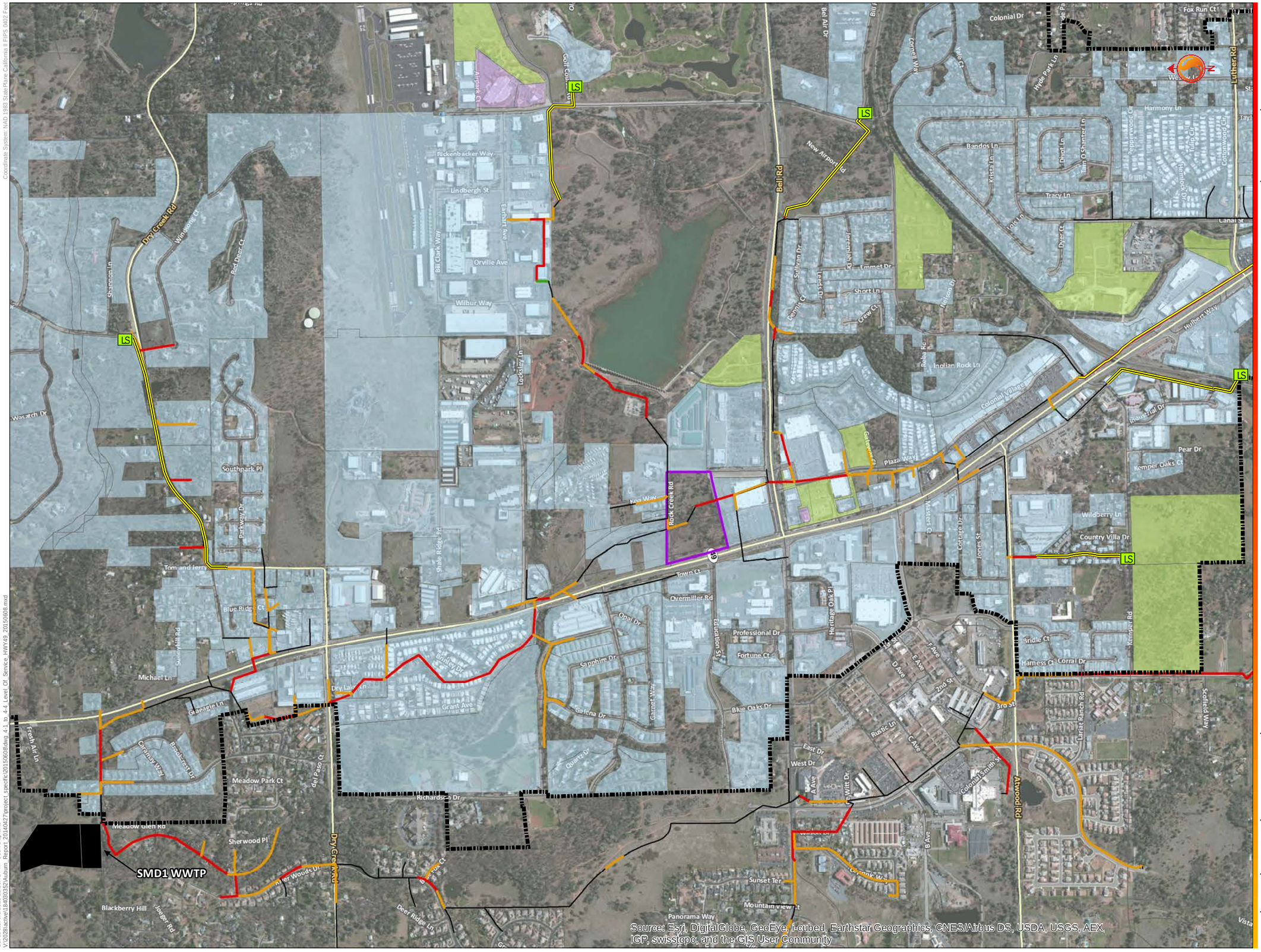
The following provides a summary of the existing system surcharging and corresponding HGL profiles for the Existing + Entitled scenario:

- **Figure B-2**: the severe surcharging identified in the Existing System results are expected to worsen slightly, affecting an additional 200 linear feet of 18-inch sewer at the upstream portion of Plaza way. This additional sewer surcharging is a result of the existing capacity restriction.

- **Figure B-3**: there are expected to be no additional sewers surcharged in this profile. The HGL of the surcharged sewers is expected to increase by a maximum of 0.2 feet with the inclusion of the entitled developments.

- **Figure B-4**: one additional manhole (AE3-05, two manholes upstream of Rock Creek Circle) is expected to overflow as a result of the increase in flows from the Entitled developments.

- **Figure B-5:** there are expected to be no additional sewers surcharged in this profile. The HGL of the surcharged sewers is expected to increase by a maximum of 0.1 feet with the inclusion of the entitled developments.



Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

Save date: 6/8/2015 12:56:42 PM User: bilapliante
V:\2028\active\184030352\Auburn_Report_20140427\project_specific\20150608\dwg_4-1_to_4-4_Level_Of_Service_HWY49_20150608.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Siphon
- Forcemain

Scenario

- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- SMD1 WWTP
- Hwy49 Buildout Boundary
- LS Lift Stations

Note: Sewers identified as "Throttled with allowable freeboard" have surcharged as a result of a localized capacity restraint, though the degree of surcharging meet the County's design standard. Sewers identified as "Throttled without allowable freeboard" have surcharged as a result of a localized capacity restraint and do not meet the County's design standard.

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title
Existing + Entitled
Level of Service
1:10 Year 24hr WWF

Project No. **184030352**

Scale 0 0.05 0.1 0.15 0.2 Miles

Figure No. **4-2**

Issue/Revision A/

4.3.3 Existing System + Entitled Developments + Auburn Creekside – Design Storm Event

As part of the development, Auburn Creekside has agreed to install improvements to the Highway 49 Trunk sewer within their parcel. At the time of the analysis and publication of earlier drafts of this report, Auburn Creekside proposed a pipe alignment through the center of their parcel similar to the existing alignment, upsized to 24-inch diameter as required by the Placer County Code Section 13.12.230. According to the County, Projects are required to construct a sewer collection system along the entire frontage of their parcel. To meet the County Code, improvement of the existing 18-inch in the form of upsizing to a 24-inch diameter pipe was considered sufficient at the time of this analysis. It was also consistent with the agreed upon scope of the sewer study the County required of the Auburn Creekside development. The evaluation of the Auburn Creekside project indicated no significant impacts to the Highway 49 trunk sewer would result from the projects construction and operation.

Since that time, Auburn Creekside and the County have come to an agreement upon an alternative alignment that would consist of a 24-inch sewer that would divert flow around the Target building through the Auburn Creekside parcel closer to Highway 49. This alignment is discussed in more detail in Section 5.4.1. Please note that the results presented within this section are based upon the information that was available at the time of the analysis, which included improvements along the proposed alignment at that time (upsizing of the existing 18-inch sewer).

For this scenario, it is predicted that the WWTP will experience a peak flow of 11.425. The inclusion of the Auburn Creekside development is not predicted to cause any additional sewer segments to become surcharged; rather, the additional loading will cause the existing surcharging to worsen trivially. Model simulation results for this scenario during peak WWF conditions are shown in **Figure 4-3**. The relative contribution to this additional surcharging is small given the number of EDUs included in the Auburn Creekside development.

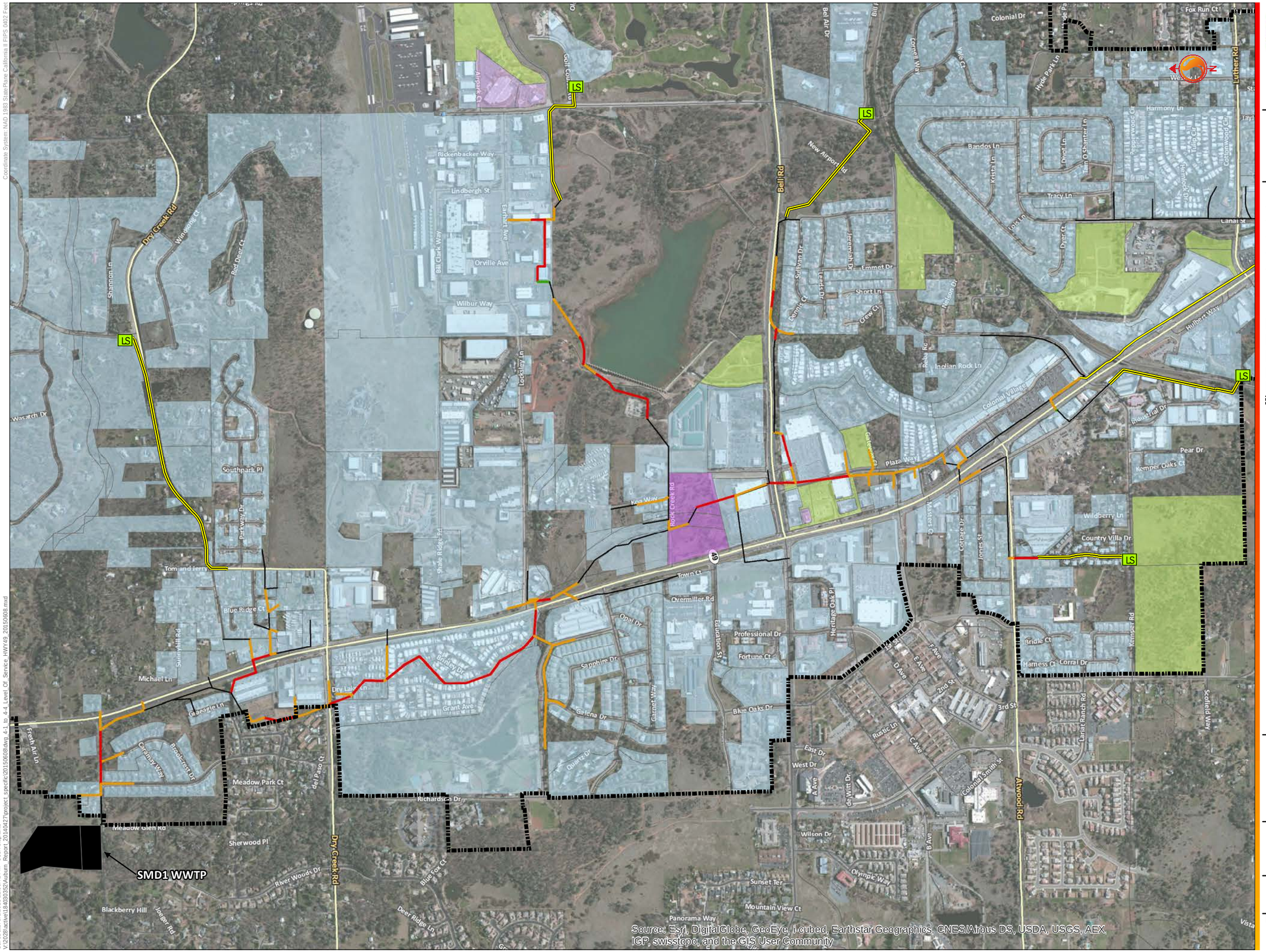
To help identify the extent of surcharging within the existing network, HGL profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Highway 49 Sanitary Sewer Trunk for this scenario.

The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: there are expected to be no additional sewers surcharged in this profile. The HGL of the surcharged sewers is expected to increase by a maximum of 0.1 feet with the inclusion of the Auburn Creekside development respective to the "Existing + Entitled scenario".

- **Figure B-3**: there are expected to be no additional sewers surcharged in this profile. The HGL of the surcharged sewers is expected to increase by a maximum of 0.1 feet with the inclusion of the Auburn Creekside development respective to the "Existing + Entitled scenario".

- **Figure B-4**: there are expected to be no additional sewers surcharged in this profile. The HGL of the surcharged sewers is expected to increase by a maximum of 0.1 feet with the inclusion of the Auburn Creekside development respective to the "Existing + Entitled scenario".



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, IGP, swisstopo, and the GIS User Community

Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

SaveDate: 6/8/2015 12:56:42 PM User: blaplante
V:\2028\active\184030352\Auburn_Report_20140427\project_specific\20150608\dwg_4-1_to_4-4_Level_Of_Service_HWY49_20150608.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Siphon
- Forcemain

Scenario

- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- SMD1 WWTP
- Hwy49 Buildout Boundary
- LS Lift Stations

Note: Sewers identified as "Throttled with allowable freeboard" have surcharged as a result of a localized capacity restraint, though the degree of surcharging meet the County's design standard. Sewers identified as "Throttled without allowable freeboard" have surcharged as a result of a localized capacity restraint and do not meet the County's design standard.

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Existing + Entitled + Auburn
Level of Service
1:10 Year 24hr WWF

Project No. **184030352**

Scale 0 0.05 0.1 0.15 0.2 Miles

Figure No. **4-3**

Issue/Revision A/

- **Figure B-5**: there are expected to be no additional sewers surcharged in this profile. The HGL of the surcharged sewers is expected to increase by a maximum of 0.1 feet with the inclusion of the Auburn Creekside development respective to the "Existing + Entitled scenario".

4.3.4 Full Build-out

Similarly to the "Existing + Entitled + Auburn Creekside" scenario, this scenario was developed using the alignment through the Auburn Creekside property proposed at the time of the analysis. It is predicted that the WWTP will experience a peak flow of 13.3 mgd for this growth scenario under design storm conditions with no improvement made to the collection system. If improvements are made to the collection system to address deficiencies described herein and no reduction in infiltration and inflow is achieved, the model predicts the WWTP will experience peak flows of approximately 18 to 19 mgd under design storm conditions. The inclusion of all potential catchments using the County's land use projects is predicted to cause system wide capacity constraints and deficiencies. Model simulation results for this scenario during peak WWF conditions are shown in **Figure 4-4**.

It should be noted that during the modeling process, it was discovered that the existing lift stations are expected to be extremely under capacity for this scenario. As the purpose of this study is to assess the impact of the Auburn Creekside development upon the Highway 49 Trunk Sewer, it was assumed that the capacities of all of the lift stations were increased and all pumps outfitted with VFDs. This approach avoids any potential underestimate of peak flow and capacity needs downstream of the lift stations while avoiding speculation regarding how the County intends to address these lift station capacity issues. This is an area of the collection system which the County may wish to study further.

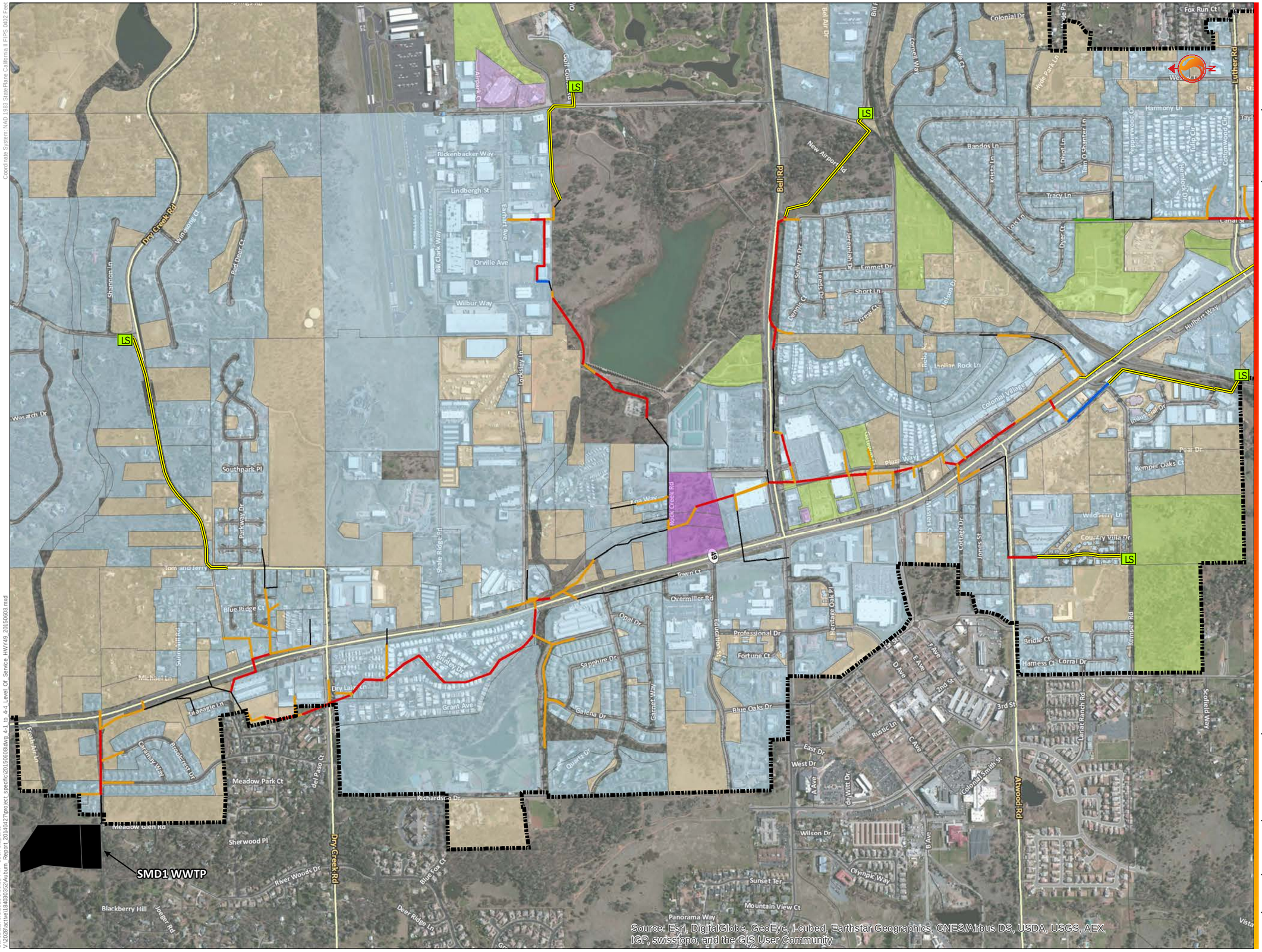
How the County chooses to address system deficiencies could affect the ultimate peak flow predicted at the WWTP. For example, if more system storage is provided, peak flow seen at the WWTP could potentially be lower than predicted here. It is Stantec's understanding that system storage in the form of surcharging is not considered by the County a viable option at this time.

To help identify the extent of surcharging within the existing network, HGL profiles have been included in **Appendix B**, which show the peak surcharge elevation along the Highway 49 Sanitary Sewer Trunk for this scenario.

The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: surcharging, reaching to surface at several manholes primarily along Plaza Way, is expected to occur along the entire length of this profile. The surcharging is primarily due to a severe capacity restraint along Plaza Way.

- **Figure B-3:** moderate surcharging (<3 feet) in the first manhole upstream of the proposed Auburn Creekside development. The predicted surcharging is greater than 1 feet and therefore does not meet the County's LOS criteria. Furthermore, all surcharging near Hwy 49 is expected to worsen, with surcharging to surface expected to occur. This is a result of a capacity constraint within the 24-inch sewer that is also present downstream beyond Dry Creek Road (shown in Figure B-4).



Coordinate System: NAD 1983 StatePlane California I FIPS 0402 Feet

SaveDate: 6/8/2015 3:33:51 PM User: blaplante
V:\2028\active\184030352\Auburn_Report_20140427\project_specific\20150608\dwg\ 4-1_to_4-4 Level Of Service_HWY49_20150608.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Siphon
- Forcemain

Scenario

- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- Full Buildout Catchments
- SMD1 WWTP
- Hwy49 Buildout Boundary
- LS Lift Stations

Note: Sewers identified as "Throttled with allowable freeboard" have surcharged as a result of a localized capacity restraint, though the degree of surcharging meet the County's design standard. Sewers identified as "Throttled without allowable freeboard" have surcharged as a result of a localized capacity restraint and do not meet the County's design standard.

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title
Full Build-out
Level of Service
1:10 Year 24hr WWF

Project No. **184030352**

Scale 0 0.05 0.1 0.15 0.2 Miles

Figure No. **4-4**

Issue/Revision A/

- **Figure B-4**: severe surcharging is expected to occur along the entire 3100 linear feet profile. The surcharging is a result of highly insufficient capacity to handle the additional build-out flows.

- **Figure B-5**: moderate surcharging is expected to occur in approximately 650 linear feet of 24-inch sewer downstream of Dry Creek Road. This surcharging has a freeboard of less than 8 feet and therefore does not meet the County's LOS criteria. Furthermore, the surcharging that was identified under the Existing System conditions near Joeger Road is predicted to worsen. Approximately 1000 linear feet of sewer is expected to be surcharged along Hwy 49 and Joeger Road, just upstream (and east) of the SMD 1 WWTP.

5.0 Recommended Capital Improvement Projects

5.1 PURPOSE

The purpose of this chapter is to provide recommendations for capital improvements along the Highway 49 wastewater trunk sewer to provide sufficient capacity to eliminate all occurrences of surcharging that were predicted to occur during a 10-year, 24-hour design storm event. It is anticipated that the County will review and incorporate the recommended capital improvements into a Capital Improvement Plan (CIP) unless the County chooses to evaluate alternate servicing options not limited to upsizing of existing sections of trunk sewer. The scope of this study is limited to upsizing options. No alternative trunk alignments (parallel or otherwise) or pumping options have been considered. The model results for the ultimate build-out system during a 10-year, 24-hour storm event, detailed in Chapter 4, have been used as the basis for these capital improvement recommendations.

The *Highway 49 Trunk Sewer Capacity Evaluation Report* includes suggestions for the County to consider prior to implementing the recommended Highway 49 Trunk improvements predicted to be necessary to accommodate full build-out. The improvements described in the following sections represent only one of the possible alternatives to conveying flows from existing and future developments.

5.2 RECOMMENDED IMPROVEMENT TO EXISTING TRUNK SYSTEM TO ACCOMMODATE EXISTING AND NEAR-TERM (EXISTING + ENTITLED, EXISTING + ENTITLED + AUBURN CREEKSIDE) DEFICIENCIES

The results of the existing system, existing system + entitled development, and the existing system + entitled + Auburn Creekside development are the basis for the recommendation of upgrades to the existing Highway 49 trunk sewer presented in this section. Note that the results indicate throttling of the peak flow, and that upgrades to only the surcharged sewer may result in surcharging in sewers previously unaffected. Therefore, an upgrade scenario was modeled to identify all sewers along the Highway 49 trunk that require upgrades to produce a result that does not exceed the County's LOS criteria. A summary of the findings is presented in **Table 5-1**.

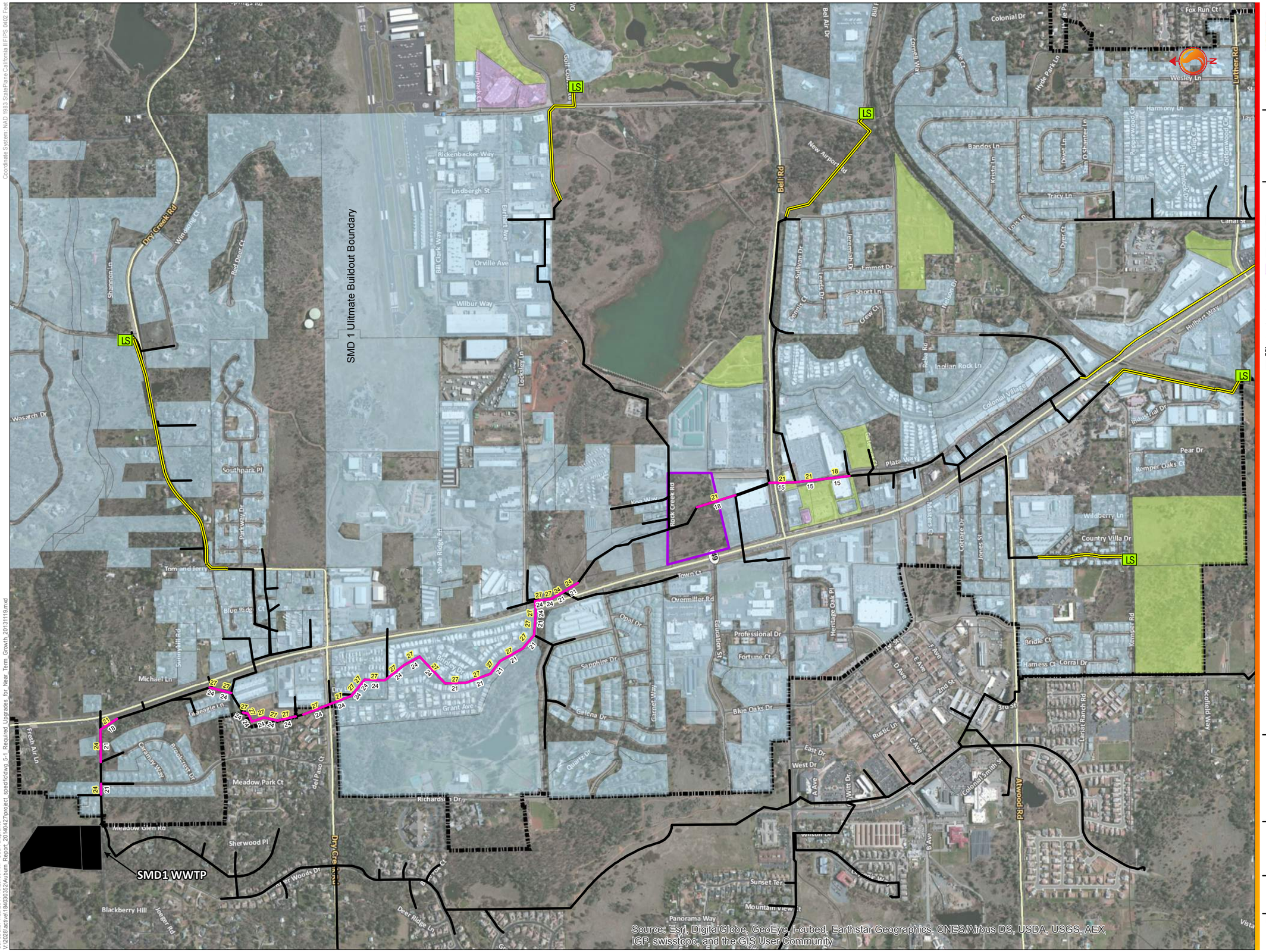
Table 5-1 Recommended Sewer Upgrades For Near-Term Developments

Pipe Segment		Existing Diameter, inches	Length of Sewer Upgrades, linear feet	Sizing for Existing System, inches (a)	Sizing for Existing + Entitled, inches	Sizing for Existing + Entitled + Auburn Creekside, inches
Upstream MH ID	Downstream MH ID					
AD4-04	AD4-03	15	298	18	18	18
AD4-03	AD4-01	15	634	21	21	21
AD3-03	AD3-02	18	466	21	21	21
AD3-13	AE3-11	21	311	24	24	24
AE3-10	AE3-02	21	1819	27	27	27
AE3-02	AF3-09	24	1985	27	27	27
AF3-81	AF3-07	24	689	27	27	27
AF3-06	AF3-04	24	257	27	27	27
AG3-04	AG3-03	18	230	27	27	27
AG3-03	AG3-02	21	375	27	27	27
AG3-14	AG3-01	21	126	27	27	27
AG2-26	AG2-25	30	52	36	36	36

(a) Sizing for Existing System represents the sewer sizing (diameter) required to accommodate existing wastewater flows with no deficiency predicted by the model simulation(s), while maintaining the County requirement that no sewer installed downstream shall be of smaller diameter than sewer installed upstream.

Figure 5-1 shows, in plan view, the sewers that are recommended to be upgraded for the near-term growth scenarios.

Figures B-6 through **B-9** in Appendix B show the impact of the improvements upon the existing system as HGL profiles. **Figures B-10** through **B-13** show the impact of the improvements upon the existing system with entitled projects. **Figure B-1** in Appendix B provides a keyplan for the specified profiles.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/28/2014 10:23:30 AM User: blaplante
V:\2028\active\184030352\Auburn_Report_20140427\project_specific\dwg_5-1_Required_Upgrades_for_Near_Term_Growth_20131119.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Scenario

- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- Siphon
- Forcemain
- Existing Required Upgrades
- Existing System
- Near Term Required Upgrades
- Hwy49 Buildout Boundary
- SMD1 WWTP

LS Lift Stations

27 Recommended Upgrade Diameter

24 Existing Pipe Diameter

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Highway 49 Required Upgrades For Existing, Entitled and Auburn Creekside Developments

Project No. 184030352

Scale 0 0.05 0.1 0.15 0.2 Miles

Figure No. 5-1

Issue/Revision A/

5.3 RECOMMENDED IMPROVEMENTS TO EXISTING TRUNK SYSTEM TO ACCOMMODATE ULTIMATE BUILD-OUT OF SYSTEM

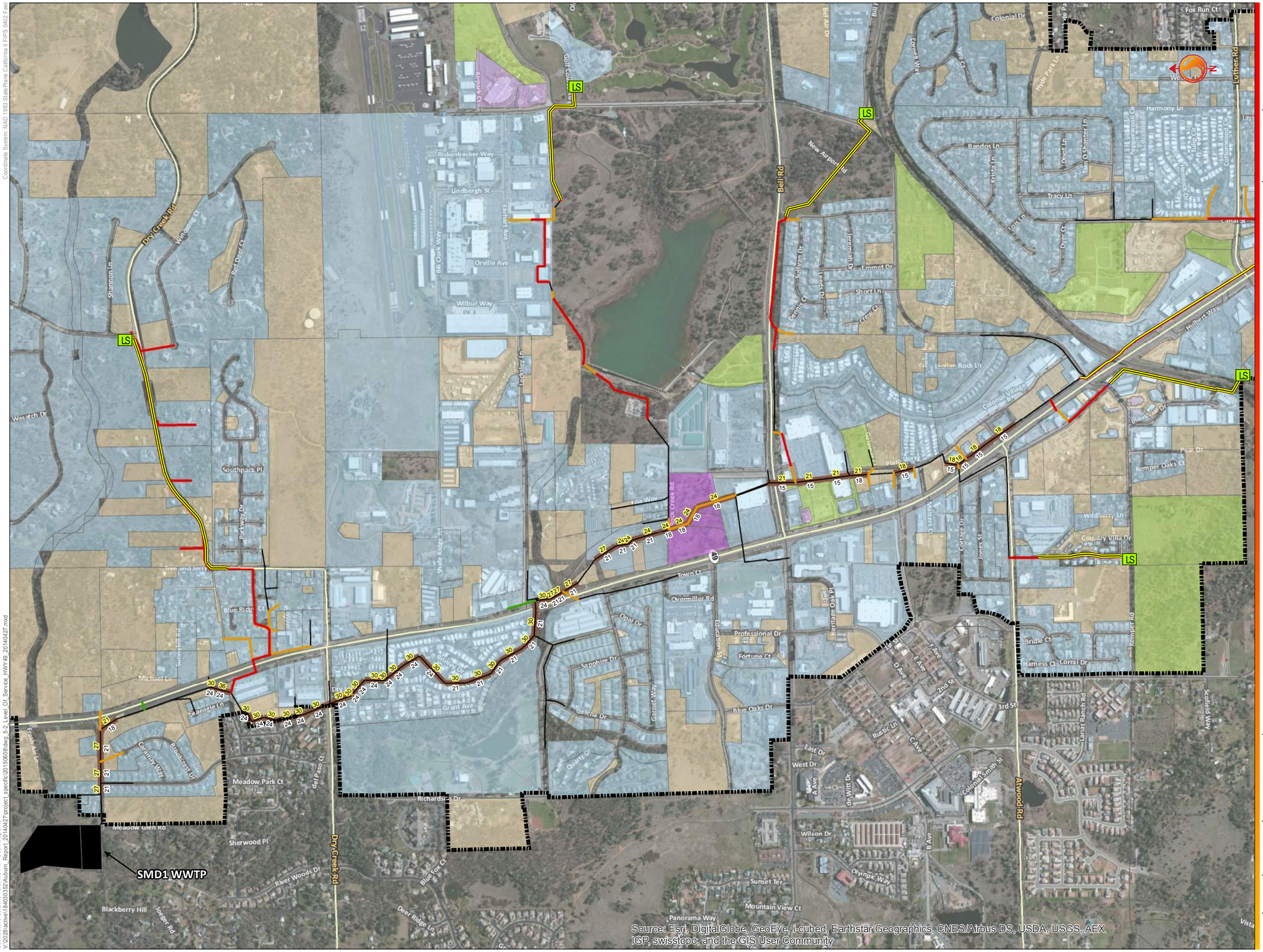
The results of the ultimate build-out analysis were the basis for the recommendation of upgrades to the existing Highway 49 trunk sewer. Note that the results indicate significant throttling of the peak flow, and that upgrades to only the surcharged sewer may result in surcharging in sewers previously unaffected. Therefore, an upgrade scenario was modeled to identify all sewers along the Highway 49 trunk that require upgrades. A summary of the findings is presented in **Table 5-2**. Note that there are pipe size differences between **Table 5-2** and **Table 5-1** which represent different spans requiring different pipe sizes to accommodate differing hydraulic conditions. Appendix D provides a combined version of Tables 5-1 and 5-2.

Table 5-2 Recommended Sewer Upgrades For Full-Buildout

Pipe Segment		Existing Diameter, inches	Length of Sewer Upgrades, linear feet	Sizing for Full Build-out, inches
Upstream MH ID	Downstream MH ID			
AD4-30	AD4-53	15	966	18
AD4-07	AD4-06	15	240	18
AD4-05	AD4-04	18	216	21
AD4-04	AD4-01	15	932	21
AD3-03	AE3-18	18	1003	24
AE3-15	AE3-10	21	979	27
AE3-10	AE3-08	24	307	30
AE3-08	AE3-02	21	1513	30
AE3-02	AF3-04	24	3286	30
AG3-04	AG3-03	18	230	30
AG3-03	AG3-01	21	750	30
AG2-26	AG2-25	30	52	36

Figure 5-2 shows the results of the capacity assessment post-completion of the capital improvements and identify in plan view the sewers that are recommended to be upgraded.

Figures B-14 through **B-17** in Appendix B show the impact of the improvements as HGL profiles. **Figure B-1** in Appendix B provides a keyplan for the specified profiles.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 6/25/2015 12:30:33 PM User: blaplante
V:\2028\active\184030352\Auburn_Report\20140427\project_specific\20150608\dwg_5-2_Level_Of_Service_HWY49_20140427.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Siphon
- Forcemain
- Recommended Sewers to Upgrade

Scenario

- Existing Catchments
- Existing Catchments w/ Entitled
- Entitled Catchments
- Auburn Creekside Development Lands
- Full Buildout Catchments
- SMD1 WWTP
- Hwy49 Buildout Boundary
- 27 Recommended Upgrade Diameter
- 24 Existing Pipe Diameter

Note: The existing pipe alignment across the Auburn Creekside project will remain in place for the foreseeable future until a connection is made to the new 24-inch pipe to be constructed across the project frontage. That new frontage alignment and proposed future connection across the Target project is shown in Figure C-1, Appendix C of this report. The purpose for showing the existing pipe alignment upsized is to allow an evaluation of the necessary downstream upsizing (and possible reduced upstream backwatering) when a new connection is ultimately made across the Target parking lot.

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title
Full Build-out With Upgrades
Level of Service
1:10 Year 24hr WWF

Project No.
184030352

Scale
0 0.05 0.1 0.15 0.2 Miles

Figure No.
5-2

Issue/Revision
A/

It should be noted that, recommendations for lift stations, etc. were not included in the scope of this evaluation. As discussed in Section 4.3.4, many of the lift stations were identified as potentially having insufficient capacity. It is recommended that the capacity of the lift stations be assessed to supplement this trunk evaluation.

As discussed in the preceding sections, reducing the throttling of flow in the Highway 49 trunk sewer will increase the peak flow in the system. Accordingly, it is recommended that the capacity of the WWTP and the proposed Regional Sewer Project pump station to be located there be reviewed, and upgrades to proceed as required. To assist with the planning, **Table 5-3** provides a summary of the ADWF, PDWF and PWWF that the WWTP is predicted to experience before and after the system upgrades.

Table 5-3 WWTP Flow Summary - Build-out Conditions Pre/Post Capital Improvements

	Average DWF [mgd]	Peak DWF [mgd]	Peak WWF [mgd]
Ultimate Build-out	3.986	6.358	13.684
Ultimate Build-out With Capital Improvements	3.986	6.358	18.719

5.4 AUBURN CREEKSIDE PROJECT SPECIFIC IMPACTS TO HIGHWAY 49 TRUNK

Based on the information presented in Chapter 4 of this report and in the *Highway 49 Trunk Sewer Capacity Evaluation Report* (December 2013, Stantec), the impact of the proposed Auburn Creekside project on the Highway 49 Trunk is minimal. Analysis of the results of model simulations suggests that the upsizing necessary to address existing deficiencies would also be sufficient to provide capacity for wastewater generated by the Auburn Creekside project.

Analysis of the results of the Existing + Entitled Developments + Auburn Creekside simulations reveal that upsizing necessary to accommodate proposed development on the Highway 49 Trunk would also be sufficient to provide capacity for the Auburn Creekside project. Chapter 4 of this report identifies limited impacts (0.1 to 0.2 feet increase in select HGLs) resulting from addition of the Auburn Creekside project.

It is Stantec's understanding that Placer County Facility Services wishes to address relative impacts of projects connecting to the Highway 49 Trunk in the context of the trunk sizing suggested by the *Highway 49 Trunk Sewer Capacity Evaluation Report* necessary to accommodate full build-out of the SMD 1 service area. As such, it would appear that impact of the Auburn Creekside on the Highway 49 Trunk could be expressed as the proportional share of the project of the cost of trunk upsizing necessary downstream of the project to provide capacity for full service area buildout.

This leads to the conclusion that the Auburn Creekside "share" of these improvements can be described as the pipe upsizing necessary to bring the downstream trunk diameters with Sizing for Existing System presented in Table 5-1 up to the diameter identified in Table 5-2. For example, the pipe segment AD3-03 through AE3-18 shows that the existing system requires an 18-in sewer (Table 5-1) and the ultimate build-out requires a 24-in sewer (Table 5-2). The incremental cost to buy and install a 21-in pipe segment

versus a 24-in pipe segment would be added towards the total costs of building the other segments and then divided up by Auburn Creekside and other future projects. If the proposed Auburn Creekside project representing 32 EDUs of needed capacity is compared to the total number of future build-out EDUs utilizing capacity in the various trunk segments downstream, a percentage of the expected cost for those improvements can be estimated. That estimate would be based on the share of 32 out of 7,646 future EDUs (7,646 = 14,059 (Table 2-2) – 6,413 (Table 2-1)), or 0.4% of the cost of build-out improvements downstream of the project site.

Table 5-4 summarizes the relative share of the capacity increase recommended in Table 5-2 attributable to the Auburn Creekside project.

Table 5-4 Relative Growth Increase

	Total Acreage (Acres)	Total Population (EDUs)	Relative Increase in Growth (EDUs)	% of Total Growth
Highway 49 Existing Developments	2,740	6,413	-	-
Entitled Projects Only	150	412	412	5.4
Auburn Creekside Only	14	32	32	0.4
Full Build-out (Highway 49 Developments Only)	10,361	14,059	7,646	100

5.4.1 Auburn Creekside Frontage Improvements

As discussed within Section 4.3.3, Auburn Creekside and the County have (subsequent to the time of this analysis) agreed upon an alignment for trunk sewer frontage improvements that would accommodate sewer flows through the Auburn Creekside property. A plan-view alignment has been drafted by Morton & Pitallo and included within Appendix C.

The agreed-upon alignment would consist of a 24-inch sewer that would connect to manhole AD4-01 (south of Target) and divert flow to the north along the west side of the Target and Auburn Creekside properties, and to reconnect to the existing Highway 49 Trunk sewer at Rock Creek Road. As per the requirements of the County, the Auburn Creekside development will include the construction of the 24-inch sewer within the Auburn Creekside property, and will remain capped at the upstream side until such time that the 24-inch diversion in the Target property is constructed. Until such time, the existing 18-inch sewer within the Auburn Creekside property will continue to convey flow from upstream sewersheds.

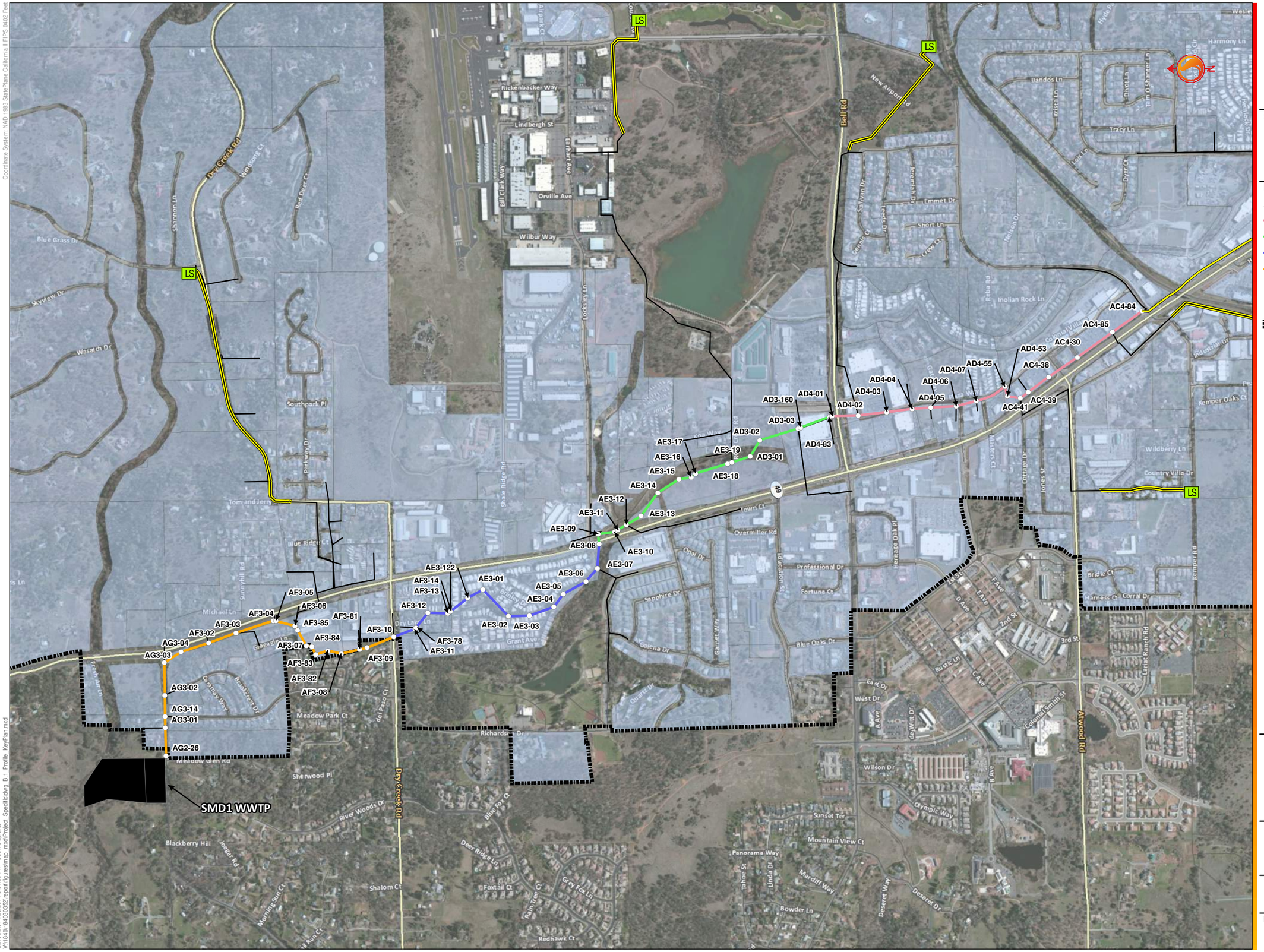
Appendix A Highway 49 Entitled Projects

Note that all APNs which contribute to existing flow in the Highway 49 sewershed are provided on a CD that is attached to the back cover of the original hard copies of this report provided to Placer County staff.

Pt No.	Northing	Easting	Rim Elevation	Invert Elevation	Description
50101	2106345.049	6819125.433	1373.7	1353.85	AD4-01
50102	2106374.199	6819113.323	1368.81	-	AD4-83
50103	2106376.291	6819106.782	1369.31	-	AD4-84
50104	2106789.983	6818978.393	1368.41	1349.96	AD3-160
50105	2106797.262	6818983.304	1368.33	1351.75	AD3-03
50106	2107193.799	6818859.038	1357.08	1349.65	AD3-02
50107	2107299.918	6818675.596	1352.43	1344.16	AD3-01
50110	2107934.86	6818482.381	1346.29	1337.27	AE3-17
50111	2107986.277	6818447.027	1342.82	1335.54	AE3-16
50112	2108131.866	6818408.308	1340.78	1333.57	AE3-15
50113	2108383.666	6818247.396	1338.94	1332.94	AE3-14
50114	2108573.804	6817974.236	1336.9	1329.20	AE3-13 x w rim
50115	2108745.234	6817870.398	1335.68	1326.88	AE3-12
50116	2108836.14	6817814.286	1332.54	1324.015	AE3-11
50117	2108879.334	6817790.425	1331.47	1323.495	AE3-10
50118	2109067.086	6817746.555	1333.6	1323.36	AE3-09
50119	2109067.717	6817603.754	1328.71	1322.97	AE3-08
50122	2109098.698	6817375.547	1329.22	1322.74	AE3-07
50123	2109241.08	6817239.892	1328.9	1322.45	AE3-06
50128	2111148.423	6816736.791	1324.79	1318.81	AF3-78
50130	2111458.26	6816541.814	1322.58	1318.26	AF3-10
50133	2111765.647	6816435.501	1322.42	1317.63	AF3-09
50134	2111839.497	6816420.441	1322.44	1317.37	AF3-81
50135	2112055.364	6816371.5	1322.52	1317.13	AF3-08
50136	2112211.924	6816409.311	1324.18	1317.04	AF3-82
50137	2112347.85	6816361.54	1322.93	1316.58	AF3-83
50138	2112390.284	6816452.724	1327.77	1316.58	AF3-84
50142	2114068.656	6815171.123	1218.42	1211.12	AG2-26
50143	2114076.339	6815497.472	1240.85	1231.59	AG3-01
50144	2114080.981	6815647.14	1244.91	1232.41	AG3-14
50145	2114090.366	6815929.064	1245.66	1233.94	AG3-02
50146	2114100.277	6816241.966	1247.71	1236.14	AG3-03
50147	2113896.49	6816418.107	1262.36	1242.26	AG3-04
50148	2113577.405	6816528.206	1283.24	1265.98	AF3-02
50149	2113245.316	6816641.331	1307.72	1290.83	AF3-03
50150	2112924.581	6816750.415	1324.66	1316.16	AF3-04
50151	2112873.338	6816743.268	1321.89	1316.66	AF3-05

No manhole dip information was provided for manholes AD4-83 and AD4-84.

Appendix B Hydraulic Gradeline Profiles



Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- No Profile
- HGL Profile 1
- HGL Profile 2
- HGL Profile 3
- HGL Profile 4
- Siphon
- Forcemain
- SMD1 WWTP
- Hwy49 Buildout Boundary
- LS Lift Stations

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

HGL Profile Key Plan

Project No. 184030352

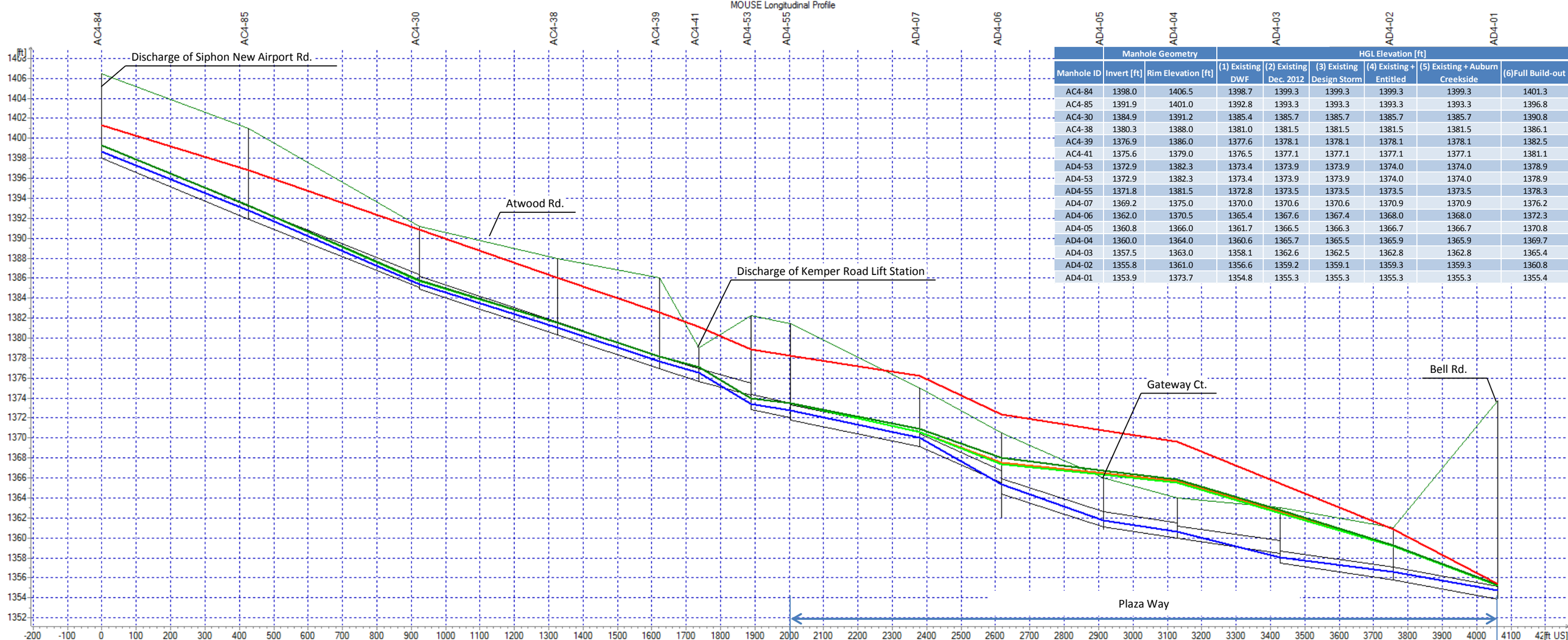
Scale 0 0.1 0.2 Miles

Figure No. **B-1**

Issue/Revision A/

Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/29/2014 3:31:30 PM User: blaplante
V:\1840\184030352\report\figures\map_mxd\Project_Specific\dwg_B_1_Profile_KeyPlan.mxd



	Manhole Geometry		HGL Elevation [ft]					
Manhole ID	Invert [ft]	Rim Elevation [ft]	(1) Existing DWF	(2) Existing Dec. 2012	(3) Existing Design Storm	(4) Existing + Entitled	(5) Existing + Auburn Creekside	(6)Full Build-out
AC4-84	1398.0	1406.5	1398.7	1399.3	1399.3	1399.3	1399.3	1401.3
AC4-85	1391.9	1401.0	1392.8	1393.3	1393.3	1393.3	1393.3	1396.8
AC4-30	1384.9	1391.2	1385.4	1385.7	1385.7	1385.7	1385.7	1390.8
AC4-38	1380.3	1388.0	1381.0	1381.5	1381.5	1381.5	1381.5	1386.1
AC4-39	1376.9	1386.0	1377.6	1378.1	1378.1	1378.1	1378.1	1382.5
AC4-41	1375.6	1379.0	1376.5	1377.1	1377.1	1377.1	1377.1	1381.1
AD4-53	1372.9	1382.3	1373.4	1373.9	1373.9	1374.0	1374.0	1378.9
AD4-53	1372.9	1382.3	1373.4	1373.9	1373.9	1374.0	1374.0	1378.9
AD4-55	1371.8	1381.5	1372.8	1373.5	1373.5	1373.5	1373.5	1378.3
AD4-07	1369.2	1375.0	1370.0	1370.6	1370.6	1370.9	1370.9	1376.2
AD4-06	1362.0	1370.5	1365.4	1367.6	1367.4	1368.0	1368.0	1372.3
AD4-05	1360.8	1366.0	1361.7	1366.5	1366.3	1366.7	1366.7	1370.8
AD4-04	1360.0	1364.0	1360.6	1365.7	1365.5	1365.9	1365.9	1369.7
AD4-03	1357.5	1363.0	1358.1	1362.6	1362.5	1362.8	1362.8	1365.4
AD4-02	1355.8	1361.0	1356.6	1359.2	1359.1	1359.3	1359.3	1360.8
AD4-01	1353.9	1373.7	1354.8	1355.3	1355.3	1355.3	1355.3	1355.4

Link Diameter	1.2500									1.5000			1.2500	1.5000			1.2500						
Ground Level	1401.00		1391.18		1388.00		1386.00	1379.00	1382.28	1381.47	1375.00		1370.50	1366.00		1364.00	1363.00		1361.00		1373.70		
Link Slope	1.38			1.15		1.14		1.11	0.92	0.77	0.71		1.54	1.12		0.53	0.50		0.51		0.62		
Existing System PDWF [MGD]	3.2852	3.2827	3.2792	3.2751	3.2715	3.2697	3.2675	3.4023	3.7473	3.7486	3.7583	3.7680	3.7772	3.7868	3.7863	3.7976	3.6203	3.6202	3.6361		4.1162		
Existing System Dec 2012 PWWF [MGD]	3.2709	3.2689	3.2698	3.2693	3.2674	3.2664	3.2653	3.4045	3.7537	3.7505	3.7501	3.7536	3.7615	3.7712	3.7710	3.7951	3.6355	3.6354	3.6514	3.6513	4.1331		
Existing System Design Storm PWWF [MGD]	3.2852	3.2827	3.2792	3.2751	3.2715	3.2697	3.2675	3.4023	3.7473	3.7486	3.7583	3.7680	3.7772	3.7868	3.7863	3.7976	3.6203	3.6202	3.6361		4.1162		
Existing + Entitled Design Storm PWWF [MGD]	3.4148	3.4130	3.4119	3.4114	3.4108	3.4103	3.4096	3.5420	3.9801		3.9773	3.9535	3.9501	3.9515	3.9514	3.9560	3.6784		3.7025		4.1844		
Existing + Entitled + Auburn Creekside Design Storm PWWF [MGD]	3.4173	3.4159	3.4143	3.4137	3.4144	3.4161	3.4177	3.5515	3.9898	3.9884	3.9878	3.9667	3.9641	3.9659	3.9657	3.9677	3.6794		3.7025	3.7026	4.1847		
Full Build-out Design Storm PWWF [MGD]	4.5288	4.5286	4.5284	4.5265	4.5264	4.5256	4.5255	4.6909	5.0211	5.0204	5.0197	5.0196	5.0254	5.0321	5.0320	4.5544	4.2978		4.2592		4.8741		
Q Manning [MGD]	4.8959			4.4669		4.4504		4.3883	4.0012	5.9505	5.7080		4.6342	6.4249		4.4403	2.6444		2.6583		2.9516		

7/3/2011

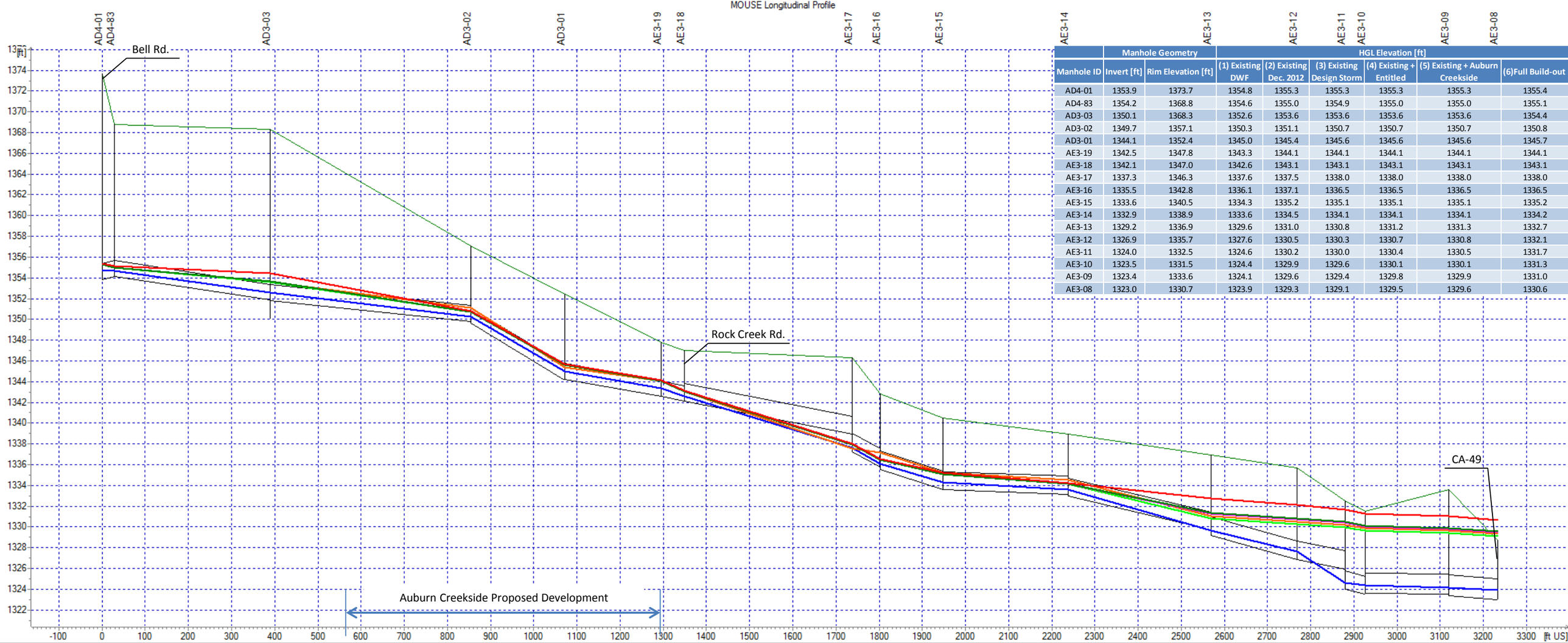
Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Entitled Design Storm HGL
- Existing + Entitled + Auburn Creekside Design Storm HGL
- Full Build-out Design Storm HGL

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-2

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 1



	Manhole Geometry		HGL Elevation [ft]					
Manhole ID	Invert [ft]	Rim Elevation [ft]	(1) Existing DWF	(2) Existing Dec. 2012	(3) Existing Design Storm	(4) Existing + Entitled	(5) Existing + Auburn Creekside	(6)Full Build-out
AD4-01	1353.9	1373.7	1354.8	1355.3	1355.3	1355.3	1355.3	1355.4
AD4-83	1354.2	1368.8	1354.6	1355.0	1354.9	1355.0	1355.0	1355.1
AD3-03	1350.1	1368.3	1352.6	1353.6	1353.6	1353.6	1353.6	1354.4
AD3-02	1349.7	1357.1	1350.3	1351.1	1350.7	1350.7	1350.7	1350.8
AD3-01	1344.1	1352.4	1345.0	1345.4	1345.6	1345.6	1345.6	1345.7
AE3-19	1342.5	1347.8	1343.3	1344.1	1344.1	1344.1	1344.1	1344.1
AE3-18	1342.1	1347.0	1342.6	1343.1	1343.1	1343.1	1343.1	1343.1
AE3-17	1337.3	1346.3	1337.6	1337.5	1338.0	1338.0	1338.0	1338.0
AE3-16	1335.5	1342.8	1336.1	1337.1	1336.5	1336.5	1336.5	1336.5
AE3-15	1333.6	1340.5	1334.3	1335.2	1335.1	1335.1	1335.1	1335.2
AE3-14	1332.9	1338.9	1333.6	1334.5	1334.1	1334.1	1334.1	1334.2
AE3-13	1329.2	1336.9	1329.6	1331.0	1330.8	1331.2	1331.3	1332.7
AE3-12	1326.9	1335.7	1327.6	1330.5	1330.3	1330.7	1330.8	1332.1
AE3-11	1324.0	1332.5	1324.6	1330.2	1330.0	1330.4	1330.5	1331.7
AE3-10	1323.5	1331.5	1324.4	1329.9	1329.6	1330.1	1330.1	1331.3
AE3-09	1323.4	1333.6	1324.1	1329.6	1329.4	1329.8	1329.9	1331.0
AE3-08	1323.0	1330.7	1323.9	1329.3	1329.1	1329.5	1329.6	1330.6

Link Diameter	1.5000									1.7500														2.0000		
Ground Level	1368.33		1357.08			1352.43		1347.75		1347.00		1346.29		1342.82		1340.48		1338.94		1336.90		1335.68	1332.54	1331.47	1333.60	.....
Link Slope	....						0.98		0.85		0.82		2.22		1.34		0.15		0.98		1.17		0.84	1.14	0.04	0.31
Existing System PDWF [MGD]	....	4.3026		4.3025					.....	5.0091		5.0092		5.0431			5.0432		5.0429	5.0410	5.0518		5.2740	.....	5.2761	5.4690
Existing System Dec 2012 PWWF [MGD]	....	4.3272	4.3271		4.3273		4.3275		.....	5.0094		5.0096	5.0445		5.0444	5.0418		5.0415	5.0413	5.0460	5.0474		5.2954	.....	5.2958	5.4929
Existing System Design Storm PWWF [MGD]	....	4.3026		4.3025					.....	5.0091		5.0092		5.0431			5.0432		5.0429	5.0410	5.0518		5.2740	.....	5.2761	5.4690
Existing + Entitled Design Storm PWWF [MGD]	....		4.3857		4.3856		4.3855			5.1001			5.1342			5.1343			5.1340	5.1318	5.1425		5.3685	.....	5.3703	5.5674
Existing + Entitled + Aubum Creekside Design Storm PWWF [MGD]	....	4.3861		4.3860		4.3859			.....	5.1241				5.1583		5.1584		5.1585	5.1580	5.1549	5.1655		5.3895	.....	5.3912	5.5878
Full Build-out Design Storm PWWF [MGD]	....	4.9870	4.9878		4.9887		4.9889			5.6165				5.6451			5.6450		5.6449	5.6430	5.6428		5.8386	.....	5.8343	6.1606
Q Manning [MGD]	....			3.9951		10.7889		5.2694	.....	9.2549			.....		11.8364		3.9324		10.1185		11.0510		9.3801	.....	2.9765	8.0859

7/3/2011

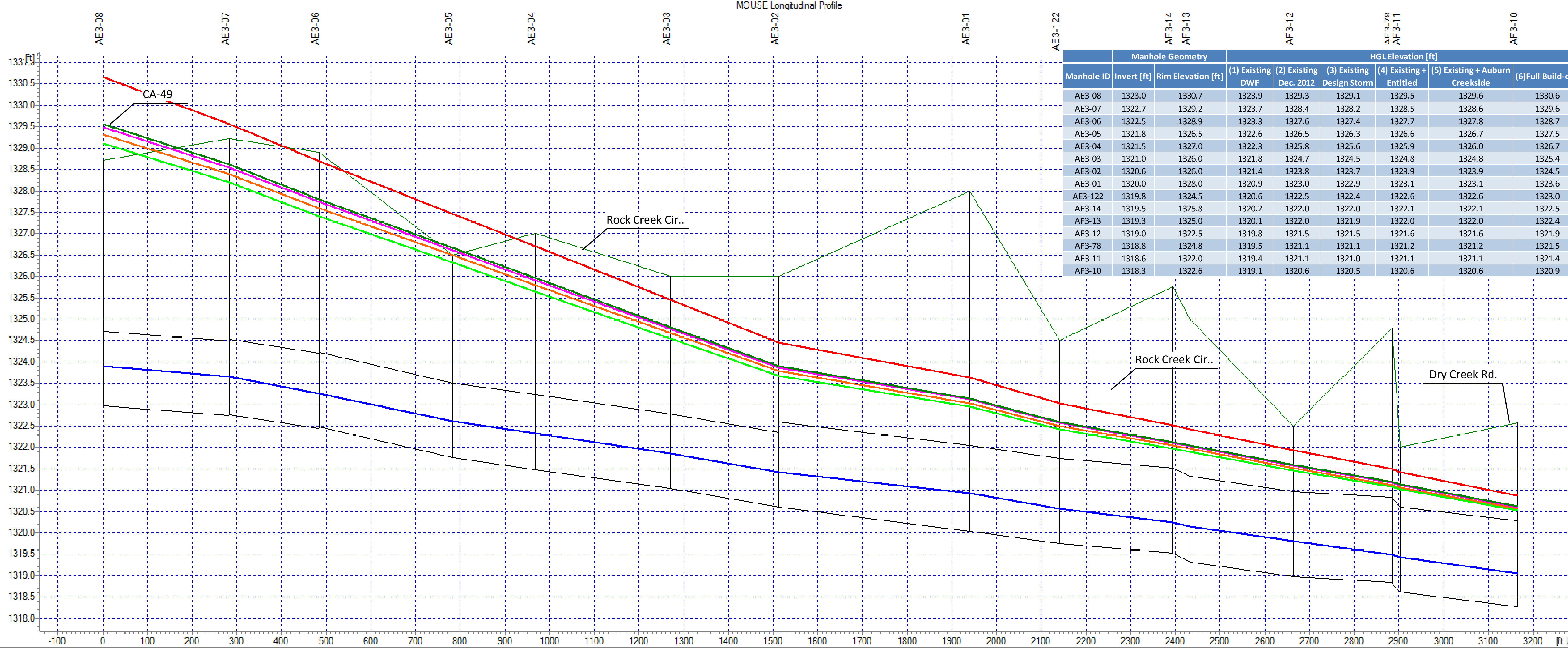
Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Entitled Design Storm HGL
- Existing + Entitled + Aubum Creekside Design Storm HGL
- Full Build-out Design Storm HGL

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-3

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 2



	Manhole Geometry		HGL Elevation [ft]					
Manhole ID	Invert [ft]	Rim Elevation [ft]	(1) Existing DWF	(2) Existing Dec. 2012	(3) Existing Design Storm	(4) Existing + Entitled	(5) Existing + Auburn Creekside	(6)Full Build-out
AE3-08	1323.0	1330.7	1323.9	1329.3	1329.1	1329.5	1329.6	1330.6
AE3-07	1322.7	1329.2	1323.7	1328.4	1328.2	1328.5	1328.6	1329.6
AE3-06	1322.5	1328.9	1323.3	1327.6	1327.4	1327.7	1327.8	1328.7
AE3-05	1321.8	1326.5	1322.6	1326.5	1326.3	1326.6	1326.7	1327.5
AE3-04	1321.5	1327.0	1322.3	1325.8	1325.6	1325.9	1326.0	1326.7
AE3-03	1321.0	1326.0	1321.8	1324.7	1324.5	1324.8	1324.8	1325.4
AE3-02	1320.6	1326.0	1321.4	1323.8	1323.7	1323.9	1323.9	1324.5
AE3-01	1320.0	1328.0	1320.9	1323.0	1322.9	1323.1	1323.1	1323.6
AE3-122	1319.8	1324.5	1320.6	1322.5	1322.4	1322.6	1322.6	1323.0
AF3-14	1319.5	1325.8	1320.2	1322.0	1322.0	1322.1	1322.1	1322.5
AF3-13	1319.3	1325.0	1320.1	1322.0	1321.9	1322.0	1322.0	1322.4
AF3-12	1319.0	1322.5	1319.8	1321.5	1321.5	1321.6	1321.6	1321.9
AF3-78	1318.8	1324.8	1319.5	1321.1	1321.1	1321.2	1321.2	1321.5
AF3-11	1318.6	1322.0	1319.4	1321.1	1321.0	1321.1	1321.1	1321.4
AF3-10	1318.3	1322.6	1319.1	1320.6	1320.5	1320.6	1320.6	1320.9

Link Diameter	1.7500	2.0000													
Ground Level	.....	1328.90	1326.50	1327.00	1326.00	1328.00	1324.50	1325.75	1325.00	1322.50	1324.79	1322.00	1322.58		
Link Slope	0.16	0.24	0.15	0.18	0.13	0.14	0.09	......	0.15	0.06	...	0.13			
Existing System PDWF [MGD]	5.8946	6.0341	6.0340	6.0329	6.0326	6.0323	6.0320	6.0317	......	6.0748	6.1068	...	6.1113		
Existing System Dec 2012 PWWF [MGD]	5.9554	6.1021	6.1019	6.0984	6.0986	6.0987	6.0989	6.0991	6.0993	6.0995	......	6.1441	6.1773	...	6.1827
Existing System Design Storm PWWF [MGD]	5.8946	6.0341	6.0340	6.0329	6.0326	6.0323	6.0320	6.0317	......	6.0748	6.1068	...	6.1113		
Existing + Entitled Design Storm PWWF [MGD]	5.9984	6.1423	6.1422	6.1390	6.1391	6.1392	6.1828	6.2150	6.2197						
Existing + Entitled + Auburn Creekside Design Storm PWWF [MGD]	6.0184	6.1609	6.1608	6.1581	6.1580	6.1579	6.1578	6.2013	6.2334	6.2380					
Full Build-out Design Storm PWWF [MGD]	6.2726	6.4312	6.4297	6.4301	6.4304	6.4306	6.4308	6.4311	6.4946	6.5289	6.5341				
Q Manning [MGD]	4.0811	5.0233	3.9770	3.9082	4.3556	5.2889	4.9752	4.3923	......	5.6860	3.8350	...	5.1802		

7/3/2011

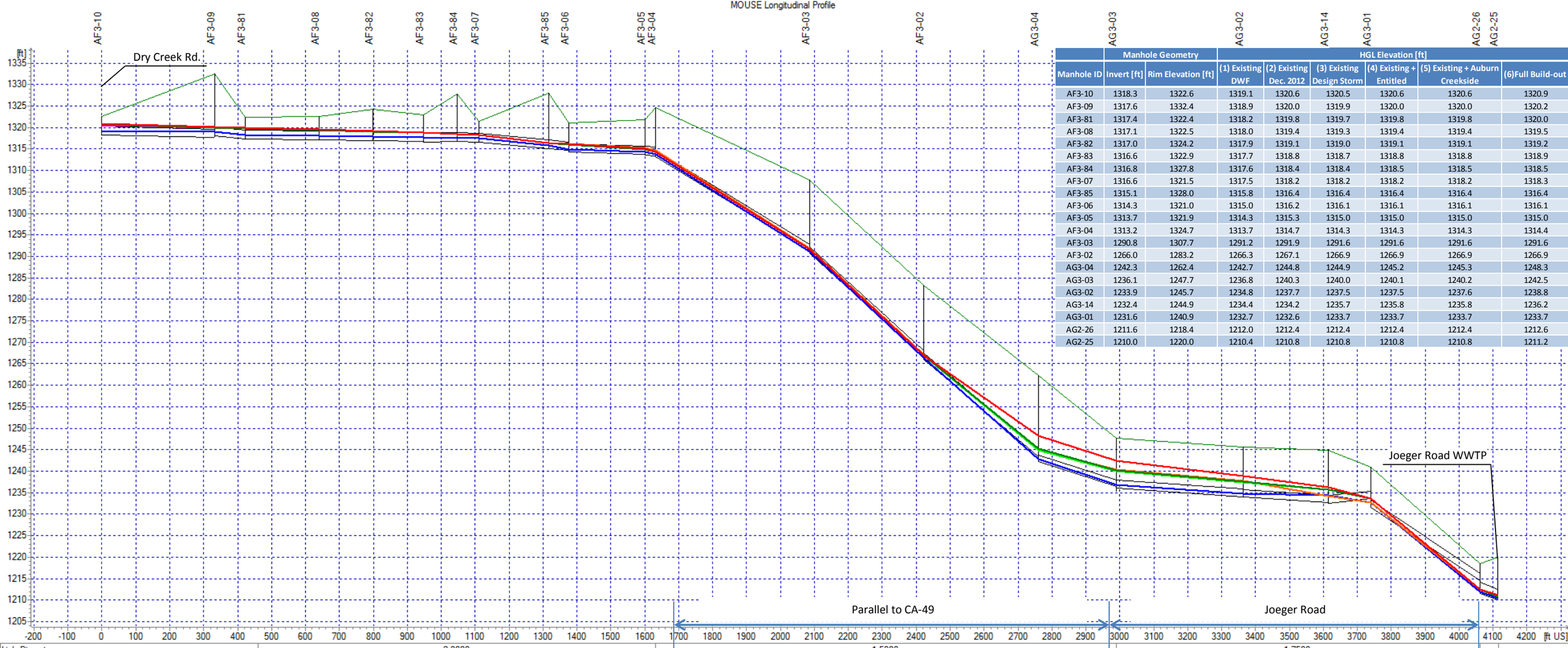
Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Entitled Design Storm HGL
- Existing + Entitled + Auburn Creekside Design Storm HGL
- Full Build-out Design Storm HGL

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-4

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 3



	Manhole Geometry		HGL Elevation [ft]					
Manhole ID	Invert [ft]	Rim Elevation [ft]	(1) Existing DWF	(2) Existing Dec. 2012	(3) Existing Design Storm	(4) Existing + Entitled	(5) Existing + Auburn Creekside	(6)Full Build-out
AF3-10	1318.3	1322.6	1319.1	1320.6	1320.5	1320.6	1320.6	1320.9
AF3-09	1317.6	1332.4	1318.9	1320.0	1319.9	1320.0	1320.0	1320.2
AF3-81	1317.4	1322.4	1318.2	1319.8	1319.7	1319.8	1319.8	1320.0
AF3-08	1317.1	1322.5	1318.0	1319.4	1319.3	1319.4	1319.4	1319.5
AF3-82	1317.0	1324.2	1317.9	1319.1	1319.0	1319.1	1319.1	1319.2
AF3-83	1316.6	1322.9	1317.7	1318.8	1318.7	1318.8	1318.8	1318.9
AF3-84	1316.8	1327.8	1317.6	1318.4	1318.4	1318.5	1318.5	1318.5
AF3-07	1316.6	1321.5	1317.5	1318.2	1318.2	1318.2	1318.2	1318.3
AF3-85	1315.1	1328.0	1315.8	1316.4	1316.4	1316.4	1316.4	1316.4
AF3-06	1314.3	1321.0	1315.0	1316.2	1316.1	1316.1	1316.1	1316.1
AF3-05	1313.7	1321.9	1314.3	1315.3	1315.0	1315.0	1315.0	1315.0
AF3-04	1313.2	1324.7	1313.7	1314.7	1314.3	1314.3	1314.3	1314.4
AF3-03	1290.8	1307.7	1291.2	1291.9	1291.6	1291.6	1291.6	1291.6
AF3-02	1266.0	1283.2	1266.3	1267.1	1266.9	1266.9	1266.9	1266.9
AG3-04	1242.3	1262.4	1242.7	1244.8	1244.9	1245.2	1245.3	1248.3
AG3-03	1236.1	1247.7	1236.8	1240.3	1240.0	1240.1	1240.2	1242.5
AG3-02	1233.9	1245.7	1234.8	1237.7	1237.5	1237.5	1237.6	1238.8
AG3-14	1232.4	1244.9	1234.4	1234.2	1235.7	1235.8	1235.8	1236.2
AG3-01	1231.6	1240.9	1232.7	1232.6	1233.7	1233.7	1233.7	1233.7
AG2-26	1211.6	1218.4	1212.0	1212.4	1212.4	1212.4	1212.4	1212.6
AG2-25	1210.0	1220.0	1210.4	1210.8	1210.8	1210.8	1210.8	1211.2

Link Diameter	2.0000											1.5000										1.7500		
Ground Level		1322.52		1324.18	1322.93		1321.50	1328.00	1321.00	1321.89	1324.66		1307.72		1283.24		1262.36		1247.71	1245.66	1244.91	1240.85	1218.42	
Link Slope	0.07		0.06	0.20	-0.22	0.22	0.76		0.23		4.83			7.19		6.71		2.53	0.56		0.52	-0.83	5.28	3.08
Existing System PDWF [MGD]	6.1335		6.1334	6.1336	6.1456		6.1459		8.3882		8.4090		8.4091	8.4189	8.4190	8.4189	8.4179	8.4081	8.4111	8.4110	8.4291	8.4704	8.4674	8.4777
Existing System Dec 2012 PWWF [MGD]	6.2066		6.2067	6.2068	6.2192		6.2194		8.3940	8.4157		8.4156	8.4155	8.4262		8.4261	8.4257	8.4224	8.4260	8.4261	8.4444	8.4865	8.4979	8.4977
Existing System Design Storm PWWF [MGD]	6.1335		6.1334	6.1336	6.1456		6.1459		8.3882		8.4090		8.4091	8.4189	8.4190	8.4189	8.4179	8.4081	8.4111	8.4110	8.4291	8.4704	8.4674	8.4777
Existing + Entitled Design Storm PWWF [MGD]		6.2428			6.2552		6.2551		8.4966	8.5180		8.5179		8.5279	8.5278	8.5277	8.5274	8.5267	8.5301		8.5483	8.5898	8.6239	8.6089
Existing + Entitled + Auburn Creekside Design Storm PWWF [MGD]	6.2610		6.2609	6.2608	6.2732		6.2730		8.5141	8.5354		8.5353	8.5352	8.5452	8.5451	8.5449	8.5446	8.5447	8.5483		8.5662	8.6069	8.6304	8.6221
Full Build-out Design Storm PWWF [MGD]	6.5592		6.5593				6.5827		9.2113		9.2354			9.2463		9.2462		9.2463	10.1315	10.1316	10.2101	10.3210	10.3580	10.3590
Q Manning [MGD]	3.8376		3.4665	6.5771	6.8103		12.6998		7.0649		14.9091			16.2964		15.7480		9.6650	7.6603		7.3559	10.1211	21.0677	

7/3/2011

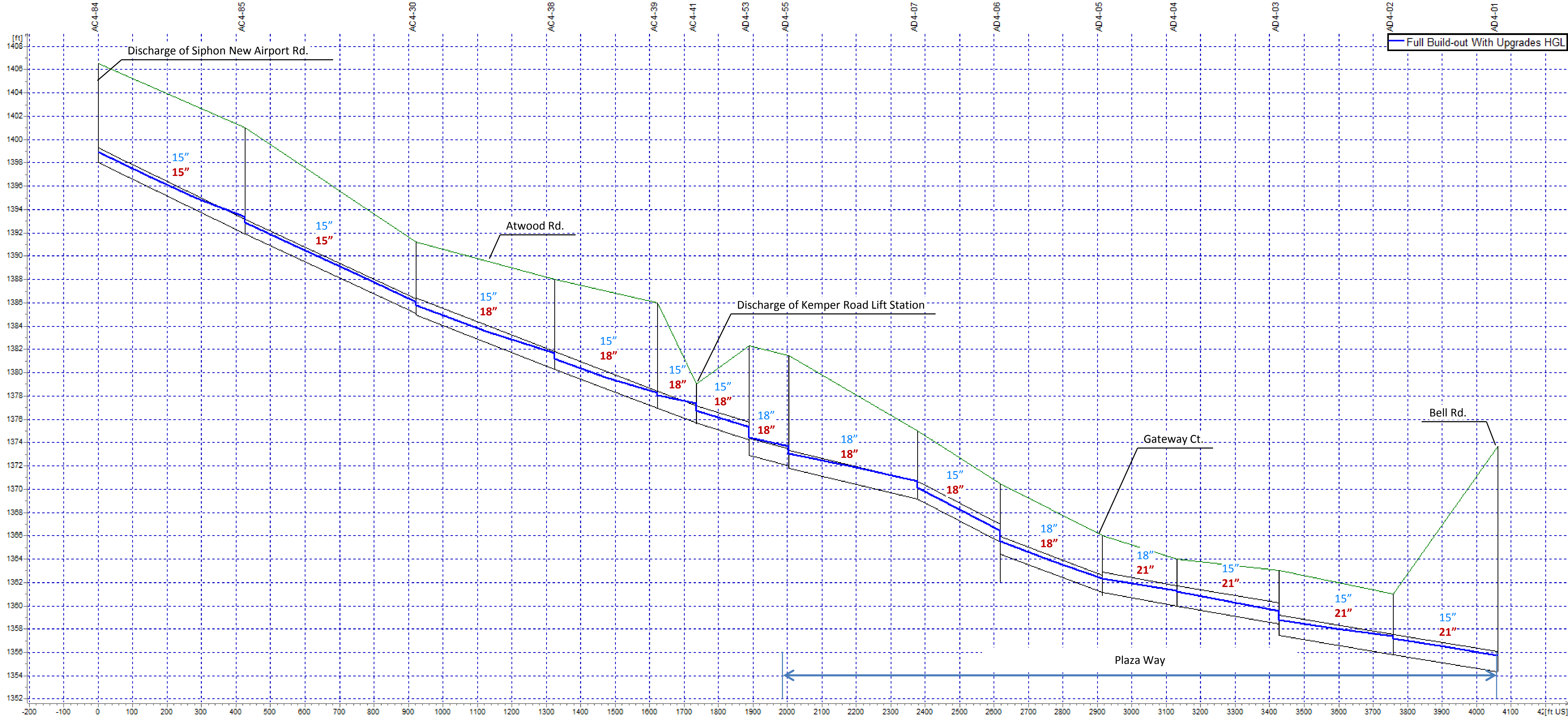
Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Entitled Design Storm HGL
- Existing + Entitled + Auburn Creekside Design Storm HGL
- Full Build-out Design Storm HGL

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-5

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 4



Link Diameter [ft]	1.2500	1.5000	1.7500																			
Ground Level [ft]	..	1401.00	1391.18	1388.00	1386.00	1379.00	1382.28	1381.47	1375.00	1370.50	1366.00	1364.00	1363.00	1361.00	1373.70							
Link Slope [%]	1.43	1.38	1.15	1.14	1.11	0.92	0.77	0.71	1.54	1.12	0.53	0.50	0.51	0.48								
Full Build-out With Upgrades Peak WWF [MGD]	4.3036	4.3035	4.6528	4.6526	4.6527	4.6526	4.6524	4.6527	4.8202	5.4489	5.4482	5.4479	5.4618	5.4737	5.4735	5.5523	5.6100	5.6095	5.6493	5.6491	6.2690	6.2693
Q Manning [MGD]	4.9929	4.8959	7.2642	7.2373	7.1364	6.5068	5.9505	5.7080	7.5362	6.4249	6.6982	6.4872	6.5212	6.3421								

7/3/2011

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

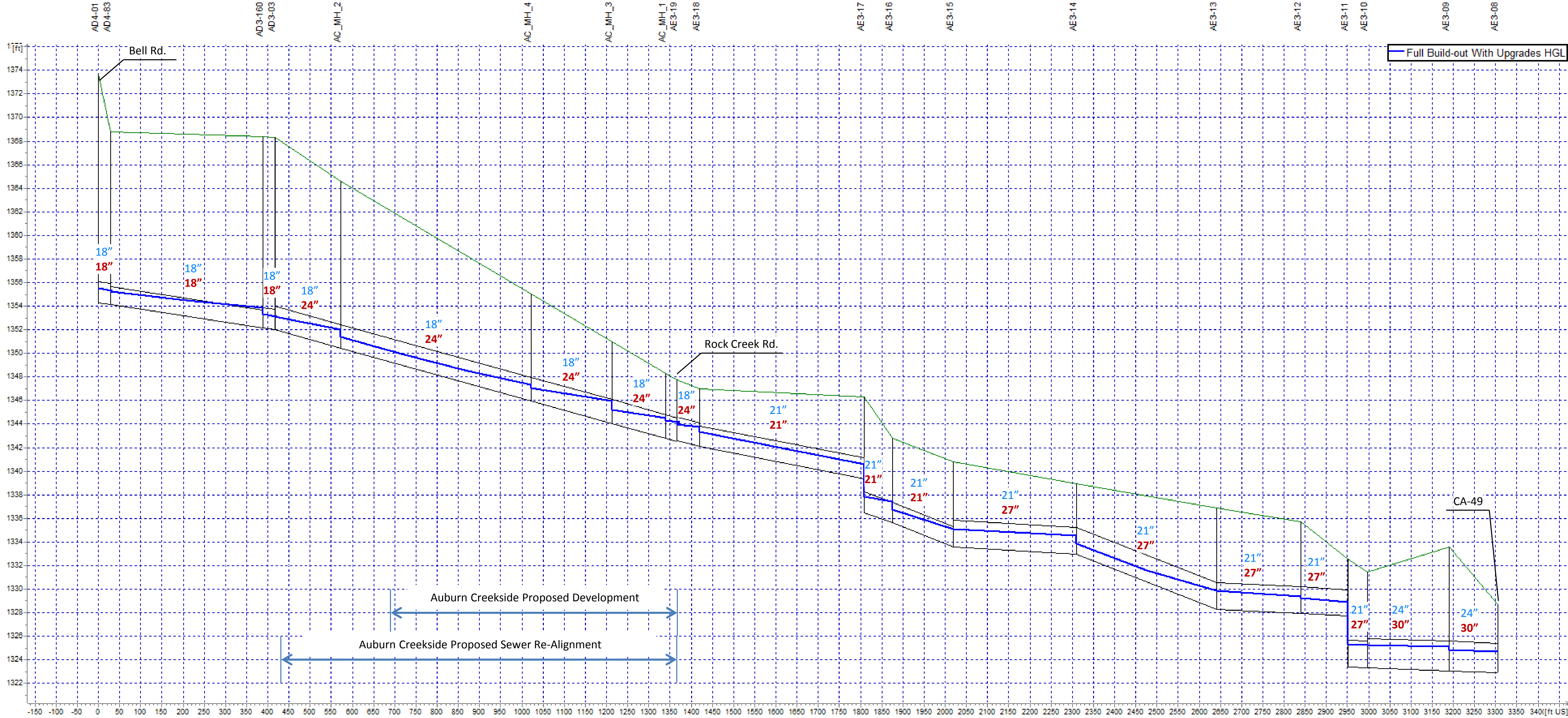
Legend:
#” Existing sewer size
#” Recommended sewer size

Note:
- Recommended sewer size is based upon the minimum industry standard size available to eliminate surcharging.
- Build-out with upgrades scenario assumes that all lift stations and forcemains have been upgraded and outfitted with VFDs. It is assumed that no onsite storage or attenuation is present. This results in the peak potential flow through the sewer trunk network.

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-6

Title
Build-out With Upgrades – 1:10 Year Design Rainfall
HGL Profile 1



Link Diameter [ft]	1.5000	....	2.0000	1.7500	2.2500	2.5000															
Ground Level [ft]	....	1368.41	1368.33	1364.58	1355.02	1350.99	1348.29	......	1347.00	1346.29	1342.82	1340.78	1338.94	1336.90	1335.68	1332.54	1331.47	1333.60	....		
Link Slope [%]	0.57	....	....	0.85	0.70	1.28	1.44	0.21	1.41	0.19	0.20	0.15	0.12	0.14							
Full Build-out With Upgrades Peak WWF [MGD]	....	3.5968	....	6.5308	6.5307	6.5306	6.5305	6.5532	6.5531	....	7.3235	7.3233	7.3690	7.3689	7.3688	7.3686	7.3685	7.3691	7.6830	....	7.6836	8.0085
Q Manning [MGD]	4.5755	....	13.0902	14.2010	14.2366	14.2231	....	....	8.3454	11.2655	11.9806	9.0801	23.7206	8.7426	8.8723	....	9.3492	9.9132			

7/3/2011

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

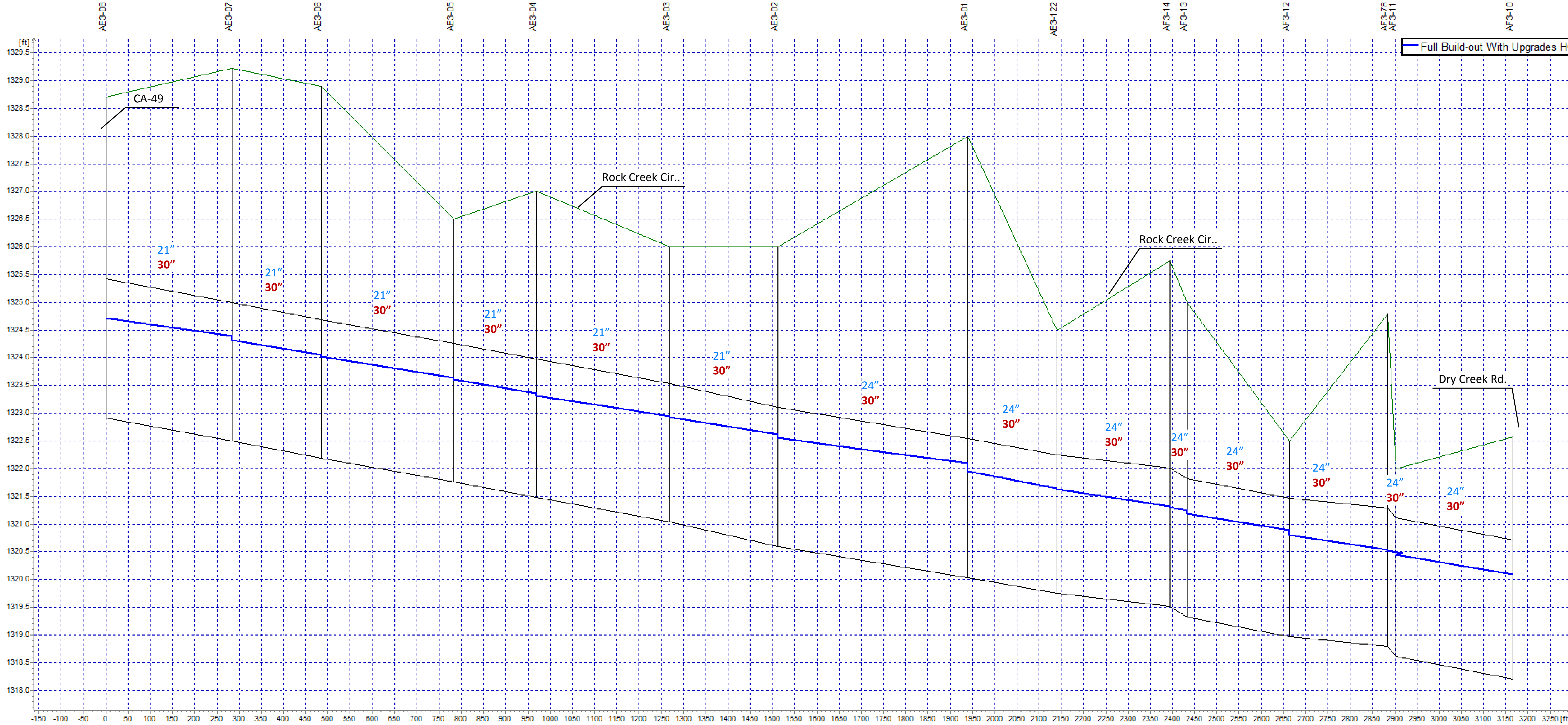
Legend:
#” Existing sewer size
#” Recommended sewer size

Note:
- Recommended sewer size is based upon the minimum industry standard size available to eliminate surcharging.
- Build-out with upgrades scenario assumes that all lift stations and forcemains have been upgraded and outfitted with VFDs. It is assumed that no onsite storage or attenuation is present. This results in the peak potential flow through the sewer trunk network.

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-7

Title
Build-out With Upgrades – 1:10 Year Design Rainfall
HGL Profile 2



Link Diameter [ft]	2.5000																
Ground Level [ft]	1329.22	1328.90	1326.50	1327.00	1326.00	1328.00	1324.50	1325.75	1325.00	1322.50	1324.79	1322.00	1322.58				
Link Slope [%]	0.15	0.14	0.15	0.18	0.13	0.14	0.09	0.53	0.15	0.08	...	0.15					
Full Build-out With Upgrades Peak WWF [MGD]	8.0081	8.3674	8.5568	8.5556	8.5543	8.5530	8.5518	8.5503	8.5488	8.5477	8.5467	8.5458	......	8.6235	8.6601	...	8.6637
Q Manning [MGD]	10.1921	10.3993	10.0504	10.2963	10.1181	11.2765	9.5902	9.0213	7.9643	......	10.3102	8.1826	...	10.3414			

7/3/2011

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

Legend:

#” Existing sewer size
#” Recommended sewer size

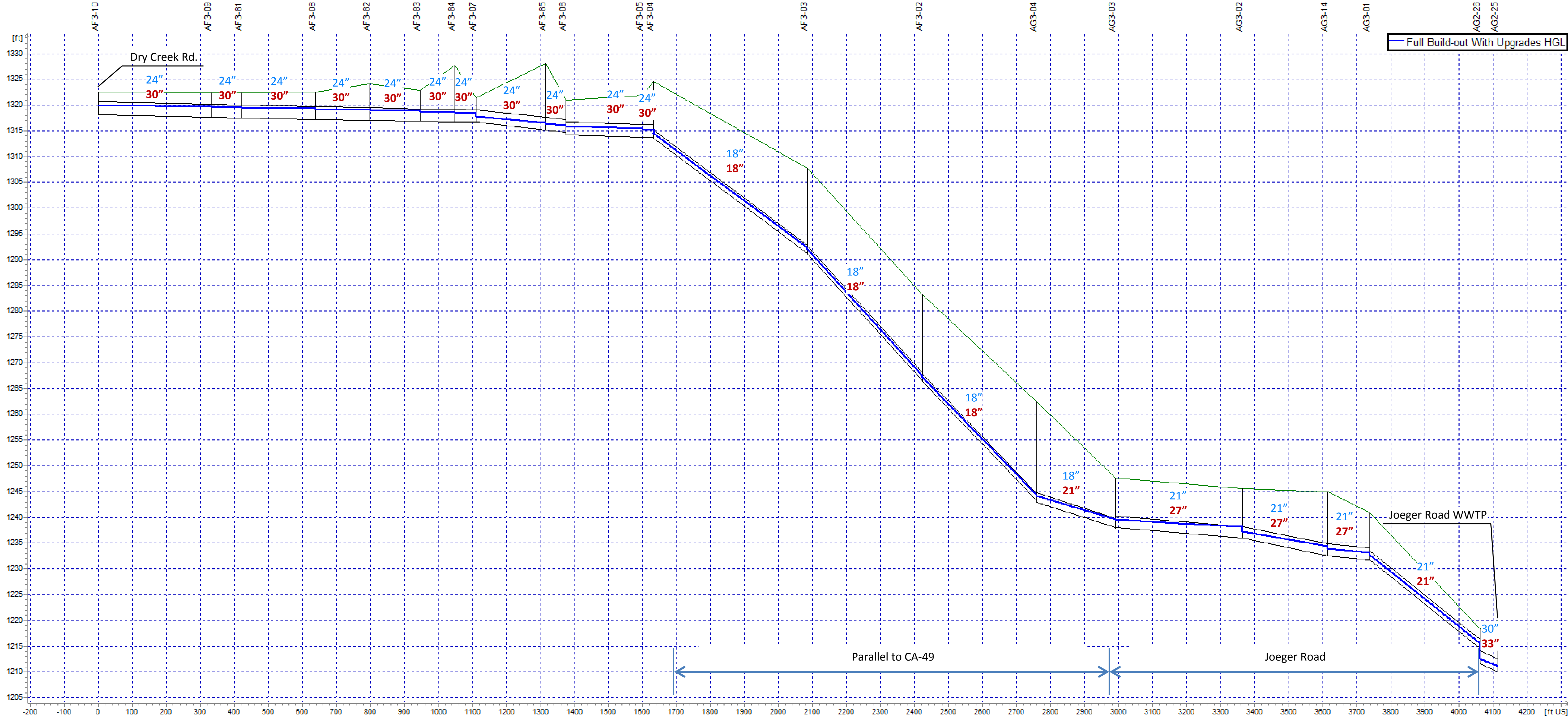
Note:

- Recommended sewer size is based upon the minimum industry standard size available to eliminate surcharging.
- Build-out with upgrades scenario assumes that all lift stations and forcemains have been upgraded and outfitted with VFDs. It is assumed that no onsite storage or attenuation is present. This results in the peak potential flow through the sewer trunk network.

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-8

Title
Build-out With Upgrades – 1:10 Year Design Rainfall
HGL Profile 3



Link Diameter [ft]	2.5000	1.5000	1.7500	2.2500	1.7500	....														
Ground Level [ft]	1322.42	1322.44	1322.52	1324.18	1322.93	1327.77	1321.50	1328.00	1321.00	1321.89	1324.66	1307.72	1283.24	1262.36	1247.71	1245.66	1244.91	1240.85	1218.42	...
Link Slope [%]	0.15	0.26	0.11	0.14	0.16	0.07	0.14	0.76	0.20	....	4.91	7.27	6.85	2.18	0.54	1.36	0.63	5.34	3.08	
Full Build-out With Upgrades Peak WWF [MGD]	8.6774	8.6764	8.6862	8.6857	8.6853	8.7097	8.7096	....	11.2288	11.2663	11.2834	11.3039	11.3041	12.2249	12.2248	12.3035	12.4149	12.4313	12.4314	....
Q Manning [MGD]	10.2785	13.4010	8.6166	9.8275	10.4423	6.9657	....	23.0279	....	11.9345	....	15.0309	16.3971	15.9142	13.5504	14.6495	23.3092	17.1606	21.1971	....

7/3/2011

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin CA 95765
Tel: (916) 773-8100
Fax: (916) 773-8448

Legend:
#” Existing sewer size
#” Recommended sewer size

Note:
- Recommended sewer size is based upon the minimum industry standard size available to eliminate surcharging.
- Build-out with upgrades scenario assumes that all lift stations and forcemains have been upgraded and outfitted with VFDs. It is assumed that no onsite storage or attenuation is present. This results in the peak potential flow through the sewer trunk network.

Client/Project
Auburn Pacific Properties, LLC
Sewer Capacity – Auburn Creekside

Figure No.
B-9

Title
Build-out With Upgrades – 1:10 Year Design Rainfall
HGL Profile 4

Appendix C Auburn Creekside Proposed Sewer Re-Alignment

This figure is extracted from the Highway 49 Trunk model and is based on site plan information provided by Morton & Pitalo which Stantec understands to be current as of the date of this report.

Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/23/2015 4:43:58 PM User: blaplante
C:\Users\blaplante\Documents\ArcGIS\Packages\dwg_C1_AC_Alignmen_4_23_2015v1011\dwg_C1_AC_Alignmen.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Proposed New Manholes
- Existing Manholes

Proposed Re-Alignment

- <all other values>
- By Auburn Creekside
- By Others
- Existing Sewer To Be Abandoned
- Existing Sewer Line
- Auburn Creekside Development Lands

Client/Project

AUBURN PACIFIC PROPERTIES, LLC
AUBURN CREEKSIDE EVALUATION
NORTH AUBURN HWY 49 TRUNK
North Auburn, Placer County

Title

Auburn Creekside
Proposed Sewer Re-Alignment
With Inverts

Project No.
184030352

Scale
0 50 100 150 200 Feet

Figure No.
C-1

Issue/Revision
A/

Appendix D Necessary Highway 49 Trunk Upgrades by Scenario

The table shown below provides a combined summary of the upgrades required to accommodate the various scenarios from Existing conditions through Build-out. The sewer sizes highlighted in bold font identify the sewers requiring upsizing.

Pipe Segment		Existing Diameter, inches	Length of Sewer Upgrades, linear feet	Sizing for Existing System, inches (a)	Sizing for Existing + Entitled, inches	Sizing for Existing + Entitled + Auburn Creekside, inches	Sizing for Full Build-out, inches
Upstream MH ID	Downstream MH ID						
AC4-30	AD4-53	15	966	15	15	15	**18**
AD4-07	AD4-06	15	240	15	15	15	**18**
AD4-05	AD4-04	18	216	18	18	18	**21**
AD4-04	AD4-03	15	298	**18**	**18**	**18**	**21**
AD4-03	AD4-01	15	634	**21**	**21**	**21**	**21**
AD3-03	AD3-02	18	466	**21**	**21**	**21**	**24**
AD3-02	AE3-18	18	537	18	18	18	**24**
AE3-15	AE3-13	21	499	21	21	21	**27**
AE3-13	AE3-11	21	311	**24**	**24**	**24**	**27**
AE3-11	AE3-10	21	193	21	21	21	**27**
AE3-10	AE3-08	24	307	**27**	**27**	**27**	**30**
AE3-08	AE3-02	21	1513	**27**	**27**	**27**	**30**
AE3-02	AF3-09	24	1985	**27**	**27**	**27**	**30**
AF3-09	AF3-81	24	89	24	24	24	**30**
AF3-81	AF3-07	24	689	**27**	**27**	**27**	**30**
AF3-07	AF3-06	24	205	24	24	24	**30**
AF3-06	AF3-04	24	257	**27**	**27**	**27**	**30**
AG3-04	AG3-03	18	230	**21**	**21**	**21**	**30**
AG3-03	AG3-02	21	375	**24**	**24**	**24**	**30**
AG3-02	AG3-14	21	250	21	21	21	**30**
AG3-14	AG3-01	21	126	**24**	**24**	**24**	**30**
AG2-26	AG2-25	30	52	**36**	**36**	**36**	**36**

North Auburn Dewitt Trunk Sewer Capacity Evaluation Report

Revised Final Report

Prepared for:
Western Care Construction, Inc.

Prepared by:
Stantec Consulting Services Inc.

March 6, 2016

Revision Record							
Revision	Description	Prepared By		Checked By		Approved By	
A	Draft Report	BL	01/23/2014	MVD	03/02/2014	DP	03/03/2014
B	Final Report	BL	04/29/2014			DP	04/30/2014
C	Revised Final Report	BL	07/29/2014	DP	08/10/2014	DP	08/10/2014
D	Revised Final Report	BL	03/06/2015	DP	03/06/2015	DP	03/06/2015

Sign-off Sheet

This document entitled North Auburn Dewitt Trunk Sewer Capacity Evaluation Report was prepared by Stantec Consulting Services Inc. for the account of Western Care Construction, Inc. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

Prepared by _____

(signature)

Brett Laplante, E.I.T.

Reviewed by 03/06/2015

Dave Price, P.E.

Stantec

Table of Contents

1.0 INTRODUCTION 1.1
1.1 PURPOSE 1.1
1.2 BACKGROUND 1.1

2.0 PROJECT CHARACTERISTICS 2.1
2.1 PURPOSE 2.1
2.2 PROJECT LOCATION 2.1
2.3 LAND USE DATA 2.3
2.4 FUTURE WASTEWATER FLOWS 2.10

3.0 OVERVIEW OF HYDRAULIC MODEL 3.1
3.1 PURPOSE 3.1
3.2 MODELING SOFTWARE 3.1
3.3 MODEL INPUTS AND CONSTRUCTION 3.1
3.3.1 Sewer Pipes and Manholes 3.2
3.3.2 Lift Stations 3.2
3.3.3 Subcatchments 3.3
3.3.4 Design Storms 3.3
3.4 MODEL CALIBRATION 3.5
3.4.1 Dry Weather Flow Calibration 3.5
3.4.2 Wet Weather Flow Calibration 3.7

4.0 WASTEWATER COLLECTION SYSTEM CAPACITY EVALUATION 4.1
4.1 PURPOSE 4.1
4.2 RECOMMENDED CAPACITY EVALUATION CRITERIA 4.1
4.2.1 Level of Service Criteria 4.1
4.2.2 Velocity 4.2
4.2.3 Pipe Capacity 4.2
4.3 MODEL RESULTS 4.2
4.3.1 Existing System – Design Storm Event 4.3
4.3.2 Existing System + Timberline Phase 1 Development – Design Storm Event 4.5
4.3.3 Existing System + Entitled Developments – Design Storm Event 4.7
4.3.4 Existing System + Entitled Developments + Timberline Phase 1 – Design Storm Event 4.9
4.3.5 Existing System + Entitled Developments + Timberline Buildout – Design Storm Event 4.11
4.3.6 Full Build-out 4.13

5.0 RECOMMENDED CAPITAL IMPROVEMENT PROJECTS 5.1
5.1 PURPOSE 5.1

5.2 RECOMMENDED IMPROVEMENT TO EXISTING TRUNK SYSTEM TO ACCOMMODATE EXISTING BUILD-OUT AND NEAR-TERM BUILD-OUT DEFICIENCIES 5.1
5.3 RECOMMENDED IMPROVEMENTS TO EXISTING TRUNK SYSTEM TO ACCOMMODATE ULTIMATE BUILD-OUT OF SYSTEM 5.4
5.4 TIMBERLINE DEVELOPMENT SPECIFIC IMPACTS TO DEWITT TRUNK 5.6
5.5 OTHER CONSIDERATIONS 5.6

LIST OF TABLES

Table 2-1 Existing Land Use Summary[a] 2.3
Table 2-2 Future Land Use Projection 2.7
Table 2-3 Population Density Summary 2.10
Table 2-4 Future Flow and Infiltration Allowance Summary 2.10
Table 3-1 Sewer Roughness Values 3.1
Table 3-2 Sewer Maintenance District 1 (SMD 1) – Highway 49 Trunk Lift Station Information 3.3
Table 3-3 DWF Calibration Results 3.6
Table 3-4 Mike Urban RDII Equation Parameters 3.8
Table 3-5 WWF Calibration Results 3.9
Table 4-1 Design Event Flow Summary (Dewitt Trunk @ MH AG2-03) 4.2
Table 5-1 Recommended Sewer Upgrades For Near-Term Developments 5.2
Table 5-2 Recommended Sewer Upgrades For Full-Buildout 5.4
Table 5-3 Relative Growth Increase 5.6

LIST OF FIGURES

Figure 2-1 SMD 1 Study Area 2.2
Figure 2-2 Dewitt Serviced Area Existing System Land Use 2.4
Figure 2-3 Dewitt Serviced Area Existing Sewershed Connections 2.5
Figure 2-4 Dewitt Serviced Area Full Build-out Projected Land Use 2.8
Figure 2-5 Dewitt Serviced Area Full Build-out Projected Land Use 2.9
Figure 3-1 Dewitt Modeled Catchments 3.4
Figure 3-2 10-year, 24-hour Design Storm Hyetograph 3.5
Figure 3-3 DWF Calibration Plot 3.6
Figure 3-4 December 16th – 21st, 2010 Calibration Results 3.9
Figure 3-5 March 13th – 18th, 2011 Calibration Results 3.10
Figure 3-6 March 23rd – 28th, 2011 Calibration Results 3.10
Figure 3-7 November 28th – December 5th, 2012 Calibration Results 3.11
Figure 4-1 Dewitt Existing System Level of Service Results 4.4
Figure 4-2 Dewitt Existing System With Proposed Timberline Development Phase 1 ..... 4.6
Figure 4-3 Dewitt Existing System With Entitled Projects Level of Service Results 4.8
Figure 4-4 Dewitt Existing System With Entitled / Proposed Timberline Development Phase 1 Level of Service Results 4.10
Figure 4-5 Dewitt Existing System With Entitled / Proposed Timberline Development Buildout Level of Service Results 4.12

Figure 4-6 Dewitt Projected Full Build-out Level of Service Results..... 4.14
Figure 5-1 Dewitt Near-Term Developments..... 5.3
Figure 5-2 Dewitt Projected Full Build-out..... 5.5

LIST OF APPENDICES

Appendix A – Dewitt Trunk Entitled Projects

Appendix B – Hydraulic Gradeline Profiles

Figure B-1 HGL Profile Keyplan
Figure B-2 Existing System Results - 1:10 Year Design Rainfall HGL Profile 1
Figure B-3A Existing System Results - 1:10 Year Design Rainfall HGL Profile 2
Figure B-3B Existing System Results - 1:10 Year Design Rainfall HGL Profile 2
Figure B-3C Existing System Results - 1:10 Year Design Rainfall HGL Profile 2
Figure B-4 Existing System Results - 1:10 Year Design Rainfall HGL Profile 3
Figure B-5 Existing System Results - 1:10 Year Design Rainfall HGL Profile 4
Figure B-6 Upgrade Impact Upon Existing System HGL Profile 1
Figure B-7 Upgrade Impact Upon Existing System HGL Profile 2
Figure B-8 Upgrade Impact Upon Existing System HGL Profile 3
Figure B-9 Upgrade Impact Upon Existing System HGL Profile 4
Figure B-10 Upgrade Impact Upon Existing + Entitled HGL Profile 1
Figure B-11 Upgrade Impact Upon Existing + Entitled HGL Profile 2
Figure B-12 Upgrade Impact Upon Existing + Entitled HGL Profile 3
Figure B-13 Upgrade Impact Upon Existing + Entitled HGL Profile 4
Figure B-14 Upgrade Impact Build-out System HGL Profile 1
Figure B-15 Upgrade Impact Build-out System HGL Profile 2
Figure B-16 Upgrade Impact Build-out System HGL Profile 3
Figure B-17 Upgrade Impact Build-out System HGL Profile 4

1.0 Introduction

1.1 PURPOSE

Placer County (County) owns and operates the wastewater collection system within Sewer Maintenance District 1 (SMD 1), which is located north of the City of Auburn in western Placer County. The collection system consists of two main sewer trunks, the Highway 49 trunk and the DeWitt trunk. These trunks convey flows from the southern portion of the SMD 1 service area to the County's wastewater treatment plant (WWTP) located on Joeger Road, west of Highway 49 and north of Dry Creek Road in the unincorporated area north of the City of Auburn (herein referred to as North Auburn).

Along the Dewitt trunk, Western Care Construction, Inc. has proposed a development located north of Bell Road and east of Richardson Drive. The purpose of this study is to assess the capacity of the Dewitt trunk to convey existing flows, and to assess the impact of this development upon the capacity of the system, to determine any upgrades that may be required to the gravity sewer system.

1.2 BACKGROUND

The proposed Timberline development is a Continuing Care community on 91.4-acres that is expected to generate wastewater equivalent to 839 EDUs (similar to 839 single family residences). The project parcel is located north of Bell Road and east of Richardson Drive in North Auburn.

This report was required by the Placer County Facility Services Department (Facility Services), which operates and maintains the SMD 1 collection, treatment and disposal facilities, to assess the impact of the project on the SMD 1 wastewater collection system. The results of the capacity evaluation were also used to assess the impact of the Timberline project on the SMD 1 collection system.

2.0 Project Characteristics

2.1 PURPOSE

The purpose of this chapter is to describe the County's existing wastewater collection system.

This chapter is divided into the following sections:

- Project Location
- Land Use Data
- Future Wastewater Flows

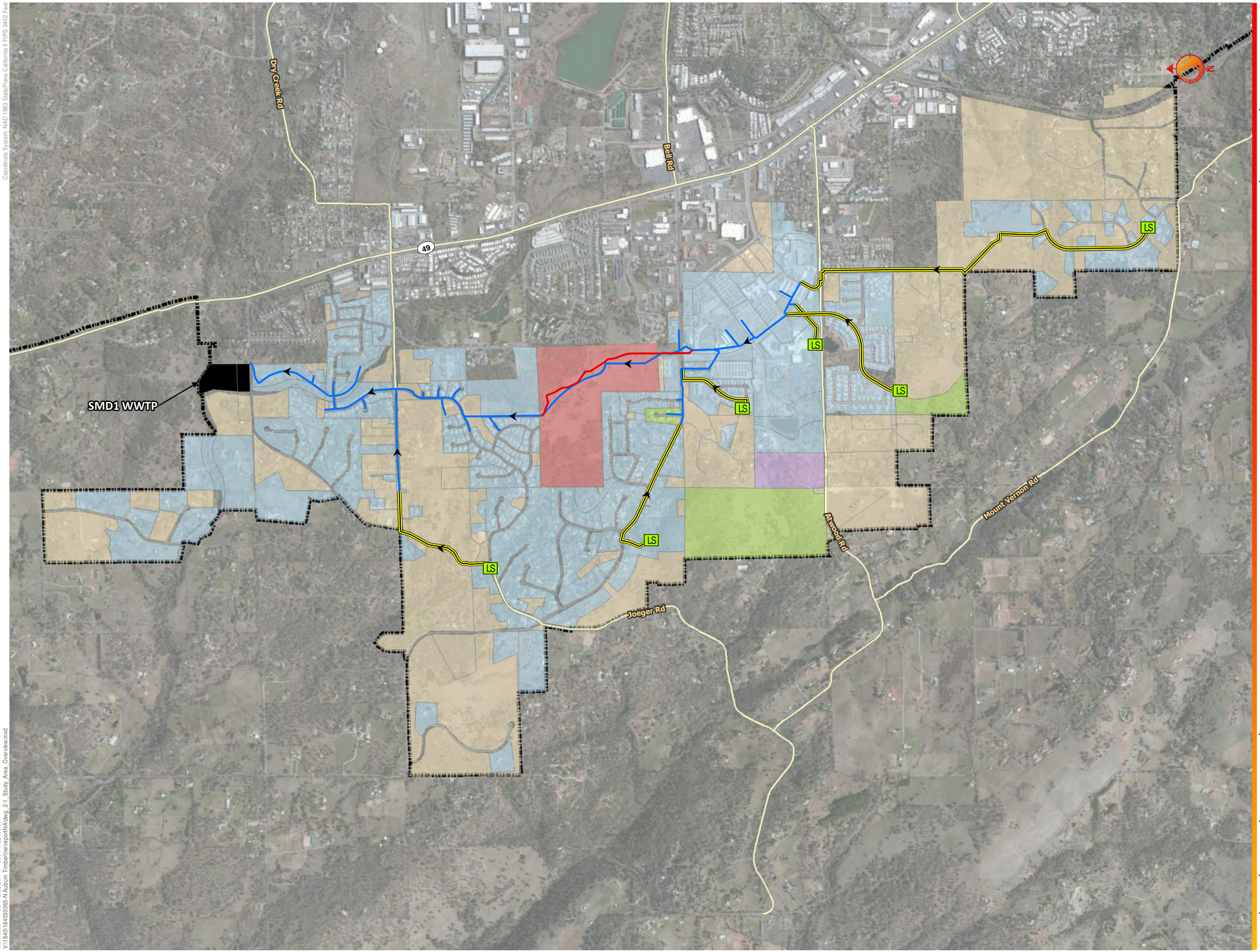
2.2 PROJECT LOCATION

Figure 2-1 shows the location of the proposed Timberline development in relation to the SMD 1 wastewater collection system for the North Auburn Dewitt Trunk Sewer Evaluation. The Study area (portion of SMD 1) is defined as the wastewater subcatchments that contributes flows to the Joeger Road WWTP serviced by the Dewitt trunk. The Timberline development is located north of Bell Road at Richardson Drive, and will add approximately 91.4 acres of serviced land to the existing Dewitt sewershed.

The portion of the SMD 1 service area which discharges into the Dewitt trunk covers an area of approximately 841 acres and currently serves approximately 1,532 equivalent dwelling units (EDUs). The wastewater generated by these users is collected and conveyed to the County's WWTP, located west of Highway 49 on Joeger Road, via a network of sewer pipelines, force mains, and lift stations.

The Dewitt trunk generally follows North Auburn roads from Vineyard Drive to Bean Road, Richardson Drive, Deer Ridge Lane, River Woods Drive, and onto Joeger Road. This trunk collects flows from commercial, industrial and residential developments along the Dewitt corridor and developments to the west. To account for the foothill terrain in the service area, lift stations convey flows from lower areas to system gravity collectors or the Dewitt trunk itself.

This Timberline development has also been tasked with re-aligning the Dewitt trunk within the Timberline development, and re-apportioning the distribution of a few neighbouring parcels. The proposed alignment has been included within this study for assessment.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/7/2014 2:28:20 PM User: maanderson
V:\1840\184030365-N Auburn Timberline\report\NA\dwg_2-1_Study_Area_Overview.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Sanitary Sewer
- Proposed New Sewer Alignment
- Forcemain

Scenario

- Existing Catchments
- Existing Catchments with Internal Growth
- Entitled Catchments
- Full Buildout Catchments
- Timberline Development Lands
- SMD1 WWTP
- SMD1 Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Study Area Overview

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
2-1

Issue/Revision
A/

2.3 LAND USE DATA

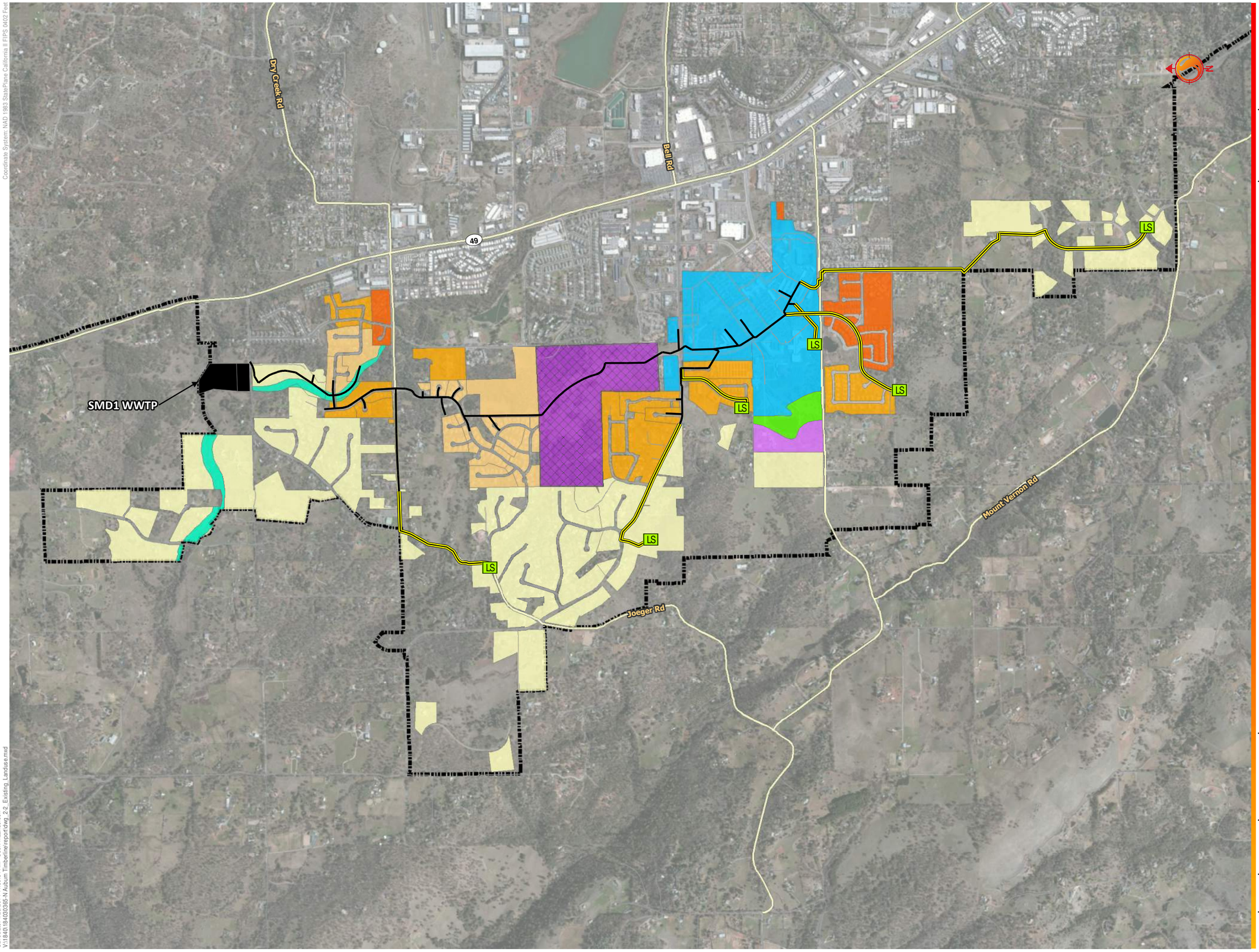
The proposed Timberline development is located north of Bell Road and east of Richardson Drive. In the first phase of the development, it is planned to add 14.4 acres of serviced land to the existing sewershed, and will contain 186 equivalent dwelling units (EDUs). The remaining phases of the development will account for an additional 77.0 acres (combined total of 91.4 acres) and 653 EDUs (combined total of 839 EDUs).

The existing land use and parcel data for the Dewitt trunk sewer shed was provided by the County in GIS format. The number of EDUs was provided by the County. Land uses for existing developments are shown in **Figure 2-2** and **Figure 2-3** and summarized along with the estimated number of EDUs associated with each land use, in **Table 2-1**.

Table 2-1 Existing Land Use Summary[a]

	SMD 1		Dewitt Sewershed	
Land Use Designation	Total Acreage (Acres)	Total Population (EDUs)	Total Acreage (Acres)	Total Population (EDUs)
City of Auburn	150	135	0	0
Commercial	251	976	7	10
Industrial	145	332	0	0
Mixed Use	17	98	0	0
Open Space	58	28	1	2
Open Space / Business Park	6	21	0	0
Professional Office	55	226	0	0
Riparian Drainage	206	164	44	44
Rural Estate 2.3 - 10 Ac. Min.	244	194	0	0
Rural Estate 4.6 - 10 Ac. Min.	24	17	9	7
Rural Low Density Residential	285	575	197	342
Rural Residential 1 - 2.3 Ac. Min.	10	5	0	0
Rural Residential 2.3 - 4.6 Ac. Min.	654	631	28	40
Low Density Residential	139	231	112	158
Low Medium Density Residential	999	2727	383	800
Medium Density Residential	310	1441	60	129
High Density Residential	25	143	0	0
Total	**3578**	**7944**	**841**	**1532**

(a) Provided by Placer County.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 1/23/2014 11:30:34 AM User: maanderson
V:\1840\184030365-N Auburn Timberline\report\dwg_2-2_Existing_Landuse.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Land Use

- Commercial
- Industrial
- Medium Density Residential 5 - 10 DU./Ac.
- Low Medium Density Residential 2 - 5 DU/Ac.
- Low Density Residential 0.4 - 0.9 Ac. Min.
- Mixed Use
- Open Space
- Riparian Drainage
- Rural Real Estate/Rural Residential
- Timberline Development Lands
- SMD1 WWTP
- SMD1 Buildout Boundary
- Sanitary Sewer
- Forcemain
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

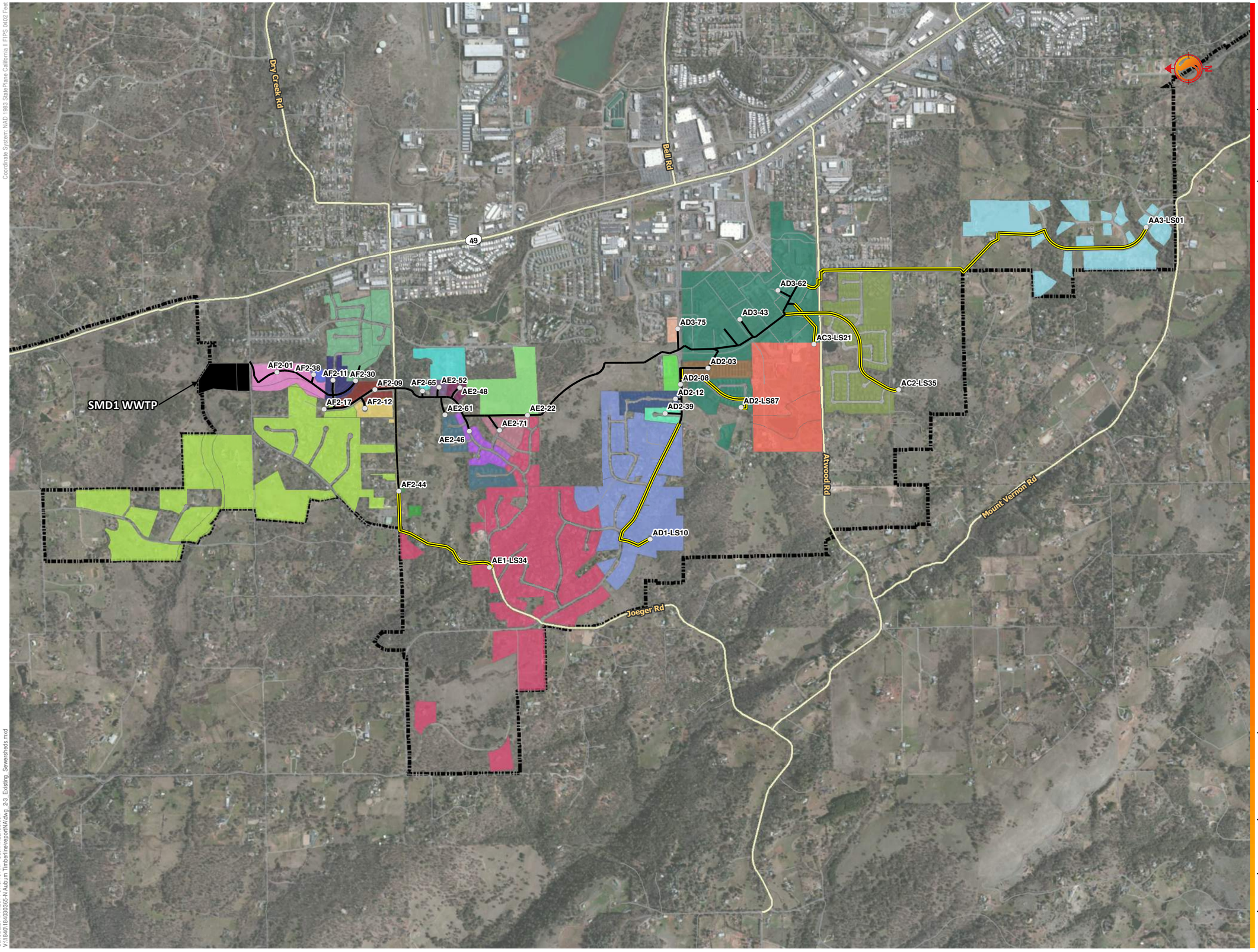
Existing Land Use

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
2-2

Issue/Revision
A/



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/11/2014 8:48:46 AM User: maanderson
V:\184\184030365-N Auburn Timberline\reports\NA\dwg_2-3_Existing_Sewersheds.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Sewer Connection

- AA3-LS01
- AC2-LS35
- AC3-LS21
- AD1-LS10
- AD2-03
- AD2-08
- AD2-12
- AD2-39
- AD2-LS87
- AD3-75
- AE1-LS34
- AE2-22
- AE2-46
- AE2-48
- AE2-52
- AE2-61
- AE2-71
- AF2-01
- AF2-09
- AF2-11
- AF2-12
- AF2-17
- AF2-30
- AF2-38
- AF2-44
- AF2-65

Modeled Nodes
SMD1 WWTP
SMD1 Buildout Boundary
Sanitary Sewer
Forcemain

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Connection of Existing Sewersheds to Modeled Network

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
2-3

Issue/Revision
A/

Placer County Facility Services provided information for the land use designations and EDU counts of the expected population and servicing growth within the SMD 1 service area by means of two shapefiles (complete with description):

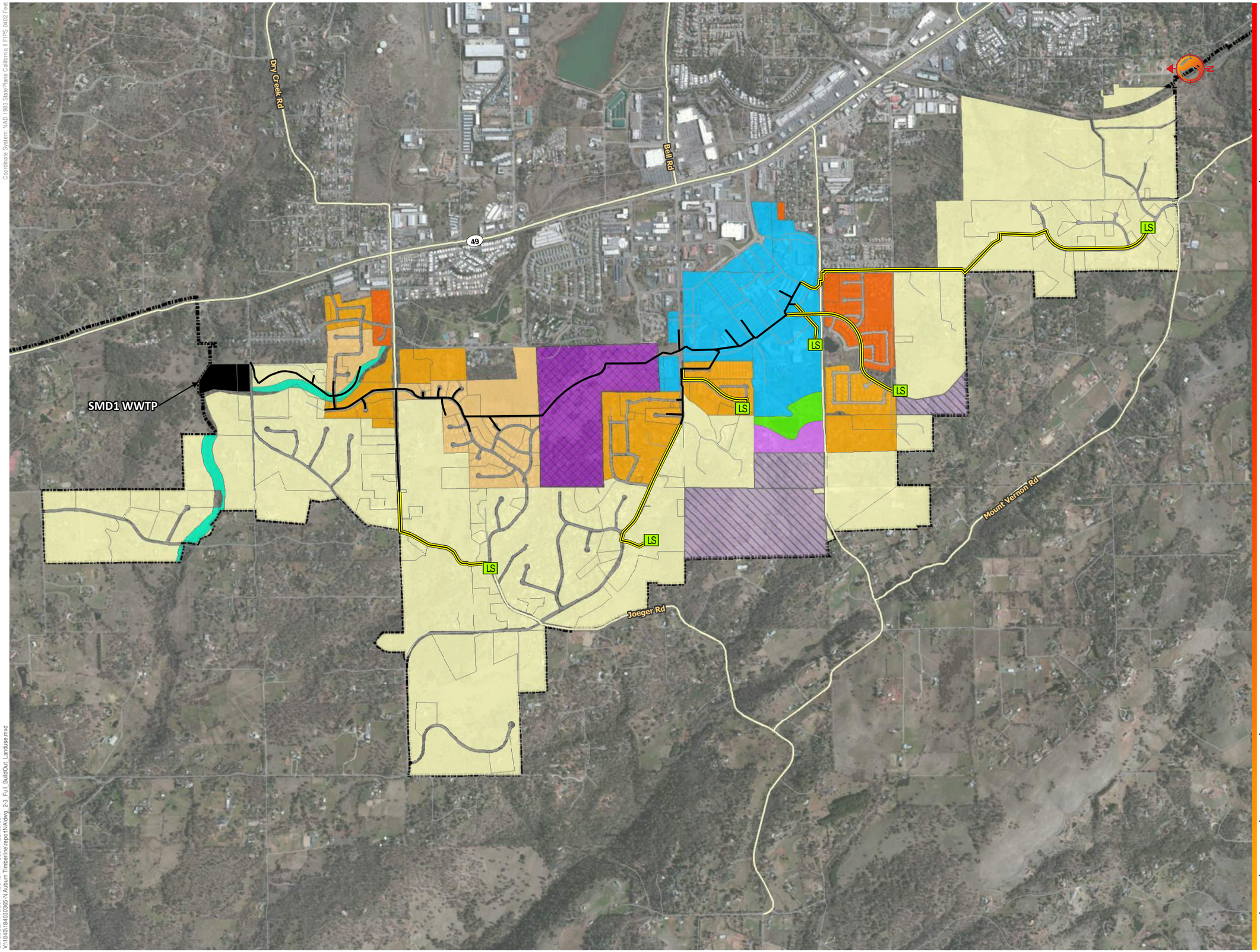
- **"SMD1Basins_20130603.shp"** – Future service area build-out extents with projected population and land area, organized by which manhole they drain to.
- **"SMD1ParcelsWithBasinAndLanduse_20130603.shp"** – Future build-out extents with project population (EDUs) and land area, discretized by parcels and landuse designations. Similar to the preceding shapefile, though with slightly less effective land area and population.

The information contained within these shapefiles were intended to represent the ultimate build-out of SMD 1 and is completely independent of the existing land use data discussed prior. Through discussion with the County, it was decided that a combination of the two shapefiles was to be used. The population estimate within the "SMD1Basins" shapefile was deemed a more accurate prediction of future populations by the County. However, the "SMD1ParcelsWithBasinAndLanduse" shapefile provided the information regarding serviced and non-serviced area. As explained in further detail in Section 4, Future Flow Estimation, the non-serviced area will not contribute to I&I within the system and is not included within the hydraulic model. The future build-out land use is shown in **Figure 2-4** and **Figure 2-5** summarized in **Table 2-2**.

Table 2-2 Future Land Use Projection

	SMD 1		Dewitt Sewershed	
Landuse Designation	Total Acreage (Acres)	Total Population (EDUs)	Total Acreage (Acres)	Total Population (EDUs)
Agricultural	52	26	0	0
City of Auburn	315	0	0	0
Commercial	679	2,957	200	1,179
Industrial	454	694	0	0
Mixed Use	66	268	13	85
Open Space	467	0	49	0
Open Space / Business Park	166	0	0	0
Professional Office	92	297	0	0
Riparian Drainage	220	0	23	0
Rural Estate 2.3 - 10 Ac. Min.	1,012	591	0	0
Rural Estate 4.6 - 10 Ac. Min.	827	519	92	51
Rural Low Density Residential	1,409	1,997	931	1,067
Rural Residential 1 - 2.3 Ac. Min.	0	0	0	0
Rural Residential 2.3 - 4.6 Ac. Min.	4769	3,144	269	192
Low Density Residential	253	708	93	276
Low Medium Density Residential	1,027	3,820	155	614
Medium Density Residential	372	2,537	46	304
High Density Residential	75	424	22	155
Total	**12,255**	**17,982**	**1,893**	**3,923**

Not including the Timberline development, there are currently 3 additional entitled development projects that are planned to be served by the Dewitt trunk sewer. In total, these three developments represent approximately 94 EDUs. A detailed list of these developments is included in **Appendix A**.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/10/2014 4:26:42 PM User: maanderson
V:\184\184030365-N Auburn Timberline\report\NA\dwg_2-3_Full_BuildOut_Landuse.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Land Use

- Commercial
- Industrial
- Medium Density Residential 5 - 10 DU./Ac.
- Low Medium Density Residential 2 - 5 DU/Ac.
- Low Density Residential 0.4 - 0.9 Ac. Min.
- Mixed Use
- Open Space
- Riparian Drainage
- Rural Real Estate/Rural Residential
- Entitled Catchments
- Timberline Development Lands
- SMD1 WWTP
- SMD1 Buildout Boundary
- Sanitary Sewer
- Forcemain
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

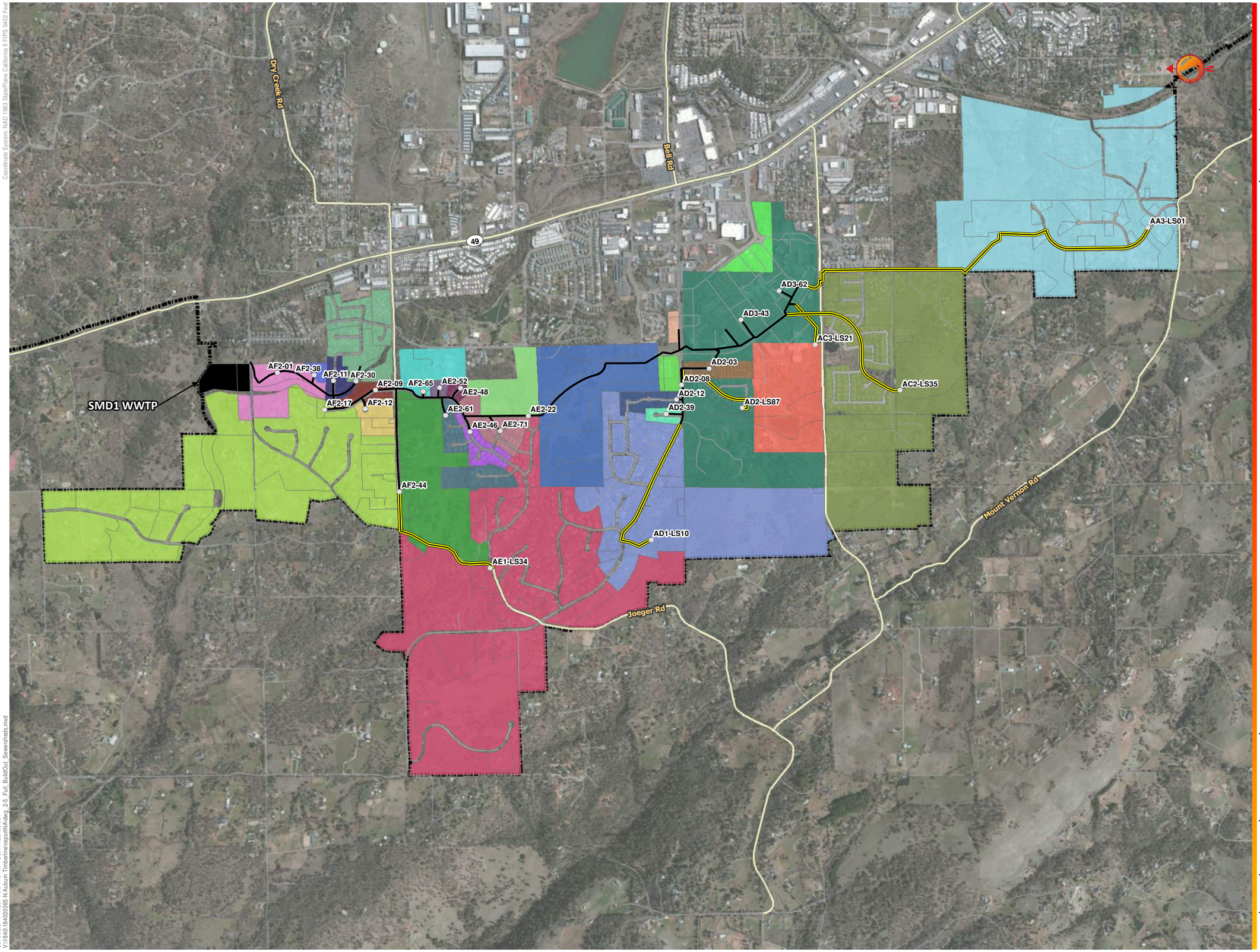
Full Build-Out Land Use

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
2-4

Issue/Revision
A/



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/11/2014 9:04:45 AM User: maanderson
V:\1840\184030365-N Auburn Timberline\report\NA\dwg_2-5_Full_BuildOut_Sewersheds.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Sewer Connection
- AA3-LS01
- AC2-LS35
- AC3-LS21
- AD1-LS10
- AD2-03
- AD2-08
- AD2-12
- AD2-39
- AD2-50
- AD2-LS87
- AD3-43
- AD3-62
- AD3-75
- AE1-LS34
- AE2-22
- AE2-46
- AE2-48
- AE2-52
- AE2-61
- AE2-71
- AF2-01
- AF2-09
- AF2-11
- AF2-12
- AF2-17
- AF2-30
- AF2-38
- AF2-44
- AF2-65

Modeled Nodes
SMD1 WWTP
SMD1 Buildout Boundary
Sanitary Sewer
Forcemain

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Connection of Future Sewersheds to Modeled Network

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
2-5

Issue/Revision
A/

2.4 FUTURE WASTEWATER FLOWS

The estimates for future (build-out) system flow were derived from a combination of existing system information, per the Placer County Design Guidelines, and through discussions with County Staff. The following provides a brief summary of the wastewater loading characteristics:

- **GWI** (groundwater infiltration) = 100 gpd / ac
  - Extrapolated from existing system performance

- **Average DWF** (dry weather flow) = 200 gpd / edu
  - Extrapolated from existing system performance
  - Diurnal loading assumed to be identical to existing system

- **RDII** (rainfall dependent infiltration and inflow) **Allowance** – 1338 gpd / ac
  - This value was derived from a technical memorandum issued by RMC entitled *South Placer Regional Wastewater & Recycled Water Systems Evaluation Project*, May, 2005 (RMC TM3a). In the report, a peak WWF (wet weather flow) of 1368 gpd/edu and a peak DWF of 380 gpd/edu are recommended. This approximates to 1000 gpd/edu infiltration. Note that the RDII allowance parameter is presented as an acreage basis rather than an EDU basis as recommended within the RMC report. As discussed later in Section 3.4.2, the hydraulic model derives the I&I based upon land area. **Table 2-3** and **Table 2-4** provide a summary of the RDII Allowance considerations.

Table 2-3 Population Density Summary

Rainfall Event	Contributing Area (ac)	Contributing EDUs	Density (edu/ac)
Existing System Model (Design Event)	3583	7944	2.22
Future Catchments Only(a)	7503	10039	1.338

a) Landuse designations that contain no population is considered to not be serviced, and therefore not included as contributing area or EDU count. These designations are: City of Auburn, Open Space, Open Space / Business Park, and Riparian Drainage.

Table 2-4 Future Flow and Infiltration Allowance Summary

Rainfall Event	Peak DWF [mgd]	Peak WWF [mgd]	Peak I&I [mgd]	RDII [gpd/ac]	RDII [gpd/edu]	PWWF [gpd/edu]
Existing System Model (Design Event)	2.67	11.5	8.8	2464	1112	1448
Future Catchments Only	4.97	15.0	10.0	1338	1000	1495

3.0 Overview of Hydraulic Model

3.1 PURPOSE

The purpose of this chapter is to present an overview of the development and calibration of the hydraulic model of the Dewitt wastewater trunk collector located in SMD 1 of Placer County.

This chapter is divided into the follow sections:

- Modeling Software
- Model Inputs and Construction
- Model Calibration

3.2 MODELING SOFTWARE

The wastewater collection system capacity was evaluated using a hydrodynamic routing model, Mike Urban 2011, Service Pack 7, by DHI.

3.3 MODEL INPUTS AND CONSTRUCTION

The GIS database files containing the physical collection system information (pipe lengths, diameters, inverts, manhole depths, etc.) were imported into the modeling software. The data import resulted in an initial model build containing the necessary information for pipes and junctions. A Manning "n" roughness coefficient was assigned to gravity sewer based upon the identified pipe material, as per **Table 3-1**.

Table 3-1 Sewer Roughness Values

Material	Manning's "n" value
Asbestos Cement	0.013
Ductile Iron	0.0145
PVC	0.012
Tranzite	0.013
Unidentified	0.013
Vitrified Clay Pipe	0.0145

Mike Urban also uses manhole loss coefficients to further determine the total resistance to flow within the network. An universal "Km" value of 0.10 was applied using the "MOUSE Mean Energy Approach" equations to calculate the resistance to the flow. Mike Urban calculates the total loss through a manhole by applying additional modifiers to the "Km" value automatically. These additional modifiers represent factors such as, but not exclusively:

- Manhole entry and exit loss coefficients

- Flow angle
- Plunging manholes
- Drop elevation

These factors are calculated within the MOUSE module, and are not user determined. The "Km" value was determined to be most appropriate through discussions with DHI staff.

Once imported into the model, a number of issues were found in the GIS source data:

- Connectivity errors. These errors were most common, and were addressed either by revisiting the as-built data or through discussions with County staff.

- Incomplete data. Assumptions were made to complete the model database connectivity, pipe sizes, and elevations.

- Invert and pipe slope and size inconsistency. In many cases, GIS data indicates pipes with negative slopes. These pipes were adjusted to have positive slopes in the model. Negative slopes are generally mistakes in the GIS database, and likely do not represent actual negative slopes in the wastewater system pipes.

The model is comprised of a network of data elements called *nodes* and *links*. The *nodes* and *links* represent the components of a typical wastewater collection system.

- A *node* is a point in the network having an X and Y coordinate. *Nodes* can represent manholes, wet wells, chamber, or outfalls.

- *Links* convey flow between nodes. They are connected at one end to a *start node* and the other end to an *end node*. *Links* can represent gravity sewers, force mains or pumps.

3.3.1 Sewer Pipes and Manholes

The sewers to be modeled were identified by the County prior to the initiation of this project. They are generally defined as any sewer trunks tributary to and including the Dewitt trunk downstream of all active lift stations. In general, the collection system upstream of lift stations was not included in the model.

3.3.2 Lift Stations

Lift stations were included within the model to facilitate the start/stop effects of the forcemains upon the downstream collection system. Note that the performance and the capacity of the lift stations were not assessed within this study.

The lift stations to be included in the model were identified by the County prior to the initiation of this project. The modeled lift stations include:

- Vineyards Lift Station
- Bell Road Lift Station

- Joeger Road Lift Station
- County Jail Lift Station
- Olympic Village Lift Station
- Atwood 3 Lift Station

ISCO Pumplink data was used as the basis for determining the actual discharge capacity of the forcemains. This data was provided by the County. **Table 3-2** summarizes the parameters used within the model.

Table 3-2 Sewer Maintenance District 1 (SMD 1) – Highway 49 Trunk Lift Station Information

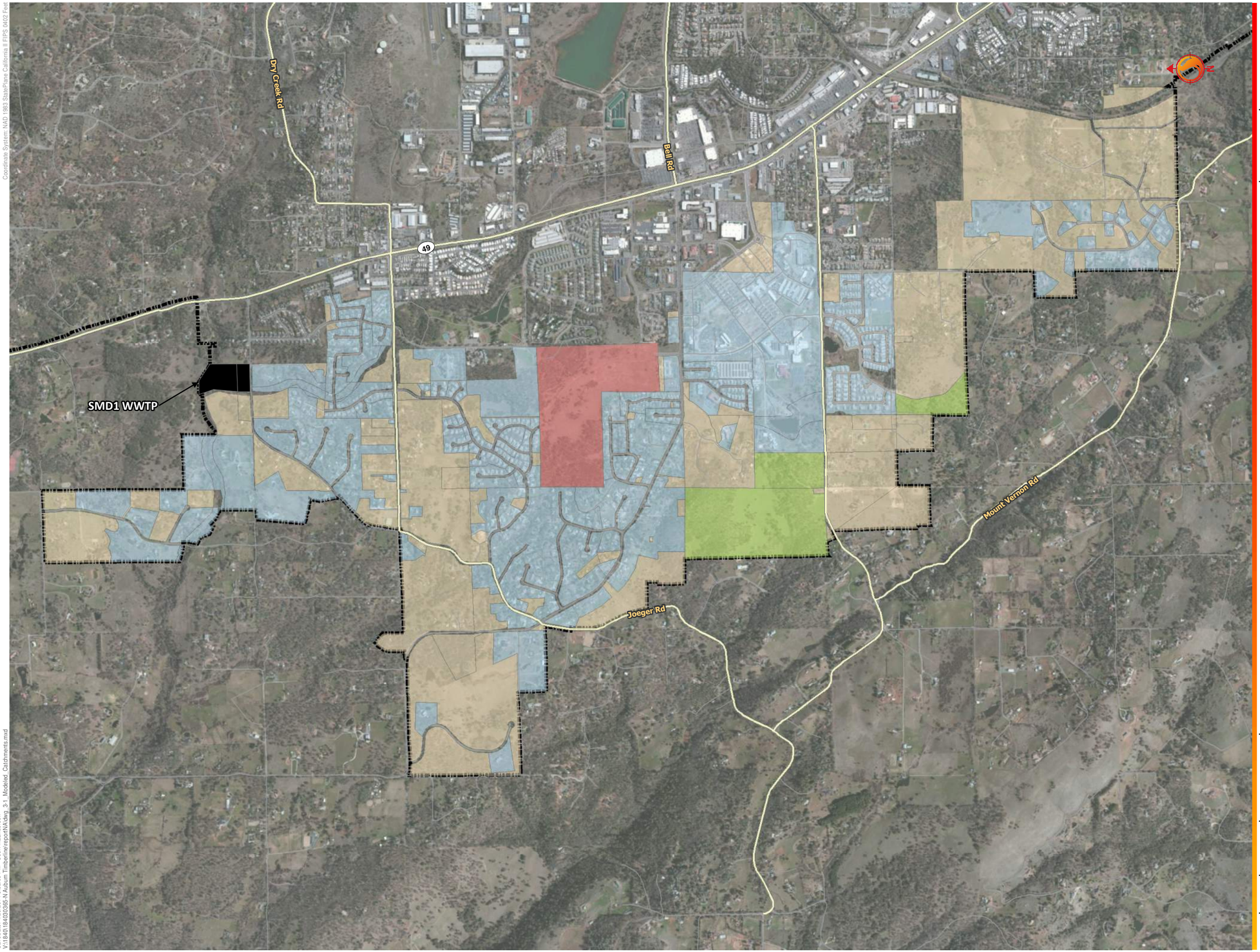
Lift Station	Model ID No.	Lead Pump Start Level (ft)	Lag Pump Start Level (ft)	Lead Pump Modeled Flow Rate (gpm)	Lag Pump Modeled Flow Rate (gpm)
Vineyards Lift Station	AA3-LS01	1195.5	1196.0	90	21
Joeger Road Lift Station	AE1-LS34	1266.0	1266.5	146	132
County Jail Lift Station	AC3-LS21	1395.6	1395.9	167	90
Olympic Village Lift Station	AD2-LS87	1379.7	1379.9	243	14
Atwood 3 Lift Station	AC2-LS35	1312.7	1313.2	90	83

3.3.3 Subcatchments

Subcatchments are used within hydrodynamic models to represent the combined land area and population that contribute to wastewater flows in a particular part of the system. Often these subcatchments are the areas upstream of a particular manhole, or lift station. The overall service area of the Dewitt Trunk shown on **Figure 3-1** is made up of a number of subcatchments. The County provided the population and extents of the subcatchments for the Dewitt Trunk within the landuse information provided in the file "SMD1ParcelsWithBasinAndLanduse_20130603.shp" discussed in section 2.3.

3.3.4 Design Storms

Design storms are usually simulated in the hydraulic model to assess the capacity of the sewer system being studied under wet weather conditions. This is typically done with the goal of assessing potential risk of surcharging the system and experiencing SSOs. For the SMD 1 collection system, Placer County Facility Services directed the use of a 10-year, 24-hour design storm to assess the capacity of the wastewater collection system.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/29/2014 3:32:05 PM User: maanderson
V:\1840\184030365-N Auburn Timberline\report\N A\dwg_3-1_Modeled_Catchments.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

Scenario

- Existing Catchments
- Entitled Catchments
- Full Buildout Catchments
- Timberline Development Lands
- SMD1 WWTP
- SMD1 Buildout Boundary

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Dewitt
Modeled Catchments

Project No.
184030365

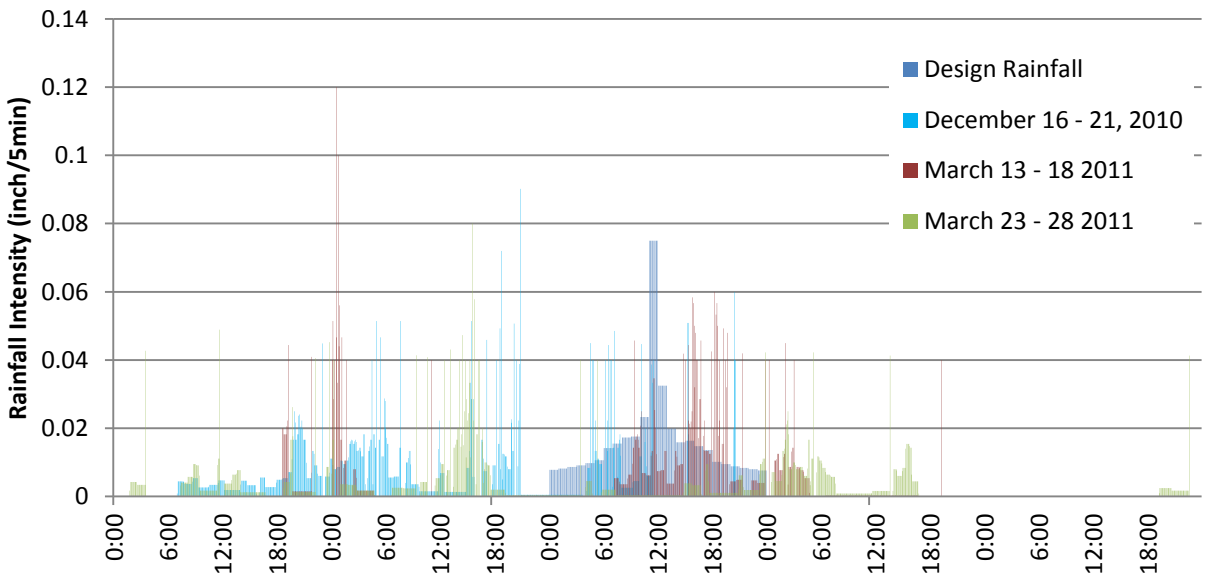
Scale
0 0.1 0.2 0.3 Miles

Figure No.
3-1

Issue/Revision
A/

The procedure outlined in the "Placer County Flood Control and Water Conservation District Stormwater Management Manual" was used as the basis for creating the design storm. The design storm total rainfall over a 24 hour period at 1400 feet elevation was 4.59 inches, distributed such that the peak intensity (0.90 inches/hour) occurred at the mid-way point of the storm event (as prescribed in the Placer County Flood Control and Water Conservation District Stormwater Management Manual). The hyetographs from the 10-year, 24-hour theoretical design storm, as well as three other, representative storms that occurred in the area during 2010 – 2012 are shown in **Figure 3-2**. Further explanation of how these design storms are used in the modeling and capacity assessment is provided in the model calibration section of this chapter.

Figure 3-2 10-year, 24-hour Design Storm Hyetograph



3.4 MODEL CALIBRATION

The calibration process is required to ensure the accuracy of the model at predicting the system performance under varying flow conditions. Using the flow monitoring data provided, the model was calibrated using actual dry weather and wet weather conditions (both flow monitoring and precipitation data). The calibrated model was then used to assess system performance under design storm conditions.

3.4.1 Dry Weather Flow Calibration

To establish a baseline for the results, the model was calibrated to DWF conditions. It should be noted that the DWF will remain unaffected regardless of the amount of rainfall that occurs, and therefore is the

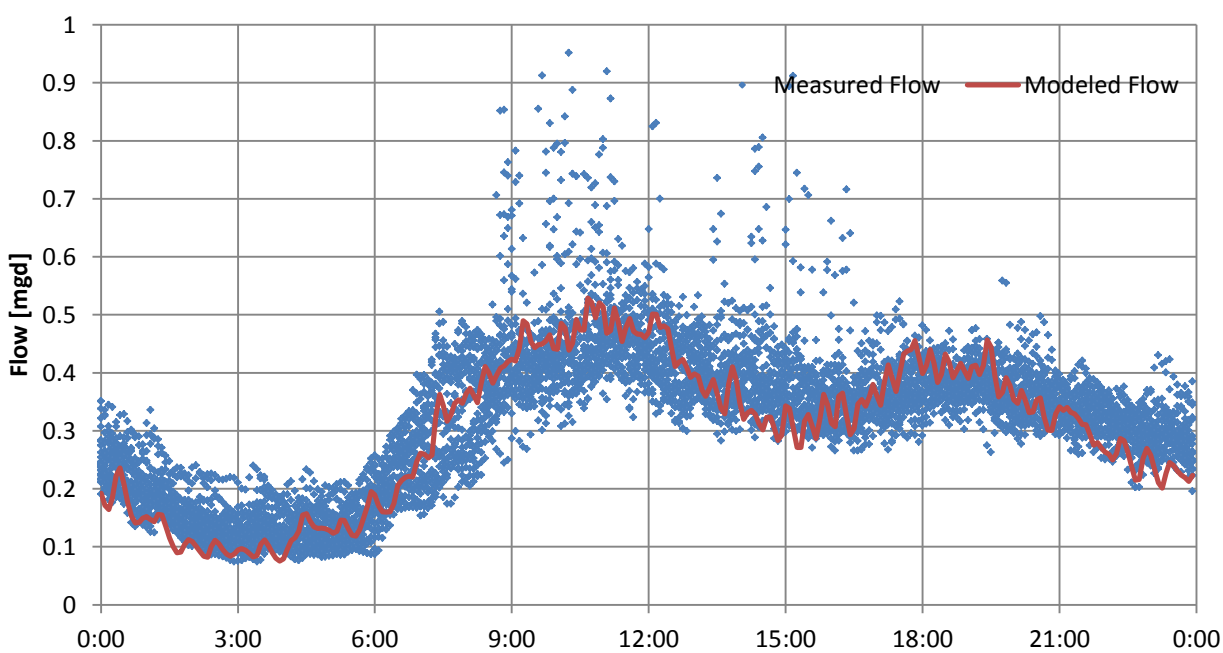
most consistent metric available. The model was compared against four (4) weeks of data (Nov 25, 2008 to Dec. 20, 2008) collected from a flow monitor located downstream along the Dewitt Trunk, in manhole AG2-03. The process for calibration included the establishment of a DWF diurnal pattern. The values of the GWI, the ADWF and the DWF peaking factors (within the diurnal pattern) were adjusted based upon the calibration criteria. The accuracy of each calibration iteration was determined qualitatively by a visual inspection and quantitatively through an analysis of the minimum, maximum, and average flows for the period. The comparison of these statistics is shown in **Table 3-3**.

Table 3-3 DWF Calibration Results

Calibration Results for WWTP Flows	Average DWF [mgd]	Peak DWF [mgd]	Minimum DWF [mgd]
Modeled Flow	**0.301**	**0.529**	**0.075**
Measured Flow	0.317	0.952	0.075
% Error	**-5.29%**	**-44.46%**	**1.14%**

Figure 3-3 shows the comparison of the "Measured" and "Modeled" DWF at the WWTP, with all of the data superimposed to eliminate the extraneous variability in day-to-day flow.

Figure 3-3 DWF Calibration Plot



Generally, the model would be considered calibrated if the difference between the modeled flow and the measured flow was less than 5%. As the reported difference in peak flow is in excess of 44% difference, an

explanation is warranted. During the course of the calibration, it was determined that a short, intense increase in flow was occurring at unpredictable times during the 2008 flow monitoring season. This increase in flow was assessed to be "real" data (i.e., not a result of flow monitoring error) as the increase was also measured at the Joeger Road WWTP. However, more recent data collected at the Joeger Road WWTP suggests that this unpredictable source of flow has been eliminated. Unfortunately, no data from the flow monitor in manhole AG2-03 is available for the more recent years, and is not unable to corroborate this suggestion. Regardless, these spikes in flow were considered to be abnormal and not representative of typical flow.

3.4.2 Wet Weather Flow Calibration

The calibrated DWF model was used as the basis for expanding the model to include WWF. The four rainfall events established in Section 3.3.4 of this report were used for the calibration. Note that the rainfall events occurred after the collection of flow data along the Dewitt Trunk terminated. Therefore, the flow data gathered at the Joeger Road WWTP was used as the basis for the WWF model.

The Mike Urban software utilizes two sets of calculation engines to model the RDII response in the network during WWF. The RDII response is simulated through the use of the "RDI" and the "Model A" equations.

The "RDI" equations characterize how the network responds to the long duration infiltration of water into the network through seepage or cracks in the sewers (the slow response). The "Model A" equations characterize how the network responds to the direct inflow of water into the network through manholes, cross-connections, roof leaders or other openings (the fast response).

A summary of the WWF finalized calibration parameters is shown in **Table 3-4**.

Table 3-4 Mike Urban RDII Equation Parameters

Model A Parameters	
Impervious Area [%]	1.1
Reduction Factor [1/1]	0.7
Initial Loss [inch]	0.03
Time of Concentration [min]	120
RDI Parameters	
RDI Area [%]	14
Umax [inch]	2
Lmax [inch)	40
Cqof [1/1]	0.3
Carea [1/1]	1
Ck [h]	8
Ckif [h]	300
Ckbf [h]	500
Tof [1/1]	0
Tif [1/1]	0
Tg [1/1]	0
InitU [inch]	0
InitL [inch]	20
InitGwl [ft]	32.808
InitOf [in/h]	0
InitIf [in/h]	0
GwSy [1/1]	0.3
GwLmin [ft]	0
GWLbf0 [ft]	32.808
GWLfl1 [ft]	0

The WWF model results for the rain events were plotted against the flow monitoring data. **Figure 3-4** through **3-6** show the comparison of the "Measured" and "Modeled" WWF. Results are also summarized in **Table 3-5**.

Table 3-5 WWF Calibration Results

Calibration Results for WWTP Flows	Dec 16 – 21, 2010		Mar 13 – 18, 2011		March 23 – 28, 2011		Nov 28 – Dec 5, 2012	
	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]	WWF Peak [mgd]	Total Volume [mil gal]
Modeled Flow	9.55	24.66	10.69	21.73	10.33	27.73	11.32	28.99
Measured Flow	9.98	23.72	10.42	20.80	9.85	24.97	10.43	29.06
% Error	**(4.33%)**	**3.96**	**2.56%**	**4.48%**	**4.85%**	**11.02%**	**8.55%**	**(0.23%)**

Figure 3-4 December 16th – 21st, 2010 Calibration Results

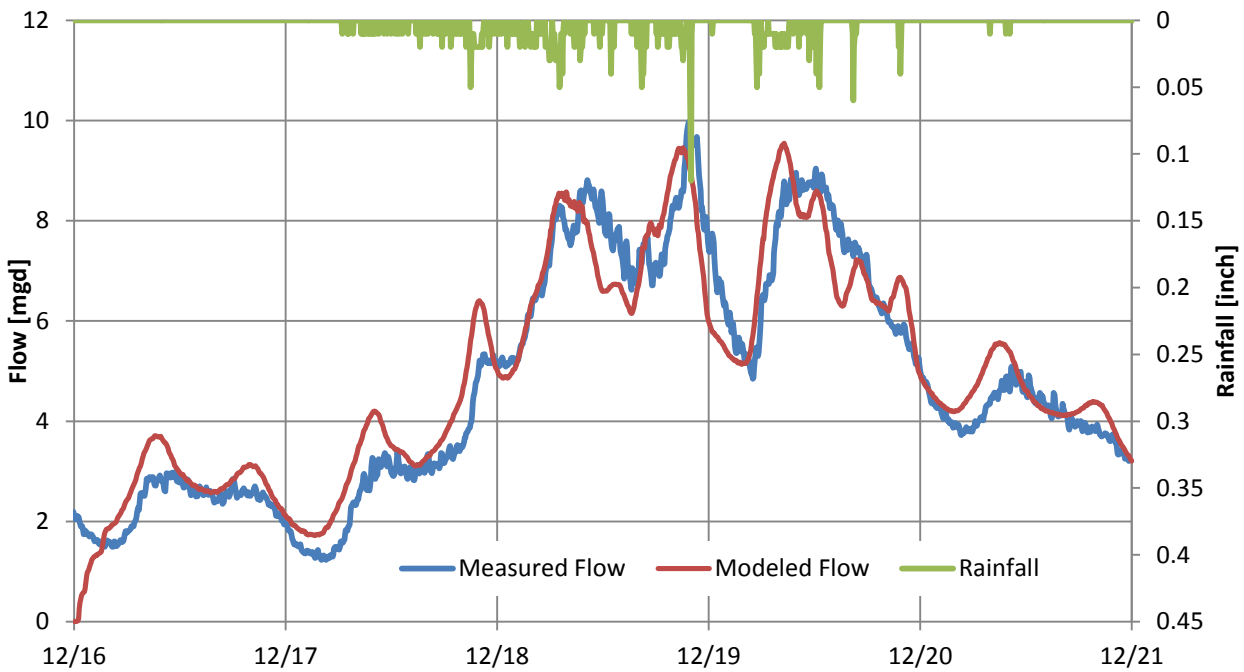


Figure 3-5 March 13th – 18th, 2011 Calibration Results

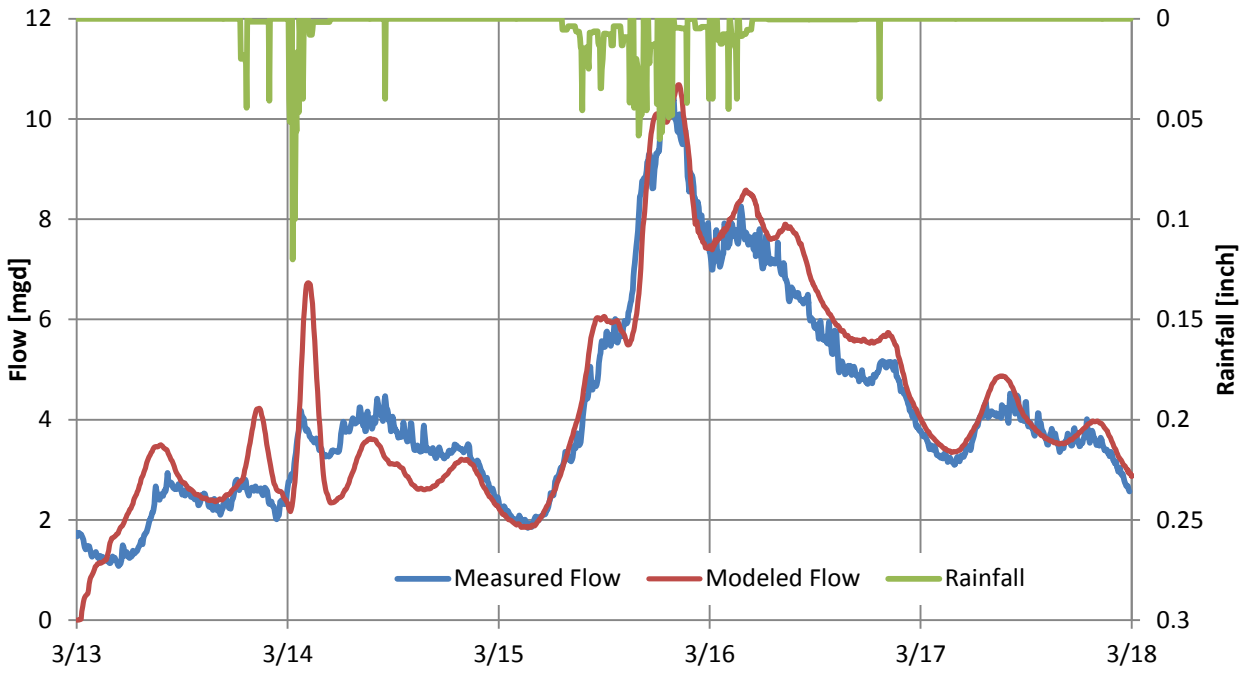


Figure 3-6 March 23rd – 28th, 2011 Calibration Results

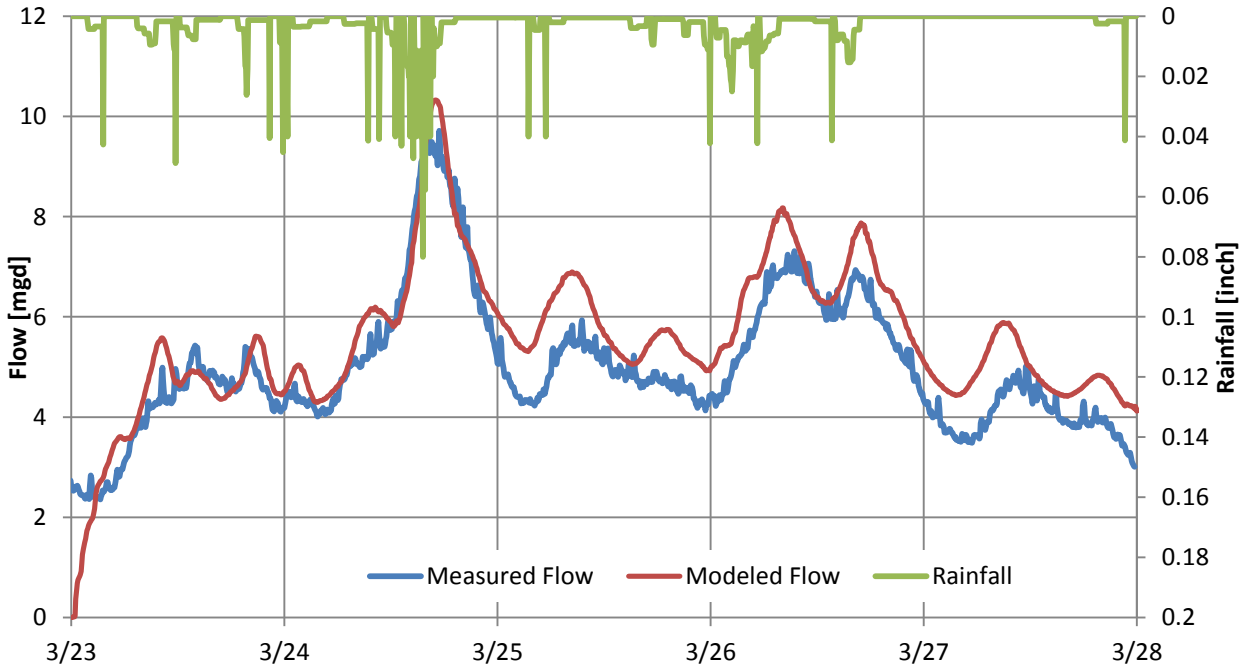
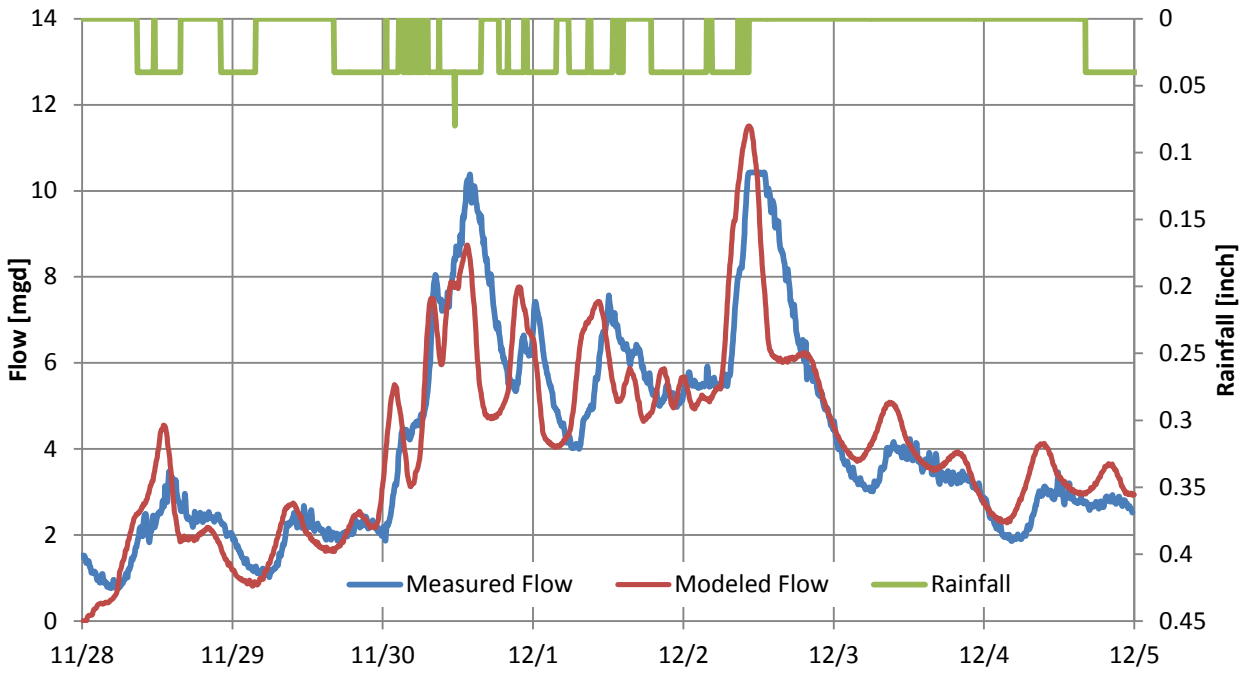


Figure 3-7 November 28th – December 5th, 2012 Calibration Results



4.0 Wastewater Collection System Capacity Evaluation

4.1 PURPOSE

The purpose of this chapter is to provide a summary of the results of the level of service (LOS) performance of the Dewitt Trunk Sewer applying the 1:10-year, 24-hour design storm design event upon the various growth scenarios.

This chapter is divided into the following sections:

- Recommended Capacity Evaluation Criteria
- Modeled Scenarios
- Model Results:
    - Existing System
    - Existing System + Timberline Phase 1 Development
    - Existing System + Entitled
    - Existing System + Entitled + Timberline Phase 1 Development
    - Existing System + Entitled + Timberline Full Build-out Development
    - Build-out of System

4.2 RECOMMENDED CAPACITY EVALUATION CRITERIA

The design rainfall event was applied to the Mike Urban model to evaluate the LOS performance in meeting the following primary criteria, which were defined by Placer County Facility Services:

- Freeboard
- Velocity
- Pipe capacity

4.2.1 Level of Service Criteria

Freeboard in a manhole is defined as the distance between the rim elevation and the hydraulic grade line (HGL). The manhole is considered to be surcharged when the HGL exceeds the pipe crown.

For freeboard for existing manholes, there are two deficiency criteria for this analysis:

1. When the rim elevation is less than or equal to 8-feet above the pipe crown:

   a. No surcharging is allowed.
2. When the rim elevation is more than 8-feet above the pipe crown:
   a. A pipeline is hydraulically deficient if there is less than 8-feet of freeboard or the surcharging is equal to or greater than 1-foot above the pipe crown.

For new improvements to the Dewitt trunk system, no hydraulic surcharging is allowed in manholes.

4.2.2 Velocity

Gravity sewer shall allow a minimum flow velocity of 2.5 ft/s and a maximum of 7 ft/s. All sewers that have a velocity outside of these criteria shall be identified.

Force mains shall allow a minimum flow velocity of 2 ft/s and a maximum of 7 ft/s. All force mains that have a velocity outside of these criteria shall be identified.

4.2.3 Pipe Capacity

Sewer pipes shall conform to the following capacity criteria under design storm conditions.

- d/D shall be a maximum of 70% for pipe less than or equal to 24 inch
- d/D shall be a maximum of 100% for pipe greater than 24 inch

4.3 MODEL RESULTS

The average DWF and peak WWF model results are summarized in **Table 4-1** and described in more detail in the following sections.

Table 4-1 Design Event Flow Summary (Dewitt Trunk @ MH AG2-03)

	Average DWF [mgd]	Peak DWF [mgd]	Peak WWF [mgd]
Existing Conditions	0.282	0.518	2.909
Existing + Timberline Phase 1	0.322	0.607	2.934
Existing + Entitled	0.309	0.557	2.917
Existing + Entitled + Timberline Phase 1	0.356	0.627	2.938
Existing + Entitled + Timberline Full Build-out	0.494	0.854	2.983
Dewitt Trunk Ultimate Build-out	0.838	1.319	3.233

4.3.1 Existing System – Design Storm Event

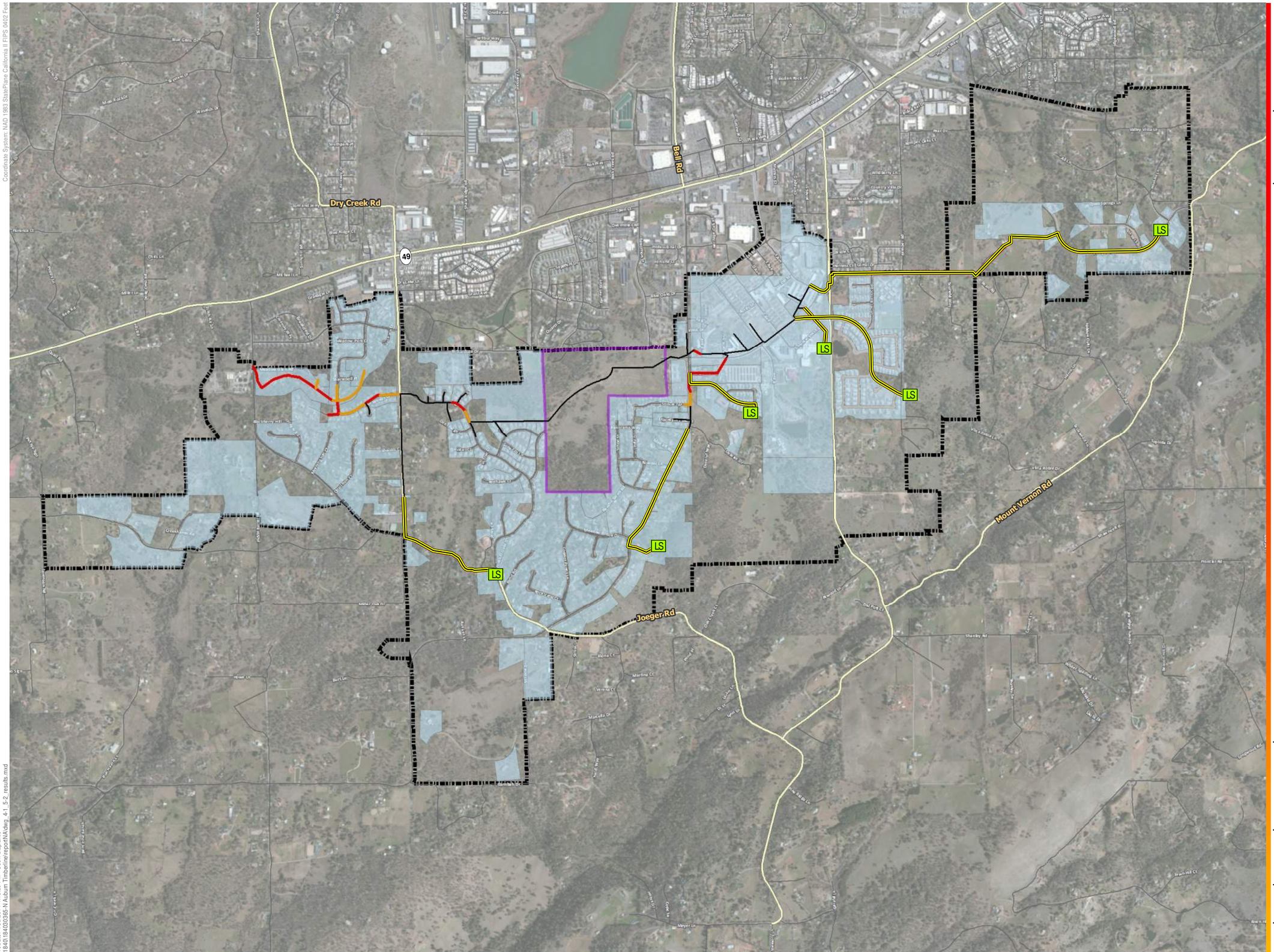
Under existing conditions, a 10-year, 24-hour design storm event is predicted to generate a peak flow of 2.909 mgd in the Dewitt Trunk sewer. This storm event is predicted to cause surcharging in several reaches along the Dewitt Trunk Sewer as well as in lateral sewers downstream of several of the lift stations. Model simulation results for the existing system during peak WWF conditions are presented in **Figure 4-1**, which indicate the following:

- Sewers shown as black lines are not predicted to have capacity issues.
- Sewers shown in green are identified as sewers that are surcharged due to downstream conditions though have sufficient freeboard to meet the County's Level of Service (LOS) criteria.
- Sewers shown in blue are identified as sewers that are surcharged due to insufficient capacity though have sufficient freeboard to meet the County's LOS criteria.
- Sewers shown in orange and red are sewers that are surcharged to an extent such that they do not meet the County's LOS criteria, and are resultant from downstream conditions and insufficient capacity, respectively.

To help identify the extent of surcharging within the existing network, hydraulic grade line (HGL) profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Dewitt Trunk. Note that these profiles also include the results for the other growth scenarios, to be discussed in the following sections.

The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: there is no expected surcharging.
- **Figure B-3A**: there is no expected surcharging.
- **Figure B-4**: minor surcharging (<2ft) along Deer Ridge Lane and terminating approximately 50ft downstream of White Doe Court, affecting approximately 700ft of 10 inch sewer. The surcharging is a result of insufficient sewer capacity and is expected to have less than 8ft of HGL freeboard, and therefore does not meet the County's LOS criteria.
- **Figure B-5**: severe surcharging resulting along Riverwoods Drive and Sherwood Way, an expected sanitary sewer overflows (SSOs) downstream of Sherwood Lane, affecting a total of over 3500ft of sewer ranging in size from 8 inches to 15 inches.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 4/30/2014 4:13:20 PM User: blaplante
V:\1840\184030365-N Auburn Timberline\report\NA\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall
- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain

Scenario
- Existing Catchments
- Timberline Development Lands
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Existing Level of Service

Project No.
184030365

Scale
0 0.1 0.2 0.3 Miles

Figure No.
4-1

Issue/Revision
A/

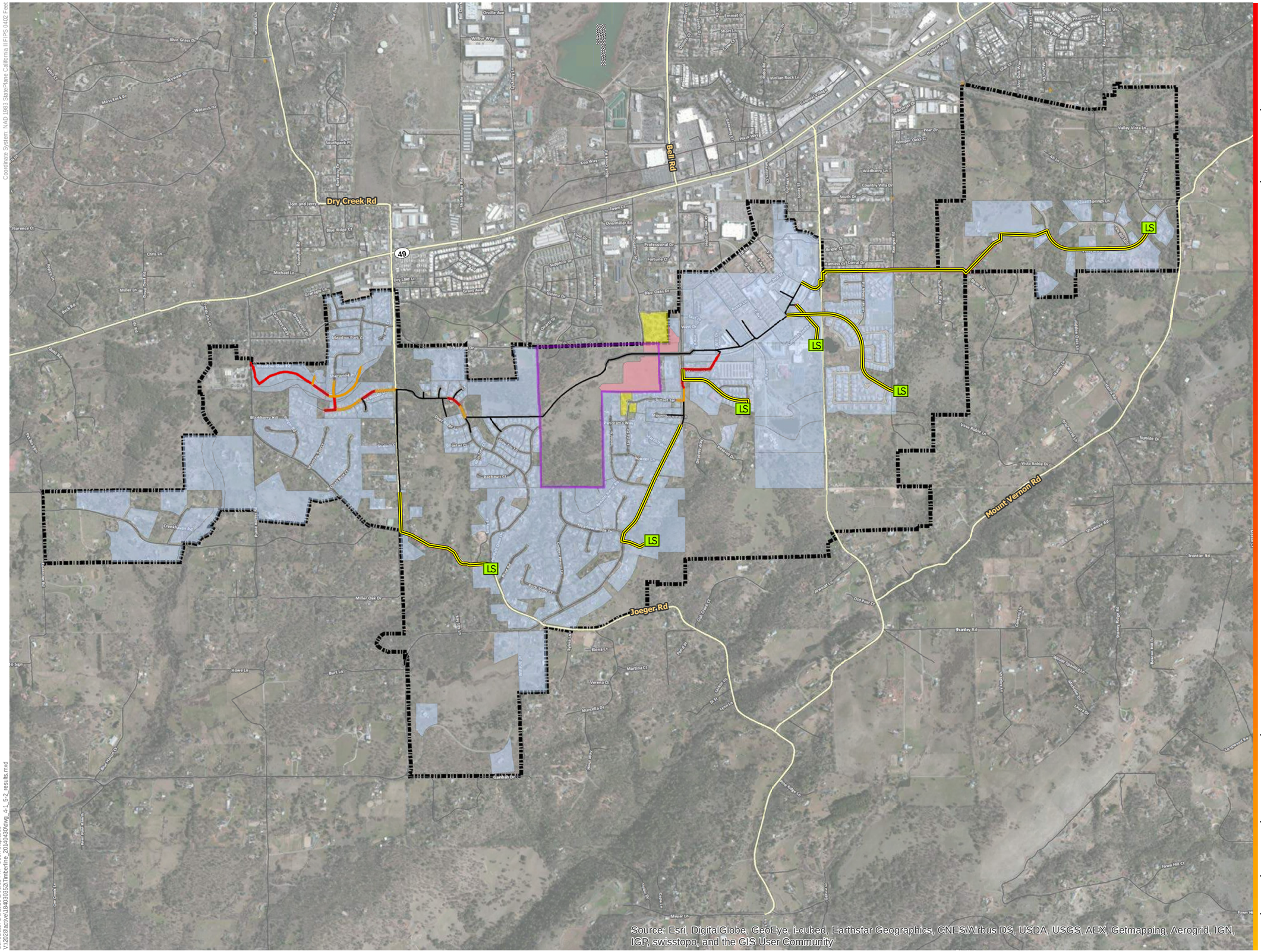
4.3.2 Existing System + Timberline Phase 1 Development – Design Storm Event

As part of the phase 1 Timberline development, a portion of the Dewitt trunk has been proposed to be re-aligned. It is predicted that the inclusion of phase 1 of the Timberline development, along with the re-alignment, will increase the flow within the Dewitt Trunk to 2.921 mgd. The surcharging in this scenario is expected to increase, but is not expected to affect any sewers not already surcharged under existing conditions. Model simulation results for the existing system and entitled projects during peak WWF conditions are shown in **Figure 4-2**.

To help identify the extent of surcharging within the existing network, HGL profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Dewitt Sanitary Sewer Trunk for this scenario.

The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: there is no expected surcharging.
- **Figure B-3B**: there is no expected surcharging along either the portion of realigned sewer, or the downstream existing sewer.
- **Figure B-4**: the surcharging along Deer Ridge Lane is not expected to affect any additional sewer. However, the HGL freeboard is expected to decrease by up to 0.9 ft (manhole AE2-51).
- **Figure B-5:** the surcharging in this reach is expected to universally worsen. No additional SSOs are expected to occur, though it is predictable that the intensity of overflow will increase.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 3/6/2015 2:05:33 PM User: blaplante
V:\2028\active\184030352\Timberline_20140430\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall
- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain
- Timberline Development Lands

Scenario
- Existing Catchments
- Timberline Phase 1 New Alignment
- Timberline Phase 1
- Offsite Catchments
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Existing + Timberline PH1 Level of Service

Project No. 184030352

Scale 0 0.1 0.2 0.3 Miles

Figure No. 4-2

Issue/Revision A/

4.3.3 Existing System + Entitled Developments – Design Storm Event

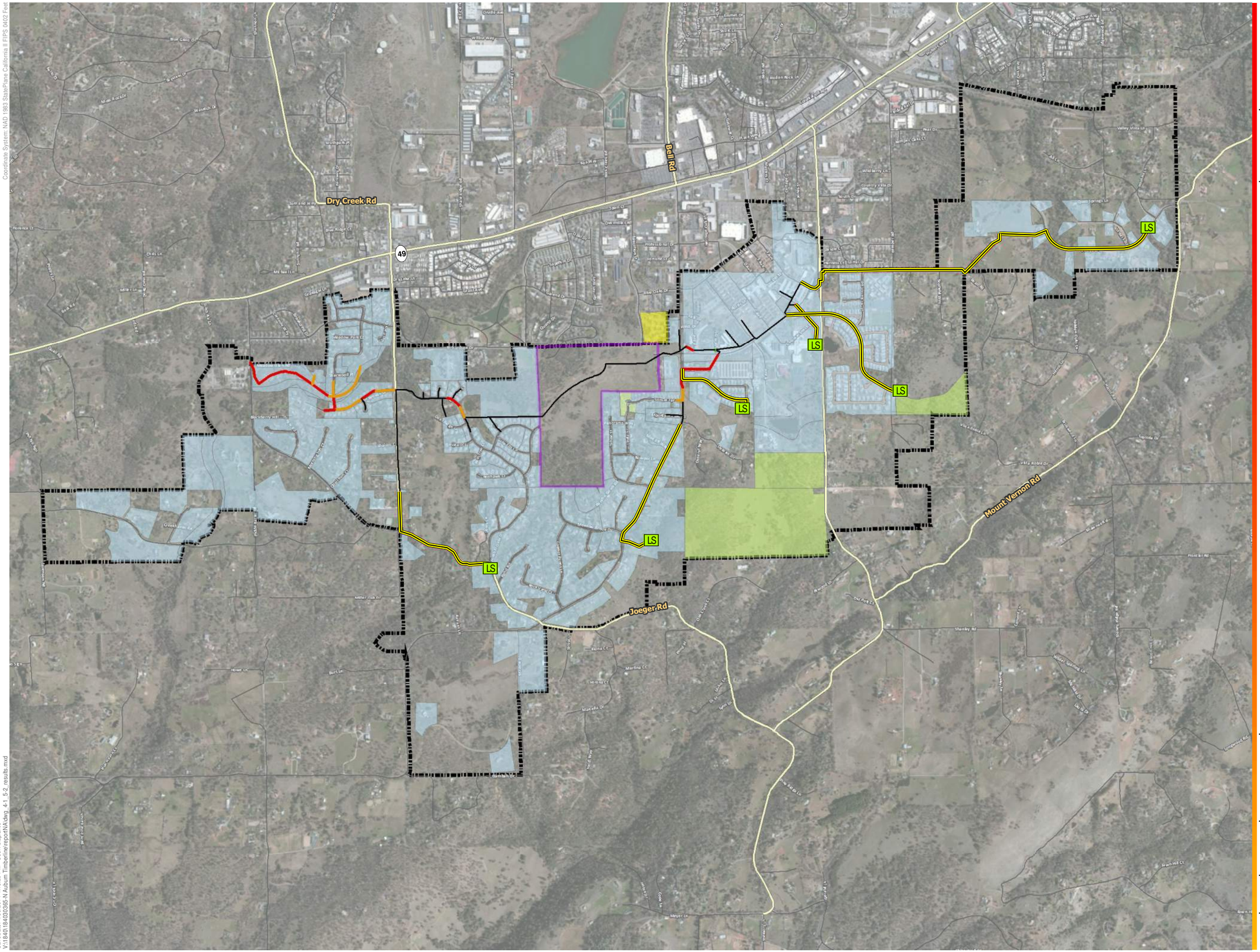
It is predicted that should every property that is currently entitled to wastewater service proceed through full development, 2.924 mgd will flow through the Dewitt Trunk. Similar to the inclusion of Timberline phase 1, the surcharging in this scenario is expected to increase, but is not expected to affect any sewers not already surcharged under existing conditions. Model simulation results for the existing system and entitled projects during peak WWF conditions are shown in **Figure 4-3**.

To help identify the extent of surcharging within the existing network, HGL profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Dewitt Sanitary Sewer Trunk for this scenario.

The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: there is no expected surcharging.
- **Figure B-3A**: there is no expected surcharging
- **Figure B-4**: the surcharging along Deer Ridge Lane is not expected to affect any additional sewer. However, the HGL freeboard is expected to decrease by up to 0.9 ft (manhole AE2-51).
- **Figure B-5:** the surcharging in this reach is expected to universally worsen. No additional SSOs are expected to occur, though it is predictable that the intensity of overflow will increase.

Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet



SaveDate: 4/30/2014 4:13:20 PM User: blaplante
V:\1840\184030365-N Auburn Timberline\report\NA\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall
- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain

Scenario
- Existing Catchments
- Entitled Catchments
- Timberline Development Lands
- Offsite Catchments
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Existing + Entitled Level of Service

Project No. 184030365

Scale 0 0.1 0.2 0.3 Miles

Figure No. 4-3

Issue/Revision A/

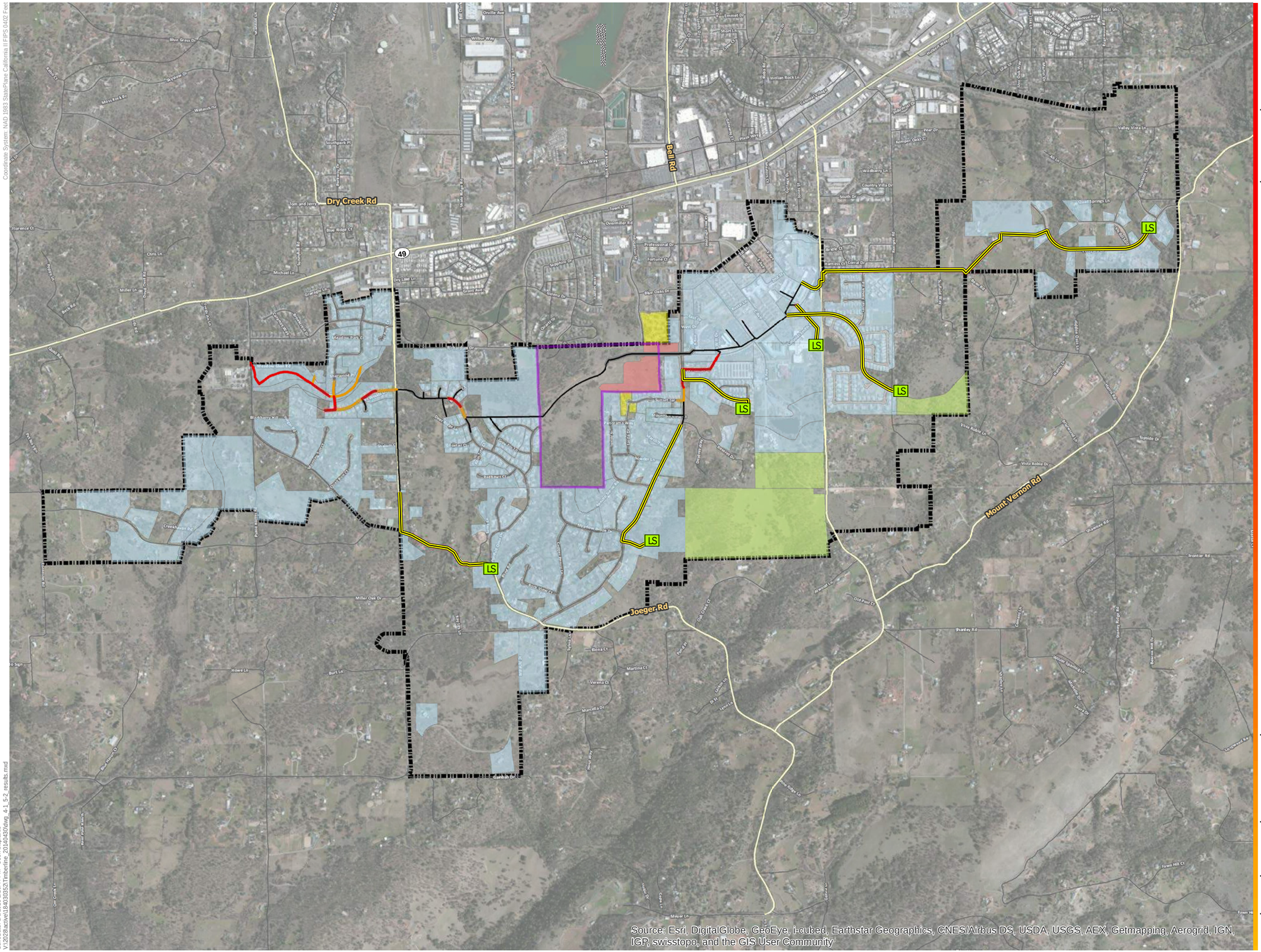
4.3.4 Existing System + Entitled Developments + Timberline Phase 1 – Design Storm Event

As part of the phase 1 Timberline development, a portion of the Dewitt trunk has been proposed to be re-aligned. It is predicted that the inclusion of the first phase of the Timberline development and entitled developments, along with the re-alignment, will increase the flow through the Dewitt trunk to 2.938 mgd. Again, the surcharging in this scenario is expected to increase, but is not expected to affect any sewers not already surcharged under existing conditions. Model simulation results for this scenario during peak WWF conditions are shown in **Figure 4-4**.

To help identify the extent of surcharging within the existing network, HGL profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Dewitt Sanitary Sewer Trunk for this scenario.

The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: there is no expected surcharging.
- **Figure B-3B**: there is no expected surcharging along either the portion of realigned sewer, or the downstream existing sewer.
- **Figure B-4**: the surcharging along Deer Ridge Lane is not expected to affect any additional sewer. However, the HGL freeboard is expected to decrease by up to 1.2 ft (manhole AE2-50).
- **Figure B-5**: the surcharging in this reach is expected to universally worsen. No additional SSOs are expected to occur, though it is predictable that the intensity of overflow will increase.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 3/6/2015 2:16:44 PM User: blaplante
V:\2028\active\184030352\Timberline_20140430\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain
- Timberline Development Lands
- Timberline Phase 1 New Alignment

Scenario

- Existing Catchments
- Entitled Catchments
- Timberline PH1
- Offsite Catchments
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Existing + Entitled + Timberline PH1 Level of Service

Project No.
184030352

Scale
0 0.1 0.2 0.3 Miles

Figure No.
4-4

Issue/Revision
A/

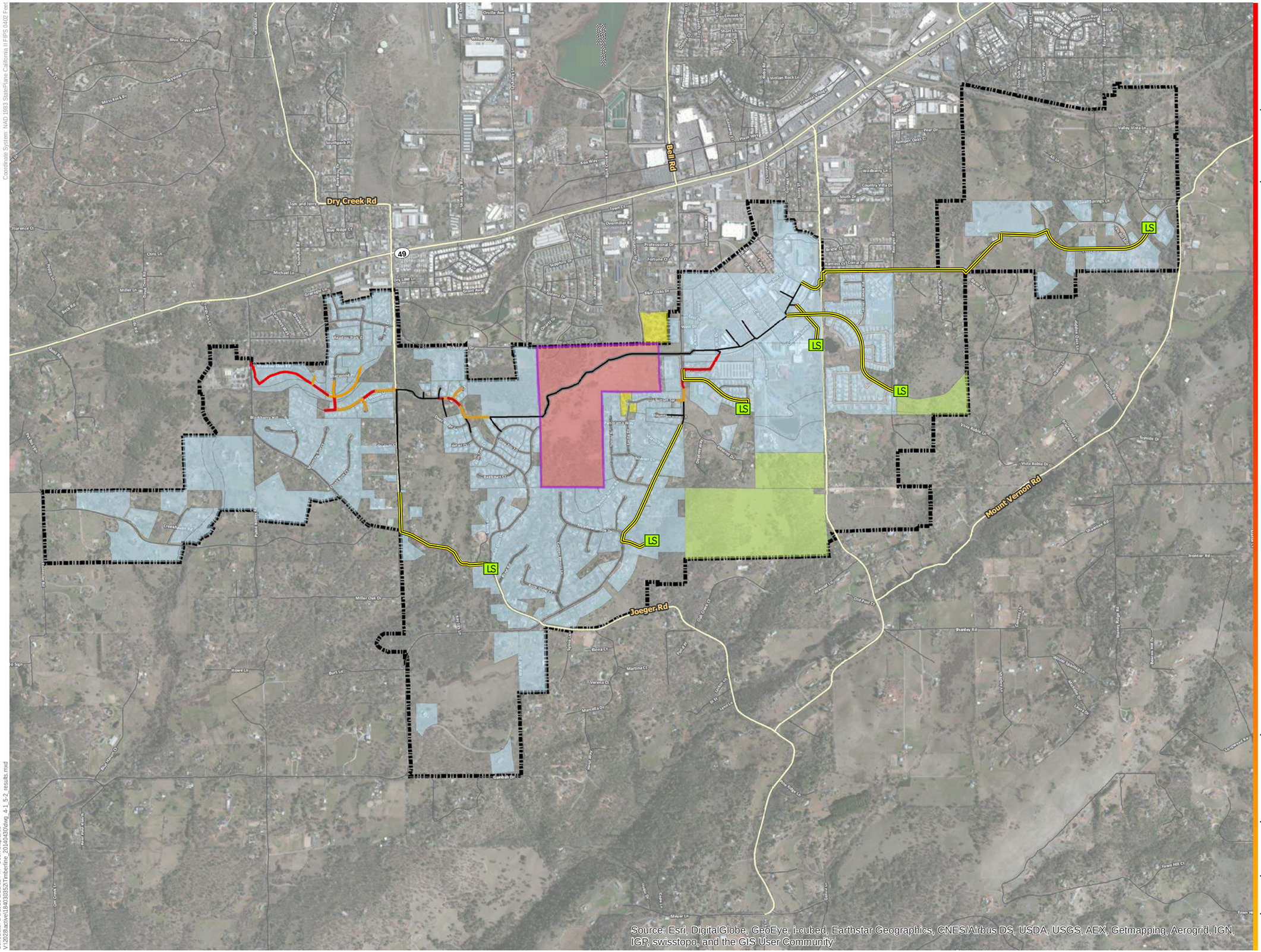
4.3.5 Existing System + Entitled Developments + Timberline Buildout – Design Storm Event

This scenario models the Timberline development with the complete re-alignment of the Dewitt trunk within the development area. It is predicted that the inclusion of the full Timberline development and entitled developments, as well as with the re-alignment, the flow through the Dewitt trunk will increase to 2.983 mgd. The additional flow is expected to worsen the surcharging, and affect a few additional sewer sections near to where the surcharging is already occurring. Model simulation results for this scenario during peak WWF conditions are shown in **Figure 4-5**.

To help identify the extent of surcharging within the existing network, HGL profiles have been included and identified by a plan-view keyplan within **Appendix B**, which show the peak surcharge elevation along the Dewitt Sanitary Sewer Trunk for this scenario.

The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: there is no expected surcharging.
- **Figure B-3C**: there is no expected surcharging along the proposed re-aligned sewer.
- **Figure B-4**: the surcharging along Deer Ridge Lane is expected to increase, resulting in an SSO in manhole AE2-26, and will also result in additional surcharging for approximately 440ft upstream.
- **Figure B-5**: the surcharging in this reach is expected to universally worsen. No additional SSOs are expected to occur, though it is predictable that the intensity of overflow will increase further.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 3/6/2015 2:21:52 PM User: blaplante
V:\2028\active\184030352\Timberline_20140430\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain
- Timberline Development Lands
- Timberline Full Build-out New Alignment

Scenario

- Existing Catchments
- Entitled Catchments
- Timberline Full Buildout
- Offsite Catchments
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Existing + Entitled + Timberline BO Level of Service

Project No.
184030352

Scale
0 0.1 0.2 0.3 Miles

Figure No.
4-5

Issue/Revision
A/

4.3.6 Full Build-out

It is predicted that the Dewitt Trunk will convey a peak flow of 3.23 mgd for this growth scenario under design storm conditions with no improvement made to the collection system. If improvements are made to the collection system to address deficiencies described herein and no reduction in infiltration and inflow is achieved, the model predicts the WWTP will experience peak flows of approximately 6 to 7 Mgal/d from the Dewitt trunk under design storm conditions. The inclusion of all potential catchments using the County's landuse projects is predicted to cause system wide capacity constraints and deficiencies. Model simulation results for this scenario during peak WWF conditions are shown in **Figure 4-6**.

It should be noted that during the modeling process, it was discovered that the existing lift stations are expected to be extremely under capacity for this scenario. As the purpose of this study is to assess the impact of the Timberline development upon the Dewitt Trunk Sewer, it was assumed that the capacities of all of the lift stations were increased and all pumps outfitted with VFDs. This approach avoids any potential underestimate of peak flow and capacity needs downstream of the lift stations while avoiding speculation regarding how the County intends to address these lift station capacity issues. This is an area of the collection system which the County may wish to study further.

How the County chooses to address system deficiencies could affect the ultimate peak flow predicted at the WWTP. For example, if more system storage is provided, peak flow seen at the WWTP could potentially be lower than predicted here. It is Stantec's understanding that system storage in the form of surcharging is not considered by the County a viable option at this time.

To help identify the extent of surcharging within the existing network, HGL profiles have been included in **Appendix B**, which show the peak surcharge elevation along the Dewitt Sanitary Sewer Trunk for this scenario.

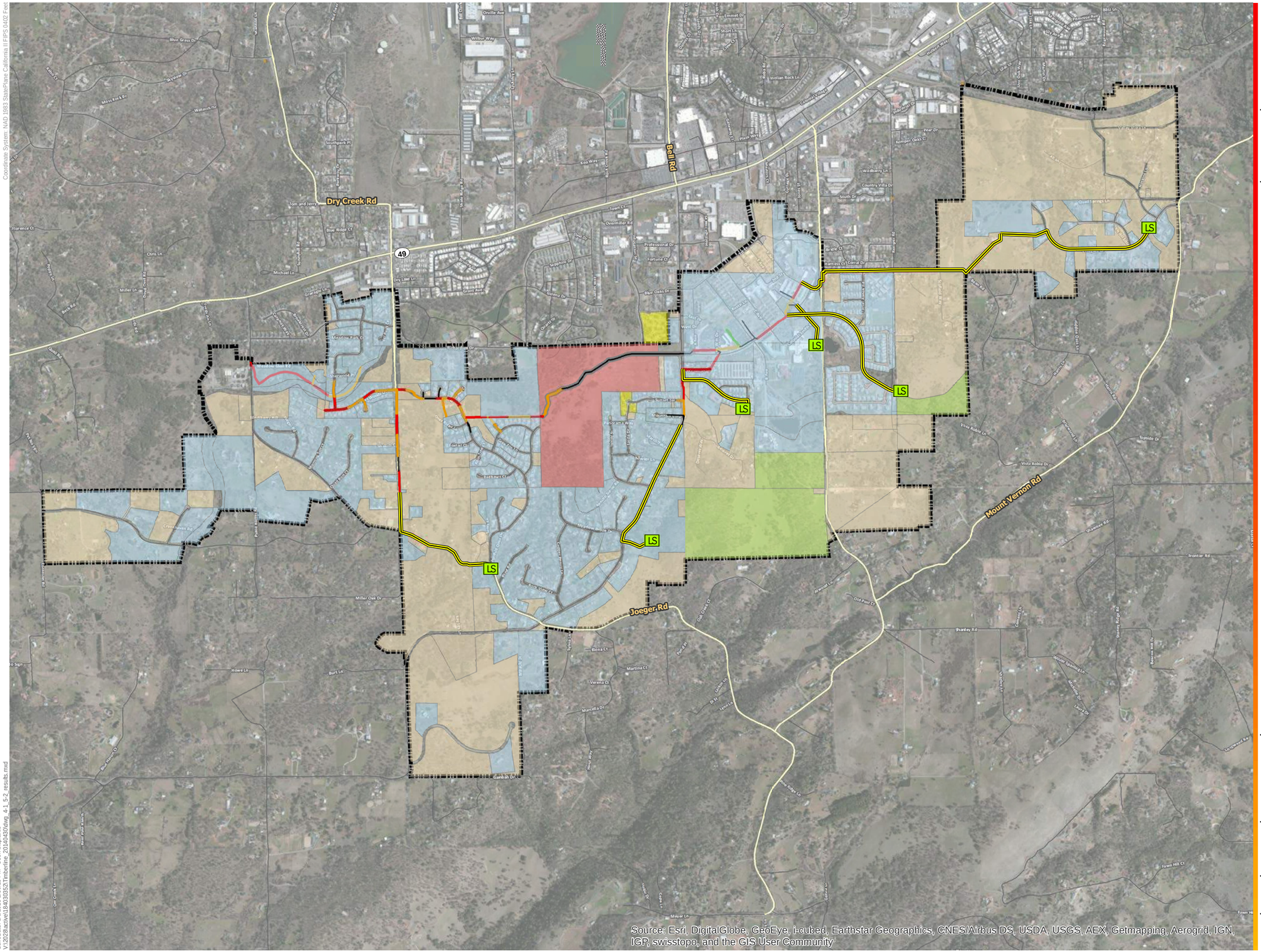
The following provides a summary of the existing system surcharging and corresponding HGL profiles:

- **Figure B-2**: the majority of this profile is expected to surcharge, and an SSO may occur at F Avenue. The surcharging is a result of insufficient capacity in these sewers.

- **Figure B-3C**: severe surcharging is expected to occur in approximately 800 ft of 18 inch sewer. The surcharging is expected to result in an SSO at the downstream manhole within the Timberline development. The surcharging is a direct result of downstream throttling, and is not a result of insufficient pipe sizing in the development.

- **Figure B-4**: severe surcharging is expected to occur along the majority of the 3000ft profile. Many of the manholes are expected to contain SSOs, which is a result of highly insufficient capacity to handle the additional build-out flows.

- **Figure B-5**: severe surcharging is expected to occur along the majority of the 3500ft profile. Many of the manholes are expected to contain SSOs, which is a result of highly insufficient capacity to handle the additional build-out flows.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 3/6/2015 2:30:15 PM User: blaplante
V:\2028\active\184030352\Timberline_20140430\dwg_4-1_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

LOS Results - 1:10yr Design Rainfall

- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard
- Forcemain

Scenario

- Existing Catchments
- Entitled Catchments
- Timberline Full Buildout
- Timberline Full Build-out New Alignment
- Offsite Catchments
- Full Buildout Catchments
- Dewitt Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Full Build-out Level of Service

Project No.

184030352

Scale

0 0.1 0.2 0.3 Miles

Figure No.

4-6

Issue/Revision

A/

5.0 Recommended Capital Improvement Projects

5.1 PURPOSE

The purpose of this chapter is to provide recommendations for capital improvements along the Dewitt wastewater trunk sewer to provide sufficient capacity to eliminate all occurrences of surcharging that were predicted to occur during a 10-year, 24-hour design storm event. It is anticipated that the County will review and incorporate the recommended capital improvements into a short term Capital Improvement Plan (CIP) unless the County chooses to evaluate alternate servicing options not limited to upsizing of existing sections of trunk sewer. The scope of this study is limited to upsizing options. No alternative trunk alignments (parallel or otherwise) or pumping options have been considered. The model results for the ultimate build-out system during a 10-year, 24-hour storm event, detailed in Chapter 4, have been used as the basis for these capital improvement recommendations.

5.2 RECOMMENDED IMPROVEMENT TO EXISTING TRUNK SYSTEM TO ACCOMMODATE EXISTING BUILD-OUT AND NEAR-TERM BUILD-OUT DEFICIENCIES

The results of the existing system scenario and all scenarios through to the existing system + entitled projects + full Timberline development scenario are the basis for recommendation of upgrades to the existing Dewitt trunk sewer presented in this section. Note that the results indicate throttling of the peak flow, and that upgrades to only the surcharged sewer may result in surcharging in sewers previously unaffected. Therefore, an upgrade scenario was modeled to identify all sewers along the Dewitt trunk that require upgrades to produce a result that does not exceed the County's LOS criteria. A summary of the findings is presented in **Table 5-1**.

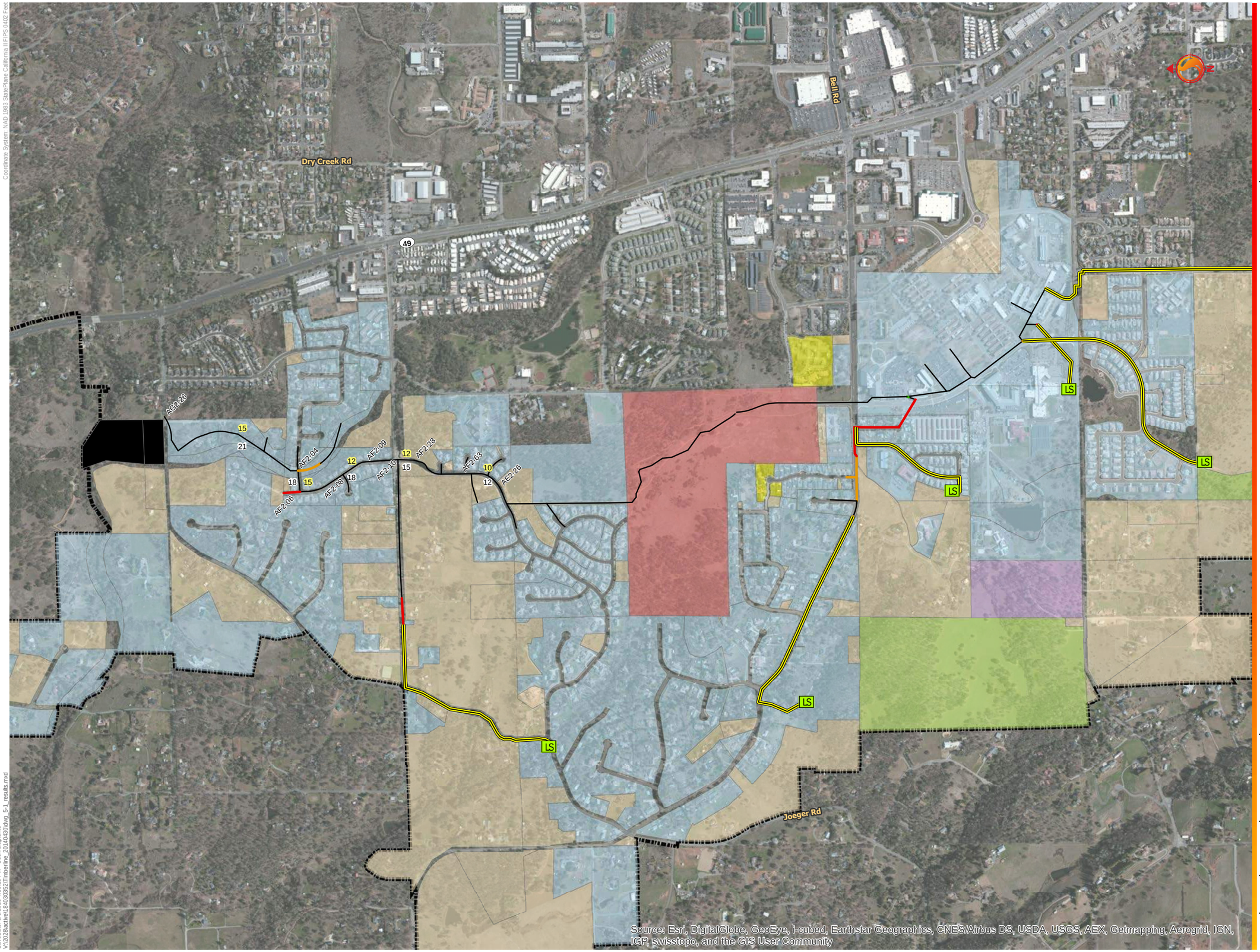
Table 5-1 Recommended Sewer Upgrades For Near-Term Developments

Pipe Segment		Existing Diameter, inches	Length of Sewer Upgrades, feet	Sizing for Existing System, inches (a)	Sizing for Existing + Timberline Phase 1, inches	Sizing for Existing + Entitled, inches	Sizing for Existing + Entitled + Timberline Phase 1, inches	Sizing for Existing + Entitled + Timberline Buildout, inches
Upstream MH ID	Downstream MH ID							
AE2-26	AF2-63	10	503	12	12	12	12	12
AF2-28	AF2-10	12	193	12	12	12	12	15
AF2-09	AF2-08	12	303	15	15	15	15	18
AF2-06	AF2-04	15	331	18	18	18	18	18
AF2-04	AG2-26	15	1931	21	21	21	21	21

(a) Sizing for Existing System represents the sewer sizing (diameter) required to accommodate existing wastewater flows with no deficiency predicted by the model simulation(s).

Figure 5-1 shows, in plan view, the sewers that are recommended to be upgraded for the near-term growth scenarios.

Figures B-6 through **B-9** in Appendix B show the impact of the improvements upon the existing system and all near-term development as HGL profiles. **Figure B-1** in Appendix B provides a keyplan for the specified profiles.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- # Existing Sewer Diameter [inch]
- # Upgrade Diameter [inch]
- Forcemain
- No Surcharging
- Backwatered with allowable freeboard
- Backwatered without allowable freeboard
- Throttled with allowable freeboard
- Throttled without allowable freeboard

Scenario

- Existing Catchments
- Existing Catchments with Internal Growth
- Entitled Catchments
- buildout_nodes
- Timberline Full Buildout
- Offsite Catchments
- Full Buildout Catchments
- SMD1 WWTP
- SMD1 Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Full Build-out With Near Term Upgrades Level of Service
1:10 Year 24hr WWF

Project No. **184030365**

Scale 0 300 600 900 Feet

Figure No. **5-1**

Issue/Revision **A/**

SaveDate: 3/6/2015 4:35:23 PM User: blaplante
V:\2028\active\184030525\Timberline_20140430\dwg_5-1_results.mxd

5.3 RECOMMENDED IMPROVEMENTS TO EXISTING TRUNK SYSTEM TO ACCOMMODATE ULTIMATE BUILD-OUT OF SYSTEM

The results of the ultimate build-out analysis were the basis for the recommendation of upgrades to the existing Dewitt trunk sewer. Note that the results indicate significant throttling of the peak flow, and that upgrades to only the surcharged sewer may result in surcharging in sewers previously unaffected. Therefore, an upgrade scenario was modeled to identify all sewers along the Dewitt trunk that require upgrades. A summary of the findings is presented in **Table 5-2**.

Table 5-2 Recommended Sewer Upgrades For Full-Buildout

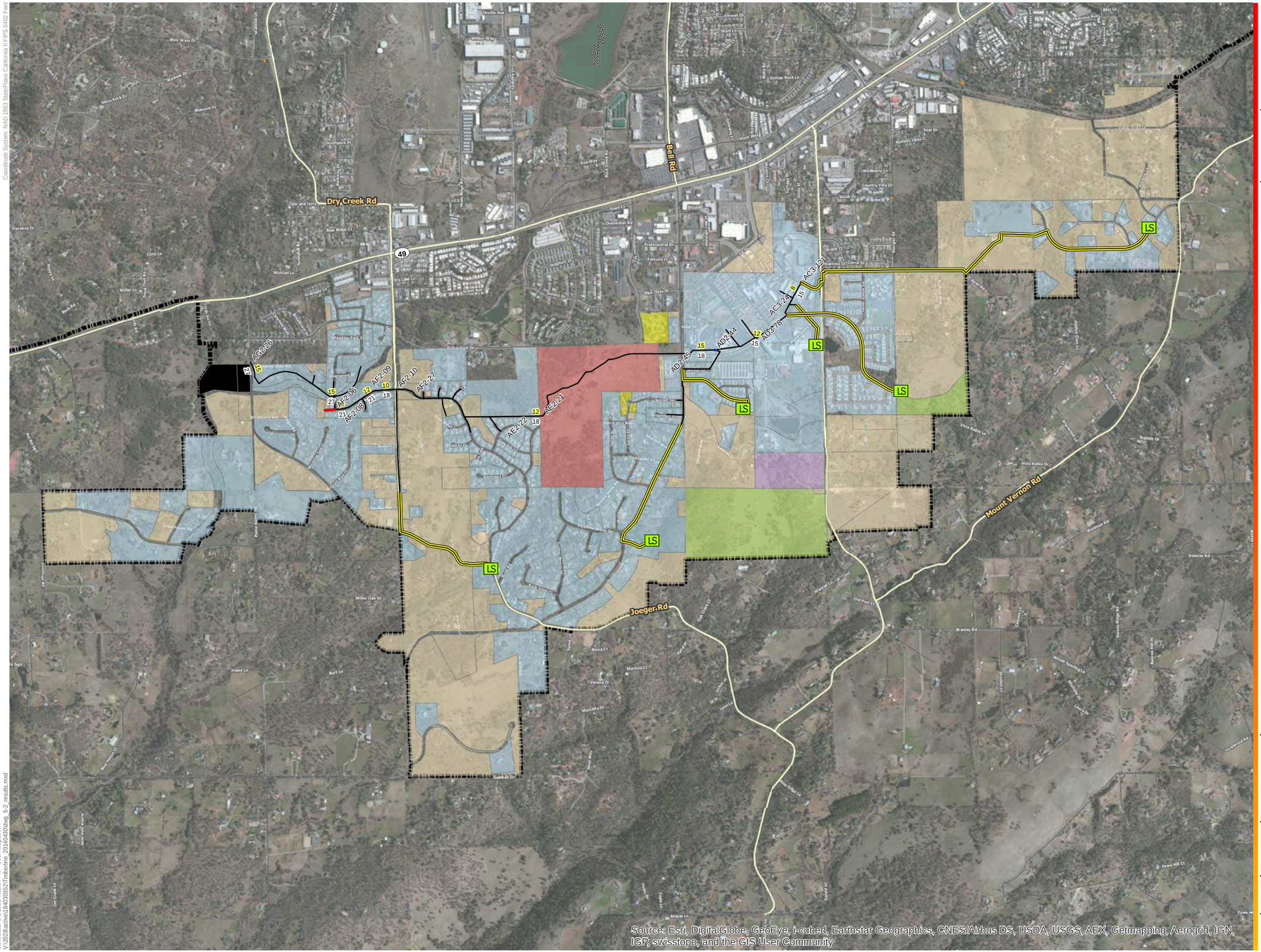
Pipe Segment		Existing Diameter, inches	Length of Sewer Upgrades, feet	Hydraulically Required Diameter, inches	Sewer Diameter Based on Placer County Policy[1], inches
Upstream MH ID	Downstream MH ID				
AC3-121	AC3-24	8	332	15	15
AC3-24	AD3-78	12	1097	15	15
AD2-44	AD2-45	15	395	18	18
AE2-21	AE2-22	12	261	18	18
AE2-22	AF2-27	10	2330	15	18
AF2-27	AF2-10	12	374	18	18
AF2-10	AF2-09	10	365	18	18
AF2-09	AF2-08	12	303	21	21
AF2-08	AF2-06	10	551	18	21
AF2-06	AG2-26	15	2262	27	27

1 Placer County has adopted a policy requiring downstream sewer pipes to be of equal or greater diameter to the upstream pipe, despite the fact that steeper downstream sewers may have greater hydraulic capacity than larger diameter but flatter upstream sewers.

Figure 5-2 shows the results of the capacity assessment post-completion of the capital improvements and identify in plan view the sewers that are recommended to be upgraded.

Figures B-10 through **B-13** in Appendix B show the impact of the improvements as HGL profiles. **Figure B-1** in Appendix B provides a keyplan for the specified profiles.

Note, recommendations for lift stations, etc. were not included in the scope of this evaluation. As discussed within Section 4.3.6, many of the lift stations were identified as potentially having insufficient capacity. It is recommended that the capacity of the lift stations be assessed, and upgrades to proceed as required.



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 3/6/2015 4:11:34 PM User: blaplante
V:\2028\active\184030352\Timberline_20140430\dwg_5-2_results.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved

The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- # Existing Diameter [inch]
- # Upgrade Diameter [inch]
- Forcemain
- SMD1 WWTP
- Timberline Full Buildout

Scenario

- Existing Catchments
- Existing Catchments with Internal Growth
- Entitled Catchments
- Full Buildout Catchments

MajorShed

- Offsite Catchments
- SMD1 Buildout Boundary
- LS Lift Stations

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

Full Build-out With Upgrades Level of Service 1:10 Year 24hr WWF

Project No.
184030352

Scale
0 0.1 0.2 0.3 Miles

Figure No.
5-2

Issue/Revision
A/

5.4 TIMBERLINE DEVELOPMENT SPECIFIC IMPACTS TO DEWITT TRUNK

Based on the information presented in Chapter 4 of this report, the impact of the proposed Timberline development on the Dewitt Trunk is limited. Analysis of the results of simulations suggests that the upsizing necessary to address existing deficiencies would also be sufficient to provide capacity for wastewater generated by the majority of the Timberline development. Only one additional upgrade of 100 feet would be required over and above the upgrades to the existing system.

It is Stantec's understanding that Placer County Facility Services wishes to address relative impacts of projects connecting to the Dewitt Trunk in the context of the trunk sizing necessary to accommodate full build-out of the SMD 1 service area. As such, it would appear that impact of the Timberline development on the Dewitt Trunk could be expressed as the proportional share of the project of the cost of trunk upsizing necessary downstream of the project to provide capacity for full service area build-out.

This leads to the conclusion that the Timberline development "share" of these improvements can be described as the pipe upsizing necessary to bring the downstream trunk diameters with sizing for Existing System presented in Table 5-1 up to the diameter identified in Table 5-2. If the proposed Timberline Development project representing 839 EDU of needed capacity is compared to the total number of future build-out EDUs utilizing capacity in the various trunk segments downstream, a percentage of the expected cost for those improvements can be estimated.

Table 5-4 summarizes the relative share of the capacity increase recommended in Table 5-2 attributable to the Timberline project.

Table 5-3 Relative Growth Increase

	Total Acreage (Acres)	Total Population (EDUs)	Relative Increase in Growth (EDUs)	% of Total Growth
Dewitt Existing Developments	841	1532	-	-
Entitled Projects Only (Excluding Timberline)	109	91	91	1.3%
Timberline Development (All Phases)	91.4	839	839	12.4%
Full Build-out (Dewitt Developments Only)	4378	8322	6790	100%

5.5 OTHER CONSIDERATIONS

A report of a separate project, *Highway 49 Trunk Sewer Capacity Evaluation Report* (December 2013, Stantec), includes suggestions for the County to consider prior to implementing the recommended upgrades presented here as necessary to accommodate full build-out. Although the report focuses upon the Highway 49 Trunk sewer, the suggestions are also valid for the Dewitt trunk. As mentioned previously, these improvements are required only if upsizing of trunk sewer segments is prescribed as the only approach to mitigating the potential impact of new development in the SMD 1 service area. Unfortunately the LOS criteria adopted by the County would require significant improvement of large

portions of the Dewitt Trunk to address existing capacity deficiencies within the system, regardless of how impacts to the system due to growth from development are addressed.

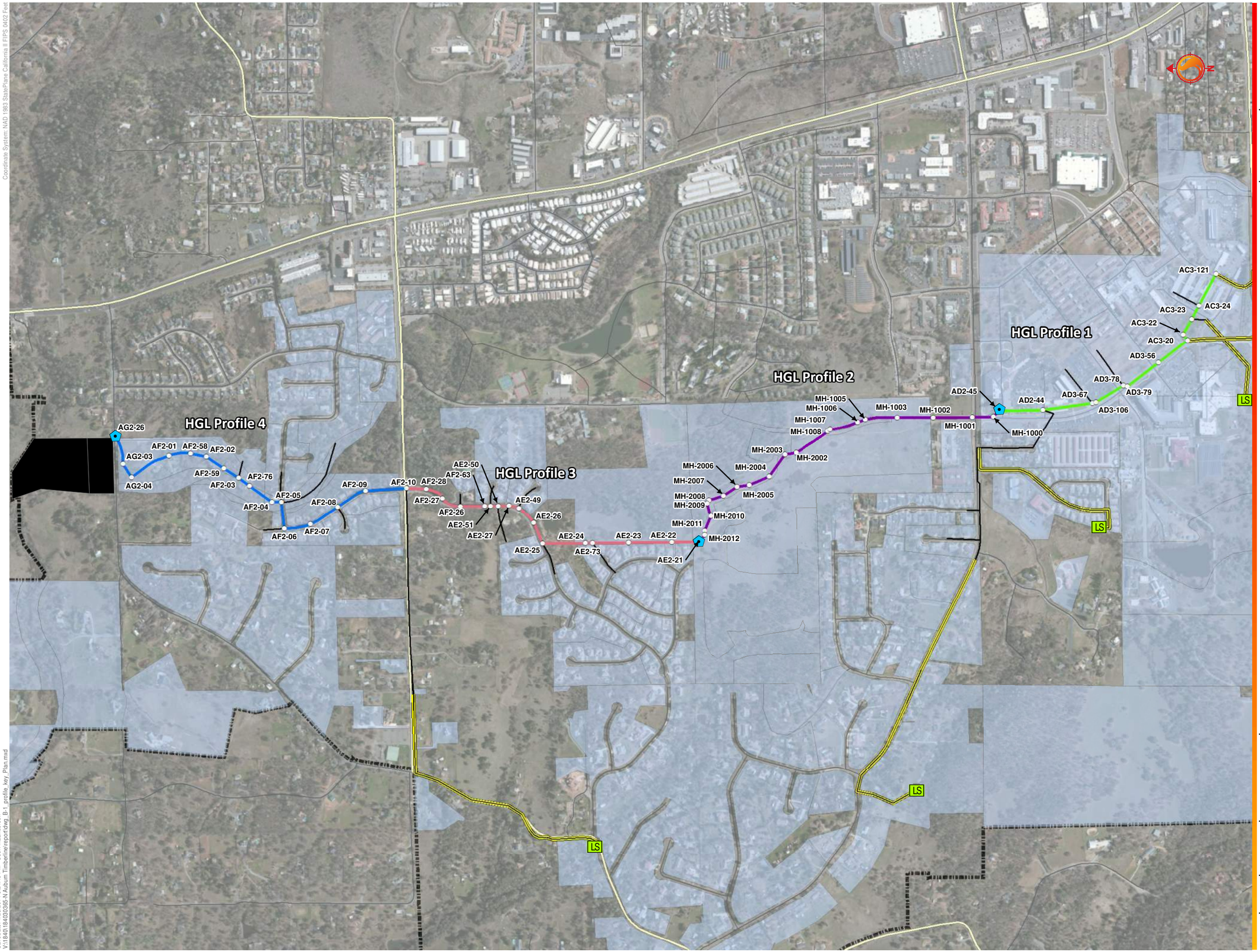
Appendix A DeWitt Trunk Entitled Projects

Note that all APNs which contribute to existing flow in the DeWitt Trunk sewershed are provided on a CD that is attached to the back cover of the original hard copies of this report provided to Placer County staff.

SMD 1 - Entitled Development Projects not currently connected DeWitt Trunk Sewer

Project Name	EDUs	APN
Atwood 80 Subdivision	65	051-070-009
Hidden Creek Subdivision (Atwood 20)	18	051-120-007
Hidden Ravine Estates Subdivision	11	051-100-069
Timberline at Auburn	839	051-140-056
SUBTOTAL	933	

Appendix B Hydraulic Gradeline Profiles



Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

SaveDate: 1/23/2014 5:24:46 PM User: maanderson
V:\1840\184030365-N Auburn Timberline\report\dwg_B-1_profile_key_Plan.mxd

Stantec

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
www.stantec.com

Copyright Reserved
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other that that authorized by Stantec is forbidden.

Legend

- Hydrograph Location
- LS Lift Stations

HGL Profile

- No Profile
- HGL Profile 1
- HGL Profile 2
- HGL Profile 3
- HGL Profile 4
- Forcemain
- SMD1 WWTP
- SMD1 Buildout Boundary

Client/Project

WESTERN CARE CONSTRUCTION, INC.
SEWER CAPACITY EVALUATION - NORTH AUBURN DEWITT TRUNK - TIMBERLINE
North Auburn, Placer County

Title

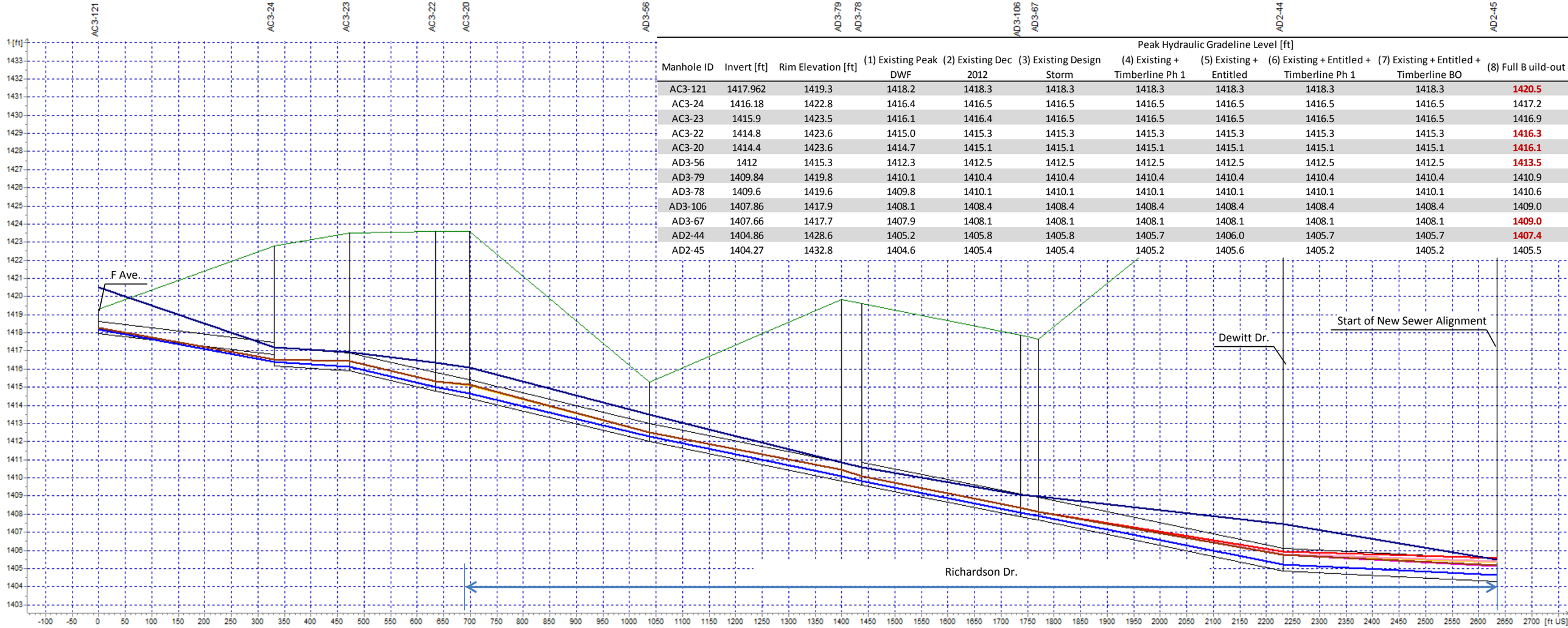
HGL Profile Key Plan

Project No. **184030365**

Scale 0 0.05 0.1 0.15 Miles

Figure No. **B-1**

Issue/Revision **A/**



Manhole ID	Invert [ft]	Rim Elevation [ft]	Peak Hydraulic Gradeline Level [ft] (1) Existing Peak DWF	(2) Existing Dec 2012	(3) Existing Design Storm	(4) Existing + Timberline Ph 1	(5) Existing + Entitled	(6) Existing + Entitled + Timberline Ph 1	(7) Existing + Entitled + Timberline BO	(8) Full B uild-out
AC3-121	1417.962	1419.3	1418.2	1418.3	1418.3	1418.3	1418.3	1418.3	1418.3	**1420.5**
AC3-24	1416.18	1422.8	1416.4	1416.5	1416.5	1416.5	1416.5	1416.5	1416.5	1417.2
AC3-23	1415.9	1423.5	1416.1	1416.4	1416.5	1416.5	1416.5	1416.5	1416.5	1416.9
AC3-22	1414.8	1423.6	1415.0	1415.3	1415.3	1415.3	1415.3	1415.3	1415.3	**1416.3**
AC3-20	1414.4	1423.6	1414.7	1415.1	1415.1	1415.1	1415.1	1415.1	1415.1	**1416.1**
AD3-56	1412	1415.3	1412.3	1412.5	1412.5	1412.5	1412.5	1412.5	1412.5	**1413.5**
AD3-79	1409.84	1419.8	1410.1	1410.4	1410.4	1410.4	1410.4	1410.4	1410.4	1410.9
AD3-78	1409.6	1419.6	1409.8	1410.1	1410.1	1410.1	1410.1	1410.1	1410.1	1410.6
AD3-106	1407.86	1417.9	1408.1	1408.4	1408.4	1408.4	1408.4	1408.4	1408.4	1409.0
AD3-67	1407.66	1417.7	1407.9	1408.1	1408.1	1408.1	1408.1	1408.1	1408.1	**1409.0**
AD2-44	1404.86	1428.6	1405.2	1405.8	1405.8	1405.7	1406.0	1405.7	1405.7	**1407.4**
AD2-45	1404.27	1432.8	1404.6	1405.4	1405.4	1405.2	1405.6	1405.2	1405.2	1405.5

Link Diameter [ft]	0.6667	1.0000								1.2500								
Ground Level [ft]	1422.80	1423.50	1423.60		1415.30			1419.84		1419.60	1417.86		1417.66		1428.60		1432.80	
Link Slope [%]	0.35	0.20	0.68		0.71		0.60		0.62	0.58		0.59	0.61			0.15		
Existing System PDWF [MGD]	0.1284	0.1249	0.2367	0.2052	0.3074	0.2962	0.3137	0.3042	.....	0.2730	0.2602	.....	0.2610	0.2630	0.2585	0.3470	0.3299	
Existing System Dec 2012 PWWF [MGD]	0.1613	0.1735	0.4900	0.4663	0.6993	0.6945	0.7074	0.7150	.....	0.7067	0.7082	.....	0.6958	0.6886	0.6768	1.2448	1.2408	
Existing System Design Storm PWWF [MGD]	0.1613	0.1722	0.5108	0.4918	0.7278	0.7393	0.7398	0.7319	.....	0.7101	0.7008	.....	0.6863	0.6809	0.6889	1.2898	1.2794	
Existing + Timberline Phase 1 PWWF [MGD]	0.1613	0.1728	0.5160	0.5010	0.7400	0.7262	0.7303	0.7334	.....	0.7162	0.7085	.....	0.6981	0.6966	0.6937	1.2937	1.2826	
Existing + Entitled PWWF [MGD]	0.1613	0.1714	0.5149	0.5024	0.7424	0.7296	0.7248	0.7321	.....	0.7175	0.7107	.....	0.6963	0.6957	0.6922	1.3078	1.3111	
Existing + Entitled + Timberline Phase 1 PWWF [MGD]	0.1613	0.1729	0.5148	0.4984	0.7367	0.7330	0.7217	0.7320	.....	0.7189	0.7131	.....	0.6986	0.6959	0.6944	1.3007	1.2926	
Existing + Entitled + Timberline Buildout PWWF [MGD]	0.1613	0.1722	0.5139	0.5020	0.7428	0.7312	0.7264	0.7207	.....	0.7172	0.7154	.....	0.7016	0.6958	0.6917	1.3120	1.3016	
Full Buildout PWWF [MGD]	0.6935	0.9103	1.1690	1.1715	1.7573		1.7570			2.0161	2.0115	.....	2.1241			2.8199		
Q Manning [MGD]	0.4144	0.9159	1.7005	1.6321	1.7328		1.5943		.....	3.4508		.....	2.9139			1.5931		

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Timberline Phase 1 HGL
- Existing + Entitled HGL
- Existing + Entitled + Timberline Phase 1 HGL
- Existing + Entitled + Timberline Buildout HGL
- Full Build-out Design Storm HGL

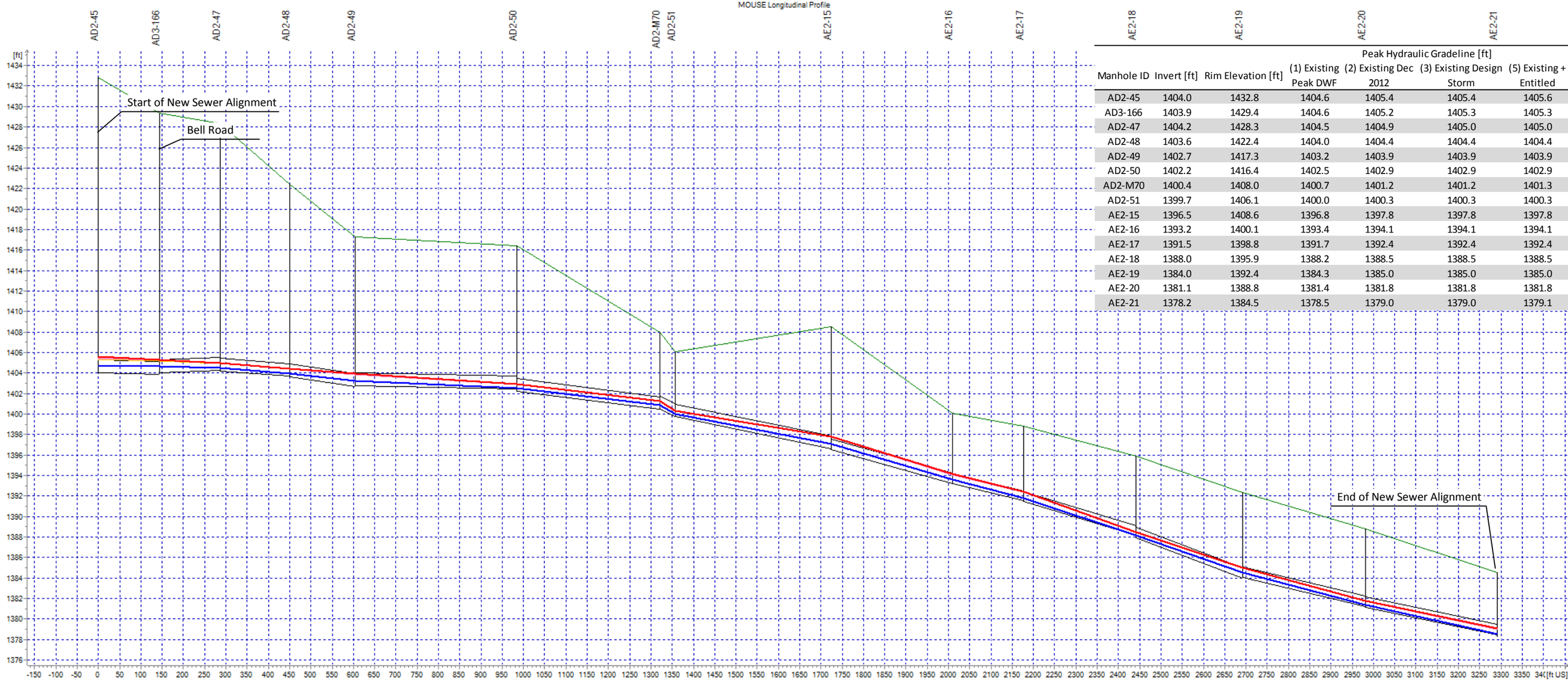
Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project
Western Care Construction, Inc.
Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.
B-2

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 1



Manhole ID	Invert [ft]	Rim Elevation [ft]	Peak Hydraulic Gradeline [ft] (1) Existing Peak DWF	(2) Existing Dec 2012	(3) Existing Design Storm	(5) Existing + Entitled
AD2-45	1404.0	1432.8	1404.6	1405.4	1405.4	1405.6
AD3-166	1403.9	1429.4	1404.6	1405.2	1405.3	1405.3
AD2-47	1404.2	1428.3	1404.5	1404.9	1405.0	1405.0
AD2-48	1403.6	1422.4	1404.0	1404.4	1404.4	1404.4
AD2-49	1402.7	1417.3	1403.2	1403.9	1403.9	1403.9
AD2-50	1402.2	1416.4	1402.5	1402.9	1402.9	1402.9
AD2-M70	1400.4	1408.0	1400.7	1401.2	1401.2	1401.3
AD2-51	1399.7	1406.1	1400.0	1400.3	1400.3	1400.3
AE2-15	1396.5	1408.6	1396.8	1397.8	1397.8	1397.8
AE2-16	1393.2	1400.1	1393.4	1394.1	1394.1	1394.1
AE2-17	1391.5	1398.8	1391.7	1392.4	1392.4	1392.4
AE2-18	1388.0	1395.9	1388.2	1388.5	1388.5	1388.5
AE2-19	1384.0	1392.4	1384.3	1385.0	1385.0	1385.0
AE2-20	1381.1	1388.8	1381.4	1381.8	1381.8	1381.8
AE2-21	1378.2	1384.5	1378.5	1379.0	1379.0	1379.1

Link Diameter	1.2500										1.0000										
Invert Level	1403.88	1404.17	1403.63	1402.71	1402.23	1400.44	1399.73	1396.53	1393.18	1391.46	1387.96	1384.00	1381.13	1378.23							
Link Slope																					
Existing System PDWF [MGD]	0.3874	0.3816	0.3738	0.3753	0.3761	0.3744	0.3709	.....	0.3666	0.3671	0.3662	0.3664	0.3644	0.3632	0.3620	0.3615	0.3622	0.3624	0.3625	0.3623	0.3619
Existing System Dec 2012 PWWF [MGD]	1.6664	1.6742	1.6698	1.6615	1.6557	1.6578	1.6597	.....	1.6609	1.6614	1.6606	1.6602	1.6592	1.6577	1.6566	1.6552	1.6538	1.6532	1.6544	1.6557	1.6567
Existing System Design Storm PWWF [MGD]	1.7073	1.7155	1.7142	1.7129	1.7123	1.7120	1.7117	.....	1.7111	1.7107	1.7116	1.7121	1.7123	1.7124			1.7123	1.7121	1.7119	1.7115	1.7110
Existing + Entitled Design Storm PWWF [MGD]	1.7520	1.7607	1.7597	1.7583	1.7572	1.7575	1.7578	.....	1.7580	1.7582	1.7581		1.7580	1.7578	1.7577	1.7575	1.7573	1.7571	1.7568		1.7571
Q Manning [MGD]	1.7144	2.2734	3.2302	1.2296		3.2912		.....	3.8213		2.6928		2.4791	2.7972		3.1300		2.4771		2.3037	

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Timberline Phase 1 HGL
- Existing + Entitled HGL
- Existing + Entitled + Timberline Phase 1 HGL
- Existing + Entitled + Timberline Buildout HGL
- Full Build-out Design Storm HGL

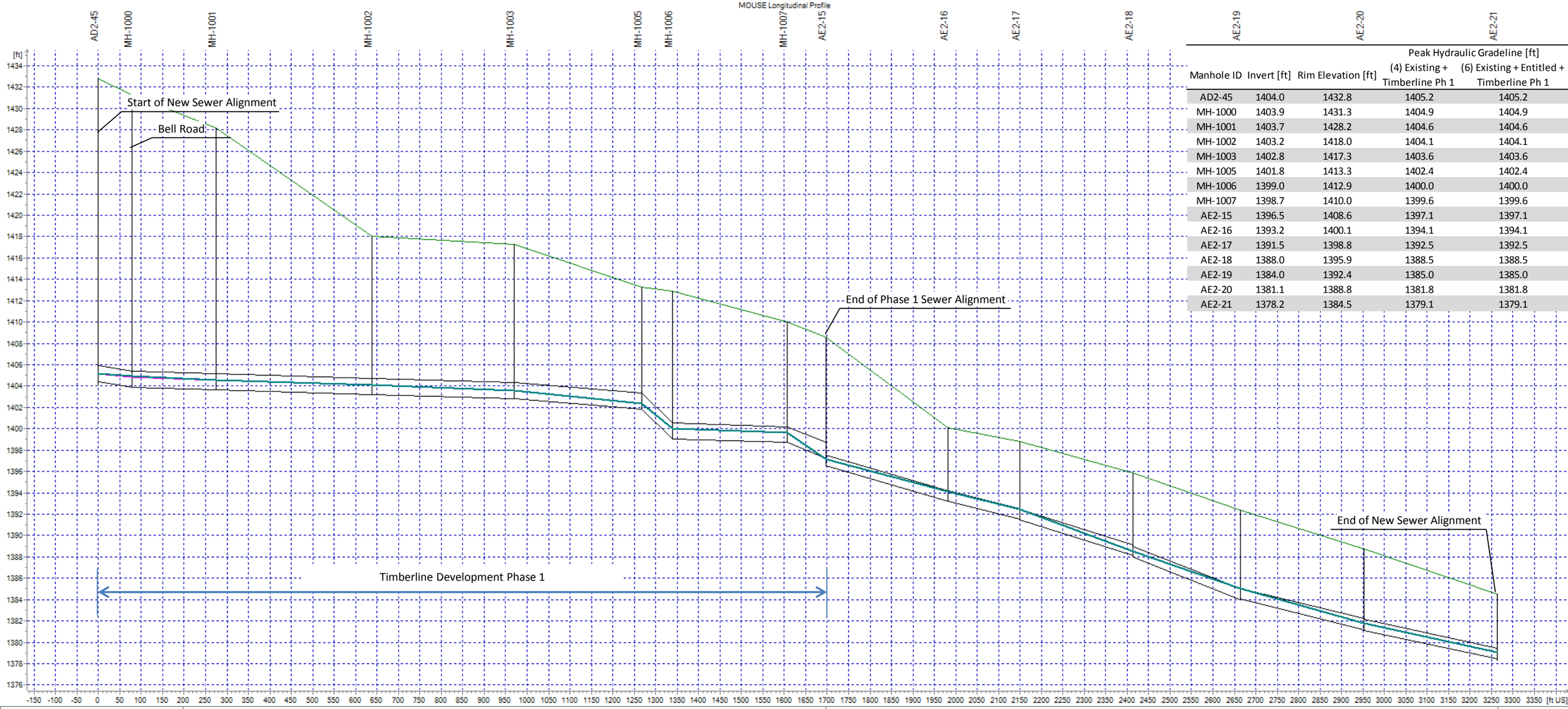
Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project
Western Care Construction, Inc.
Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.
B-3A

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 2



Manhole ID	Invert [ft]	Rim Elevation [ft]	Peak Hydraulic Gradeline [ft] (4) Existing + Timberline Ph 1	Peak Hydraulic Gradeline [ft] (6) Existing + Entitled + Timberline Ph 1
AD2-45	1404.0	1432.8	1405.2	1405.2
MH-1000	1403.9	1431.3	1404.9	1404.9
MH-1001	1403.7	1428.2	1404.6	1404.6
MH-1002	1403.2	1418.0	1404.1	1404.1
MH-1003	1402.8	1417.3	1403.6	1403.6
MH-1005	1401.8	1413.3	1402.4	1402.4
MH-1006	1399.0	1412.9	1400.0	1400.0
MH-1007	1398.7	1410.0	1399.6	1399.6
AE2-15	1396.5	1408.6	1397.1	1397.1
AE2-16	1393.2	1400.1	1394.1	1394.1
AE2-17	1391.5	1398.8	1392.5	1392.5
AE2-18	1388.0	1395.9	1388.5	1388.5
AE2-19	1384.0	1392.4	1385.0	1385.0
AE2-20	1381.1	1388.8	1381.8	1381.8
AE2-21	1378.2	1384.5	1379.1	1379.1

Link Diameter	1.5000											1.0000										
Invert Level	1403.67		1403.23		1402.83		1401.83		1399.02	1398.70		1396.53	1393.18		1391.46	1387.96		1384.00		1381.13		1378.23
Link Slope																						
Existing + Timberline Phase 1 PWWF [MGD]	1.7326	1.7404	1.7388	1.7371	1.7356	1.7665	1.7662	1.7668	1.8511	1.8517	1.8520	1.8523	1.8525	1.8524	1.8523	1.8521	1.8519	1.8516	1.8513	1.8508	1.8500	1.8493
Existing + Entitled + Timberline Phase 1 PWWF [MGD]	1.7506	1.7582	1.7578	1.7572	1.7565	1.7881	1.7874	1.7869	1.8542	1.8539	1.8544	1.8548	1.8551	1.8553	1.8554	1.8555		1.8554	1.8553	1.8551	1.8548	1.8543
Q Manning [MGD]	2.5646	2.5577		2.5471		4.2625		14.4781	2.5408		9.5097	2.6928		2.4791	2.7972		3.1300		2.4771		2.3037	

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Timberline Phase 1 HGL
- Existing + Entitled HGL
- Existing + Entitled + Timberline Phase 1 HGL
- Existing + Entitled + Timberline Buildout HGL
- Full Build-out Design Storm HGL

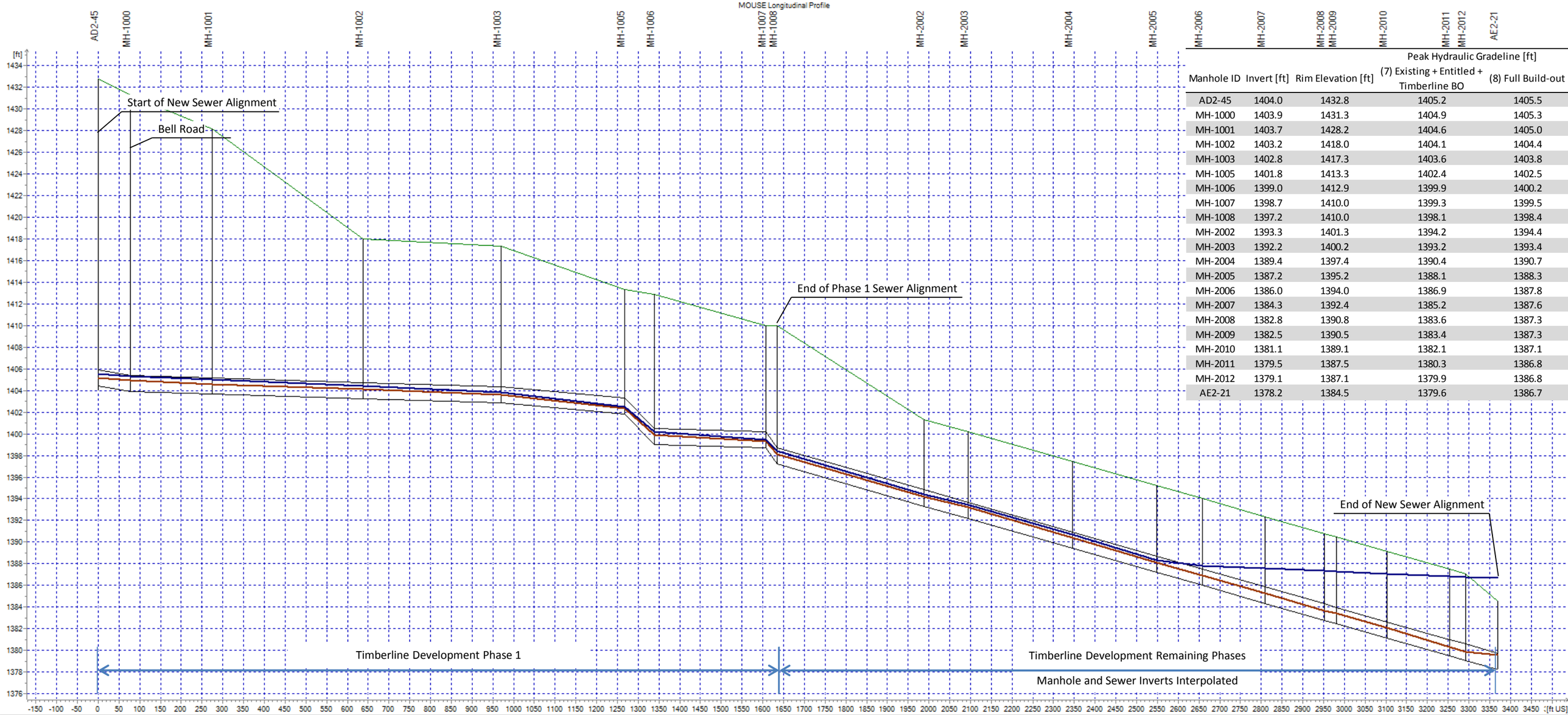
Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project
Western Care Construction, Inc.
Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.
B-3B

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 2



Manhole ID	Invert [ft]	Rim Elevation [ft]	Peak Hydraulic Gradeline [ft] (7) Existing + Entitled + Timberline BO	Peak Hydraulic Gradeline [ft] (8) Full Build-out
AD2-45	1404.0	1432.8	1405.2	1405.5
MH-1000	1403.9	1431.3	1404.9	1405.3
MH-1001	1403.7	1428.2	1404.6	1405.0
MH-1002	1403.2	1418.0	1404.1	1404.4
MH-1003	1402.8	1417.3	1403.6	1403.8
MH-1005	1401.8	1413.3	1402.4	1402.5
MH-1006	1399.0	1412.9	1399.9	1400.2
MH-1007	1398.7	1410.0	1399.3	1399.5
MH-1008	1397.2	1410.0	1398.1	1398.4
MH-2002	1393.3	1401.3	1394.2	1394.4
MH-2003	1392.2	1400.2	1393.2	1393.4
MH-2004	1389.4	1397.4	1390.4	1390.7
MH-2005	1387.2	1395.2	1388.1	1388.3
MH-2006	1386.0	1394.0	1386.9	1387.8
MH-2007	1384.3	1392.4	1385.2	1387.6
MH-2008	1382.8	1390.8	1383.6	1387.3
MH-2009	1382.5	1390.5	1383.4	1387.3
MH-2010	1381.1	1389.1	1382.1	1387.1
MH-2011	1379.5	1387.5	1380.3	1386.8
MH-2012	1379.1	1387.1	1379.9	1386.8
AE2-21	1378.2	1384.5	1379.6	1386.7

Link Diameter	1.5000																			
Invert Level	1403.67	1403.23	1402.83	1401.83	1399.02	1398.70	1397.20	1393.33	1392.16	1389.43	1387.21	1386.00	1384.35	1382.78	1382.46	1381.13	1379.50	.....	.....	
Link Slope																				
Existing + Entitled + Timberline Buildout PWWF [MGD]	0.0001		0.0002	0.0005	0.0001	....	0.0003													
Full Buildout PWWF [MGD]	0.0001		0.0002	0.0005	0.0001	....	0.0003													

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Timberline Phase 1 HGL
- Existing + Entitled HGL
- Existing + Entitled + Timberline Phase 1 HGL
- Existing + Entitled + Timberline Buildout HGL
- Full Build-out Design Storm HGL

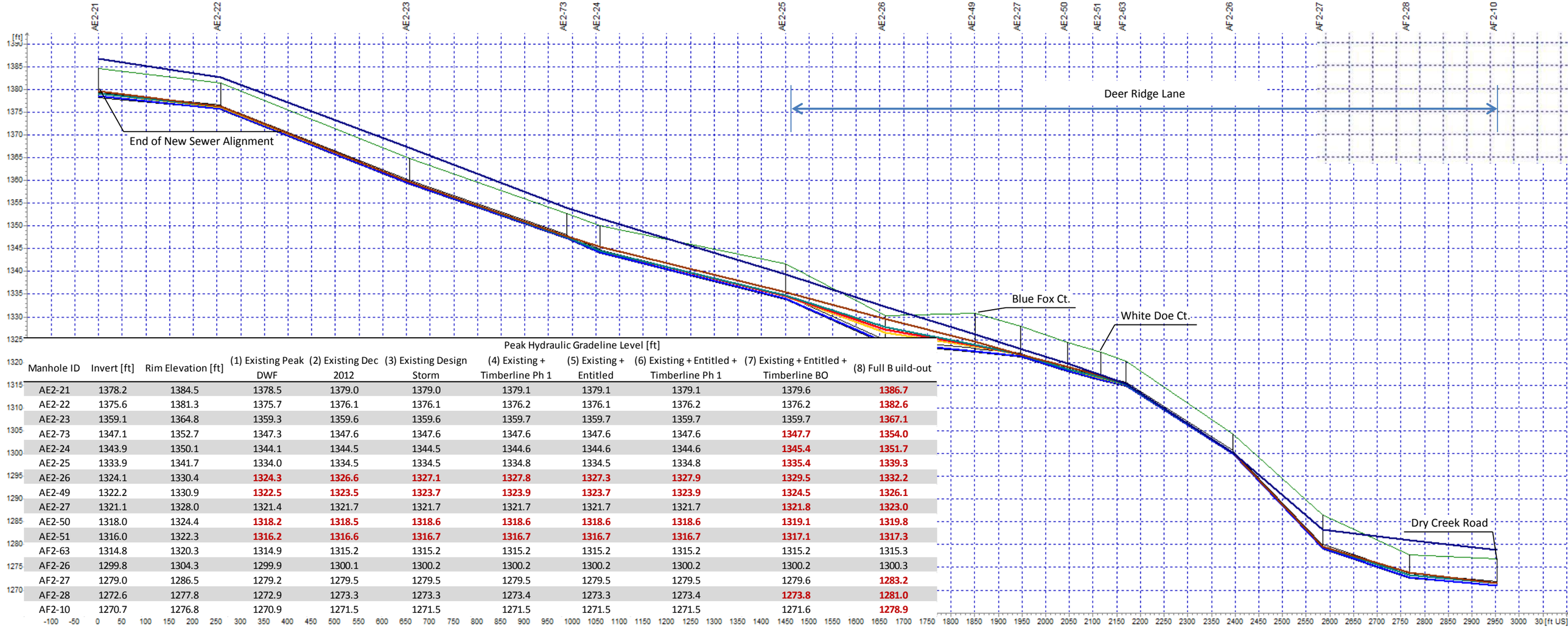
Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project
Western Care Construction, Inc.
Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.
B-3C

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 2



Manhole ID	Invert [ft]	Rim Elevation [ft]	(1) Existing Peak DWF	(2) Existing Dec 2012	(3) Existing Design Storm	(4) Existing + Timberline Ph 1	(5) Existing + Entitled	(6) Existing + Entitled + Timberline Ph 1	(7) Existing + Entitled + Timberline BO	(8) Full B uild-out
AE2-21	1378.2	1384.5	1378.5	1379.0	1379.0	1379.1	1379.1	1379.1	1379.6	**1386.7**
AE2-22	1375.6	1381.3	1375.7	1376.1	1376.1	1376.2	1376.1	1376.2	1376.2	**1382.6**
AE2-23	1359.1	1364.8	1359.3	1359.6	1359.6	1359.7	1359.7	1359.7	1359.7	**1367.1**
AE2-73	1347.1	1352.7	1347.3	1347.6	1347.6	1347.6	1347.6	1347.6	**1347.7**	**1354.0**
AE2-24	1343.9	1350.1	1344.1	1344.5	1344.5	1344.6	1344.6	1344.6	**1345.4**	**1351.7**
AE2-25	1333.9	1341.7	1334.0	1334.5	1334.5	1334.8	1334.5	1334.8	**1335.4**	**1339.3**
AE2-26	1324.1	1330.4	**1324.3**	**1326.6**	**1327.1**	**1327.8**	**1327.3**	**1327.9**	**1329.5**	**1332.2**
AE2-49	1322.2	1330.9	**1322.5**	**1323.5**	**1323.7**	**1323.9**	**1323.7**	**1323.9**	**1324.5**	**1326.1**
AE2-27	1321.1	1328.0	1321.4	1321.7	1321.7	1321.7	1321.7	1321.7	**1321.8**	**1323.0**
AE2-50	1318.0	1324.4	**1318.2**	**1318.5**	**1318.6**	**1318.6**	**1318.6**	**1318.6**	**1319.1**	**1319.8**
AE2-51	1316.0	1322.3	**1316.2**	**1316.6**	**1316.7**	**1316.7**	**1316.7**	**1316.7**	**1317.1**	**1317.3**
AF2-63	1314.8	1320.3	1314.9	1315.2	1315.2	1315.2	1315.2	1315.2	1315.2	1315.3
AF2-26	1299.8	1304.3	1299.9	1300.1	1300.2	1300.2	1300.2	1300.2	1300.2	1300.3
AF2-27	1279.0	1286.5	1279.2	1279.5	1279.5	1279.5	1279.5	1279.5	1279.6	**1283.2**
AF2-28	1272.6	1277.8	1272.9	1273.3	1273.3	1273.4	1273.3	1273.4	**1273.8**	**1281.0**
AF2-10	1270.7	1276.8	1270.9	1271.5	1271.5	1271.5	1271.5	1271.5	1271.6	**1278.9**

Link Diameter [ft]	1.0000	0.8333																									1.0000	
Ground Level [ft]	1381.29			1364.79			1352.74			1350.12			1341.66			1330.36	1330.87	1328.04	1324.35	1322.26	1320.29		1304.33		1286.50		1277.82	1276.80
Link Slope [%]	1.02	4.10			3.58			4.42	2.55				4.63		0.96	1.07	3.17	2.70	2.20	6.62			10.91		3.48		0.89	
Existing System PDWF [MGD]	0.3719	0.3770	0.3755	0.3741	0.3750	0.3754		0.3841	0.3839	0.3833	0.3821		0.3904		0.3921	0.3949	0.3947	0.4041	0.4058	0.4052	0.4044		0.4065		0.4071		0.4073	
Existing System Dec 2012 PWWF [MGD]	1.6578	1.7333			1.7330	1.7325		1.7628	1.7621	1.7613	1.7603		1.7885		1.7874	1.7975	1.7978	1.8424	1.8503	1.8508			1.8855		1.8859			
Existing System Design Storm PWWF [MGD]	1.7154	1.8093	1.8097	1.8099	1.8102	1.8104		1.8467			1.8466		1.8807		1.8798	1.8903	1.8902	1.9425	1.9505	1.9502			1.9929		1.9925		1.9915	
Existing + Timberline Phase 1 PWWF [MGD]	1.8503	1.9384	1.9388	1.9391	1.9395	1.9398		1.9741	1.9743	1.9745	1.9746		2.0067		2.0064	2.0167	2.0166	2.0661	2.0741	2.0740			2.1144				2.1142	
Existing + Entitled PWWF [MGD]	1.7575	1.8451						1.8799	1.8800	1.8801			1.9131		1.9132	1.9238		1.9746	1.9829	1.9830			2.0246		2.0247			
Existing + Entitled + Timberline Phase 1 PWWF [MGD]	1.8534	1.9439	1.9437	1.9436	1.9437			1.9798	1.9796	1.9793	1.9790		2.0128		2.0115	2.0223		2.0738	2.0824	2.0826			2.1248		2.1251		2.1256	
Existing + Entitled + Timberline Buildout PWWF [MGD]	2.1232	2.2171	2.2170		2.2168	2.2166		2.2488	2.2454	2.2452	2.2450		2.2769		2.2771	2.2875		2.3371		2.3453			2.3859		2.3860		2.3859	
Full Buildout PWWF [MGD]	2.7121	2.7511		2.7510	2.5238	2.5237		2.5392	2.5059	2.5058			2.5243		2.4995	2.5060	2.5064	2.5512		2.5561			2.6426		2.6415		2.4415	
Q Manning [MGD]	2.3248	2.8644			2.3983			2.9723	2.2579				3.0429		1.3851	1.4659	2.5194	2.3216	2.0991	3.6383			4.6697		4.2871		2.1735	

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Timberline Phase 1 HGL
- Existing + Entitled HGL
- Existing + Entitled + Timberline Phase 1 HGL
- Existing + Entitled + Timberline Buildout HGL
- Full Build-out Design Storm HGL

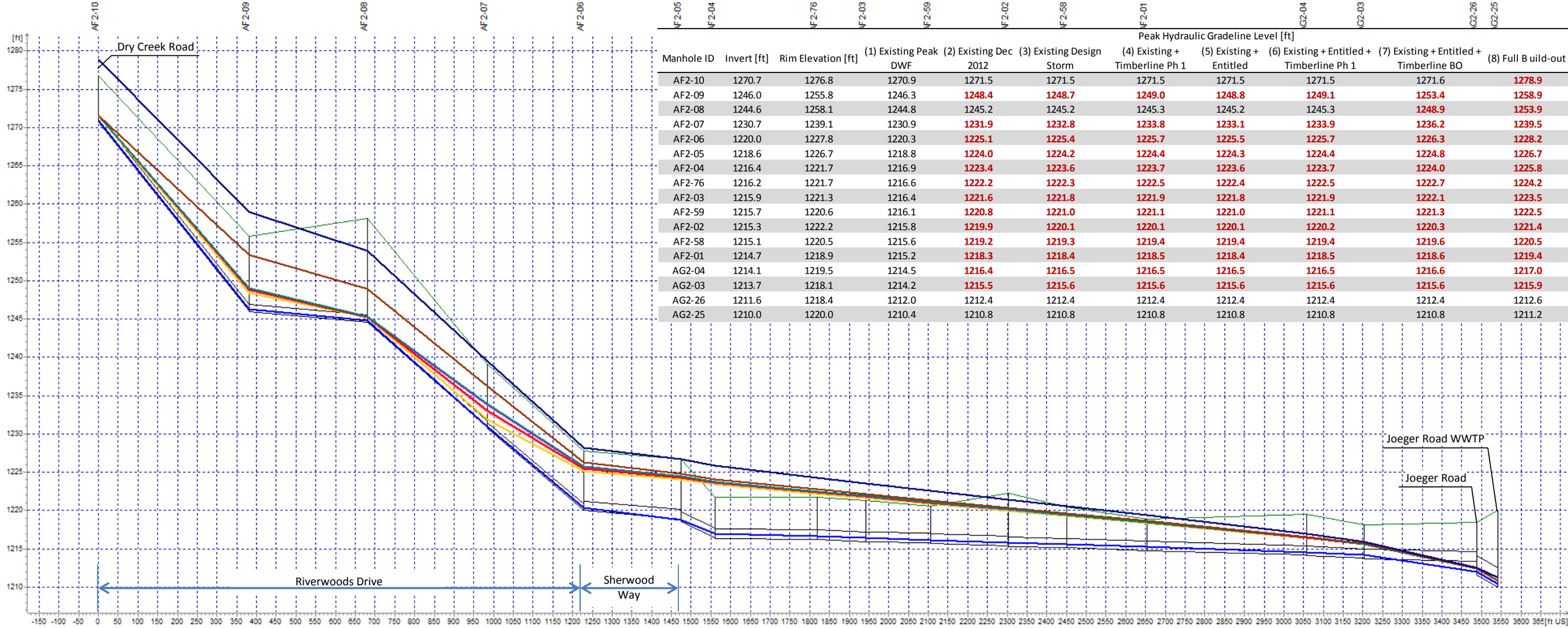
Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project
Western Care Construction, Inc.
Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.
B-4

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 3



Manhole ID	Invert [ft]	Rim Elevation [ft]	Peak Hydraulic Gradeline Level [ft] (1) Existing Peak DWF	(2) Existing Dec 2012	(3) Existing Design Storm	(4) Existing + Timberline Ph 1	(5) Existing + Entitled	(6) Existing + Entitled + Timberline Ph 1	(7) Existing + Entitled + Timberline BO	(8) Full B uild-out
AF2-10	1270.7	1276.8	1270.9	1271.5	1271.5	1271.5	1271.5	1271.5	1271.6	1278.9
AF2-09	1246.0	1255.8	1246.3	1248.4	1248.7	1249.0	1248.8	1249.1	1253.4	1258.9
AF2-08	1244.6	1258.1	1244.8	1245.2	1245.2	1245.3	1245.2	1245.3	1248.9	1253.9
AF2-07	1230.7	1239.1	1230.9	1231.9	1232.8	1233.8	1233.1	1233.9	1236.2	1239.5
AF2-06	1220.0	1227.8	1220.3	1225.1	1225.4	1225.7	1225.5	1225.7	1226.3	1228.2
AF2-05	1218.6	1226.7	1218.8	1224.0	1224.2	1224.4	1224.3	1224.4	1224.8	1226.7
AF2-04	1216.4	1221.7	1216.9	1223.4	1223.6	1223.7	1223.6	1223.7	1224.0	1225.8
AF2-76	1216.2	1221.7	1216.6	1222.2	1222.3	1222.5	1222.4	1222.5	1222.7	1224.2
AF2-03	1215.9	1221.3	1216.4	1221.6	1221.8	1221.9	1221.8	1221.9	1222.1	1223.5
AF2-59	1215.7	1220.6	1216.1	1220.8	1221.0	1221.1	1221.0	1221.1	1221.3	1222.5
AF2-02	1215.3	1222.2	1215.8	1219.9	1220.1	1220.1	1220.1	1220.2	1220.3	1221.4
AF2-58	1215.1	1220.5	1215.6	1219.2	1219.3	1219.4	1219.4	1219.4	1219.6	1220.5
AF2-01	1214.7	1218.9	1215.2	1218.3	1218.4	1218.5	1218.4	1218.5	1218.6	1219.4
AG2-04	1214.1	1219.5	1214.5	1216.4	1216.5	1216.5	1216.5	1216.5	1216.6	1217.0
AG2-03	1213.7	1218.1	1214.2	1215.5	1215.6	1215.6	1215.6	1215.6	1215.6	1215.9
AG2-26	1211.6	1218.4	1212.0	1212.4	1212.4	1212.4	1212.4	1212.4	1212.4	1212.6
AG2-25	1210.0	1220.0	1210.4	1210.8	1210.8	1210.8	1210.8	1210.8	1210.8	1211.2

Link Diameter [ft]	0.8333	1.0000		0.8333														1.2500									.....
Ground Level [ft]	1255.84		1258.11		1239.08			1227.77		1226.68	1221.67		1221.68	1221.25	1220.57	1222.23	1220.46		1218.86		1219.47		1218.14	1218.42			...
Link Slope [%]	6.49	0.47		4.55		4.32			0.46	2.47	0.05			0.22	0.06	0.18	0.11	0.20	0.15			0.26	0.11			3.08	
Existing System PDWF [MGD]	0.4968	0.5075	0.5089	0.5160	0.5170	0.5168	0.5155	0.5339	0.5215	0.5469	0.5532	0.5556	0.5565	0.5532	0.5453	0.5344	0.5376	0.5405	0.5358			0.5289	0.5308	0.5321			.....
Existing System Dec 2012 PWWF [MGD] ...	2.2974	2.3218	2.3217	2.3406	2.3396	2.3309	2.3310	2.8205	2.8203	2.9637	2.8026	2.8025	2.7960	2.7962	2.7944	2.7942	2.7943	2.8336						2.8337			.....
Existing System Design Storm PWWF [MGD] ...	2.4077	2.4357	2.4358	2.4561	2.4559	2.4545	2.4544	2.9529	2.9527	3.0950	2.8351	2.8350	2.8258	2.8259		2.8261	2.8262	2.8609									.....
Existing + Timberline Phase 1 PWWF [MGD]	2.5172	2.5440		2.5626	2.5608	2.5595		3.0464	3.0463	3.1807	2.8638	2.8637	2.8477	2.8467	2.8469	2.8470	2.8471	2.8807									.....
Existing + Entitled PWWF [MGD]	2.4280	2.4553		2.4753	2.4750	2.4734	2.4733	2.9698	2.9696	3.1113	2.8435	2.8434	2.8329	2.8335	2.8340	2.8341	2.8342	2.8676			2.8677						.....
Existing + Entitled + Timberline Phase 1 PWWF [MGD]	2.5291	2.5568		2.5749	2.5743	2.5711		3.0576	3.0575	3.1943	2.8684		2.8539	2.8534	2.8535		2.8536	2.8863									.....
Existing + Entitled + Timberline Buildout PWWF [MGD] ...	2.7871	2.8091	2.8086	2.8263	2.8259	2.8240	2.8239	3.2839	3.2838	3.4038	2.9293		2.9073	2.8989	2.8952		2.8953	2.9261									.....
Full Buildout PWWF [MGD]	3.1622	2.9905		3.0086		3.0079		3.4740	3.4739	3.5939	3.2627		3.1907	3.1533		3.1333		3.1593									.....
Q Manning [MGD]	3.6009	1.5691		3.0148		2.9372		2.8142		6.5510	0.9713		1.9487	1.0284	1.7617	1.4111	1.8569	1.6063			2.1083		1.3938				.....

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

- Existing System DWF HGL
- Existing System Dec 2012 HGL
- Existing System Design Storm HGL
- Existing + Timberline Phase 1 HGL
- Existing + Entitled HGL
- Existing + Entitled + Timberline Phase 1 HGL
- Existing + Entitled + Timberline Buildout HGL
- Full Build-out Design Storm HGL

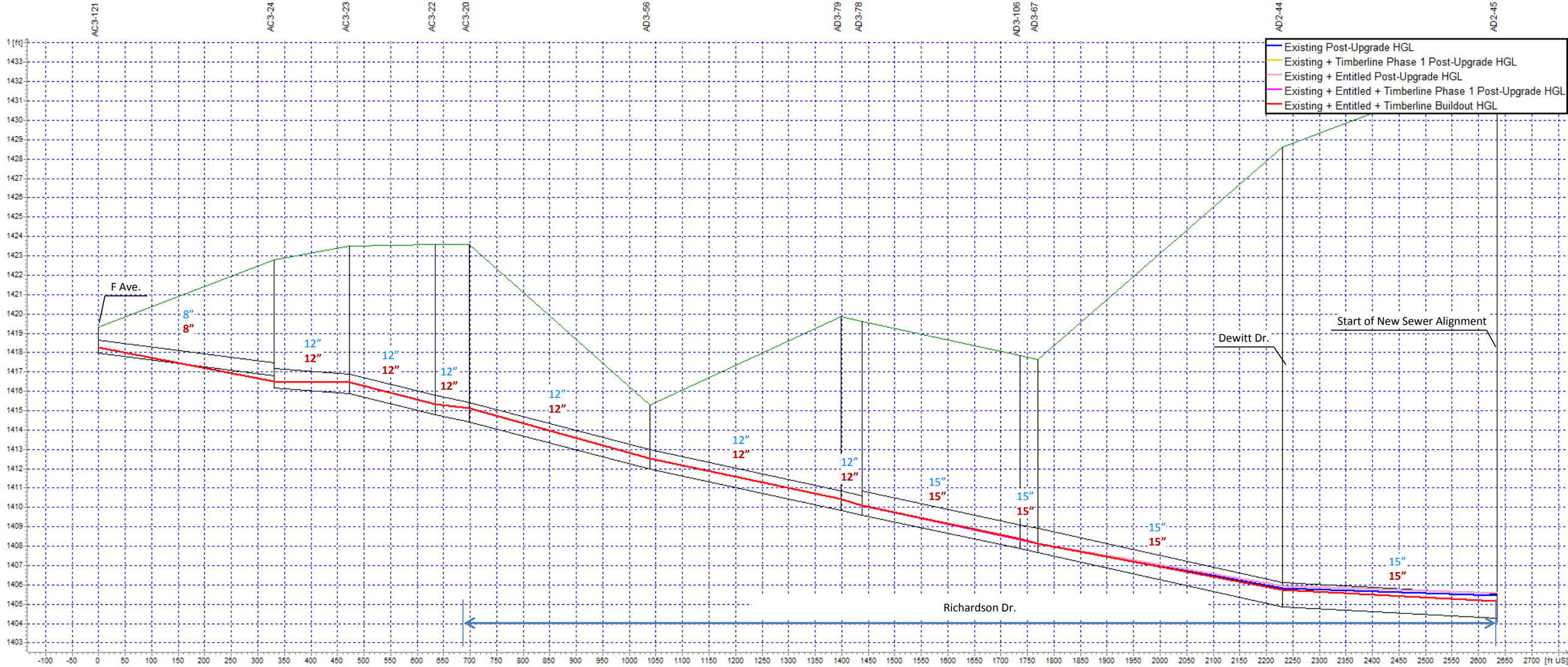
Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project
Western Care Construction, Inc.
Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.
B-5

Title
Existing System Results – 1:10 Year Design Rainfall
HGL Profile 4



Link Diameter [ft]	0.6667	1.0000								1.2500							
Ground Level [ft]	1422.80	1423.50	1423.60	1415.30	1419.84	1419.60	1417.86	1417.66	1428.60	1432.80							
Link Slope [%]	0.35	0.20	0.68	0.71	0.60	0.62	0.58	0.59	0.61	0.15							
Existing Post-Upgrade PWWF [MGD]	0.1613	0.1731	0.5127	0.4949	0.7439	0.7398	0.7275	0.7162	.....	0.7157	0.7153	.....	0.7023	0.6966	0.6942	1.2888	1.2824
Existing + Timberline Phase 1 Post-Upgrade PWWF [MGD]	0.1613	0.1728	0.5160	0.5010	0.7400	0.7262	0.7303	0.7334	.....	0.7162	0.7085	.....	0.6981	0.6966	0.6937	1.2937	1.2826
Existing + Entitled Post-Upgrade PWWF [MGD]	0.1613	0.1729	0.5117	0.4933	0.7313	0.7453	0.7416	0.7310	.....	0.7086	0.7065	.....	0.6967	0.6979	0.6905	1.3084	1.3030
Existing + Entitled + Timberline Phase 1 Post-Upgrade PWWF [MGD]	0.1613	0.1729	0.5148	0.4984	0.7367	0.7330	0.7217	0.7320	.....	0.7189	0.7131	.....	0.6986	0.6959	0.6944	1.3007	1.2926
Existing + Entitled + Timberline Buildout Post-Upgrade PWWF [MGD]	0.1613	0.1719	0.5162	0.5005	0.7393	0.7347	0.7309	0.7183	.....	0.7064	0.7052	.....	0.7035	0.7053	0.7000	1.3080	1.3055
Q Manning Post-Upgrade [MGD]	0.4144	0.9159	1.7005	1.6321	1.7328		1.5943		.....	3.4508		.....	2.9139			1.5931	

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend

12" Existing Sewer Diameter

12" Recommended Sewer Diameter to Eliminate Surcharging

Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project

Western Care Construction, Inc.

Sewer Capacity – North Auburn Dewitt Trunk - Timberline

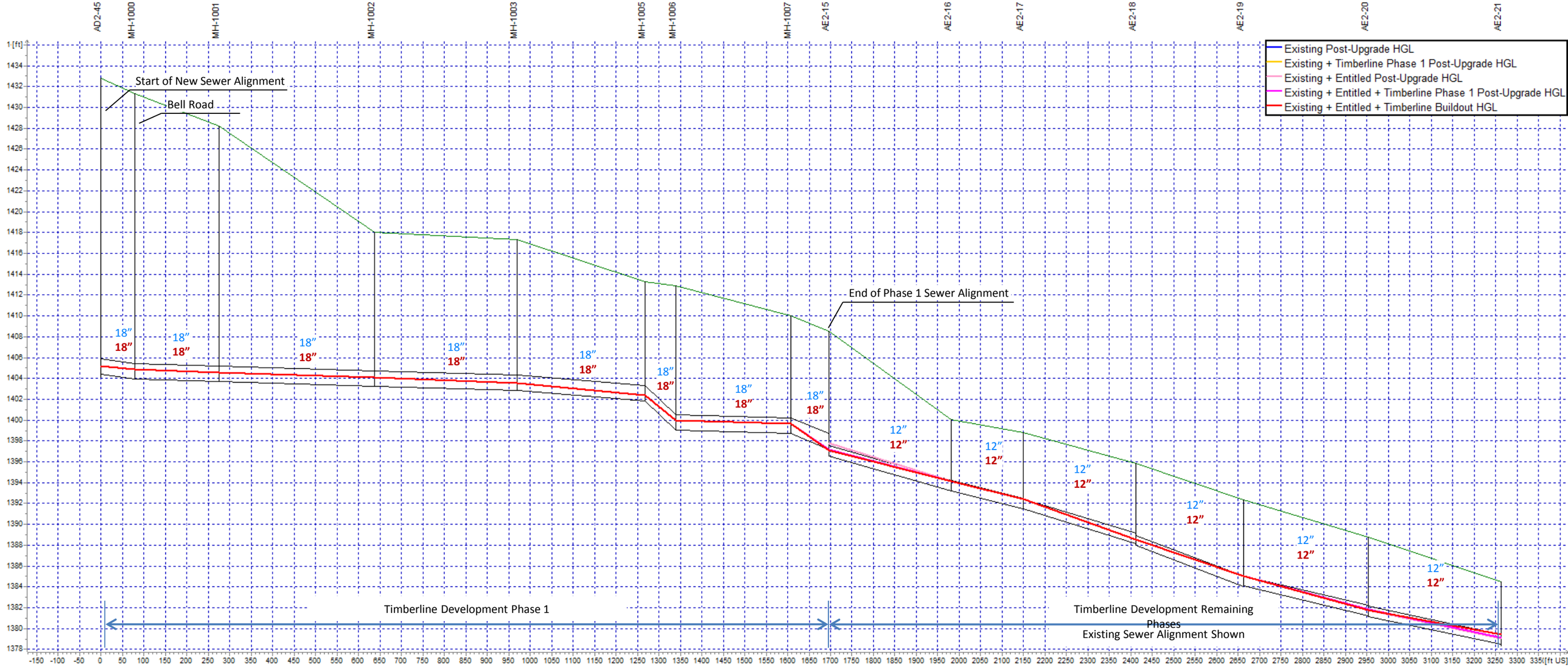
Figure No.

B-6

Title

Impact of Upgrades Upon Near-Term Developments

HGL Profile 1



Link Diameter [ft]	1.5000										1.0000											
Ground Level [ft]	1428.20	1418.00		1417.30		1413.30	1412.90	1410.00			1408.55	1400.08	1398.79		1395.87		1392.36		1388.78		1384.52	
Link Slope [%]																						
Existing Post-Upgrade PWWF [MGD]											1.7353	1.7357	1.7362	1.7366	1.7370	1.7372	1.7373	1.7374	1.7373	1.7371	1.7369	
Existing + Timberline Phase 1 Post-Upgrade PWWF [MGD]	1.7404	1.7388	1.7371	1.7356	1.7665	1.7662	1.7668	1.8511	1.8517	1.8520	1.8523	1.8525	1.8524	1.8523	1.8521	1.8519	1.8516	1.8513	1.8508	1.8500	1.8493	
Existing + Entitled Post-Upgrade PWWF [MGD]												1.7589		1.7587	1.7585	1.7582	1.7580	1.7576	1.7572	1.7566	1.7570	
Existing + Entitled + Timberline Phase 1 Post-Upgrade PWWF [MGD]	1.7582	1.7578	1.7572	1.7565	1.7881	1.7874	1.7869	1.8542	1.8539	1.8544	1.8548	1.8551	1.8553	1.8554	1.8555		1.8554	1.8553	1.8551	1.8548	1.8543	
Existing + Entitled + Timberline Buildout Post-Upgrade PWWF [MGD]	1.7602	1.7565	1.7553	1.7544	1.7858	1.7862	1.7872	1.7972	1.7977	1.7979	1.7981	1.7980	1.7977	1.7974	1.7970	1.7966	1.7962	1.7958	1.7953	1.7948	1.7946	
Q Manning Post-Upgrade [MGD]	2.5577		2.5471		4.2625		14.4781	2.5408		9.5097	2.6928		2.4791	2.7972		3.1300		2.4771		2.3037		

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend

12" Existing Sewer Diameter

12" Recommended Sewer Diameter to Eliminate Surcharging

Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project

Western Care Construction, Inc.

Sewer Capacity – North Auburn Dewitt Trunk - Timberline

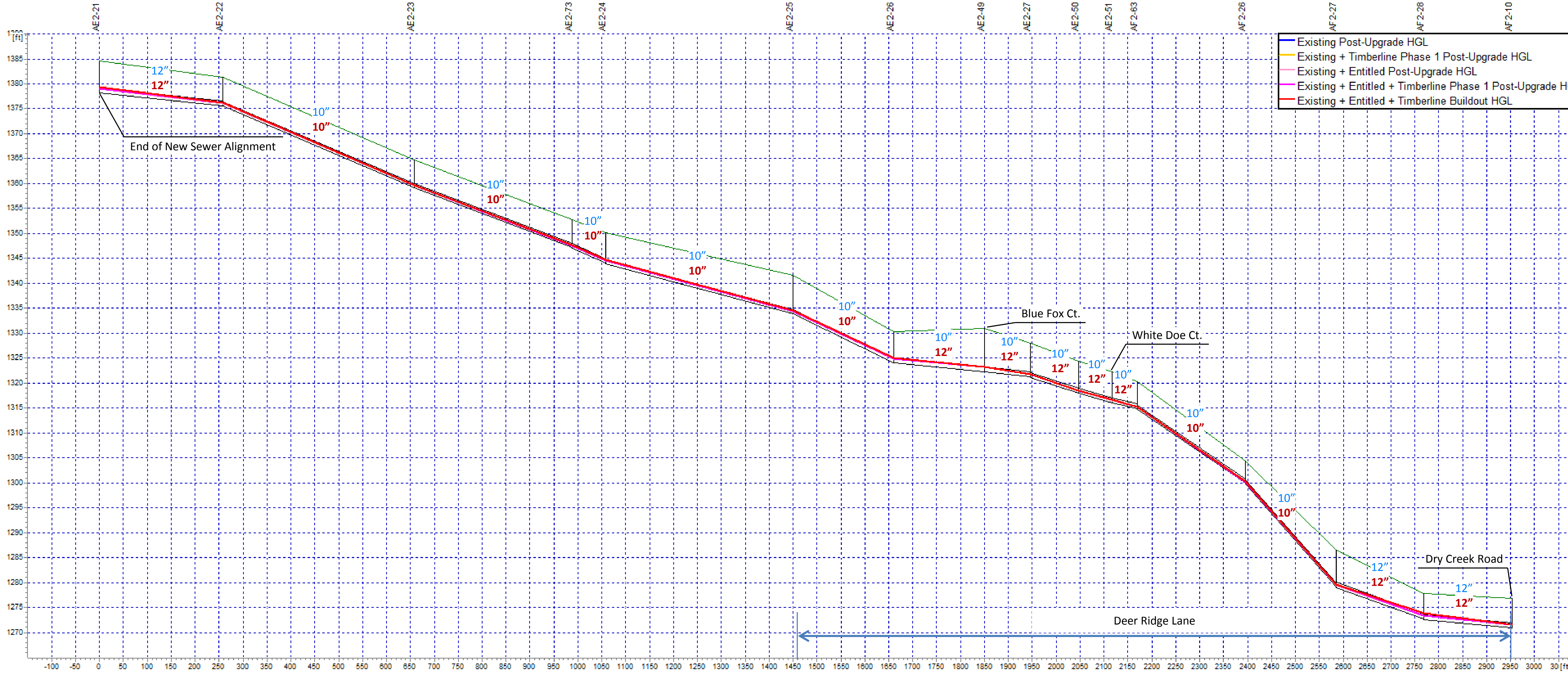
Figure No.

B-7

Title

Impact of Upgrades Upon Near-Term Developments

HGL Profile 2



Link Diameter [ft]	0.8333										1.0000					0.8333		1.0000	
Ground Level [ft]	1381.29		1364.79		1352.74		1350.12		1341.66	1330.36	1330.87	1328.04	1324.35	1322.26	1320.29	1304.33	1286.50	1277.82	1276.80
Link Slope [%]	4.10			3.58		4.42	2.55			4.63	0.96	1.07	3.17	2.70	2.20	6.62	10.91	3.48	0.89
Existing Post-Upgrade PWWF [MGD]	1.8268	1.8267	1.8266	1.8265	1.8264	1.8614		1.8613	1.8612	1.8946		1.9053		1.9570	1.9653	1.9654	2.0074	2.0075	2.0077
Existing + Timberline Phase 1 Post-Upgrade PWWF [MGD]	1.9384	1.9388	1.9391	1.9395	1.9398	1.9741	1.9743	1.9745	1.9746	2.0068	2.0067	2.0171	2.0170	2.0664	2.0744		2.1148	2.1147	2.1145
Existing + Entitled Post-Upgrade PWWF [MGD]	1.8457	1.8459	1.8461	1.8464	1.8467	1.8810	1.8811	1.8813	1.8814	1.9136	1.9137	1.9241		1.9751	1.9835	1.9836	2.0258	2.0260	2.0262
Existing + Entitled + Timberline Phase 1 Post-Upgrade PWWF [MGD]	1.9439	1.9437	1.9436	1.9437		1.9798	1.9796	1.9794	1.9790	2.0128	2.0118	2.0223	2.0222	2.0736	2.0821	2.0824	2.1247	2.1252	2.1260
Existing + Entitled + Timberline Buildout Post-Upgrade PWWF [MGD]	2.2226	2.2225	2.2224	2.2222	2.2218	2.2575	2.2571	2.2566	2.2561	2.2897	2.2898	2.3007	2.3011	2.3525	2.3611	2.3614	2.4036	2.4039	2.4041
Q Manning Post-Upgrade [MGD]	2.8644			2.3983		2.9723	2.2579			3.0429	2.2526	2.3841	4.0975	3.7758	3.4139	3.6383	4.6697	4.2871	2.1735

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend
12” Existing Sewer Diameter
12” Recommended Sewer Diameter to Eliminate Surcharging

Note:
- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project
Western Care Construction, Inc.
Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.
B-8

Title
Impact of Upgrades Upon Near-Term Developments
HGL Profile 3

Link Diameter [ft]	....	1.2500		0.8333				1.5000		1.7500											....
Ground Level [ft]		1255.84		1258.11		1239.08		1227.77	1226.68	1221.67	1221.68	1221.25	1220.57	1222.23	1220.46	1218.86	1219.47		1218.14	1218.42	....
Link Slope [%]	....	0.47		4.55		4.32		0.46	2.47	0.05	0.22	0.06	0.18	0.11	0.20	0.15		0.26	0.11		3.08
Existing Post-Upgrade PWWF [MGD]	....	2.4502	2.4498	2.4694	2.4692	2.4690	2.4688	3.0292	3.1863	3.1855	3.1838	3.1862	3.1835	3.1819	3.1822	3.2322	3.2316	3.2307	3.2299	3.2292	....
Existing + Timberline Phase 1 Post-Upgrade PWWF [MGD]	....	2.5452	2.5449	2.5647	2.5645	2.5643	2.5641	3.1273	3.2860	3.2840	3.2839	3.2878	3.2870	3.2856	3.2841	3.3342	3.3339	3.3343	3.3345		....
Existing + Entitled Post-Upgrade PWWF [MGD]	....	2.4570	2.4567	2.4765	2.4763	2.4761	2.4759	3.0379	3.1962	3.1963	3.1956	3.1989	3.1975	3.1956	3.1940	3.2451	3.2454		3.2453	3.2451	....
Existing + Entitled + Timberline Phase 1 Post-Upgrade PWWF [MGD]	....	2.5576		2.5777		2.5776	2.5775	3.1424	3.3009	3.2982	3.2983	3.3022	3.3015	3.3001	3.2986	3.3486	3.3477	3.3482	3.3485	3.3487	....
Existing + Entitled + Timberline Buildout Post-Upgrade PWWF [MGD]	....	2.8333	2.8317	2.8512	2.8508	2.8507	2.8509	3.4082	3.5658	3.5661	3.5654	3.5687	3.5673	3.5654	3.5634	3.6137	3.6141	3.6143		3.6142	....
Q Manning Post-Upgrade [MGD]	....	2.8451		3.0148		2.9372		4.5765	10.6533	2.3826	4.7805	2.5228	4.3218	3.4616	4.5551	3.9404		5.1719	3.4191		....

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend

12″ Existing Sewer Diameter

12″ Recommended Sewer Diameter to Eliminate Surcharging

15″ Recommended Sewer Diameter to Eliminate Surcharging for Timberline Full Build-out Only

Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project

Western Care Construction, Inc.

Sewer Capacity – North Auburn Dewitt Trunk - Timberline

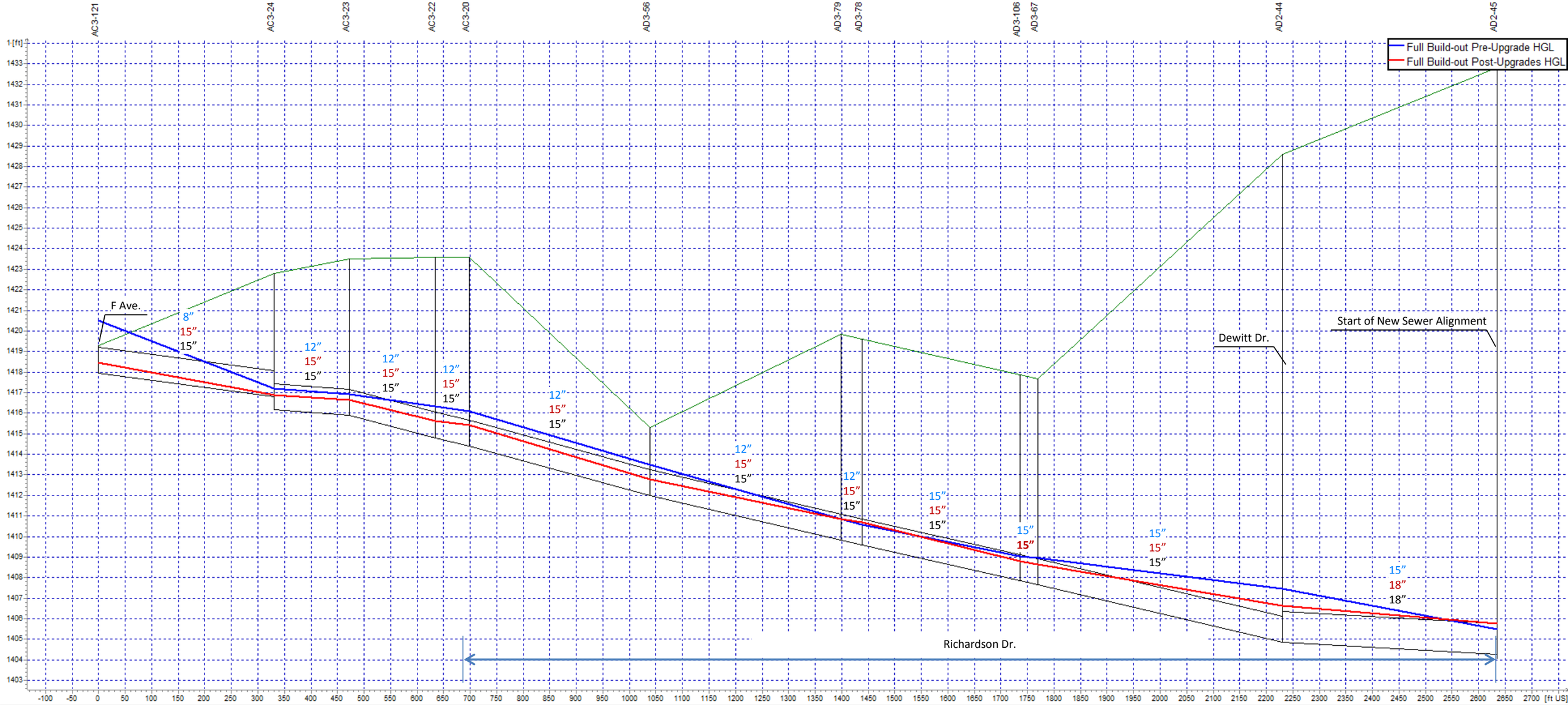
Figure No.

B-9

Title

Impact of Upgrades Upon Near-Term Developments

HGL Profile 4



Link Diameter [ft]	1.2500																										1.5000	
Ground Level [ft]	1419.30		1422.80		1423.50		1423.60			1415.30			1419.84		1419.60		1417.86		1417.66			1428.60				1432.80		
Link Slope [%]		0.35		0.20		0.68		0.71			0.60			0.62		0.58		0.59		0.61					0.15			
Full Build-out Pre-Upgrades PWWF [MGD]		0.6935		0.9103		1.1690	1.1715		1.7573			1.7570				2.0161	2.0115			2.1241					2.8199			
Full Build-out Post-Upgrades PWWF [MGD]	0.7479		0.7472		0.9668		1.2230	1.2220		1.8339		1.8340		1.8333	1.8323		2.0894	2.0887		2.2099		2.2075		2.2076	3.0831		3.0830	
Q Manning Post-Upgrade [MGD]		2.2156		1.6608		3.0835	2.9595		3.1420			2.8908				3.4508				2.9139					2.5907			

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend

#" Existing Sewer Diameter

#" Hydraulically Required Diameter to Eliminate Surcharging

#" Required Diameter to meet Placer County Policy of sewer diameter consistency

Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project

Western Care Construction, Inc.

Sewer Capacity – North Auburn Dewitt Trunk - Timberline

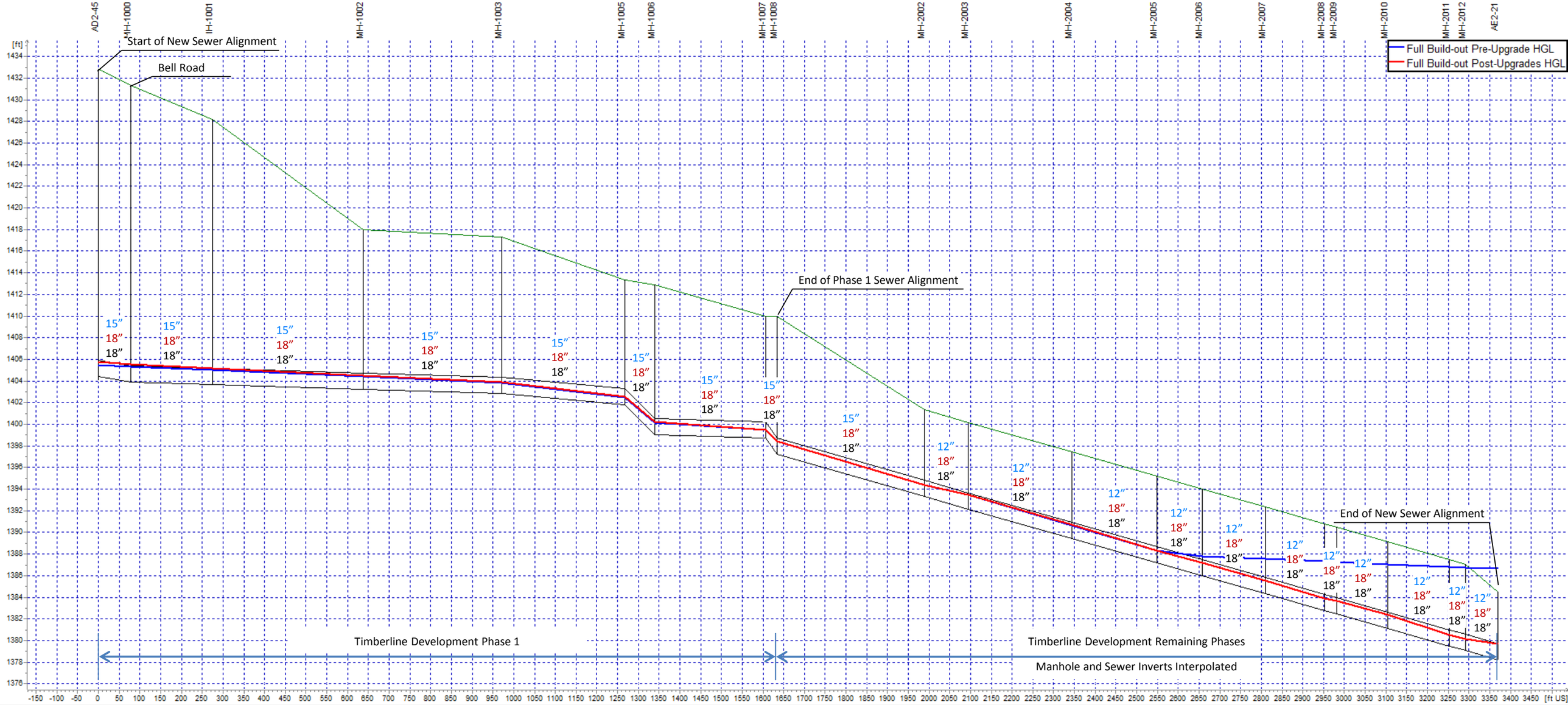
Figure No.

B-10

Title

Impact of Upgrades Upon Full Build-out System

HGL Profile 1



Link Diameter [ft]	1.5000																								
Ground Level [ft]	.....	1428.20	1418.00	1417.30	1413.30	1412.90	1410.00	1401.33	1400.16	1397.43	1395.21	1394.00	1392.35	1390.78	1390.46	1389.13	1387.50	.....	.....						
Link Slope [%]																									
Full Build-out Pre-Upgrades PWWF [MGD]	2.8179	2.8292	2.8291	2.8290	2.8291	2.9025	2.9024	2.9089	2.9088	....	2.9086	2.9084	2.9081	2.9080	2.9083	2.9042	2.9007	2.8992	....	2.8964	2.8950	.....	2.8910		
Full Build-out Post-Upgrades PWWF [MGD]	3.0823	3.0936	3.0925	3.0915	3.0909	3.1666	3.1661	3.1658	3.1724	3.1729	....	3.1734	3.1737	3.1738	3.1739	3.1737	3.1735	3.1733	3.1730	....	3.1725	3.1721	.....	3.1716	
Q Manning Post-Upgrade [MGD]	2.5646	2.5577	2.5471	4.2625	14.4781	2.5408	....	7.6830	....	7.6830															

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend

#" Existing Sewer Diameter

#" Hydraulically Required Diameter to Eliminate Surcharging

#" Required Diameter to meet Placer County Policy of sewer diameter consistency

Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project

Western Care Construction, Inc.

Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.

B-11

Title

Impact of Upgrades Upon Full Build-out System

HGL Profile 2

Link Diameter [ft]	1.5000	1.2500	1.5000														
Ground Level [ft]	...	1381.29	1364.79	1352.74	1350.12	1341.66	1330.36	1330.87	1328.04	1324.35	1322.26	1320.29	1304.33	1286.50	1277.82	1276.80	
Link Slope [%]	1.02	4.10	3.58	4.42	2.55	4.63	0.96	1.07	3.17	2.70	2.20	6.62	10.91	3.48	0.89		
Full Build-out Pre-Upgrades PWWF [MGD]	...	2.7121	2.7511	2.7510	2.5238	2.5237	2.5392	2.5059	2.5058	2.5243	2.4995	2.5060	2.5064	2.5512	2.5561	2.6426	2.6415	2.4415
Full Build-out Post-Upgrades PWWF [MGD]	...	3.4151	3.5177	3.5759	3.5760	3.6093	3.6199	3.6200	3.6968	3.7048	3.7975	3.7976	3.7977					
Q Manning Post-Upgrade [MGD]	6.8551	8.4472	7.0726	8.7655	6.6585	8.9735	4.0846	4.3230	7.4298	6.8465	6.1902	10.7296	13.7711	12.6414	6.4091		

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend

#" Existing Sewer Diameter

#" Hydraulically Required Diameter to Eliminate Surcharging

#" Required Diameter to meet Placer County Policy of sewer diameter consistency

Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project

Western Care Construction, Inc.

Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.

B-12

Title

Impact of Upgrades Upon Full Build-out System

HGL Profile 3

Link Diameter [ft]	1.5000	1.7500	1.5000	2.2500	....																
Ground Level [ft]	....	1255.84	1258.11	1239.08	1227.77	1226.68	1221.67	1221.68	1221.25	1220.57	1222.23	1220.46	1218.86	1219.47	1218.14	1218.42	....				
Link Slope [%]	6.49	0.47	4.55	4.32	0.46	2.47	0.05	0.22	0.06	0.18	0.11	0.20	0.15	0.26	0.11	3.08					
Full Build-out Pre-Upgrades PWWF [MGD]	3.1622	2.9905	3.0086	3.0079	3.4740	3.4739	3.5939	3.2627	3.1907	3.1533	3.1333	3.1593	....								
Full Build-out Post-Upgrades PWWF [MGD]	....	5.2464	5.2745	5.2754	5.3174	5.3176	5.3177	6.0575	6.2273	6.2245	6.2208	6.2262	6.2224	6.2234	6.2239	6.2958	6.2952	6.2944	6.2937	6.2929	....
Q Manning Post-Upgrade [MGD]	17.2689	6.9795	14.4580	14.0863	9.8569	22.9454	4.6574	9.3445	4.9315	8.4480	6.7664	8.9041	7.7024	10.1097	6.6834	....					

7/3/2011

Stantec Consulting Ltd.
3875 Atherton Road
Rocklin CA 95765
Tel. 916.773.8100
Fax. 916.773.8448

Legend

#″ Existing Sewer Diameter

#″ Hydraulically Required Diameter to Eliminate Surcharging

#″ Required Diameter to meet Placer County Policy of sewer diameter consistency

Note:

- Scenarios 1, 2, 3, and 5 Results are based on the existing sewer alignment through proposed timberline development.
- Scenarios 4 and 6 results are based on future proposed alignment through Phase 1 development only.
- Scenarios 7 and 8 is based on ultimate future alignment.

Client/Project

Western Care Construction, Inc.

Sewer Capacity – North Auburn Dewitt Trunk - Timberline

Figure No.

B-13

Title

Impact of Upgrades Upon Full Build-out System

HGL Profile 4

PLACER COUNTY GOVERNMENT CENTER

SEWER FLOW DATA BY FACILITY

PCGC SEWER INFLOWS

Parcel	Description	Qty	Unit	AWWF (gpm)	PWWF (cfs)
FUTURE COUNTY SPACE					
A	Health and Human Services - Auburn Service Area and Administration	584	pers	6	0.05
B	County Administrative Center	183	pers	2	0.02
C	Agricultural Commissioner and Farm Advisor	57	pers	1	0.01
D	County Warehouse	3	pers	0	0.01
E	Museums Warehouse	7	pers	0	0.01
F	Corporation Yard Administration and Training Center	5	pers	0	0.01
G	Sheriff and Probation Support	50	pers	1	0.01
H	Fire Station and Fire Station 180 Expansion	16	pers	1	0.01
I	Administrative Services IT/Telecom/Warehouse	10	pers	0	0.01
J	FAB & CDRC Annex	109	pers	1	0.01
K	K1 - Sheriff's Dive Unit	2	pers	0	0.01
K	K2 - Utilities Department			0	0.01
K	K3 - Parks and Grounds			0	0.01
K	K4 - Tire Barn			0	0.01
	Urban Street				
FUTURE COMMUNITY SPACE					
L	Dewitt Heritage/Adaptive Reuse	245	pers	3	0.02
M	Community Events Center	810	pers	8	0.08
OS	Central Green			0	
POTENTIAL NON-COUNTY SPACE					
R1	Residential	44	DU	24	0.22
R2	Residential	36	DU	20	0.18
R3	Residential	73	DU	41	0.36
R4	Residential	55	DU	31	0.27
R5	Residential	54	DU	30	0.27
R6	Residential	38	DU	21	0.19
R7	Residential	38	DU	21	0.19
R8	Residential	50	DU	28	0.25
SR1	Small Residential	18	DU	10	0.09
SR2	Small Residential	12	DU	7	0.06
SR3	Small Residential	15	DU	8	0.07
HO	Hotel	225	pers	23	0.21
F1	Flex	190	pers	13	0.12
F2	Flex	238	pers	17	0.15
F3	Flex	196	pers	14	0.12
F4	Flex	184	pers	13	0.11
F5	Flex	294	pers	20	0.18
F6	Flex	124	pers	9	0.08
OS	Open Space			0	
EXISTING COUNTY SPACE					
E01	Existing CDRC (3091 County Center Drive)	259	pers	3	0.02
E02	Existing FAB (2950 Richardson Drive)	253	pers	3	0.02
	DeWitt Museum (2985 Richardson Drive) (staff + visitors)	32	pers	0	0.01
	Chapel (2945 First St.) (staff + visitors)	77	pers	0	0.01
	Corporation Yard	176	pers	2	0.02
	Women's Shelter - Peace for Families	30	pers	2	0.02
	Residential Facility (11084 B. Ave) (formerly CES)	30	pers	2	0.02
	Juvenile Detention Center (11260 B. Ave.)	35	pers	2	0.02
	Auburn Justice Center (2929 Richardson Drive)	406	pers	4	0.04
	Auburn Jail (2275/2775 Richardson Drive)	455	pers	32	0.28
	Animal Services Center (11232 B. Ave.)	15	pers	0	0.01
					3.86

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT
Tier 1

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 1 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow)	Flow / Capacity	Depth/ Rise (%)
71	P-67	AD2-85	1,394.00	O-2	1,393.00	361.8	0.00	6	0.01	0.31	2.18	0.34	0.38	81.8	68.8
74	P-70	AD2-104	1,402.24	AD2-100	1,395.16	401.2	0.02	6	0.011	0.01	1.48	0.11	0.88	1.1	22.7
75	P-85	UNK-17	1,386.00	O-3	1,384.05	53.3	0.04	8	0.01	0	0	0	3.01	0	0
77	P-56	UNK-16	1,390.00	UNK-18	1,385.00	82.1	0.06	8	0.01	0.35	6.89	0.17	3.88	9	25.6
78	P-57	AC3-32	1,391.00	UNK-16	1,390.00	344.8	0.00	8	0.01	0.06	1.4	0.16	0.85	7.1	24.7
79	P-58	AC3-123	1,392.65	AC3-32	1,391.00	109.2	0.02	8	0.01	0.06	2.51	0.1	1.93	3.1	15.3
80	P-59	AC2-099	1,393.65	AC3-123	1,392.65	154.5	0.01	8	0.01	0.06	1.86	0.1	1.27	4.7	14.8
81	P-60	AD2-098	1,394.52	AC2-099	1,393.65	179.7	0.01	8	0.01	0.06	1.68	0.11	1.09	5.5	15.9
82	P-61	AD02-057	1,395.04	AD2-098	1,394.52	64.9	0.01	8	0.01	0.02	1.44	0.08	1.41	1.4	12.4
83	P-62	AC2-002	1,397.96	AD02-057	1,395.04	237.3	0.01	8	0.01	0.02	1.66	0.05	1.74	1.1	8.2
84	P-63	AC2-001	1,400.00	AC2-002	1,397.96	127.2	0.02	8	0.01	0.02	1.82	0.05	1.99	1	7.7
85	P-82	UNK-18	1,385.00	O-3	1,384.05	29.6	0.03	8	0.01	0.35	5.48	0.16	2.8	12.5	23.9
86	P-89	AD3-45	1,420.86	AD3-44	1,419.84	118.6	0.01	12	0.01	0.52	3.69	0.24	4.29	12.1	23.5
90	P-6	UNK-06	1,410.80	AD3-78	1,409.60	326.6	0.00	15	0.011	2	3.63	0.58	4.62	43.3	46.3
93	P-9	AD3-156	1,416.00	AD3-57	1,413.30	138	0.02	6	0.01	0.05	2.69	0.09	1.02	4.9	18.2
94	P-10	AD3-58	1,419.90	AD3-156	1,416.00	140.5	0.03	6	0.01	0.04	2.85	0.07	1.21	3.3	14.9
97	P-15	AD3-61	1,429.50	AD3-58	1,419.90	236.3	0.04	6	0.01	0.01	2.13	0.05	1.47	0.7	10.4
99	P-17	AC3-20	1,414.40	AD3-56	1,411.90	341.3	0.01	15	0.011	1.94	4.64	0.47	6.54	29.7	37.3
100	P-18	AC3-22	1,414.80	AC3-20	1,414.40	60.8	0.01	12	0.011	1.54	4.23	0.49	3.41	45.2	48.6
101	P-19	AC3-23	1,415.90	AC3-22	1,414.80	149.1	0.01	12	0.01	1.54	4.74	0.47	3.98	38.6	46.5
102	P-20	AC3-24	1,416.18	AC3-23	1,415.90	143.3	0.00	12	0.01	1.19	2.7	0.55	2.05	57.9	54.6
104	P-22	AC3-62	1,423.29	AC3-24	1,416.18	271.5	0.03	8	0.01	0.76	6.37	0.4	2.54	30.1	60.6
105	P-23	AD3-63	1,424.90	AC3-62	1,423.29	75.9	0.02	8	0.011	0.66	5.29	0.29	2.08	31.6	42.8
109	P-29	AD3-42	1,409.64	AD3-78	1,409.60	127.5	0.00	12	0.01	0.57	1.13	0.61	0.82	69.6	61.4
111	P-31	AD3-44	1,419.84	AD3-43	1,415.86	173.3	0.02	12	0.01	0.54	5.29	0.21	7.02	7.7	21.1
112	P-51	AC3-141	1,414.70	AC3-20	1,414.40	116.3	0.00	10	0.01	0.4	2.27	0.4	1.45	27.6	48
113	P-52	AC3-31	1,416.20	AC3-23	1,415.90	124.8	0.00	12	0.01	0.35	2.09	0.37	2.27	15.4	36.6
114	P-72	AD3-78	1,409.60	AD3-106	1,407.86	284.1	0.01	15	0.01	2.57	5.02	0.57	6.57	39.1	45.7
115	P-73	AD3-106	1,407.86	AD3-67	1,407.66	36.7	0.01	15	0.01	2.57	4.8	0.57	6.17	41.6	45.9
118	P-3	AD2-44	1,404.86	AD2-45	1,404.27	377.3	0.00	15	0.01	2.95	3.06	0.92	3.32	88.8	73.4
119	P-4	AD3-67	1,407.66	AD2-44	1,404.86	451.6	0.01	15	0.01	2.61	5.07	0.74	6.61	39.5	59.1
125	P-45	AD3-069	1,422.00	AD3-101	1,420.47	141.9	0.01	8	0.01	0.02	1.59	0.05	1.63	1.2	7.8
126	P-46	AD3-71	1,427.79	AD3-069	1,422.00	366.7	0.02	8	0.01	0.01	1.47	0.05	1.97	0.5	6.8
127	P-47	AD3-72	1,430.70	AD3-71	1,427.79	81.1	0.04	8	0.011	0.01	1.84	0.03	2.71	0.4	4.8
135	P-79	AD3-47	1,424.09	NEW AD3-46	1,422.53	302.2	0.01	12	0.01	0.5	3.05	0.27	3.33	15	27.3
136	P-36	AD3-48	1,426.00	AD3-47	1,424.09	382.7	0.01	12	0.01	0.49	2.99	0.27	3.27	15	26.9
137	P-94	AD3-103	1,426.53	NEW AD3-46	1,422.53	302.9	0.01	6	0.01	0.01	1.46	0.16	0.84	1.2	32.3
232	P-103	AC3-26	1,419.00	AC3-25	1,417.96	127.2	0.01	8	0.01	0.1	2.35	0.21	1.42	7	31.7
235	CO-9	AC3-510	1,397.00	UNK-16	1,390.00	100	0.07	6	0.01	0	0	0.1	1.93	0	20.9
249	CO-15	NEW MH-10	1,408.18	NEW MH-13	1,407.84	691.4	0.00	12	0.013	0	0	0.24	0.79	0	23.6
250	CO-16	NEW MH-13	1,407.84	NEW MH-12	1,407.68	322.3	0.00	6	0.01	0	0	0.45	0.16	0	90.6
251	CO-17	NEW MH-12	1,407.68	AD3-67	1,407.66	37.3	0.00	6	0.01	0	0	0.5	0.17	0	100
258	CO-18	NEW MH-14	1,424.50	NEW MH-15	1,424.36	267.8	0.00	6	0.01	0.11	0.91	0.3	0.17	66	59.3
259	CO-19	NEW MH-15	1,424.36	NEW MH-17	1,422.50	79.2	0.02	6	0.01	0.4	5.23	0.21	1.12	35.7	41.3
260	CO-20	NEW MH-17	1,422.50	NEW MH-18	1,414.50	210.1	0.04	6	0.01	0.4	6.23	0.18	1.42	28.1	36.2
261	CO-21	NEW MH-18	1,414.50	NEW MH-19	1,395.73	232.6	0.08	6	0.01	0.4	8.14	0.19	2.07	19.3	37.2
262	CO-22	NEW MH-16	1,424.50	NEW MH-15	1,424.36	244	0.00	6	0.01	0.09	0.9	0.25	0.17	51.5	50.9
264	CO-23	NEW MH-19	1,395.73	O-1	1,393.58	119.9	0.02	6	0.01	0.4	4.73	0.22	0.98	41	44.6
265	CO-24	AD2-2	1,420.00	AD2-44	1,404.86	174.6	0.09	8	0.01	0.31	7.53	0.39	4.62	6.7	58.8
266	CO-25	AD2-45	1,404.27	AD2-047	1,403.48	251.6	0.00	18	0.01	2.97	4.05	0.65	7.65	38.9	43.3
268	P-8	AD3-57	1,413.30	AD3-56	1,411.90	152.9	0.01	6	0.01	0.06	2.17	0.27	0.7	8.6	54.5
269	P-7	AD3-56	1,411.90	UNK-06	1,410.80	69.1	0.02	15	0.011	2	6.2	0.49	9.64	20.8	39.3
271	P-30	AD3-43	1,415.86	MH-20	1,412.75	139.6	0.02	12	0.01	0.55	5.25	0.19	6.9	8	19.2
272	CO-30	MH-20	1,412.75	AD3-42	1,409.64	139.2	0.02	12	0.01	0.56	5.3	0.4	6.93	8.1	40.4
277	CO-33	AC3-25	1,417.96	AC3-121	1,417.90	25.5	0.00	8	0.01	0.31	2.1	0.3	0.77	40.9	44.5
278	P-21	AC3-121	1,417.90	AC3-24	1,416.18	318.5	0.01	12	0.01	0.31	2.71	0.38	3.41	9.2	38.1
306	CO-47	NEW MH-35	1,391.50	NEW MH-36	1,387.36	144.8	0.03	6	0.01	0.08	3.54	0.12	1.23	6.5	23.3
308	CO-48	NEW MH-36	1,387.36	NEW MH-37	1,379.50	274.9	0.03	6	0.01	0.23	4.8	0.15	1.23	18.7	30.3
310	CO-49	NEW MH-37	1,379.50	NEW MH-38	1,375.46	181	0.02	6	0.01	0.23	4.39	0.16	1.09	21.1	31.2
312	CO-50	NEW MH-38	1,375.46	NEW MH-39	1,366.50	401.8	0.02	6	0.01	0.23	4.39	0.33	1.09	21.1	65.6
314	CO-51	NEW MH-39	1,366.50	NEW MH-40	1,377.00	257.8	-0.04	6	0.01	0.23	1.17	0.44	1.47	15.6	87
316	CO-52	NEW MH-40	1,377.00	O-5	1,376.50	198.3	0.00	6	0.01	0.23	1.97	0.29	0.37	62.7	57.4
321	P-81	NEW MH-100	1,428.06	NEW MH-42	1,426.82	127.3	0.01	8	0.01	0.03	1.74	0.15	1.55	1.9	22.8
322	CO-56	NEW MH-42	1,426.82	AD3-48	1,426.00	83.5	0.01	8	0.01	0.43	3.8	0.26	1.55	27.7	38.7
344	CO-58	NEW AD3-46	1,422.53	MH-43	1,422.26	54.5	0.01	12	0.01	0.52	3.03	0.27	3.24	16	27.1
345	CO-59	MH-43	1,422.26	MH-44	1,421.57	142.7	0.01	12	0.01	0.52	3.01	0.27	3.22	16.2	27.2
346	CO-60	MH-44	1,421.57	AD3-45	1,420.86	85.2	0.01	12	0.01	0.52	3.66	0.24	4.23	12.3	23.7
349	CO-61	MH-45	1,432.26	MH-46	1,429.61	249.9	0.01	8	0.01	0.01	1.28	0.04	1.62	0.6	5.9
350	CO-62	MH-46	1,429.61	NEW MH-100	1,428.06	217	0.01	8	0.01	0.01	1.11	0.06	1.33	0.8	8.3
357	P-83	AC3-29	1,429.45	AC3-27	1,427.69	106.7	0.02	8	0.011	0.22	3.55	0.19	1.83	12	28.3
358	P-84	AC3-27	1,427.69	AD3-63	1,424.90	299.2	0.01	8	0.011	0.33	3.25	0.26	1.38	23.9	39.2
359	P-28	AD3-66	0.00	AD3-65	1,433.04	93.7	-15.25	8	0.011	0.11	0.32	0.54	55.76	0.2	80.7
360	P-27	AD3-65	1,433.04	AD3-64	1,429.52	112.3	0.03	8	0.011	0.22	4.45	0.13	2.53	8.7	20.1
361	P-26	AD3-64	1,429.52	AD3-63	1,424.90	159.7	0.03	8	0.011	0.22	4.32	0.22	2.43	9.1	32.7
367	P-69	AD2-100	1,395.16	UNK-20	1,395.00	157.2	0.00	6	0.01	0.07	1.04	0.23	0.23	30.1	46.4
368	P-68	UNK-20	1,395.00	AD2-85	1,394.00	252.3	0.00	6	0.01	0.27	2.43	0.31	0.46	58.8	62.7
371	P-44	AD3-101	1,420.47	AD3-105	1,418.13	170.2	0.01	10	0.01	0.02	1.68	0.05	3.34	0.6	5.6

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 1 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow)	Flow / Capacity	Depth/ Rise (%)
372	P-43	AD3-105	1,418.13	AD3-068	0.00	58.8	24.04	10	0.01	0.03	24.98	0.01	139.63	0	1.2
373	P-42	AD3-068	0.00	AD3-67	1,407.66	409.3	-3.44	10	0.01	0.04	0.07	0.71	52.84	0.1	85.2
375	P-11	UNK-8	1,422.97	AD3-58	1,419.90	337.9	0.01	6	0.01	0.02	1.56	0.07	0.7	2.9	13.3
377	P-12	UNK-09	1,424.31	UNK-8	1,422.97	117	0.01	6	0.01	0.01	1.38	0.05	0.78	1.3	9.8
379	P-25	BLDG-410	1,437.50	AC3-29	1,429.45	402.6	0.02	8	0.01	0.11	3.31	0.13	2.22	5	19.3
385	P-76	AD3-050	1,433.86	AD3-053	1,431.62	142.6	0.02	8	0.011	0.01	1.37	0.04	1.79	0.6	6.3
386	P-77	AD3-053	1,431.62	AD3-052	1,429.31	134.8	0.02	8	0.011	0.02	1.74	0.05	1.87	1.1	8
387	P-75	AD3-052	1,429.31	AD3-051	1,428.03	70.2	0.02	8	0.011	0.03	2.03	0.07	1.93	1.6	10.4
388	P-78	AD3-051	1,428.03	AD3-049	1,427.02	241.5	0.00	12	0.01	0.04	1.33	0.09	2.99	1.3	8.9
389	P-80	AD3-049	1,427.02	AD3-48	1,426.00	338	0.00	12	0.01	0.05	1.28	0.19	2.54	2	18.6

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 1 (MANHOLES)

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (cfs)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
2	AD2-85	1,400.20	1,400.20	1,394.00	0.27	0.31	0.34	1,394.34	1,394.35
4	AD2-100	1,400.47	1,400.47	1,395.16	0.01	0.07	0.19	1,395.35	1,395.35
5	AD2-104	1,409.64	1,409.64	1,402.24	0	0.01	0.04	1,402.28	1,402.28
6	UNK-17	1,394.00	1,394.00	1,386.00	0	0	0.00	1,386.00	1,386.00
7	UNK-18	1,394.30	1,394.30	1,385.00	0.35	0.35	0.16	1,385.16	1,385.21
8	AC3-510	1,402.00	1,402.00	1,397.00	0	0	0.00	1,397.00	1,397.00
9	UNK-16	1,401.80	1,401.80	1,390.00	0.06	0.35	0.14	1,390.14	1,390.21
10	AC3-32	1,405.00	1,405.00	1,391.00	0.06	0.06	0.12	1,391.12	1,391.12
11	AC3-123	1,407.24	1,407.24	1,392.65	0.06	0.06	0.08	1,392.73	1,392.74
12	AC2-099	1,407.67	1,407.67	1,393.65	0.06	0.06	0.10	1,393.75	1,393.75
13	AD2-098	1,410.79	1,410.79	1,394.52	0.02	0.06	0.11	1,394.63	1,394.63
14	AD02-057	1,404.75	1,404.75	1,395.04	0.02	0.02	0.06	1,395.10	1,395.10
15	AC2-002	1,403.57	1,403.57	1,397.96	0.02	0.02	0.05	1,398.01	1,398.01
16	AC2-001	1,405.00	1,405.00	1,400.00	0	0.02	0.05	1,400.05	1,400.05
18	AD3-45	1,427.60	1,427.60	1,420.86	0.52	0.52	0.24	1,421.10	1,421.10
22	AD3-78	1,411.40	1,411.40	1,409.60	2.57	2.57	0.54	1,410.14	1,410.18
23	UNK-06	1,413.80	1,413.80	1,410.80	2	2	0.57	1,411.37	1,411.40
25	AD3-57	1,417.80	1,417.80	1,413.30	0.05	0.06	0.10	1,413.40	1,413.41
26	AD3-156	1,421.00	1,421.00	1,416.00	0.04	0.05	0.08	1,416.08	1,416.09
27	AD3-58	1,425.20	1,425.20	1,419.90	0.03	0.04	0.06	1,419.96	1,419.97
30	AD3-61	1,434.50	1,434.50	1,429.50	0	0.01	0.03	1,429.53	1,429.53
31	AD3-56	1,414.00	1,414.00	1,411.90	2	2	0.39	1,412.29	1,412.35
32	AC3-20	1,420.38	1,420.38	1,414.40	1.94	1.94	0.47	1,414.87	1,414.90
33	AC3-22	1,421.00	1,421.00	1,414.80	1.54	1.54	0.47	1,415.27	1,415.30
34	AC3-23	1,420.00	1,420.00	1,415.90	1.54	1.54	0.43	1,416.33	1,416.37
35	AC3-24	1,420.00	1,420.00	1,416.18	1.08	1.19	0.55	1,416.73	1,416.74
36	AC3-25	1,419.64	1,419.64	1,417.96	0.1	0.31	0.30	1,418.26	1,418.26
37	AC3-62	1,427.58	1,427.58	1,423.29	0.66	0.76	0.25	1,423.54	1,423.60
38	AD3-63	1,429.20	1,429.20	1,424.90	0.55	0.66	0.26	1,425.16	1,425.20
42	AD3-42	1,414.94	1,414.94	1,409.64	0.56	0.57	0.61	1,410.25	1,410.26
43	AD3-43	1,420.86	1,420.86	1,415.86	0.54	0.55	0.19	1,416.05	1,416.09
44	AD3-44	1,425.26	1,425.26	1,419.84	0.52	0.54	0.19	1,420.03	1,420.07
45	AC3-141	1,418.70	1,418.70	1,414.70	0	0.4	0.30	1,415.00	1,415.01
46	AC3-31	1,422.00	1,422.00	1,416.20	0	0.35	0.27	1,416.47	1,416.47
47	AD3-106	1,418.36	1,418.36	1,407.86	2.57	2.57	0.56	1,408.42	1,408.46
50	AD2-45	1,432.42	1,432.42	1,404.27	2.95	2.97	0.65	1,404.92	1,404.94
51	AD2-44	1,428.87	1,428.87	1,404.86	2.92	2.95	0.92	1,405.78	1,405.79
52	AD3-67	1,419.47	1,419.47	1,407.66	2.61	2.61	0.55	1,408.21	1,408.25
55	AD2-2	1,427.00	1,427.00	1,420.00	0	0.31	0.12	1,420.12	1,420.21
57	AD3-101	1,427.57	1,427.57	1,420.47	0.02	0.02	0.05	1,420.52	1,420.52
58	AD3-069	1,429.13	1,429.13	1,422.00	0.01	0.02	0.05	1,422.05	1,422.06
59	AD3-71	1,431.72	1,431.72	1,427.79	0.01	0.01	0.03	1,427.82	1,427.82
60	AD3-72	1,433.82	1,433.82	1,430.70	0	0.01	0.03	1,430.73	1,430.73
65	NEW MH-100	1,433.87	1,433.87	1,428.06	0.01	0.03	0.06	1,428.12	1,428.13
67	NEW AD3-46	1,430.00	1,430.00	1,422.53	0.51	0.52	0.27	1,422.80	1,422.81
68	AD3-47	1,429.14	1,429.14	1,424.09	0.49	0.5	0.26	1,424.35	1,424.37
69	AD3-48	1,432.50	1,432.50	1,426.00	0.48	0.49	0.26	1,426.26	1,426.28
70	AD3-103	1,434.00	1,434.00	1,426.53	0	0.01	0.04	1,426.57	1,426.57
231	AC3-26	1,423.00	1,423.00	1,419.00	0	0.1	0.12	1,419.12	1,419.12
240	NEW MH-10	1,420.38	1,420.38	1,408.18	0	0	0.07	1,408.25	1,408.25

247	NEW MH-12	1,419.47	1,419.47	1,407.68	0	0	0.57	1,408.25	1,408.25
248	NEW MH-13	1,411.40	1,411.40	1,407.84	0	0	0.41	1,408.25	1,408.25
252	NEW MH-14	1,428.00	1,428.00	1,424.50	0	0.11	0.30	1,424.80	1,424.80
253	NEW MH-15	1,428.00	1,428.00	1,424.36	0.2	0.4	0.21	1,424.57	1,424.57
254	NEW MH-16	1,428.00	1,428.00	1,424.50	0	0.09	0.25	1,424.75	1,424.75
255	NEW MH-17	1,426.00	1,426.00	1,422.50	0.4	0.4	0.18	1,422.68	1,422.68
256	NEW MH-18	1,418.00	1,418.00	1,414.50	0.4	0.4	0.15	1,414.65	1,414.65
257	NEW MH-19	1,399.23	1,399.23	1,395.73	0.4	0.4	0.22	1,395.95	1,395.95
270	MH-20	1,417.90	1,417.90	1,412.75	0.55	0.56	0.19	1,412.94	1,412.94
276	AC3-121	1,419.65	1,419.65	1,417.90	0.31	0.31	0.21	1,418.11	1,418.11
304	NEW MH-35	1,395.00	1,395.00	1,391.50	0	0.08	0.09	1,391.59	1,391.59
305	NEW MH-36	1,390.86	1,390.86	1,387.36	0.08	0.23	0.15	1,387.51	1,387.51
307	NEW MH-37	1,383.00	1,383.00	1,379.50	0.23	0.23	0.16	1,379.66	1,379.66
309	NEW MH-38	1,378.96	1,378.96	1,375.46	0.23	0.23	0.16	1,375.62	1,375.62
311	NEW MH-39	1,370.00	1,370.00	1,366.50	0.23	0.23	3.50	1,370.00	1,370.00
313	NEW MH-40	1,393.00	1,393.00	1,377.00	0.23	0.23	0.29	1,377.29	1,377.29
320	NEW MH-42	1,433.05	1,433.05	1,426.82	0.03	0.43	0.24	1,427.06	1,427.06
342	MH-43	1,429.22	1,429.22	1,422.26	0.52	0.52	0.27	1,422.53	1,422.53
343	MH-44	1,429.22	1,429.22	1,421.57	0.52	0.52	0.24	1,421.81	1,421.81
347	MH-45	1,435.84	1,435.84	1,432.26	0	0.01	0.04	1,432.30	1,432.30
348	MH-46	1,433.87	1,433.87	1,429.61	0.01	0.01	0.04	1,429.65	1,429.65
351	AC3-29	1,433.32	1,433.32	1,429.45	0.11	0.22	0.16	1,429.61	1,429.61
352	AC3-27	1,431.49	1,431.49	1,427.69	0.22	0.33	0.22	1,427.91	1,427.91
353	AD3-64	1,433.18	1,433.18	1,429.52	0.22	0.22	0.14	1,429.66	1,429.66
354	AD3-65	1,438.68	1,438.68	1,433.04	0.11	0.22	0.13	1,433.17	1,433.17
355	AD3-66	1,439.83	1,439.83	0.00	0	0.11	1,433.45	1,433.45	1,433.45
366	UNK-20	14,000.00	14,000.00	1,395.00	0.07	0.27	0.28	1,395.28	1,395.28
369	AD3-105	1,423.81	1,423.81	1,418.13	0.02	0.03	0.01	1,418.14	1,418.14
370	AD3-068	0.00	0.00	0.00	0.03	0.04	0.00	0.00	0.00
374	UNK-8	1,428.50	1,428.50	1,422.97	0.01	0.02	0.06	1,423.03	1,423.03
376	UNK-09	1,430.90	1,430.90	1,424.31	0	0.01	0.04	1,424.35	1,424.35
378	BLDG-410	1,443.50	1,443.50	1,437.50	0	0.11	0.10	1,437.60	1,437.60
380	AD3-050	1,440.97	1,440.97	1,433.86	0	0.01	0.04	1,433.90	1,433.90
381	AD3-053	1,437.53	1,437.53	1,431.62	0.01	0.02	0.05	1,431.67	1,431.67
382	AD3-052	1,434.46	1,434.46	1,429.31	0.02	0.03	0.06	1,429.37	1,429.37
383	AD3-051	1,433.24	1,433.24	1,428.03	0.03	0.04	0.08	1,428.11	1,428.11
384	AD3-049	1,431.91	1,431.91	1,427.02	0.04	0.05	0.10	1,427.12	1,427.12

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT
Tier 2

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 2 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow)	Flow / Capacity	Depth/Rise (%)
71	P-67	AD2-85	1,394.00	O-2	1,393.00	361.8	0.00	Circle	6	0.01	0.34	2.21	0.37	0.38	89.6	73.9
74	P-70	AD2-104	1,402.24	AD2-100	1,395.16	401.2	0.02	Circle	6	0.011	0.01	1.48	0.13	0.88	1.1	26.5
75	P-85	UNK-17	1,386.00	O-3	1,384.05	53.3	0.04	Circle	8	0.01	0	0	0	3.01	0	0
77	P-56	UNK-16	1,390.00	UNK-18	1,385.00	82.1	0.06	Circle	8	0.01	0.35	6.89	0.17	3.88	9	25.6
78	P-57	AC3-32	1,391.00	UNK-16	1,390.00	344.8	0.00	Circle	8	0.01	0.06	1.4	0.16	0.85	7.1	24.7
79	P-58	AC3-123	1,392.65	AC3-32	1,391.00	109.2	0.02	Circle	8	0.01	0.06	2.51	0.1	1.93	3.1	15.3
80	P-59	AC2-099	1,393.65	AC3-123	1,392.65	154.5	0.01	Circle	8	0.01	0.06	1.86	0.1	1.27	4.7	14.8
81	P-60	AD2-098	1,394.52	AC2-099	1,393.65	179.7	0.01	Circle	8	0.01	0.06	1.68	0.11	1.09	5.5	15.9
82	P-61	AD02-057	1,395.04	AD2-098	1,394.52	64.9	0.01	Circle	8	0.01	0.02	1.44	0.08	1.41	1.4	12.4
83	P-62	AC2-002	1,397.96	AD02-057	1,395.04	237.3	0.01	Circle	8	0.01	0.02	1.66	0.05	1.74	1.1	8.2
84	P-63	AC2-001	1,400.00	AC2-002	1,397.96	127.2	0.02	Circle	8	0.01	0.02	1.82	0.05	1.99	1	7.7
85	P-82	UNK-18	1,385.00	O-3	1,384.05	29.6	0.03	Circle	8	0.01	0.35	5.48	0.16	2.8	12.5	23.9
86	P-89	AD3-45	1,420.86	AD3-44	1,419.84	118.6	0.01	Circle	12	0.01	1.26	4.75	0.37	4.29	29.4	37.1
90	P-6	UNK-06	1,410.80	AD3-78	1,409.60	326.6	0.00	Circle	15	0.011	1.98	3.62	0.62	4.62	42.8	49.8
93	P-9	AD3-156	1,416.00	AD3-57	1,413.30	138	0.02	Circle	6	0.01	0.03	2.31	0.07	1.02	2.9	14.6
94	P-10	AD3-58	1,419.90	AD3-156	1,416.00	140.5	0.03	Circle	6	0.01	0.02	2.31	0.06	1.21	1.6	11.2
97	P-15	AD3-61	1,429.50	AD3-58	1,419.90	236.3	0.04	Circle	6	0.01	0.01	2.13	0.04	1.47	0.7	7.4
99	P-17	AC3-20	1,414.40	AD3-56	1,411.90	341.3	0.01	Circle	15	0.011	1.94	4.64	0.47	6.54	29.7	37.3
100	P-18	AC3-22	1,414.80	AC3-20	1,414.40	60.8	0.01	Circle	12	0.011	1.54	4.23	0.49	3.41	45.2	48.6
101	P-19	AC3-23	1,415.90	AC3-22	1,414.80	149.1	0.01	Circle	12	0.01	1.54	4.74	0.47	3.98	38.6	46.5
102	P-20	AC3-24	1,416.18	AC3-23	1,415.90	143.3	0.00	Circle	12	0.01	1.19	2.7	0.55	2.05	57.9	54.6
104	P-22	AC3-62	1,423.29	AC3-24	1,416.18	271.5	0.03	Circle	8	0.01	0.76	6.37	0.4	2.54	30.1	60.6
105	P-23	AD3-63	1,424.90	AC3-62	1,423.29	75.9	0.02	Circle	8	0.011	0.66	5.29	0.29	2.08	31.6	42.8
109	P-29	AD3-42	1,409.64	AD3-78	1,409.60	127.5	0.00	Circle	12	0.01	1.34	1.7	0.78	0.82	163.1	77.7
111	P-31	AD3-44	1,419.84	AD3-43	1,415.86	173.3	0.02	Circle	12	0.01	1.28	6.8	0.33	7.02	18.2	32.9
112	P-51	AC3-141	1,414.70	AC3-20	1,414.40	116.3	0.00	Circle	10	0.01	0.4	2.27	0.4	1.45	27.6	48
113	P-52	AC3-31	1,416.20	AC3-23	1,415.90	124.8	0.00	Circle	12	0.01	0.35	2.09	0.37	2.27	15.4	36.6
114	P-72	AD3-78	1,409.60	AD3-106	1,407.86	284.1	0.01	Circle	15	0.01	3.32	5.37	0.66	6.57	50.4	52.8
115	P-73	AD3-106	1,407.86	AD3-67	1,407.66	36.7	0.01	Circle	15	0.01	3.32	5.12	0.66	6.17	53.7	53
118	P-3	AD2-44	1,404.86	AD2-45	1,404.27	377.3	0.00	Circle	15	0.01	3.68	3	1.08	3.32	110.7	86.3
119	P-4	AD3-67	1,407.66	AD2-44	1,404.86	451.6	0.01	Circle	15	0.01	3.34	5.4	0.89	6.61	50.5	71.5
123	P-86	NEW MH01	1,420.26	AD3-44	1,419.84	353	0.00	Circle	10	0.01	0.02	0.72	0.22	0.98	2	26.6
124	P-87	AD3-101	1,420.47	NEW MH01	1,420.26	169.2	0.00	Circle	10	0.01	0.02	0.73	0.08	1	2	9.8
125	P-45	AD3-069	1,422.00	AD3-101	1,420.47	141.9	0.01	Circle	8	0.01	0.01	1.29	0.06	1.63	0.6	9
126	P-46	AD3-71	1,427.79	AD3-069	1,422.00	366.7	0.02	Circle	8	0.01	0.01	1.47	0.04	1.97	0.5	5.4
127	P-47	AD3-72	1,430.70	AD3-71	1,427.79	81.1	0.04	Circle	8	0.011	0.01	1.84	0.03	2.71	0.4	4.8
128	P-90	NEW MH-71	1,421.26	AD3-45	1,420.86	134.8	0.00	Circle	12	0.01	0.55	2.57	0.34	2.52	21.8	34.4
135	P-79	AD3-47	1,424.09	NEW AD3-46	1,422.53	302.2	0.01	Circle	12	0.01	0.68	3.33	0.32	3.33	20.4	31.8
136	P-36	AD3-48	1,426.00	AD3-47	1,424.09	382.7	0.01	Circle	12	0.01	0.65	3.25	0.31	3.27	19.9	31.3
137	P-94	AD3-103	1,426.53	NEW AD3-46	1,422.53	302.9	0.01	Circle	6	0.01	0.01	1.46	0.18	0.84	1.2	36.8
224	CO-1	AD2-100	1,395.16	NEW MH-101	1,395.11	102.9	0.00	Circle	6	0.01	0.02	0.56	0.25	0.16	12.4	50.4
225	P-69	NEW MH-101	1,395.11	NEW MH-102	1,395.00	205.7	0.00	Circle	6	0.01	0.1	0.89	0.31	0.17	59.3	61.7
226	CO-3	NEW MH-102	1,395.00	NEW MH-103	1,394.78	78.9	0.00	Circle	6	0.01	0.3	2.17	0.33	0.38	77.9	66.4
227	P-68	NEW MH-103	1,394.78	AD2-85	1,394.00	200.6	0.00	Circle	6	0.01	0.3	2.47	0.34	0.45	66	67.4
232	P-103	AC3-26	1,419.00	AC3-25	1,417.96	127.2	0.01	Circle	8	0.01	0.1	2.35	0.21	1.42	7	31.7
235	CO-9	AC3-510	1,397.00	UNK-16	1,390.00	100	0.07	Circle	6	0.01	0	0	0.1	1.93	0	20.9
244	CO-12	NEW MH-9	1,408.38	NEW MH-10	1,408.18	435.3	0.00	Circle	6	0.01	0.01	0.45	0.12	0.16	6.4	24
249	CO-15	NEW MH-10	1,408.18	NEW MH-13	1,407.84	691.4	0.00	Circle	12	0.013	0.01	0.35	0.32	0.79	1.3	32.4
250	CO-16	NEW MH-13	1,407.84	NEW MH-12	1,407.68	322.3	0.00	Circle	6	0.01	0.01	0.46	0.5	0.16	6.2	99.4
251	CO-17	NEW MH-12	1,407.68	AD3-67	1,407.66	37.3	0.00	Circle	6	0.01	0.01	0.05	0.5	0.17	5.9	100
258	CO-18	NEW MH-14	1,424.50	NEW MH-15	1,424.36	267.8	0.00	Circle	6	0.01	0.11	0.91	0.3	0.17	66	59.3
259	CO-19	NEW MH-15	1,424.36	NEW MH-17	1,422.50	79.2	0.02	Circle	6	0.01	0.4	5.23	0.21	1.12	35.7	41.3
260	CO-20	NEW MH-17	1,422.50	NEW MH-18	1,414.50	210.1	0.04	Circle	6	0.01	0.4	6.23	0.18	1.42	28.1	36.2
261	CO-21	NEW MH-18	1,414.50	NEW MH-19	1,395.73	232.6	0.08	Circle	6	0.01	0.4	8.14	0.19	2.07	19.3	37.2
262	CO-22	NEW MH-16	1,424.50	NEW MH-15	1,424.36	244	0.00	Circle	6	0.01	0.09	0.9	0.25	0.17	51.5	50.9
264	CO-23	NEW MH-19	1,395.73	O-1	1,393.58	119.9	0.02	Circle	6	0.01	0.4	4.73	0.22	0.98	41	44.6
265	CO-24	AD2-2	1,420.00	AD2-44	1,404.86	174.6	0.09	Circle	8	0.01	0.34	7.72	0.39	4.62	7.4	59.2
266	CO-25	AD2-45	1,404.27	AD2-047	1,403.48	251.6	0.00	Circle	18	0.01	3.7	4.29	0.74	7.65	48.3	49
268	P-8	AD3-57	1,413.30	AD3-56	1,411.90	152.9	0.01	Circle	6	0.01	0.04	1.93	0.26	0.7	5.7	52.5
269	P-7	AD3-56	1,411.90	UNK-06	1,410.80	69.1	0.02	Circle	15	0.011	1.98	6.18	0.49	9.64	20.5	39.1
271	P-30	AD3-43	1,415.86	MH-20	1,412.75	139.6	0.02	Circle	12	0.01	1.33	6.78	0.3	6.9	19.2	29.7
272	CO-30	MH-20	1,412.75	AD3-42	1,409.64	139.2	0.02	Circle	12	0.01	1.33	6.8	0.56	6.93	19.1	55.7
274	P-92	NEW MH-73	1,427.02	MH-21	1,425.28	400	0.00	Circle	8	0.01	0.38	2.74	0.3	1.04	36.7	45.5
275	CO-32	MH-21	1,425.28	NEW MH-72	1,424.67	141.5	0.00	Circle	8	0.01	0.5	2.93	0.33	1.03	48.6	49.1
277	CO-33	AC3-25	1,417.96	AC3-121	1,417.90	25.5	0.00	Circle	8	0.01	0.31	2.1	0.3	0.77	40.9	44.5
278	P-21	AC3-121	1,417.90	AC3-24	1,416.18	318.5	0.01	Circle	12	0.01	0.31	2.71	0.38	3.41	9.2	38.1
283	CO-37	NEW MH-24	1,395.20	NEW MH-101	1,395.11	39.4	0.00	Circle	6	0.01	0.04	1.18	0.23	0.35	11.4	46.4
294	CO-42	NEW MH-29	1,413.74	AD3-167	1,410.50	117.5	0.03	Circle	6	0.01	0.26	4.9	0.19	1.21	21.5	37.1
296	CO-43	AD3-167	1,410.50	O-4	1,409.50	80.1	0.01	Circle	6	0.01	0.31	3.87	0.21	0.82	38	42.7
306	CO-47	NEW MH-35	1,391.50	NEW MH-36	1,387.36	144.8	0.03	Circle	6	0.01	0.08	3.54	0.12	1.23	6.5	23.3
308	CO-48	NEW MH-36	1,387.36	NEW MH-37	1,379.50	274.9	0.03	Circle	6	0.01	0.23	4.8	0.15	1.23	18.7	30.3
310	CO-49	NEW MH-37	1,379.50	NEW MH-38	1,375.46	181	0.02	Circle	6	0.01	0.23	4.39	0.16	1.09	21.1	31.2
312	CO-50	NEW MH-38	1,375.46	NEW MH-39	1,366.50	401.8	0.02	Circle	6	0.01	0.23	4.39	0.33	1.09	21.1	65.6
314	CO-51	NEW MH-39	1,366.50	NEW MH-40	1,377.00	257.8	-0.04	Circle	6	0.01	0.23	1.17	0.44	1.47	15.6	87
316	CO-52	NEW MH-40	1,377.00	O-5	1,376.50	198.3	0.00	Circle	6	0.01	0.23	1.97	0.29	0.37	62.7	57.4
318	P-91	NEW MH-72	1,424.67	NEW MH-41	1,422.66	423.4	0.01	Circle	10	0.01	0.55	3.09	0.32	1.96	28	38.1
319	CO-54	NEW MH-41	1,422.66	NEW MH-71	1,421.26	423.4	0.00	Circle	10	0.01	0.55	2.71	0.33	1.64	33.6	39.9
321	P-81	NEW MH-100	1,428.06	NEW MH-42	1,426.82	127.3	0.01	Circle	8	0.01	0.38	3.68	0.26	1.55	24.5	39.4
322	CO-56	NEW MH-42	1,426.82	AD3-48	1,426.00	83.5	0.01	Circle	8	0.01	0.65	4.25	0.31	1.55	41.9	46.5
344	CO-58	NEW AD3-46	1,422.53	MH-43	1,422.26	54.5	0.01	Circle	12	0.01	0.69	3.28	0.31	3.24	21.3	31.5
345	CO-59	MH-43	1,422.26	MH-44	1,421.57	142.7	0.01	Circle	12	0.01	0.7	3.28	0.32	3.22	21.8	31.7
346	CO-60	MH-44	1,421.57	AD3-45	1,420.86	85.2	0.01	Circle	12	0.01	0.71	4	0.32	4.23	16.8	32.4
349	CO-61	MH-45	1,432.26	MH-46	1,429.61	249.9	0.01	Circle	8	0.01	0.01	1.28	0.05	1.62	0.6	7.1
350	CO-62	MH-46	1,429.61	NEW MH-100	1,428.06	217	0.01	Circle	8	0.01	0.02	1.39	0.15	1.33	1.5	22.7

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 2 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow)	Flow / Capacity	Depth/Rise (%)
357	P-83	AC3-29	1,429.45	AC3-27	1,427.69	106.7	0.02	Circle	8	0.011	0.22	3.55	0.19	1.83	12	28.3
358	P-84	AC3-27	1,427.69	AD3-63	1,424.90	299.2	0.01	Circle	8	0.011	0.33	3.25	0.26	1.38	23.9	39.2
359	P-28	AD3-66	0.00	AD3-65	1,433.04	93.7	-15.25	Circle	8	0.011	0.11	0.32	0.54	55.76	0.2	80.7
360	P-27	AD3-65	1,433.04	AD3-64	1,429.52	112.3	0.03	Circle	8	0.011	0.22	4.45	0.13	2.53	8.7	20.1
361	P-26	AD3-64	1,429.52	AD3-63	1,424.90	159.7	0.03	Circle	8	0.011	0.22	4.32	0.22	2.43	9.1	32.7
362	P-42	NEW AD3-68	1,418.00	AD3-67	1,407.66	374.7	0.03	Circle	6	0.01	0.01	1.86	0.27	1.21	0.8	53.2
364	P-25	AC3-30	1,437.50	AC3-29	1,429.45	403.8	0.02	Circle	8	0.01	0.11	3.3	0.13	2.22	5	19.3

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 2 (MANHOLES)

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (cfs)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
2	AD2-85	1,400.20	1,400.20	1,394.00	0.3	0.34	0.37	1,394.37	1,394.38
3	NEW MH-102	1,400.00	1,400.00	1,395.00	0.1	0.3	0.33	1,395.33	1,395.34
4	AD2-100	1,400.47	1,400.47	1,395.16	0.01	0.02	0.23	1,395.39	1,395.39
5	AD2-104	1,409.64	1,409.64	1,402.24	0	0.01	0.04	1,402.28	1,402.28
6	UNK-17	1,394.00	1,394.00	1,386.00	0	0	0.00	1,386.00	1,386.00
7	UNK-18	1,394.30	1,394.30	1,385.00	0.35	0.35	0.16	1,385.16	1,385.21
8	AC3-510	1,402.00	1,402.00	1,397.00	0	0	0.00	1,397.00	1,397.00
9	UNK-16	1,401.80	1,401.80	1,390.00	0.06	0.35	0.14	1,390.14	1,390.21
10	AC3-32	1,405.00	1,405.00	1,391.00	0.06	0.06	0.12	1,391.12	1,391.12
11	AC3-123	1,407.24	1,407.24	1,392.65	0.06	0.06	0.08	1,392.73	1,392.74
12	AC2-099	1,407.67	1,407.67	1,393.65	0.06	0.06	0.10	1,393.75	1,393.75
13	AD2-098	1,410.79	1,410.79	1,394.52	0.02	0.06	0.11	1,394.63	1,394.63
14	AD02-057	1,404.75	1,404.75	1,395.04	0.02	0.02	0.06	1,395.10	1,395.10
15	AC2-002	1,403.57	1,403.57	1,397.96	0.02	0.02	0.05	1,398.01	1,398.01
16	AC2-001	1,405.00	1,405.00	1,400.00	0	0.02	0.05	1,400.05	1,400.05
18	AD3-45	1,427.60	1,427.60	1,420.86	1.26	1.26	0.37	1,421.23	1,421.23
22	AD3-78	1,411.40	1,411.40	1,409.60	3.32	3.32	0.63	1,410.23	1,410.27
23	UNK-06	1,413.80	1,413.80	1,410.80	1.98	1.98	0.57	1,411.37	1,411.39
25	AD3-57	1,417.80	1,417.80	1,413.30	0.03	0.04	0.08	1,413.38	1,413.39
26	AD3-156	1,421.00	1,421.00	1,416.00	0.02	0.03	0.06	1,416.06	1,416.07
27	AD3-58	1,425.20	1,425.20	1,419.90	0.01	0.02	0.04	1,419.94	1,419.94
30	AD3-61	1,434.50	1,434.50	1,429.50	0	0.01	0.03	1,429.53	1,429.53
31	AD3-56	1,414.00	1,414.00	1,411.90	1.98	1.98	0.38	1,412.28	1,412.34
32	AC3-20	1,420.38	1,420.38	1,414.40	1.94	1.94	0.47	1,414.87	1,414.90
33	AC3-22	1,421.00	1,421.00	1,414.80	1.54	1.54	0.47	1,415.27	1,415.30
34	AC3-23	1,420.00	1,420.00	1,415.90	1.54	1.54	0.43	1,416.33	1,416.37
35	AC3-24	1,420.00	1,420.00	1,416.18	1.08	1.19	0.55	1,416.73	1,416.74
36	AC3-25	1,419.64	1,419.64	1,417.96	0.1	0.31	0.30	1,418.26	1,418.26
37	AC3-62	1,427.58	1,427.58	1,423.29	0.66	0.76	0.25	1,423.54	1,423.60
38	AD3-63	1,429.20	1,429.20	1,424.90	0.55	0.66	0.26	1,425.16	1,425.20
42	AD3-42	1,414.94	1,414.94	1,409.64	1.33	1.34	0.81	1,410.45	1,410.46
43	AD3-43	1,420.86	1,420.86	1,415.86	1.28	1.33	0.30	1,416.16	1,416.23
44	AD3-44	1,425.26	1,425.26	1,419.84	1.28	1.28	0.29	1,420.13	1,420.20
45	AC3-141	1,418.70	1,418.70	1,414.70	0	0.4	0.30	1,415.00	1,415.01
46	AC3-31	1,422.00	1,422.00	1,416.20	0	0.35	0.27	1,416.47	1,416.47
47	AD3-106	1,418.36	1,418.36	1,407.86	3.32	3.32	0.65	1,408.51	1,408.55
50	AD2-45	1,432.42	1,432.42	1,404.27	3.68	3.7	0.74	1,405.01	1,405.03
51	AD2-44	1,428.87	1,428.87	1,404.86	3.68	3.68	1.14	1,406.00	1,406.02
52	AD3-67	1,419.47	1,419.47	1,407.66	3.34	3.34	0.63	1,408.29	1,408.33
53	NEW AD3-68	1,423.81	1,423.81	1,418.00	0	0.01	0.03	1,418.03	1,418.03
55	AD2-2	1,427.00	1,427.00	1,420.00	0	0.34	0.12	1,420.12	1,420.22
56	NEW MH01	1,426.00	1,426.00	1,420.26	0.02	0.02	0.08	1,420.34	1,420.34
57	AD3-101	1,427.57	1,427.57	1,420.47	0.01	0.02	0.08	1,420.55	1,420.55
58	AD3-069	1,429.13	1,429.13	1,422.00	0.01	0.01	0.04	1,422.04	1,422.04
59	AD3-71	1,431.72	1,431.72	1,427.79	0.01	0.01	0.03	1,427.82	1,427.82
60	AD3-72	1,433.82	1,433.82	1,430.70	0	0.01	0.03	1,430.73	1,430.73
61	NEW MH-71	1,431.20	1,431.20	1,421.26	0.55	0.55	0.32	1,421.58	1,421.58
62	NEW MH-72	1,434.00	1,434.00	1,424.67	0.5	0.55	0.30	1,424.97	1,424.97
63	NEW MH-73	1,431.91	1,431.91	1,427.02	0	0.38	0.28	1,427.30	1,427.30
65	NEW MH-100	1,433.87	1,433.87	1,428.06	0.02	0.38	0.22	1,428.28	1,428.31

67	NEW AD3-46	1,430.00	1,430.00	1,422.53	0.69	0.69	0.31	1,422.84	1,422.86
68	AD3-47	1,429.14	1,429.14	1,424.09	0.65	0.68	0.31	1,424.40	1,424.41
69	AD3-48	1,432.50	1,432.50	1,426.00	0.65	0.65	0.30	1,426.30	1,426.32
70	AD3-103	1,434.00	1,434.00	1,426.53	0	0.01	0.04	1,426.57	1,426.57
222	NEW MH-101	1,400.31	1,400.31	1,395.11	0.06	0.1	0.28	1,395.39	1,395.39
223	NEW MH-103	1,400.00	1,400.00	1,394.78	0.3	0.3	0.30	1,395.08	1,395.08
231	AC3-26	1,423.00	1,423.00	1,419.00	0	0.1	0.12	1,419.12	1,419.12
239	NEW MH-9	1,410.00	1,410.00	1,408.38	0	0.01	0.09	1,408.47	1,408.47
240	NEW MH-10	1,420.38	1,420.38	1,408.18	0.01	0.01	0.15	1,408.33	1,408.33
247	NEW MH-12	1,419.47	1,419.47	1,407.68	0.01	0.01	0.65	1,408.33	1,408.33
248	NEW MH-13	1,411.40	1,411.40	1,407.84	0.01	0.01	0.49	1,408.33	1,408.33
252	NEW MH-14	1,428.00	1,428.00	1,424.50	0	0.11	0.30	1,424.80	1,424.80
253	NEW MH-15	1,428.00	1,428.00	1,424.36	0.2	0.4	0.21	1,424.57	1,424.57
254	NEW MH-16	1,428.00	1,428.00	1,424.50	0	0.09	0.25	1,424.75	1,424.75
255	NEW MH-17	1,426.00	1,426.00	1,422.50	0.4	0.4	0.18	1,422.68	1,422.68
256	NEW MH-18	1,418.00	1,418.00	1,414.50	0.4	0.4	0.15	1,414.65	1,414.65
257	NEW MH-19	1,399.23	1,399.23	1,395.73	0.4	0.4	0.22	1,395.95	1,395.95
270	MH-20	1,417.90	1,417.90	1,412.75	1.33	1.33	0.30	1,413.05	1,413.05
273	MH-21	1,433.50	1,433.50	1,425.28	0.38	0.5	0.33	1,425.61	1,425.61
276	AC3-121	1,419.65	1,419.65	1,417.90	0.31	0.31	0.21	1,418.11	1,418.11
282	NEW MH-24	1,400.40	1,400.40	1,395.20	0	0.04	0.19	1,395.39	1,395.39
291	NEW MH-29	1,417.24	1,417.24	1,413.74	0	0.26	0.16	1,413.90	1,413.90
293	AD3-167	1,414.00	1,414.00	1,410.50	0.26	0.31	0.21	1,410.71	1,410.71
304	NEW MH-35	1,395.00	1,395.00	1,391.50	0	0.08	0.09	1,391.59	1,391.59
305	NEW MH-36	1,390.86	1,390.86	1,387.36	0.08	0.23	0.15	1,387.51	1,387.51
307	NEW MH-37	1,383.00	1,383.00	1,379.50	0.23	0.23	0.16	1,379.66	1,379.66
309	NEW MH-38	1,378.96	1,378.96	1,375.46	0.23	0.23	0.16	1,375.62	1,375.62
311	NEW MH-39	1,370.00	1,370.00	1,366.50	0.23	0.23	3.50	1,370.00	1,370.00
313	NEW MH-40	1,393.00	1,393.00	1,377.00	0.23	0.23	0.29	1,377.29	1,377.29
317	NEW MH-41	1,432.60	1,432.60	1,422.66	0.55	0.55	0.33	1,422.99	1,422.99
320	NEW MH-42	1,433.05	1,433.05	1,426.82	0.38	0.65	0.30	1,427.12	1,427.12
342	MH-43	1,429.22	1,429.22	1,422.26	0.69	0.7	0.32	1,422.58	1,422.58
343	MH-44	1,429.22	1,429.22	1,421.57	0.7	0.71	0.28	1,421.85	1,421.85
347	MH-45	1,435.84	1,435.84	1,432.26	0	0.01	0.04	1,432.30	1,432.30
348	MH-46	1,433.87	1,433.87	1,429.61	0.01	0.02	0.06	1,429.67	1,429.67
351	AC3-29	1,433.32	1,433.32	1,429.45	0.11	0.22	0.16	1,429.61	1,429.61
352	AC3-27	1,431.49	1,431.49	1,427.69	0.22	0.33	0.22	1,427.91	1,427.91
353	AD3-64	1,433.18	1,433.18	1,429.52	0.22	0.22	0.14	1,429.66	1,429.66
354	AD3-65	1,438.68	1,438.68	1,433.04	0.11	0.22	0.13	1,433.17	1,433.17
355	AD3-66	1,439.83	1,439.83	0.00	0	0.11	1,433.45	1,433.45	1,433.45

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT
Tier 3 System

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 3 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow)
71	P-67	AD2-85	1,394.00	O-2	1,393.00	361.8	0.00	6	0.01	0.34	2.21	0.37	0.38
74	P-70	AD2-104	1,402.24	AD2-100	1,395.16	401.2	0.02	6	0.011	0.01	1.48	0.13	0.88
75	P-85	UNK-17	1,386.00	O-3	1,384.05	53.3	0.04	8	0.01	0	0	0	3.01
77	P-56	UNK-16	1,390.00	UNK-18	1,385.00	82.1	0.06	8	0.01	0.35	6.89	0.17	3.88
78	P-57	AC3-32	1,391.00	UNK-16	1,390.00	344.8	0.00	8	0.01	0.06	1.4	0.16	0.85
79	P-58	AC3-123	1,392.65	AC3-32	1,391.00	109.2	0.02	8	0.01	0.06	2.51	0.1	1.93
80	P-59	AC2-099	1,393.65	AC3-123	1,392.65	154.5	0.01	8	0.01	0.06	1.86	0.1	1.27
81	P-60	AD2-098	1,394.52	AC2-099	1,393.65	179.7	0.01	8	0.01	0.06	1.68	0.11	1.09
82	P-61	AD02-057	1,395.04	AD2-098	1,394.52	64.9	0.01	8	0.01	0.02	1.44	0.08	1.41
83	P-62	AC2-002	1,397.96	AD02-057	1,395.04	237.3	0.01	8	0.01	0.02	1.66	0.05	1.74
84	P-63	AC2-001	1,400.00	AC2-002	1,397.96	127.2	0.02	8	0.01	0.02	1.82	0.05	1.99
85	P-82	UNK-18	1,385.00	O-3	1,384.05	29.6	0.03	8	0.01	0.35	5.48	0.16	2.8
86	P-89	AD3-45	1,420.86	AD3-44	1,419.84	118.6	0.01	12	0.01	1.4	4.88	0.39	4.29
90	P-6	UNK-06	1,410.80	AD3-78	1,409.60	326.6	0.00	15	0.011	2.43	3.81	0.69	4.62
93	P-9	AD3-156	1,416.00	AD3-57	1,413.30	138	0.02	6	0.01	0.06	2.77	0.09	1.02
94	P-10	AD3-58	1,419.90	AD3-156	1,416.00	140.5	0.03	6	0.01	0.06	3.12	0.08	1.21
97	P-15	AD3-61	1,429.50	AD3-58	1,419.90	236.3	0.04	6	0.01	0.01	2.13	0.06	1.47
99	P-17	AC3-20	1,414.40	AD3-56	1,411.90	341.3	0.01	15	0.011	2.37	4.91	0.52	6.54
100	P-18	AC3-22	1,414.80	AC3-20	1,414.40	60.8	0.01	15	0.011	1.97	4.48	0.52	6.18
101	P-19	AC3-23	1,415.90	AC3-22	1,414.80	149.1	0.01	15	0.01	1.97	5.01	0.48	7.22
102	P-20	AC3-24	1,416.18	AC3-23	1,415.90	143.3	0.00	15	0.01	1.62	2.93	0.58	3.72
104	P-22	AC3-62	1,423.29	AC3-24	1,416.18	271.5	0.03	8	0.01	0	0	0.3	2.54
105	P-23	AD3-63	1,424.90	AC3-62	1,423.29	75.9	0.02	8	0.011	0	0	0	2.08
109	P-29	AD3-42	1,409.64	AD3-78	1,409.60	127.5	0.00	12	0.01	1.45	1.84	0.8	0.82
111	P-31	AD3-44	1,419.84	AD3-43	1,415.86	173.3	0.02	12	0.01	1.4	6.98	0.34	7.02
112	P-51	AC3-141	1,414.70	AC3-20	1,414.40	116.3	0.00	10	0.01	0.4	2.27	0.43	1.45
113	P-52	AC3-31	1,416.20	AC3-23	1,415.90	124.8	0.00	12	0.01	0.35	2.09	0.38	2.27
114	P-72	AD3-78	1,409.60	AD3-106	1,407.86	284.1	0.01	15	0.01	3.87	5.58	0.73	6.57
115	P-73	AD3-106	1,407.86	AD3-67	1,407.66	36.7	0.01	15	0.01	3.87	5.31	0.73	6.17
118	P-3	AD2-44	1,404.86	AD2-45	1,404.27	377.3	0.00	15	0.01	4.35	3.55	1.15	3.32
119	P-4	AD3-67	1,407.66	AD2-44	1,404.86	451.6	0.01	15	0.01	3.98	5.64	0.97	6.61
120	P-42	NEW AD3-68	1,418.00	AD3-67	1,407.66	374.7	0.03	6	0.01	0.01	1.86	0.27	1.21
123	P-86	NEW MH01	1,420.26	AD3-44	1,419.84	353	0.00	10	0.01	0	0	0.19	0.98
124	P-87	AD3-101	1,420.47	NEW MH01	1,420.26	169.2	0.00	10	0.01	0	0	0	1
125	P-45	AD3-069	1,422.00	AD3-101	1,420.47	141.9	0.01	8	0.01	0	0	0	1.63
126	P-46	AD3-71	1,427.79	AD3-069	1,422.00	366.7	0.02	8	0.01	0	0	0	1.97
127	P-47	AD3-72	1,430.70	AD3-71	1,427.79	81.1	0.04	8	0.011	0	0	0	2.71
128	P-90	NEW MH-71	1,421.26	AD3-45	1,420.86	134.8	0.00	12	0.01	0.71	2.76	0.38	2.52
135	P-79	AD3-47	1,424.09	NEW AD3-46	1,422.53	302.2	0.01	12	0.01	0.67	3.32	0.32	3.33
136	P-36	AD3-48	1,426.00	AD3-47	1,424.09	382.7	0.01	12	0.01	0.64	3.23	0.31	3.27
137	P-94	AD3-103	1,426.53	NEW AD3-46	1,422.53	302.9	0.01	6	0.01	0.02	1.78	0.19	0.84
224	CO-1	AD2-100	1,395.16	NEW MH-101	1,395.11	102.9	0.00	6	0.01	0.02	0.56	0.25	0.16
225	P-69	NEW MH-101	1,395.11	NEW MH-102	1,395.00	205.7	0.00	6	0.01	0.1	0.89	0.31	0.17
226	CO-3	NEW MH-102	1,395.00	NEW MH-103	1,394.78	78.9	0.00	6	0.01	0.3	2.17	0.33	0.38
227	P-68	NEW MH-103	1,394.78	AD2-85	1,394.00	200.6	0.00	6	0.01	0.3	2.47	0.34	0.45
229	P-102	AC3-30	1,437.50	NEW MH-3	1,429.00	271.2	0.03	6	0.01	0.46	6.03	0.22	1.29
232	P-103	AC3-26	1,419.00	AC3-25	1,417.96	127.2	0.01	8	0.01	0	0	0.2	1.42
234	CO-8	NEW MH-5	1,427.40	AD3-103	1,426.53	181.8	0.01	6	0.01	0.02	1.25	0.07	0.5
235	CO-9	AC3-510	1,397.00	UNK-16	1,390.00	100	0.07	6	0.01	0	0	0.1	1.93
244	CO-12	NEW MH-9	1,408.38	NEW MH-10	1,408.18	435.3	0.00	6	0.01	0.1	0.84	0.29	0.16
249	CO-15	NEW MH-10	1,408.18	NEW MH-13	1,407.84	691.4	0.00	12	0.013	0.1	0.69	0.47	0.79
250	CO-16	NEW MH-13	1,407.84	NEW MH-12	1,407.68	322.3	0.00	6	0.01	0.1	0.51	0.5	0.16
251	CO-17	NEW MH-12	1,407.68	AD3-67	1,407.66	37.3	0.00	6	0.01	0.1	0.51	0.5	0.17
258	CO-18	NEW MH-14	1,424.50	NEW MH-15	1,424.36	267.8	0.00	6	0.01	0.11	0.91	0.3	0.17
259	CO-19	NEW MH-15	1,424.36	NEW MH-17	1,422.50	79.2	0.02	6	0.01	0.4	5.23	0.21	1.12
260	CO-20	NEW MH-17	1,422.50	NEW MH-18	1,414.50	210.1	0.04	6	0.01	0.4	6.23	0.18	1.42
261	CO-21	NEW MH-18	1,414.50	NEW MH-19	1,395.73	232.6	0.08	6	0.01	0.4	8.14	0.19	2.07
262	CO-22	NEW MH-16	1,424.50	NEW MH-15	1,424.36	244	0.00	6	0.01	0.09	0.9	0.25	0.17
264	CO-23	NEW MH-19	1,395.73	O-1	1,393.58	119.9	0.02	6	0.01	0.4	4.73	0.22	0.98
265	CO-24	AD2-2	1,420.00	AD2-44	1,404.86	174.6	0.09	8	0.01	0.34	7.72	0.39	4.62
266	CO-25	AD2-45	1,404.27	AD2-047	1,403.48	251.6	0.00	18	0.01	4.37	4.47	0.81	7.65
268	P-8	AD3-57	1,413.30	AD3-56	1,411.90	152.9	0.01	6	0.01	0.06	2.13	0.29	0.7
269	P-7	AD3-56	1,411.90	UNK-06	1,410.80	69.1	0.02	15	0.011	2.43	6.54	0.55	9.64
271	P-30	AD3-43	1,415.86	MH-20	1,412.75	139.6	0.02	12	0.01	1.45	6.95	0.31	6.9
272	CO-30	MH-20	1,412.75	AD3-42	1,409.64	139.2	0.02	12	0.01	1.45	6.97	0.58	6.93
274	P-92	NEW MH-73	1,427.02	MH-21	1,425.28	400	0.00	8	0.01	0.38	2.74	0.3	1.04
275	CO-32	MH-21	1,425.28	NEW MH-72	1,424.67	141.5	0.00	8	0.01	0.5	2.93	0.34	1.03
277	CO-33	AC3-25	1,417.96	AC3-121	1,417.90	25.5	0.00	8	0.01	0.49	2.34	0.41	0.77
278	P-21	AC3-121	1,417.90	AC3-24	1,416.18	318.5	0.01	15	0.01	1.61	4.23	0.51	6.18
280	P-101	NEW MH-3	1,429.00	NEW MH-23	1,424.24	237.5	0.02	6	0.01	0.46	5.11	0.24	1.03

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 3 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow)
281	CO-36	NEW MH-23	1,424.24	AC3-25	1,417.96	312.9	0.02	6	0.01	0.47	5.14	0.32	1.03
283	CO-37	NEW MH-24	1,395.20	NEW MH-101	1,395.11	39.4	0.00	6	0.01	0.04	1.18	0.23	0.35
286	CO-38	NEW MH-25	1,425.50	NEW MH-26	1,423.39	76.5	0.03	6	0.01	0.19	4.5	0.13	1.22
288	CO-39	NEW MH-26	1,423.39	NEW MH-27	1,419.54	139.8	0.03	6	0.01	0.19	4.48	0.17	1.21
290	CO-40	NEW MH-27	1,419.54	NEW MH-28	1,417.00	91.9	0.03	6	0.01	0.44	5.68	0.21	1.21
292	CO-41	NEW MH-28	1,417.00	NEW MH-29	1,413.74	118.2	0.03	6	0.01	0.44	5.69	0.24	1.21
294	CO-42	NEW MH-29	1,413.74	AD3-167	1,410.50	117.5	0.03	6	0.01	0.7	6.38	0.32	1.21
296	CO-43	AD3-167	1,410.50	O-4	1,409.50	80.1	0.01	6	0.01	0.7	4.67	0.36	0.82
306	CO-47	NEW MH-35	1,391.50	NEW MH-36	1,387.36	144.8	0.03	6	0.01	0.08	3.54	0.12	1.23
308	CO-48	NEW MH-36	1,387.36	NEW MH-37	1,379.50	274.9	0.03	6	0.01	0.23	4.8	0.15	1.23
310	CO-49	NEW MH-37	1,379.50	NEW MH-38	1,375.46	181	0.02	6	0.01	0.23	4.39	0.16	1.09
312	CO-50	NEW MH-38	1,375.46	NEW MH-39	1,366.50	401.8	0.02	6	0.01	0.23	4.39	0.33	1.09
314	CO-51	NEW MH-39	1,366.50	NEW MH-40	1,377.00	257.8	-0.04	6	0.01	0.23	1.17	0.44	1.47
316	CO-52	NEW MH-40	1,377.00	O-5	1,376.50	198.3	0.00	6	0.01	0.23	1.97	0.29	0.37
318	P-91	NEW MH-72	1,424.67	NEW MH-41	1,422.66	423.4	0.01	10	0.01	0.71	3.31	0.36	1.96
319	CO-54	NEW MH-41	1,422.66	NEW MH-71	1,421.26	423.4	0.00	10	0.01	0.71	2.9	0.38	1.64
321	P-81	NEW MH-100	1,428.06	NEW MH-42	1,426.82	127.3	0.01	8	0.01	0.37	3.65	0.26	1.55
322	CO-56	NEW MH-42	1,426.82	AD3-48	1,426.00	83.5	0.01	8	0.01	0.64	4.24	0.31	1.55
344	CO-58	NEW AD3-46	1,422.53	MH-43	1,422.26	54.5	0.01	12	0.01	0.69	3.28	0.31	3.24
345	CO-59	MH-43	1,422.26	MH-44	1,421.57	142.7	0.01	12	0.01	0.69	3.26	0.31	3.22

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 3 (MANHOLES)

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (cfs)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
2	AD2-85	1,400.20	1,400.20	1,394.00	0.3	0.34	0.37	1,394.37	1,394.38
3	NEW MH-102	1,400.00	1,400.00	1,395.00	0.1	0.3	0.33	1,395.33	1,395.34
4	AD2-100	1,400.47	1,400.47	1,395.16	0.01	0.02	0.23	1,395.39	1,395.39
5	AD2-104	1,409.64	1,409.64	1,402.24	0	0.01	0.04	1,402.28	1,402.28
6	UNK-17	1,394.00	1,394.00	1,386.00	0	0	0.00	1,386.00	1,386.00
7	UNK-18	1,394.30	1,394.30	1,385.00	0.35	0.35	0.16	1,385.16	1,385.21
8	AC3-510	1,402.00	1,402.00	1,397.00	0	0	0.00	1,397.00	1,397.00
9	UNK-16	1,401.80	1,401.80	1,390.00	0.06	0.35	0.14	1,390.14	1,390.21
10	AC3-32	1,405.00	1,405.00	1,391.00	0.06	0.06	0.12	1,391.12	1,391.12
11	AC3-123	1,407.24	1,407.24	1,392.65	0.06	0.06	0.08	1,392.73	1,392.74
12	AC2-099	1,407.67	1,407.67	1,393.65	0.06	0.06	0.10	1,393.75	1,393.75
13	AD2-098	1,410.79	1,410.79	1,394.52	0.02	0.06	0.11	1,394.63	1,394.63
14	AD02-057	1,404.75	1,404.75	1,395.04	0.02	0.02	0.06	1,395.10	1,395.10
15	AC2-002	1,403.57	1,403.57	1,397.96	0.02	0.02	0.05	1,398.01	1,398.01
16	AC2-001	1,405.00	1,405.00	1,400.00	0	0.02	0.05	1,400.05	1,400.05
18	AD3-45	1,427.60	1,427.60	1,420.86	1.4	1.4	0.39	1,421.25	1,421.25
20	AC3-30	1,443.50	1,443.50	1,437.50	0	0.46	0.21	1,437.71	1,437.76
22	AD3-78	1,411.40	1,411.40	1,409.60	3.87	3.87	0.69	1,410.29	1,410.34
23	UNK-06	1,413.80	1,413.80	1,410.80	2.43	2.43	0.64	1,411.44	1,411.47
25	AD3-57	1,417.80	1,417.80	1,413.30	0.06	0.06	0.10	1,413.40	1,413.40
26	AD3-156	1,421.00	1,421.00	1,416.00	0.06	0.06	0.08	1,416.08	1,416.09
27	AD3-58	1,425.20	1,425.20	1,419.90	0.01	0.06	0.07	1,419.97	1,419.99
30	AD3-61	1,434.50	1,434.50	1,429.50	0	0.01	0.03	1,429.53	1,429.53
31	AD3-56	1,414.00	1,414.00	1,411.90	2.43	2.43	0.43	1,412.33	1,412.39
32	AC3-20	1,420.38	1,420.38	1,414.40	2.37	2.37	0.52	1,414.92	1,414.96
33	AC3-22	1,421.00	1,421.00	1,414.80	1.97	1.97	0.49	1,415.29	1,415.32
34	AC3-23	1,420.00	1,420.00	1,415.90	1.97	1.97	0.45	1,416.35	1,416.39
35	AC3-24	1,420.00	1,420.00	1,416.18	1.61	1.62	0.58	1,416.76	1,416.77
36	AC3-25	1,419.64	1,419.64	1,417.96	0.47	0.49	0.39	1,418.35	1,418.35
37	AC3-62	1,427.58	1,427.58	1,423.29	0	0	0.00	1,423.29	1,423.29
38	AD3-63	1,429.20	1,429.20	1,424.90	0	0	0.00	1,424.90	1,424.90
42	AD3-42	1,414.94	1,414.94	1,409.64	1.45	1.45	0.84	1,410.48	1,410.49
43	AD3-43	1,420.86	1,420.86	1,415.86	1.4	1.45	0.31	1,416.17	1,416.25
44	AD3-44	1,425.26	1,425.26	1,419.84	1.4	1.4	0.30	1,420.14	1,420.22
45	AC3-141	1,418.70	1,418.70	1,414.70	0	0.4	0.30	1,415.00	1,415.01
46	AC3-31	1,422.00	1,422.00	1,416.20	0	0.35	0.27	1,416.47	1,416.47
47	AD3-106	1,418.36	1,418.36	1,407.86	3.87	3.87	0.72	1,408.58	1,408.62
50	AD2-45	1,432.42	1,432.42	1,404.27	4.35	4.37	0.81	1,405.08	1,405.11
51	AD2-44	1,428.87	1,428.87	1,404.86	4.32	4.35	1.47	1,406.33	1,406.35
52	AD3-67	1,419.47	1,419.47	1,407.66	3.98	3.98	0.70	1,408.36	1,408.41
53	NEW AD3-68	1,423.81	1,423.81	1,418.00	0	0.01	0.03	1,418.03	1,418.03
55	AD2-2	1,427.00	1,427.00	1,420.00	0	0.34	0.12	1,420.12	1,420.22
56	NEW MH01	1,426.00	1,426.00	1,420.26	0	0	0.00	1,420.26	1,420.26
57	AD3-101	1,427.57	1,427.57	1,420.47	0	0	0.00	1,420.47	1,420.47
58	AD3-069	1,429.13	1,429.13	1,422.00	0	0	0.00	1,422.00	1,422.00
59	AD3-71	1,431.72	1,431.72	1,427.79	0	0	0.00	1,427.79	1,427.79
60	AD3-72	1,433.82	1,433.82	1,430.70	0	0	0.00	1,430.70	1,430.70
61	NEW MH-71	1,431.20	1,431.20	1,421.26	0.71	0.71	0.36	1,421.62	1,421.62
62	NEW MH-72	1,434.00	1,434.00	1,424.67	0.5	0.71	0.35	1,425.02	1,425.02
63	NEW MH-73	1,431.91	1,431.91	1,427.02	0	0.38	0.28	1,427.30	1,427.30

65	NEW MH-100	1,433.87	1,433.87	1,428.06	0.01	0.37	0.22	1,428.28	1,428.30
67	NEW AD3-46	1,430.00	1,430.00	1,422.53	0.69	0.69	0.31	1,422.84	1,422.86
68	AD3-47	1,429.14	1,429.14	1,424.09	0.64	0.67	0.30	1,424.39	1,424.41
69	AD3-48	1,432.50	1,432.50	1,426.00	0.64	0.64	0.30	1,426.30	1,426.32
70	AD3-103	1,434.00	1,434.00	1,426.53	0.02	0.02	0.05	1,426.58	1,426.58
222	NEW MH-101	1,400.31	1,400.31	1,395.11	0.06	0.1	0.28	1,395.39	1,395.39
223	NEW MH-103	1,400.00	1,400.00	1,394.78	0.3	0.3	0.30	1,395.08	1,395.08
228	NEW MH-3	1,433.00	1,433.00	1,429.00	0.46	0.46	0.23	1,429.23	1,429.23
231	AC3-26	1,423.00	1,423.00	1,419.00	0	0	0.00	1,419.00	1,419.00
233	NEW MH-5	1,434.00	1,434.00	1,427.40	0	0.02	0.07	1,427.47	1,427.47
239	NEW MH-9	1,410.00	1,410.00	1,408.38	0	0.1	0.29	1,408.67	1,408.67
240	NEW MH-10	1,420.38	1,420.38	1,408.18	0.1	0.1	0.30	1,408.48	1,408.48
247	NEW MH-12	1,419.47	1,419.47	1,407.68	0.1	0.1	0.74	1,408.42	1,408.42
248	NEW MH-13	1,411.40	1,411.40	1,407.84	0.1	0.1	0.64	1,408.48	1,408.48
252	NEW MH-14	1,428.00	1,428.00	1,424.50	0	0.11	0.30	1,424.80	1,424.80
253	NEW MH-15	1,428.00	1,428.00	1,424.36	0.2	0.4	0.21	1,424.57	1,424.57
254	NEW MH-16	1,428.00	1,428.00	1,424.50	0	0.09	0.25	1,424.75	1,424.75
255	NEW MH-17	1,426.00	1,426.00	1,422.50	0.4	0.4	0.18	1,422.68	1,422.68
256	NEW MH-18	1,418.00	1,418.00	1,414.50	0.4	0.4	0.15	1,414.65	1,414.65
257	NEW MH-19	1,399.23	1,399.23	1,395.73	0.4	0.4	0.22	1,395.95	1,395.95
270	MH-20	1,417.90	1,417.90	1,412.75	1.45	1.45	0.31	1,413.06	1,413.06
273	MH-21	1,433.50	1,433.50	1,425.28	0.38	0.5	0.33	1,425.61	1,425.61
276	AC3-121	1,419.65	1,419.65	1,417.90	0.49	1.61	0.44	1,418.34	1,418.34
279	NEW MH-23	1,427.24	1,427.24	1,424.24	0.46	0.47	0.24	1,424.48	1,424.48
282	NEW MH-24	1,400.40	1,400.40	1,395.20	0	0.04	0.19	1,395.39	1,395.39
284	NEW MH-25	1,429.00	1,429.00	1,425.50	0	0.19	0.13	1,425.63	1,425.63
285	NEW MH-26	1,426.89	1,426.89	1,423.39	0.19	0.19	0.13	1,423.52	1,423.52
287	NEW MH-27	1,423.04	1,423.04	1,419.54	0.19	0.44	0.21	1,419.75	1,419.75
289	NEW MH-28	1,420.50	1,420.50	1,417.00	0.44	0.44	0.21	1,417.21	1,417.21
291	NEW MH-29	1,417.24	1,417.24	1,413.74	0.44	0.7	0.27	1,414.01	1,414.01
293	AD3-167	1,414.00	1,414.00	1,410.50	0.7	0.7	0.36	1,410.86	1,410.86
304	NEW MH-35	1,395.00	1,395.00	1,391.50	0	0.08	0.09	1,391.59	1,391.59
305	NEW MH-36	1,390.86	1,390.86	1,387.36	0.08	0.23	0.15	1,387.51	1,387.51
307	NEW MH-37	1,383.00	1,383.00	1,379.50	0.23	0.23	0.16	1,379.66	1,379.66
309	NEW MH-38	1,378.96	1,378.96	1,375.46	0.23	0.23	0.16	1,375.62	1,375.62
311	NEW MH-39	1,370.00	1,370.00	1,366.50	0.23	0.23	3.50	1,370.00	1,370.00
313	NEW MH-40	1,393.00	1,393.00	1,377.00	0.23	0.23	0.29	1,377.29	1,377.29
317	NEW MH-41	1,432.60	1,432.60	1,422.66	0.71	0.71	0.38	1,423.04	1,423.04
320	NEW MH-42	1,433.05	1,433.05	1,426.82	0.37	0.64	0.30	1,427.12	1,427.12
342	MH-43	1,429.22	1,429.22	1,422.26	0.69	0.69	0.31	1,422.57	1,422.57

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT
Tier 4 / Ultimate System

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 4 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth/ Rise (%)
71	P-67	AD2-85	1,394.00	O-2	1,393.00	361.8	0.00	6.00	0.01	0.31	2.18	0.34	0.38	81.8	68.8
74	P-70	AD2-104	1,402.24	AD2-100	1,395.16	401.2	0.02	6.00	0.011	0.01	1.48	0.11	0.88	1.1	21.2
75	P-85	UNK-17	1,386.00	O-3	1,384.05	53.3	0.04	8.00	0.01	0	0	0	3.01	0	0
77	P-56	UNK-16	1,390.00	UNK-18	1,385.00	82.1	0.06	8.00	0.01	0.35	6.89	0.17	3.88	9	25.6
78	P-57	AC3-32	1,391.00	UNK-16	1,390.00	344.8	0.00	8.00	0.01	0.06	1.4	0.16	0.85	7.1	24.7
79	P-58	AC3-123	1,392.65	AC3-32	1,391.00	109.2	0.02	8.00	0.01	0.06	2.51	0.1	1.93	3.1	15.3
80	P-59	AC2-099	1,393.65	AC3-123	1,392.65	154.5	0.01	8.00	0.01	0.06	1.86	0.1	1.27	4.7	14.8
81	P-60	AD2-098	1,394.52	AC2-099	1,393.65	179.7	0.01	8.00	0.01	0.06	1.68	0.11	1.09	5.5	15.9
82	P-61	AD02-057	1,395.04	AD2-098	1,394.52	64.9	0.01	8.00	0.01	0.02	1.44	0.08	1.41	1.4	12.4
83	P-62	AC2-002	1,397.96	AD02-057	1,395.04	237.3	0.01	8.00	0.01	0.02	1.66	0.05	1.74	1.1	8.2
84	P-63	AC2-001	1,400.00	AC2-002	1,397.96	127.2	0.02	8.00	0.01	0.02	1.82	0.05	1.99	1	7.7
85	P-82	UNK-18	1,385.00	O-3	1,384.05	29.6	0.03	8.00	0.01	0.35	5.48	0.16	2.8	12.5	23.9
86	P-89	AD3-45	1,420.86	AD3-44	1,419.84	118.6	0.01	12.00	0.01	1.47	4.95	0.4	4.29	34.3	40.4
90	P-6	UNK-06	1,410.80	AD3-78	1,409.60	326.6	0.00	15.00	0.011	2.38	3.8	0.69	4.62	51.5	55.2
93	P-9	AD3-156	1,416.00	AD3-57	1,413.30	138	0.02	6.00	0.01	0.01	1.65	0.04	1.02	1	7.7
94	P-10	AD3-58	1,419.90	AD3-156	1,416.00	140.5	0.03	6.00	0.01	0.01	1.86	0.03	1.21	0.8	6.7
97	P-15	AD3-61	1,429.50	AD3-58	1,419.90	236.3	0.04	6.00	0.01	0.01	2.13	0.03	1.47	0.7	6.2
99	P-17	AC3-20	1,414.40	AD3-56	1,411.90	341.3	0.01	15.00	0.011	2.37	4.91	0.52	6.54	36.3	41.7
100	P-18	AC3-22	1,414.80	AC3-20	1,414.40	60.8	0.01	15.00	0.011	1.97	4.48	0.52	6.18	31.9	41.8
101	P-19	AC3-23	1,415.90	AC3-22	1,414.80	149.1	0.01	15.00	0.01	1.97	5.01	0.48	7.22	27.3	38.5
102	P-20	AC3-24	1,416.18	AC3-23	1,415.90	143.3	0.00	15.00	0.01	1.62	2.93	0.58	3.72	43.6	46.2
104	P-22	AC3-62	1,423.29	AC3-24	1,416.18	271.5	0.03	8.00	0.01	0	0	0.3	2.54	0	44.3
105	P-23	AD3-63	1,424.90	AC3-62	1,423.29	75.9	0.02	8.00	0.011	0	0	0	2.08	0	0
109	P-29	AD3-42	1,409.64	AD3-78	1,409.60	127.5	0.00	12.00	0.01	1.53	1.94	0.81	0.82	186.5	81.2
111	P-31	AD3-44	1,419.84	AD3-43	1,415.86	173.3	0.02	12.00	0.01	1.47	7.08	0.35	7.02	21	35.4
112	P-51	AC3-141	1,414.70	AC3-20	1,414.40	116.3	0.00	10.00	0.01	0.4	2.27	0.43	1.45	27.6	51.5
113	P-52	AC3-31	1,416.20	AC3-23	1,415.90	124.8	0.00	12.00	0.01	0.35	2.09	0.38	2.27	15.4	37.5
114	P-72	AD3-78	1,409.60	AD3-106	1,407.86	284.1	0.01	15.00	0.01	3.91	5.59	0.73	6.57	59.5	58.4
115	P-73	AD3-106	1,407.86	AD3-67	1,407.66	36.7	0.01	15.00	0.01	3.91	5.32	0.74	6.17	63.3	59
118	P-3	AD2-44	1,404.86	AD2-45	1,404.27	377.3	0.00	15.00	0.01	4.36	3.55	1.15	3.32	131.3	91.9
119	P-4	AD3-67	1,407.66	AD2-44	1,404.86	451.6	0.01	15.00	0.01	4.02	5.65	0.98	6.61	60.9	78.2
120	P-42	NEW AD3-68	1,418.00	AD3-67	1,407.66	374.7	0.03	6.00	0.01	0.01	1.91	0.27	1.21	0.9	53.4
123	P-86	NEW MH01	1,420.26	AD3-44	1,419.84	353	0.00	10.00	0.01	0	0	0.19	0.98	0	23.3
124	P-87	AD3-101	1,420.47	NEW MH01	1,420.26	169.2	0.00	10.00	0.01	0	0	0	1	0	0
125	P-45	AD3-069	1,422.00	AD3-101	1,420.47	141.9	0.01	8.00	0.01	0	0	0	1.63	0	0
126	P-46	AD3-71	1,427.79	AD3-069	1,422.00	366.7	0.02	8.00	0.01	0	0	0	1.97	0	0
127	P-47	AD3-72	1,430.70	AD3-71	1,427.79	81.1	0.04	8.00	0.011	0	0	0	2.71	0	0
128	P-90	NEW MH-71	1,421.26	AD3-45	1,420.86	134.8	0.00	12.00	0.01	1.47	3.33	0.55	2.52	58.4	54.9
131	P-88	NEW MH-68	1,422.12	NEW MH-71	1,421.26	278.7	0.00	12.00	0.01	0.76	2.85	0.46	2.57	29.7	46.1
132	P-93	NEW AD3-46	1,422.53	NEW MH-68	1,422.12	129.9	0.00	12.00	0.01	0.68	2.79	0.36	2.6	26.3	36.2
135	P-79	AD3-47	1,424.09	NEW AD3-46	1,422.53	302.2	0.01	12.00	0.01	0.66	3.31	0.33	3.33	19.9	33.2
136	P-36	AD3-48	1,426.00	AD3-47	1,424.09	382.7	0.01	12.00	0.01	0.63	3.22	0.31	3.27	19.4	30.9
137	P-94	AD3-103	1,426.53	NEW AD3-46	1,422.53	302.9	0.01	6.00	0.01	0.02	1.78	0.21	0.84	2.4	41.5
224	CO-1	AD2-100	1,395.16	NEW MH-101	1,395.11	102.9	0.00	6.00	0.01	0.02	0.56	0.2	0.16	12.4	39.9
225	P-69	NEW MH-101	1,395.11	NEW MH-102	1,395.00	205.7	0.00	6.00	0.01	0.07	0.82	0.27	0.17	41.5	54
226	CO-3	NEW MH-102	1,395.00	NEW MH-103	1,394.78	78.9	0.00	6.00	0.01	0.27	2.12	0.31	0.38	70.1	61.7
227	P-68	NEW MH-103	1,394.78	AD2-85	1,394.00	200.6	0.00	6.00	0.01	0.27	2.41	0.31	0.45	59.4	62.9
229	P-102	AC3-30	1,437.50	NEW MH-3	1,429.00	271.2	0.03	6.00	0.01	0.46	6.03	0.22	1.29	35.6	44
232	P-103	AC3-26	1,419.00	AC3-25	1,417.96	127.2	0.01	8.00	0.01	0	0	0.2	1.42	0	29.6
234	CO-8	NEW MH-5	1,427.40	AD3-103	1,426.53	181.8	0.01	6.00	0.01	0.02	1.25	0.07	0.5	4	13.6
235	CO-9	AC3-510	1,397.00	UNK-16	1,390.00	100	0.07	6.00	0.01	0	0	0.1	1.93	0	20.9
244	CO-12	NEW MH-9	1,408.38	NEW MH-10	1,408.18	435.3	0.00	6.00	0.01	0.1	0.84	0.3	0.16	63.9	59.2
249	CO-15	NEW MH-10	1,408.18	NEW MH-13	1,407.84	691.4	0.00	12.00	0.013	0.1	0.69	0.47	0.79	12.7	47.1
250	CO-16	NEW MH-13	1,407.84	NEW MH-12	1,407.68	322.3	0.00	6.00	0.01	0.1	0.51	0.5	0.16	61.5	100
251	CO-17	NEW MH-12	1,407.68	AD3-67	1,407.66	37.3	0.00	6.00	0.01	0.1	0.51	0.5	0.17	59	100
258	CO-18	NEW MH-14	1,424.50	NEW MH-15	1,424.36	267.8	0.00	6.00	0.01	0.11	0.91	0.3	0.17	66	59.3
259	CO-19	NEW MH-15	1,424.36	NEW MH-17	1,422.50	79.2	0.02	6.00	0.01	0.4	5.23	0.21	1.12	35.7	41.3
260	CO-20	NEW MH-17	1,422.50	NEW MH-18	1,414.50	210.1	0.04	6.00	0.01	0.4	6.23	0.18	1.42	28.1	36.2
261	CO-21	NEW MH-18	1,414.50	NEW MH-19	1,395.73	232.6	0.08	6.00	0.01	0.4	8.14	0.19	2.07	19.3	37.2
262	CO-22	NEW MH-16	1,424.50	NEW MH-15	1,424.36	244	0.00	6.00	0.01	0.09	0.9	0.25	0.17	51.5	50.9
264	CO-23	NEW MH-19	1,395.73	O-1	1,393.58	119.9	0.02	6.00	0.01	0.4	4.73	0.22	0.98	41	44.6
265	CO-24	AD2-2	1,420.00	AD2-44	1,404.86	174.6	0.09	8.00	0.01	0.31	7.53	0.39	4.62	6.7	58.8
266	CO-25	AD2-45	1,404.27	AD2-047	1,403.48	251.6	0.00	18.00	0.01	4.39	4.47	0.81	7.65	57.4	54.3
268	P-8	AD3-57	1,413.30	AD3-56	1,411.90	152.9	0.01	6.00	0.01	0.01	1.28	0.27	0.7	1.4	53.1
269	P-7	AD3-56	1,411.90	UNK-06	1,410.80	69.1	0.02	15.00	0.011	2.38	6.51	0.54	9.64	24.7	43.3
271	P-30	AD3-43	1,415.86	MH-20	1,412.75	139.6	0.02	12.00	0.01	1.53	7.06	0.32	6.9	22.1	32
272	CO-30	MH-20	1,412.75	AD3-42	1,409.64	139.2	0.02	12.00	0.01	1.53	7.08	0.59	6.93	22	59.4
274	P-92	NEW MH-73	1,427.02	MH-21	1,425.28	400	0.00	8.00	0.01	0.38	2.74	0.3	1.04	36.9	45.6
275	CO-32	MH-21	1,425.28	NEW MH-72	1,424.67	141.5	0.00	8.00	0.01	0.5	2.93	0.34	1.03	48.6	50.5
277	CO-33	AC3-25	1,417.96	AC3-121	1,417.90	25.5	0.00	8.00	0.01	0.49	2.34	0.41	0.77	63.7	61.6
278	P-21	AC3-121	1,417.90	AC3-24	1,416.18	318.5	0.01	15.00	0.01	1.61	4.23	0.51	6.18	26.1	41
280	P-101	NEW MH-3	1,429.00	NEW MH-23	1,424.24	237.5	0.02	6.00	0.01	0.46	5.11	0.24	1.03	44.5	47
281	CO-36	NEW MH-23	1,424.24	AC3-25	1,417.96	312.9	0.02	6.00	0.01	0.47	5.14	0.32	1.03	45.5	63.1
283	CO-37	NEW MH-24	1,395.20	NEW MH-101	1,395.11	39.4	0.00	6.00	0.01	0.04	1.18	0.18	0.35	11.4	35.9
286	CO-38	NEW MH-25	1,425.50	NEW MH-26	1,423.39	76.5	0.03	6.00	0.01	0.19	4.49	0.13	1.22	15.5	26.6
288	CO-39	NEW MH-26	1,423.39	NEW MH-27	1,419.54	139.8	0.03	6.00	0.01	0.19	4.47	0.17	1.21	15.6	34.1
290	CO-40	NEW MH-27	1,419.54	NEW MH-28	1,417.00	91.9	0.03	6.00	0.01	0.44	5.67	0.21	1.21	36	41.4

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 4 (CONDUITS)

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth/ Rise (%)
292	CO-41	NEW MH-28	1,417.00	NEW MH-29	1,413.74	118.2	0.03	6.00	0.01	0.44	5.67	0.24	1.21	35.9	47.9
294	CO-42	NEW MH-29	1,413.74	AD3-167	1,410.50	117.5	0.03	6.00	0.01	0.69	6.37	0.31	1.21	57.5	62.6
296	CO-43	AD3-167	1,410.50	O-4	1,409.50	80.1	0.01	6.00	0.01	0.69	4.66	0.35	0.82	85.1	70.9
306	CO-47	NEW MH-35	1,391.50	NEW MH-36	1,387.36	144.8	0.03	6.00	0.01	0.08	3.54	0.12	1.23	6.5	23.3
308	CO-48	NEW MH-36	1,387.36	NEW MH-37	1,379.50	274.9	0.03	6.00	0.01	0.23	4.8	0.15	1.23	18.7	30.3
310	CO-49	NEW MH-37	1,379.50	NEW MH-38	1,375.46	181	0.02	6.00	0.01	0.23	4.39	0.16	1.09	21.1	31.2
312	CO-50	NEW MH-38	1,375.46	NEW MH-39	1,366.50	401.8	0.02	6.00	0.01	0.23	4.39	0.33	1.09	21.1	65.6
314	CO-51	NEW MH-39	1,366.50	NEW MH-40	1,377.00	257.8	-0.04	6.00	0.01	0.23	1.17	0.44	1.47	15.6	87
316	CO-52	NEW MH-40	1,377.00	O-5	1,376.50	198.3	0.00	6.00	0.01	0.23	1.97	0.29	0.37	62.7	57.4
318	P-91	NEW MH-72	1,424.67	NEW MH-41	1,422.66	423.4	0.01	10.00	0.01	0.71	3.31	0.36	1.96	36.1	43.7
319	CO-54	NEW MH-41	1,422.66	NEW MH-71	1,421.26	423.4	0.00	10.00	0.01	0.71	2.9	0.47	1.64	43.3	55.9
321	P-81	NEW MH-100	1,428.06	NEW MH-42	1,426.82	127.3	0.01	8.00	0.01	0.36	3.62	0.26	1.55	23.3	38.6
322	CO-56	NEW MH-42	1,426.82	AD3-48	1,426.00	83.5	0.01	8.00	0.01	0.63	4.22	0.31	1.55	40.8	45.8

PLACER COUNTY GOVERNMENT CENTER

SEWER MODEL OUTPUT TIER 4 (MANHOLES)

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (cfs)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
2	AD2-85	1,400.20	1,400.20	1,394.00	0.27	0.31	0.34	1,394.34	1,394.35
3	NEW MH-102	1,400.00	1,400.00	1,395.00	0.07	0.27	0.31	1,395.31	1,395.32
4	AD2-100	1,400.47	1,400.47	1,395.16	0.01	0.02	0.17	1,395.33	1,395.33
5	AD2-104	1,409.64	1,409.64	1,402.24	0	0.01	0.04	1,402.28	1,402.28
6	UNK-17	1,394.00	1,394.00	1,386.00	0	0	0.00	1,386.00	1,386.00
7	UNK-18	1,394.30	1,394.30	1,385.00	0.35	0.35	0.16	1,385.16	1,385.21
8	AC3-510	1,402.00	1,402.00	1,397.00	0	0	0.00	1,397.00	1,397.00
9	UNK-16	1,401.80	1,401.80	1,390.00	0.06	0.35	0.14	1,390.14	1,390.21
10	AC3-32	1,405.00	1,405.00	1,391.00	0.06	0.06	0.12	1,391.12	1,391.12
11	AC3-123	1,407.24	1,407.24	1,392.65	0.06	0.06	0.08	1,392.73	1,392.74
12	AC2-099	1,407.67	1,407.67	1,393.65	0.06	0.06	0.10	1,393.75	1,393.75
13	AD2-098	1,410.79	1,410.79	1,394.52	0.02	0.06	0.11	1,394.63	1,394.63
14	AD02-057	1,404.75	1,404.75	1,395.04	0.02	0.02	0.06	1,395.10	1,395.10
15	AC2-002	1,403.57	1,403.57	1,397.96	0.02	0.02	0.05	1,398.01	1,398.01
16	AC2-001	1,405.00	1,405.00	1,400.00	0	0.02	0.05	1,400.05	1,400.05
18	AD3-45	1,427.60	1,427.60	1,420.86	1.47	1.47	0.40	1,421.26	1,421.26
20	AC3-30	1,443.50	1,443.50	1,437.50	0	0.46	0.21	1,437.71	1,437.76
22	AD3-78	1,411.40	1,411.40	1,409.60	3.91	3.91	0.69	1,410.29	1,410.34
23	UNK-06	1,413.80	1,413.80	1,410.80	2.38	2.38	0.64	1,411.44	1,411.46
25	AD3-57	1,417.80	1,417.80	1,413.30	0.01	0.01	0.04	1,413.34	1,413.34
26	AD3-156	1,421.00	1,421.00	1,416.00	0.01	0.01	0.04	1,416.04	1,416.04
27	AD3-58	1,425.20	1,425.20	1,419.90	0.01	0.01	0.03	1,419.93	1,419.93
30	AD3-61	1,434.50	1,434.50	1,429.50	0	0.01	0.03	1,429.53	1,429.53
31	AD3-56	1,414.00	1,414.00	1,411.90	2.38	2.38	0.42	1,412.32	1,412.39
32	AC3-20	1,420.38	1,420.38	1,414.40	2.37	2.37	0.52	1,414.92	1,414.96
33	AC3-22	1,421.00	1,421.00	1,414.80	1.97	1.97	0.49	1,415.29	1,415.32
34	AC3-23	1,420.00	1,420.00	1,415.90	1.97	1.97	0.45	1,416.35	1,416.39
35	AC3-24	1,420.00	1,420.00	1,416.18	1.61	1.62	0.58	1,416.76	1,416.77
36	AC3-25	1,419.64	1,419.64	1,417.96	0.47	0.49	0.39	1,418.35	1,418.35
37	AC3-62	1,427.58	1,427.58	1,423.29	0	0	0.00	1,423.29	1,423.29
38	AD3-63	1,429.20	1,429.20	1,424.90	0	0	0.00	1,424.90	1,424.90
42	AD3-42	1,414.94	1,414.94	1,409.64	1.53	1.53	0.86	1,410.50	1,410.51
43	AD3-43	1,420.86	1,420.86	1,415.86	1.47	1.53	0.32	1,416.18	1,416.26
44	AD3-44	1,425.26	1,425.26	1,419.84	1.47	1.47	0.31	1,420.15	1,420.23
45	AC3-141	1,418.70	1,418.70	1,414.70	0	0.4	0.30	1,415.00	1,415.01
46	AC3-31	1,422.00	1,422.00	1,416.20	0	0.35	0.27	1,416.47	1,416.47
47	AD3-106	1,418.36	1,418.36	1,407.86	3.91	3.91	0.72	1,408.58	1,408.63
50	AD2-45	1,432.42	1,432.42	1,404.27	4.36	4.39	0.81	1,405.08	1,405.12
51	AD2-44	1,428.87	1,428.87	1,404.86	4.33	4.36	1.48	1,406.34	1,406.35
52	AD3-67	1,419.47	1,419.47	1,407.66	4.02	4.02	0.70	1,408.36	1,408.41
53	NEW AD3-68	1,423.81	1,423.81	1,418.00	0	0.01	0.03	1,418.03	1,418.03
55	AD2-2	1,427.00	1,427.00	1,420.00	0	0.31	0.12	1,420.12	1,420.21
56	NEW MH01	1,426.00	1,426.00	1,420.26	0	0	0.00	1,420.26	1,420.26
57	AD3-101	1,427.57	1,427.57	1,420.47	0	0	0.00	1,420.47	1,420.47
58	AD3-069	1,429.13	1,429.13	1,422.00	0	0	0.00	1,422.00	1,422.00
59	AD3-71	1,431.72	1,431.72	1,427.79	0	0	0.00	1,427.79	1,427.79
60	AD3-72	1,433.82	1,433.82	1,430.70	0	0	0.00	1,430.70	1,430.70
61	NEW MH-71	1,431.20	1,431.20	1,421.26	1.47	1.47	0.55	1,421.81	1,421.81
62	NEW MH-72	1,434.00	1,434.00	1,424.67	0.5	0.71	0.35	1,425.02	1,425.02
63	NEW MH-73	1,431.91	1,431.91	1,427.02	0	0.38	0.28	1,427.30	1,427.30

64	NEW MH-68	1,433.00	1,433.00	1,422.12	0.68	0.76	0.37	1,422.49	1,422.49
65	NEW MH-100	1,433.87	1,433.87	1,428.06	0	0.36	0.22	1,428.28	1,428.30
67	NEW AD3-46	1,430.00	1,430.00	1,422.53	0.68	0.68	0.35	1,422.88	1,422.89
68	AD3-47	1,429.14	1,429.14	1,424.09	0.63	0.66	0.30	1,424.39	1,424.41
69	AD3-48	1,432.50	1,432.50	1,426.00	0.63	0.63	0.30	1,426.30	1,426.31
70	AD3-103	1,434.00	1,434.00	1,426.53	0.02	0.02	0.05	1,426.58	1,426.58
222	NEW MH-101	1,400.31	1,400.31	1,395.11	0.06	0.07	0.22	1,395.33	1,395.33
223	NEW MH-103	1,400.00	1,400.00	1,394.78	0.27	0.27	0.28	1,395.06	1,395.06
228	NEW MH-3	1,433.00	1,433.00	1,429.00	0.46	0.46	0.23	1,429.23	1,429.23
231	AC3-26	1,423.00	1,423.00	1,419.00	0	0	0.00	1,419.00	1,419.00
233	NEW MH-5	1,434.00	1,434.00	1,427.40	0	0.02	0.07	1,427.47	1,427.47
239	NEW MH-9	1,410.00	1,410.00	1,408.38	0	0.1	0.29	1,408.67	1,408.67
240	NEW MH-10	1,420.38	1,420.38	1,408.18	0.1	0.1	0.30	1,408.48	1,408.48
247	NEW MH-12	1,419.47	1,419.47	1,407.68	0.1	0.1	0.74	1,408.42	1,408.42
248	NEW MH-13	1,411.40	1,411.40	1,407.84	0.1	0.1	0.64	1,408.48	1,408.48
252	NEW MH-14	1,428.00	1,428.00	1,424.50	0	0.11	0.30	1,424.80	1,424.80
253	NEW MH-15	1,428.00	1,428.00	1,424.36	0.2	0.4	0.21	1,424.57	1,424.57
254	NEW MH-16	1,428.00	1,428.00	1,424.50	0	0.09	0.25	1,424.75	1,424.75
255	NEW MH-17	1,426.00	1,426.00	1,422.50	0.4	0.4	0.18	1,422.68	1,422.68
256	NEW MH-18	1,418.00	1,418.00	1,414.50	0.4	0.4	0.15	1,414.65	1,414.65
257	NEW MH-19	1,399.23	1,399.23	1,395.73	0.4	0.4	0.22	1,395.95	1,395.95
270	MH-20	1,417.90	1,417.90	1,412.75	1.53	1.53	0.32	1,413.07	1,413.07
273	MH-21	1,433.50	1,433.50	1,425.28	0.38	0.5	0.33	1,425.61	1,425.61
276	AC3-121	1,419.65	1,419.65	1,417.90	0.49	1.61	0.44	1,418.34	1,418.34
279	NEW MH-23	1,427.24	1,427.24	1,424.24	0.46	0.47	0.24	1,424.48	1,424.48
282	NEW MH-24	1,400.40	1,400.40	1,395.20	0	0.04	0.13	1,395.33	1,395.33
284	NEW MH-25	1,429.00	1,429.00	1,425.50	0	0.19	0.13	1,425.63	1,425.63
285	NEW MH-26	1,426.89	1,426.89	1,423.39	0.19	0.19	0.13	1,423.52	1,423.52
287	NEW MH-27	1,423.04	1,423.04	1,419.54	0.19	0.44	0.21	1,419.75	1,419.75
289	NEW MH-28	1,420.50	1,420.50	1,417.00	0.44	0.44	0.21	1,417.21	1,417.21
291	NEW MH-29	1,417.24	1,417.24	1,413.74	0.44	0.69	0.27	1,414.01	1,414.01
293	AD3-167	1,414.00	1,414.00	1,410.50	0.69	0.69	0.35	1,410.85	1,410.85
304	NEW MH-35	1,395.00	1,395.00	1,391.50	0	0.08	0.09	1,391.59	1,391.59
305	NEW MH-36	1,390.86	1,390.86	1,387.36	0.08	0.23	0.15	1,387.51	1,387.51
307	NEW MH-37	1,383.00	1,383.00	1,379.50	0.23	0.23	0.16	1,379.66	1,379.66
309	NEW MH-38	1,378.96	1,378.96	1,375.46	0.23	0.23	0.16	1,375.62	1,375.62
311	NEW MH-39	1,370.00	1,370.00	1,366.50	0.23	0.23	3.50	1,370.00	1,370.00
313	NEW MH-40	1,393.00	1,393.00	1,377.00	0.23	0.23	0.29	1,377.29	1,377.29
317	NEW MH-41	1,432.60	1,432.60	1,422.66	0.71	0.71	0.38	1,423.04	1,423.04
320	NEW MH-42	1,433.05	1,433.05	1,426.82	0.36	0.63	0.30	1,427.12	1,427.12

Appendix D – Master Drainage Report

Williams + Paddon Architects + Planners Inc.
Master Plan Update – Wet Utility Infrastructure

PLACER COUNTY GOVERNMENT CENTER MASTER DRAINAGE REPORT

March 20, 2019

A report prepared by Peter Kulchawik, P.E. and Teresa Garrison, P.E. on behalf of:

CARTWRIGHT

Table of Contents

Table of Contents i
List of Tables ii
List of Plates ii
List of Appendices ii
Executive Summary iii
1 INTRODUCTION 1
1.1 OBJECTIVES AND PURPOSE 1
1.2 DESIGN STANDARDS AND CRITERIA 2
2 BASELINE MODEL 3
2.1 BACKGROUND INFORMATION 3
2.2 HYDROLOGIC SETTING 4
2.3 BASELINE MODEL DEVELOPMENT 7
2.4 BASELINE MODEL VALIDATION 9
2.5 BASELINE MODEL RESULTS 11
2.6 CONSIDERATIONS FOR ALTERNATIVES ANALYSIS 13
3 ALTERNATIVES ANALYSIS 14
3.1 SITE-SPECIFIC ISSUES AND RECOMMENDATIONS 14
3.2 CAMPUS-WIDE ISSUES AND RECOMMENDATIONS 15
4 STRATEGY FOR OVERALL STORMWATER MANAGEMENT PLAN 16
4.1 FINAL OPTION MODEL DEVELOPMENT 16
4.2 FINAL OPTION MODEL RESULTS 17
4.3 WATER-QUALITY TREATMENT 20
5 TIERING ANALYSIS 22
5.1 TIERING ANALYSIS MODEL DEVELOPMENT 22
5.2 TIERING ANALYSIS RESULTS 23
5.3 STORM DRAIN SYSTEM IMPLEMENTATION PHASING RECOMMENDATIONS 24
6 CONCLUSIONS 28
7 LIMITATIONS 29

List of Tables

Table 1 – Baseline model catchment parameters 7
Table 2 – Baseline model validation: comparison of modeled flow rates to previously-completed modeled flow rates by others 10
Table 3 – Baseline model results for peak flow rates at outfalls from PCGC 11
Table 4 – Freeboard availability in stormwater detention basins 12
Table 5 – Final Option model catchment parameters 17
Table 6 - Summary new and retrofitted stormwater basins 19
Table 7 – Comparison of peak flow rates at outfalls between baseline conditions and the final option 20
Table 8 – Tiering model subcatchment parameters 22
Table 9 – Tiering model subcatchment parameters (continued) 22
Table 10 – 2-year event model results for tiering analysis 24
Table 11 – 10-year event model results for tiering analysis 24
Table 12 – 100-year event model results for tiering analysis 24

List of Plates

Plate 1 – Baseline model configuration schematic
Plate 2 – Baseline model results for ponding during the 10-year event
Plate 3 – Baseline model results for ponding during the 100-year event
Plate 4 – Baseline model results and existing land use
Plate 5 – Tier 1 model results and system improvements
Plate 6 – Tier 2 model results and system improvements
Plate 7 – Tier 3 model results and system improvements
Plate 8 – Tier 4 (final option) model results and system improvements
Plate 9 – Final Option model configuration schematic

List of Appendices

Appendix A – XPSTORM model results
Appendix B – Alternative land plans
Appendix C – Final Option and Tiering land plans

Executive Summary

A master drainage report was prepared to support the wet utility infrastructure component of the Placer County Government Center (PCGC) Master Plan Update by providing a comprehensive analysis of the existing and anticipated future storm drain systems. No previous master drainage report has been prepared for PCGC, and thus far stormwater planning has occurred in a piecemeal fashion without overarching guidance on integrating individual projects into a cohesive stormwater system. A coupled hydrologic-hydraulic model was developed with the XP-STORM platform for the entire 200-acre PCGC to (1) gain an understanding of shortcomings in the existing stormwater infrastructure, and (2) guide stormwater planning according to state and local requirements as the campus evolves toward the ultimate buildout condition.

A baseline (existing conditions) model was developed based on site-specific survey data, engineering plans, and drainage reports, and later supplemented by a focused field investigation to resolve data gaps. The model was validated against stormwater studies from previous projects; in most instances the studies agreed with the baseline model results, and discrepancies that occurred could be explained by land use changes or the higher-resolution data used for the master drainage report. Five outfall locations (where stormwater leaves PCGC) were identified to establish limits for stormwater flow rates under the buildout condition. The baseline model highlighted several shortcomings in the existing stormwater system, including many undersized pipes in the southeast portion of the campus, roadway overtopping at Atwood Drive, shallow flooding near the Finance Administration Building, and insufficient freeboard in detention basins.

The findings from the baseline model were used to inform the alternatives analysis, and eventually identify a land plan for the Final Option. The stormwater management approach for the Final Option is to meet flood control and hydromodification management requirements with several detention basins strategically placed throughout the campus that will provide flow controls for the entire PCGC, while leaving compliance with water-quality treatment requirements to individual projects as they come online.

The Final Option will be implemented over a 20-year horizon in four phases (or “tiers”), with each tier representing a construction milestone every five years. The stormwater system was modeled for each tier to demonstrate that the PCGC will meet flood control and hydromodification criteria under all interim conditions. The tiering study was also used to make recommendations on the implementation timing of individual elements within complete set of improvements for the Final Option (Tier 4).

The Final Option will require that a total of seven new stormwater basins and reconfiguration of three existing basins to meet County requirements for flood control and hydromodification management. Several new pipes and upsizing of existing pipes in select locations are needed to convey the anticipated future flow rates. The model showed that the stormwater basins are effective in limiting peak flow rates at each of the five outfalls from PCGC to be no greater than the existing peak flow rates. Individual projects will incorporate water-quality features according to the West Placer Storm Water Quality Design Manual, and will include site design, source control, and stormwater treatment features. Stormwater treatment features such as bioretention basins typically provide some level of flow control, and will likely

reduce flow rates beyond the post-construction flow rates estimated by the XPSTORM model.

1 INTRODUCTION

This report supports the wet utility infrastructure component of the Placer County Government Center (PCGC) Master Plan Update by providing a comprehensive analysis of the existing and anticipated future storm drain systems. The Master Plan Update will build on the Comprehensive Facilities Master Plan for Placer County (1993) by providing a long-term vision and ongoing facilities planning with a 20-year time horizon. As part of this effort, all utilities are being evaluated to ensure they are sufficient to support the proposed improvements. In the case of the storm drain system, the primary analysis tool for the 200-acre PCGC site is a coupled hydrologic-hydraulic model. This sub-regional scale model was developed to provide an integral understanding of the current storm drain system, and to facilitate comprehensive stormwater planning for the entire project site.

1.1 OBJECTIVES AND PURPOSE

The purpose of this report is to supplement the overall wet utility infrastructure study by Cartwright Engineers. The objectives of the Cartwright study are to support the Master Plan Update by providing a comprehensive overview of the wet utilities, encompassing the water, sewer and stormwater systems, through (1) collection of existing wet utilities information, and (2) assessment of the existing utility systems and the future utility system improvements needed for the planned PCGC buildout condition. The former objective has been addressed by Cartwright and is not discussed in detail herein. Nonetheless, to assist in preparing this report, a thorough understanding of the existing storm drain system was gained through a review of background information along with field investigations. The main purpose of this report is to address the second study objective through the following work flow:

1. Develop a coupled hydrologic-hydraulic model of baseline (i.e. existing) conditions for PCGC and its storm drain system;
2. Review and validate the model to be consistent with previously completed stormwater studies;
3. Present the baseline model results with particular emphasis on undersized portions of the storm drain system that have the potential to cause flooding;
4. Model multiple alternatives to inform the planning team of storm drain system considerations for each alternative, and to guide the selection of a preferred alternative;
5. Present the necessary storm drain system improvements for the preferred alternative (Final Option) that addresses site-specific constraints and meets state and local regulatory requirements;
6. Assess the storm drain system at all interim configurations leading up to the Final Option to demonstrate the project will meet peak flow and hydromodification criteria during all interim conditions, as well as to value engineer the implementation of stormwater improvements; and
7. Develop an overall strategy and recommendations for a Storm Water and Drainage Management Plan for the Placer County Government Center Campus Master Plan that addresses the drainage planning elements necessary to mitigate stormwater impacts including conveyance, storage, general recommendations for project specific water-quality treatment, and hydromodification controls.

1.2 DESIGN STANDARDS AND CRITERIA

Design Standards applied to the formulation of this study include:

- Placer County Flood Control and Water Conservation District Stormwater Management Manual (September 1994);
- Placer County Land Development Manual (October 1996);
- Waste Discharge Requirements (WDRs) for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s; State Water Resources Control Board Water Quality Order No. 2013-001-DWQ); and
- West Placer Storm Water Quality Design Manual (April 2016).

2 BASELINE MODEL

The baseline model was generated using the XPSTORM software package (XP Solutions, 2016) to evaluate the existing conditions of the PCGC. A preliminary model was built based on background information on the existing infrastructure, and then was refined with additional information collected during a site visit. The final baseline model was validated against flowrates estimated in previously completed drainage reports and other hydraulic analyses throughout PCGC.

2.1 BACKGROUND INFORMATION

Cartwright Engineers compiled a large amount of background information on the existing stormwater infrastructure within and around the PCGC. The background information consisted of engineering plans, drainage reports, survey information, and additional reports that provided insight into how the stormwater infrastructure for the site functions. The following documents were reviewed to prepare the baseline model:

- City of Auburn Stormwater Management Plan by City of Auburn Department of Public Works (2008);
- Placer County Government Center Storm Drain Plan by West Yost Associates (2010);
- Auburn/Bowman Community Plan Hydrology Study by Placer County Department of Public Works (1992);
- Engineering Plans for Placer County Finance Administration Building: Drainage and Sewer Plan by Morton and Pitalo, Inc (1995);
- Engineering Plans for Placer County Dewitt Center Auburn Justice Center: Utilities by Placer County (2004);
- Draft - Placer County Government Center Master Plan Update - Wet Utilities Infrastructure by Cartwright Engineers (2016, in progress);
- NRCS Hydrologic Soil Report downloaded from the USDA Web Soil Survey (data accessed October 2016);
- Drainage Report, Home Depot Shopping Center, Auburn, Placer County, CA by Blair, Church and Flynn Consulting Engineers (2007);
- Photos and notes from site visit by Cartwright Engineers (August 2016);
- Preliminary Drainage Study for Placer County Auburn Animal Shelter by Wood Rodgers (2013);
- DeWitt Center Stormwater Detention Storage Study for Watersheds A1-A3 by A.R. Associates (2003a);
- DeWitt Center Land Development Building Stormwater Detention Storage Study for Bell Road/Rock Creek Watershed (Shed B1) by A.R. Associates (2003b);
- Placer County Main Jail Housing Unit 4 Stormwater Detention Pond Final Report by A.R. Associates (2000);
- Grading Study, Placer Animal Shelter by Wood Rodgers (2013);

- Draft - Stormwater and Surface Water Quality Best Management Practices (BMP) Plan for Placer County Auburn Animal Shelter by Wood Rodgers (2013);
- Improvement Plans for Olympus Village, Placer County, CA, Engineering Plans by GW Consulting Engineers (2002);
- Improvement Plans Atwood Ranch Unit III, Placer County, CA, Engineering As-Built Plans by A.R. Associates (2008);
- DeWitt Center Site Directory for Utilities, Engineering Plans by County of Placer (1994).
- Administrative Draft Storm Drainage and Water Quality Existing Conditions Report by URS (2002);
- 2012 Monitoring Report for the DeWitt Government Center by Dudek (2012);
- Drainage Study for Timberline at Auburn Phase 1 by Wood Rodgers (2014);
- Willow Creek Shopping Center On-Site Improvement Plans by TSD Engineering, Inc (2015);
- Drainage Report for Sunset Terrace Estates by Western Planning and Engineering (1990);
- Willow Creek Retail Placer County, CA, Preliminary Hydrology and Hydraulics, by TSD Engineering (2014);
- Placer County, CA Flood Insurance Rate Map Number 06061C0755H by FEMA (Effective Date November 2, 2018)
- Placer County, CA Flood Insurance Rate Map Number 06061C0761H by FEMA (Effective Date November 2, 2018);
- Improvement Plans Land Development Building Placer County, CA by A.R. Associates (2004);
- Home Depot Utility Engineering As-built Plans by Lars Andersen and Associates (2005);
- Atwood Ranch 1 drainage calculations by A.R. Associates (1988);
- County of Placer DeWitt Center Auburn Justice Center technical drawings by Beverly Prior Architects (2004); and
- Aerial mapping of DeWitt County Center by Andregg Geomatics (May 1, 2015).

2.2 HYDROLOGIC SETTING

The PCGC spans a topographic high point, with the western portion of the site (roughly 80% of the total area) draining south into the North Auburn Ravine watershed (Catchments 1, 2, 3, and 6) and the eastern portion draining north into the Rock Creek Watershed (Catchments 4 and 5). The project site was separated into six main catchments based on the site topography and the locations of outfalls where stormwater leaves the site. Each catchment was then divided into subcatchments based on the locations of storm drain inlets and storage basins. The six catchments were divided into a total of 37 subcatchments for a total tributary area of 231 acres (Plate 2).

Mean annual precipitation at the PCGC is on the order of 36 inches[1]. Precipitation is almost entirely rainfall, with the winter months typically being the wettest time of year, although intense rainfall

[1] From PRISM 30-year normals, 1981 to 2010, www.prism.oregonstate.edu, accessed October 2018.

during summer thunderstorms is also common.

The following paragraphs provide a description of the individual catchments and the general layout of the storm drain network within each catchment. See Plate 1 for a general map of PCGC and the names of nodes and links used in the XPSTORM baseline model. Catchments and subcatchments are shown in Plate 2.

- Catchment 1. Catchment 1 (C1) is located on the western edge of the PCGC and is bounded by Bell Road and the Combie Canal to the north and Atwood Drive to the south. C1 has an area of 88.5 acres and drains to the North Auburn Ravine watershed. Subcatchment 1J is the highest portion of C1 and includes the northern portion of the Community Development Resource Center. Flows from 1J are detained in a 0.3-acre-foot detention basin (1J/Storage1) at the southeast corner of the intersection of Bell Road and Richardson Drive. Flows leaving the detention basin flow west along Bell Road (runoff is offsite of PCGC at this point) in a combination of pipes and open channels to the intersection of Bell Road and Olympic Way. Flow crosses Olympic Way through a 24-inch culvert and drains southwest in a natural channel. The natural channel continues until it enters a 0.05-acre-foot on-line detention basin (Node 1I/Storage1) located to the west of the Olympic Residential Development. The outflow from the detention basin is controlled by an 18-inch pipe and overflow spillway. The flow continues down the natural channel toward B Avenue. On the upstream side of B Avenue, a small amount of flow ponds (Node 1E/Storage2) before entering three parallel box culverts (each 5.2-feet wide by 3.7-feet high) under B Avenue (runoff has re-entered PCGC at this point). Runoff from Subcatchments 1F and 1G also flows into Node E1/Storage upstream of B Avenue. Flow passing under B Avenue then enters the large southwest pond (Node 1B/Storage1, capacity 13.4 acre-feet). Runoff from sub-catchment 1D is collected by a series of inlets along B Avenue and piped through an 18-inch pipe into the northeastern end of this pond. Flows from the Animal Services Center (Subcatchment 1C) also flow into Node 1B/Storage1 on the southern end, after being collected and detained by a 0.33-acre-foot detention basin (Node 1C/Storage1). Flows out of Node 1B/Storage are controlled by a weir box at the southern end and flow through a 48-inch diameter pipe to a natural channel. Flow is constricted at an old 6-foot wide concrete structure represented by Link 122. The southernmost storage (Node 1A/Storage1) is a natural depression, created from the natural topography and the Atwood Drive road embankment. The outfall from C1 is a 48-inch culvert under Atwood Drive with open channel downstream.
- Catchment 2. Catchment 2 (C2) has an area of 41.4 acres. C2 spans the central portion of the PCGC and drains to the south towards the North Auburn Ravine watershed. The upstream extent of C2 is the southern portion of the Community Development Resources Center, Finance Administration Building, Auburn Justice Center, and associated parking lots. A series of inlets collects runoff from Subcatchments 2B through 2F and conveys flow under Catchment 3 (the Jail complex) and to a 2.2-acre-foot detention basin (Node 2A/Storage1) located to the west of Jail House #4. Outflow from the detention basin is metered by an outlet control structure (Node 2A Control Structure: a combination orifice, v-notch weir and overflow weir); this feature was modeled in XPSTORM by a stage-discharge table. Flow leaves through a 42-inch pipe to a natural channel and a 1.8-acre-foot storage pond (Node 2A/Storage2) located just north of Atwood Road. Flow from Catchment 3, and overflow from Catchment 6 combine at the Node 2A/Storage2 pond. Two culverts (one 30- and one 15-inch pipe) convey flows under Atwood Drive to an existing pond south of Atwood Road (not modeled), with the inflow to the pond designated as Outfall C2/C3.

- Catchment 3. Catchment 3 (C3) has an area of 12.8 acres located in the south-central portion of the PCGC and drains to the North Auburn Ravine watershed. Catchment 3 drains the Jail and Juvenile Detention Center. Runoff is collected by the parking lots and drains through a 42-inch diameter pipe to the southern end of the Jail Complex and into the natural pond (Node 2A/Storage2).
- Catchment 4. Catchment 4 (C4) has an area of 12.7 acres located in the northeast corner of the PCGC and drains to the Rock Creek watershed. The Ophir Canal traverses C4, but is not part of the storm drain system and only receives direct precipitation. C4 collects runoff from the Health and Human Services buildings and parts of First Street, with flow directed beneath the Ophir Canal in a pipe. Flow travels north to an inlet at the eastern boundary of the PCGC (a small depressional area at the inlet that was modeled as a storage area), then is conveyed offsite via a 24-inch pipe directed east toward Professional Drive.
- Catchment 5. Catchment 5 (C5) has an area of 29.9 acres located on the eastern boundary of the PCGC and drains to the Rock Creek Watershed. C5 includes the Home Depot development and the First Street and Professional Drive stormwater basins. Runoff from the southern end of C5 (Subcatchment 5C) drains to the 1.03-acre-foot First Street detention basin (Node 5C/Storage1) where the outflow is controlled by an orifice outlet. Outflow from the First Street detention basin combines with runoff from Subcatchment 5E and is piped along Willow Creek Drive and under the Home Depot parking lot. Runoff from the west end of C5 (Subcatchment 5D) drains to the 2.00-acre-feet Professional Drive detention basin (Node 5D/Storage1) where the outflow is controlled by an orifice outlet. Flow is then piped along the northern edge of Home Depot and routed to the 30-inch outlet pipe (Outlet C5) located at the northeast corner of the C5. On-site runoff from Home Depot is collected and detained in an underground storage facility (Node 5A/Storage1) beneath the parking lot. Flows are controlled by multiple orifices before entering the 30-inch outfall pipe.
- Catchment 6. Catchment 6 (C6) drains the southeastern 45.8-acre portion of the PCGC and drains to the North Auburn Ravine watershed. C6 includes the County Government offices, the Corporation Yard, and the Atwood Ranch 1 development (Subcatchement 6I, outside the PCGC). The C6 storm drain system appeared to contain some of the oldest storm drain infrastructure of the PCGC. All runoff in C6 drains toward an open channel along the north side of Atwood Drive. Many of the collector storm pipes were not incorporated into the XPSTORM baseline model as they are less than 10 inches in diameter. The model simplified the feeder drain layout by selecting a main point of concentration for each of the subcatchments. Runoff from the northern Subcatchments 6E, 6F, 6G and 6H is piped to a common junction at Richardson Drive. Runoff from Subcatchments 6B, 6C and 6D is piped towards Atwood Drive where it daylights into the open channel along Atwood Drive. Flows then converge at Richardson Drive and flow west under the road through a 36-inch culvert. After the culvert, a natural channel routes flow to the west to a junction and culvert along Atwood Drive. A 22-inch culvert goes under Atwood Drive as Outfall C6. At that junction (Node 6A/6) an overflow weir allows flows in excess of the capacity of the 22-inch culvert to overflow to the east along an open channel to the Node 3A/Storage1 pond, and leave the site through Outfall C2/C3

Two irrigation canals traverse the PCGC: the Combie Canal runs along the western boundary and the Ophir Canal runs parallel to First Street through the eastern portion of the site. Neither canal is known to be managed as part of the storm drain system, although it is possible they receive small amounts of

runoff during extreme storm events.

2.3 BASELINE MODEL DEVELOPMENT

The hydrology and storm drain hydraulics of PCGC were modeled using the XPSTORM software package (XP Solutions, 2016). XPSTORM integrates hydrologic and hydraulic computations into a single model thereby streamlining the modeling process. The model includes multiple hydrologic parameterization methods which allow the rainfall-to-runoff calculations to conform to the prevailing engineering standards. Lastly, XPSTORM is well-suited for modeling complex urban watersheds because it is capable of simulating a variety of features including pipes, manholes, ponds, weirs, and overland flow. The model development described herein is consistent with the methods described in Section V.3 of the Placer County Flood Control and Water Conservation District Stormwater Management Manual (SWMM) for HEC-1 models, which are required for master planning models. XPSTORM has the ability to parameterize a hydrologic model in an identical manner as HEC-1.

Table 1 – Baseline model catchment parameters

Catchment / Subcatchment	Area (acres)	Percent Impervious (%)
Catchment 1		
1A	12.4	3.0
1B	13.4	8.6
1C	5.0	59.5
1D	3.7	37.8
1E	14.8	16.4
1F	10.6	51.2
1G	11.8	67.9
1H	2.9	41.9
1I	7.7	43.2
1J	6.3	46.0
C1 Total	88.5	32.9
Catchment 2		
2A	1.6	8.0
2B	15.9	43.2
2C	3.2	68.1
2D	3.9	55.6
2E	5.7	42.6
2F	7.4	74.2
2G	3.6	52.6
C2 Total	41.2	51.6
Catchment 3		
3A	3.3	36.7
3B	4.7	75.5
3C	4.7	69.2
C3 Total	12.8	63.2

Catchment / Subcatchment	Area (acres)	Percent Impervious (%)
Catchment 4		
4A	2.4	12.0
4B	9.0	39.9
4C	1.3	75.3
C4 Total	12.7	39.2
Catchment 5		
5A	11.2	81.2
5B	0.8	99.2
5C	3.6	57.9
5D	11.6	41.9
5E	2.6	0.1
C5 Total	29.9	56.6
Catchment 6		
6A	11.5	55.7
6B	7.7	76.3
6C	1.4	99.4
6D	5.3	64.7
6E	4.9	67.7
6F	2.4	42.4
6G	2.3	69.9
6H	3.8	90.4
6I	6.4	59.4
C6 Total	45.8	66.1
Total	230.8	47.9

Rainfall depths for the 2-, 10-, and 100-year, 24-hour storms were estimated from the Design Storm Procedures presented in Appendix V-B of the SWMM as 2.78, 4.53, and 6.73 inches, respectively. The depths were adjusted for the average elevation of PCGC, approximately 1,400 feet (NAVD88). Design storm hyetographs were generated for each storm using the depth-duration-frequency coefficients in Appendix V-A of the SWMM.

The runoff routing of the catchments was modeled using the Kinematic wave method for overland flow. The required data for this method includes area (acres), percent impervious, subcatchment width (feet), and slope (feet/feet). Soil mapping for the PCGC showed the site is predominately Auburn silt loam with small patches of the Auburn-Rock outcrop complex (roughly 5 percent of the total area). Both soil types are classified as Hydrologic Soil Group (HSG) C Soils, indicating moderate runoff potential and somewhat restricted water transmission through the soil. Rainfall abstractions were represented as an initial loss of zero and a constant infiltration rate of 0.16 inches/hour. This value is based on Section V of the Placer County SWMM for landscaped areas, and was selected because the majority of pervious open space is landscaping and has been previously disturbed.

The geometry of the storm drain system was assimilated into the model based on the background information for pipe sizes, lengths, alignments, materials, and elevations. Manning's roughness values were applied based on the pipe material or assumed to be 0.014 if no material was known. The storm system was simplified for the modeling, and smaller (less than 10-inch) lateral pipes were generally excluded from the model. The sections of the storm drain system with open channel flow were modeled as either an irregular or a trapezoidal channel shape, as appropriate. The roughness for the channels was assessed during the site visits and averaged over the channel length.

In instances where the amount of flow was greater than the capacity of the storm drain system, the baseline model was configured to show temporary surface flooding at the model nodes. When flooding occurred at a node, water was stored above ground at the respective node until there was sufficient hydraulic capacity within the system for it to reenter the network. This method allows areas to be identified where the storm drain system is inadequately sized to convey flood flows and where shallow surface flooding would be expected.

The baseline PCGC model included 13 storage basins which represented the existing stormwater detention basins or natural depressions that attenuate stormwater runoff. Storage in the basins was modeled using stage-storage tables generated from the background information or from survey data provided by Cartwright Engineers.

As discussed previously, PCGC has five outfall locations, with three along Atwood Drive (C1, C2/C3, and C6), one on Professional Drive (C4), and one between Highway 49 and Heritage Oaks Circle (C5). All outfalls were set with a free outfall boundary condition, with the depth set equal to the minimum of the normal or critical depth for the flow in the outfall conduit. The three outfalls along Atwood Road are all free outfalls because the 100-year flood level in the pond in the Atwood Ranch development (A.R. Associates, 2008) is lower than the invert of the outfall pipe. For the other two outfalls the 10- and 100-year events are completely contained within the pipes. No previous studies were found that suggested there is a tailwater condition that would violate the assumption of a free outfall boundary condition, and this study assumed that the downstream pipe system was designed to convey the 10-

and 100-year events.

The detention ponds along Atwood Drive were modeled by A.R. Associates (2000) for the addition of Unit 4 to the Placer County Main Jail House. A wetland area located south of the jail was slated to be used as a detention pond (approximate location of Node 3A/Storage1), however, the wetland designation prompted relocating the detention pond to the west (location of Node 2A/Storage2). Based on an October 2016 site visit it is clear the wetland area receives stormwater runoff from Atwood Drive. The culvert along Atwood Drive (Link 136) was partially blocked with sediment at the time of the site visit (the Manning's roughness was set to 0.1 to account for the loss of capacity), which causes water to overflow into the wetland. For this reason, the wetland was modeled as a shallow storage facility in the baseline model.

The precise alignment of a storm drain pipe along Atwood Drive between First Street and F Avenue (Link 16 in Subcatchment 6B) could not be confirmed through the background information or field verification. This pipe connects the northern Corporation Yard to an open channel along Atwood Drive. The pipe size for this link was assumed to be the same as the upstream pipe size leaving the Corporation Yard, and its length was estimated from an assumed alignment.

Sunset Terrace Estates was assumed to drain to the north and away from the PCGC stormwater catchments. The Sunset Terrace Estates are located to the northwest of the Bell Road and Richardson Drive intersection. The drainage report for Sunset Terrace Estates (Western Planning and Engineering, 1990) showed all on-site stormwater draining to an 18-inch pipe located near a low point on the north side of Bell Road. The 18-inch pipe is not believed to turn south and drain through Catchment 1 because (1) it would require crossing the Combie Canal, and (2) no storm drain outlet was found in this location during field investigation. For these reasons, runoff from Sunset Terrace Estates was assumed to drain north.

2.4 BASELINE MODEL VALIDATION

The baseline model was validated by comparing the modeled output flow rates to other modeled/calculated rates obtained from previous studies in the background research. No recorded streamflow or flood data is available for calibration with actual storm events, so the validation effort focused on comparing flow rates at major outfalls from the project site to previously completed work.

Slight variations in the output between any two models are expected. However, any significant differences were investigated to determine if there is a reasonable explanation for the difference. Table 2 is a list of the locations near outfalls where there was available information that could be used in the model validation process. Explanations for significant differences in flow rates are discussed in the following paragraphs.

Table 2 – Baseline model validation: comparison of modeled flow rates to previously-completed modeled flow rates by others

Point Description	Peak Flow Rate - Q (cfs)				Source #
	Modeled 10-yr	Sourced 10-yr	Modeled 100-yr	Sourced 100-yr	
Outfall C5	20.1	9.7	34.2	-	1
5D/Storage - Professional Drive Basin	2.9	3.1	4.1	3.9	2
5C/Storage - First Street Basin	2.9	2.7	3.4	3.7	2
5A/Storage - Home Depot Onsite	8.4	7.3	16.9	12.9	2
1J/Storage - Bell and Richardson Drive	3.4	4.0	4.6	6.0	3
2A/Storage 1- West of Jail House #4	29.6	46.0	54.4	92.0	4

Source key:
1 Willow Creek Retail Placer County, CA, Preliminary Hydrology and Hydraulics by TSD Engineering (2014).
2 Drainage Report Home Depot Shopping Center, by Blair, Church and Flynn Consulting Engineers (2007).
3 DeWitt Center Land Development Building Stormwater Detention Storage Study for Bell Road/Rock Creek Watershed (Shed B1) by A.R. Associates (2003).
4 Placer County Main Jail Housing Unit 4 Stormwater Detention Pond Final Report by A.R. Associates (2000).

The Willow Creek Retail Preliminary Hydrology and Hydraulic report (TSD Engineering, 2014) described a peak flow of 7.3 cfs during the 10-year event flowing from the Home Depot storm drain system to the receiving 30-inch pipe. Review of the drainage report for Home Depot (Blair, Church and Flynn Consulting Engineers, 2007) showed that 7.3 cfs is just the outflow from the on-site underground detention system (XPSTORM Node 5A/Storage1) and that additional flow enters the 30-inch pipe from off-site facilities, namely the First Street and Professional Drive detention basins (XPSTORM Nodes 5C/Storage1 and 5D/Storage1, respectively). The simulated flows in the XPSTORM model closely agreed with the modeling from the Home Depot Report for the outflow from the respective detention basins (Blair, Church and Flynn Consulting Engineers, 2007). Moreover, the XPSTORM baseline model considered flow rates from the entire watershed (Catchment 5). For these reasons, the XPSTORM results are a more complete representation of flow rates in the 30-inch pipe (i.e. Outfall C5), and are adopted as the baseline flow rates.

The model estimated outflow from Node 2A/Storage1 (the detention basin west of Jail House) to be much lower than described by A.R. Associates (2000). It appears three factors are related to the difference in flows between the modeling described by A.R. Associates (2000) and the XPSTORM results:

1. A.R. Associates (2000) estimated the contributing watershed area using 20-foot interval contours. The XPSTORM model was developed with a one-foot contour photogrammetric survey (i.e. Andregg Geomatics, 2015), which resulted in a contributing watershed area that is roughly 20% smaller than the A.R. Associates (2000) area. The difference is attributed to the ability to detect small-scale topographic features, and changes to the land use and site grading since 2000.

2. Development in the vicinity of the Jail has occurred in the years since the study by A.R. Associates (2000), which has changed local drainage patterns. Specifically, A.R. Associates (2000) routed runoff from an 8-acre area north of the Jail through the permanent detention pond. Field

investigation and the storm drain mapping by West Yost Associates (2010)—showed that this area (Subcatchments 3B and 3C) bypasses the detention basin via a 48-inch main directed beneath the Jail building complex.

3. The watershed maps in the A.R. Associates (2000) study and review of historical aerial images on Google Earth show three complexes of original DeWitt Center buildings in 2000 that no longer exist. The absence of these buildings in the XPSTORM baseline model manifested as a decrease in the impervious coverage for a nearly 10-acre area spread over Subcatchments 2B, 2D, and 2E. The expected effect from this change in land use would be more infiltration of rainfall and lower peak flow rates.

For the reasons described above, the XPSTORM results can be considered more representative of present day conditions and are adopted as baseline flow rates at Node 2A/Storage1. The A.R. Associates (2000) study described the permanent detention pond as being sized to accommodate a complete buildout condition of the contributing watershed and is discussed further in the alternatives analysis portion of this report.

2.5 BASELINE MODEL RESULTS

The baseline model was run for the 2-year, 10-year, and the 100-year, 24-hour storms. The unabridged baseline model output tables are included in Appendix A of this report. The outfall flowrates are provided in Table 3. Locations where the existing storm drain does not have the capacity to convey the full 10- and 100-year flow rates are shown in Plate 2 and Plate 3.

Table 3 – Baseline model results for peak flow rates at outfalls from PCGC

Outfall Location by Catchment	Peak Flow Rate (cfs)		
	2-yr	10-yr	100-yr
C1	17.8	44.2	85.3
C2/3	23.6	41.3	66.5
C4	9.3	18.2	29.6
C5	9.2	20.1	34.2
C6	22.8	32.1	37.7

The model showed the area subject to the most significant potential flooding (for both the 10- and 100-year event) as being along Atwood Road just west of the Richardson Drive intersection. The model suggested that, during a 100-year event, 1.5 acre-feet of runoff would not be contained within the storm drain system and would overtop Atwood Road. Sediment accumulation was observed in the Atwood Road culvert during the October 2016 field investigations; the existing 18-inch pipe was at least 80% blocked and likely exacerbates the overtopping.

The model indicated that the 100-year event exceeds the capacity of the culvert running under Atwood Road (from Atwood Ranch 1, Subcatchment 6I), and shallow surface flooding would occur to the south of Atwood Road. This flooding occurs outside of the PCGC campus, and is only discussed herein because drainage from Atwood Ranch 1 is routed through PCGC before crossing Atwood Road again at Outlet C6.

The model also predicted spot areas of flooding at various locations throughout Catchment 6, with the collection point for Subcatchment 6H having an overflow volume of 0.55 acre-feet during the 100-year storm event; this excess volume of water is presumed to sheet flow southwesterly via E Avenue and parking areas. Many of the Catchment 6 buildings appear to be original to the World War II era DeWitt Center, and the storm drains are likely of the same vintage. Many of the Catchment 6 pipes are 8 and 10 inches in diameter and do not meet the current storm drain sizing requirements (i.e. 12-inch minimum diameter). The flooding throughout Catchment 6 is likely the reason why flowrates in Table 3 for the 10- and 100-year events are more similar compared to other catchments; ponded water would have the effect of lowering peak flow rates in Catchment 6.

Table 4 – Freeboard availability in stormwater detention basins

Model Node	Description	Basin Rim Ground Elev. (ft)	Max Water Surface Elev. (ft)		Remaining Freeboard (ft)	
			10-yr	100-yr	10-yr	100-yr[1]
1A/Storage1	Natural Storage Basin on Atwood Drive	1,367.5	1,358.1	1,358.5	9.4	9.0
1B/Storage1	Southwest Pond	1,384.3	1,381.2	1,381.6	3.1	2.7
1C/Storage1	Animal Control Center SW Pond/Basin	1,392.3	1,390.9	1,391.6	1.3	*0.7*
1E/Storage2	Natural Upstream Storage from Southwest SW Pond	1,387.7	1,382.8	1,383.1	4.9	4.6
1I/Storage1	Olympic Way SW Basin	1,393.0	1,390.6	1,391.8	2.4	1.2
1J/Storage1	Bell/Richardson SW Basin	1,429.4	1,427.7	1,428.6	1.7	*0.8*
2A/Storage1	Jail House #4 SW Basin	1,399.0	1,397.2	1,398.2	1.8	*0.8*
2A/Storage2	Natural Pond Along Atwood Drive	1,391.1	1,388.4	1,389.4	2.7	1.7
3A/Storage1	Old SW Basin, now Wetland	1,390.0	1,388.8	1,389.4	1.2	*0.6*
5A/Storage1	Home Depot On-site Underground SW Detention	1,406.0	1,390.5	1,390.7	NA[2]	NA[2]
5C/Storage1	First Street SW Basin	1,435.0	1,430.3	1,431.2	4.7	3.8
5D/Storage1	Professional Drive SW Basin	1,412.7	1,410.0	1,412.0	2.7	*0.7*

1. Italicized cells do not meet the 1-foot minimum freeboard requirement set by Placer County SWMM.
2. Storage is provided by underground pipes and not subject to freeboard requirements.

The model suggested that flooding would occur during a 100-year event in the upper portions of Catchment 2, near the Finance Administrative Building. The total volume of overtopping in this

location is relatively small, no more than 0.22 acre-feet at any location. Given that the flooding would be minor and would only occur during an extreme event, this finding is treated as acceptable and will not be treated as a major consideration in the alternatives analysis.

The stormwater storage basins were evaluated based on the available freeboard between the maximum water surface elevation for a storm event and the existing ground elevation of the basin rim. The Placer County SWMM requires a minimum of 1 feet of freeboard above the 100-year water level. For the 100-year storm event, five of the 13 basins do not meet this requirement (Table 4). The basins that do not meet the freeboard requirement would not have excess capacity (as currently designed) for additional stormwater storage.

2.6 CONSIDERATIONS FOR ALTERNATIVES ANALYSIS

The following list is a summary of findings from the baseline model and the review of background information. This information is highlighted as being pertinent to the alternatives analysis.

- The First Street detention basin (Node 5C/Storage1) appears to have additional volume available for stormwater attenuation that could be utilized while still meeting the County requirement for one foot of freeboard during the 100-year event. The amount of extra storage is relatively small, and supplemental detention facilities in the vicinity of Subcatchment 5C should be anticipated. Nonetheless, using the extra volume in the First Street detention basin in conjunction with other facilities has the potential to decrease the required size of the supplemental detention facilities.

- The “permanent detention pond” (Node 2A/Storage1) located west of the jail complex was originally described as being sized to accommodate a complete buildout condition of the contributing watershed. However, the current modeling suggested that the basin has insufficient freeboard under existing conditions. The basin could still be utilized, but its volume will need to be increased.

- The baseline model showed the storm drain system as having inadequate capacity to contain storm flows throughout Catchment 6. Development within this portion of PCGC will likely require an overhaul of much of the storm drain system.

3 ALTERNATIVES ANALYSIS

Three land use alternatives developed by Williams + Paddon Architects + Planners, Inc. (Appendix B) were reviewed in order to provide input and recommendations on how each land plan would affect the PCGC storm drain system. The illustrative nature of the land plans did not lend itself to reliably simulating each alternative with the XPSTORM model, however, the results for the baseline conditions model were applied to highlight where proposed development coincides with existing deficiencies of the storm drain system. This section documents the input and recommendations provided to the design team used to guide the alternatives analysis process.

3.1 SITE-SPECIFIC ISSUES AND RECOMMENDATIONS

Alternative land use appeared to impact existing storm drain infrastructure in the following locations:

- The First Street Stormwater Detention Basin is located southwest of the roundabout between First Street and F Avenue. All three alternatives proposed development that would impact this detention basin. The detention basin is part of the off-site improvements for Home Depot. Any alteration of the First Street Stormwater Detention Basin would require that the stormwater management system for Home Depot and the surrounding area be evaluated in detail.

- The Professional Drive Stormwater Detention Basin is located at the corner of Professional Drive and First Street. Alternatives 1 and 3 proposed development that has the potential to impact this detention basin. Although Alternative 2 showed this area as green space, it will still need to account for this basin being part of the future landscape. The detention basin is part of off-site improvements for Home Depot. Any alteration of the Professional Drive Detention Basin will require that the stormwater management system for Home Depot and the surrounding area be evaluated in detail.

Alternatives appeared to coincide with areas that are prone to flooding and/or where the storm drain system is undersized in the following locations:

- The baseline model suggested that Subcatchments 6E, 6G, and 6H flood in the 10-year storm event. Any development that increases the impervious area within this area would exacerbate existing flooding problems. The storm drain system in this area appears to have been constructed as part of the original DeWitt Center, and would require upgrades extending down to Atwood Drive at the jail maintenance access driveway (approximately 1,600 linear feet) to comply with current Placer County design standards.

- Field observations and topographic mapping suggested that Atwood Drive may overtop during extreme events. In part, the overtopping is likely related to inadequacies in the storm drain system described in the item above.

- Field efforts thus far have not been conclusive in mapping stormwater infrastructure in the vicinity of Subcatchment 6B; it is likely that key manholes and/or drain inlets have been buried or overgrown with vegetation. Any development in this area will either require (1) subsurface investigations to conclusively locate existing stormwater infrastructure or (2) treating the area as new development requiring an entirely new stormwater system.

- The baseline model suggested that the area of the proposed Buildings D & L (Clerk Recorder Facility and CDRC Growth and Consolidation) floods in the 100-year storm event. Development of this area may require stormwater detention facilities to meet current Placer County design standards and should focus on minimizing additional impervious area.

Additional considerations are summarized as follows:

- Based on the available data, Building H (Fire Station Expansion) did not appear to be hydrologically connected to one of the five outfalls analyzed herein. Since its drainage does not impact campus-scale storm water planning issues, it was not included in the model. Improvements to this portion of PCGC should be accompanied by an on-site drainage report.

- The Ophir Canal is located along the eastern boundary between Willow Creek Drive and First Street. Any development in this area would need to accommodate the canal through the project footprint.

3.2 CAMPUS-WIDE ISSUES AND RECOMMENDATIONS

Beyond addressing the specific issues described in the previous section, additional considerations apply for stormwater planning of the entire PCGC campus. Given there are multiple stormwater basins already in place, controlling flow rates through regional basins may be an effective stormwater management strategy. Several regional basins could be designed to control the 10- and 100-year events, as well as the 2-year, 24-hour event to meet hydromodification requirements. It would be difficult, however, to design the regional basins to meet water-quality treatment criteria. Moreover, centralized water-quality treatment is not consistent with guidance of the West Placer Storm Water Quality Design Manual (2016). As such, water-quality treatment should be the responsibility of individual projects, and would achieve the favored dispersed treatment approach. Each project should set aside roughly 10 percent of the total acreage for water-quality treatment features during preliminary planning, although final design and calculations may demonstrate less space is required.

The success of this approach hinges on the assumption that the land use of individual developments will closely resemble the land use assumed for sizing of regional basins. If an individual project violates this assumption, the project may need to provide additional on-site flow control and storage volume. The approach will also require coordination with County staff for approval, and establishing a fee structure to share the cost of the regional basins among individual developments.

4 STRATEGY FOR OVERALL STORMWATER MANAGEMENT PLAN

This section describes the model results for the final PCGC Master Plan option ('Final Option'), and the full suite of stormwater infrastructure needed to meet regulatory requirements for flow and water-quality controls. The Final Option represents the evolution of the alternatives presented in the previous section into a vision for the PCGC that incorporates feedback from a variety of stakeholders and community members. This section begins by presenting the development of the XPSTORM model for the Final Option, goes on to present the model results and required improvements to the storm drain system, and concludes by providing general recommendations for how individual projects should approach water-quality treatment.

4.1 FINAL OPTION MODEL DEVELOPMENT

The baseline model was adapted to simulate the ultimate buildout condition for the Final Option. Land use in the model was revised based on a land plan provided by Williams + Paddon (dated October 10, 2018; see Appendix C). Land use was able to be revised in greater detail for two projects where preliminary grading plans were available: the Health and Human Services building in Subcatchments 2H and 2I and the Affordable Housing project in Subcatchment 4A. Subcatchment boundaries were revised based on the land plan and by assuming minimal adjustments to the existing topography (Plate 8). Subcatchment parameters were updated to reflect land use under the buildout condition (Table 5). The total watershed area for the Final Option is 9.2 acres larger than the baseline condition; the increase is from development in Subcatchments 1K, 4A, 5E, and 5F which were conservatively assumed to all drain to one of the five outfalls. Stormwater basins were added to the model, and in some cases, their shape and size adjusted. Similarly, outlet control structures for stormwater basins were redesigned to provide the appropriate flow controls. In all cases, preliminary grading plans for stormwater basins were developed to ensure they fit within the spatial confines of the land plan. Where new development coincided with pipes that the baseline model suggested to be undersized, the pipes were upsized to convey the 100-year event. The Final Option model maintained the same five outfalls from the PCGC campus as the baseline model, and utilized the baseline flow rates from the outfalls to establish thresholds for future outflow rates.

Preliminary designs for stormwater basins were developed according to Section VII of the SWMM to meter outflow rates from the 2-year, 24-hour event (to meet hydromodification requirements) up to the 100-year, 24-hour event. The PCGC stormwater basins will be classified as local detention basins; as such, one foot of freeboard for the 100-year event is required. Outlet structures for all basins were designed to have a low-flow orifice at the basin floor, and a high-flow weir just below the basin rim elevation to maintain the required amount of freeboard (with the exception of Basin 2A where the outlet structure will remain unchanged). All side slopes are no steeper than 3:1 (horizontal to vertical). None of the basins are so big as to fall under the jurisdiction of the California Division of Safety of Dams.

All pipes that the model indicated to be undersized are assumed to be upsized according to Section VI of the SWMM, which requires new development to convey the 10-year event and to prevent property damage and loss of life during the 100-year event. Without a detailed grading and site plan it is difficult to predict how the 100-year event might pose a threat to property or loss of life. For this reason, and to provide a conservative estimate for pipe sizes, all upsized pipes were designed to

convey the entire 100-year event. However, parts of the PCGC not slated for redevelopment (for instance, the parking area for the Community Development Resource Center where the baseline model showed to pipes to surcharge) were not upsized.

Table 5 – Final Option model catchment parameters

Catchment / Subcatchment	Area (acres)	Percent Impervious (%)
Catchment 1		
1A	10.0	3.7
1B	13.3	8.7
1C	5.0	58.5
1D	3.7	38.8
1E	12.5	16.6
1F	10.6	51.2
1G	11.8	72.2
1H	2.9	31.8
1I	7.7	43.2
1J	6.1	46.2
1K	3.4	43.8
1L	2.3	62.4
C1 Total	89.4	35.7
Catchment 2		
2A	1.7	8.0
2B	4.4	70.5
2C	3.2	68.8
2D	4.2	63.4
2E	6.9	46.0
2F	7.0	70.0
2G	3.6	52.6
2H	5.5	71.9
2I	6.2	71.2
C2 Total	42.5	62.0
Catchment 3		
3A	3.3	36.7
3B	4.7	75.5
3C	4.7	69.6
C3 Total	12.8	63.2

Catchment / Subcatchment	Area (acres)	Percent Impervious (%)
Catchment 4		
4A	2.9	54.8
4B	8.6	64.4
4C	1.3	85.3
C4 Total	12.8	64.4
Catchment 5		
5A	11.2	81.3
5C	5.8	73.7
5D	6.6	62.0
5E	9.0	70.3
5F	2.0	65.6
C5 Total	34.6	72.6
Catchment 6		
6A	11.6	57.5
6B	7.2	71.5
6C	1.4	99.4
6D	2.0	91.0
6E	3.5	79.4
6F	2.2	43.8
6G	2.9	63.0
6H	2.9	66.4
6I	6.4	59.4
6J	1.6	30.6
C6 Total	41.6	64.3
Total	233.6	54.1

4.2 FINAL OPTION MODEL RESULTS

A total of seven new stormwater basins and reconfiguration of three existing basins are needed to meet County requirements for flood control and hydromodification management. The locations of the

stormwater basins are shown in Plate 8, and their preliminary dimensions are summarized in Table 6. Other pertinent details for each basin are summarized as follows:

- Basin 1K: A new small basin to control runoff from the proposed residential development in the southwest corner of the planning area.
- Basin 1L: A new small basin to control runoff from Subcatchments 1G and 1L.
- Basin 2A: A large existing basin to control runoff from Catchment 2. A study by A.R. Associates (2000) indicated this basin is sized to accommodate a complete buildout condition, however, their study assumed different ultimate watershed conditions than the current land plan. The model indicated that the volume of Basin 2A will need to be increased to accommodate the additional runoff. The modeling assumed the basin could be expanded into the open space south of the solar farm. The footprint of the basin would need to be increased by roughly 8,700 square feet (34 percent).
- Basin 4A: A new small basin located in the northeast corner of the project site to control runoff from the north portion of the Affordable Housing project (Subcatchment 4A). The basin is proposed for dual use for flood control and water-quality treatment for the north portion of the Affordable Housing project.
- Basin 4B: A new small basin to control runoff from Subcatchment 4B.
- Basin 5C (First Street Basin): An existing basin, the volume of which is not fully utilized under existing conditions. The land plan impinges on the footprint of the existing basin, and it will need to be regraded to be compatible with the Final Option. The outlet structure will need to be reconfigured to control flow rates in a way that enhances utilization of the storage volume.
- Basin 5D (Professional Drive Basin): An existing basin that controls runoff from Subcatchments 5D and 5F (the south portion of the Affordable Housing project). The only change to Basin 5D is minor regrading of the emergency overflow outlet to raise its elevation by 1.0 feet so the basin will comply with the County freeboard criteria.
- Basin 5E: A new medium-sized basin to control runoff from Subcatchment 5E. While the footprint of this basin fits within the current land plan, it may be possible to reduce its size by grading a portion of Subcatchment 5E to drain to Basin 5C, thereby using the extra volume in Basin 5C to control flows from a portion of Subcatchment 5E.
- Basin 6A: A new large basin to control runoff from Catchment 6. If the size of Basin 6A cannot fit within the final land plan, there appear to be other areas in Catchment 6 (for instance, the landscaped area along Atwood Drive) that could be utilized to meet the total storage volume requirement.
- Basin 6F: A new medium-sized basin to control runoff from Subcatchments 6G and 6F. The footprint of Basin 6A was maximized within the open space south of the jail building, and Basin 6F is needed to provide supplemental storage to alleviate flooding that the baseline model showed to

occur along Atwood Drive.

Table 6 - Summary new and retrofitted stormwater basins

Basin	Basin Geometry				Outlet Structure Geometry		
	Bottom Area (ft^2)	Top Area (ft^2)	Depth (ft)	Total Volume (ac-ft)	Orifice Diameter (in)	Weir Width (ft)	Weir Stage (ft)
1K	1,665	5,588	6	0.48	6	4	4.25
1L	2,600	8,244	6	0.72	15	5	3.75
2A	14,939	35,720	6.5	3.81	same as existing		
4A	3,320	5,760	3.5	0.31	12	3	1.5
4B	572	2,783	6	0.15	12	4	4
5C	6,975	16,207	7	1.83	6" x 6"	4	6
5D	923	20,015	7	2.00	same as existing		
5E	9,705	21,156	8	2.78	4	5	6
6A	32,015	49,549	6	5.59	2.5' x 2.5'	4	4.75
6F	8,303	16,678	7	1.70	9	4	6

1. Basin geometry is inclusive of the required 1 foot of freeboard for storage basins.
2. With the exception of Basin 4A, all orifices were designed at stage = 0.0 ft (invert at basin floor). The orifice invert for Basin 4A is 1.0 ft above the basin floor because it is proposed for dual use for flood control and water quality treatment.
3. For basins proposed to be regraded (e.g. 2A and 5C) the figures are for the total new size.

Pipe segments that the model indicated required upsizing to meet the County standard for conveyance are shown in Plate 8. Many new minor collector pipes will need to be installed as each project comes online, but are not shown since the model focused on major arterial pipes only. Drainage studies for individual projects should consider how the capacity of collector pipes is affected by the hydraulic grade lines in the receiving arterial pipes.

The land plan shows development occurring on top of the existing Ophir Canal alignment. The canal is not known to be part of the current storm drain system, as such, enclosing the canal should simply consider the anticipated flow rates and other Nevada Irrigation District design requirements (beyond the scope of this report).

The model suggests that the stormwater basins are effective in limiting peak flow rates at each of the five outfalls from PCGC to be no greater than the existing peak flow rates. Table 7 compares peak flow rates under existing conditions to the Final Option. The Final Option will be implemented in four tiers. Each tier will be completed within five years for a total time of 20 years to achieve the buildout condition. Interim site conditions—where the campus would be somewhere between the existing and buildout condition—are evaluated in detail in the following section (Tiering Analysis).

Table 7 – Comparison of peak flow rates at outfalls between baseline conditions and the Final Option

Outfall	2-yr Event			10-yr Event			100-yr Event		
	Baseline	Final Option	Change	Baseline	Final Option	Change	Baseline	Final Option	Change
C1	17.8	16.7	-1.1	44.2	41.1	-3.1	85.3	81.4	-3.9
C2/3	23.6	22.3	-1.3	41.3	36.1	-5.2	66.5	65.2	-1.3
C4	9.3	6.5	-2.8	18.2	14.8	-3.4	29.6	26.4	-3.2
C5	9.2	7.7	-1.5	20.1	16.0	-4.1	34.2	26.7	-7.5
C6	22.8	10.5	-12.3	32.1	18.9	-13.2	37.7	34.4	-3.3

Nuisance flooding areas identified by the baseline model results would be addressed through improvements to the storm drain system with two exceptions. First, flooding during the 100-year event on the south side of Atwood Road within the Atwood Ranch 1 development (Node 6I/1) will not be addressed because the flooding occurs outside of the PCGC campus. Second, flooding during a 100-year event in the upper portions of Catchment 2, near the Finance Administrative Building, is not addressed. At most, the model showed the total volume of overtopping in this location to be 0.22 acre-feet. This amount of flooding only occurs during an extreme event; to address the flooding would require reconfiguring the storm drain system in a part of PCGC that is already built out.

4.3 WATER-QUALITY TREATMENT

The design team along with the County has agreed on a strategy of meeting flood control and hydromodification requirements with several campus-scale stormwater basins while leaving water-quality treatment requirements to individual projects as they come online. The West Placer Storm Water Quality Design Manual (WPSWQDM; 2016) provides detailed guidance for integrating low-impact development (LID) strategies into the site design for projects so that they will comply with Clear Water Act regulations, specifically, the National Pollutant Discharge Eliminations System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit.

The requirements for a project will vary depending on the amount of impervious area to be created or replaced, but in general, the work flow to meet water-quality requirements will be as follows:

1. Complete a site assessment to evaluate local conditions and identify constraints and opportunities for LID features;

2. Develop a site layout that includes site design measures, source control, and stormwater treatment features;

3. Implement site design measures to reduce surface runoff to the maximum extent practicable by infiltration, evapotranspiration, and/or harvesting;

4. Include source control measures to reduce the potential for stormwater and pollutants from coming in contact with one another (e.g. trash enclosures, covered storage areas, and developing “good housekeeping” operational practices);

5. Treat the remaining portion of the post-construction 85th percentile, 24-hour storm with

stormwater treatment features (biofiltration-based features such as bioretention facilities are preferred, but flow-through systems may be permitted in special cases);

6. Develop a Post-Construction Storm Water Quality Plan (SWQP) using the templates provided in the WPSWQDM and submit to the County for review and approval; and

7. Maintain the LID features for the life of the project through a well-developed operations and maintenance plan.

The WPSWQDM presents hydromodification management as a component of water-quality treatment design process, however, the campus-scale stormwater basins for PCGC will be designed to control the 2-year, 24-hour event to meet the County's hydromodification criteria. Bioretention facilities and other LID features typically provide some level of flow control, and will likely reduce flow rates beyond the post-construction flow rates estimated by the XPSTORM model.

5 TIERING ANALYSIS

This section describes the interim conditions model results for the PCGC Master Plan. The previous section presented model results for the Final Option (Tier 4) which will be implemented over a 20-year timeline. Elements of the Final Option have been grouped into four tiers. One tier will be completed roughly every 5 years with the end of the fourth tier coinciding with the end of the 20-year building horizon. This section presents results for three interim conditions—Tier 1, Tier 2, and Tier 3—that represent gradual build-out of PCGC toward the Final Option. Stormwater infrastructure needed to meet regulatory requirements for flow controls are presented for each tier.

5.1 TIERING ANALYSIS MODEL DEVELOPMENT

The baseline model was adapted by incrementally adding elements of the Final Option to simulate each tier. Land use in the model was revised based on construction and demolition plans provided by Williams + Paddon (dated October 10, 2018; see Appendix C). Subcatchment boundaries for each tier were also adjusted using engineering judgement to estimate the likely grading plan. Subcatchment parameters were calculated for the tiers and three additional XPSTORM models were compiled for Tiers 1, 2, and 3. Subcatchment parameters for baseline conditions and all four tiers are compared in Table 8 and Table 9, and land plans and stormwater system configurations are shown in Plates 5 through 7.

Table 8 – Tiering model subcatchment parameters

Outfall	Baseline		Tier 1		Tier 2		Tier 3		Tier 4	
	Area (ac)	% Imp	Area (ac)	% Imp	Area (ac)	% Imp	Area (ac)	% Imp	Area (ac)	% Imp
1A	12.4	3.0	10.0	3.7	10.0	3.7	10.0	3.7	10.0	3.7
1B	13.4	8.6	13.3	8.7	13.3	8.7	13.3	8.7	13.3	8.7
1C	5.0	58.5	5.0	58.5	5.0	58.5	5.0	58.5	5.0	58.5
1D	3.7	37.8	3.7	37.8	3.7	38.7	3.7	38.8	3.7	38.8
1E	14.8	16.4	14.8	16.4	14.8	15.8	12.5	16.6	12.5	16.6
1F	10.6	51.2	10.6	51.2	10.6	51.2	10.6	51.2	10.6	51.2
1G	11.8	67.9	11.8	67.9	11.8	72.5	11.8	72.5	11.8	72.2
1H	2.9	42.1	2.9	42.1	2.9	42.1	2.9	42.1	2.9	31.8
1I	7.7	43.2	7.7	43.2	7.7	43.2	7.7	43.2	7.7	43.2
1J	6.3	46.0	6.3	46.0	6.3	46.0	6.1	45.7	6.1	46.2
1K	N/A	N/A	3.4	43.8	3.4	43.8	3.4	43.8	3.4	43.8
1L	N/A	N/A	N/A	N/A	N/A	N/A	2.3	62.4	2.3	62.4
2A	1.6	8.0	1.6	8.0	1.6	8.0	1.6	8.0	1.6	8.0
2B	15.9	44.4	5.2	67.2	4.4	70.5	4.4	70.5	4.4	70.5
2C	3.2	68.1	3.2	68.5	3.2	68.8	3.2	68.8	3.2	68.8
2D	3.9	55.6	3.6	54.0	4.2	63.4	4.2	63.4	4.2	63.4
2E	5.7	42.6	5.4	40.6	5.6	46.3	6.9	39.8	6.9	46.0
2F	7.4	74.2	7.4	74.2	7.3	67.4	7.0	70.0	7.0	70.0
2G	3.6	52.6	3.6	52.6	3.6	52.6	3.6	52.6	3.6	52.6
2H	N/A	N/A	5.5	71.9	5.5	71.9	5.5	71.9	5.5	71.9
2I	N/A	N/A	5.7	71.7	6.2	71.2	6.2	71.2	6.2	71.2

Table 9 – Tiering model subcatchment parameters (continued)

Outfall	Baseline		Tier 1		Tier 2		Tier 3		Tier 4	
	Area (ac)	% Imp	Area (ac)	% Imp	Area (ac)	% Imp	Area (ac)	% Imp	Area (ac)	% Imp
3A	3.3	36.7	3.3	36.7	3.3	36.7	3.3	36.7	3.3	36.7
3B	4.7	75.5	4.7	75.5	4.7	75.5	4.7	75.5	4.7	75.5
3C	4.7	69.6	4.7	69.6	4.7	69.6	4.7	69.6	4.7	69.6
4A	2.4	16.7	2.9	49.8	2.9	52.4	2.9	54.8	2.9	54.8
4B	9.0	39.9	8.7	40.6	8.7	39.3	8.6	63.6	8.6	64.4
4C	1.3	75.3	1.3	75.2	2.1	60.1	1.3	85.3	1.3	85.3
5A	11.2	81.2	11.2	81.2	11.2	81.3	11.2	81.3	11.2	81.3
5C	3.6	57.9	3.6	57.9	6.9	61.5	5.8	73.7	5.8	73.7
5D	11.6	41.9	11.1	41.1	7.4	58.4	6.6	62.0	6.6	62.0
5E	2.6	0.1	2.6	0.1	9.0	36.1	9.0	70.3	9.0	70.3
5F	N/A	N/A	2.0	65.6	2.0	65.6	2.0	65.6	2.0	65.6
6A	11.5	55.7	11.5	55.4	11.7	54.8	11.6	57.5	11.6	57.5
6B	7.7	75.6	7.7	75.6	7.7	69.2	7.2	71.5	7.2	71.5
6C	1.4	99.4	1.4	99.4	1.4	99.4	1.4	99.4	1.4	99.4
6D	5.3	64.7	5.3	64.7	4.2	51.8	2.0	91.0	2.0	91.0
6E	4.9	67.7	4.9	65.8	4.9	53.3	3.5	79.4	3.5	79.4
6F	2.4	42.4	2.4	41.8	2.2	43.8	2.2	43.8	2.2	43.8
6G	2.3	69.9	2.4	69.9	2.4	44.9	2.9	63.0	2.9	63.0
6H	3.8	90.4	3.8	90.4	3.2	26.3	8.9	63.4	8.9	66.4
6I	6.4	59.4	6.4	59.4	6.4	59.4	6.4	59.4	6.4	59.4
6J	N/A	N/A	N/A	N/A	1.6	23.3	1.6	30.6	1.6	30.6

The tiering models maintained the same five outfalls from the PCGC campus as the baseline and Final Option models, and utilized the baseline flow rates from the outfalls to establish thresholds for outflow rates for each tier. The model was used to assess when each of the improvements to the stormwater system will need to be implemented to prevent flow rates at the five outfalls from exceeding baseline conditions. Recommendations for timing NID canal realignments were made on a construction feasibility basis, and should be evaluated in greater detail by County staff and the design civil engineer for other constraints that were not considered in this study (for instance, conflicts with other utilities).

5.2 TIERING ANALYSIS RESULTS

The model results for the tiering analysis showed that at no point during the 20-year build-out horizon would peak flow rates at the five outfalls be greater than baseline conditions. Peak flow rates at the outfalls are summarized in Tables 10 through 12. Similar to the model results for the Final Option, the nuisance flood areas on Atwood Ranch 1 and near the Finance Administration Building are anticipated to persist for all tiers.

Table 10 – 2-year event model results for tiering analysis

Outfall	2-yr Event				
	Baseline	Tier 1	Tier 2	Tier 3	Tier 4
C1	17.8	17.4	17.5	16.8	16.7
C2/3	23.6	22.9	23.0	22.3	22.3
C4	9.3	5.9	6.2	6.5	6.5
C5	9.2	8.9	7.7	7.7	7.7
C6	22.8	22.8	21.1	10.5	10.5

Table 11 – 10-year event model results for tiering analysis

Outfall	10-yr Event				
	Baseline	Tier 1	Tier 2	Tier 3	Tier 4
C1	44.2	43.5	43.7	41.2	41.1
C2/3	41.3	36.3	36.7	36.0	36.1
C4	18.2	12.8	14.2	14.8	14.8
C5	20.1	19.3	16.1	16.0	16.0
C6	32.1	32.1	31.2	18.9	18.9

Table 12 – 100-year event model results for tiering analysis

Outfall	100-yr Event				
	Baseline	Tier 1	Tier 2	Tier 3	Tier 4
C1	85.3	84.1	84.2	81.5	81.4
C2/3	66.5	64.8	65.2	66..1	65.2
C4	29.6	25.4	25.4	26.4	26.4
C5	34.2	33.1	26.9	26.7	26.7
C6	37.7	37.7	37.6	34.3	34.4

5.3 STORM DRAIN SYSTEM IMPLEMENTATION PHASING RECOMMENDATIONS

The tiering analysis modeling results are only valid if certain elements of the storm drain system are implemented with each tier. In some cases, temporary grading or orifice plates on stormwater basin outlet structures are needed to achieve the modeled flow rates. These temporary features are being recommended on a value engineering basis; that is, to defer construction of non-critical stormwater improvements to future tiers whenever possible. The stormwater elements required for each tier are summarized as follows:

Tier 1:

- Construct Basin 4A. Basin 4A will control flows from the north portion of the affordable housing project and part of realigned First Street (Subcatchment 4A).
- Construct Basin 4B. Basin 4B will control flows from the remaining part of realigned First Street and for future development during Tier 3 in Subcatchment 4B.

- Reconfigure Basin 5C and Basin 5D. The model showed the maximum 100-year water surface elevation in Basin 5D and flow rates at Outfall C5 would exceed baseline conditions without mitigation for the Tier 1 improvements. The increase in flow rates can be offset with a temporary orifice plate (a 6-inch square plate fixed on to the existing 9-inch square plate) on the First Street Basin (Basin 5C), which the baseline model showed to be underutilized. The increase in the maximum water surface elevation in Basin 5D can be addressed by placing fill to raise a low point along the basin rim by approximately 0.9 feet. As future tiers come online, the maximum water surface elevation will decrease, and the fill will no longer be critical to maintaining the required amount of freeboard in Basin 5D.
- Enclose NID Canal – North Segment. The existing NID canal along First Street will need to be enclosed for roughly 900 feet from the north end of the Professional Drive roundabout to 250 feet south of Bell Road. The canal enclosure is not part of the stormwater management strategy and is not represented in the XPSTORM model, however, it is needed to accommodate Tier 1 improvements and the additional drainage area from the new surface is accounted for in the modeling.
- Reconfigure Basin 2A. The model showed that the peak water surface elevation during the 100-year event in Basin 2A would increase by 0.5 feet once Tier 1 is implemented (without altering the basin to increase its volume), which would leave roughly 0.3 feet of freeboard. Basin 2A should be regraded to increase its volume by 1.2 acre-feet. Regrading should include increasing the basin footprint by roughly 8,700 square feet to increase the storage volume in lower elevation bands of the basin. Doing so will allow Basin 2A to control flows to no greater than pre-project conditions with no alterations to the current outlet structure. The Health and Human Services project represents the largest increase in impervious area within Catchment 2 for the entire PCGC Master Plan Update, and is driving the Basin 2A reconfiguration.
- Improve First Street storm drain. The model showed undersized pipes would potentially cause surface flooding. The storm drain improvements will increase pipe capacity to conform with County criteria for freeboard during the 10-year event.
- Improve B Avenue storm drain. Without mitigation, the hydraulic grade line does not meet County criteria for freeboard during the 10-year event. The model showed that replacing existing storm drain pipes with smooth-walled HDPE pipe of the same diameter would increase the capacity of the storm drain and provide sufficient freeboard.
- Construct Basin 1K. Basin 1K will control flows from the new impervious area in residential development (Subcatchment 1K).

Tier 2:

- Construct Basin 5E. Basin 5E will control flows from the east portion of the first phase of the commercial center.
- Reconfigure Basin 5C. Basin 5C will control flows from the west portion of the first phase of the commercial center. The reconfigured Basin 5C is of similar size as existing Basin 5C, and the regrading is needed to accommodate the basin within the planned Tier 2 improvements. A permanent 6-inch square orifice should be included in the outlet structure for Basin 5C near the floor of the basin.
- Enclose NID Canal – South Segment. The existing NID canal along First Street will need to be

enclosed for roughly 780 feet from an existing lateral connection north of the Atwood Fire Station to the Willow Creek roundabout. The enclosed canal will need to be carefully designed to maintain the performance of the lateral connection. The canal enclosure is not part of the stormwater management strategy and is not represented in the XPSTORM model, however, it is needed to accommodate Tier 2 improvements and the newly-created surface area is accounted for in the modeling.

- Improve E Avenue storm drain. The baseline model identified several undersized storm drain pipes along E Avenue. The Williams + Paddon plans showed demolition and realignment of a portion of E Avenue during Tier 2 which would be an appropriate time to address deficiencies in the storm drain system. The new 24-inch diameter pipe is significant not only to collecting runoff from E Avenue, but also for conveying runoff from Tier 3 and 4 improvements in Subcatchment 6H.
- Construct Basin 6F. Basin 6F will control runoff from Tier 3 and Tier 4 improvements within Subcatchment 6H. Until Basin 6A is constructed during Tier 3, a temporary 3-inch diameter orifice plate is required to control peak flow rates at Outfall C6. Construction of Basin 6F will also require an outlet pipe that daylights in the ditch upstream of Richardson Drive.
- Improve Subcatchment 6J storm drain. Although minimal improvements are proposed for Subcatchment 6J, runoff will need to be safely routed across First Street and into the storm drain system. An 18-inch pipe is proposed to route runoff from Subcatchment 6J to the storm drain system near the west end of the corporation yard.
- Improve Subcatchment 6B storm drain. During field investigations it was noted that a 30-inch pipe flows into a 24-inch pipe. The model showed that the constriction would cause flooding in the open space to the south of the Corporation Yard (Node 6B/1). A 30-inch pipe is proposed to replace the existing 24-inch pipe in the same location.

Tier 3:

- Replace Basin 6F orifice plate. The temporary 3-inch diameter orifice plate on the outlet structure for Basin 6F will be replaced with a 9-inch diameter plate. This work must be done concurrently with construction of Basin 6A.
- Construct Basin 6A. Basin 6A will control runoff from the commercial center in Subcatchment 6H. Basin 6F is in series with Basin 6A and the two basins work together to provide flow control. Basin 6A will control flows leaving Outlet C6 so that Atwood Road is not overtopped in large storm events and the clogged pipe leading to Subcatchment 3A may then be abandoned. It is possible to construct Basin 6A during Tier 2 which would preclude the need to install a temporary orifice plate on Basin 6F in Tier 2 and subsequently replace the orifice plate in Tier 3. Since Basin 6A will alleviate flooding on Atwood Road, it may be desirable to implement the the Tier 3 basin improvements sooner.
- Replace Richardson Drive culvert. The model showed minor ponding on the upstream side of the 3-foot diameter culvert under Richardson Drive (just north of Atwood Road intersection). A 4-foot by 3-foot box culvert is proposed to increase the capacity at this crossing and to eliminate the ponding. It is possible to replace the culvert during Tier 2 without adversely affecting other elements of the storm drain system.
- Construct Basin 1L. Basin 1L will control runoff for projects along B Avenue.

- Enclose NID Canal – North Segment Extension. The NID canal enclosure completed during Tier 1 will need to be extended to the north for roughly 300 feet to Bell Road to accommodate Tier 3 improvements.

Tier 4:

- No new improvements to the storm drain are required for Tier 4. The stormwater facilities in place at the end of Tier 3 are adequate to manage the small changes in land use that will occur between Tier 3 and Tier 4.

6 CONCLUSIONS

The XPSTORM model showed that regulatory requirements for flood control and hydromodification can be met by installing a series of campus-scale stormwater basins. The stormwater basins and other improvements to the storm drain system should be phased according to the tiering analysis results presented herein to limit peak flow rates for interim conditions (Tiers 1, 2, and 3) and for the Final Option (Tier 4) to no greater than baseline conditions. Water-quality treatment will be addressed as each individual project comes online, the design for which will follow the guidance of the WPSWQDM.

Several arterial storm drain pipes will need to be upsized to accommodate the flow rates anticipated for the Final Option, particularly in Catchment 6 where much of the storm drain infrastructure has not been improved since the original DeWitt Center was constructed.

In aggregate, the improvements to the storm drain system are expected to alleviate the surface flooding problems that are predicted under existing conditions during the 10-year and larger events. The only exceptions are (1) shallow flooding the model showed in the parking lot of the Community Development Resource Center, which is outside of the development envelope for the Final Option, and (2) shallow flooding on the south side of Atwood Drive in the Atwood Ranch 1 neighborhood which is outside of the PCGC campus.

Minor collector storm drain pipes were not modeled as part of this study; this subject will be addressed in subsequent drainage reports for individual projects, and should consider how the hydraulics of the arterial storm drain pipes (e.g. implied tailwater for local improvements) inform the design of smaller, lateral pipes.

7 LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice in surface-water hydrology existing in Northern California for projects of similar scale at the time the investigations were performed. No other warranties, expressed or implied, are made.

As is customary, we note that readers should recognize that interpretation and evaluation of subsurface conditions and physical factors affecting the hydrologic context of any site is a difficult and inexact art. Judgments leading to conclusions and recommendations are generally made with an incomplete knowledge of the conditions present. More extensive or extended studies, including additional hydrologic baseline monitoring, can reduce the inherent uncertainties associated with such studies. We note, in particular, that many factors affect local and regional ground-water levels. If the client wishes to further reduce the uncertainty beyond the level associated with this study, the authors should be notified for additional consultation.

We have used standard environmental information such as precipitation, topographic mapping, and soil mapping, in our analyses and approaches without verification or modification, in conformance with local custom. New information or changes in regulatory guidance could influence the plans or recommendations, perhaps fundamentally. As updated information becomes available, the interpretations and recommendations contained in this report may warrant change. To aid in revisions, we ask that readers or reviewers advise us of new plans, conditions, or data of which they are aware.

Concepts, findings and interpretations contained in this report are intended for the exclusive use of the Cartwright Engineering under the conditions presently prevailing except where noted otherwise. Their use beyond the boundaries of the site could lead to environmental or structural damage, and/or to noncompliance with water-quality policies, regulations or permits. Data developed or used in this report were collected and interpreted solely for developing an understanding of the hydrologic context at the site as an aid to stormwater master planning. They should not be used for other purposes without great care, updating, review of sampling and analytical methods used, and consultation with the authors.

Finally, we ask once again that readers who have additional pertinent information, who observed changed conditions, or who may note material errors should contact us with their findings at the earliest possible date, so that timely changes may be made.

Plates

Plate 1 – Baseline model configuration schematic
Plate 2 – Baseline model results for ponding during the 10-year event
Plate 3 – Baseline model results for ponding during the 100-year event
Plate 4 – Baseline model results and existing land use
Plate 5 – Tier 1 model results and system improvements
Plate 6 – Tier 2 model results and system improvements
Plate 7 – Tier 3 model results and system improvements
Plate 8 – Tier 4 (final option) model results and system improvements
Plate 9 – Final Option model configuration schematic

LEGEND

- Model Node
- Model Storage Basin
- Model Link
- Subcatchment boundary
- PCGC Boundary

The model links and nodes shown on this map do not necessarily represent actual locations of storm drain infrastructure. In many cases, geometric complexities of the storm drain system were simplified within the XPSTORM model to maintain a reasonable model scale while preserving accuarcy of results. In all cases parameters for links and nodes in the model (e.g. length, pipe size, inverts, etc.) were estimated from the best-available information.

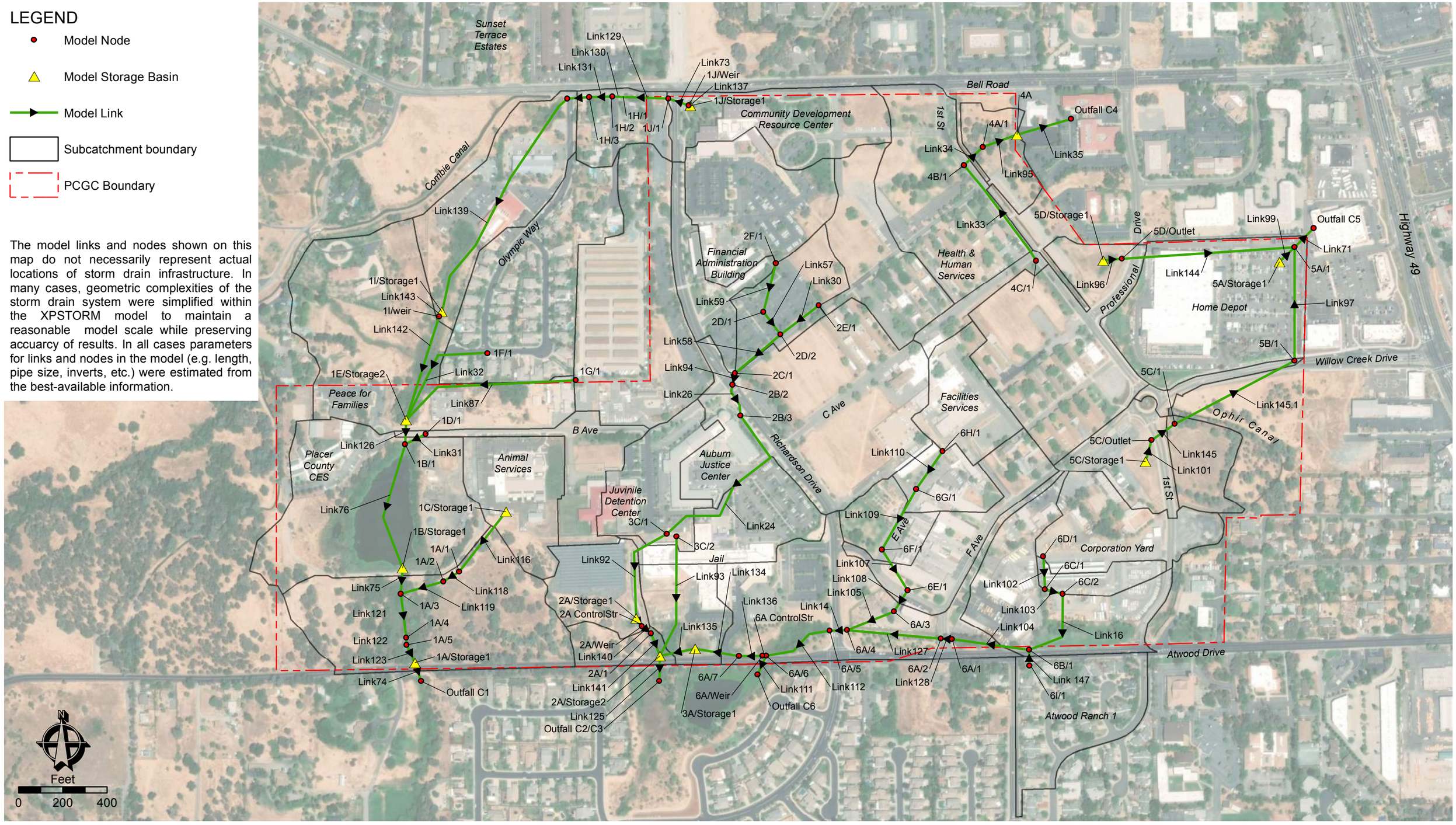


PLATE 1 - BASELINE MODEL CONFIGURATION SCHEMATIC

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

COUNTY OF Placer

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.

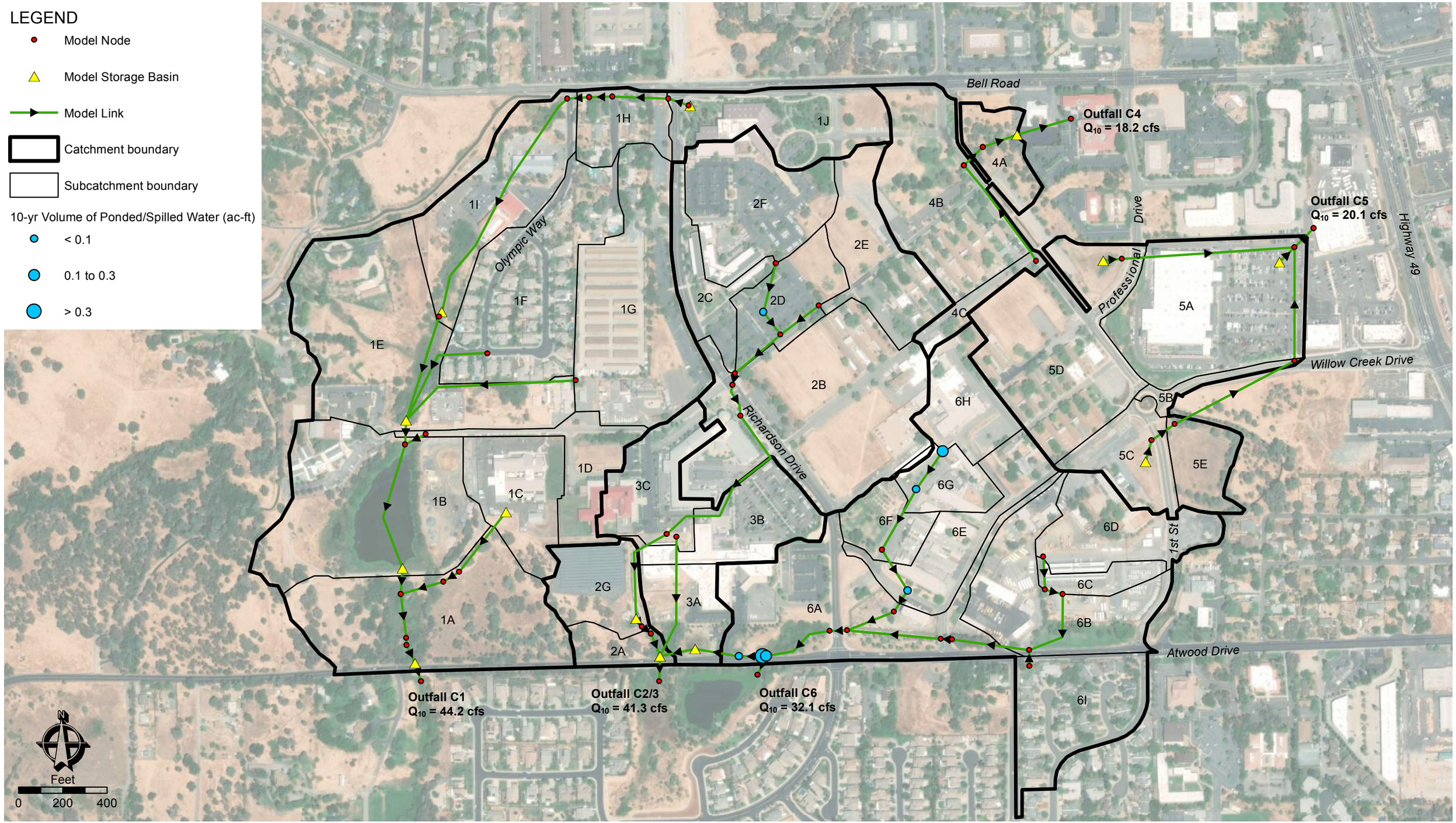


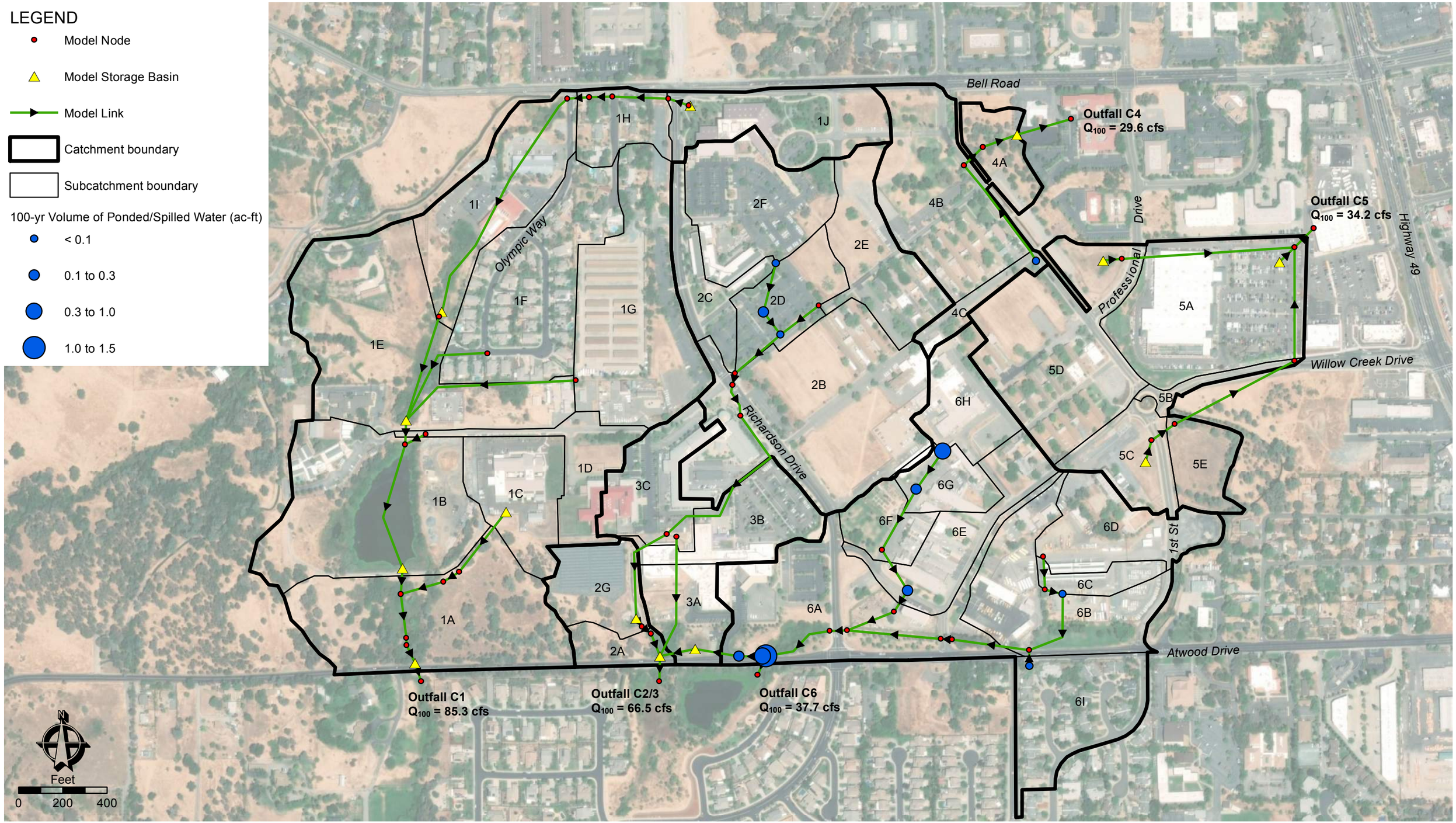
PLATE 2 - BASELINE MODEL RESULTS FOR PONDING DURING THE 10-YEAR EVENT

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

COUNTY OF Placer

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.



COUNTY OF Placer

PLATE 3 - BASELINE MODEL RESULTS FOR PONDING DURING THE 100-YEAR EVENT

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.

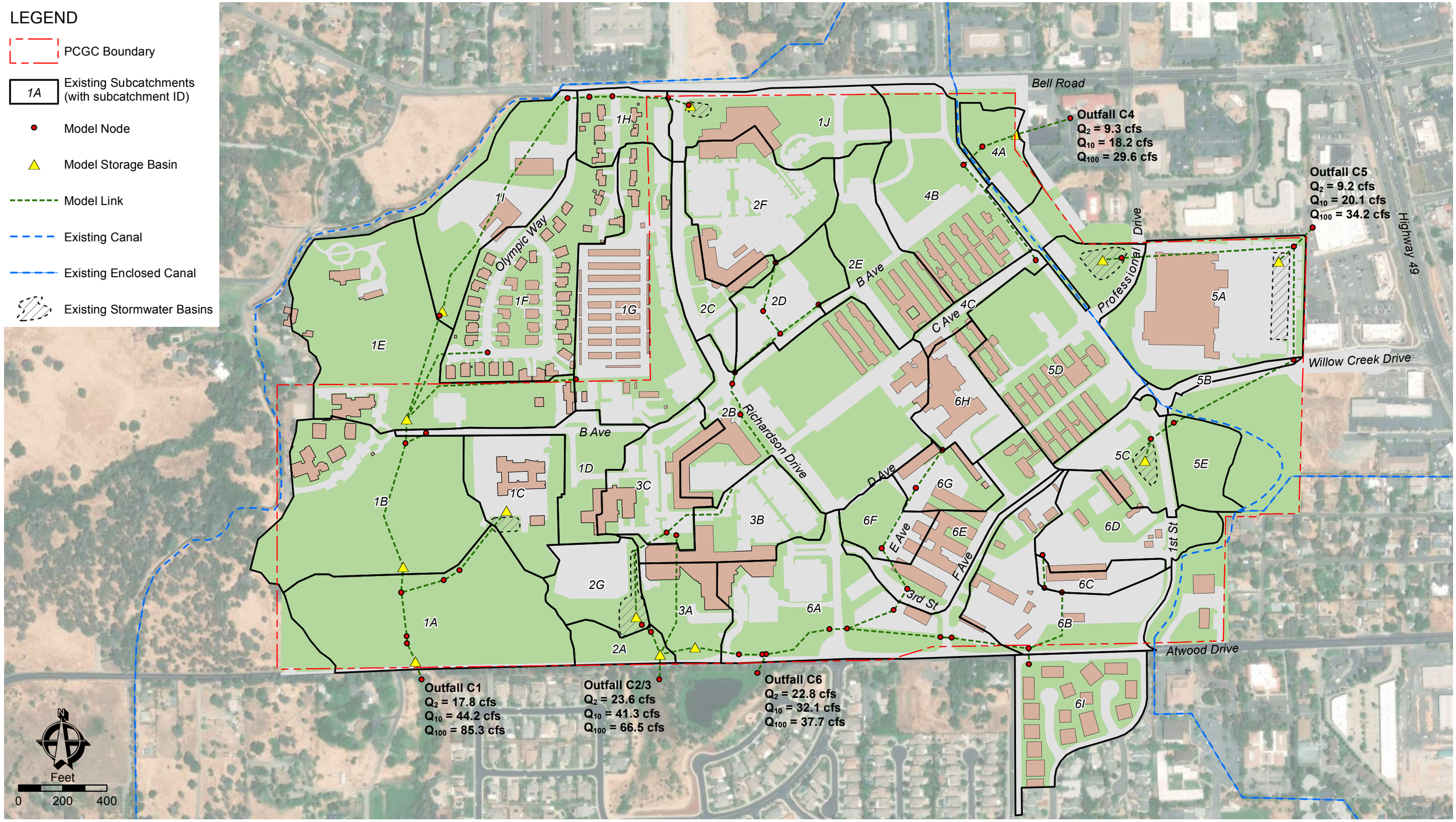


PLATE 4 - BASELINE CONDITIONS MODEL RESULTS AND EXISTING LAND USE

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

COUNTY OF Placer

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.

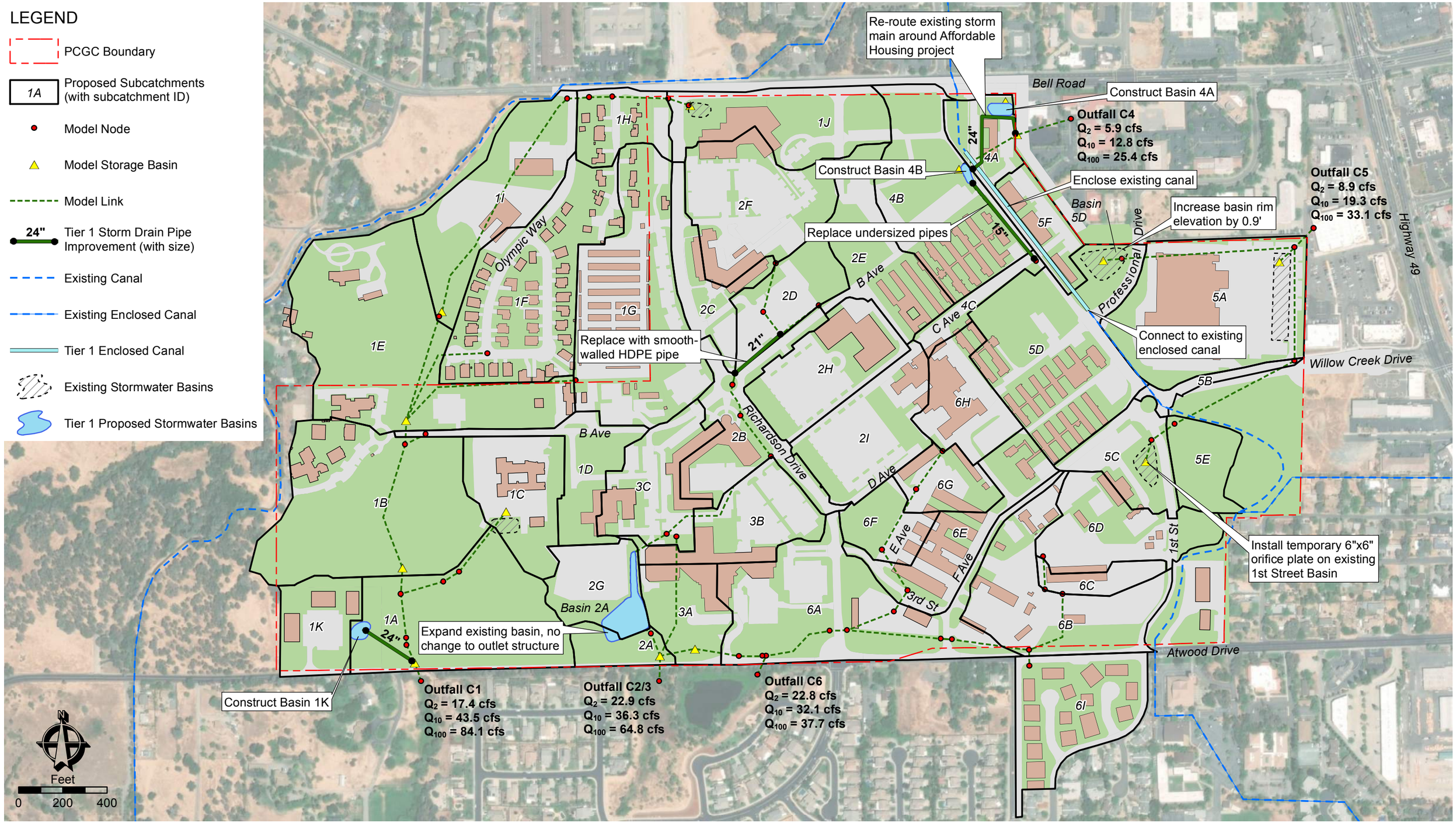
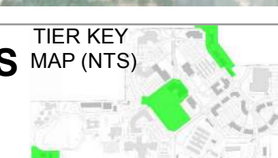


PLATE 5 - TIER 1 MODEL RESULTS AND SYSTEM IMPROVEMENTS

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

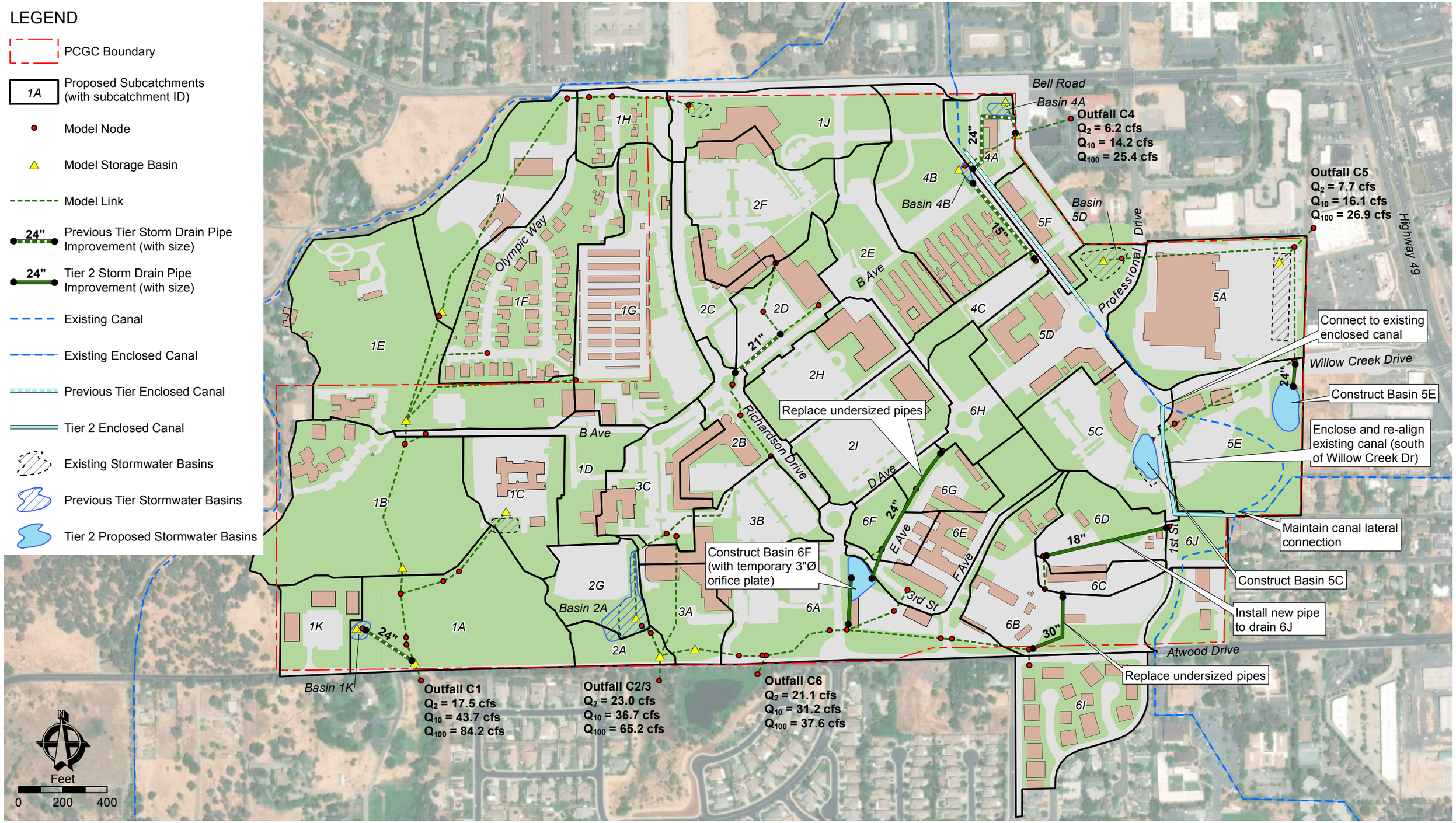
TIER KEY MAP (NTS)



COUNTY OF Placer

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.



COUNTY OF Placer

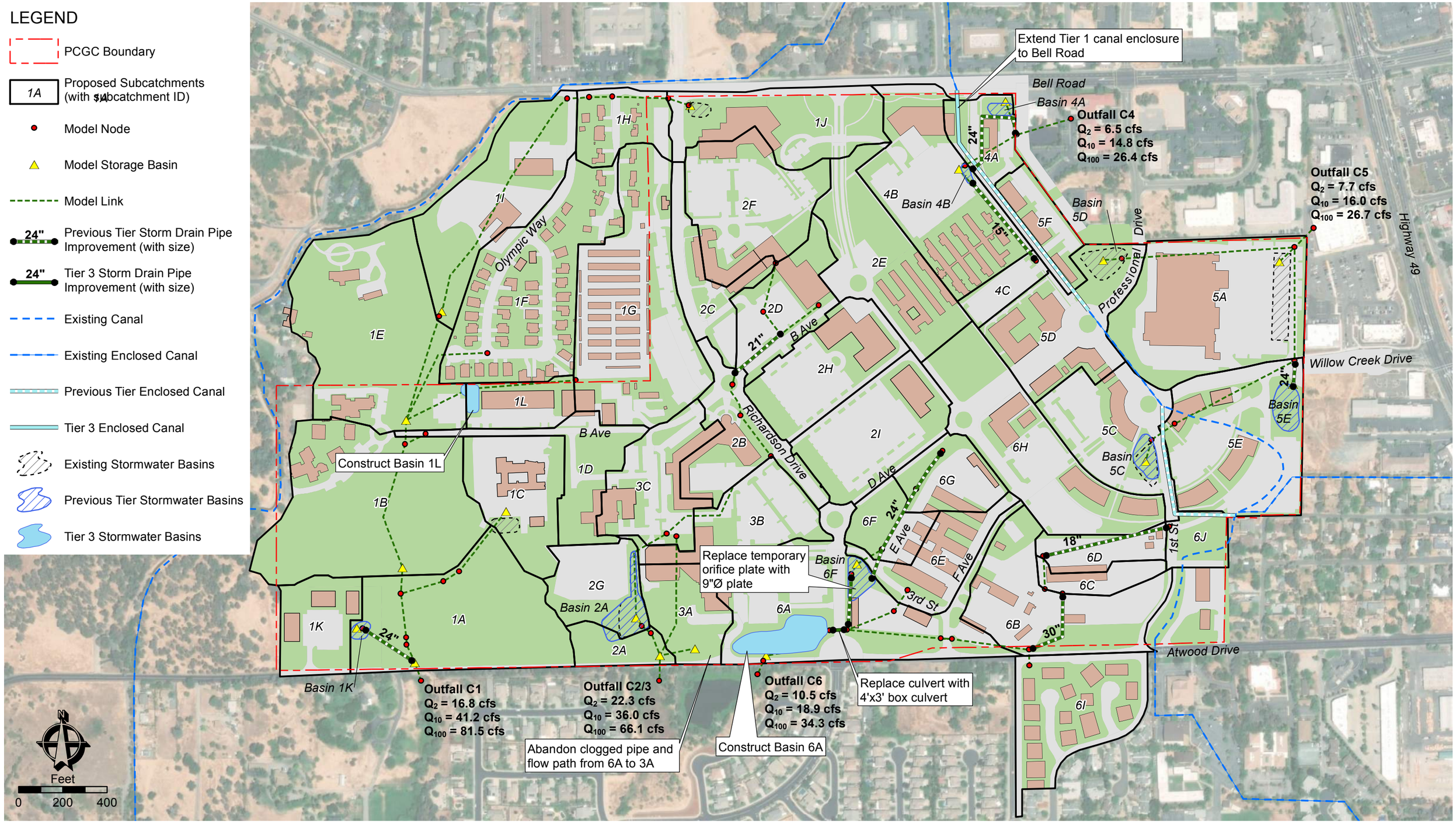
PLATE 6 - TIER 2 MODEL RESULTS AND SYSTEM IMPROVEMENTS

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

TIER KEY MAP (NTS)

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.



COUNTY OF Placer

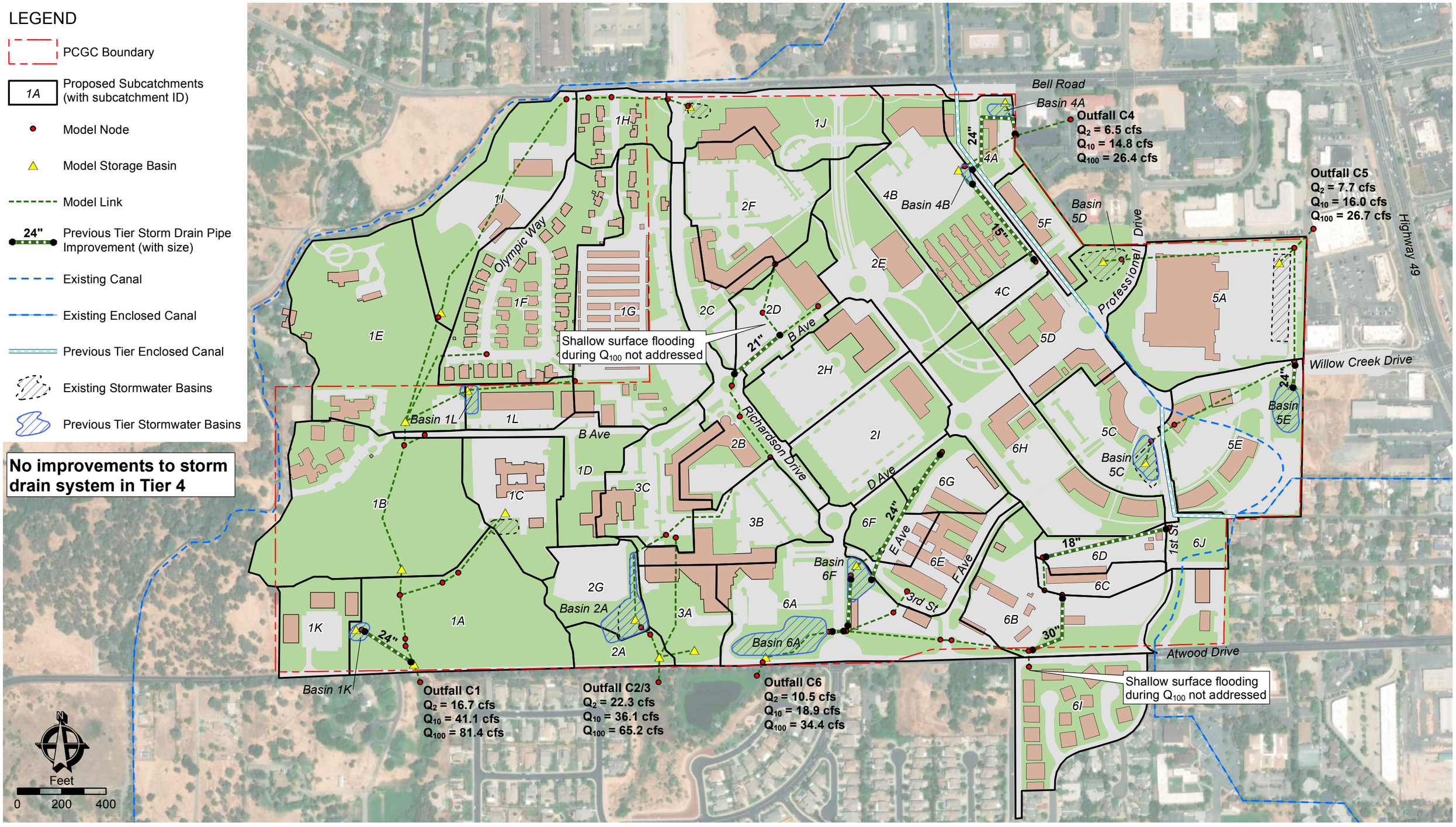
PLATE 7 - TIER 3 MODEL RESULTS AND SYSTEM IMPROVEMENTS

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

TIER KEY MAP (NTS)

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.

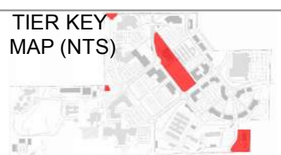


COUNTY OF Placer

PLATE 8 - TIER 4 MODEL RESULTS AND SYSTEM IMPROVEMENTS

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

TIER KEY MAP (NTS)



CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.

Model Node

Model Storage Basin

Model Link

Subcatchment boundary

The model links and nodes shown on this map do not necessarily represent actual locations of storm drain infrastructure. In many cases, geometric complexities of the storm drain system were simplified within the XPSTORM model to maintain a reasonable model scale while preserving accuarcy of results. In all cases parameters for links and nodes in the model (e.g. length, pipe size, inverts, etc.) were estimated from

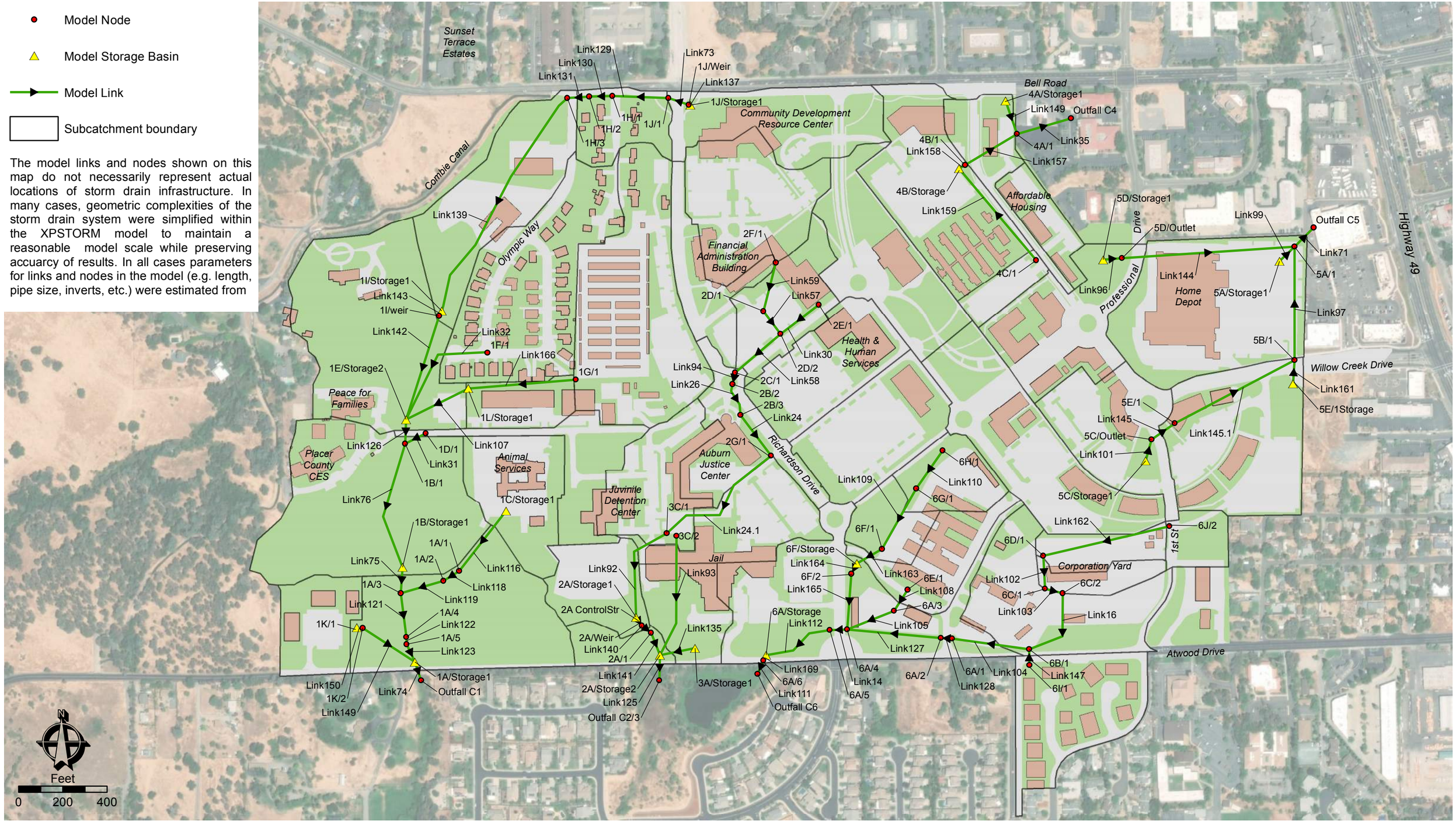


PLATE 9 - FINAL OPTION MODEL CONFIGURATION SCHEMATIC

MASTER DRAINAGE REPORT - PLACER COUNTY GOVERNMENT CENTER

COUNTY OF Placer

CARTWRIGHT NOR CAL

© 2019 Balance Hydrologics, Inc.

Appendix A: XP STORM Model Results

Node Name	Ground Elevation (ft)	Invert Elevation (ft)	Type
1A/1	1387.50	1385.50	Node
1A/2	1388.00	1383.00	Node
1A/3	1370.00	1365.00	Node
1A/4	1366.00	1360.00	Node
1A/5	1365.00	1358.00	Node
1A/Storage1	1367.50	1357.00	Storage Node
1B/1	1387.70	1380.80	Node
1B/Storage1	1384.30	1380.00	Storage Node
1C/Storage1	1396.50	1390.00	Storage Node
1D/1	1387.26	1382.85	Node
1E/Storage2	1387.70	1381.90	Storage Node
1F/1	1395.00	1386.00	Node
1G/1	1398.78	1395.00	Node
1H/1	1426.00	1423.50	Node
1H/2	1425.00	1423.00	Node
1H/3	1425.10	1421.50	Node
1I/Storage1	1393.00	1388.50	Storage Node
1I/weir	1393.00	1388.50	Node
1J/1	1428.00	1425.00	Node
1J/Storage1	1430.00	1426.00	Storage Node
1J/Weir	1430.00	1425.50	Node
2A/1	1399.00	1392.50	Node
2A/Storage1	1402.00	1393.00	Storage Node
2A/Storage2	1390.50	1387.00	Storage Node
2A/Weir	1398.00	1393.00	Node
2B/2	1411.17	1407.20	Node
2B/3	1411.46	1406.50	Node
2C/1	1411.61	1408.58	Node
2D/1	1417.18	1412.81	Node
2D/2	1417.19	1410.38	Node
2E/1	1422.00	1417.59	Node
2F/1	1421.76	1416.64	Node
3A/Storage1	1390.50	1386.00	Storage Node
3C/1	1405.92	1400.00	Node
3C/2	1404.34	1395.14	Node
4A	1415.50	1412.20	Storage Node
4A/1	1425.84	1420.00	Node
4B/1	1429.00	1424.00	Node
4C/1	1429.30	1427.00	Node
5A/1	1405.36	1385.30	Node
5A/Storage1	1406.00	1388.76	Storage Node
5B/1	1404.76	1395.62	Node
5C/Outlet	1435.00	1428.00	Node
5C/Storage1	1435.00	1428.00	Storage Node
5D/Outlet	1413.00	1388.32	Node

Node Name	Ground Elevation (ft)	Invert Elevation (ft)	Type
5D/Storage1	1413.00	1406.00	Storage Node
5E/1	1433.00	1423.00	Node
6A/1	1408.00	1405.50	Node
6A/2	1407.70	1403.50	Node
6A/3	1405.00	1402.49	Node
6A/4	1397.86	1394.86	Node
6A/5	1395.89	1392.89	Node
6A/6	1393.00	1388.20	Node
6A/7	1391.00	1388.00	Node
6A/Weir	1390.00	1388.20	Node
6B/1	1416.50	1413.62	Node
6C/1	1427.57	1420.44	Node
6C/2	1426.04	1419.60	Node
6D/1	1426.99	1421.76	Node
6E/1	1406.89	1403.61	Node
6F/1	1414.95	1412.25	Node
6G/1	1424.34	1422.29	Node
6H/1	1429.78	1427.00	Node
6I/1	1417.00	1413.89	Node
Outfall C1	1358.00	1354.00	Node
Outfall C2/3	1390.00	1385.00	Node
Outfall C4	1407.00	1401.30	Node
Outfall C5	1391.57	1385.14	Node
Outfall C6	1391.00	1388.00	Node

Node Name	Ground Elevation (ft)	Maximum HGL (ft)		
		2-yr	10-yr	100-yr
1A/1	1387.50	1386.08	1386.34	1386.53
1A/2	1388.00	1385.24	1385.32	1385.36
1A/3	1370.00	1365.15	1365.25	1365.38
1A/4	1366.00	1360.21	1360.38	1360.59
1A/5	1365.00	1358.36	1358.63	1358.97
1A/Storage1	1367.50	1357.69	1358.08	1358.53
1B/1	1387.70	1381.07	1381.25	1381.66
1B/Storage1	1384.30	1380.74	1381.17	1381.64
1C/Storage1	1396.50	1390.61	1390.90	1391.57
1D/1	1387.26	1383.31	1383.48	1383.71
1E/Storage2	1387.70	1382.46	1382.76	1383.11
1F/1	1395.00	1386.84	1387.24	1388.07
1G/1	1398.78	1395.41	1395.62	1395.89
1H/1	1426.00	1424.00	1424.08	1424.18
1H/2	1425.00	1423.47	1423.54	1423.64
1H/3	1425.10	1421.76	1421.83	1421.89
1I/Storage1	1393.00	1389.88	1390.57	1391.75
1I/weir	1393.00	1388.91	1389.05	1389.20
1J/1	1428.00	1425.53	1425.62	1425.75
1J/Storage1	1430.00	1426.97	1427.72	1428.60
1J/Weir	1430.00	1426.17	1426.28	1426.44
2A/1	1399.00	1392.89	1393.03	1393.20
2A/Storage1	1402.00	1395.68	1397.24	1398.20
2A/Storage2	1390.50	1387.93	1388.40	1389.37
2A/Weir	1398.00	1393.89	1394.21	1394.61
2B/2	1411.17	1408.48	1408.99	1409.30
2B/3	1411.46	1407.80	1408.32	1408.74
2C/1	1411.61	1409.32	1409.72	1409.98
2D/1	1417.18	1413.61	1417.31	1418.19
2D/2	1417.19	1412.68	1416.81	1417.60
2E/1	1422.00	1418.09	1418.65	1421.82
2F/1	1421.76	1417.39	1420.28	1422.17
3A/Storage1	1390.50	1388.70	1388.76	1389.36
3C/1	1405.92	1401.18	1401.67	1402.08
3C/2	1404.34	1395.73	1395.92	1396.15
4A	1415.50	1412.83	1413.10	1413.40
4A/1	1425.84	1420.39	1420.55	1420.69
4B/1	1429.00	1424.74	1425.10	1427.04
4C/1	1429.30	1427.47	1428.78	1429.46
5A/1	1405.36	1386.38	1386.90	1387.43
5A/Storage1	1406.00	1390.16	1390.45	1390.70
5B/1	1404.76	1396.09	1396.25	1396.44
5C/Outlet	1435.00	1428.38	1428.47	1428.52
5C/Storage1	1435.00	1429.58	1430.28	1431.24

Node Name	Ground Elevation (ft)	Maximum HGL (ft)		
		2-yr	10-yr	100-yr
5D/Outlet	1413.00	1406.39	1406.50	1406.60
5D/Storage1	1413.00	1408.25	1409.95	1412.01
5E/1	1433.00	1423.39	1423.53	1423.68
6A/1	1408.00	1406.02	1406.24	1406.46
6A/2	1407.70	1404.44	1404.61	1404.77
6A/3	1405.00	1403.11	1403.19	1403.26
6A/4	1397.86	1396.43	1396.93	1397.57
6A/5	1395.89	1393.55	1393.72	1394.98
6A/6	1393.00	1391.66	1393.40	1394.73
6A/7	1391.00	1390.74	1391.51	1392.14
6A/Weir	1390.00	1390.74	1391.50	1392.14
6B/1	1416.50	1414.94	1415.28	1415.64
6C/1	1427.57	1421.06	1421.36	1426.27
6C/2	1426.04	1420.70	1421.29	1426.19
6D/1	1426.99	1422.42	1422.65	1426.85
6E/1	1406.89	1405.98	1407.20	1407.90
6F/1	1414.95	1412.76	1412.91	1413.13
6G/1	1424.34	1424.44	1424.74	1425.15
6H/1	1429.78	1430.29	1430.83	1431.40
6I/1	1417.00	1415.18	1416.09	1417.26
Outfall C1	1358.00	1354.69	1355.08	1355.53
Outfall C2/3	1390.00	1385.93	1386.40	1387.30
Outfall C4	1407.00	1401.93	1402.20	1402.50
Outfall C5	1391.57	1386.10	1386.58	1387.04
Outfall C6	1391.00	1389.83	1389.83	1389.83

Name	Shape	Diameter/ Height (ft)	Bottom Width (ft)	Length (ft)	Downstream Invert Elevation (ft)	Upstream Invert Elevation (ft)	Slope (ft/ft)
Link14	Circular	3	--	80	1392.89	1394.86	0.025
Link16	Circular	2	--	486	1414.00	1419.60	0.012
Link24	Circular	4	--	864	1400.00	1406.50	0.008
Link26	Circular	3	--	154	1406.50	1407.20	0.005
Link30	Circular	1.5	--	218	1411.24	1417.59	0.029
Link31	Circular	1.5	--	80	1381.00	1382.85	0.023
Link32	Circular	2	--	70	1385.25	1386.00	0.011
Link33	Circular	0.83	--	542	1424.00	1427.00	0.006
Link34	Circular	1.67	--	120	1420.00	1424.00	0.033
Link35	Circular	2	--	250	1401.30	1412.20	0.044
Link57	Circular	1.75	--	129	1410.78	1412.81	0.016
Link58	Circular	1.75	--	270	1408.58	1410.38	0.007
Link59	Circular	1.5	--	227	1412.81	1416.64	0.017
Link71	Circular	3	--	70	1385.14	1385.30	0.002
Link73	Circular	1.5	--	115	1425.00	1425.50	0.004
Link74	Circular	4	--	70	1354.00	1357.00	0.043
Link75	Circular	4	--	125	1365.00	1380.00	0.120
Link76	Trapezoidal	4.3	100	110	1380.00	1380.80	0.007
Link87	Trapezoidal	3	6	600	1383.00	1395.00	0.020
Link92	Circular	3.5	--	167	1398.00	1400.00	0.012
Link93	Circular	3.5	--	407	1387.00	1395.14	0.020
Link95	Trapezoidal	0.5	1.2	154	1412.20	1420.00	0.051
Link97	Circular	2	--	516	1385.30	1395.62	0.020
Link102	Circular	2	--	150	1420.44	1421.76	0.009
Link103	Circular	2.5	--	84	1419.60	1420.44	0.010
Link104	Circular	2.5	--	350	1405.50	1414.00	0.024
Link105	Circular	1.5	--	227	1394.86	1402.49	0.034
Link107	Circular	1.25	--	217	1403.61	1412.25	0.040
Link108	Circular	1.25	--	112	1402.49	1403.61	0.010
Link109	Circular	0.67	--	313	1412.25	1422.29	0.032
Link110	Circular	0.5	--	211	1422.29	1427.00	0.022
Link111	Ellipse	2.83	--	93	1388.00	1388.20	0.002
Link112	Natural	--	--	325	1388.20	1392.89	0.014
Link116	Circular	1.25	--	256	1385.50	1390.00	0.018
Link118	Circular	1.25	--	54	1383.00	1385.50	0.046
Link119	Trapezoidal	3	3	165	1365.00	1385.00	0.121
Link121	Trapezoidal	3	25	33	1360.00	1365.00	0.152
Link122	Trapezoidal	6	6	33	1358.00	1360.00	0.061
Link123	Trapezoidal	2	15	50	1357.00	1358.00	0.020
Link129	Circular	1.5	--	250	1423.50	1425.00	0.006
Link130	Trapezoidal	2	2	105	1423.00	1423.50	0.005
Link131	Circular	2	--	100	1421.50	1423.00	0.015
Link134	Circular	1.5	--	200	1386.00	1388.00	0.010

Name	Shape	Diameter/ Height (ft)	Bottom Width (ft)	Length (ft)	Downstream Invert Elevation (ft)	Upstream Invert Elevation (ft)	Slope (ft/ft)
Link135	Trapezoidal	2	7	60	1387.00	1388.50	0.025
Link136	Trapezoidal	1	1	120	1388.00	1388.20	0.002
Link139	Natural	--	--	1200	1390.00	1421.50	0.026
Link140	Circular	3.5	--	40	1392.50	1393.00	0.013
Link141	Natural	--	--	100	1387.00	1392.50	0.055
Link142	Natural	--	--	500	1381.90	1388.50	0.013
Link144	Circular	1.25	--	822	1388.32	1406.00	0.022
Link145	Circular	1.5	--	268	1423	1428.00	0.019
Link145.1	Circular	1.5	--	630	1395.62	1423.00	0.043
Link147	Circular	1.5	--	83	1413.62	1413.89	0.003

Name	Maximum Flow Rate (cfs)		
	2-yr	10-yr	100-yr
Link14	25.8	41.5	58.4
Link16	5.7	10.1	14.7
Link24	25.1	47.0	67.3
Link26	15.7	27.5	32.9
Link30	4.0	7.9	13.9
Link31	3.0	5.5	9.2
Link32	7.9	15.2	26.2
Link33	1.1	2.0	2.2
Link34	7.6	14.8	23.7
Link35 (C4)	9.3	18.2	29.6
Link57	6.3	11.7	14.8
Link58	13.1	22.8	25.2
Link59	6.4	11.3	13.9
Link71 (C5)	9.2	20.1	34.2
Link73	2.5	3.4	4.6
Link74 (C1)	17.8	44.2	85.3
Link75	13.5	33.7	64.5
Link76	34.7	69.8	120.3
Link87	8.7	16.8	29.1
Link92	25.1	47.0	67.4
Link93	8.1	14.4	23.8
Link95	7.6	14.8	23.7
Link97	3.5	6.4	10.4
Link102	4.5	8.0	13.3
Link103	4.5	8.0	13.3
Link104	17.8	31.6	47.6
Link105	8.1	10.1	11.2
Link107	4.2	5.8	8.3
Link108	8.1	10.1	11.2
Link109	2.2	2.2	2.3
Link110	1.0	1.1	1.1
Link111 (C6)	22.8	32.1	37.7
Link112	25.6	41.4	94.8
Link116	3.7	6.8	8.7
Link118	3.7	6.8	8.7
Link119	3.7	6.8	8.7
Link121	14.6	36.3	72.4
Link122	14.6	36.3	72.4
Link123	14.6	36.3	72.4
Link125 (C2/3)	23.6	41.3	66.5
Link129	2.5	3.4	4.6
Link130	2.5	3.4	4.6
Link131	2.5	3.4	4.6
Link134	1.4	1.6	1.8
Link135	3.8	6.2	9.7

Name	Maximum Flow Rate (cfs)		
	2-yr	10-yr	100-yr
Link136	3.4	6.2	6.1
Link139	3.6	6.5	9.8
Link140	15.0	29.7	54.9
Link141	15.0	29.7	55.0
Link142	8.0	16.2	26.9
Link144	1.9	2.9	4.1
Link145	1.8	2.9	3.4
Link145.1	3.0	5.5	8.5
Link147	5.4	9.7	14.0

Node Name	Ground Elevation (ft)	Invert Elevation (ft)	Type
1A/1	1387.50	1385.50	Node
1A/2	1388.00	1383.00	Node
1A/3	1370.00	1365.00	Node
1A/4	1366.00	1360.00	Node
1A/5	1365.00	1358.00	Node
1A/Storage1	1367.50	1357.00	Storage Node
1B/1	1387.70	1380.80	Node
1B/Storage1	1384.30	1380.00	Storage Node
1C/Storage1	1396.50	1390.00	Storage Node
1D/1	1387.26	1382.85	Node
1E/Storage2	1387.70	1381.90	Storage Node
1F/1	1395.00	1386.00	Node
1G/1	1400.00	1395.00	Node
1H/1	1426.00	1423.50	Node
1H/2	1425.00	1423.00	Node
1H/3	1425.10	1421.50	Node
1I/Storage1	1393.00	1388.50	Storage Node
1I/weir	1393.00	1388.50	Node
1J/1	1428.00	1425.00	Node
1J/Storage1	1430.00	1426.00	Storage Node
1J/Weir	1430.00	1425.50	Node
1K/1	1386.00	1380.00	Storage Node
1K/2	1385.00	1360.00	Node
1L/Storage	1395.00	1389.00	Storage Node
2A/1	1399.00	1392.50	Node
2A/Storage1	1402.00	1393.00	Storage Node
2A/Storage2	1390.50	1387.00	Storage Node
2A/Weir	1398.00	1393.00	Node
2B/2	1411.17	1407.20	Node
2B/3	1411.46	1406.50	Node
2C/1	1411.61	1408.58	Node
2D/1	1417.18	1412.81	Node
2D/2	1417.19	1410.38	Node
2E/1	1422.00	1417.59	Node
2F/1	1421.76	1416.64	Node
2G/1	1411.95	1404.74	Node
3A/Storage1	1390.50	1386.00	Storage Node
3C/1	1405.92	1400.00	Node
3C/2	1404.34	1395.14	Node
4A/1	1416.00	1411.76	Storage Node
4A/Storage1	1415.50	1412.00	Storage Node
4B/1	1429.20	1424.00	Node
4B/Storage	1430.00	1424.00	Storage Node
4C/1	1429.30	1427.00	Node
5A/1	1405.36	1385.30	Node

Node Name	Ground Elevation (ft)	Invert Elevation (ft)	Type
5A/Storage1	1406.00	1388.76	Storage Node
5B/1	1404.76	1395.62	Node
5C/Outlet	1435.00	1428.00	Node
5C/Storage1	1435.00	1428.00	Storage Node
5D/Outlet	1413.00	1388.32	Node
5D/Storage1	1413.00	1406.00	Storage Node
5E/1	1433.00	1423.00	Node
5E/Storage	1412.00	1405.00	Storage Node
6A/1	1408.00	1405.50	Node
6A/2	1407.70	1403.50	Node
6A/3	1405.00	1402.49	Node
6A/4	1397.86	1394.86	Node
6A/5	1395.89	1392.89	Node
6A/6	1393.00	1388.00	Node
6A/Storage	1394.00	1388.00	Storage Node
6B/1	1416.50	1413.62	Node
6C/1	1427.57	1420.44	Node
6C/2	1426.04	1419.60	Node
6D/1	1426.99	1421.76	Node
6E/1	1406.89	1403.61	Node
6F/1	1414.95	1412.25	Node
6F/2	1412.00	1405.00	Node
6F/Storage	1412.00	1405.00	Storage Node
6G/1	1424.34	1422.29	Node
6H/1	1429.78	1427.00	Node
6I/1	1417.00	1413.89	Node
6J/1	1436.00	1427.45	Node
Outfall C1	1358.00	1354.00	Node
Outfall C2/3	1390.00	1385.00	Node
Outfall C4	1407.00	1401.30	Node
Outfall C5	1391.57	1385.14	Node
Outfall C6	1391.00	1388.00	Node

Node Name	Ground Elevation (ft)	Maximum HGL (ft)		
		2-yr	10-yr	100-yr
1A/1	1387.50	1386.08	1386.34	1386.53
1A/2	1388.00	1385.24	1385.33	1385.36
1A/3	1370.00	1365.14	1365.24	1365.37
1A/4	1366.00	1360.21	1360.37	1360.58
1A/5	1365.00	1358.35	1358.61	1358.95
1A/Storage1	1367.50	1357.67	1358.04	1358.49
1B/1	1387.70	1381.04	1381.23	1381.64
1B/Storage1	1384.30	1380.74	1381.15	1381.61
1C/Storage1	1396.50	1390.61	1390.90	1391.57
1D/1	1387.26	1383.31	1383.48	1383.71
1E/Storage2	1387.70	1382.41	1382.66	1383.04
1F/1	1395.00	1386.84	1387.24	1388.07
1G/1	1400.00	1397.57	1397.86	1398.24
1H/1	1426.00	1424.00	1424.08	1424.18
1H/2	1425.00	1423.47	1423.54	1423.63
1H/3	1425.10	1421.76	1421.82	1421.89
1I/Storage1	1393.00	1389.88	1390.56	1391.75
1I/weir	1393.00	1388.91	1389.05	1389.20
1J/1	1428.00	1425.53	1425.62	1425.74
1J/Storage1	1430.00	1426.96	1427.69	1428.57
1J/Weir	1430.00	1426.17	1426.28	1426.43
1K/1	1386.00	1381.49	1382.85	1384.37
1K/2	1385.00	1360.30	1360.37	1360.47
1L/Storage	1395.00	1392.14	1393.24	1393.89
2A/1	1399.00	1392.89	1393.00	1393.20
2A/Storage1	1402.00	1395.53	1397.00	1398.20
2A/Storage2	1390.50	1387.90	1388.27	1389.20
2A/Weir	1398.00	1393.87	1394.14	1394.61
2B/2	1411.17	1408.73	1409.33	1409.81
2B/3	1411.46	1407.78	1408.29	1408.66
2C/1	1411.61	1409.42	1409.98	1410.66
2D/1	1417.18	1413.50	1416.19	1418.01
2D/2	1417.19	1411.89	1415.52	1417.42
2E/1	1422.00	1418.19	1418.66	1422.21
2F/1	1421.76	1417.38	1418.86	1422.09
2G/1	1411.95	1406.16	1406.72	1407.15
3A/Storage1	1390.50	1388.66	1388.73	1389.19
3C/1	1405.92	1401.30	1401.83	1402.27
3C/2	1404.34	1395.73	1395.92	1396.15
4A/1	1416.00	1412.28	1412.56	1412.88
4A/Storage1	1415.50	1413.63	1413.82	1414.03
4B/1	1429.20	1424.49	1424.75	1425.04
4B/Storage	1430.00	1427.01	1428.50	1429.18
4C/1	1429.30	1427.42	1428.78	1429.30

Node Name	Ground Elevation (ft)	Maximum HGL (ft)		
		2-yr	10-yr	100-yr
5A/1	1405.36	1386.28	1386.72	1387.16
5A/Storage1	1406.00	1390.16	1390.45	1390.70
5B/1	1404.76	1395.96	1396.03	1396.26
5C/Outlet	1435.00	1428.33	1428.40	1428.46
5C/Storage1	1435.00	1429.99	1431.08	1432.51
5D/Outlet	1413.00	1406.38	1406.47	1406.56
5D/Storage1	1413.00	1407.91	1409.23	1410.86
5E/1	1433.00	1423.25	1423.30	1423.34
5E/Storage	1412.00	1407.81	1409.93	1411.35
6A/1	1408.00	1405.99	1406.18	1406.42
6A/2	1407.70	1404.41	1404.58	1404.74
6A/3	1405.00	1402.82	1402.94	1403.06
6A/4	1397.86	1395.38	1395.62	1395.91
6A/5	1395.89	1393.49	1393.67	1393.85
6A/6	1393.00	1390.14	1391.07	1391.58
6A/Storage	1394.00	1390.25	1391.44	1392.79
6B/1	1416.50	1414.88	1415.20	1415.56
6C/1	1427.57	1420.91	1421.08	1421.28
6C/2	1426.04	1420.13	1420.32	1420.54
6D/1	1426.99	1422.29	1422.48	1422.72
6E/1	1406.89	1404.29	1404.60	1406.60
6F/1	1414.95	1412.90	1413.14	1413.59
6F/2	1412.00	1405.39	1405.47	1405.74
6F/Storage	1412.00	1407.72	1409.83	1411.67
6G/1	1424.34	1423.02	1423.30	1423.67
6H/1	1429.78	1427.67	1427.92	1428.25
6I/1	1417.00	1415.13	1416.00	1417.22
6J/1	1436.00	1427.78	1427.92	1428.09
Outfall C1	1358.00	1354.67	1355.04	1355.49
Outfall C2/3	1390.00	1385.90	1386.27	1387.20
Outfall C4	1407.00	1401.82	1402.10	1402.42
Outfall C5	1391.57	1386.01	1386.42	1386.81
Outfall C6	1391.00	1390.04	1390.83	1390.83

Name	Shape	Diameter/ Height (ft)	Bottom Width (ft)	Length (ft)	Downstream Invert Elevation (ft)	Upstream Invert Elevation (ft)	Slope (ft/ft)
Link14	Rectangular	3	4	80	1392.89	1394.86	0.025
Link16	Circular	2.5	--	486	1414.00	1419.60	0.012
Link24	Circular	4	--	234	1404.74	1406.50	0.008
Link24.1	Circular	4	--	630	1400.00	1404.74	0.008
Link26	Circular	3	--	154	1406.50	1407.20	0.005
Link30	Circular	1.5	--	218	1411.24	1417.59	0.029
Link31	Circular	1.5	--	80	1381.00	1382.85	0.023
Link32	Circular	2	--	70	1385.25	1386.00	0.011
Link35	Circular	2	--	240	1401.30	1411.76	0.044
Link57	Circular	1.75	--	129	1410.78	1412.81	0.016
Link58	Circular	1.75	--	270	1408.58	1410.38	0.007
Link59	Circular	1.5	--	227	1412.81	1416.64	0.017
Link71	Circular	3	--	70	1385.14	1385.30	0.002
Link73	Circular	1.5	--	115	1425.00	1425.50	0.004
Link74	Circular	4	3	70	1354.00	1357.00	0.043
Link75	Circular	4	--	125	1365.00	1380.00	0.120
Link76	Trapezoidal	4.3	100	110	1380.00	1380.80	0.007
Link92	Circular	3.5	--	167	1398.00	1400.00	0.012
Link93	Circular	3.5	--	407	1387.00	1395.14	0.020
Link97	Circular	2	--	516	1385.30	1395.62	0.020
Link102	Circular	2	--	150	1420.44	1421.76	0.009
Link103	Circular	2.5	--	84	1419.60	1420.44	0.010
Link104	Circular	2.5	--	350	1405.50	1414.00	0.024
Link105	Circular	2	--	227	1394.86	1402.49	0.034
Link108	Circular	1.25	--	112	1402.49	1403.61	0.010
Link109	Circular	2	--	313	1412.25	1422.29	0.032
Link110	Circular	2	--	211	1422.29	1427.00	0.022
Link111	Circular	2.83	--	60	1388.00	1388.10	0.002
Link112	Natural	0	--	325	1388.20	1392.89	0.014
Link116	Circular	1.25	--	256	1385.50	1390.00	0.018
Link118	Circular	1.25	--	54	1383.00	1385.50	0.046
Link119	Trapezoidal	3	3	165	1365.00	1385.00	0.121
Link121	Trapezoidal	3	25	33	1360.00	1365.00	0.152
Link122	Trapezoidal	6	6	33	1358.00	1360.00	0.061
Link123	Trapezoidal	2	15	50	1357.00	1358.00	0.020
Link129	Circular	1.5	--	250	1423.50	1425.00	0.006
Link130	Trapezoidal	2	2	105	1423.00	1423.50	0.005
Link131	Circular	2	--	100	1421.50	1423.00	0.015
Link135	Trapezoidal	2	7	60	1387.00	1388.50	0.025
Link139	Natural	0	--	1200	1390.00	1421.50	0.026
Link140	Circular	3.5	--	40	1392.50	1393.00	0.013
Link141	Natural	--	--	100	1387.00	1392.50	0.055
Link142	Natural	--	--	500	1381.90	1388.50	0.013

Name	Shape	Diameter/ Height (ft)	Bottom Width (ft)	Length (ft)	Downstream Invert Elevation (ft)	Upstream Invert Elevation (ft)	Slope (ft/ft)
Link144	Circular	1.25	--	822	1388.32	1406.00	0.022
Link145	Circular	1.5	--	268	1423.00	1428.00	0.019
Link145.1	Circular	1.5	--	630	1395.62	1423.00	0.043
Link147	Circular	1.5	--	83	1413.62	1413.89	0.003
Link149.1	Circular	2	--	200	1358.00	1360.00	0.010
Link157	Circular	2	--	350	1412.00	1424.00	0.034
Link159	Circular	1.25	--	540	1424.00	1427.00	0.006
Link162	Circular	1.5	--	569	1421.76	1427.45	0.010
Link163	Circular	2	--	70	1408.00	1412.25	0.061
Link165	Circular	2	--	235	1394.86	1405.00	0.043
Link166	Trapezoidal	3	6	960	1390.00	1397.00	0.007

Name	Maximum Flow Rate (cfs)		
	2-yr	10-yr	100-yr
Link14	20.7	36.5	57.4
Link16	4.1	7.4	12.4
Link24	25.1	45.8	61.7
Link24.1	30.0	54.8	76.8
Link26	22.1	40.1	51.7
Link30	5.6	10.2	14.9
Link31	3.0	5.5	9.2
Link32	7.9	15.2	26.2
Link35 (C4)	6.5	14.8	26.4
Link57	6.0	10.6	18.4
Link58	15.1	27.2	31.3
Link59	6.0	10.6	13.9
Link71 (C5)	7.7	16.0	26.7
Link73	2.5	3.3	4.6
Link74 (C1)	16.7	41.1	81.4
Link75	13.5	32.4	62.9
Link76	30.0	58.7	111.0
Link92	29.9	54.9	76.8
Link93	8.1	14.4	23.8
Link97	1.9	2.7	6.5
Link102	2.9	5.3	8.8
Link103	2.8	5.3	8.8
Link104	15.7	28.1	44.3
Link105	3.0	5.3	8.8
Link108	3.0	5.3	8.8
Link109	10.1	17.9	29.7
Link110	7.6	13.6	22.5
Link111 (C6)	10.5	18.9	34.4
Link112	20.7	36.5	57.3
Link116	3.7	6.8	8.7
Link118	3.7	6.8	8.7
Link119	3.7	6.8	8.7
Link121	14.4	34.8	70.1
Link122	14.4	34.8	70.1
Link123	14.3	34.8	70.1
Link125 (C2/3)	22.3	36.1	65.2
Link129	2.5	3.3	4.6
Link130	2.5	3.3	4.6
Link131	2.5	3.3	4.6
Link135	2.7	4.9	8.2
Link139	3.5	6.4	9.7
Link140	14.4	26.1	54.7
Link141	14.4	26.1	54.7
Link142	7.9	16.0	26.7
Link144	1.8	2.6	3.6

Name	Maximum Flow Rate (cfs)		
	2-yr	10-yr	100-yr
Link145	1.2	1.8	2.3
Link145.1	1.2	1.8	2.3
Link147	5.4	9.7	14.5
Link149.1	1.0	1.5	2.5
Link157	5.1	11.6	20.9
Link159	1.1	2.1	2.8
Link162	1.1	2.1	3.7
Link163	11.9	21.3	35.3
Link165	2.8	4.2	12.1
Link166	8.8	16.8	29.0

Appendix B: Alternative Land Plans

LEGEND

A	HEALTH AND HUMAN SERVICES
B	COUNTY ADMINISTRATIVE CENTER
C	AGRICULTURAL COMMISSIONER AND FARM ADVISOR FACILITY
D	CLERK RECORDER ELECTIONS TRAINING/ WAREHOUSE FACILITY
E	MUSEUM WAREHOUSE FACILITY
F	CORPORATION YARD ADMINISTRATION AND TRAINING CENTER
G	SHERIFF AND PROBATION SUPPORT FACILITY
H	FIRE STATION 180 EXPANSION
I	ADMINISTRATION SERVICES IT/TELECOM/ WAREHOUSE
J	FINANCE ADMINISTRATION BUILDING ANNEX
K	COMMUNITY BUILDING
L	CDRC GROWTH AND CONSOLIDATION

NEW COUNTY BUILDINGS

RESIDENTIAL

HOTEL

FLEX SPACE/ MIXED-USE

RETAIL

OPTION 1

PLACER COUNTY GOVERNMENT CENTER
AUBURN, CALIFORNIA

0 200 800
100 400

LEGEND

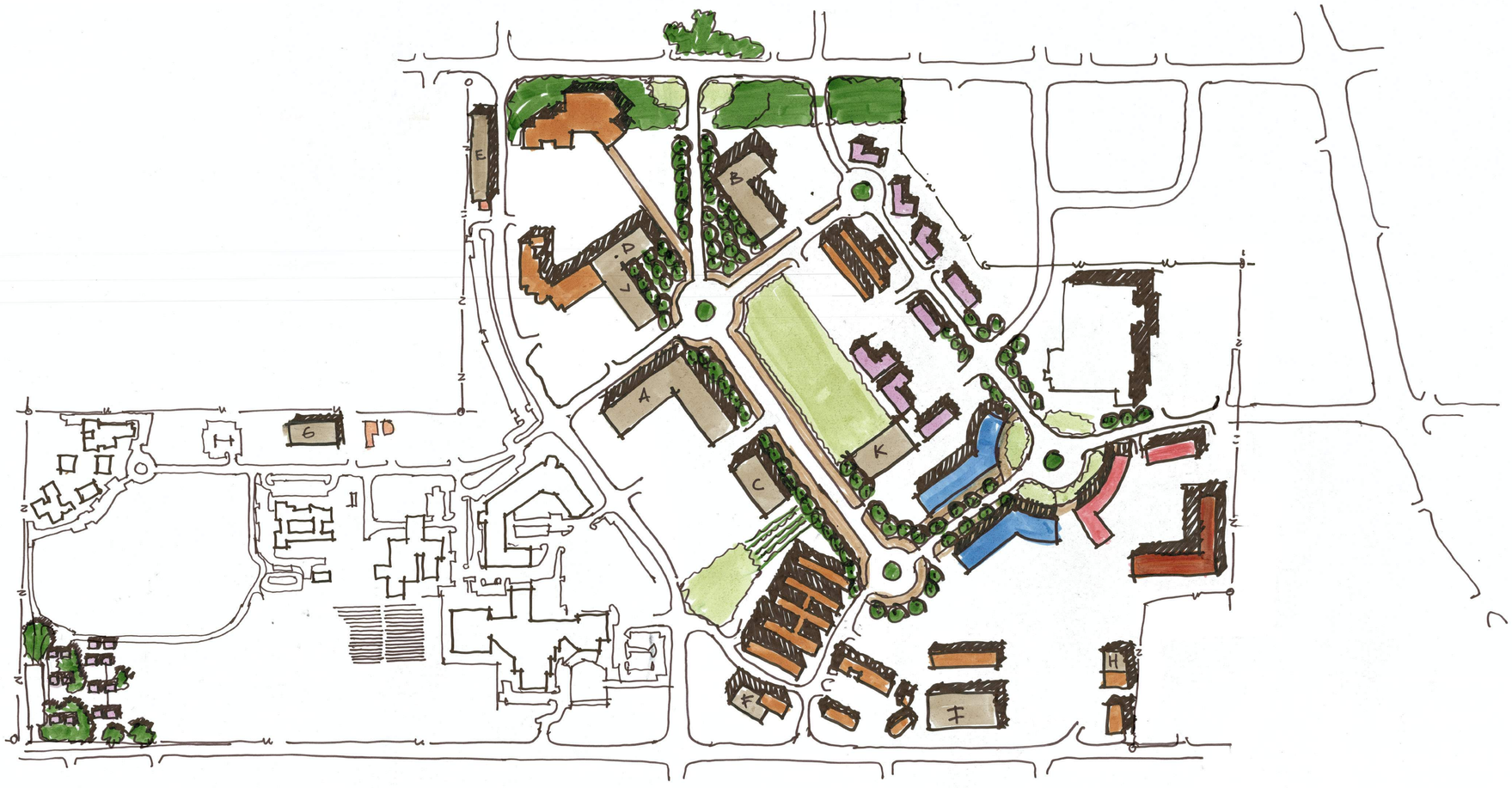
A	HEALTH AND HUMAN SERVICES
B	COUNTY ADMINISTRATIVE CENTER
C	AGRICULTURAL COMMISSIONER AND FARM ADVISOR FACILITY
D	CLERK RECORDER ELECTIONS TRAINING/ WAREHOUSE FACILITY
E	MUSEUM WAREHOUSE FACILITY
F	CORPORATION YARD ADMINISTRATION AND TRAINING CENTER
G	SHERIFF AND PROBATION SUPPORT FACILITY
H	FIRE STATION 180 EXPANSION
I	ADMINISTRATION SERVICES IT/TELECOM/ WAREHOUSE
J	FINANCE ADMINISTRATION BUILDING ANNEX
K	COMMUNITY BUILDING
L	CDRC GROWTH AND CONSOLIDATION

- NEW COUNTY BUILDINGS
- RESIDENTIAL
- HOTEL
- FLEX SPACE/ MIXED-USE
- RETAIL

OPTION 2

PLACER COUNTY GOVERNMENT CENTER
AUBURN, CALIFORNIA

0 200 800
100 400



LEGEND

A	HEALTH AND HUMAN SERVICES
B	COUNTY ADMINISTRATIVE CENTER
C	AGRICULTURAL COMMISSIONER AND FARM ADVISOR FACILITY
D	CLERK RECORDER ELECTIONS TRAINING/ WAREHOUSE FACILITY
E	MUSEUM WAREHOUSE FACILITY
F	CORPORATION YARD ADMINISTRATION AND TRAINING CENTER
G	SHERIFF AND PROBATION SUPPORT FACILITY
H	FIRE STATION 180 EXPANSION
I	ADMINISTRATION SERVICES IT/TELECOM/ WAREHOUSE
J	FINANCE ADMINISTRATION BUILDING ANNEX
K	COMMUNITY BUILDING
L	CDRC GROWTH AND CONSOLIDATION
	NEW COUNTY BUILDINGS
	RESIDENTIAL
	HOTEL
	FLEX SPACE/ MIXED-USE
	RETAIL

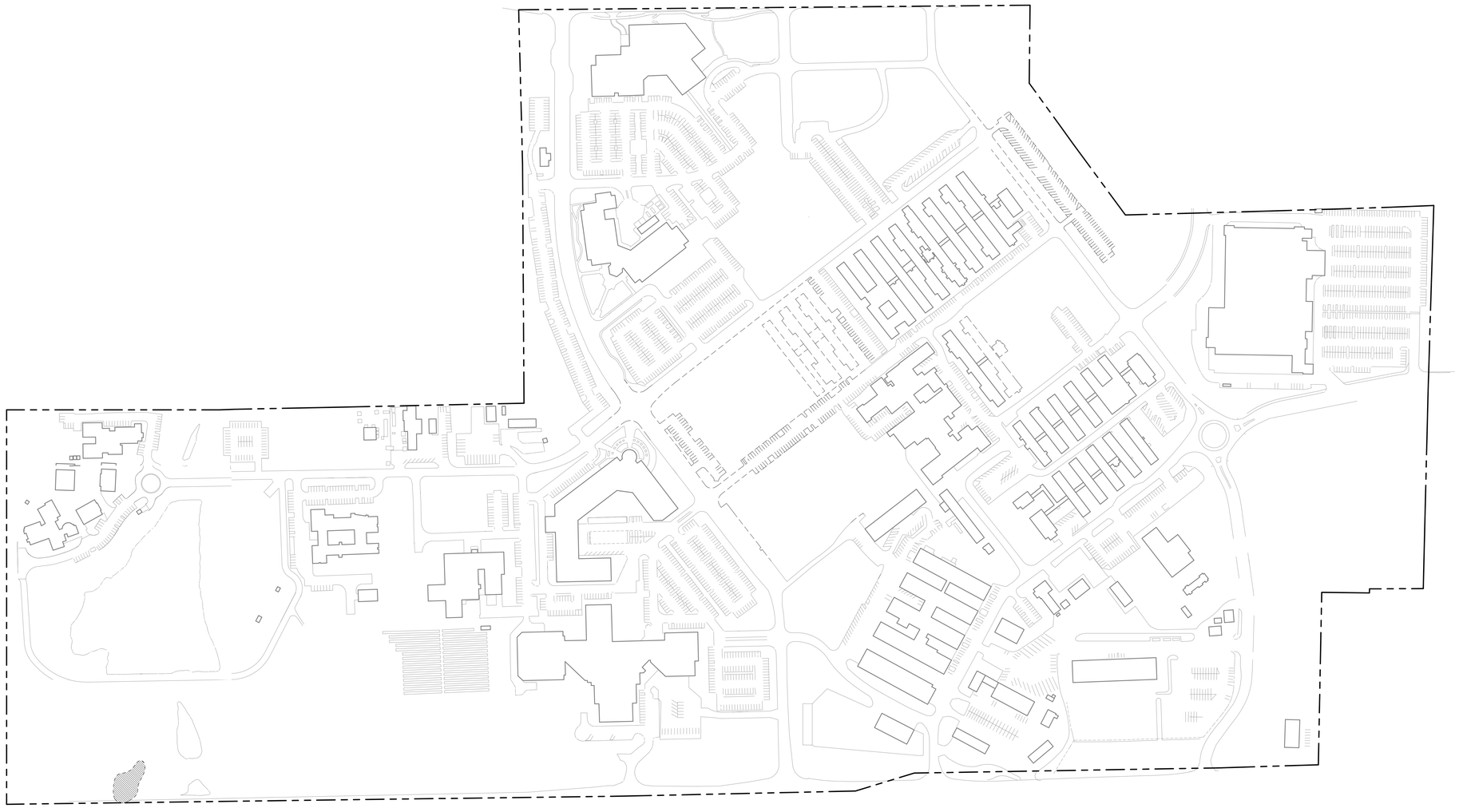
OPTION 3

PLACER COUNTY GOVERNMENT CENTER
AUBURN, CALIFORNIA

0 200 800
100 400

Appendix C: Final Option and Tiering Land Plans

TIER 1 - DEMOLITION

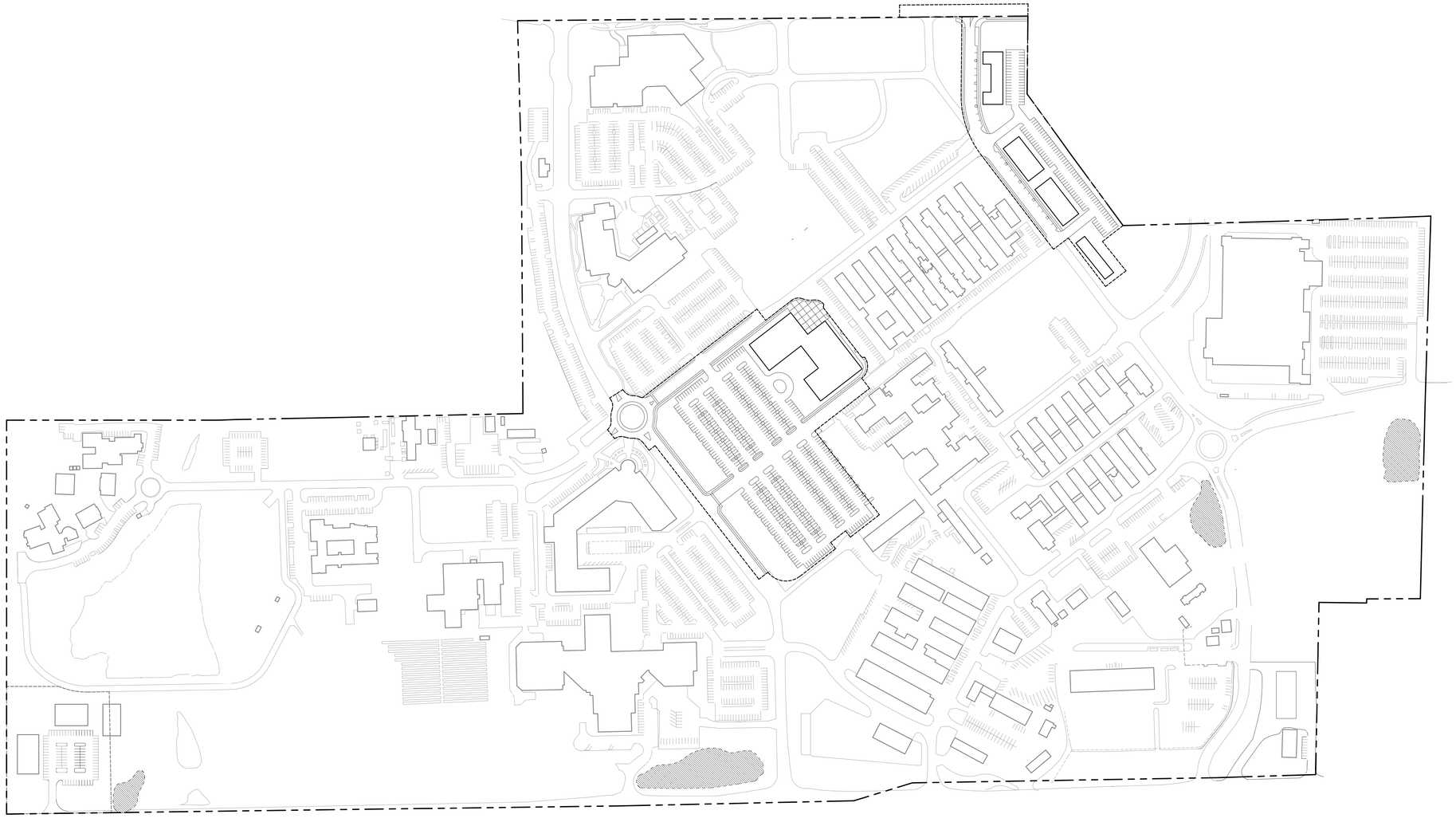


williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

TIER 1 - NEW CONSTRUCTION

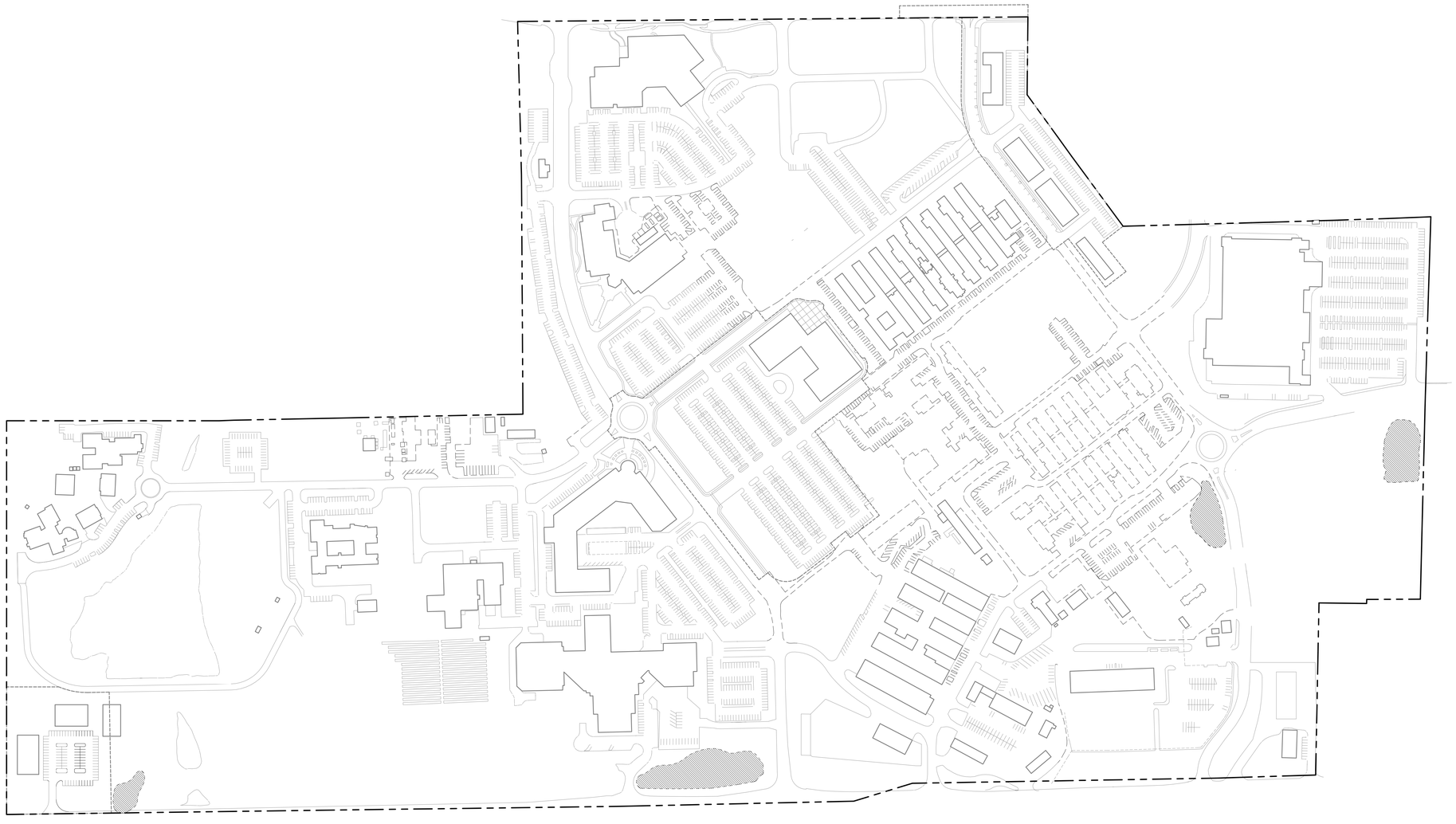


williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

TIER 2 - DEMOLITION

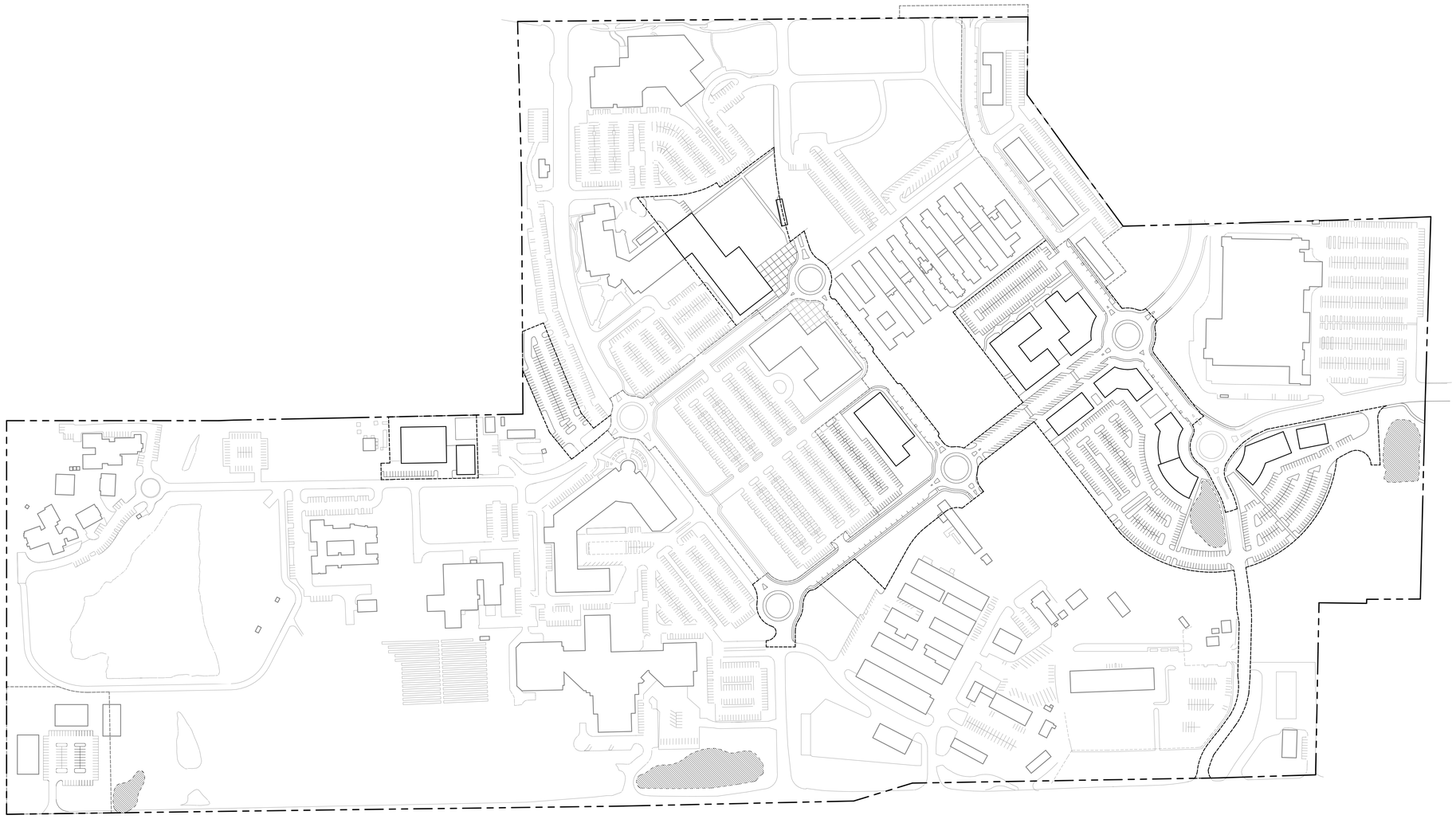


williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

TIER 2 - NEW CONSTRUCTION

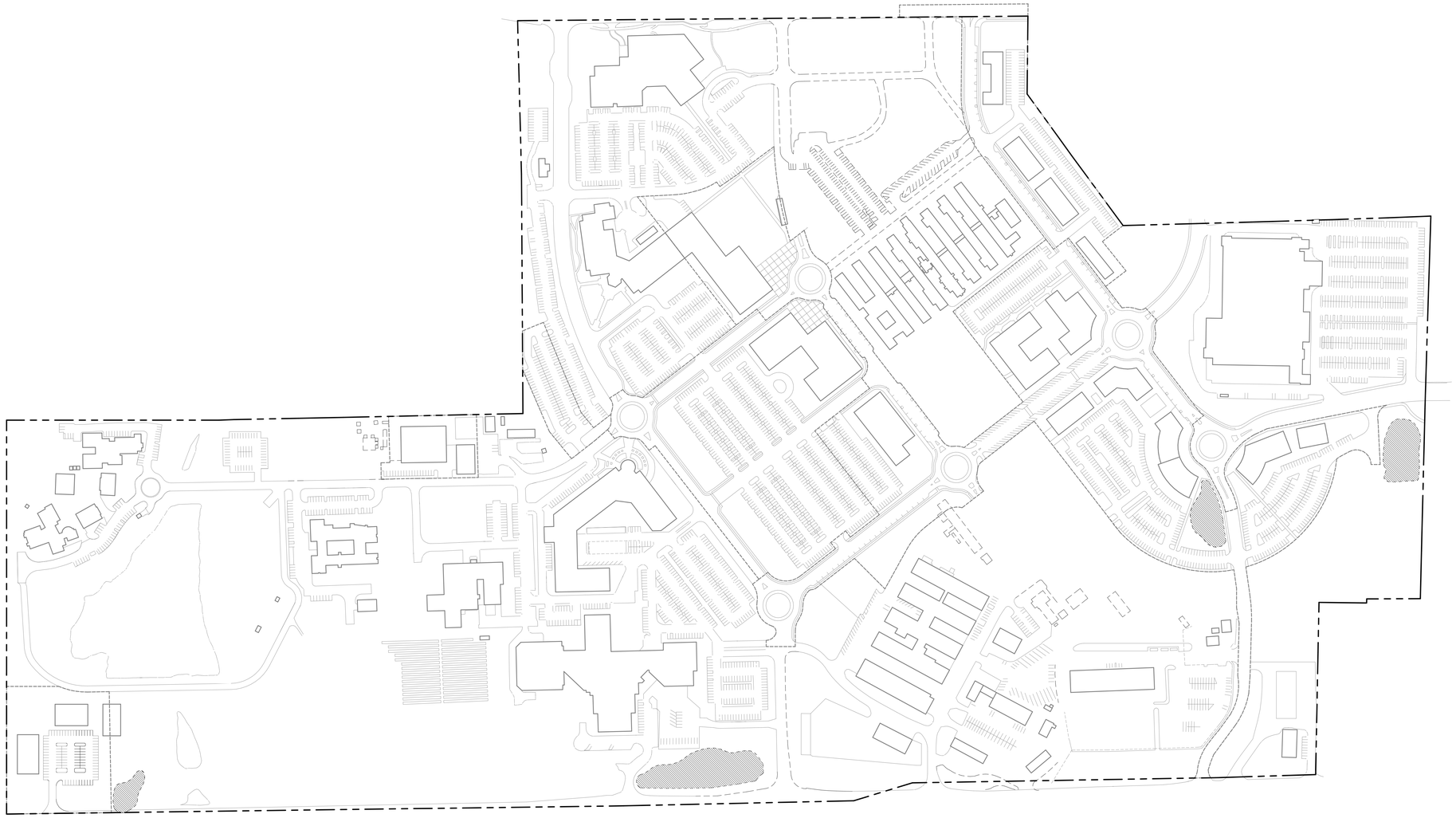


williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

TIER 3 - DEMOLITION

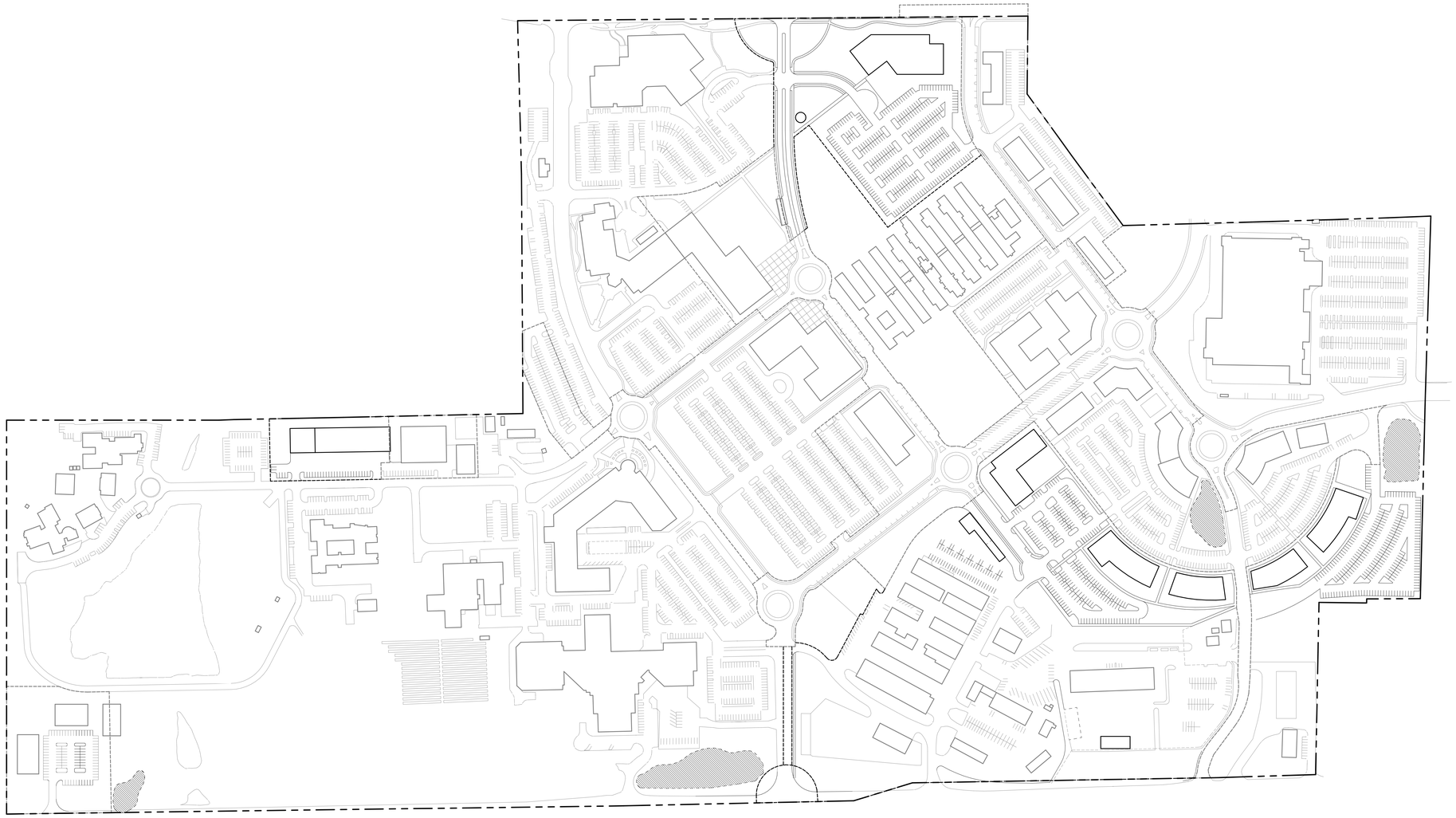


williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

TIER 3 - NEW CONSTRUCTION

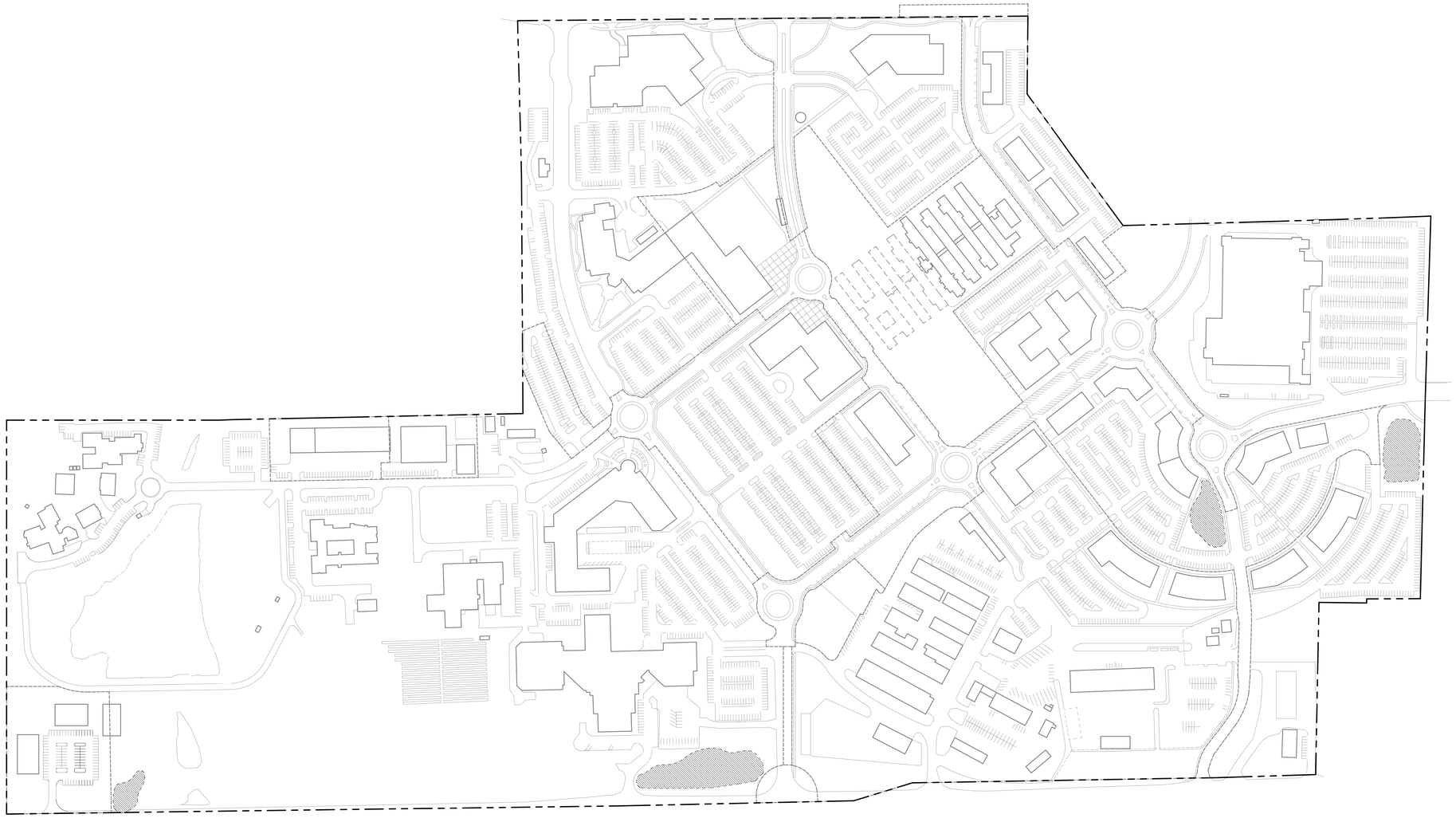


williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

TIER 4 - DEMOLITION

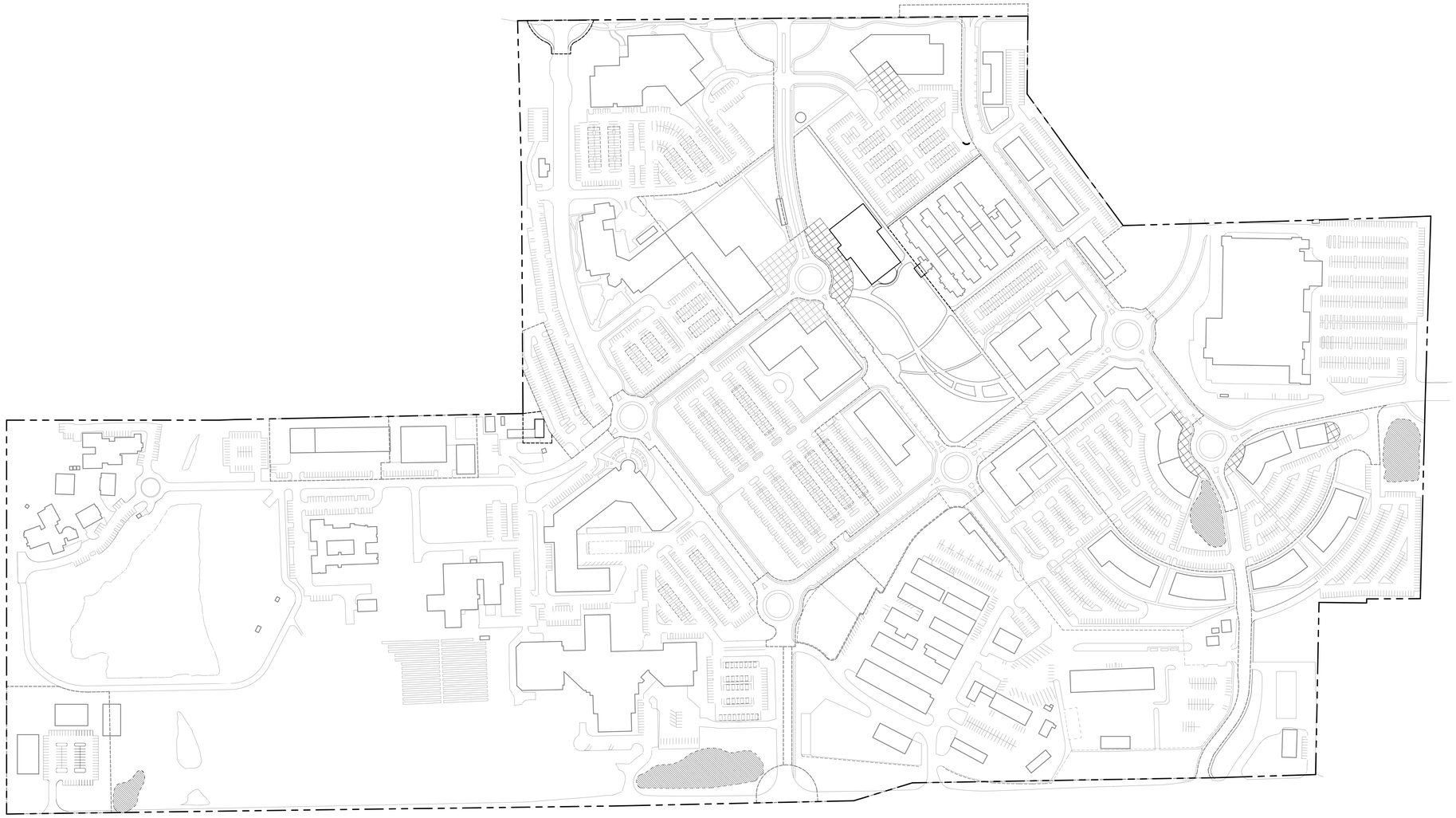


williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

TIER 4 - NEW CONSTRUCTION



williams + paddon

ARCHITECTS + PLANNERS

10 OCTOBER 2018

APPENDIX F: ELECTRICAL AND TELECOMMUNICATIONS ASSESSMENT

Appendix F

Electrical Systems

Electrical Site, Facility, and Utility Assessment scope:

1. County facility assessment affirmation:
    a. The Placer County Campus has existing electrical site plans developed by West Yost Associates. These plans were found to be accurate relative to conditions observed in the field. That said, these drawings are limited in scope in that they do not fully depict the entire electrical installations on Campus. Most medium voltage feeder runs were included, but most 480v and 120v circuits were not included. This is typical for a big picture approach on a large campus like the Government Center.
    b. Other building specific assessments from Lionakis Architects, dated May 2013 were also reviewed. These documents were deemed accurate relative to the current field inspections and survey work completed. Although, since 2013 there have been a number of advancements with LED luminaires and lighting controls. This when combined with the most current revolution of CA T24 part 6 (the energy code), it now makes sense to consider updating the lighting systems in all of these buildings to LED while simultaneously integrating advanced dimming/daylighting controls systems.

2. Electrical Utility and service assessment:
    a. The medium voltage electrical infrastructure on the Placer County Government Center is owned and maintained by PG&E.
    b. The nominal medium voltage service voltage used on Campus is 12kV.
    c. Most medium voltage cabling is routed below grade in the streets and right of way. However, there are a number of locations/areas where risers to power poles, and cabling routed on power poles exist. There areas are:
        - B Ave. animal control center yard
        - E Ave.
        - 3rd Street
        - F Ave.
        - 2nd Street
        - 1st Street
        - B Ave (East of Richardson)
        - County Center Drive
    d. The primary electrical service cabling routed through Campus originates in multiple locations from PG&E as follows:
        - Bell Road/Richardson Drive
        - Bell Road/County Center Drive

- Bell Road/1st Street
- 3rd Street/Atwood Road
- Atwood Road/11432 F Avenue

e. PG&E has indicated they have sufficient capacity on their systems to serve the current Campus electrical demand with no concerns.
f. PG&E expressed confidence in their ability to serve the new Placer County Government Center properties in the future as the Campus develops new buildings, adds additional square footage, and continues to both maintain and renovate their existing facilities.
g. Note that PG&E will not install or engineer new capital infrastructure for future projects until proposed projects are engineered and applications submitted to PG&E for service design.
h. Electrically speaking, the Campus's point of demarcation with PG&E is at the service transformers for each building. This point represents the handoff from PG&E owned and maintained facilities to County Owned and maintained facilities.
i. All medium voltage cabling, conduits, and site box/vault infrastructure on site is controlled by PG&E and dictated by their standards and engineering design.
j. The Government Center Campus has been decommissioning facilities over the last few years and this effort has led to a decrease in the electrical demand on Campus.
k. The observed PG&E transformers and corresponding building main switchboards were in good working condition. No breaker failures, or nuisance trips were reported by the County electricians or staff. See table 1 below for a summary of electrical service transformers for the buildings on campus.

Buildings Served	**Transformer size (KVA)**	**Secondary Configuration**
11106 B Ave	300	120/208V, 3P, 4W
CES lift station	45	277/480V, 3P, 4W
Peace for Families	150	120/208V, 3P, 4W
Animal Shelter	300	277/480V, 3P, 4W
Animal Control	75	120/208V, 3P, 4W
B Ave Yard	150	120/208V, 3P, 4W
2929 Richardson	1,000	277/480V, 3P, 4W
2775 Richardson	1,000	277/480V, 3P, 4W

Table 1

3. Campus Photovoltaic System assessment:
   a. There are multiple photovoltaic (PV) systems installed on the campus. They are a mix of ground mount, and roof mount with a total capacity of approximately 580 KW.
   b. The existing PV systems are located at the Finance Administration Building (FAB), the 100 ramp (buildings 110-114), the DPWF Garage

(building 400), and a large ground mount array just South of the Juvenile Detention Center (JDC).

c. The PV systems are in good working condition, with no problems noted during interviews with Facilities. Most systems have useful lives that exceed 20 years and the oldest campus system is approaching 10 years old at this time.
d. The JDC array is the system coming up on its 10 year Energy Service Contract and Ground Lease where the County will need to make a decision about its future use. Currently this is the largest system on campus.
e. The PV system arrays are currently producing approximately 906,000 KWhr's per year. The Campus is currently using about 7,450,000 KWhr's of electricity per year. This generation represents about 13% of the total demand on Campus in 2015.
f. No future installations, or pending additional PV system projects are currently in planning for the Government Center Campus.
g. Note that additional PV system installations will be required to achieve the Campus's goal of being zero net energy (ZNE).
h. ZNE will be required in California for new construction projects as soon as 2030. In preparation of this mandate the PCGC should start thinking about where on site new PV arrays could be placed. New building should consider PV arrays on their roof and parking lot areas. These two locations have significant additional benefits such as reducing the heat island effect and providing shade for building occupants and vehicles in the hot summer months.
i. All new buildings on the Campus moving forward should be designed as ZNE at the minimum. In addition, additional PV arrays will be required to be installed to offset the existing buildings electrical use.

4. Campus Generator System assessment:
    a. The observed generator systems on campus were a mix of diesel fuel and propane/natural gas, and in good working conditions.
    b. At the facility assessment interview it was mentioned that one of the two Jail facility generators may be undersized relative to the building loads. It was also mentioned the Auburn Justice Center's generator may be too big. These conditions should be further reviewed.
    c. Another comment the facilities team made relative to the existing generators on campus was that some of the diesel units do not have enough building demand load and are experiencing wet stacking. Wet staking results when generator equipment operates at low loads and not all the fuel is properly burned. In the worst case scenario this can result in generator failure during a utility outage condition, or damage to the generator related to unburned fuel combusting.
    d. Wet stacking can be prevented by using either a resistive load bank during testing, or with the addition of appropriate building load during testing. Per NFPA 110 section 8.4.2 the County should exercise their generators

with at least 30% nameplate load on the generators for their monthly testing. This is in addition to the yearly load bank testing that is currently included by the County's generator maintenance vendor.

5. Electrical distribution, transformers, and panel boards assessment:
    a. The observed building distribution boards were in good working condition.
    b. The observed building low voltage transformers were in good working condition.
    c. The observed building branch circuit panelboards were in good working condition. But there were multiple buildings with a lack of branch circuit breaker spare and space availability. There are also buildings were multiple sub feed panels serve additional sub fed panels, and so on.
        - This condition often happens in buildings over time as new loads are added and changed in a given facility. Eventually over time there will be no spare breakers available or spaces left to install new breakers in a panelboard.
        - The most effective solution for this is to either add additional sub fed branch circuit panelboards or to replace existing panelboards with new boards that have more breaker positions available (new panelboards can have as many as 84 circuits in a single panel section where original construction boards were often limited to 30).
        - Another option is to add multi section panels instead of single section boards.
        - We suggest clients maintain 20% spare or space in panelboards to allow for future flexibility during renovations or maintenance. At no point in time should a panel be allowed to have less than 3 branch circuit breaker positions available without addressing the concern before it becomes a problem.
        - The 100, 200, 300, and 400 block building areas were specifically identified as facilities where breaker spares and spaces were not consistently available for the electricians. Separate construction projects should be planned for these buildings to add additional panelboard sections to help meet the 20% criteria.
        - The 100 Ramp buildings have some Zinsco panels installed. Historically, Zinsco brand electrical panels have been associated with problematic electrical events, centered around a lack of tripping during electrical overcurrent scenarios. These panels are no longer manufactured and also have a lack of available spare breakers in the marketplace. As such, they are becoming very expensive to maintain. We suggest the panels be replaced with new equipment where possible.

6. Campus lighting assessment:
    a. Exterior lighting:

- Most exterior wall mounted light fixtures have been converted to LED by the County. This is a good step towards improved energy efficiency as LED lighting on the exterior of buildings is a great retrofit option. Some benefits are improved light quality, decreased energy usage, minimizing future maintenance/lamp replacements, and better security for the buildings.
- Parking lot lighting fixtures should also be considered for retrofit. Most of these fixtures are HID and are great retrofit candidates for future projects.

b. Interior lighting:
    - Most of the County building observed had fluorescent luminaires in good to fair condition.
    - Occupancy sensors were observed on Campus, but there is a lack of uniformity across the buildings for occupancy sensors, controls type, and switching (checker board vs. a/b switching).
    - Recent advancements in LED lighting technologies coupled with the decrease in LED controls and fixture costs have made this a perfect time to consider retrofits. New wireless sensors, and switches have even eliminated the need for surface mounted conduits and difficult installations. The County should plan for upgrades to LED type fixtures and controls for all facilities to meet their ZNE objectives.
    - New luminaires will allow for enhanced lighting quality for both building occupants and the public which patron the buildings.
    - Energy savings is available when fixtures are paired with advanced controls like continuous daylight dimming and occupancy based sensors. The advent of dimming has now allowed for a high low protocol based on occupancy. This advancement in controls ensures that people will not step into public spaces within the buildings were all of the fixtures are turned off. Instead the fixtures are dimmed down to low levels in public spaces when no occupancy is detected, and then raise up to full output when a person enters the space. The fade rate for this transition can be controlled such that most people do not even notice the lighting levels and energy savings.

7. Fire alarm assessment:
    a. All buildings surveyed had current and operational fire alarm systems. These systems were in good working condition. Pull stations and strobes were observed in public spaces.
    b. No maintenance or programmatic concerns were noted by the facilities maintenance department during their interview.

8. Opportunities for improvement:
    a. The Campus should consider development of Campus electrical design standards (they currently have low voltage system design standards).

These standards would help guide future projects completed on the Campus and would help regulate simple things like indoor and outdoor light fixture color temperatures (4,000 degrees Kelvin), minimum branch panel breaker spares and spaces, requiring panel schedules and cards to be updated for each project, making sure abandoned or old conductors and cabling are removed with each project, clarifying requirements for field testing of circuit breakers, etc.

b. Lighting retrofits for interior lighting with a controls upgrade should be considered for any of the older buildings on campus that are not being removed as part of the Masterplan scope.
c. Lighting retrofits should be considered for all exterior parking lot lighting fixtures that are not currently LED. Consider occupancy based controls for these fixtures to improve both security on Campus, and improve energy efficiency.

<u>Telecommunication and Information Technology Systems</u>

1. AT&T Incoming Service
    a. The AT&T service is entering the campus site from a pole on Bell road at the corner of Richardson Blvd. The service has a secondary connection from the same pole. The cable transitions to underground from the pole to the MDF locations.
    b. The AT&T entrance facility has a primary fiber and copper entrance to the campus and serves two MDF locations. The primary MDF is located on B Ave. at the corner of Richardson Blvd. The second MDF is located on C Ave. on the corner of 2nd Street.
    c. AT&T fiber serves the B street Both MDF locations have ATT copper.
    d. The C street MDF serves some AT&T customers that will be effected when the building is demolished. AT&T will need to reroute there cable to there customers from the B street MDF.

2. Site Conduit (MDF Building)
    a. The communications Hub of the Placer County Government Center is the IT building located on B Ave. There are about seven existing 4" conduits serving the building from a vault on B-Ave. The conduits are all used and 30% to 100% full. All distribution to the site buildings and AT&T incoming service utilizes the conduit.
    b. An additional ten 4” conduits shall be provided from the building to Richardson Blvd.

3. Site Conduits
    a. The existing site conduit system utilizes a combination of AT&T maintained conduit and Placer County maintained conduit. The distribution by county owned cable utilizes both conduit systems to convey cable throughout the Campus Center. After meeting with the Placer County IT department, it was made clear that the conduit pathway is inadequate for future growth. In many instances, the routes taken for cable distribution uses Placer county conduit and then into AT&T conduit and back to placer county conduit. In some cases the route may enter several buildings before reaching its destination.
    b. AT&T uses the same method to route cable onto the campus utilizing both AT&T maintained and placer county maintained conduit pathway.
    c. Opportunities for improvement: It is best practice to only route placer county cable through county maintained conduit and to not use the AT&T utilities infrastructure. When well planned, the new conduit will provide the county with site pathway for new building projects. The instances where major backbone cable is routed through and between buildings, interruption in service can and will cause major outages and cost when these building are slated for demolition. A potential plan would be:
        - Tier 1: Provide a major conduit pathway from Richardson Blvd., west along B Ave. to County Center Dr. and C Ave..
            1. Provide new conduit or intercept existing conduit into existing buildings.
            2. Provide new conduit into new building/s
        - Tier 1: Provide a major conduit pathway from 1st Street and Bell Ave. to D Ave.
            1. Provide new conduit into new building/s
            2. This conduit will provide utilities for provider cabling.
        - Tier 2: Provide a major conduit pathway from Richardson Blvd. and B Ave to D Ave., D Ave to 1st Street, D Ave to F Ave., D Ave. to C Ave., D and 2nd St to F Ave, D Ave and Richardson Blvd to F Ave, F Ave to 2nd Street. D Ave and 1st to Willow Creek Dr., Willow Creek Dr to west and east of new housing development.
        - Tier 3: Provide a major conduit pathway from, Bell and County Center Dr. to B Ave., F Ave to 1st Street at maintenance buildings, Willow Creek Dr to the east side of 1st street.
            1. These routes will allow for extension of pathway to future projects and provide the conduit loops desired by the IT department.

4. Demolition
    a. Tier 1: Demolish all fiber optic cable and copper cable from Tier 1 project buildings to be demolished to secondary MDF.
    b. Tier 2: Demolish secondary MDF cable and racks from MDF building.
    c. Tier 2: Demolish all cable from secondary MDF to each building cable is served to (south and east of secondary MDF building).

d. Tier 3: Remove Maintenance buildings fiber and copper cable to IT building on F street.

5. Site Fiber Cable
    a. The standard for the county is to install singlemode fiber and OM4 multimode fiber for any current and future projects. The county has legacy 62.5/125 MM site fiber serving the majority of the campus buildings.
    b. Tier 1: Provide new 24 strand SMF and 24 strand OM4 fiber from the campus main MDF to the new HHS building.
    c. Tier 1: Provide new 12 SMF and 12 OM4 fiber from the campus main MDF to the existing IDF at the C Ave building where fiber was demolished.
    d. Tier 2: Provide new 12 strand SMF and 12 strand OM4 fiber from the campus main MDF to each building that has a fiber connection from the secondary MDF which will be demolished.
    e. Tier 3: Provide new 48 strand SMF and 48 strand OM4 fiber from the campus main MDF to the Technology building on F Ave.

APPENDIX G: CANDIDATE FUNDING APPROACHES

MEMORANDUM

To: Jack Paddon and Greg Tonello

From: David Zehnder, Russ Powell, and Frank Refuerzo

Subject: Placer County Government Center Master Plan Update Market Analysis; EPS #152083

Date: October 25, 2018

The Economics of Land Use

Economic & Planning Systems, Inc. (EPS) has conducted a market analysis for selected land uses to help inform the proposed Placer County Government Center Master Plan Update (PCGC MPU) and its land use options. EPS initiated market profiles for development prospects for the PCGC for retail, medical office, lodging, and market-rate apartments. EPS prepared pro forma models for each land use and conducted interviews with real estate brokers familiar with Auburn and, in particular, the State Route 49 (Highway 49) corridor. EPS also prepared a retail gap analysis to determine underrepresented retail categories and other retail opportunities in the Auburn area.

Summary of Findings

The PCGC site offers a unique opportunity to provide a myriad of services and amenities to the North Auburn area and beyond. Although the PCGC MPU focuses on creating a campus for government uses, the additions of public open space, community amenities, and proposed mix of nongovernmental land uses present the chance to create a town center that is currently missing in the North Auburn area. PCGC is situated between residential neighborhoods and located near existing shopping centers along Highway 49, while also existing in the midst of a larger community with strong ties to agriculture and artisanship. While land uses like retail and residential development may be found nearby, the interplay of these land uses with open space and civic buildings, can allow for the creation of a town center that is not only missing in North Auburn, but one that also enhances the community's own sense of identity amidst the rather nondescript and uninspiring development currently located along the Highway 49 corridor.

Overall improving economic conditions have led to increased market activity, most notably evidenced by declining vacancy rates for the four non-governmental land uses being contemplated for PCGC. These

Economic & Planning Systems, Inc.
400 Capitol Mall, 28th Floor
Sacramento, CA 95814
916 649 8010 tel
916 649 2070 fax

Oakland
Sacramento
Denver
Los Angeles

www.epsys.com

vacancy rates are declining mostly due to the absorption of existing supply as very little new development has been delivered in the Greater Auburn area. Although vacancy rates have been steadily (and in some cases sharply) declining for these land uses, rent growth trends vary by land use. Multifamily residential has recorded a strong and consistent rent growth trend post-recession. Hotels in the Roseville-Auburn area have also experienced an increase in their average daily room rates, growing by more than 8 percent from the previous year in both 2014 and 2015. This positive growth contrasts with the recent lease rate history for retail and office uses, whose lease rates have slightly improved since the recession but for the most part are experiencing stagnated growth. However, declining vacancies across the board indicate a promising outlook for future development.

The findings from this market analysis are summarized in **Table 1** on the following page. Various key points regarding overall site and planning considerations are identified below:

- The mix of government, residential, and commercial uses, is not only in line with placemaking trends that value walkability, public spaces, and mixed uses, but also presents an opportunity to create a town center that enhances and reflects North Auburn's identity.
- Existing and proposed community assets—like nearby medical facilities, the Foothill Farmers Market, and the community itself—should be leveraged to inform development programming.
- The Auburn area is host to many wineries and breweries. These industries could be leveraged to create a unique identity for the North Auburn area with a nod to the agricultural past of the area.
- The site's location off of Highway 49 is a benefit due to its proximity to the high-traffic corridor and existing retail hub, yet also a disadvantage given its lower visibility and lack of direct access, which are less attractive to traditional retail developers and tenants.
- The competitive advantage of PCGC relative to other sites can be improved through the inclusion of onsite amenities such as open space as well as through various placemaking techniques such as creating connections between the land uses.
- A phasing strategy can build demand and mitigate risk by first bringing in uses for which there is higher demand, such as multifamily residential and hotel, to be followed by uses like office whose development prospects will benefit from an improved sense of place.

Table 1
Placer County Government Center
PCGC MPU Market Analysis
Summary of Findings

Item	NON-GOVERNMENTAL LAND USES			
	Multifamily Residential	**Retail**	**Office**	**Hotel**
Plan Options [1]				
Option 1				
Proposed Acreage [2]	14.3	2.0	10.0	2.3
Proposed Units/Square Feet/Rooms [3]	298 units	20,000 square feet	126,984 square feet	100 rooms
Option 2				
Proposed Acreage [2]	10.6	2.0	6.3	2.3
Proposed Units/Square Feet/Rooms [3]	212 units	20,000 square feet	80,000 square feet	100 rooms
Option 3				
Proposed Acreage [2]	15.1	2.0	10.9	2.3
Proposed Units/Square Feet/Rooms [3]	302 units	20,000 square feet	138,413 square feet	100 rooms
Current Market Conditions	Highest rent in ten years; strong rent growth and declining vacancies; new construction is mostly custom single-family homes; aging population, little population growth	Modest rent growth since reaching recent low point in 2012, but still shy of pre-recession peak of $2.34 psf; sharply declining vacancy; greater Auburn well-served by robust and diverse retail offerings	Stagnant rent growth; very little new supply delivered; sharply declining vacancy since 2013; 2016 Q3 vacancy of 4.5% is lowest in 10-year history; increasingly compressed office market likely to lead office rents upward	Roseville-Auburn region posted no net increase in supply of available rooms since 2011; occupancy rates have stayed around 70 percent since 2013; despite increased occupancy, few new major demand generators
New Development Opportunities	Very little new multifamily supply may indicate pent up demand for this product; County-owned land makes for potential site for affordable, workforce, or senior housing; proximity to existing community amenities as well as proposed onsite amenities	Aging retail stock with little new supply; proximity to existing retail hub; many typical strip mall centers; opportunity to create new retail experience; adjacent Home Depot and government center uses generate traffic	Nearby medical facilities and aging population signal potential medical office demand; complement and support existing community assets; adjacency to government uses can be competitive advantage for particular office users; potential educational anchor; potential to serve as professional service hub for communities to the North	Dearth of hotels in area, closest competitive hotel is 96-room Holiday Inn built in 1995; typical local/visitor demand for overnight stays can be supplemented by: hospitals, medical facilities, government uses, and onsite community- conference center
New Development Constraints	Market-rate multifamily residential is marginally feasible at 20 units per acre; high market activity for custom and single-family homes; potential community resistance to affordable housing and higher density development	Current average asking rent unlikely to support new construction; potential competition from existing retail hub; low visibility from Highway 49; over 3 miles from Interstate; alternative sites in the area are more attractive to traditional retail developers and tenants	Stagnant rent growth; declining vacancies result of positive net absorption of existing space as new supply may not be supportable with current achievable rents; high-growth sectors like tech may not be best-suited for site, at least in initial phases	Competitive position of PCGC relative to potential hotel sites closer to Interstate; distance from Interstate may hamper ability to capture mountain tourist demand; new hotel under construction in Bowman can absorb near-term and Interstate pass by demand
Site/Planning Considerations	Higher densities make project more feasible; negotiate equitable land lease agreements to boost viability of market-rate and affordable projects; promote walkability and access to open space and onsite amenities; residential uses near site interior would preserve valuable higher traffic areas for commercial uses	Leverage traffic generated by Home Depot and the site's natural elevation to promote visibility; walkable connections between onsite government uses, residential, and commercial uses; strategic design and programming to create new experiences (e.g. food hall concept; walkability, etc.)	Strategic phasing of office to be delivered in later years can be beneficial as demand for this use will increase as project's sense of place improves; find potential anchors (education/medical) to facilitate planning; create flexible retail/office product to mitigate risk; limit office development, especially in initial phases due to a risky office market relative to other proposed uses	Conference and meeting space is in general short supply in this portion of Placer County, making onsite connections between community-conference center and hotel can bolster demand; an extended-stay concept can fill a current void in the area for this niche product

summary

Source: CoStar Online; Williams + Paddon; EPS.

[1] Proposed plan options provided by Williams + Paddon.
[2] Required acreage could be reduced with increased density (e.g. 212 units on 7.07 acres at 30 units an acre)
[3] Assumes estimated 20 units per acre for residential; 0.25 FAR for retail; 0.3 FAR for office; and 43 rooms per acre for hotel.

Introduction

The purpose of this memorandum is to present market analysis findings and to offer suggestions for the proper mix of nongovernmental land uses in the PCGC. The majority of the PCGC site will be dedicated to County government functions which will be housed in a combination of existing and new buildings. The programming of the remaining "surplus" acres is being contemplated in this market analysis. This memorandum's findings should be used to refine options for the appropriate amount of space devoted to proposed nongovernmental uses in the Plan.

The concept behind the proposed mixed land use plan revolves around the trend toward activating employment centers. In the recent past, much press has been dedicated to the diversification of single-use business parks and other employment centers toward more dynamic mixed-use projects that reflect the preferences of today's labor force for work environments.[1] [2] [3] This concept is now being explored in light of government centers. For example, the Golden 1 Center in Downtown Sacramento, on a grand scale, seeks to activate perhaps the largest government center in California and is well on its way to doing so.[4] Major business parks in Northern California have employed this strategy, including Hacienda Business Park in Pleasanton and Bishop Ranch in San Ramon.[5] [6] Indeed, the emerging concepts behind knowledge-driven innovation centers are now integrating residential space and amenities to achieve the placemaking attributes preferred by today's labor force, consumers, and residents.

The PCGC hosts various County functions, but for the most part, it currently operates as a single land use. Situated approximately two blocks west of Highway 49, the site is adjacent to existing stores The Home Depot and Smart & Final, two retailers along the well-established commercial corridor along Highway 49. Across the site's northern border of Bell Road are a myriad of medical facilities, the largest of which is the Sutter Auburn Faith Hospital. Further north, as well as to the west and south of the site, are residential land uses of varying densities from low density single family homes on multi-acre lots, to more compact single family homes and multifamily complexes. Across the Highway 49 corridor to the east is mostly residential development.

---

[1] Brass, Kevin. "Outdoor Space, Modern Food Offerings Help Energize Aging Corporate Campuses." Urban Land. November 16, 2016. http://urbanland.uli.org/economy-markets-trends/outdoor-space-modern-food-offerings-help-energize-aging-corporate-campuses/

[2] Fitzgerald, Jay. "Developers take steps to reinvent suburban office parks." Boston Globe. July 27, 2014. http://www.nytimes.com/2008/05/11/realestate/11wczo.html?

[3] Brenner, Elsa. "Parking Space as Living Space?" New York Times. May 11, 2008. http://www.bostonglobe.com/business/2014/07/26/suburban-office-parks-turning-live-work-play-development-compete-with-cities/kYJHwumXiLKU2bFvCvhBeM/story.html

[4] Lillis, Ryan and Bizjak, Tony. "New arena? Check. Now where's the rest of that promised downtown development?" The Sacramento Bee. August 22, 2016. http://www.sacbee.com/news/local/city-arena/article96833117.html

[5] http://www.bishopranch.com/about/history/

[6] http://haciendabusinesspark.com/

Site access from Highway 49 is primarily provided by Bell Road on the north side, Atwood Road on the south, and Willow Creek Drive in between the two. These three roadways are served by traffic signals at their respective intersections with Highway 49. Currently, the main north-south roadways through the site are Richardson Drive on the western portion of the site and 1st Street on the eastern portion. Non-governmental land uses are proposed around the intersection of Willow Creek Drive and 1st Street located in the eastern part of the PCGC.

The site has low visibility from Highway 49. From the intersection of Highway 49 and Willow Creek Drive, The Home Depot is visible as it is only one block removed from the Highway. Although the Willow Creek-1st Street intersection is slightly visible from Highway 49, the rest of the PCGC campus identified for non-governmental uses is not as obviously visible to the passive eye. There is also a slight grade change from Highway 49 up to PCGC.

Despite considerable traffic generated by The Home Depot, through traffic into the PCGC on Willow Creek Drive is light. County employees and visitors to PCGC primarily access the site from Bell Road and Atwood Road. The non-governmental uses proposed in the eastern part of the site are not readily visible from Richardson Drive and will primarily be served by 1st Street. Traffic patterns are likely to change as more governmental buildings are brought to the PCGC campus and as new land uses are introduced over time.

Key Demographic Trends for North Auburn

EPS prepared a demographic analysis for the City of Auburn and the North Auburn CDP, then contrasted the findings with Loomis, Rocklin, Roseville, Placer County, El Dorado County, Sacramento County, and the State of California. **Table 2** summarizes various demographic comparisons between North Auburn, the City of Auburn, and other jurisdictions.

Age is an important demographic metric to consider for programming future land uses in Greater Auburn. North Auburn generally is younger than the City of Auburn, but overall, the greater Auburn population has an older median age than South Placer and Sacramento Counties. The only exception is the City of Lincoln, which has a large age-restricted community (Lincoln Hills). Nearby areas, such as Lake of the Pines and Meadow Vista, tend to be older than the greater Auburn area.

School enrollment trends also suggest the area is home to an aging population. Enrollment for Kindergarten through 8th Grade in the Auburn Union School District has declined by about one third over the last 20 years, showing a declining percentage of young people and fewer school-age residents. The proportion of kindergarten and first grade students are disproportionately Hispanic, which may indicate a growing trend of Hispanic families with young children. In terms of higher education, fewer people in Auburn (and North Auburn in particular) have college degrees than other jurisdictions.

The greater Auburn area has a higher percentage of renter-occupied households compared to the other jurisdictions, whose median household incomes tend to be higher than communities in greater Auburn. For example, Lake of the Pines and Meadow Vista both have higher median incomes than Auburn.

DRAFT

Table 2
Placer County Government Center
PCGC MPU Market Analysis
Demographic Comparison

	Population					Housing				Household Income		Education	
Community	Total Population	Median Age	% Under 18 Years	% Over 62 Years	% Over 65 Years	Total Housing Units	% Owner-occupied	% Renter-occupied	Median Gross Rent	Median HH Income	Mean HH Income	% HS or Higher	% Bachelor's or Higher
North Auburn CDP	**14,011**	**40.5**	**21.7%**	**24.4%**	**21.7%**	**5,438**	**61.1%**	**38.9%**	**$959**	**$48,052**	**$64,200**	84.5%	19.3%
City of Auburn	**13,690**	**47.5**	**17.3%**	**24.3%**	**20.6%**	**6,395**	**54.0%**	**46.0%**	**$1,036**	**$54,085**	**$80,798**	94.1%	35.1%
Town of Loomis	6,589	42.1	25.0%	21.1%	14.2%	2,425	76.9%	23.1%	$1,617	$82,813	$93,689	96.2%	29.0%
City of Rocklin	56,974	36.1	27.0%	13.5%	10.8%	22,196	65.7%	34.3%	$1,360	$79,274	$95,743	95.4%	39.6%
City of Roseville	118,788	37.5	25.8%	17.0%	14.3%	48,506	64.6%	35.4%	$1,283	$94,461	$106,077	94.6%	36.7%
City of Lincoln	42,819	42.3	22.6%	30.8%	25.8%	17,717	78.0%	22.0%	$1,525	$70,870	$89,664	93.5%	32.6%
Placer County	361,518	40.7	23.7%	20.4%	16.6%	132,627	70.5%	29.5%	$1,277	$73,747	$93,596	94.0%	35.7%
El Dorado County	181,465	44.4	21.7%	20.8%	16.3%	88,496	74.1%	25.9%	$1,073	$68,507	$91,565	92.6%	32.1%
Sacramento County	1,418,788	35.3	25.0%	15.0%	12.0%	558,694	55.9%	44.1%	$1,035	$55,615	$73,456	86.2%	28.2%
State of California	38,066,920	35.8	24.2%	15.1%	12.1%	13,781,929	54.8%	45.2%	$1,243	$61,489	$86,704	81.5%	31.0%

demographics

Source: US Census Bureau, 2014 American Community Survey

Market Analysis

EPS undertook a multi-pronged approach to market analysis, consisting of market research, pro forma modeling, and conducting interviews with real estate professionals attuned to the specifics of the Auburn market.

Market research included accessing industry-accepted real estate sources such as CoStar, LoopNet, and Smith Travel Research. These sources provided data regarding real estate inventory, lease rates, vacancy and occupancy, and other performance metrics specific to the Placer County market. EPS also undertook a retail gap analysis using ESRI. Individually, these sources have some limitations and should be viewed as one set among many sets of information on real estate dynamics.

Findings from this market research informed key assumptions used in pro forma models created for the proposed land uses, which are used as a "screen" by which basic feasibility concerns may be highlighted. To arrive at a price for land, data was gathered from LoopNet, which aggregates information on current land listings. According to this data, the average listing price for land in the Auburn area is $84,951 per acre. A land price of $85,000 per acre was used in the aforementioned pro forma models. More detailed information regarding the LoopNet data can be found in **Appendix A**.

EPS also conducted interviews with various brokers with specific knowledge of the North Auburn market and the greater Auburn area market. EPS interviewed real estate brokers specializing in office, retail, and housing. In order to gain a better understanding of more specific uses, EPS also discussed hospitality/conference uses with the Chief Executive Officer for Placer Valley Tourism, retail uses with a national retail expert, and residential uses with an affordable housing developer.

Residential

Placer County Government Center sits adjacent to residential communities to the north and south. Introducing residential land uses on the project site would offer new and dynamic programming while maintaining consistency with the existing fabric of the greater community. For the purposes of informing the PCGC MPU, the residential market analysis conducted in this report focuses on the multifamily residential sector.

According to CoStar Online, the Auburn multifamily market counts 56 properties and 1,753 units in its current inventory, of which 11 properties consisting of 599 units are affordable.[7] **Appendix A** summarizes the Auburn market-rate multifamily residential market. For the last five consecutive quarters, the vacancy rate for Auburn multifamily properties has been under 3 percent, and it has remained under 5 percent for the last 14 consecutive quarters. This low vacancy is characteristic of a tight market and may be a positive sign that future residential development would be quickly absorbed.

---

[7] CoStar Online, accessed November 17, 2016. Affordable properties listed by CoStar as either rent restricted or rent subsidized.

Another strong market indicator is the growth in average asking rents, which presents a strong growth trend in Auburn. For market-rate properties in Auburn, the average asking rent for the third quarter of 2016 was $1,354 per unit, an increase of more than 15 percent from the average asking rent 5 years prior of $1,172. **Figure 1** shows the shifts in vacancy rate and asking rent in the overall Auburn market-rate multifamily residential market over the last 10 years. If vacancy rates continue to drop or remain at these low levels, it is likely that rents will continue along its current growth trajectory.

Figure 1
Auburn Market-rate Multifamily Residential Market: Vacancy and Asking Rent

Source: CoStar Online, accessed November 17, 2016.

Income and age levels would indicate a need for more affordable housing along the Highway 49 corridor. EPS interviewed USA Properties Fund, which has a low income development in North Auburn, to see if there would be a need for additional affordable housing located in PCGC and an interest to supply it. USA Properties expressed that there would be very strong interest in pursuing such a project. The tenant profiles for their current project are low wage earners that work in the large retailers nearby, people who may work part-time as a result of having disabilities and retirees with small pensions and social security.

Multifamily residential properties along the Highway 49 Corridor between Dry Creek Road and Interstate 80 comprise a subset of the Auburn inventory with strong multifamily residential market potential, evidenced by low vacancy rates and a lack of new supply. A majority of the units included in this subset were built before 2000. This aging housing stock signals potential opportunities for new housing supply. The low vacancy rates in this market subset further

demonstrate that there may be demand to support new supply. **Table 3** summarizes a sampling of the multifamily inventory along the Highway 49 corridor.

Table 3
North Auburn—Highway 49 Corridor Multifamily Residential Inventory

Multifamily Property	Year Built	Units	Vacancy	Avg. Unit Size (SF)	Land (Sq.Ft.)	Land (Acres)	Units/ Acre	Asking Rent	Asking Rent PSF
Address									
11805 Dry Creek Rd	1979	56	0.2%	950	174,240	4.00	14	$1,189	$1.25
11325 Quarts Dr	1978	96	1.5%	808	400,752	9.20	10	$1,143	$1.41
3540 Snowcap View Circle [3]	1985	80	3.5%	764	335,412	7.70	10	$1,073	$1.41
12085 Rock Creek Rd	1980	20	2.0%	900	444,312	10.20	2	$998	$1.11
1545 Grass Valley Hwy	1965	48	2.1%	708	399,965	9.18	5	$779	$1.10
1115 Evergreen Pl	1989	58	4.7%	929	331,056	7.60	8	$1,061	$1.14
11690 Edgewood Dr	2005	6	1.7%	1,334	43,560	1.00	6	$1,401	$1.05
701 Auburn Ravine Rd [3] [4]	1974	50	2.2%	562	120,550	2.77	18	$943	$1.68
12100 Persimmon Terrace	1979	44	3.9%	892	191,664	4.40	10	$1,119	$1.65
600 Auburn Ravine Rd [3] [4]	1994	60	3.5%	535	87,120	2.00	30	$606	$1.13
781 Mikkelsen Dr	1993	80	2.3%	800	69,696	1.60	50	$1,112	$1.39
788 Mikkelsen Dr	1993	24	7.5%	1,100	69,696	1.60	15	$1,104	$1.00
618-638 Mikkelsen Dr [3] [4]	1978	50	2.2%	665	130,680	3.00	17	$1,049	$1.58
190 Summit St	1964	25	2.0%	800	50,094	1.15	22	$982	$1.23
279-295 Placer St	1964	20	2.0%	906	53,004	1.22	16	$843	$0.93
Total/Weighted Average		**717**	**2.7%**	**791**	**2,901,801**	**66.62**	**11**	**$1,020**	**$1.29**

HW49 mf inventory

Source: CoStar Online, accessed on November 17, 2016.

[1] Multifamily residential inventory includes multifamily CoStar listings along the Highway 49 Corridor between Dry Creek Road and I-80, for which appropriate property, vacancy, and rent information were available. Excludes 3250 Blue Oaks Drive The Oaks at Auburn Retirement Community.
[2] All properties are market-rate unless otherwise noted. Does not include rent-restricted properties.
[3] Rent-subsidized affordable houisng.
[4] Senior housing.

The 15 multifamily residential properties along the Highway 49 corridor listed in the above Table 3 range from 2 to 50 dwelling units per acre and have a weighted average of 11 dwelling units per acre. The proposed density of 20 units per acre for the site's residential component is within the range of the multifamily densities currently existing along the Highway 49 corridor. Three of the properties analyzed have densities above 20 units an acre. Pending market conditions, a residential density greater than 20 units per acre may be required to achieve desired levels of financial return. The pro forma analysis in the next section describes in greater detail the feasibility of residential development at 20 units per acre under current market conditions.

Pro Forma

According to CoStar, multifamily residential properties that have sold in the Auburn area since 2014 have traded at cap rates ranging from 4.8 percent to 7.1 percent. These properties have been sold at prices ranging from $70,000 per unit to $207,000 per unit, a spread that reflects the variety of multifamily properties in the area. Properties commanding prices above $100,000 per unit have been smaller properties with less than 10 units.

The pro forma in the following **Table 4** models a market-rate residential development for the site and shows a project that is marginally feasible. Changes in market conditions, such as increased construction costs or lower than expected rents could render the new residential development infeasible. At 20 units per acre, residential development is risky when compared to building in markets that could command higher rents. Increasing density (units per acre) would help to boost profit margins and mitigate project risk. The densest multifamily residential property along Highway 49 is 50 units per acre. An increased density from 30-35 units per acre would make the project more attractive to potential developers while retaining densities similar to those found in the surrounding residential neighborhoods.

Interviews

The primary buyers of homes in Auburn now are older retirees that have cashed out their equity in areas such as the Bay Area and are using that equity to buy homes in Auburn[8]. Most purchases are cash deals. There are few younger families purchasing homes in Auburn. Most of the new construction is for custom homes.

EPS discussed affordable housing with a local broker and USA Properties, an affordable housing developer. USA Properties' Terracina Oaks project is located just east of the PCGC, one block off of Highway 49, behind Michael's. Given the success of this Auburn project, they believe that affordable housing would work well at PCGC. A local broker who has advocated for affordable housing noted the strong resistance to this kind of project recently, so indicated it should be marketed in a positive way so as to avoid some of the pitfalls that befell the project near Raley's.

Opportunities/Constraints

From an economic standpoint, market-rate multifamily residential development is a marginally feasible land use. Residential development would be in line with the residential character of the existing neighborhoods to the north and south of the site. Several market fundamentals point to strong potential for residential development, including very low vacancy rates and a consistent growth trend in asking rent. With custom homes comprising a large portion of new residential construction and few deliveries of market-rate multifamily residential development in recent years, there may be pent up demand for market-rate multifamily housing.

Aside from market-rate housing, workforce, affordable, and senior housing are three market segments that show particular promise unique to residential development on this site. Given the County's ownership of the land, unique land leasing and development arrangements can be contemplated in order to make these residential uses viable on this site, providing housing products that are in short supply and/or high demand in Auburn, but which may not be financially feasible to build on land with less amenable land arrangements.

Although it appears that the market would support new residential development, there are a number of constraints. One such constraint is the high cost of new construction relative to achievable rents. Should construction costs rise considerably, certain housing products may be

[8] From an interview with Dave Hungerford, a real estate broker with Lyon Real Estate, Auburn.

DRAFT

Table 4
Placer County Government Center
PCGC MPU Market Analysis
Multifamily Residential Land Use Pro Forma

Item	Assumption		Total
DEVELOPMENT ASSUMPTIONS			
Site Area	5.0	acres	
Floor to Area Ratio	0.85		
Gross Building Area	185,294	square feet	
Efficiency Ratio	85.0%		
Gross Leasable Area	157,500	square feet	
Average Unit Size	900	square feet	
Number of Units	175		
Dwelling Units per Acre	35		
Parking	1	space per unit	175
REVENUE ASSUMPTIONS			
Average Lease Rate	$1,620	per unit/month	
Average Lease Rate	$1.80	per square foot/month	$3,402,000
Less Vacancy	5.0%		($170,100)
Effective Gross Income			$3,231,900
Less Operating Expenses	20.0%	of Effective Gross Income	($646,380)
Other income (parking revenue?)	50.00	per space/month	$105,000
Net Operating Income (NOI)			**$2,585,520**
Capitalization Rate	6.0%		
Capitalized Building Value		NOI/Capitalization Rate	$43,092,000
Less Disposition Cost	3.0%		($1,292,760)
Total Building Value			**$41,799,240**
COST ASSUMPTIONS			
Land Costs [1]	$85,000	per acre	**($425,000)**
Direct Costs			
Basic site work	10	per land square foot	($2,178,000)
Hard Construction Costs	130	per gross square foot	($24,088,235)
Parking Costs	10,000	per space	($1,750,000)
Subtotal Direct Costs			**($28,016,235)**
Indirect Costs			
Soft Costs			
Predevelopment	1.0%	of Direct Costs	($280,162)
A&E	5.0%	of Direct Costs	($1,400,812)
Pre-opening/Marketing	1.5%	of Direct Costs	($420,244)
Legal	1.0%	of Direct Costs	($280,162)
Other Professional Services	1.0%	of Direct Costs	($280,162)
Subtotal Soft Costs	9.5%	of Direct Costs	**($2,661,542)**
Other Costs			
Contingency	10.0%	of Direct and Soft Costs	($3,067,778)
Real Estate Taxes	1.1%	12 months, construction/value	(308,179)
Permit Costs	0.0%	of Direct Costs	
Impact Fees [2]	$30,000	per unit	($5,250,000)
Developer Fee	3.0%	of Direct and Soft Costs	($920,333)
Subtotal Other Costs			**($9,546,290)**
Subtotal Indirect Costs			**($12,207,832)**
Total Project Costs			**($40,649,067)**
Total Project Costs per unit			**($232,280)**
DEVELOPER PROFIT			
Project Value			$41,799,240
Total Project Costs			($40,649,067)
Profit		Value - Project Costs	$1,150,173
Profit Margin		Profit/Project Costs	**2.8%**

pro forma MFres

Source: LoopNet; CoStar.

[1] Average of current land listed for sale in the Greater Auburn area according to LoopNet, accessed on November 30, 2016. See Table A-1.
[2] Placeholder figure used for illustrative purposes only.

rendered infeasible. Developing at higher densities, negotiating land lease rates, and lowering development impact fees would help the financial prospects of residential development. Other constraints include potential resistance to dense residential development and negative public perception of affordable housing.

Retail

When EPS first initiated market research for potential retail uses, Placer County (County) was amidst negotiations with Costco for a potential ground lease on PCGC land near the existing Home Depot. Subsequently Costco has notified the County that it will no longer look to the PCGC as a potential store site and a site in Loomis has been identified.[9] The Loomis site being contemplated is at the intersection of Brace Road and Sierra College Boulevard, near two large retail centers located at the Sierra College Boulevard exit off Interstate 80—Rocklin Commons and Rocklin Crossings. These two shopping centers present a diverse mix of retail offerings anchored by the likes of Walmart, Target, Bass Pro Shops, and a movie theater. In this sense, the Loomis site is similar to the PCGC site given its proximity to existing retail centers. However, the Loomis site is advantageous in that it is near Interstate 80 and in close to proximity to a larger population pool, making it an easy alternative to Costco's busy Roseville store. With this "big box" no longer a strong possibility, EPS has turned its attention to identify other retail market opportunities potentially applicable to the Auburn area, the North 49 Corridor, and the site.

Performing a preliminary retail gap analysis on the Auburn and North Auburn area revealed that limited retail opportunities exist in the area. For the retail market study area outlined in **Figure 2**, data from ESRI's Retail MarketPlace showed a retail surplus of approximately $471 million across all retail industry groups. **Table 5** details the leakage and surplus of the retail market study area by industry group. Despite the overall retail surplus in Auburn, there are seven industry groups that show retail gaps, amounting to a total retail gap of $39 million.

The retail market study area also shows significant surplus across many retail sectors (e.g., home improvement, food and beverage, motor vehicle). Large surpluses may not necessarily indicate a true oversupply of services, but rather that the market area represents a hub to which consumers from outside the area are drawn. The surplus in home improvement is probably a result of the Home Depot located next to the Government Center in addition to smaller home improvement retailers found throughout the study area. This surplus may indicate that the area could possibly attract a junior anchor store whose services would complement existing retailers, such as barbecue stores (Barbecues Galore), flooring services, and nurseries.

---

[9] Van der Meer, Ben. "Exclusive: Costco looking at possible Loomis Store." November 17, 2016. http://www.bizjournals.com/sacramento/news/2016/11/17/exclusive-costco-looking-at-possible-loomis-store.html

Figure 2
Auburn/North Auburn Retail Market Study Area

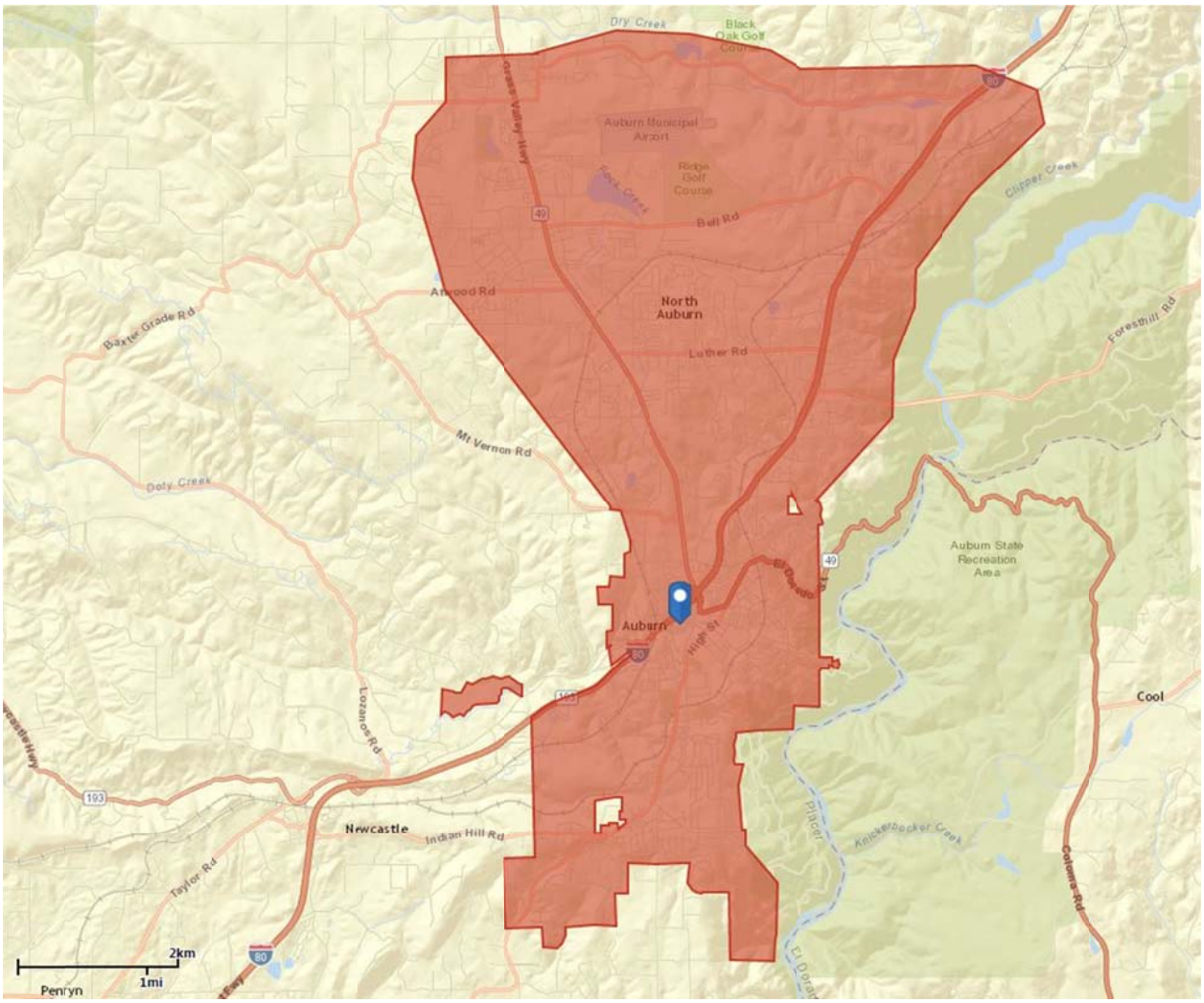


Image Source: ESRI Business Analyst Online

Table 5
ESRI Retail MarketPlace Profile—Greater Auburn Study Area

Industry Group [1]	Demand (Retail Potential)	Supply Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Motor Vehicle & Parts Dealers	**$93,233,835**	**$266,789,563**	**($173,555,728)**	**(48.2)**	**47**
Automobile Dealers	$76,729,752	$226,675,040	($149,945,288)	(49.4)	22
Other Motor Vehicle Dealers	$10,834,350	$23,049,799	($12,215,449)	(36.1)	9
Auto Parts, Accessories & Tire Stores	$5,669,733	$17,064,724	($11,394,991)	(50.1)	16
Furniture & Home Furnishings Stores	**$14,036,970**	**$7,396,447**	**$6,640,523**	**31.0**	**13**
Furniture Stores	$7,665,841	$4,397,567	$3,268,274	27.1	4
Home Furnishings Stores	$6,371,129	$2,998,880	$3,372,249	36.0	9
Electronics & Appliance Stores	**$22,106,405**	**$56,410,095**	**($34,303,690)**	**(43.7)**	**27**
Bldg Materials, Garden Equip. & Supply Stores	**$20,326,808**	**$50,729,931**	**($30,403,123)**	**(42.8)**	**40**
Bldg Material & Supplies Dealers	$18,095,757	$40,896,253	($22,800,496)	(38.7)	33
Lawn & Garden Equip & Supply Stores	$2,231,051	$9,833,678	($7,602,627)	(63.0)	7
Food & Beverage Stores	**$79,941,727**	**$145,269,884**	**($65,328,157)**	**(29.0)**	**36**
Grocery Stores	$68,628,836	$131,779,604	($63,150,768)	(31.5)	12
Specialty Food Stores	$7,323,198	$6,529,085	$794,113	5.7	17
Beer, Wine & Liquor Stores	$3,989,693	$6,961,195	($2,971,502)	(27.1)	7
Health & Personal Care Stores	**$28,781,316**	**$68,409,654**	**($39,628,338)**	**(40.8)**	**30**
Gasoline Stations	**$25,378,573**	**$51,349,787**	**($25,971,214)**	**(33.8)**	**18**
Clothing & Clothing Accessories Stores	**$27,579,588**	**$18,311,026**	**$9,268,562**	**20.2**	**39**
Clothing Stores	$19,902,437	$6,820,729	$13,081,708	49.0	22
Shoe Stores	$2,901,221	$2,772,025	$129,196	2.3	5
Jewelry, Luggage & Leather Goods Stores	$4,775,930	$8,718,272	($3,942,342)	(29.2)	12
Sporting Goods, Hobby, Book & Music Stores	**$11,926,867**	**$21,699,268**	**($9,772,401)**	**(29.1)**	**34**
Sporting Goods/Hobby/Musical Instr Stores	$10,297,437	$18,263,079	($7,965,642)	(27.9)	26
Book, Periodical & Music Stores	$1,629,430	$3,436,189	($1,806,759)	(35.7)	8
General Merchandise Stores	**$63,839,201**	**$94,293,414**	**($30,454,213)**	**(19.3)**	**6**
Department Stores Excluding Leased Depts.	$42,299,170	$90,695,239	($48,396,069)	(36.4)	4
Other General Merchandise Stores	$21,540,031	$3,598,175	$17,941,856	71.4	2
Miscellaneous Store Retailers	**$22,016,142**	**$45,927,793**	**($23,911,651)**	**(35.2)**	**66**
Florists	$896,819	$693,656	$203,163	12.8	4
Office Supplies, Stationery & Gift Stores	$3,142,243	$10,716,154	($7,573,911)	(54.7)	16
Used Merchandise Stores	$1,451,924	$5,509,976	($4,058,052)	(58.3)	21
Other Miscellaneous Store Retailers	$16,525,156	$29,008,007	($12,482,851)	(27.4)	25
Food Services & Drinking Places	**$43,400,734**	**$97,506,060**	**($54,105,326)**	**(38.4)**	**136**
Full-Service Restaurants	$24,318,065	$47,141,557	($22,823,492)	(31.9)	77
Limited-Service Eating Places	$17,418,294	$48,075,692	($30,657,398)	(46.8)	51
Special Food Services	$910,248	$1,216,634	($306,386)	(14.4)	4
Drinking Places - Alcoholic Beverages	$754,127	$1,072,177	($318,050)	(17.4)	4
Total	**$452,568,166**	**$924,092,922**	**($471,524,756)**	**N/A**	**492**

retail gap detail

Source: ESRI Business Analyst Online, Retail Market Place Profile; EPS.

[1] Nonstore retailers such as mail-order houses and direct selling establishments are not included.

Provided the existing $39 million retail gap, and using a conservative assumption of $300 in retail sales per square foot, EPS estimates nearly 130,000 square feet of retail space can be supported in the market area. As summarized in **Table 6**, EPS estimates that if the retail market area can capture between approximately 15 and 25 percent of those sales, resulting development would be an additional 20,000 to 33,000 square feet of retail development. The Auburn/North Auburn area has leakage of retail in furniture stores; clothing stores; and specialty general merchandise stores. However, this location may not be ideally suited to accommodate these types of retailers. Since Auburn may serve as a central location for other communities to the north, additional retail beyond the 20,000-33,000 square feet may be supportable. However, Auburn is generally well-served by a wide-range of types of retail.

Table 6
Preliminary Retail Market Area Gap Analysis

Item	Retail Gap	Estimated Supportable Square Feet [1]	Estimated Capture Rate 15%	Estimated Capture Rate 25%
Formula	*A*	*B = A / $300*	*B * 15%*	*B * 25%*
Industry Group				
Furniture Stores	$3,268,274	10,894	1,634	2,724
Home Furnishings Stores	$3,372,249	11,241	1,686	2,810
Specialty Food Stores	$794,113	2,647	397	662
Clothing Stores	$13,081,708	43,606	6,541	10,901
Shoe Stores	$129,196	431	65	108
Other General Merchandise Stores	$17,941,856	59,806	8,971	14,952
Florists	$203,163	677	102	169
Total	**$38,790,559**	**129,302**	**19,395**	**32,325**
				retail gap sf

Source: ESRI Business Analyst Online, Retail Market Place Profile; EPS.

The retail market has shown positive signs, including decreased vacancy rates and positive net absorption over several consecutive quarters. For the overall Auburn retail inventory, vacancy has stayed below 6 percent since the fourth quarter of 2013, dropping to 4.0 percent in the third quarter of 2016. There has been very little supply added to the inventory—approximately 58,000 square feet has been added since 2010, bringing the current retail stock to just over 2.8 million square feet. A quarterly summary of the Auburn retail market over the last ten years can be found in **Appendix A**.

The 10-year trends for retail vacancy and rent are demonstrated in **Figure 3**. Although rent for retail space has slightly improved over the last several quarters, they are a far cry from pre-recession rents. Despite rather stagnant rent growth, the steadily declining vacancy rate signals promise—as vacancy rates decline, rents are likely to increase and make their way back towards levels capable of sustaining new construction.

Over the last four quarters, retail space in the area has commanded between $1.30 and $1.50 per square foot. According to initial pro forma analysis, new construction would not be feasible with these rents, as new retail development is typically comprised of anchor tenants who may be able to negotiate rents within this range, but which would be much lower than the lease rates charged to the smaller in-line retailers who benefit from the traffic generated by anchor tenants. Furthermore, rent growth for both retail and office has stagnated in the area, posing additional concerns about the viability of new construction on the site. Of additional concern is the site's location relative to competing retail locations that are either located directly along Highway 49 or closer to Interstate 80.

Figure 3
Auburn Retail Market: 10-Year Vacancy Rate and Rent Trends

CoStar Online, accessed on November 17 2016.

Strategic retail programming would be helpful in achieving above average rates for the new retail that are capable of supporting new development. For example, new retail to support demographics and/or to complement existing community amenities (e.g. adjacent retailers, medical facilities) could prove successful given the presence of an already robust retail sector in Auburn. Considering the age levels and income levels of this area, discount retail could be a viable retail product. As previously discussed, the creation of a "town center" concept on the site would offer the site a competitive place-based advantage over other sites along the Highway 49 corridor, which may benefit from direct access and visibility from the Highway, but whose more traditional strip mall development may lack in character and ambiance. The town center concept has the potential to make up for less ideal site characteristics by creating a unique mixed-use retail environment that can offer new experiences within the already well-served retail sector that surrounds the site.

Pro Forma

For all retail property sales over the last 5 years, the average cap rate is 6.99 percent and the median cap rate is 6.89 percent. The average sales price per building square foot over the same 5-year period is $129.17 compared to the median sales price per building square foot of $143.18

A 5-year history of retail properties larger than 10,000 square feet reveals an average cap rate of 7.1 percent and a median cap rate of 7.2 percent. On a sales price per building square foot basis, the history revealed an average of $193.38 per square foot and a median of $110.46 per square foot.

Table 7 shows a pro forma that models a flexible retail/office product. Under current market conditions, this product may not seem feasible—the average Auburn rents are not high enough to support new construction. The pro forma model shows a negative 2.9 percent profit margin using the $1.81 per square foot in rent taken from the average of new retail construction in Auburn in the third quarter of 2016. However, declining vacancy rates and improving rent growth indicate that these uses may be supportable in the future. In order to achieve a profit margin of 6 percent, rents must increase by 9.1 percent to reach $1.98 per square foot. Decreasing development impact fees and making favorable land agreements are two options for making retail/office product more appealing to potential developers.

Interviews

Brokers stated that the overall Auburn retail market is well served by all retail sectors. They do not feel there are under-served niches. The general view is that the Auburn market serves primarily Auburn and outlying areas, like Grass Valley and Colfax. Businesses locating in Auburn often are established by people who live in the Auburn area, or want to relocate to the Auburn area to be near their homes. There was general skepticism regarding being able to attract a retailer such as Costco. One broker observed that retailers with impacted Roseville stores are locating in Rocklin before they would look farther up Interstate 80, like Wal-Mart did at Sierra College Boulevard.

Brokers suggested that grocery-anchored retail centers could help to attract strong retail co-locators. But North Auburn may already be well-served by Safeway and Bel Air. EPS explored the possibilities of a Trader Joe's or Whole Foods Market with one broker, who did not believe Trader Joe's would be interested. Although the size of a typical Trader Joe's seems like a good fit for PCGC, the company seems to be focusing on urban locations and expansion on the East Coast. However, there is agreement that grocery retailers could serve as a major draw for prime retail.

EPS asked brokers if they knew of any junior anchors that liked to locate near Home Depot stores, but none offered primary examples. EPS has noted that Lowe's often locates near Home Depot, as they have done in Roseville and Lincoln. EPS looked at nearby Home Depot stores to see what kind of other junior anchor retailers have co-located near stores in Roseville. One is near the Fry's Electronics along I-80. Interestingly, the one along Highway 65 has a Sprouts Farmers Market. This would be a unique retail business opportunity for Auburn and could fill the market niche that Trader Joe's or Whole Foods would have filled. It could be complimentary to Smart and Final near Home Depot. However, by and large, there seem to be no major trends in the types of retailers surrounding existing Home Depots, as they are collectively surrounded by a diverse array of junior anchors and smaller in-line retailers.

DRAFT

Table 7
Placer County Government Center
PCGC MPU Market Analysis
Retail/Office Land Use Pro Forma

Item	Assumption		Total
DEVELOPMENT ASSUMPTIONS			
Site Area	5.0	acres	
Floor to Area Ratio	0.25		
Gross Building Area	54,450	square feet	
Efficiency Ratio	90.0%		
Gross Leasable Area	49,005	square feet	
Parking	1	space per 1,000 square feet	54
REVENUE ASSUMPTIONS			
Average Lease Rate	$1.81	per square foot/month	
Average Lease Rate	$21.72	per square foot/year	$1,064,389
Less Vacancy	10.0%		($106,439)
Effective Gross Income			$957,950
Less Operating Expenses	25.0%		($239,487)
Net Operating Income (NOI)			**$718,462**
Capitalization Rate	6.9%		
Capitalized Building Value		NOI/Capitalization Rate	$10,412,497
Less Disposition Cost	3.0%		($312,375)
Total Building Value			**$10,100,122**
COST ASSUMPTIONS			
Land Costs [1]	$85,000	per acre	($425,000)
Direct Costs			
Basic site work	5	per square foot	($1,089,000)
Hard Construction Costs	110	per square foot	($5,989,500)
Tenant Improvements	0		$0
Parking Costs	10,000	per space	($544,500)
Subtotal Direct Costs			**($7,623,000)**
Indirect Costs			
Soft Costs			
Predevelopment	1.0%	of Direct Costs	($76,230)
A&E	5.0%	of Direct Costs	($381,150)
Pre-opening/Marketing	1.5%	of Direct Costs	($114,345)
Legal	1.0%	of Direct Costs	($76,230)
Other Professional Services	1.0%	of Direct Costs	($76,230)
Subtotal Soft Costs	9.5%	of Direct Costs	**($724,185)**
Other Costs			
Contingency	10.0%	of Direct and Soft Costs	($834,719)
Real Estate Taxes	1.1%	12 months, construction/value	
Permit Costs	0.0%	of Direct Costs	
Impact Fees [2]	$10.00	per building square foot	($544,500)
Developer Fee	3.0%	of Direct and Soft Costs	($250,416)
Other Costs Subtotal			**($1,629,634)**
Indirect Costs Subtotal			**($9,976,819)**
Total Project Costs			**($10,401,819)**
Total Project Costs per gross bldg. sq. ft.			**($191)**
DEVELOPER PROFIT			
Project Value			$10,100,122
Total Project Costs			($10,401,819)
Profit		Value - Project Costs	($301,697)
Profit Margin		Profit/Project Costs	**(2.9%)**

pro forma office

Source:

[1] Average of current land listed for sale in the Greater Auburn area according to LoopNet, accessed on November 30, 2016. See Table A-1.
[2] Placeholder figure used for illustrative purposes only.

Opportunities/Constraints

As previously discussed, the Greater Auburn area is generally well-serviced by a wide range of retailers. This holds true to the specific location of the site. The area around the intersection of Highway 49 and Bell Road is an active retail node. It hosts many major retail anchors, including The Home Depot, Target, Safeway, and Kmart, as well as smaller in-line retailers and food and beverage businesses. Aside from The Home Depot, all have direct access and high visibility from either Highway 49 or Bell Road.

This existing retail node presents both strengths and weaknesses for new retail development on the Site. The Site's location adjacent to an active retail node can be leveraged to draw from the consumer base who shops at the existing retailers. In this sense, new development can add to the critical mass of retailers, collectively functioning as a regional retail center. New development would also have to compete with existing development on two fronts. First, new development will have to compete for consumer spending. New retailers that offer complementary goods and services to existing retailers would help build a more positive synergy and enhance the overall retail hub as a destination. New development will also have to compete with vacant space within existing developments for tenants, as new retailers may prefer space within existing shopping centers shared with major anchors.

Retail on this site is more likely to be successful if it offers experiences that are different than current offerings in nearby shopping centers. These unique experiences can take the form of retailers that provide products and services that are currently lacking in the area (or that are perhaps complementary to existing retail offerings), but placemaking can also create new experiences that are currently missing from the typical strip mall development that exists in abundance along Highway 49. New and exciting typologies such as a food hall concept, retail that is interconnected with mixed uses and open space, and other programmatic strategies can be employed to create a new retail experience for North Auburn.

A major constraint to new retail development on the Site is low visibility from Highway 49. Although direct access to the major thoroughfares would be ideal for retail development, The Home Depot has shown that retail located off the Highway can be successful. The Home Depot's success is due to its characteristic as a major anchor. The ability to attract anchor and junior anchor tenants to the Site is critical to offset the negative effects of low visibility from Highway 49. Attracting high quality tenants to pre-lease space will also be critical in securing financing. To the extent that many high-quality tenants already have presence in the area, it may be more difficult to find new high-quality tenants to pre-lease, and thus may be more difficult to underwrite the retail project.

There are additional site-specific characteristics that offer opportunities for new retail development. Potential onsite demand generators would benefit new development. The presence of Placer County government functions onsite can translate into a consistent customer base of County employees and visitors, who currently lack access to walkable retail and food and beverage options. New onsite residents serve as another potential customer base, one that is likely to frequent the new retail at different times of the day and week than the County employees and visitors, extending the potential business hours for retailers. Retail options would also serve as an amenity to onsite residential and non-residential uses, which could have a positive effect on rents for other land uses, to the extent that the walkability goals of the PCGC MPU are achieved. However, retail rents in Auburn have not shown strong growth in recent

years, raising concerns about the overall financial feasibility of this land use, especially provided the high cost of new construction. One way to mitigate such concerns is to develop a flexible retail/office product.

Office

Widespread growth across the Sacramento Valley has contributed to an improving office market. In its 2016 Q2 Office Snapshot, Cushman & Wakefield reported that the office vacancy rate for the Sacramento Valley has dropped 110 basis points from the previous year, dropping to 12.6 percent from 13.7 percent.

The outlook for office space in Auburn has greatly improved in recent years. From 2008-2010, vacancy rates hovered between 10 and 12 percent, before starting a steady increase to its peak of 15 percent at the end of 2012. Since then, office vacancy has sharply declined, posting a 4.5 percent vacancy rate in the third quarter of 2016. This has been the result of many quarters of positive net absorption over the last three years, with no new supply being delivered to market since 2012. Since 2010, only one building (about 23,000 square feet) has been added to the office inventory. These office market characteristics are outlined in greater detail in **Appendix A**. The average office vacancy and gross rent rates for the last ten years are charted in **Figure 4**. **Figure 4** shows the sharp decline in vacancy rates over the last few years, which will likely result in a corresponding rise in rents, despite a rather stagnant rent growth response in recent quarters.

Much of the office inventory in Auburn is older. Out of 205 office buildings, only 20 have been built since 2000. The ten year average vacancy rate for buildings constructed since 2000 is 15.5 percent, which is higher than same average for the overall Auburn office inventory. This may be explained by the higher gross rents that this newer construction is commanding. For the third quarter of 2016, the newer buildings averaged $1.81 per square foot in gross rent compared to $1.51 for the overall office market.

The lack of new supply, along with low vacancy rates, could signal the need for more office space in Auburn. Commercial real estate interests from the Auburn area have suggested that the office market is driven by businesses who serve the local population, including professional services that serve Auburn and proximate communities (e.g., medical office), rather than catering to regional-serving industries or business sectors. However, Auburn has an opportunity to serve as a center for smaller nearby communities like Grass Valley. A medical tenant who expanded from Grass Valley into Auburn was cited as an example of this activity.

Technology space may not be a primary product in the Auburn area, as such users often seek closer proximity to research institutions and more urban settings. There was a more positive outlook for more general flex office space, with sites such as the Auburn airport having some success in this regard (currently about 20,000 square feet available). However, the PCGC site would not be the most appropriate location for these uses.

Figure 4
Auburn Office Market: 10-Year Vacancy Rate and Rent Trends

Source: CoStar Online, accessed on November 17, 2016.

The concentration of an older population in the greater Auburn area could encourage growth in medical office space and age-related service providers. Educational uses are another potential growth sector, as Sierra College and CSU Sacramento have both expanded into Placer County. The introduction of ancillary educational facilities to larger institutions would provide an additional demand generator for office and retail uses on the site, and may even have a positive impact on occupancy and lease rates of the adjacent residential development.

The Sierra College district encompasses Placer and Nevada counties primarily. Along with campuses in Rocklin and Grass Valley, they have a nurses program in Roseville. Auburn is approximately 20 miles from the Rocklin campus. PCGC could become a site for vocational uses, which the community college is embracing more broadly. There is still a strong ag presence in the greater Auburn area and North Auburn is home to many wineries. There are ag uses on the Rocklin campus, but an extension to Auburn may be the type of educational use that could thrive on PCGC.

Medical office seems to hold the most positive prospects for serving the area and may build on the existing presence of medical facilities near Government Center. Incubator space should be developed with more caution, as these are most successful when located near universities, large talent pools, and/or other institutions. While some unassuming geographies like Grass Valley and Nevada City boast relatively robust tech/innovation/maker communities, they have emerged from a highly-educated and business savvy resident population who are drawn to these places

for various quality of life reasons. In order to attract these types of enterprises to occupy incubator space, a certain quality of life criterion has to be met—although they may eventually want to locate in a functioning and well-planned mixed-use campus, it will be challenging to attract them as part of the first phase of development.

Pro Forma

For the five year history of office sales transactions for properties larger than 10,000 square feet, the average cap rate was 9.01 percent and the median cap rate was 9.5 percent. The average sales price per building square foot was $106.82 whereas the median was $92.72 per building square foot.

For all Auburn office property sales, both the average and median cap rate was 8.06 percent. The average sales price per building square foot was $129.17 whereas the median was $143.18 per building square foot.

Interviews

The broker with the best knowledge of the office market in Auburn noted there is approximately 1.0 million square foot of office space in Auburn with a 15 percent vacancy rate. The Auburn office market primarily serves Auburn and surrounding communities. Primary uses are medical offices and professional services. The broker noted that medical office space for practitioners is shrinking as technology allows for smaller footprints for medical offices. Recently, Western Sierra Medical Center sought additional space in the Auburn area and the broker indicated another medical group is interested in office space in Auburn.

EPS inquired about flex space in Auburn and the overall demand. They indicated that this space is currently provided at the airport and there is only 20,000 square foot of space currently available, so there could be demand for this type of use; however, they were not sure if PCGC was the appropriate location for this land use as its users are typically looking for a combination of office and warehouse in one location. The presence of emerging technology hubs in Auburn and Grass Valley hints at a possibility of future expansion, but if space is designated at PCGC to meet serve these users, it may take a long time to absorb.

Opportunities/Constraints

The Office market in Auburn is improving in regards to vacancy rates. Although vacancy rates have dropped in recent years, there has not been a strong rent growth pattern. Stagnant rent growth appears to be the biggest constraint for developing new office product in the area. Currently, the relatively small population appears to be well-served in terms office space. Brokers indicated that there are not many business sectors that find Auburn to offer a strategic location advantage. This presents another potential barrier to the viability of new office development, as business sectors with large space needs may look to more competitive submarkets that are strategically located near larger talent bases.

There are several site characteristics that present opportunities for office development, particularly leveraging existing community assets and demographics for future uses. A clear benefit to potential office development is the proximity to the many County government functions onsite. Businesses that support or complement existing and future County uses may find this to be a strategic location. Surrounding medical facilities also provide another opportunity to provide complementary businesses and services to existing uses. Medical office

and other medical-related businesses may similarly find this location to be strategic. The ageing demographic of Auburn may create further demand for health-related services and businesses. With little office space delivered in recent years, new businesses as well as existing businesses in older buildings may look to locate or relocate in newer construction.

Opportunities for additional office development will likely be owner/user driven. With the ageing population there may opportunities for healthcare providers to expand clinics and associated medical uses into smaller, 10,000 to 15,000 square office buildings. Additions of smaller office inventory may also attract other office uses affiliated with government uses, service providers for disadvantaged populations, and perhaps small service providers catering to the daytime PCGC population. The office market should be monitored to see if existing larger medical office users are looking to expand in the North Auburn Area.

Despite the aforementioned opportunities that may exist for new office development in the Auburn area, stagnant rent growth coupled with high construction costs remain the largest barrier to project feasibility.

Lodging

According to a Smith Travel Research Trend Report on select hotels[10] in the Roseville-Auburn Region, there has been a steady rise in lodging demand from 2010 to 2015. Supply, on the other hand, has stagnated, with no new net increase in the supply of available rooms since 2011. The effects of the general increase in demand and stagnant supply in the local hotel market can be seen in the average occupancy and room rates of the hotels in the trend report. Average annual occupancy rates in 2010 were at approximately 56 percent and have risen steadily each year until 2013 when they reached 70 percent. Annual occupancy rates have since hovered around 70 percent. Average daily rates (ADR) have also increased on an annual basis since 2010 when the annual ADR was $86.93. In recent years, this rise in ADR has accelerated, growing by more than 8 percent from the previous year in both 2014 and 2015. The ADR for 2015 is reported at $109.06.

For hotels in and between Roseville and Auburn, there are no properties with more than 2,000 square feet of total meeting space. Many of the lodging properties offered small scale meeting space between 500 and 1,500 square feet. The absence of a hotel-conference center concept in the current market may indicate an opportunity for new supply.

While the supply of new hotel rooms has stagnated, there has been some evidence that the supply is beginning to respond to the strong performance indicators for lodging as several projects are reportedly in the pipeline. The Springhill Suites by Marriott hotel currently under construction at Bowman Road and Luther Road must be considered when analyzing the prospects for a hotel-conference center concept on the Government Center site. The Springhill Suites will

---

[10] For the purposes of this analysis, selections for the Smith Travel Research Trend Report for hotels in the County were filtered according to ZIP code and hotel class. Hotel classes included in this trend report are Upper Midscale Class, Midscale Class, and Upscale Class. Hotels in the following ZIP codes were included in the trend report: 95602, 95603, 95658, 95663, 95650, 95677, 95678, and 95661. Hotels opened before January 1995 were excluded from the trend report. A total of 18 hotels were selected as part of the Smith Travel Research Trend Report.

offer 128 rooms and 2,000 square feet of meeting space.[11] The hotel site is located just off of Interstate-80 and is reported to cost $18.5 million, which is approximately $145,000 per room.[12]

Although a hotel-conference center concept would offer a unique product in this particular market, other non-hotel venues that are serving the demand for meeting/conference space must be considered. The competitive position of the Government Center site for hotel-conference center uses must also be considered relative to other potential Auburn area sites. In late 2015, an 80-room boutique hotel with a 200-person conference center had been proposed in Old Town Auburn on a parking lot across the street from the historic courthouse.[13]

The presence of a County-operated community/conference center on the PCGC site would improve the economic prospects of an adjacent hotel project as it would offload the cost burden associated with building and maintaining the space from potential developers. The conference center would provide a community service while simultaneously acting as a demand generator for an on-site hotel.

Interviews

EPS interviewed David Attaway, of Placer Valley Tourism, an organization tasked with promoting Placer County as an overnight destination. David Attaway admitted that their focus is on the South Placer hotel market and did not have strong knowledge of the Auburn market. However, he offered insights into the South Placer market. The focus of Placer Valley Tourism is to fill rooms in off-seasons. Currently, they are emphasizing their efforts on attracting youth sports tournaments and faith-based organization as event space users with the intention of creating more lodging demand. David Attaway indicated that they do not have demand for conference space, which is expected as conferences tend to gravitate to urban or resort locations. He did confirm that there is very little conference space in South Placer given the low demand, but noted that the City of Rocklin has the Sunset Center that is quite busy, primarily with weddings, but offers meeting space for various groups. There is no associated or nearby lodging for this center.

Pro Forma

The pro forma model in **Table 8** shows that lodging is a feasible land use. Using conservative capitalization rate and occupancy assumptions, a hotel project of 100 rooms returns an attractive profit margin. An average daily room rate of $110 is used, consistent with data provided in the

---

[11] Thomson, Gus. "Auburn's New Hotel: 10 Things That May Surprise You." September 23, 2016. http://www.auburnjournal.com/article/9/23/16/auburn%E2%80%99s-new-hotel-10-things-may-surprise-you

[12] Anderson, Mark. "Construction to begin on $18.5 million hotel near Auburn." Sacramento Business Journal. September 21, 2016. http://www.bizjournals.com/sacramento/news/2016/09/21/construction-to-begin-on-18-5-million-hotel-near.html

[13] Caspers, Tricia. "Boutique hotel in store for Old Town Auburn?" Auburn Journal. November 11, 2015. http://www.auburnjournal.com/article/11/11/15/boutique-hotel-store-old-town-auburn

DRAFT

Table 8
Placer County Government Center
PCGC MPU Market Analysis
Hotel Land Use Pro Forma

Item		Assumption	Total
ASSUMPTIONS			
DEVELOPMENT ASSUMPTIONS			
Site Area	2.3	acres	
Floor to Area Ratio	0.80		
Gross Building Area	80,000	square feet	
Efficiency Ratio	85.0%		
Gross Leasable Area	68,000	square feet	
Gross Square feet per room	800	square feet	
Number of Hotel Rooms	100		
Parking	1	space per room	100
REVENUE ASSUMPTIONS			
Average Daily Rate	110	per night	$4,015,000
Occupancy Rate	60.0%		$2,409,000
Effective Gross Income			$2,409,000
Less Operating Expenses	30.0%		($722,700)
Other income (F&B, retail, mtg)	0.00	per room	$0
Net Operating Income (NOI)			**$1,686,300**
Capitalization Rate	8.0%		
Capitalized Building Value		NOI/Capitalization Rate	$21,078,750
Less Disposition Cost	3.0%		($632,363)
Total Building Value			**$20,446,388**
COST ASSUMPTIONS			
Land Costs [1]	$85,000	per acre	($195,500)
Direct Costs			
Basic site work	10	per square foot	($1,001,880)
Hard Construction Costs	130	per square foot	($10,400,000)
Parking Costs	10,000	per space	($1,000,000)
Subtotal Direct Costs			**($12,401,880)**
Indirect Costs			
Soft Costs			
Predevelopment	1.0%	of Direct Costs	($124,019)
A&E	5.0%	of Direct Costs	($620,094)
Pre-opening/Marketing	1.5%	of Direct Costs	($186,028)
Legal	1.0%	of Direct Costs	($124,019)
Other Professional Services	1.0%	of Direct Costs	($124,019)
Subtotal Soft Costs	9.5%	of Direct Costs	**($1,178,179)**
Other Costs			
Contingency	10.0%	of Direct and Soft Costs	($1,358,006)
Real Estate Taxes	1.1%	12 months, construction/value	
Permit Costs	0.0%	of Direct Costs	
Impact Fees []2	$ 5,000	per room	($500,000)
Developer Fee	3.0%	of Direct and Soft Costs	($407,402)
Subtotal Other Costs			**($2,265,408)**
Subtotal Indirect Costs			**($3,443,586)**
Total Project Costs			**($16,040,966)**
Total Project Costs per room			**($160,410)**
DEVELOPER PROFIT			
Project Value			$20,446,388
Total Project Costs			($16,040,966)
Profit		Value - Project Costs	$4,405,421
Profit Margin		Profit/Project Costs	27%

pro forma hotel

Source:

[1] Average of current land listed for sale in the Greater Auburn area according to LoopNet, accessed on November 30, 2016. See Table A-1.
[2] Placeholder figure used for illustrative purposes only.

Smith Travel Research (STR) report on nearby hotels. The STR report provided steadily increasing average room rates and occupancy rates over the years, the latter of which has reached 70 percent. Given that the site is located off Highway 49 and relatively removed from Interstate 80, a conservative occupancy rate of 60 percent is used in the pro forma model. The model assumes no income from other sources that might be found in other hotels, such as food and beverage spending, recreation and leisure activities, and parking. This pro forma does not model a meeting/conference space component to the hotel since it is assumed that this amenity would be provided in a nearby County building.

Opportunities/Constraints

Hotel development is a promising land use for the PCGC site. The Greater Auburn area has low lodging inventory as well as a low supply of conference/meeting space. Smith Travel Research data on hotels within the Auburn-Roseville region shows increasing demand, rising room rates, and very little new development. An onsite hotel/conference center concept has the capacity to create an attraction with conference center space as well as increasing lodging capacity of the greater region. The region is in particularly short supply of conference/meeting space, and providing such space would be a benefit to the greater community. The potential for the County to build and operate the conference/community center would alleviate some of the cost burden from the hotel. Government-related functions and other community and private events at the conference center would also serve as a demand generator for the hotel. Additionally, nearby hospitals and medical facilities may also create future demand for overnight stays.

There are several site and market constraints to hotel development. The Site's location off of Highway 49 offers limited visibility, which is a constraint, although not as significant of a constraint for hotel development as it is for retail uses. More significant constraints are the market considerations regarding new hotel development. Although lodging demand has steadily increased over the years, new hotel development has not been delivered.

Response to the increased lodging demand has been growing, most explicitly evidenced by the Springhill Suites project currently under construction along Interstate 80 near Bowman. The Springhill Suites project is well-located on the Interstate with high visibility, and is likely to gain a large share of the pass-by market. The Springhill Suites project is also providing 2,000 square feet of meeting space, catering to gatherings looking to take advantage of its hilltop vistas. This poses competition for the limited meeting and event market in Auburn. Discussion of a new boutique hotel across from the historic Auburn courthouse is further evidence of a growing supply-side response. Although these projects can be considered as competition, they are also indicative of a strengthening hotel market with no penetration since the Holiday Inn was built in Auburn 20 years ago.

Conclusion

There are three site configurations under consideration for the PCGC-MPU. Non-governmental uses are proposed for the areas along Willow Creek Drive near The Home Depot and along First Street. Each site option has a residential use planned for the southwest corner of the PCGC campus, off of Atwood Road. New government uses are located near the center of the campus. A large open space is planned for the center of the campus. Some of the non-governmental uses will abut or be nearby the open space.

The location of non-governmental uses in each option will suffer from a lack of proximity and visibility from Highway 49. The project is not likely to provide "destination" retail opportunities, as its retail component is likely to be comprised of neighborhood-serving retail will be best suited to serve nearby uses. These retail uses would seem to benefit most from being positioned in close proximity to The Home Depot and adjacent Smart & Final. Residential and office uses on the other hand, are less reliant on traffic than retail and would find just as much success being located towards the interior of the site. Placing these uses towards the interior of the site would bring traffic past the retailers and into the site, while also generating onsite demand for retailers. The strategic placement of non-governmental uses can help shape future traffic patterns in ways that are beneficial to those uses and the community as a whole.

General Comments

Retail is sized appropriately across the three options, proposing approximately 20,000 square feet of retail space.

The three options are described in greater detail below.

Option 1

Major traffic circulation for Option 1 is planned for Willow Creek Drive, 1st Street, B Avenue, C Avenue, and Richardson Drive. The County Administrative Center is located at Bell Road and 1st Avenue. The location of the most frequented County buildings in this option will encourage traffic movements along Richardson Drive and Bell Road. Under this use plan, government buildings would not necessarily generate new traffic near Willow Creek Drive and 1st Street, where non-governmental uses are planned. A proposed hotel with approximately 100 rooms is planned for an area south of the Willow Creek Drive and 1st Street roundabout. Commercial office and retail are additional uses surrounding this roundabout.

There are residential uses are located adjacent to these non-governmental uses. If residential is the first use to develop in this area, the main traffic generation to this area will be driven by residential uses. Of the proposed 298 residential units under Option 1, approximately 180 will be adjacent to the non-governmental uses (retail, office, and hotel). Retail uses under each option are planned for approximately 21,000 square foot within the Willow Creek/1st Street vicinity. If development of this retail use relies upon a certain amount of traffic generation through this intersection, it is uncertain if there will be sufficient traffic to encourage development of this use.

Office uses are planned for approximately 130,000 square feet within this area. Sutter Auburn Faith Hospital is located two blocks to the north of PCGC and there are many medical offices located nearby, with some medical providers looking to expand in the North Auburn area. If this area were activated by addition of various office uses related to the medical industry, this could activate traffic along Willow Creek and perhaps generate sufficient visibility for neighborhood commercial that could serve residents on PCGC, County employees, and office employees. Again, this area is not readily visible from the Highway 49 corridor so residential and office uses will bring the visitors to Willow Creek Drive/1st Street and encourage retail development.

Option 2

Major circulation for Option 2 will be along Willow Creek Drive, 1st Street, Richardson Avenue, and County Center Drive off of Bell Road. Office, retail, residential, and the hotel are all heavily planned along Willow Creek Drive to County Center Drive. This configuration may encourage

more traffic trips along Willow Creek Drive. There is approximately 83,000 square foot of office planned for this option, with 212 residential units. The County Administrative Centre moved towards the interior of the campus. A community center is planned in each option near the open space. In this option, the County Administrative Center also abuts the open space. The office and retail are closer to the open space in this option. The combination of uses bordering on the open space and community center may better activate this space for non-governmental uses. This option also concentrates more uses south of The Home Depot, which generates significant traffic all days of the week. This option may best utilize the proximity to The Home Depot.

Option 3

Option 3 eliminated Willow Creek Drive as a major access to the center of the campus. Willow Creek Drive terminates at 1st Street where non-governmental uses are concentrated along Willow Creek and 1st Street. There are a planned 302 residential units located along 1st Street and adjoining the open space and community center. Retail uses are primarily south of The Home Depot, with office uses along the roundabout at Willow Creek Drive and 1st Street. There is approximately 140,000 square foot of office planned for the area around the roundabout. The County Administrative Center is along Bell Road between 1st Street and County Center Drive.

Professional Drive will provide access to the center of the campus, along with County Center Drive. Professional Drive will give the most direct access for residential uses, but will also pass near the non-governmental uses. This land use option seems to create unique districts for governmental, non-governmental uses, and residential uses. It is conceivable that Willow Creek Drive will be the access point for non-governmental uses, Professional Drive for residential uses, and County Center Drive for governmental uses. Retail will be highly visible from Highway 49. The neighborhood commercial would not necessarily be with walking distance for County employees, but would be reasonably close to residential uses.

APPENDIX A:

Additional Market Data

Table A-1 Auburn Multifamily Residential Inventory – All Market-rate Buildings A-1

Table A-2 Auburn Retail Market Fundamentals – All Buildings A-2

Table A-3 Auburn Retail Market Fundamentals – Buildings Constructed Since 2000 ..... A-3

Table A-4 Auburn Office Market Fundamentals – All Buildings A-4

Table A-5 Auburn Office Market Fundamentals – Buildings Constructed Since 2000 ..... A-5

Table A-6 Comparable Land Listing in the Auburn Area A-6

DRAFT

Table A-1
Placer County Government Center
PCGC MPU Market Analysis
Auburn Multifamily Residential Inventory - All Market-rate Buildings [1]

Period	Inventory			Vacant Units	Vacancy Rate	Net Absorption Units	Deliveries Units	Asking Rent	
	Buildings	Units	Avg. Unit SF					Per Unit	Per Sq. Ft.
2007 Q1	30	998	799	35	3.5%	2	-	$1,201	$1.49
2007 Q2	30	998	799	37	3.7%	(2)	-	$1,221	$1.51
2007 Q3	30	998	799	38	3.8%	(2)	-	$1,232	$1.53
2007 Q4	30	998	799	39	3.9%	(1)	-	$1,228	$1.52
2008 Q1	31	1,007	799	45	4.5%	3	9	$1,228	$1.52
2008 Q2	32	1,023	808	42	4.1%	3	16	$1,235	$1.53
2008 Q3	32	1,023	808	41	4.1%	1	-	$1,238	$1.53
2008 Q4	32	1,023	808	43	4.3%	(2)	-	$1,231	$1.53
2009 Q1	32	1,023	808	48	4.8%	(5)	-	$1,224	$1.52
2009 Q2	32	1,023	808	57	5.7%	(9)	-	$1,217	$1.51
2009 Q3	32	1,023	808	63	6.2%	(5)	-	$1,196	$1.48
2009 Q4	32	1,023	808	63	6.2%	-	-	$1,171	$1.45
2010 Q1	32	1,023	808	61	6.0%	2	-	$1,147	$1.42
2010 Q2	32	1,023	808	54	5.3%	7	-	$1,153	$1.43
2010 Q3	32	1,023	808	50	5.0%	4	-	$1,162	$1.44
2010 Q4	32	1,023	808	47	4.7%	3	-	$1,165	$1.44
2011 Q1	32	1,023	808	46	4.5%	2	-	$1,169	$1.45
2011 Q2	32	1,023	808	44	4.4%	1	-	$1,170	$1.45
2011 Q3	33	1,029	808	45	4.5%	5	6	$1,172	$1.45
2011 Q4	33	1,029	808	43	4.2%	3	-	$1,174	$1.46
2012 Q1	33	1,029	808	44	4.4%	(2)	-	$1,180	$1.46
2012 Q2	33	1,029	808	47	4.7%	(3)	-	$1,187	$1.47
2012 Q3	33	1,029	808	53	5.3%	(6)	-	$1,190	$1.47
2012 Q4	33	1,029	808	54	5.4%	(1)	-	$1,191	$1.48
2013 Q1	33	1,029	808	53	5.3%	1	-	$1,200	$1.49
2013 Q2	33	1,029	808	47	4.7%	6	-	$1,213	$1.50
2013 Q3	33	1,029	808	45	4.4%	2	-	$1,218	$1.51
2013 Q4	33	1,029	808	41	4.1%	4	-	$1,220	$1.51
2014 Q1	33	1,029	808	42	4.2%	(1)	-	$1,225	$1.52
2014 Q2	33	1,029	808	39	3.8%	3	-	$1,232	$1.53
2014 Q3	33	1,029	808	36	3.5%	3	-	$1,240	$1.54
2014 Q4	33	1,029	808	34	3.4%	2	-	$1,247	$1.55
2015 Q1	33	1,029	808	32	3.2%	2	-	$1,260	$1.56
2015 Q2	33	1,029	808	31	3.1%	1	-	$1,267	$1.57
2015 Q3	33	1,029	808	27	2.6%	4	-	$1,289	$1.60
2015 Q4	33	1,029	808	25	2.5%	2	-	$1,302	$1.61
2016 Q1	33	1,029	808	25	2.4%	1	-	$1,320	$1.64
2016 Q2	33	1,029	808	26	2.5%	(1)	-	$1,342	$1.66
2016 Q3	33	1,029	808	25	2.5%	-	-	$1,354	$1.68
Average					**4.3%**			**$1,186**	**$1.47**

MF trend all

Source: CoStar Online, accessed on November 17 2016.

DRAFT

Table A-2
Placer County Government Center
PCGC MPU Market Analysis
Auburn Retail Market Fundamentals - All Buildings [1]

Period	Inventory Buildings	Inventory Sq. Ft.	Vacant Sq. Ft.	Vacancy Rate	Net Absorption	Deliveries Sq. Ft.	Triple Net Rent
2007 Q1	295	2,676,225	107,586	4.0%	26,066	-	$2.31
2007 Q2	297	2,691,382	112,462	4.2%	25,181	15,157	$2.34
2007 Q3	297	2,691,382	109,136	4.1%	3,326	-	$2.31
2007 Q4	298	2,700,382	114,302	4.2%	3,834	9,000	$2.32
2008 Q1	299	2,722,397	104,570	3.8%	30,262	22,015	$2.29
2008 Q2	300	2,763,698	151,893	5.5%	(9,037)	41,301	$2.24
2008 Q3	301	2,769,198	178,973	6.5%	(25,760)	5,500	$2.27
2008 Q4	301	2,769,198	240,412	8.7%	(61,439)	-	$2.29
2009 Q1	301	2,769,198	238,132	8.6%	10,960	-	$2.19
2009 Q2	303	2,789,940	260,691	9.3%	(1,817)	20,742	$2.25
2009 Q3	303	2,789,940	294,238	10.5%	(33,547)	-	$2.15
2009 Q4	303	2,789,940	299,969	10.8%	(12,231)	-	$2.16
2010 Q1	303	2,789,940	295,454	10.6%	11,015	-	$1.48
2010 Q2	304	2,792,459	309,630	11.1%	(17,657)	2,519	$1.47
2010 Q3	304	2,792,459	307,104	11.0%	2,766	-	$1.39
2010 Q4	303	2,790,749	293,653	10.5%	12,901	-	$1.38
2011 Q1	303	2,790,749	251,004	9.0%	2,649	-	$1.40
2011 Q2	303	2,790,749	215,749	7.7%	78,055	-	$1.27
2011 Q3	303	2,790,749	222,665	8.0%	(5,116)	-	$1.24
2011 Q4	303	2,790,749	240,907	8.6%	(18,242)	-	$1.21
2012 Q1	303	2,790,749	216,487	7.8%	22,977	-	$1.28
2012 Q2	303	2,790,749	229,915	8.2%	(14,385)	-	$1.29
2012 Q3	303	2,790,749	240,562	8.6%	(8,247)	-	$1.29
2012 Q4	303	2,790,749	233,989	8.4%	6,573	-	$1.36
2013 Q1	303	2,790,749	227,610	8.2%	1,802	-	$1.28
2013 Q2	302	2,768,749	205,392	7.4%	3,395	-	$1.40
2013 Q3	303	2,771,158	175,831	6.3%	1,039	2,409	$1.37
2013 Q4	303	2,771,158	157,640	5.7%	16,867	-	$1.27
2014 Q1	303	2,771,158	153,808	5.6%	34,787	-	$1.32
2014 Q2	303	2,771,158	148,588	5.4%	3,284	-	$1.39
2014 Q3	303	2,771,158	152,828	5.5%	(1,164)	-	$1.38
2014 Q4	303	2,771,158	146,180	5.3%	6,348	-	$1.32
2015 Q1	303	2,771,158	154,981	5.6%	(13,361)	-	$1.28
2015 Q2	302	2,764,738	149,361	5.4%	3,886	-	$1.31
2015 Q3	302	2,764,738	124,656	4.5%	17,439	-	$1.33
2015 Q4	306	2,817,553	143,092	5.1%	33,874	52,815	$1.31
2016 Q1	306	2,817,553	142,517	5.1%	8,580	-	$1.46
2016 Q2	306	2,817,553	120,094	4.3%	13,901	-	$1.50
2016 Q3	306	2,817,553	112,178	4.0%	10,410	-	$1.48
Average				**7.0%**			**$1.59**

retail trend all

Source: CoStar Online, accessed on November 17 2016.

DRAFT

Table A-3
Placer County Government Center
PCGC MPU Market Analysis
Auburn Retail Market Fundamentals - Buildings Constructed Since 2000 [1]

Period	Inventory Buildings	Inventory Sq. Ft.	Vacant Sq. Ft.	Vacancy Rate	Net Absorption	Deliveries Sq. Ft.	Triple Net Rent
2007 Q1	9	208,572	4,400	2.1%	1,400	-	$2.74
2007 Q2	11	223,729	17,980	8.0%	1,577	15,157	$2.74
2007 Q3	11	223,729	19,980	8.9%	(2,000)	-	$2.74
2007 Q4	12	232,729	27,480	11.8%	1,500	9,000	$2.61
2008 Q1	13	254,744	21,162	8.3%	28,333	22,015	$2.59
2008 Q2	14	296,045	60,065	20.3%	2,398	41,301	$2.58
2008 Q3	15	301,545	78,930	26.2%	(22,045)	5,500	$2.61
2008 Q4	15	301,545	80,734	26.8%	(1,804)	-	$2.60
2009 Q1	15	301,545	77,270	25.6%	12,144	-	$2.63
2009 Q2	17	322,287	80,989	25.1%	17,023	20,742	$2.28
2009 Q3	17	322,287	80,489	25.0%	500	-	$2.28
2009 Q4	17	322,287	80,689	25.0%	(200)	-	$2.28
2010 Q1	17	322,287	85,074	26.4%	(4,385)	-	$1.99
2010 Q2	18	324,806	90,374	27.8%	(2,781)	2,519	$2.01
2010 Q3	18	324,806	83,313	25.7%	4,211	-	$1.98
2010 Q4	18	324,806	79,063	24.3%	2,500	-	$1.91
2011 Q1	18	324,806	79,912	24.6%	3,751	-	$1.97
2011 Q2	18	324,806	79,576	24.5%	336	-	$1.65
2011 Q3	18	324,806	76,546	23.6%	3,030	-	$1.71
2011 Q4	18	324,806	77,014	23.7%	(468)	-	$1.66
2012 Q1	18	324,806	70,783	21.8%	4,788	-	$1.64
2012 Q2	18	324,806	71,814	22.1%	412	-	$1.59
2012 Q3	18	324,806	72,990	22.5%	(1,176)	-	$1.63
2012 Q4	18	324,806	72,990	22.5%	-	-	$1.68
2013 Q1	18	324,806	72,003	22.2%	987	-	$1.67
2013 Q2	18	324,806	72,638	22.4%	(635)	-	$1.67
2013 Q3	19	327,215	42,057	12.9%	659	2,409	$1.65
2013 Q4	19	327,215	39,290	12.0%	2,767	-	$1.64
2014 Q1	19	327,215	39,909	12.2%	31,712	-	$1.43
2014 Q2	19	327,215	43,667	13.3%	(3,758)	-	$1.43
2014 Q3	19	327,215	43,849	13.4%	(182)	-	$1.43
2014 Q4	19	327,215	39,524	12.1%	4,325	-	$1.23
2015 Q1	19	327,215	42,405	13.0%	(2,881)	-	$1.18
2015 Q2	19	327,215	45,027	13.8%	(2,622)	-	$1.23
2015 Q3	19	327,215	23,637	7.2%	12,390	-	$1.23
2015 Q4	22	375,665	40,201	10.7%	38,256	48,450	$1.20
2016 Q1	22	375,665	38,747	10.3%	4,084	-	$1.20
2016 Q2	22	375,665	35,561	9.5%	3,186	-	$1.33
2016 Q3	22	375,665	28,922	7.7%	3,611	-	$1.31
Average				**17.8%**			**$1.82**

retail trend new

Source: CoStar Online, accessed on November 17 2016.

DRAFT

Table A-4
Placer County Government Center
PCGC MPU Market Analysis
Auburn Office Market Fundamentals - All Buildings [1]

Period	Inventory Buildings	Inventory Sq. Ft.	Vacant Sq. Ft.	Vacancy Rate	Net Absorption	Deliveries Sq. Ft.	Gross Rent
2007 Q1	200	1,700,527	68,840	4.0%	41,954	38,336	$1.83
2007 Q2	202	1,759,085	159,817	9.1%	(32,419)	58,558	$2.00
2007 Q3	202	1,759,085	151,576	8.6%	7,623	0	$1.98
2007 Q4	204	1,808,108	210,207	11.6%	(9,240)	49,023	$1.96
2008 Q1	204	1,808,108	199,971	11.1%	10,486	0	$1.93
2008 Q2	204	1,808,108	192,697	10.7%	7,274	0	$1.97
2008 Q3	204	1,808,108	183,053	10.1%	9,644	0	$1.94
2008 Q4	204	1,808,108	190,239	10.5%	(7,186)	0	$1.89
2009 Q1	204	1,808,108	202,457	11.2%	(12,218)	0	$1.85
2009 Q2	204	1,808,108	212,271	11.7%	(12,048)	0	$1.82
2009 Q3	204	1,808,108	198,426	11.0%	16,079	0	$1.69
2009 Q4	204	1,808,108	201,707	11.2%	(4,715)	0	$1.68
2010 Q1	204	1,808,108	200,808	11.1%	(42)	0	$1.67
2010 Q2	204	1,808,108	213,213	11.8%	(10,030)	0	$1.58
2010 Q3	204	1,808,108	211,062	11.7%	(474)	0	$1.60
2010 Q4	204	1,808,108	226,674	12.5%	(12,987)	0	$1.65
2011 Q1	204	1,808,108	228,087	12.6%	(1,413)	0	$1.57
2011 Q2	204	1,808,108	212,531	11.8%	15,556	0	$1.54
2011 Q3	204	1,808,108	211,463	11.7%	(902)	0	$1.50
2011 Q4	204	1,808,108	218,630	12.1%	(6,477)	0	$1.49
2012 Q1	204	1,808,108	214,261	11.9%	2,189	0	$1.43
2012 Q2	204	1,808,108	228,692	12.6%	(12,353)	0	$1.43
2012 Q3	205	1,830,704	263,079	14.4%	(10,409)	22,596	$1.45
2012 Q4	205	1,830,704	273,845	15.0%	(10,766)	0	$1.49
2013 Q1	205	1,830,704	262,025	14.3%	11,820	0	$1.43
2013 Q2	205	1,830,704	274,672	15.0%	(13,707)	0	$1.47
2013 Q3	205	1,830,704	270,331	14.8%	5,401	0	$1.42
2013 Q4	205	1,830,704	264,330	14.4%	1,199	0	$1.46
2014 Q1	205	1,830,704	245,544	13.4%	19,577	0	$1.42
2014 Q2	205	1,830,704	202,202	11.0%	42,019	0	$1.51
2014 Q3	205	1,830,704	198,581	10.8%	6,721	0	$1.51
2014 Q4	205	1,830,704	169,027	9.2%	27,370	0	$1.60
2015 Q1	205	1,830,704	167,642	9.2%	3,682	0	$1.55
2015 Q2	205	1,830,704	159,857	8.7%	8,868	0	$1.62
2015 Q3	205	1,830,704	159,338	8.7%	(6,434)	0	$1.47
2015 Q4	205	1,830,704	159,693	8.7%	7,636	0	$1.53
2016 Q1	205	1,830,704	136,779	7.5%	18,414	0	$1.55
2016 Q2	205	1,830,704	105,522	5.8%	31,525	0	$1.60
2016 Q3	205	1,830,704	82,151	4.5%	20,087	0	$1.51
Average				**10.9%**			**$1.59**

office trend all

Source: CoStar Online, accessed on November 17 2016.

DRAFT

Table A-5
Placer County Government Center
PCGC MPU Market Analysis
Auburn Office Market Fundamentals - Buildings Constructed Since 2000 [1]

Period	Inventory Buildings	Inventory Sq. Ft.	Vacant Sq. Ft.	Vacancy Rate	Net Absorption	Deliveries Sq. Ft.	Gross Rent
2007 Q1	15	311,005	9,936	3.2%	35,600	38,336	$2.01
2007 Q2	17	369,563	66,512	18.0%	1,982	58,558	$2.24
2007 Q3	17	369,563	60,071	16.3%	6,441	0	$2.26
2007 Q4	19	418,586	101,630	24.3%	7,464	49,023	$2.23
2008 Q1	19	418,586	85,130	20.3%	16,500	0	$2.25
2008 Q2	19	418,586	84,656	20.2%	474	0	$2.25
2008 Q3	19	418,586	75,983	18.2%	8,673	0	$2.23
2008 Q4	19	418,586	71,859	17.2%	4,124	0	$2.23
2009 Q1	19	418,586	73,833	17.6%	(1,974)	0	$2.23
2009 Q2	19	418,586	71,599	17.1%	0	0	$2.23
2009 Q3	19	418,586	66,376	15.9%	7,457	0	$1.99
2009 Q4	19	418,586	66,399	15.9%	(23)	0	$1.91
2010 Q1	19	418,586	67,735	16.2%	(1,336)	0	$1.94
2010 Q2	19	418,586	67,735	16.2%	0	0	$1.83
2010 Q3	19	418,586	67,735	16.2%	0	0	$1.83
2010 Q4	19	418,586	71,613	17.1%	(3,878)	0	$1.86
2011 Q1	19	418,586	73,367	17.5%	(1,754)	0	$1.84
2011 Q2	19	418,586	71,778	17.1%	1,589	0	$1.82
2011 Q3	19	418,586	69,508	16.6%	300	0	$1.76
2011 Q4	19	418,586	59,799	14.3%	11,679	0	$1.73
2012 Q1	19	418,586	68,836	16.4%	(9,037)	0	$1.72
2012 Q2	19	418,586	68,969	16.5%	(133)	0	$1.72
2012 Q3	20	441,182	80,169	18.2%	11,396	22,596	$1.74
2012 Q4	20	441,182	75,737	17.2%	4,432	0	$1.80
2013 Q1	20	441,182	80,353	18.2%	(4,616)	0	$1.78
2013 Q2	20	441,182	82,187	18.6%	(2,894)	0	$1.84
2013 Q3	20	441,182	86,282	19.6%	(3,035)	0	$1.83
2013 Q4	20	441,182	90,273	20.5%	(5,449)	0	$1.82
2014 Q1	20	441,182	72,862	16.5%	18,869	0	$1.83
2014 Q2	20	441,182	69,731	15.8%	3,131	0	$1.83
2014 Q3	20	441,182	68,486	15.5%	1,245	0	$1.81
2014 Q4	20	441,182	50,019	11.3%	18,467	0	$1.80
2015 Q1	20	441,182	48,611	11.0%	1,408	0	$1.81
2015 Q2	20	441,182	44,228	10.0%	3,345	0	$1.80
2015 Q3	20	441,182	43,599	9.9%	1,667	0	$1.84
2015 Q4	20	441,182	43,599	9.9%	0	0	$1.80
2016 Q1	20	441,182	45,802	10.4%	(2,203)	0	$1.82
2016 Q2	20	441,182	28,510	6.5%	17,292	0	$1.81
2016 Q3	20	441,182	24,599	5.6%	3,911	0	$1.81
Average				**15.5%**			**$1.87**

office trend new

Source: CoStar Online, accessed on November 17 2016.

Table A-6
Placer County Government Center
PCGC MPU Market Analysis
Comparable Land Listings in the Auburn Area

Address	Zip Code	Price	Size (acres)	Price per Acre	Notes
Blue Oaks and Education Street	95602	$599,000	1.3	$460,769	Corner parcel zoned for medical office or senior care.
NEC Plaza and Gateway Court	95603	$900,000	3.4	$264,706	Infill site with flexible zoning; adjacent to kmart, Michael's, and petco.
Atwood Road and Atwood Lane	95603	$5,785,000	80.0	$72,313	Tentative map approved with lot sies from 0.5 to 0.75 acres
Kemper Road	95603	$2,397,000	24.4	$98,238	47 tentative map lots; lot size 55'x101' and 50'x110'
3130 Professional Drive	95603	$1,100,000	1.1	$1,000,000	Ready to build ±11,500 sf of office/medical office; includes active building permit, permits fees paid
1080 Highway 49	95603	$1,299,000	32.0	$40,594	Auburn infill parcel zoned for 10 units per acre.
Average				$84,951	

land sale comp

Source: LoopNet, accessed on November 30, 2016

APPENDIX H: ZERO NET ENERGY, ZERO NET WATER AND CARBON NEUTRALITY PLANNING ASSESSMENT FINDINGS

Placer County Government Center Master Plan

Zero Net Energy, Zero Net Water and Carbon Neutrality Master Planning Support

Task 1a and 1b deliverables

Prepared for:

williams + paddon

2237 Douglas Blvd., Suite 160
Roseville, California 95661

EARTH associates

CONTENTS

1 Zero Net Energy Master Planning – Task 1a and 1b 3

1.1 Energy Policy and Planning Issues Impacting the PCGCMP 3

1.1.1 Energy Policy Context 3

1.1.2 Technical Feasibility of ZNE and Related Research Efforts 8

1.1.3 Defining "Zero Net Energy" (ZNE) 15

1.2 PCGC Existing Facility Energy Analysis 17

1.2.1 Building Energy Consumption 18

1.2.2 Building Energy Costs 21

1.2.3 Building Energy Use Intensity (EUI) 22

1.2.4 Existing Building and ZNE Performance Benchmarks 24

1.3 Existing PV System Performance 29

1.3.1 FAB PV System 31

1.3.2 Buildings 110-111 PV System 31

1.3.3 Building 400 (County Maintenance) PV Array 32

1.3.4 Juvenile Detention PV Array 33

2 Zero Net Water Master Planning – Task 1a and 1b 35

2.1 Water Policy and Planning Issues Impacting the PCGCMP 35

2.1.1 Net Zero Water 35

2.1.2 California Water Action Plan 35

2.1.3 Resilience Initiatives 36

2.2 Pre-Development Water Balance 36

2.3 Existing Condition Water Balance 37

2.4 Water Analysis Details 39

2.4.1 Existing Land Use Characterization 39

2.4.2 Rain and Stormwater 39

2.4.3 Potable Water Consumption and End Use 40

3 Carbon Master Planning—Tasks 1a and 1b 43

3.1 GHG Emissions Analysis 43

3.1.1 GHG Emission Factors 43

3.1.2 PCGC Existing GHG Emissions 44
3.2 Life Cycle Carbon Analysis of Retaining Vs. Replacing Existing DeWitt Buildings 45
3.2.1 Methodology and Analysis Details 48
4 Climate Change, Resiliency and Vulnerabilities Assessment 50
4.1 Executive Summary and Key Findings 50
4.2 Introduction and Purpose 52
4.3 Projected Climatic and Environmental Changes Impacting the PCGC 52
4.3.1 Average Annual Temperature Rise 53
4.3.2 Summer High Temperature Trends 54
4.3.3 Winter High Temperature Trends 55
4.3.4 Day and Night High Temperatures (2010 and 2030) 56
4.3.5 Extreme Heat 57
4.3.6 Snowpack 59
4.3.7 Precipitation 60
4.3.8 Wildfire 62

1 ZERO NET ENERGY MASTER PLANNING – TASK 1A AND 1B

1.1 ENERGY POLICY AND PLANNING ISSUES IMPACTING THE PCGCMP

This section outlines some of the key energy-related policy and regulatory drivers that will impact the PCGC over the next 20+ years and which the master planning team is focused on. The single largest energy issue facing PCGCMP are the State's "Big Bold" goals of requiring all new residential construction to be zero net energy (ZNE) by 2020, all new nonresidential construction be ZNE by 2030, and 50% of all existing nonresidential construction be ZNE by 2030. These ambitious and challenging requirements fall within the PCGCMP's planning horizon. Placer County and the PCGCMP is addressing these requirements in a proactive manner.

The intent of this section is to inform the master planning team and stakeholders on key energy issues, and specifically ZNE, that need to be addressed in the master plan.

1.1.1 Energy Policy Context

California has led the nation in building energy efficiency for over 40 years. Efficiency has limited the increase in statewide electricity consumption to ~1% per year and kept natural gas use growth at near 0%. And California continues to lead the nation and world in energy efficiency.

California has embraced a dramatic plan to completely reshape its energy future over the next 30 years. This will have significant impacts on PCGC over its next 20 year master planning horizon. Figure 1 illustrates some of the key energy-related policy milestones that will impact PCGC over the next 30 years. Details are discussed in the following subsections.

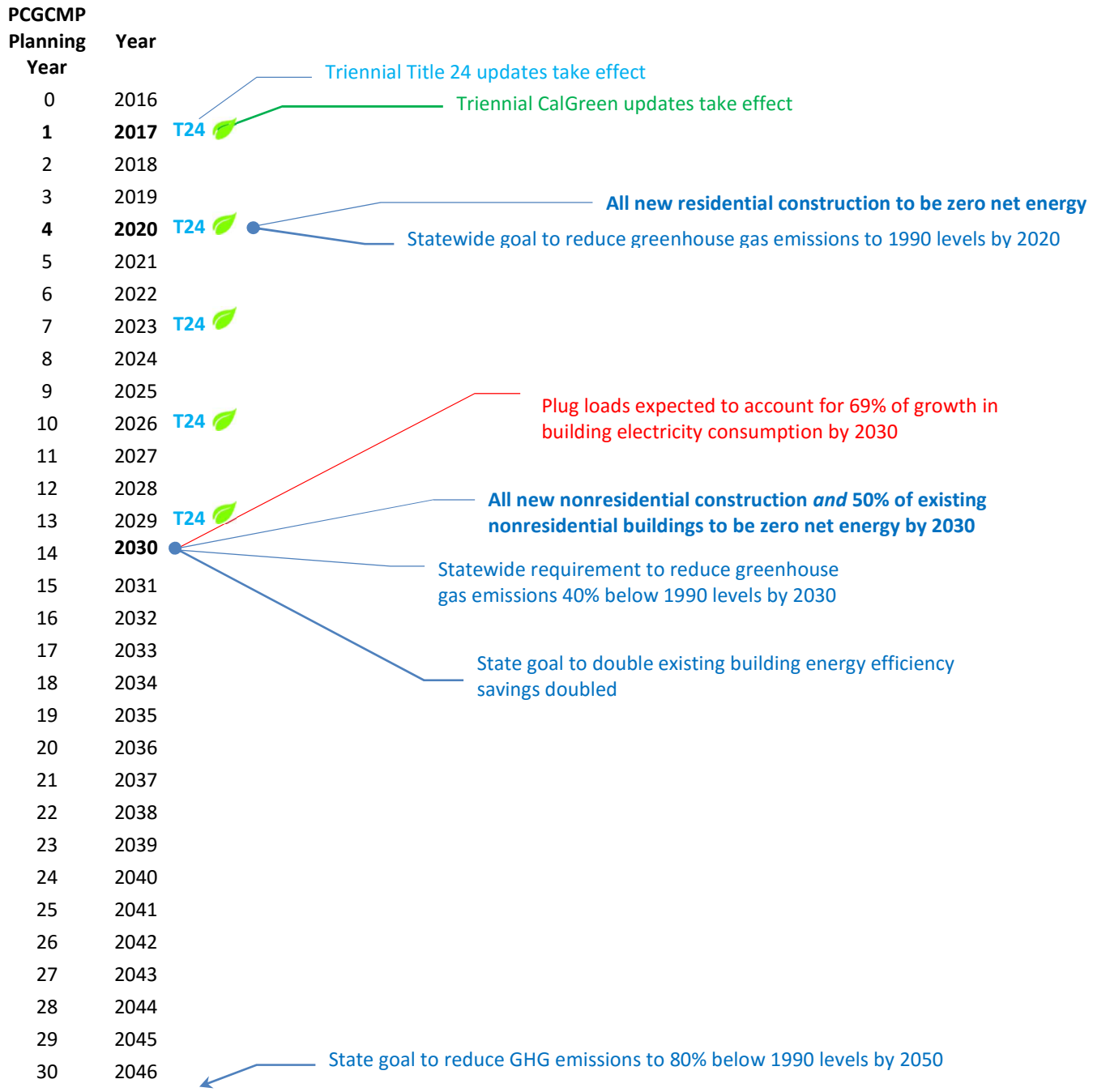


Figure 1: Key energy policy goals impacting PCGCMP's 20 year planning horizon

1.1.1.1 AB 32

California's energy policy was dramatically refocused in 2006 due to growing concerns about global climate change. California **Assembly Bill 32 (AB 32)—the California Global Warming Solutions Act of 2006**—was a game-changer with respect to energy policy.

- AB 32 requires California to **reduce its GHG emissions to 1990 levels by 2020** (a reduction of ~15% below "business as usual"). **California is currently on track to meet or exceed this goal**[1]. This goal date occurs during the early phases of PCGC's next planning horizon.
- AB 32's ultimate goal is to **reduce greenhouse gas emissions to 80% below 1990 levels by 2050.**
- An interim requirement to **reduce statewide greenhouse gas emissions to 40% below 1990 levels by 2030** was subsequently added by Governor Brown's Executive Order B-30-15 in April 20151. This deadline occurs during the latter period of PCGCMP's planning horizon, and will represent a significant milestone if achieved. It also will necessitate a substantial departure from business as usual.

1.1.1.2 California Energy Efficiency Strategic Plan—ZNE Goals

In response to AB 32, the California Public Utilities Commission (CPUC) adopted California's first Long Term Energy Efficiency Strategic Plan (Strategic Plan) on Sept. 18, 2008. This Strategic Plan was a roadmap to achieve maximum energy savings across all major groups and sectors in California and help meet AB 32 goals in the energy sector. The Strategic Plan was updated in January 2011.

The Strategic Plan laid out for "big bold" energy efficiency goals, as illustrated in the following figure. These include requiring all new residential construction (3 stories or less) to be zero net energy (ZNE) by 2020, and all new nonresidential construction to be ZNE by 2030.

[11]California Office of the Governor. "New California Goal Aims to Reduce Emissions 40% below 1990 levels by 2030." 4/29/2015. http://www.gov.ca.gov/news.php?id=18938

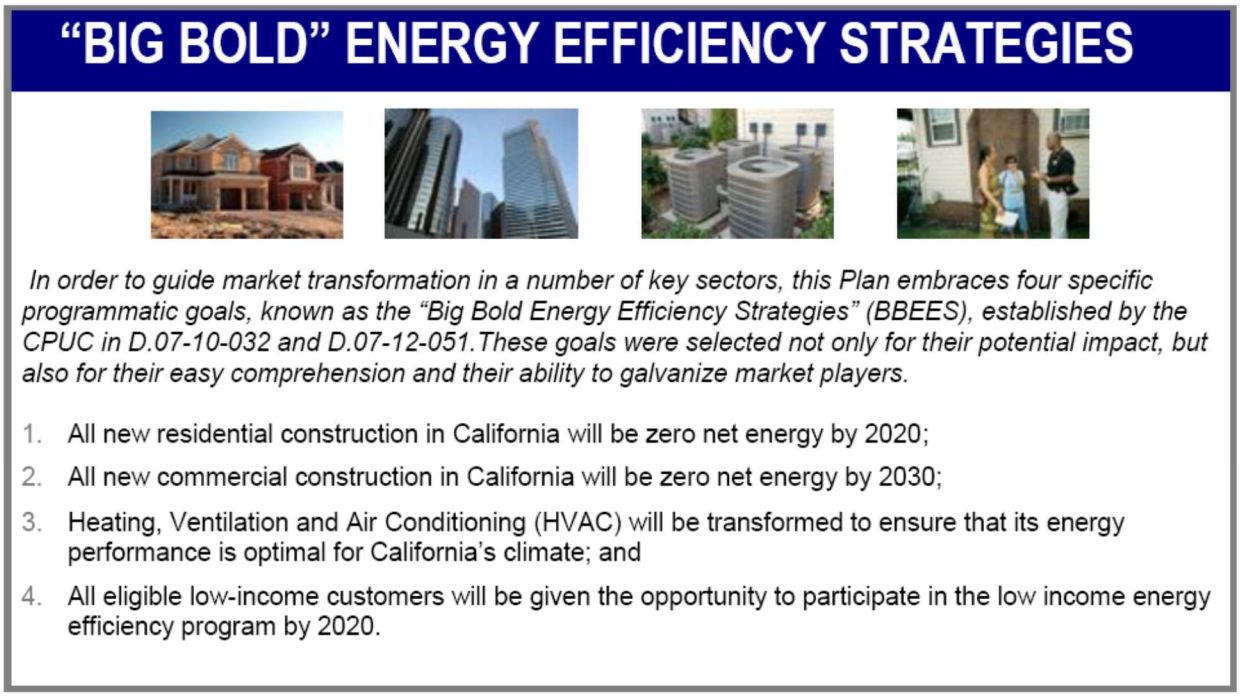


Figure 2: California Energy Efficiency Strategic Plan's "Big Bold" energy efficiency goals

The California Energy Commission (CEC) has adopted the ZNE goals as part of their long term planning through the Integrated Energy Policy Report (IEPR).

It should be noted that the Strategic Plan and IEPR's ZNE goals are aspirational. They provide long term targets for the CPUC and CEC. ZNE is not directly mandated. The CPUC and CEC must follow their mandated cost-effectiveness rules (each agency's cost effectiveness requirements are different) to achieve their ZNE goals. There is no guarantee that the ZNE goals will be achieved.

However, it should be noted that the CEC, CPUC, and a wide array of stakeholders are working hard to achieve the ZNE goals and embed ZNE, or steps towards ZNE, in key codes, standards and policy. Even if the ZNE goals are not met, the trajectory of the codes and standards are strongly moving in this direction.

The California Investor Owned Utilities (IOU) have been active in pursuing the State's ZNE goals. This includes supporting ZNE demonstrations, pilot programs, technical assistance, incentives, research, and supporting Title 24 code update efforts to achieve ZNE.

These ZNE requirements are very aggressive and coming up fast—there are only three and a half years until all new residential construction is to be built to achieve ZNE. The ZNE requirements for nonresidential construction will take effect midway through PCGC's next planning horizon.

1.1.1.3 Title 24 Part 6 (Building Energy Efficiency Standards)

California's building energy efficiency standards, or simply "Title 24" are one of the primary policy tools for realizing the State's ZNE goals. Title 24 is updated every three years. Beginning with the 2013 update to California's Title 24 Building Energy Efficiency Standards, there has been focused attention on moving the building energy code towards ZNE. One of the major changes in the 2013 update to Title 24 was the requirement that every building be "solar ready"—a specified minimum area is required to be reserved

for future solar (either PV or solar water heating) on residential and non-residential roofs, along with a few other minor design considerations. This anticipates the increased drop in PV prices over time and is a key strategy to making buildings constructed today more readily converted to ZNE in the future.

The recently approved 2016 Title 24 updates (which take effect January 1, 2017) aggressively tighten up energy efficiency requirements.

- For residential construction, regulated energy use will be reduced by ~18%. Some of the most significant changes include:
    - High Performance Walls, requiring increased insulation in all climate zones;
    - High Performance Attics, requiring increased attic sealing and insulation, or moving ductwork into conditioned space;
    - High Performance Lighting, which requires high efficacy bulbs (CFL or LED) in every socket and cuts lighting energy use in half; and,
    - Tankless Water Heaters, which reduce water storage losses.

- For non-residential construction, the key highlights include:
    - Increased roof insulation in all climate zones and increased wall insulation in some climate zones;
    - Improved lighting efficiency;
    - Improved elevator and escalator efficiency; and,
    - Interlocking controls to turn on heating and cooling systems for buildings with operable windows.

This leaves one more code change cycle before the 2020 ZNE residential goals take effect. Work on this next round of updates has already commenced[2].

1.1.1.4 CalGreen

California has adopted the nation's first mandatory green building code, called CalGreen (part of California's Title 24 building codes: Title 24, Part 11). CalGreen is on a 3-year update cycle as well. CalGreen does not directly address energy—it defers to the requirements of Title 24 Part 6 (Energy Efficiency Standards). However, it does provide a mechanism for jurisdictions to adopt as mandatory "Tier 1" and "Tier 2" performance levels which exceed the code.

It should be noted that there were efforts in the 2013 CalGreen update cycle to strengthen the existing "Solar Oriented Development" requirements in CalGreen and California's Subdivision Map Act. These requirements are not currently well enforced, and there are minimum compliance and documentation requirements aside from projects to "consider" a wide variety of solar oriented community strategies. Some key energy policy stakeholders want to strengthen these requirements and require projects to more specifically consider a wide range of key planning decisions that can make significant impacts in building energy use. These planning-stage measures would impact projects even before building design teams (architects and engineers) are engaged.

It is recommended that the PCGCMP team consider a wide range of "solar oriented community" design strategies in the master planning process. This includes street/lot/building/roof orientation to maximize

[2] http://www.energy.ca.gov/title24/2019standards/index.html

desired solar heating/daylighting, minimize unwanted solar heating gains that increase air conditioning needs, and maximize rooftop solar energy generating potential.

1.1.1.5 Federal and Other ZNE Initiatives

In addition to California ZNE efforts, there are significant federal ZNE efforts. While there is no national move to require ZNE buildings, the Federal Government, through a series of executive orders and related policy, have established aggressive ZNE requirements for Federal buildings. Departments of State and Defense for example have mandated high levels of energy efficiency across vast quantities of buildings. Federal agencies as a class are actively looking at both existing building stock and new construction and continuing to ratchet up efficiency standards to a high level. Carbon constraints in the built environment have become key to Federal planning efforts, whether for the sake of national security, environmental impact or regulatory compliance.

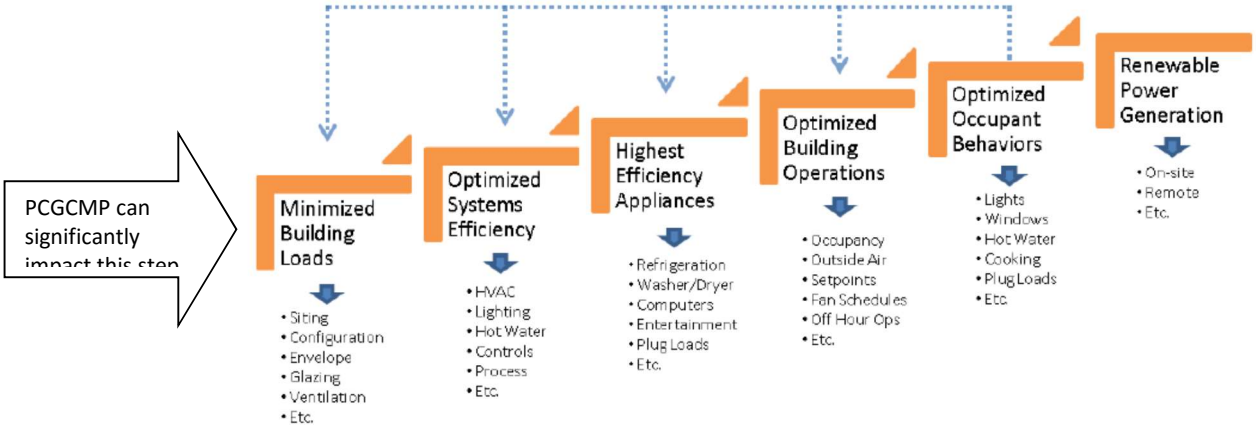
1.1.2 Technical Feasibility of ZNE and Related Research Efforts

1.1.2.1 Roadmap to ZNE

In 2012 the State of California released a roadmap for meeting its ZNE goals, "The Road to ZNE: Mapping Pathways to ZNE Buildings in California[3]". EARTH + associates personnel were involved in this study and the underlying research. This roadmap focuses on new construction.

A number of key points and data are excerpted from this study which are relevant to the PCGCMP.

One of the first items to note that is relevant to the master planning process is that there is a hierarchical "loading" order for how to best attain ZNE buildings, illustrated in Figure 3. The first, and most effective step towards achieving ZNE is to minimize building loads. Much of this is related to building siting and early phase planning efforts that often occur before the design team is on board. This includes siting, street/building/lot/roof orientation (all of these are impacted in the planning phase), massing, landscape and microclimate issues, etc.



[3] Heschong Mahone Group, Portland State University, Energy & Environmental Economics, New Buildings Institute, and CTG Energetics. "The Road to ZNE: Mapping Pathways to ZNE Buildings in California – Appendices". 12/20/2012. Funded by PG&E. Study ID: PGE0327.02 http://www.calmac.org/publications/The%5FRoad%5Fto%5FZNE%5FReport%5FCALMAC%5FPGE0327.01.pdf

Figure 3: Steps to achieving ZNE in individual buildings[4]

The PCGCMP will have an important role in laying the groundwork for future buildings attaining ZNE. There are exciting opportunities for Placer County to demonstrate how forward thinking in master planning can significantly facilitate the ability of future buildings to attain ZNE.

Another important take away from the roadmap is the recommendation the 2030 ZNE requirement be phased in over time for different building types. Building types/uses that can more readily attain ZNE should be required to achieve ZNE prior to the 2030 deadline. Figure 4 shows the "Road to ZNE"'s proposed path to achieving ZNE in nonresidential buildings by 2030. The roadmap calls for warehouses to be built to ZNE by 2016; state buildings and schools by 2019; small offices, retail, college and lodging by 2022; large offices and food stores by 2025; and the remaining building types—including health, restaurants and refrigerated warehouses—by 2030. Similar proposals have been made by other energy policy stakeholders. While the outcome of this proposal is uncertain, the PCGCMP team should keep in mind that there is a possibility that some nonresidential building types may be required to achieve ZNE prior to 2030. The figure is also useful for illustrating the envisioned tightening of Title 24 and CalGreen standards over time to meet the 2030 goals.

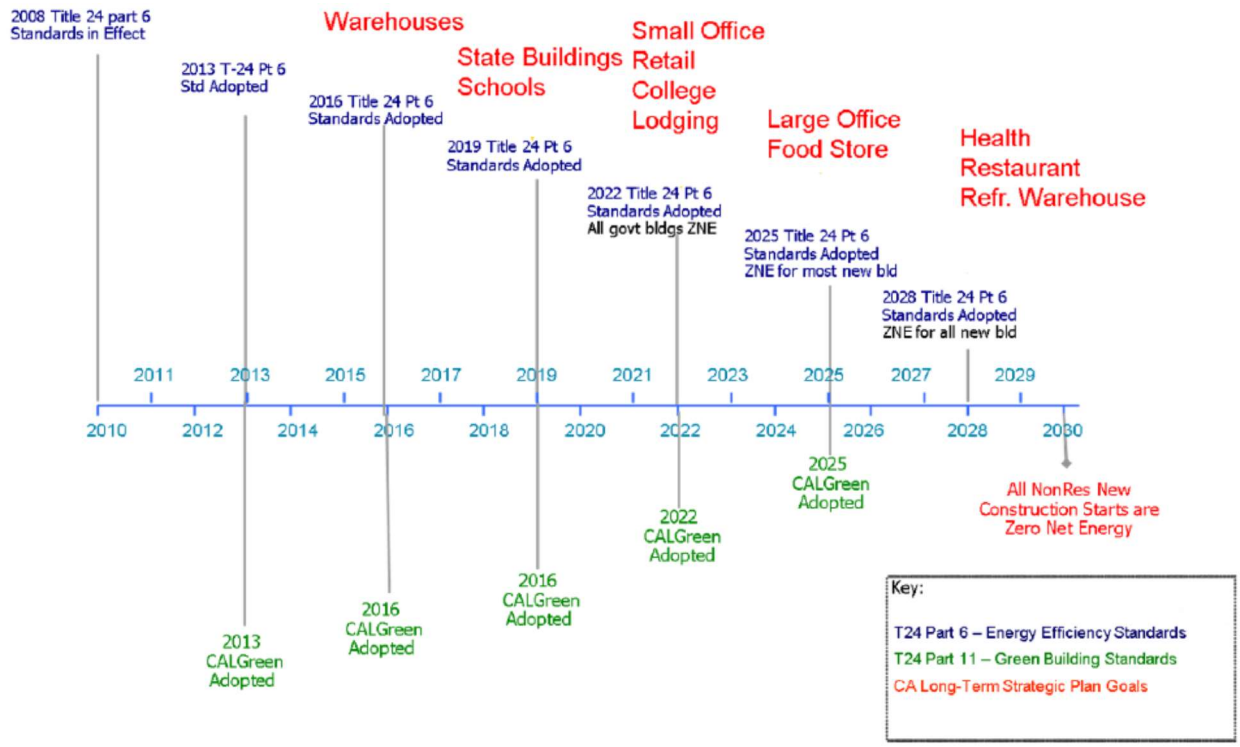


Figure 4: The "Road to ZNE"'s path to nonresidential ZNE by 2030

1.1.2.2 Technical Feasibility of ZNE in New Construction

In a companion study the "Road to ZNE" roadmap described in the preceding section,

[4]Figure from "The Road to ZNE: Mapping Pathways to ZNE Buildings in California – Appendices", page 12.

California's investor owned utilities also commissioned a technical potential study to analyze the technical feasibility of achieving its ZNE goals, "The Technical Feasibility of Zero Net Energy Buildings in California."[5]
This study analyzed the technical potential of different building types meeting the State's ZNE goals in different California Climate Zones, using currently available building efficiency technology and practices. The study found that with a few exceptions, nearly all buildings can meet the 2030 ZNE goals. The buildings that cannot achieve ZNE may be able to achieve ZNE by additional parking lot mounted PV systems. Meeting a ZNE-TDV definition (refer to section 1.1.3 for more details) versus a ZNE-site definition. Approximately 30% more PV is required for a ZNE site definition.

Table 1 summarizes the ZNE technical potential study results for three representative climate zones. The green highlighted building types are buildings that can technically achieve ZNE by 2020. Most of the likely building types that are expected in the PCGCMP fall into the ZNE achievable category.

Table 1: 2020 ZNE technical feasibility study results summary

[5] Arup North America Ltd., Davis Energy Group, Sun Light & Power, New Buildings Institute
Engineering 350, and Sustainable Design + Behavior. "The Technical Feasibility of Zero Net Energy Buildings in California." Prepared for Pacific Gas & Electric Company on behalf of Southern California Edison, San Diego Gas and Electric Company, Southern California Gas Company; The Technical Feasibility of Zero Net Energy Buildings in California. December 31, 2012

Technical Feasibility Summary										TDV$/ft² (30 yr)
Percent of 2020 New Build		15: Palm Springs			12: Sacramento			3: Oakland		
		Load:	*Solar:*	*Net:*	*Load:*	*Solar:*	*Net:*	*Load:*	*Solar:*	*Net:*
Single Family Home	47%	12	-12	0	10	-10	0	8	-8	0
Multi-family Low-rise	8.5%	20	-20	0	15	-15	0	14	-14	0
Multi-family High-rise	3%	30	-11	19	23	-11	12	17	-12	5
Medium Office	2.1%	24	-24	0	19	-19	0	16	-16	0
Large Office	6.9%	22	-7	15	17	-7	10	15	-8	7
Strip Mall	6.7%	27	-27	0	24	-24	0	22	-22	0
School	2.8%	32	-32	0	27	-27	0	22	-22	0
Large Hotel	1.5%	47	-14	33	41	-13	28	41	-14	27
Grocery	1.8%	69	-69	0	68	-68	0	64	-64	0
Sit-down Restaurant	1.0%	150	-95	55	132	-93	39	114	-99	15
Hospital	1.9%	64	-16	48	61	-15	46	61	-17	44
Warehouse	6.6%	9	-9	0	7	-7	0	7	-7	0
College	1.7%	41	-40	1	36	-36	0	31	-31	0
Other Commercial	7.9%	32	-22	10	28	-20	8	25	-19	6

Three prototypes that cannot reach ZNE using rooftop solar might reach ZNE using parking lot PV systems – Multi-family High-rise, Large Office, and Sit Down Restaurant. See Section 4.2.1.3 for further discussion of the potential contribution of parking lot PV systems in pursuing the ZNE goals.

The key efficiency measures that were used in many of the buildings prototypes to achieve ZNE include:

1. LED Lighting
2. Plug Load Reductions
3. Fan and Duct Efficiency
4. 95%+ Efficiency Gas Appliances
5. Natural Ventilation
6. Windows U Factor and Solar Heat Gain Coefficient
7. Heat Recovery (air, mechanical equipment, and water)

1.1.2.3 Existing Buildings Energy Efficiency Action Plan

The State of California realizes that achieving California's energy and climate goals requires radical improvement in the energy performance of existing buildings, and that this will require more than simply regulatory solutions. The State has a goal to double existing building energy efficiency by 2030. This will impact PCGC's existing buildings, and potentially new buildings constructed prior to the State's 2030 deadline for all new nonresidential construction to be ZNE.

AB 758

Assembly Bill 758 (Skinner, Chapter 470, Statutes 2009) requires the California Energy Commission (CEC), in collaboration with the California Public Utilities Commission and stakeholders, to develop a comprehensive program to achieve greater energy efficiency in the state's existing buildings. Work is to be completed in three phases:

- The first phase of this effort, completed in late 2015, included the development of an "**Existing Buildings Energy Efficiency Action Plan**[6]"—a roadmap document for achieving the State's long term existing building energy efficiency goals.
- Future phase 2 work will focus on implementing the "No Regrets Strategies" and developing the "Voluntary Pathways" necessary to scale up the efforts statewide and develop the partnerships, and markets needed, as outlined in the "Existing Buildings Energy Efficiency Action Plan."
- Phase 3 efforts will develop and institute **Mandatory Approaches** that will move energy efficiency practices into the mainstream.

Existing Buildings Energy Efficiency Action Plan

The California Energy Commission's "Existing Buildings Energy Efficiency Action Plan[6]" is a 10 year roadmap "to activate market forces and transform California's existing residential, commercial, and public building stock into high-performing and energy-efficient buildings," with goals of "accelerated growth of energy efficiency markets, more effective targeting and delivery of building upgrade services, improved quality of occupant and investor decisions, and vastly improved performance of California's buildings."

The plan has five goals, each with a series of strategies to achieve it, outlined below. The strategies in **bold red print** are strategies that are most relevant to, and/or may most likely impact the PCGCMP.

GOAL 1: INCREASED GOVERNMENT LEADERSHIP IN ENERGY EFFICIENCY

Strategy 1.1 State and School Buildings
Strategy 1.2 Nonresidential Benchmarking and Disclosure
Strategy 1.5 Building Efficiency Standards Development and Compliance
Strategy 1.6 Plug-Load Efficiency
Strategy 1.7 Local Government Leadership
Strategy 1.8 Energy Efficiency as a Clean Distributed Energy Resource
Strategy 1.9 Leadership: Existing Building Efficiency Collaborative

GOAL 2: DATA - DRIVEN DECISION MAKING

Strategy 2.1 Modern, Accessible Data Resources
Strategy 2.2 Consumer - Focused Energy Efficiency

GOAL 3: INCREASED BUILDING INDUSTRY INNOVATION AND PERFORMANCE

Strategy 3.1 Streamlined and Profitable Industry

---

[6] California Energy Commission. "California's Existing Buildings Energy Efficiency Action Plan." CEC-400-2015-013-F. September 2015. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN206015_20150904T153548_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf

Strategy 3.2 Performance - Driven Value
Strategy 3.3 High - Performance Workforce and Education
Strategy 3.4 Zero - Net - Energy Retrofits

GOAL 4: RECOGNIZED VALUE OF ENERGY EFFICIENCY UPGRADES
Strategy 4.1 Real Estate Value
Strategy 4.2 Marketing, Education, and Outreach

GOAL 5: AFFORDABLE AND ACCESSIBLE ENERGY EFFICIENCY SOLUTIONS
Strategy 5.1 Foster Private Capital Market
Strategy 5.2 Asset - Based Financing
Strategy 5.3 Borrower - Based Financing
Strategy 5.4 Integrated and Streamlined Delivery of Efficiency Solutions, Finance, and Utility Incentives
Strategy 5.5 Government Building Finance Mechanisms
Strategy 5.6 Leveled Tax Playing Field
Strategy 5.7 Establish Deeper Subsidies for Full Participation by Low - Income Households

Relevant strategies and their potential impact on the PCGCMP are discussed in more detail below

Strategy 1.2 Nonresidential Benchmarking and Disclosure

- Required periodic benchmarking of commercial and multifamily buildings above 50,000 square feet in floor area, by 2017
- Energy-use metrics reported via ENERGY STAR® Portfolio Manager.
- Encourages ongoing performance monitoring and continuous commissioning.
- Public disclosure for each building at second reporting cycle; disclosure policy informs building market transactions.

While it is not clear yet if county owned buildings will be subject to the benchmarking requirements, it is likely they will be. The benchmarking and encouragement of ongoing performance monitoring and continuous commissioning strongly suggest the need for a detailed and coordinated energy management program for the PCGC. Benchmarking and related building performance monitoring is critical to long term building efficiency. This should result in long term efficiency and cost savings for the PCGC and is a 'best practice' utilized by many public and private organizations managing large portfolios of buildings.

Strategy 1.6 Plug - Load Efficiency

Strategy 1.7 Local Government Leadership

- "Local Government Challenge Program" to encourage local governments to implement innovative efficiency programs and gather relevant experience for wider application.
- Examples include:
    - Aggressive efficiency for public buildings.
    - Early implementation of nonresidential benchmarking and disclosure programs.
    - Innovation in building permitting and code enforcement systems.
    - Data - driven communitywide energy planning.
    - Energy performance districts.

There are abundant opportunities for Placer County to build upon its existing energy leadership (e.g., the mPower program, existing building energy efficiency and renewable energy systems, and the PCGCMP) and to become a state leader. The PCGCMP presents a number of opportunities to align with key State energy policies and goals. Key opportunities include: aggressive efficiency for existing buildings at the PCGC, consideration of improved benchmarking as part of the PCGCMP, and consideration of creating an "energy performance district" or "eco-district" in the PCGCMP.

Strategy 2.1 Modern, Accessible Data Resources

- Ensure the availability, **ease of access, and usability of energy consumption data** in all sectors.
- **Utilities map meters to buildings, consistent with whole-building benchmarking.**
- Adopt common data exchange protocols for energy use and building energy performance data; maintain utility tariffs in a machine-readable format on a public website.
- Provide efficiency project cost and savings data to all market actors

Ease of access and usability of PG&E's energy consumption data for the PCGC is currently challenging. The utility provided "Energy Report" provided for the PCGCMP analysis contained 536 pages of data that required extensive processing and analysis. While the data is very rich and valuable for PCGC energy management, it is currently challenging to use. This presents an excellent opportunity for the PCGC to work with PG&E (and potentially relevant CEC stakeholders implementing the Existing Buildings Energy Efficiency Roadmap Goal 2) to collaborate on ways to implement strategy 2.1. This would include working to map meters to buildings and develop more robust energy management and benchmarking tools for larger portfolios of buildings such as on the PCGC.

Strategy 3.4 Zero Net-Energy Retrofits

GOAL 4: RECOGNIZED VALUE OF ENERGY EFFICIENCY UPGRADES

Strategy 4.1 Real Estate Value

Strategy 4.2 Marketing, Education, and Outreach

GOAL 5: AFFORDABLE AND ACCESSIBLE ENERGY EFFICIENCY SOLUTIONS

Strategy 5.1 Foster Private Capital Market

Strategy 5.2 Asset-Based Financing

Strategy 5.3 Borrower-Based Financing

Strategy 5.4 Integrated and Streamlined Delivery of Efficiency Solutions, Finance, and Utility Incentives

Strategy 5.5 Government Building Finance Mechanisms

Strategy 5.6 Level Playing Field regarding Tax

Strategy 5.7 Establish Deeper Subsidies for Full Participation by Low - Income Households

1.1.3 Defining "Zero Net Energy" (ZNE)

A fundamental challenge when dealing with Zero Net Energy (ZNE) is its definition. A ZNE building is typically conceptualized as producing as much energy through renewable generation sources as it uses in the course of a year. However, a precise definition of ZNE is a little more complex:

- Does the ZNE definition include only electricity, or other fuels such as natural gas.
- Is the energy measured at the site where it is delivered or is it based on "source energy"?
- Or is it based on something else, such as "Time Dependent Valuation" (TDV) that is currently used in California's Title 24 Building Energy Efficiency Standards?
- What is the boundary? Is ZNE based exclusively on the building footprint, or a larger "project", or possibly even at a "campus" level? Must the renewable energy generation be integrated into the building, can it be ground-based on adjacent land, or possibly part of a larger centralized system in a campus setting, or even part of a larger off-campus system?
- How do you deal with non-regulated process loads such as laundries, or electric vehicle charging?

Current Definition – ZNE TDV

There has been much discussion on the specific definition of ZNE for California's ZNE goals. The current California ZNE definition was adopted by the California Energy Commission and is in the 2013 Integrated Energy Policy Report (IEPR)[7]:

> "A Zero Net Energy (ZNE) Code building is one where the net of the amount of energy produced by on-site renewable energy resources is equal to the value of the energy consumed annually by the building, at the level of a single "project" seeking development entitlements and building code permits, measured using the California Energy Commission's Time Dependent Valuation (TDV) metric. A ZNE Code Building meets an Energy Use Intensity (EUIs) value designated in the Building Energy Standards by building type and climate zone that reflect best practices for highly efficient buildings."

The current definition is based on TDV. This has been an ongoing point of debate. TDV is essentially a "societal value" of energy, which includes electricity grid constraints, costs for turning on dirty "peaker" plants, air pollution and greenhouse gas costs, etc. There is a different TDV multiplier for each hour of the year. TDV was developed for use in California's Title 24 Building Energy Efficiency Standards. While the use of TDV makes sense from the policy and code perspective for new buildings, it does have some drawbacks. Difficult to conceptualize, it is not well understood by the public. It is also challenging to implement for existing buildings. There are ongoing efforts to refine how this ZNE TDV definition should be applied to existing buildings.

[7] California Energy Commission, "2013 Integrated Energy Policy Report," January, 2014. pg. 36.

It should also be noted that the Energy Use Intensities in the current ZNE definition, "A ZNE Code Building meets an Energy Use Intensity (EUIs) value designated in the Building Energy Standards by building type and climate zone that reflect best practices for highly efficient buildings." are not yet defined.

ZNE Definition Potential Evolution

It should be noted that there are significant stakeholders who are lobbying for different non-TDV based ZNE definitions.

The voluntary market (which is responsible for all current ZNE buildings) does use nor respond to the esoteric ZNE TDV definitions. The most prevalent ZNE definition in use is ZNE site energy. This is intuitive to the public, simple to measure and verify, and is the most commonly used metric in use today.

The "Road to ZNE" roadmap notes that there may not be one ZNE definition or metric that fits all situations, and notes that multiple definitions may be needed (i.e., a ZNE TDV metric may be appropriate for showing that a new building has been designed to meet the ZNE goals, but may not be the right definition for measuring actual ZNE performance in existing buildings). The "Road to ZNE" roadmap proposes a "taxonomy" for ZNE definitions, as shown in Figure 5. This shows a range of ZNE definitions that meet both the regulatory needs for determining whether a new building has been built to code so that it can potentially be operated to achieve ZNE (i.e., a ZNE asset rating)—note that there is a significant distinction between building an efficient building that has been designed to achieve ZNE, versus actually operating a building to achieve ZNE. Even the most efficient building can be poorly operated and miss its energy goals. This is a useful diagram to illustrate how California ZNE stakeholders are currently grappling with ZNE definitional issues.

Mandate → Voluntary

	CEC: ZNE TDV	CPUC: ZNE Equivalent*	Market: ZNE Site
Fuels Covered	Electricity + Natural Gas	Electricity + Natural Gas	Electricity + Natural Gas
Asset Value	Yes	Yes	N/A
Performance Index	N/A	N/A	Yes
Energy End Uses	Regulated Only	Regulated and Unregulated	Regulated and Unregulated
Cost-effectiveness Tests Required	CEC TDV Test	CPUC Tests (e.g. TRC)	N/A
Renewables On-Site	Yes	Yes	Yes
Renewables Off-Site	Yes	Yes	N/A
ZNE Equivalencies	Allowed	Allowed	N/A
EUI Target	TDV/sf/yr equivalent to a kBtu/sf/yr target. Will vary by building type and climate zone. Could be expressed as HERS 0 or BEARS 0.	X Btu/sf/yr **including** approved Equivalencies. Will vary by building type and climate zone.	kBtu/sf/yr Will vary by building type and climate zone.

* ZNE Capable as an alternative

Regulated End Uses → All End Uses

Figure 2: Proposed ZNE Metric Taxonomy

Figure 5: "Road to ZNE's" proposed ZNE metric taxonomy

Similarly, the Existing Buildings Energy Efficiency Action Plan (see section 1.1.2.3) notes that several ZNE definition variants are being considered, including a "ZNE-ready" (highly efficient buildings without renewable power) and "net-positive" (produce more energy than they use).

For PCGCMP purposes, the important factors to note for planning is that there is currently a ZNE definition based on TDV. This is primarily relevant to designing new buildings from a code compliance perspective. This is complex and not well applied to existing buildings. However, the public and market currently use a simpler definition of "site ZNE"—i.e., at the end of the year you can show that your building used as much energy as was generated onsite. This is a performance-based metric that is intuitive and easy to measure. It is generally easier to achieve ZNE TDV than ZNE site energy. Thus, if ZNE site energy is used as the primary planning metric, the PCGC should also likely meet ZNE TDV. It is also necessary to keep in mind that the ZNE definition has been evolving, and may continue to evolve, particularly for existing buildings.
The PCGCMP will likely find using "ZNE site" to be the most advantageous and intuitive definition.

1.2 PCGC Existing Facility Energy Analysis

PG&E provides both electricity and natural gas to the PCGC. Utility consumption data for 2015 and part of 2016 was obtained and analyzed. Some buildings are served by a single meter, and some meters serve multiple buildings. Meter data was mapped to individual buildings to the extent that it could be disaggregated from the utility billing data.

For 2015, the PCGC consumed 183,997 Therms (18,400 MMBTU) of natural gas, costing $174,750. PCGC consumed 7,468,080 kWh of electricity (25,481 MMBTU) of electricity costing $1,320,760. Total energy costs were $1,495,510 and total building energy consumption was 43,880 MMBTU. Figure 6 shows total annual building energy use for PCGC, with consumption (in kBTU/year) shown on the left and costs shown on the right.

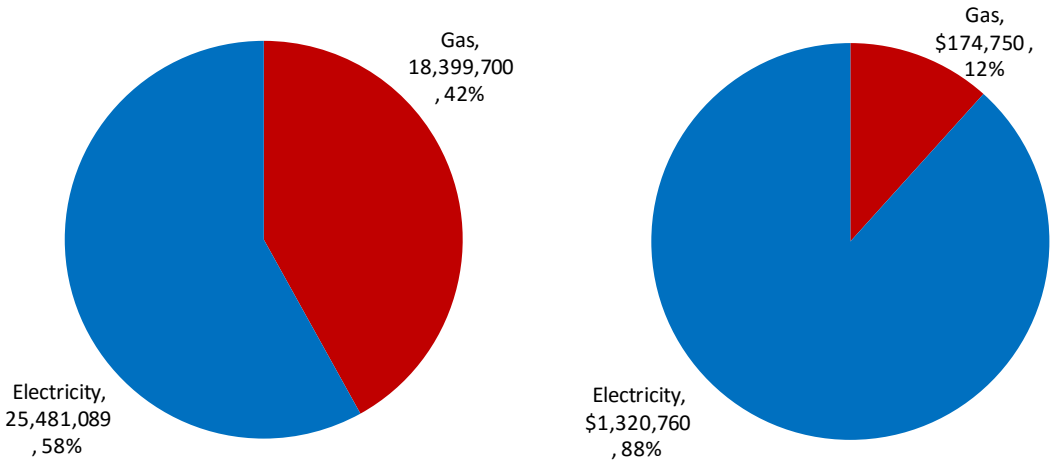


Figure 6: Annual PCGC building energy use: consumption in kBTU (left) and annual costs (right)

Sections 1.2.1 through 1.2.3 provide detailed breakdowns of building level energy consumption.

1.2.1 Building Energy Consumption

Figure 7 shows building energy consumption for 2015. Acronyms for the building names are shown in

Table 2. Electricity and natural gas consumption data are converted to a common unit (kBTU/year) to facilitate comparison. Estimated solar PV electricity generation is shown for the four buildings/complexes that have solar systems--adding the purchased electricity and solar production shows the total building electricity consumption; adding gas consumption to this shows the total building energy use. Data is sorted by building area, with the largest sized buildings on the left and smallest buildings on the right. Note that in a few cases individual buildings are shown as well as aggregated consumption for various blocks of buildings[8].

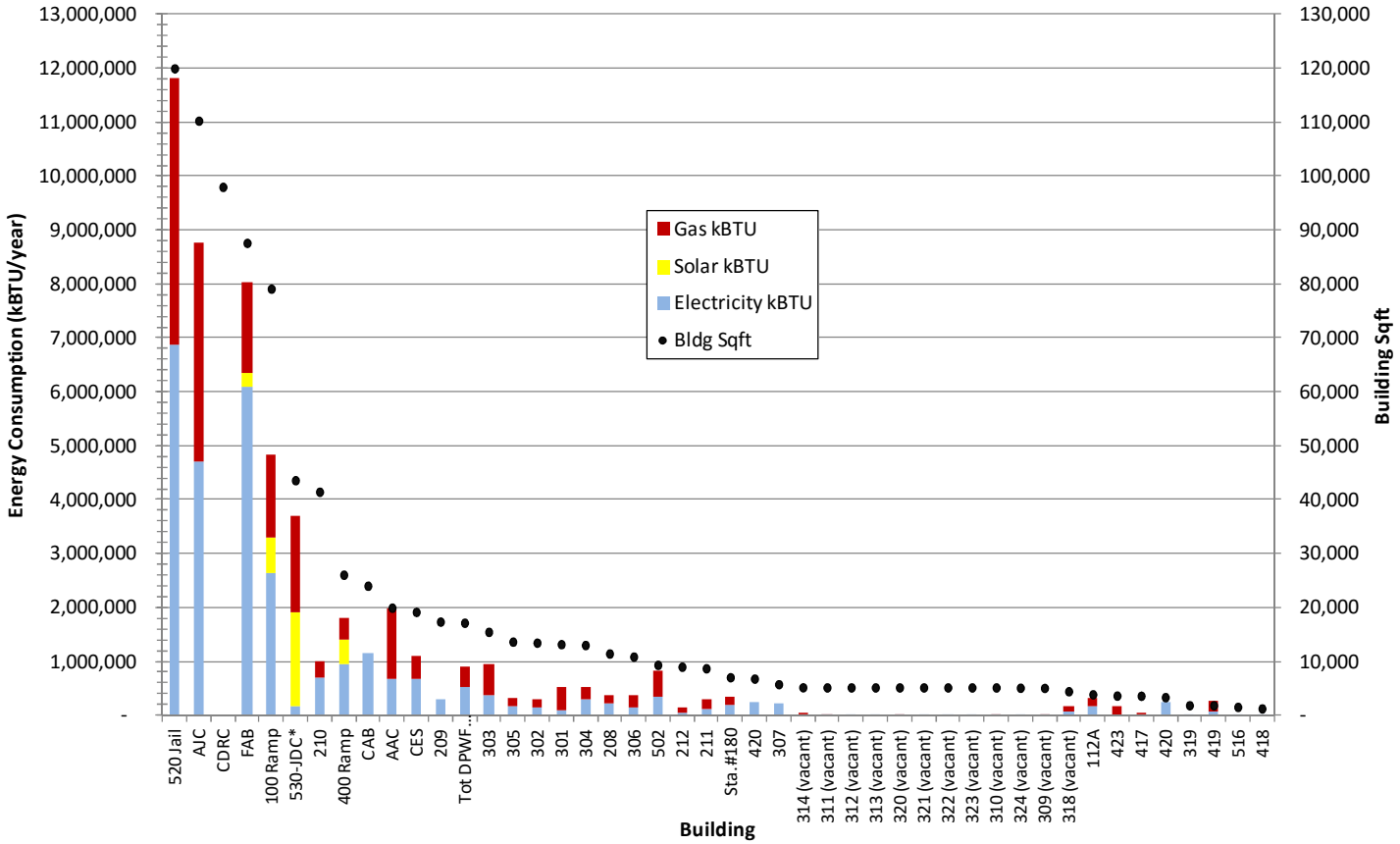


Figure 7: PCGC 2015 building energy consumption (in kBTU/year) (sorted by building size)

[8] Data is shown to the extent that electricity and natural gas billing data can be disaggregated.

Table 2: Building name acronyms

AAC	Auburn Administration Center
AJC	Auburn Justice Center
CAB	County Administration Bldg.
CDRC	Community Development Resource Center
DPW&F	Department of Public Works & Facilities
FAB	Finance Administration Bldg.
HHS	Health & Human Services
JDC	Juvenile Detention Center
OES	Office of Emergency Services
PCSO	Placer County Sheriff's Office
RHA	Right Hand Auburn

There are four larger buildings over 50,000 sqft: the Jail (Building 520) with a total area of 119,910 ft^2, The Auburn Justice Center (AJC) building with 110,200 ft^2, the Community Resource Development Center (CDRC) with 97,923 ft^2, and the Finance Administration Building (FAB) with 87,543 ft^2. Together, these four largest buildings represent 49% of the PCGC's building square footage. These four buildings consume the large majority of the PCGC's energy. Note that energy consumption data is not available for the CDRC. The three largest buildings for which energy consumption data is available for (the jail complex, AJC, and FAB) consume 58% of the natural gas and 69% of the electricity used by PCGC's buildings, and 65% of all the center's building energy.

From the energy perspective, PCGCMP efforts should focus on the larger buildings which represent a much larger percentage of the total.

There are four solar PV arrays installed at the PCGC: an 82 kW array on the 400 ramp (county maintenance), a 132 kW array on building 100/110, a 45 kW array on the FAB, and a 325 kW ground mounted array adjacent to the JDC.

Figure 8 shows similar data in a different format. The total energy consumption (in kBTU/year) is plotted against building area (in square feet). There is a strong linear correlation between building size vs. energy use—i.e., building energy use increases approximately linearly with building size. The primary exception is the Auburn Jail, which consumes significantly more energy and is an intensive energy consuming building due to the nature of the occupancy.

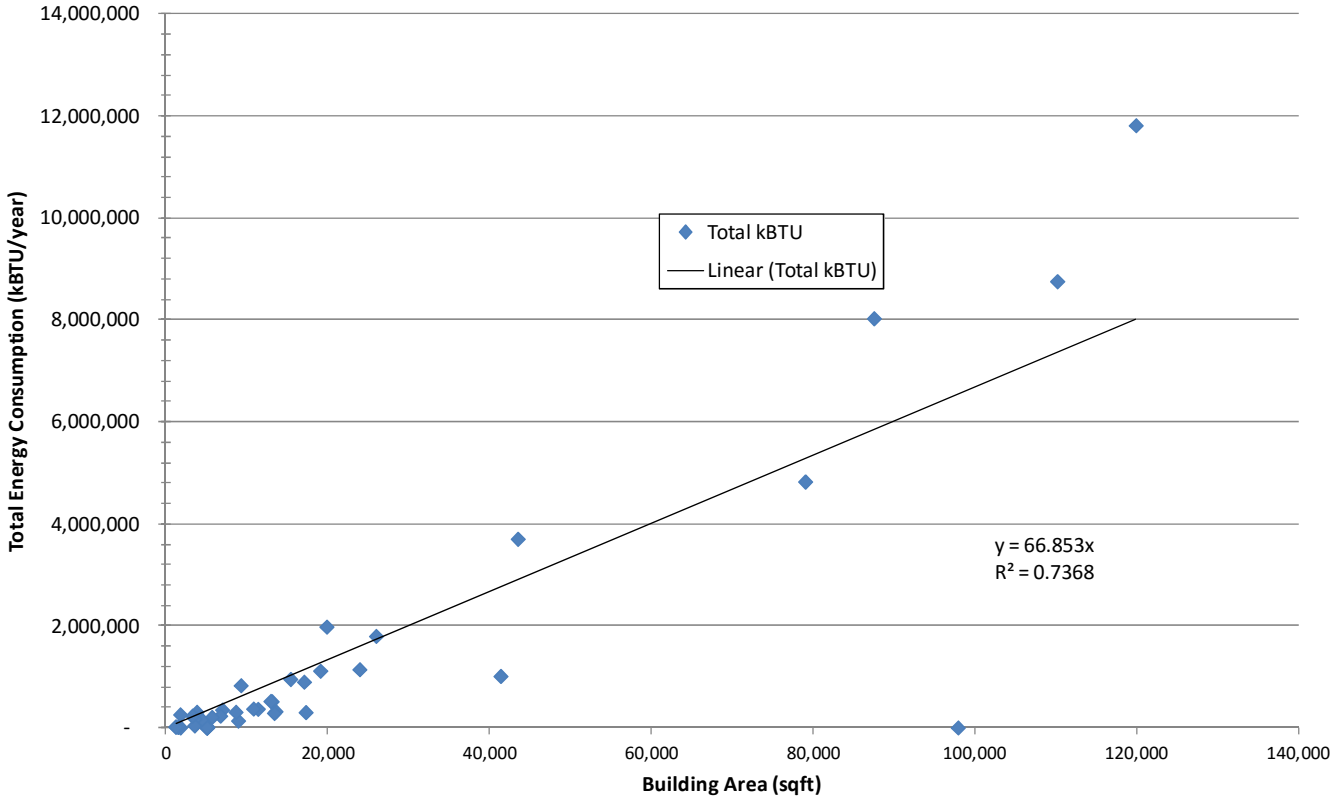


Figure 8: PCGC 2015 total building energy consumption vs. building area

1.2.2 Building Energy Costs

Figure 9 shows similar data to Figure 7, except energy costs (versus consumption) are shown.

Natural gas is significantly cheaper than electricity. The majority of the energy costs are due to electricity use. Note that the electricity costs are for purchased electricity and reflect the savings due to the PV systems on the FAB, Building 110/111, the 400 ramp, and the JDC.

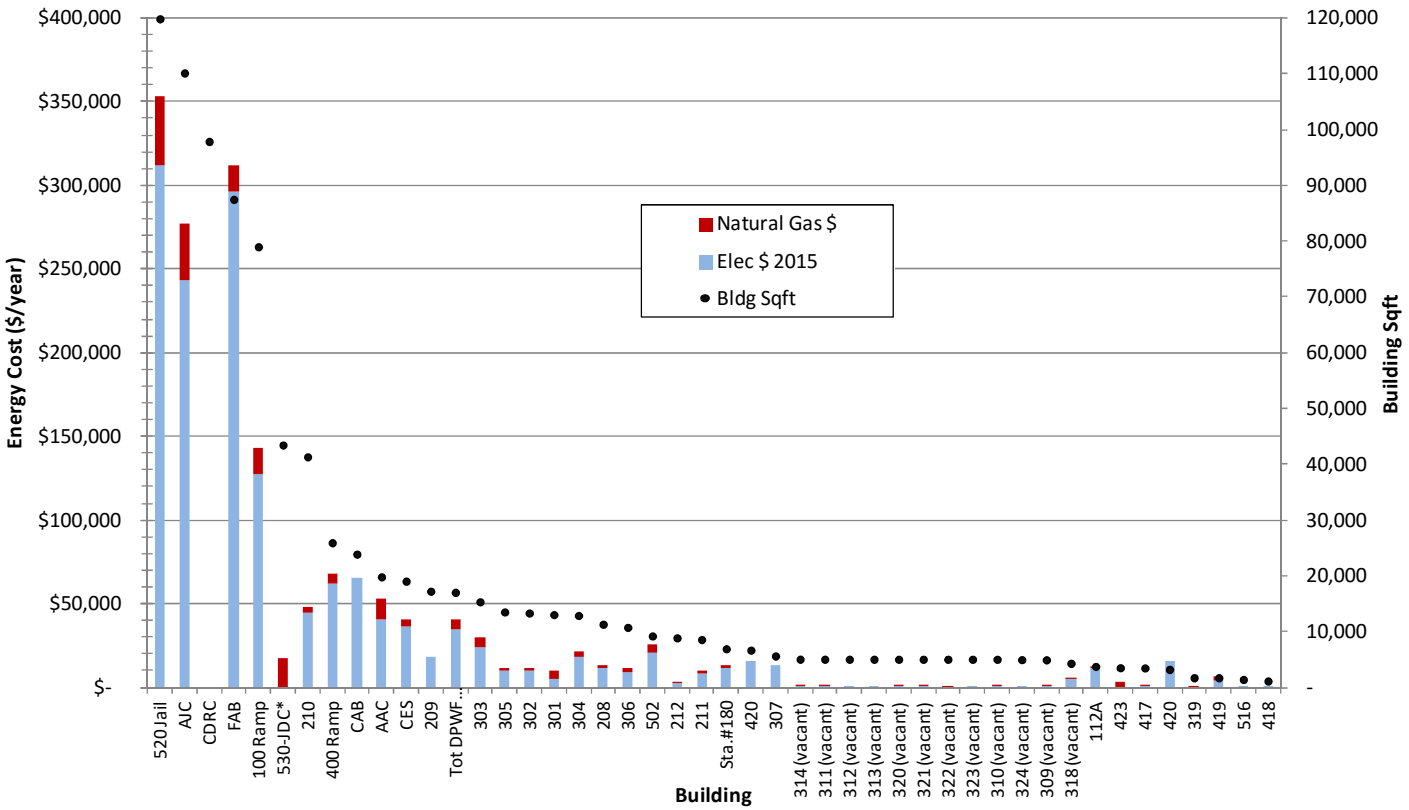


Figure 9: PCGC 2015 building energy costs (sorted by building size)

1.2.3 Building Energy Use Intensity (EUI)

Figure 10 plots building energy use intensity (EUI), measured in annual building energy use divided by building area (kBTU/sqft/year). This provides a normalized measure of building energy use intensity that can be used to compare and benchmark building energy use against different buildings. Note that the first column of data is for the total PCGC, which is not included in the preceding graphs due to graph scale/readability issues.

Also shown on this graph is a solid green line showing the average EUI for existing buildings in Auburn's climate zone, based on the U.S. Department of Energy's Commercial Building Energy Consumption Survey (CBECS)—refer to section 1.2.4.2 for more detail. The average building EUI varies with building area. Note that the average EUI for all buildings, regardless of building size, is 78 kBTU/ft^2.

Also shown on the graph is an indication of the EUI level typically expected for ZNE buildings. ZNE buildings typically have a building EUI of 30 kBTU/sf/year or lower. Buildings with an EUI of 30-40 kBTU/sqft are considered "Near-ZNE"—meaning they can achieve ZNE with relatively mild energy efficiency improvements or a larger PV array. Buildings with EUIs above 40 kBTU/SF are generally regarded as needing significant energy efficiency improvements in order to attain ZNE.

The three largest buildings for which energy consumption data is available—the Auburn Jail, AJC, and FAB—have EUIs at or above the CBECS average. The Auburn Jail is expected to have a higher EUI due to its intensive use. The JDC has a total EUI (including energy provided by its solar system) that is just

above the CBECS building average. However, it should be noted that the JDC has very minimal purchased electricity use—the large ground mounted PV array supplies over 90% of the electricity used by this building. The JDC is nearly "Zero Net Electricity". A majority of the smaller buildings use less energy than the CBECS average.

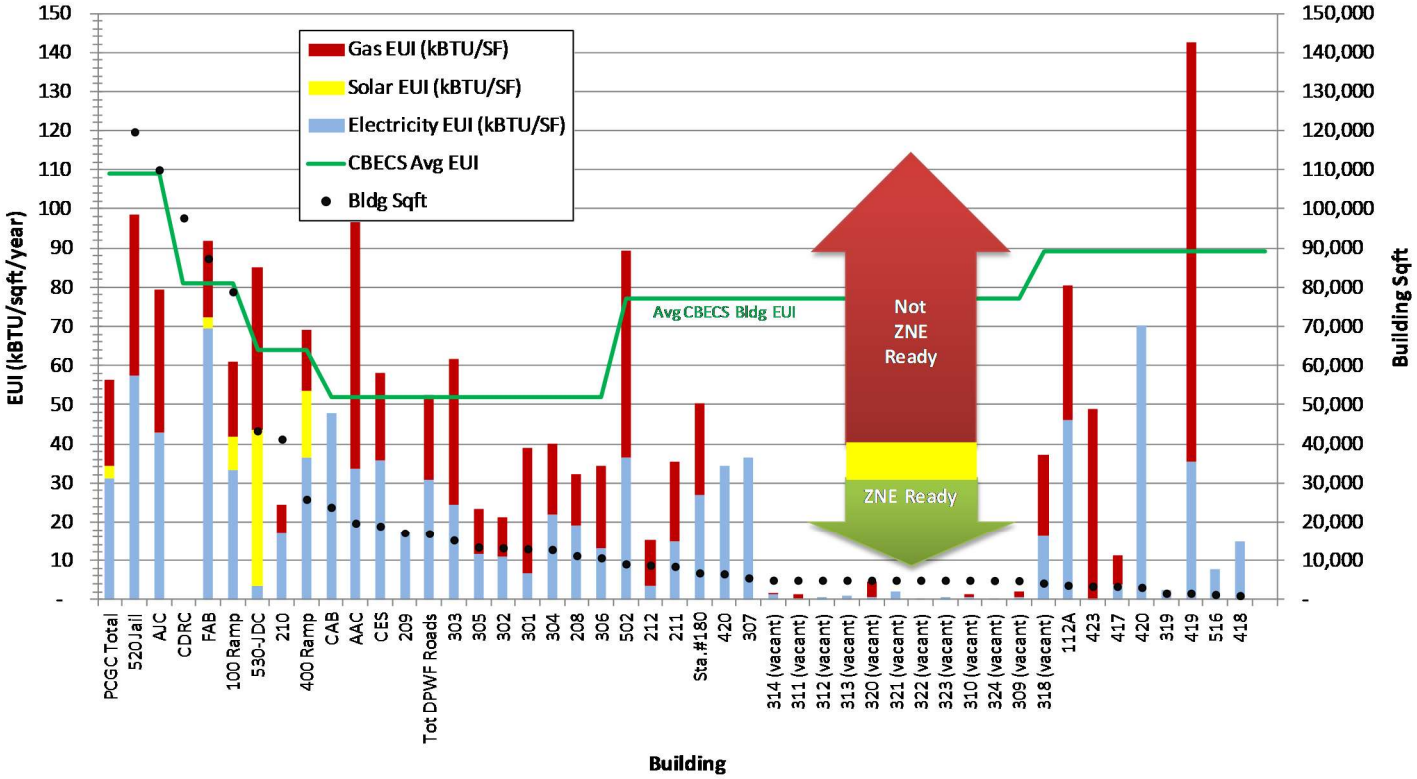


Figure 10: PCGC 2015 building energy use index (EUI) (sorted by building size)

1.2.4 Existing Building and ZNE Performance Benchmarks

1.2.4.1 ZNE Building EUI Benchmarks

There has been significant research on what building efficiency levels (as measured by their energy use intensity (EUI)), are needed for buildings to attain ZNE. While it is technically feasible for even the most inefficient building to attain ZNE if enough solar is added, the consensus (and performance of currently documented ZNE buildings)[9] is that buildings with EUI's # 30 kBTU/sqft/year are "ZNE Capable". Buildings with EUIs between 30 and 40 kBTU/sqft/year are "Near" ZNE capable and could attain ZNE with moderate efficiency improvements (in the 10-20% range) or a larger PV array. Buildings with EUIs > 40 kBTU/sf/year are not good candidates for achieving ZNE. The Technical Feasibility Study discussed in Section 9 provides additional details on specific EUIs for different building types in different climate zones which may be useful for Task 5 discussions.

Figure 10 shows PCGC building EUIs with indicators at 30 kBTU/sqft that show "ZNE capable" building performance. Excluding the vacant buildings, most buildings are consuming more energy than typical for ZNE and other high performing buildings. This indicates that there are significant opportunities for energy efficiency improvements in existing buildings.

1.2.4.2 Existing Building Benchmarks

There are two primary sources of existing building energy performance data available that are relevant to the PCGCMP.

The U.S. Energy Information Administration's Commercial Building Energy Consumption Survey (CBECS) is the U.S. Department of Energy's primary commercial building energy end use study. CBECS obtains detailed energy consumption and building characteristic data for a sample of commercial buildings throughout the U.S. 2003 is the latest available study data. While somewhat dated, it is still a good source of data for existing buildings. CBECS climate zone 4 data is shown below. This includes Auburn's climate (<2000 CDD, <4000 HDD, and encompasses California Climate Zone 11). The average building EUI for CBECS climate zone 4 is 79 kBTU/ft^2.

[9] Refer to the "

Table 3 shows the CBECS Climate Zone 4 EUIs broken out by principal building use type. There are significant variations between different building types. Figure 11 shows CBECS Climate Zone 4 EUIs by floor space. Figure 12 shows CBECS Climate Zone 4 EUI data by year of construction.

Table 3: CBECS Climate Zone 4 Average EUI Summary

	EUI (kBTU/SF)			
Climate Zone/Building Use Type	**Average**	**Std. Dev.**	**Min**	**Max**
CBECS CZ4 / CA CZs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	136	144	2	1,207
Education	118	114	16	593
Enclosed mall	128	8	119	134
Food sales	267	114	97	460
Food service	410	231	67	702
Inpatient health care	312	168	102	727
Laboratory	269	116	104	441
Lodging	86	48	5	173
Nonrefrigerated warehouse	41	35	4	145
Nursing	206	89	89	302
Office	120	83	9	572
Other	301	221	173	557
Outpatient health care	189	120	26	355
Public assembly	112	169	3	836
Public order and safety	103	46	54	148
Refrigerated warehouse	73	n/a	73	73
Religious worship	26	17	2	57
Retail other than mall	100	75	3	286
Service	128	295	5	1,207
Strip shopping mall	158	65	82	346
Vacant	45	53	4	151

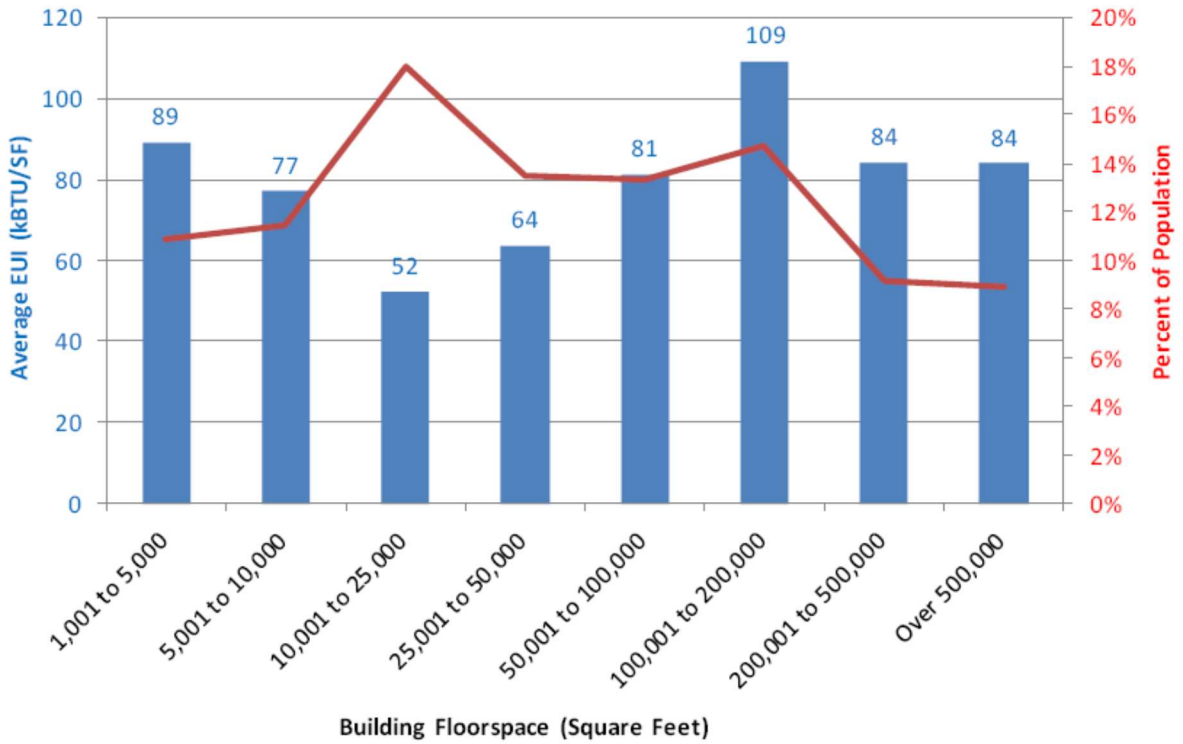


Figure 11: CBECS Climate Zone 4 EUIs by building floor space

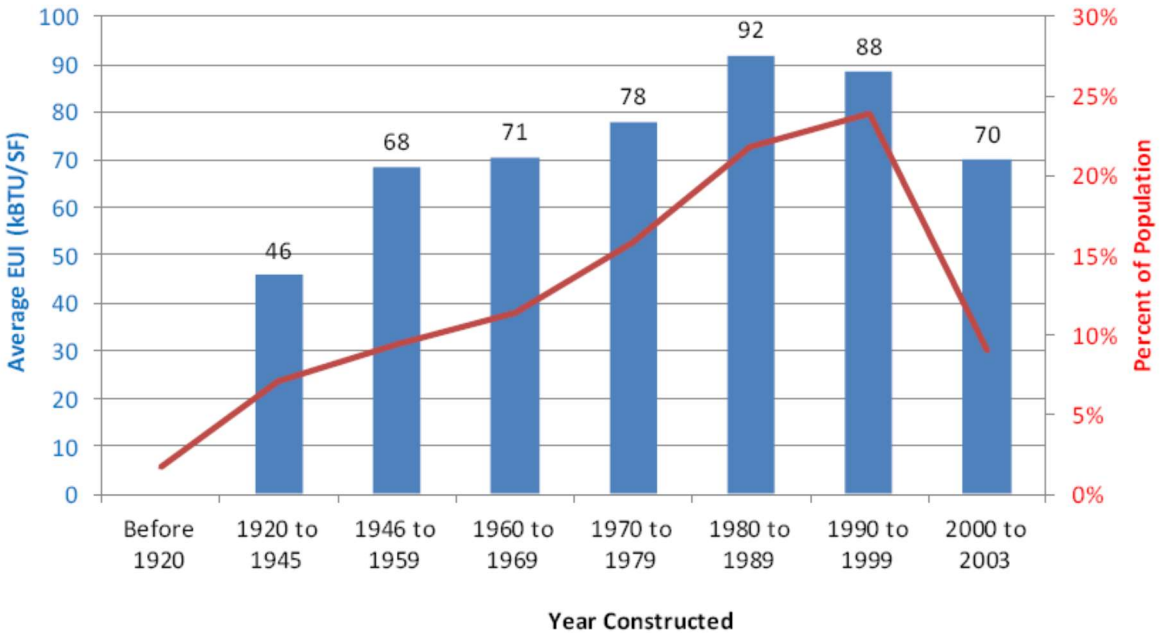


Figure 12: CBECS Climate Zone 4 EUIs by year of construction

California LEED Building EUI Comparison

For the "Road to ZNE" roadmap study, all of California's LEED rated buildings were analyzed to determine their building energy performance, based on modeled (vs. actual) energy consumption that was part of the LEED submittal. Note that this data is for buildings registered for LEED in or prior to 2011

(the latest available data). The following data tables and figures are excerpted from the "Road to ZNE" roadmap, Appendix G. Table 4 shows the building EUI data by building type. Both the base-case (code compliant) and proposed (i.e., as designed) building performance data is shown. Data is averaged by building type. One interesting thing to note is that the average building EUIs are all quite high compared to "ZNE Ready" performance levels of <30 kBTU/sqft. This indicates that simply building to a general "LEED" standard is insufficient for achieving ZNE. Planners and designers must really focus on building efficiency.

Table 4: California LEED rated building EUI summary, by building type

				EUI (kBTU/SF)										
				Proposed Building						Base-Case Buildng				
Building Type	Count	% Above ASHRAE	Avg EAc1 pts	Total	Regulated	Process/Plug		Electricity	Natural Gas	Total	Regulated	Process/Plug		Electricity	Natural Gas
Office	88	29%	6.2	85	43	42	51%	67	17	111	69	42	62%	87	23
Higher Ed	69	26%	5.4	78	54	24	69%	54	20	96	72	24	75%	68	24
Multi-Family	31	26%	5.4	65	45	20	69%	39	25	81	60	20	75%	50	29
Other	30	25%	5.3	620	324	296	52%	588	33	986	690	296	70%	937	49
Industrial	28	31%	6.8	1,717	155	1,561	9%	483	1,234	2,554	334	2,220	13%	686	2,380
Office-Mixed	28	24%	4.8	88	48	40	55%	59	27	106	65	40	62%	70	34
Assembly	23	25%	5.0	84	58	26	69%	60	23	112	86	26	77%	79	33
K-12	21	32%	7.0	96	77	20	80%	55	41	127	107	20	85%	75	52
Other-Public Order/Safety	16	25%	5.0	68	52	16	76%	40	15	90	74	16	82%	50	22
Other-Military	12	29%	6.4	64	40	23	63%	51	12	87	63	24	73%	68	19
laboratory	10	26%	5.3	170	102	68	60%	134	24	213	145	68	68%	168	29
Library	10	23%	5.0	59	43	16	73%	47	13	75	59	16	79%	61	15
Retail	9	28%	6.1	132	79	53	60%	100	32	168	115	53	68%	130	38
Lodging	9	22%	4.2	109	65	44	59%	46	59	129	84	45	65%	61	64
Library	8	26%	5.5	69	50	19	72%	52	16	98	77	21	78%	74	24
warehouse	8	32%	7.3	398	110	288	28%	391	7	571	223	348	39%	557	14
Health Care	6	21%	4.0	124	88	36	71%	92	32	165	129	36	78%	111	54
Retail	6	29%	6.2	130	53	77	41%	77	53	160	82	78	51%	99	73

Figure 13 shows a histogram of California LEED rated office building EUIs, broken down by California Climate Zone[10]. There are not many LEED buildings in Auburn's climate zone (California Climate Zone 11). None of the buildings in California Climate Zone 11 perform below the 30 kBTU/SF "ZNE Ready" threshold.

[10] Not to be confused with CBEC's climate zones, which are different.

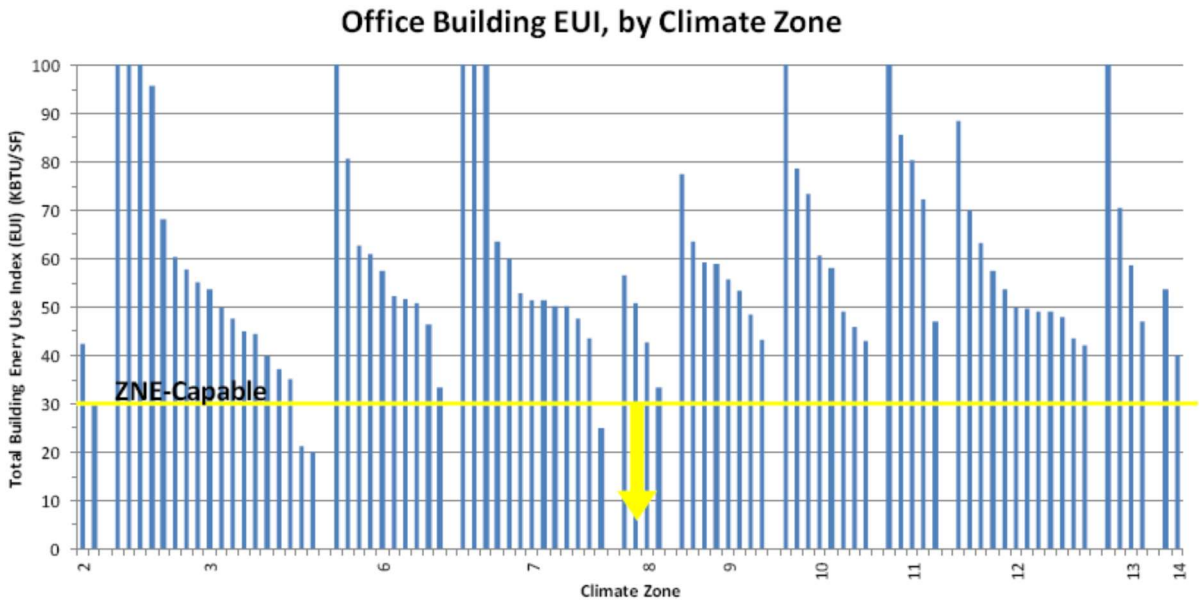


Figure 13: Histogram of LEED NC office building EUIs by Climate Zone

1.3 Existing PV System Performance

The PCGC has four solar PV systems in operation. These include a 45 kW PV System at the Finance Administration Building (FAB), a 132 kW PV system on buildings 110-111, a 82 kW system on Building 400, and a 325 kW ground mounted system serving the Juvenile Detention Center (JDC). PV system performance was analyzed for each system. The National Renewable Energy Lab's PV Watts solar analysis tool was used to estimate PV generation for each system based on system orientation (azimuth), tilt, nominal array size, typical PV losses, and local solar resources and climate data.

Table 5 shows estimated electricity generation from each PV system. The last row shows the annual purchased electricity for the systems that are on a net metering rate. Negative net metering data indicates that the system generated more electricity than was used on the meter.

Table 5: Summary of PCGC PV generation

Month	Blgd 400	Bldg 110/111	FAB	JDC
1	5,611	8,252	3,209	22,220
2	6,264	9,229	3,588	24,758
3	11,074	16,705	6,169	43,796
4	12,388	19,187	6,723	49,007
5	14,455	22,820	7,655	57,223
6	14,626	23,411	7,623	57,951
7	14,566	23,151	7,643	57,685
8	14,189	22,232	7,595	56,170
9	12,320	18,722	6,806	48,730
10	10,475	15,490	5,947	41,426
11	6,823	9,835	3,993	26,972
12	6,017	8,666	3,519	23,812
Total Solar kWh	128,807	197,702	70,469	509,750
Net energy metering total purchased kWh	(8,080.00)	(65,400.00)	n/a	46,452.00

1.3.1 FAB PV System

On March 29, 2005 the Board authorized the Director of Facility Services to negotiate and execute an Agreement for the design and installation of a 45 kilowatt PV System at the Larry Oddo Finance Administration Building.

Figure 14: FAB building PV system

The FAB PV system is not on a net metering rate.

1.3.2 Buildings 110-111 PV System

On January 10, 2006, the Placer County Board authorized the installation of a 132-kilowatt system on PCGC Buildings 110-111.

Table 6: Building 110/11 PV System Net Energy Metering Purchased/Sold Electricity

Month	On Peak kWh	Part Peak kWh	Off Peak kWh	Total kWh
Dec-15	**0.00**	**720.00**	**2,160.00**	**2,880.00**
Nov-15	-960	-1,680	1,440	-1,200
Oct-15	-3,120	120	720	-2,280
Sep-15	-3,360	480	-360	-3,240
Aug-15	-3,720	480	840	-2,400
Jul-15	-3,840	240	840	-2,760
Jun-15	-5,400	-1,440	-3,120	-9,960
May-15	-6,480	-4,680	-2,760	-13,920
Apr-15	0	-9,720	-1,800	-11,520
Mar-15	0	-6,840	-1,200	-8,040
Feb-15	0	-3,360	480	-2,880
Jan-15	0	-1,440	1,080	-360
2015Total	-26,880	-27,120	-1,680	-55,680

Figure 15: Building 110/111 PV system

1.3.3 Building 400 (County Maintenance) PV Array

Also in 2006, the PCGC authorized the installation of an 82-kilowatt system on PCGC Building 400 (County Maintenance).

Table 7: Building 400 PV System Net Energy Metering Purchased/Sold Electricity

Month	On Peak kWh	Part Peak kWh	Off Peak kWh	Total kWh
Dec-15	-	4,960	5,600	10,560
Nov-15	960	3,760	5,680	10,400
Oct-15	-	-	-	-
Sep-15	(3,040)	(560)	1,600	(2,000)
Aug-15	(3,600)	(1,120)	2,000	(2,720)
Jul-15	(3,760)	(800)	2,080	(2,480)
Jun-15	(4,160)	(1,760)	(1,280)	(7,200)
May-15	(3,920)	(4,160)	(400)	(8,480)
Apr-15	-	(7,040)	480	(6,560)
Mar-15	-	(4,800)	960	(3,840)
Feb-15	-	(2,080)	2,480	400

Jan-15	-	-	3,840	3,840
2015 Total	**(17,520)**	**(13,600)**	**23,040**	**(8,080)**

Figure 16: Building 400 PV system

1.3.4 Juvenile Detention PV Array

In a continuing effort to generate clean electrical power through renewable resources staff has looked at six additional sites at the Dewitt Center. Staff subsequently directed Solar Power, on behalf of Placer County, to submit applications to the Self Generation Incentive Program offered by the California Public Utility Commission. The County recently received Conditional Reservation Notice from PG&E for a ground array system to be located near the Juvenile Detention Center at the Placer County Government Center. Should your Board approve this recommendation, Solar Power will lease land from the County on which they will design, install, and operate a 325 kilowatt ground mounted system, including all switch gear, connections, and associated improvements.

Table 8: JDC PV System Net Energy Metering Purchased/Sold Electricity

Month	On Peak kWh	Part Peak kWh	Off Peak kWh	Total kWh
Dec-15	0	1,717	19,183	20,900
Nov-15	-941	-6,662	14,649	7,046
Oct-15	-14,113	-869	18,237	3,255
Sep-15	-17,591	-611	23,085	4,883
Aug-15	-18,962	-1,185	21,942	1,795
Jul-15	-14,564	-1,705	13,119	-3,150
Jun-15	-13,429	-2,262	13,876	-1,815
May-15	-18,856	-9,216	4,749	-23,323
Apr-15	0	-15,583	13,978	-1,605
Mar-15	0	-5,871	15,573	9,702
Feb-15	0	-9,502	15,591	6,089
Jan-15	0	3,330	19,345	22,675
2015 Total	**(98,456)**	**(48,419)**	**193,327**	**46,452**

Table 9: JDC PV system

2 ZERO NET WATER MASTER PLANNING – TASK 1A AND 1B

2.1 WATER POLICY AND PLANNING ISSUES IMPACTING THE PCGCMP

California will continue to face significant water constraints and challenges into the foreseeable future. Population and economic growth will continue to place additional demands on water, while drought, decreasing snowpack, wildfire, and other issues place unique vulnerabilities on the State's water supplies.

Placer County is uniquely situated with respect to water—its geographic reach extends up into the Sierras to the headwaters and snowpack storage and down to lower elevations with significant agricultural uses. Placer County must deal first hand with a wide variety of threats facing its water supply—from drought to extreme storm events, decreasing snowpack, wildfires, human impacts on water supply, storm water impacts, etc.

The PCGCMP is in a strategic position to both be a good steward of the county's water supply, as well as demonstrate state of the art thinking and design for how to better manage our water resources with a holistic, integrated focus.

2.1.1 Net Zero Water

Although Net Zero Water is not as well-known a goal as Net Zero Energy, California's record setting five-year drought has focused virtually every government agency, business and household on water issues. The result of the worst drought in a century--has been acute water shortages, over-pumping of groundwater, reduced water in streams and increased risk of wildfire. It touches most aspects of County life. Like much of the state, Placer County continues to experience moderate to severe drought conditions.

2.1.2 California Water Action Plan

In response to the crisis, Governor Brown mandated statewide reductions in water use—measures that have been somewhat relaxed in the aftermath of a dramatic comeback for Northern California's snowpack. In addition the State has developed The California Water Action Plan, a crucial policy guide for dealing with the statewide crisis. The Action Plan is a five-year roadmap toward sustainable water management and July 2016 marks the halfway point in the plan's implementation. Plan implementation has seen "an increase in regional self-reliance and integrated water management across all levels of government", among other successes. On the downside, the drought has caused a reduction in available groundwater, increased wildfires, decimated forest trees and reduced jobs in the agriculture sector.

Against this challenging backdrop, Placer County is well positioned to be a leader in water management and conservation. The County is home to the entire course of major water supplies. Unlike the Southern part of the state, where water is brought for long distances, Placer County lives among its water sources and residents drink local water. From the mountains to the lower elevations, water in Placer County is home-sourced. This is an aspect of water management that can tie in to the Government Center Campus.

PLANNING CAN DRAMATICALLY IMPROVE CONSERVATION

Because water shortages are a guaranteed condition of living in California, the benefits of planning are many. Although Net Zero Energy is supported by alternative generation sources, Net Zero Water is not. There is no new water being made! Thus conservation and reuse become essential tools for dealing with

water shortages. The Placer County Government Center Master Plan Update not only offers an excellent opportunity to develop a strong water planning process, but also can be a platform to demonstrate wise water management practices to the entire community.
Voluntary green building programs are one option for reducing water use in buildings. Although there is currently only one LEED building at Dewitt Center, the County could mandate a green building standard for new County buildings —either its own standards or one of the accepted system such as LEED, Build It Green, Living Building Challenge etc.

DROUGHT IMPACTS AND TREE LOSS
The state's record-setting drought is part of a historic pattern that California tends to suffer cyclically. What's different now is that scientific data has confirmed the role of human activity in causing climate change. Increasing temperatures are causing secondary disasters such as loss of trees, their cooling canopy, species-protecting habitat, their carbon sequestration and anti-erosion properties as well as numerous other benefits.
Local impacts are serious: Bark beetles are infesting drought-weakened trees, killing 66 million trees statewide and 20% of forests, which comprise 30% of Placer County. The result has been dramatically increased wildfire risk. Consequently the County recently declared a local emergency. Government Center trees are of course not immune to this destruction. Moreover, even if the drought should end, history shows it will return. A potential scenario is that temperatures will continue to rise and threaten the resilience of an unprepared community.

2.1.3 Resilience Initiatives

Traditionally the County has promoted numerous campaigns and efforts related to resilience such as Wildfire Community Preparedness Day. An event like Wildfire Community Preparedness Day can be modified and adapted to other aspects of resilience, such as Emergency Water Supplies. Thus one aspect of the Master Plan could be to explore and test adaptive strategies related to resilience, which become increasingly important as temperatures continue to rise, drought continues and new environmental (and community) threats emerge.

2.2 PRE-DEVELOPMENT WATER BALANCE

A water balance for the PCGC's pre-development conditions has been performed. This serves as a reference point to understand the water flows prior to development. The analysis was conducted using the EPA's National Stormwater Calculator[11]. Based on adjacent and nearby undeveloped areas, this analysis assumes that the PCGC pre-development conditions were a 50/50 split between forest and meadow.

Figure 17 shows the pre-development water flows. The site has an annual rainfall of 36.48 inches. Of this rain hitting the site, 95% of it is infiltrated into the ground (charging aquifers and feeding streams), 4% runs off the site (surface runoff), and 1% of the rain is evaporated.

[11] This is a sophisticated planning-level scenario analysis tool. It uses a detailed storm water calculation engine (EPA's SWMM model), detailed soil and hourly rain and climatic data and extensive design and performance data on a range of low impact development storm water management strategies. It does not substitute for detailed civil engineering hydraulic modeling and analysis.

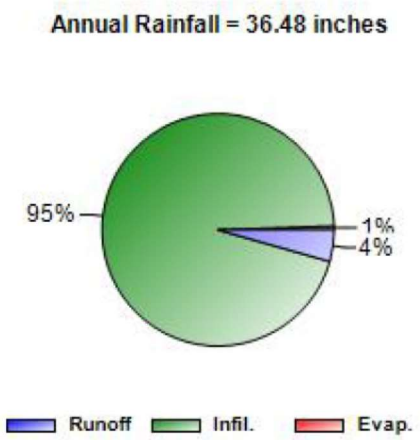


Figure 17: pre-development water flow summary

2.3 Existing Condition Water Balance

A water balance has been conducted for the existing PCGC campus to estimate water flows and uses across the site. Figure 18 summarizes the site's annual water balance. All data is shown in acre-feet (AF)[12].

The site receives just over 36" of rain per year. This equates to 608 acre-feet of water hitting the site annually. Of this rainfall, 63% (382 acre feet) hits the landscape and infiltrates into the soil to recharge groundwater and streams. 4% (23 acre feet) evaporates. The remaining 33% (203 AF) strikes roofs (49 AF) and other hardscape (155) and runs off into the storm water system. This compares to almost no runoff for predevelopment conditions (see Figure 17).

For 2015, PCGC purchased 127 AF of water. 74 AF was used for interior/domestic uses, and 53 AF was used for irrigation (which was severely curtailed in 2015 due to the drought). Irrigation would be significantly larger in a normal year. Approximately 66 AF goes into the sewer. Details of the analysis are provided in the next "Water Analysis Details" section.

[12] An acre-foot is one acre of water one foot deep.

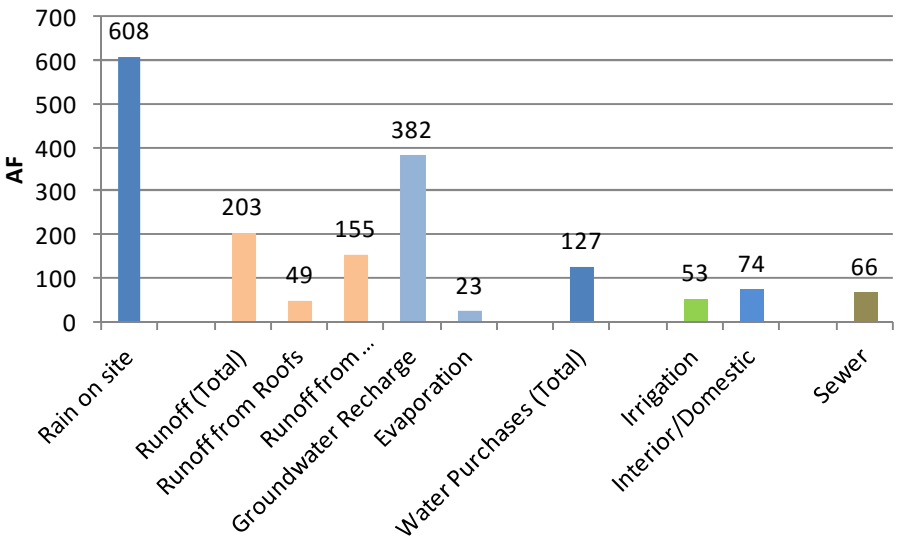


Figure 18: Existing condition water balance (2015)

This water balance illustrates a number of interesting facts. First, there is significantly more rainfall on the site than is used by the facility. In fact, unwanted storm water runoff is significantly larger than water purchases. Runoff from roofs alone nearly meet 2015 irrigation needs. While there will be challenges using all of this given the distributed nature of the site, there are nevertheless significant opportunities.

The water balance suggests significant opportunities for rainwater capture/reuse from the roofs, and opportunities for a wide range of green-infrastructure storm water management techniques. There may also be opportunities for gray water reuse and ecological water recycling (i.e., subsurface constructed wetlands aka vegetated submerged beds).

2.4 Water Analysis Details

This section presents details of the existing conditions water analysis.

2.4.1 Existing Land Use Characterization

Table 10 shows a preliminary estimate of current PCGC land uses. This data is used to estimate storm water generation from different surfaces, rainwater capture opportunities, etc.

Table 10: Approximate land use characterization of current PCGC

Description	Area (acres)	% of Total
Roofs	16.0	8%
Streets	14.2	7%
Parking & Hardscape	37.6	19%
Irrigated	17.7	9%
Unirrigated Open Space	25.4	13%
Irrigation Ditch	0.9	0%
Detention	4.9	2%
Solar Array	1.8	1%
Pond	2.5	1%
Misc Hardscape	2.0	1%
Other Unirrigated Open Space	77.1	39%
Total	**200.0**	**100%**
Total Impervious	***72.51***	***36%***

2.4.2 Rain and Stormwater

A detailed analysis of rain and storm water generation was performed using the U.S. EPA's National Stormwater Calculator. Figure 19 compares the pre-development state to existing condition storm water generation. The site is currently 36% impervious (i.e., roofs, roads, parking lots). This results in approximately 33% of the total rainfall hitting the site to run off, compared to only 4% in pre-development conditions. Thus there are significant opportunities on the campus for low impact design (LID), aka green storm water infrastructure storm water management strategies.

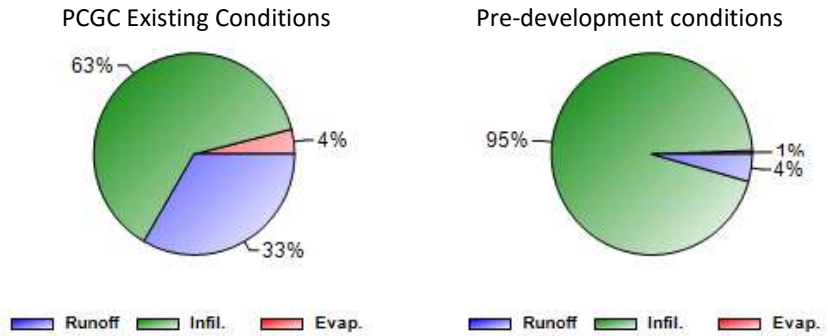
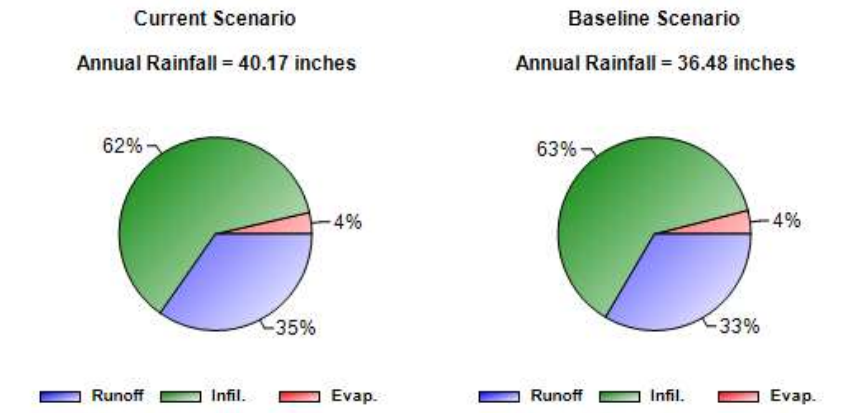


Figure 19: Existing conditions vs. pre-development storm water statistics

Impacts Due to Climate Change

The EPA's National Stormwater Calculator has the capability to analyze the storm water impacts of several different climate change scenarios. The following figure shows the potential impacts for near-term climate change impacts given a warm/wet scenario. Rainfall increases by nearly 4" per year in this condition, and runoff goes from 12.25 inches to 14 inches. This is not a significant change from existing conditions, but does help inform the design team on possible near term climate change impacts. Caution should be used in interpreting and using these results, however.



Statistic	Current Scenario	Baseline Scenario
Average Annual Rainfall (inches)	40.17	36.48
Average Annual Runoff (inches)	14.00	12.25

Figure 20: Possible climate change impacts on storm water runoff (left) vs. existing conditions (right)

2.4.3 Potable Water Consumption and End Use

Monthly water consumption data from 2006 to 2015 was analyzed. Figure 21 and Table 11 summarize the annual water consumption, water end uses, and waste water generation. Figure 22 plots monthly water consumption for the past 10 years. All data is shown in acre-feet (AF).

There are a number of trends. Total water use has been decreasing over the years, with very deep cuts in the last few years due to the drought.

Note that monthly water use in Figure 22 always drops to a minimum in the winter months. These are the months when there is minimum irrigation water use, and represents the "baseload" water use. The majority of this water use is for interior domestic purposes. The variable portion of the water use (i.e., the "spikes", or increased water consumption during summer months) represents irrigation and cooling water. Since the majority of the buildings use air-cooled a/c equipment (except the FAB), the majority of this additional summer water use is attributed to irrigation. Evaporation from the pool accounts for some of this water use, but it is quite small compared to irrigation. Thus interior domestic water consumption can be disaggregated from irrigation water use. Note that both interior and exterior water consumption has been dropping. The PCGC has been increasingly efficient with its water consumption on all levels. Waste water generation is estimated at 90% of the interior domestic water use (a typical assumption).

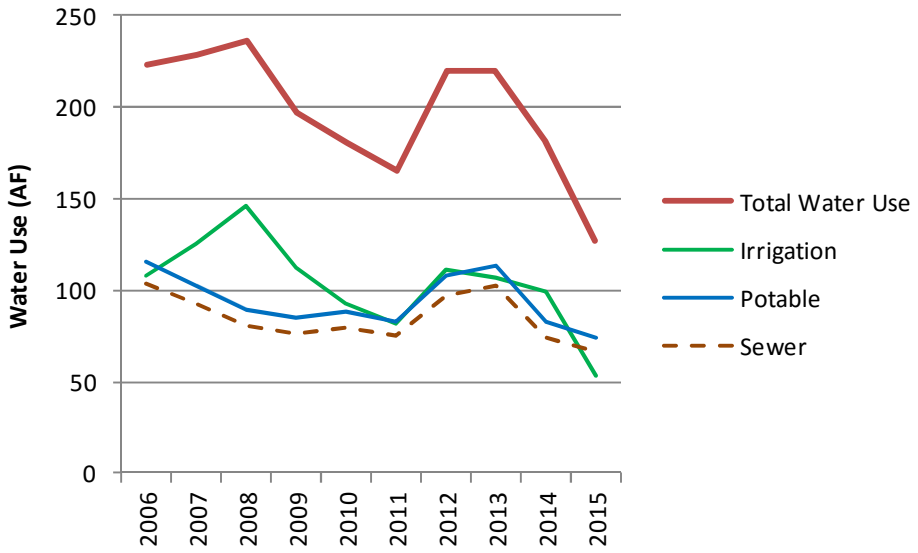


Figure 21: Annual water consumption and estimated end uses

Table 11: Annual water consumption and estimated end uses

Year	Total Water Use	Potable	Irrigation	Sewer
2006	223.4	115.6	107.8	104.1
2007	228.4	102.6	125.8	92.3
2008	235.8	89.3	146.6	80.3
2009	197.1	84.8	112.3	76.3
2010	180.5	88.1	92.4	79.3
2011	164.8	83.1	81.6	74.8
2012	219.8	108.3	111.5	97.5
2013	219.8	113.3	106.5	101.9
2014	181.9	82.6	99.3	74.4
2015	126.6	73.8	52.8	66.4

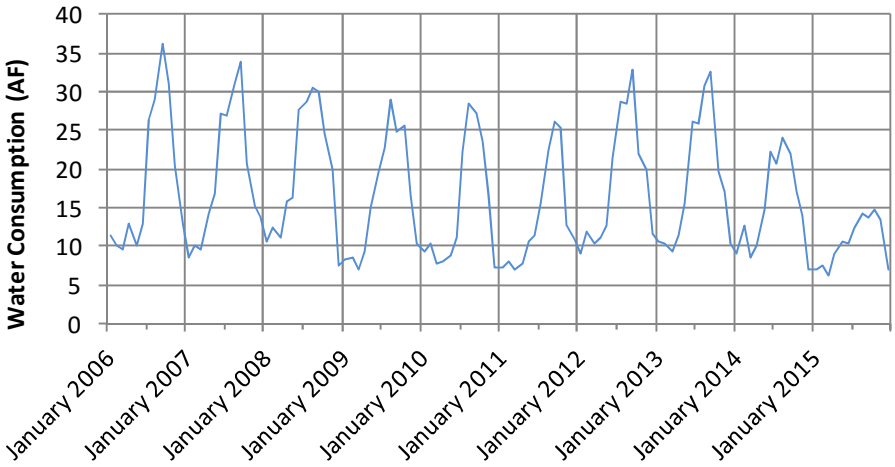


Figure 22: Monthly water consumption

3 CARBON MASTER PLANNING—TASKS 1A AND 1B

3.1 GHG EMISSIONS ANALYSIS

3.1.1 GHG Emission Factors

GHG Emission factors used in this analysis are presented below. Note the GHG emissions are typically measured in metric tons of CO_2 (MTCO2).

Electricity

Electricity is provided by PG&E. Electricity emission factors are shown in the following table. Electricity emission factors vary year to year based on the mix of fuels used to generate the electricity. California's electricity GHG emission factors are improving due to Renewable Portfolio Standards which require utilities to increase electricity generation from renewable energy sources. Emission factors through 2014 are 3rd party verified GHG emission factors; emission factors for 2015 and beyond are based on independent CPUC projections[13, 14].

Table 12: Electricity GHG emission factors

Year	Lbs CO2/MWh	MTCO2/MWh
2003	620	0.281
2004	566	0.257
2005	489	0.222
2006	456	0.207
2007	636	0.288
2008	641	0.291
2009	575	0.261
2010	445	0.202
2011	393	0.178
2012	445	0.202
2013	427	0.194
2014	435	0.197
*2015**	391	0.177
*2016**	370	0.168
*2017**	349	0.158
*2018**	328	0.149
*2019**	307	0.139
*2020**	290	0.132

[13] All data except 2014 is from: PG&E, "Greenhouse Gas Emission Factors: Guidance for PG&E Customers," November 2015. https://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf

[14] Updated 2014 emission factor is from: PG&E, "Climate Change Vulnerability Assessment," 2016. http://www.pgecurrents.com/wp-content/uploads/2016/02/PGE_climate_resilience.pdf

Natural Gas
Natural gas GHG emission factors do not change over time like electricity. Natural gas GHG factors are 11.7 lbs CO2/therm, or **0.00531 MTCO2/therm**[15].

Water
There is a significant amount of energy and carbon embodied in water. Over 20% of California's energy use goes toward water pumping, conveyance (i.e. aqueducts), treatment and heating.

PCGC's water is provided by Placer County Water Agency (PCWA). PCWA Conducted an Energy and Green House Gas Benchmark Study[16] to quantify the amount of energy and GHGs in its water supply. It projects for future water system build-out, that it will supply 217,200 AF of water per year with a total energy use of 68,048,500 kWh[17]. This results in a system-wide average embodied electricity factor of **313.3 kWh/AF** of water supplied. This latest data currently available is used for this analysis. This electricity emission factor is multiplied by the appropriate year's electricity GHG factor to obtain the total estimated embodied GHGs in water.

Wastewater
Specific Data for wastewater treatment energy use for PCGC was not available. Industry average data is used. Average wastewater collection energy consumption is 191.5 kWh/AF, and wastewater treatment energy is 622.7 kWh/AF[18], for a total wastewater energy factor of **814.2 kWh/AF**.

3.1.2 PCGC Existing GHG Emissions

Greenhouse gas emissions for the PCGC was estimated for 2015. Figure 23 and Table 13 summarize the results. GHG emissions are shown for building energy use, water consumption, and wastewater generation. Transportation related GHG emissions are also shown for the natural gas sold from the CNG fuel station. GHG emissions for other aspects of the campus operation (i.e., office consumables, refrigerants) are not included in this analysis. The PCGC has an estimated total annual GHG emissions of 3,048 metric tons of CO_2 (MTCO2) per year. Water and wastewater related emissions are very small compared to energy emissions. Electricity related GHG emissions make up almost half of the PCGC's annual emissions.

---

[15] PG&E, "Greenhouse Gas Emission Factors: Guidance for PG&E Customers," November 2015. https://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf
[16] Placer County Water Agency, "Energy And Green House Gas Benchmark Study," July 2009. http://www.pcwa.net/files/docs/enviro/PCWA_Benchmark_Study_Summary_July_2009.pdf
[17] Placer County Water Agency, Table 2.7, "Energy And Green House Gas Benchmark Study," July 2009. http://www.pcwa.net/files/docs/enviro/PCWA_Benchmark_Study_Summary_July_2009.pdf
[18] De Monsabert, S. et. al., "Incorporating Energy Impacts into Water Supply and Wastewater Management," Table 2. 2009 ACEEE Summer Study on Energy Efficiency in Industry Proceedings. http://aceee.org/files/proceedings/2009/data/papers/6_86.pdf

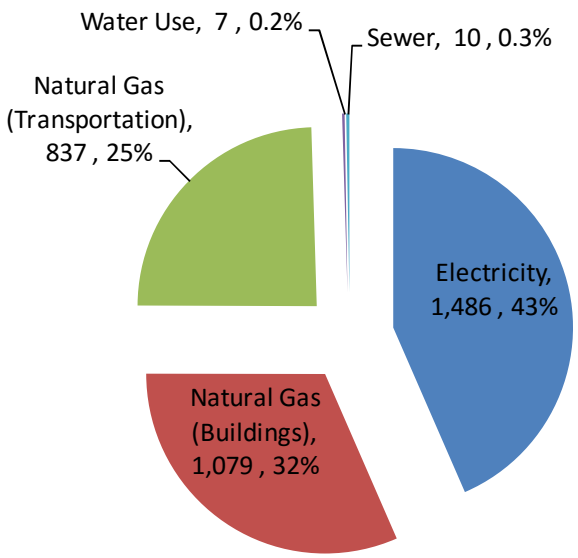


Figure 23: 2015 PCGC GHG emissions (in metric tons of CO_2)

Table 13: 2015 PCGC GHG emissions (in metric tons of CO_2)

Electricity	**Natural Gas** (buildings)	**Natural Gas** (Transportation - CNG Station)	**Water**	**Sewer**	**Total**
1,486	1,079	837	7	10	3,418
43%	32%	24%	0.2%	0.3%	100%

3.2 Life Cycle Carbon Analysis of Retaining Vs. Replacing Existing DeWitt Buildings

One of the questions that has arisen is whether it makes sense, from a carbon perspective, to keep some of the older DeWitt buildings or replace them with more efficient construction. A life cycle carbon analysis was performed to provide insight into this question.

A prototypical ~4,000 sq ft DeWitt barracks wing was analyzed. This is representative of Ramp 100 buildings (and similar buildings on other ramps) as illustrated in the following figure.

Figure 24: Ramp 100 buildings

Construction characteristics and details are taken from the PCGC Facility Condition Report. Typical foundation, wall and floor details are shown. It is a simple building.

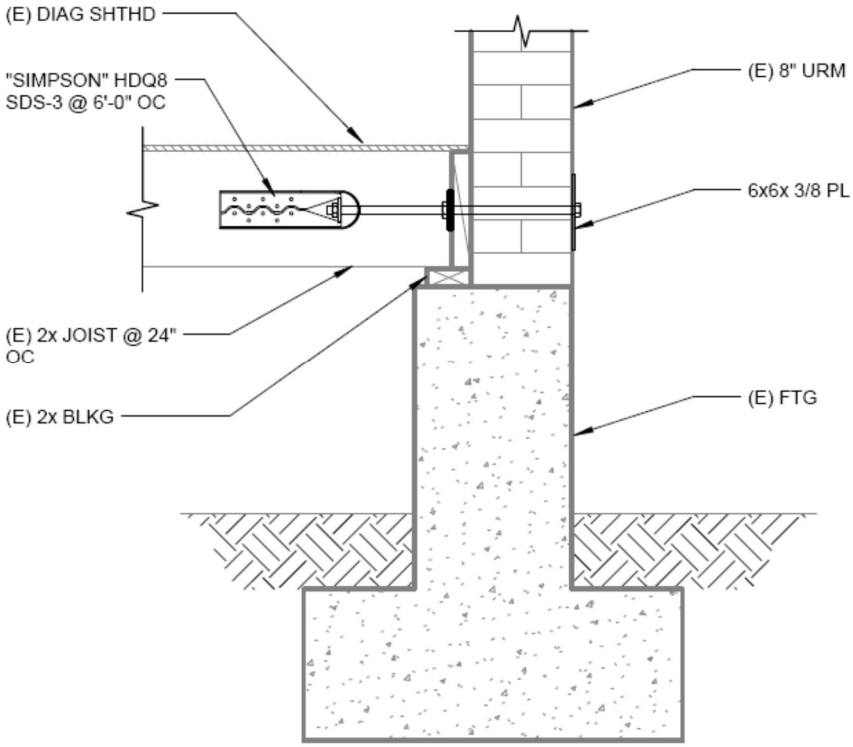


Figure 25: Typical wall and floor construction of Ramp 100 buildings

A life cycle carbon analysis was made using the Athena Institute's Impact Estimator (see below for a description of the methodology).

End-of-life (demolition, recycling/landfilling) emissions for this building are 5 metric tons of CO_2 (MTCO2). The majority of the GHG emissions for building demolition are due to transportation and

onsite equipment. Much of the construction waste is recycled. The masonry does not decompose and release GHG's.

Building energy use for building 112a was used as representative of Ramp 100 and similar buildings on other ramps (note: many of the older buildings are vacant, used for storage, utility data is not disaggregated, or buildings are otherwise not representative of typical use). Building 112a has a total building energy use intensity (EUI) of 80.3 kWH/sqft/year. This is just under the average EUI of 89 KBT/sqft for this building size in this climate zone. Building 112a's gas use is 34.2 kBTU/sqft and electricity use is 46.1 kBTU/sqft. This results in annual GHG emissions of 16.1 MTCO2 from energy consumption. Note that annual energy related GHG emissions are more than the end of life (demolition) emissions.

A same sized new building[19] was also analyzed, using typical wood frame construction. The embodied GHG's in the new building's materials are 24 MTCO2. Construction results in 15 MTCO2 of emissions.

New construction building energy use is estimated at 35 kBTU/sqft/year, which is representative of a high performing, "zero net energy capable" building, consistent with the Master Plan intent. This results in 7.3 MTCO2 of emissions per year due to energy. This is significantly less than the existing building's energy consumption.

Figure 26 compares the cumulative GHG emissions for continued use of the existing building, versus replacing the building with a new more efficient building. The red columns represent the cumulative GHG emissions from the existing building. The green columns represent the new building. The first year includes the end of life GHG emissions associated with tearing down the existing building. The second year includes embodied material and construction emissions for building the new building. Subsequent years include the operational energy GHG emissions. By year 4, the savings from reduced energy use in the new building make up for the additional GHG emissions associated with replacing the existing building.

The results indicate that the life cycle greenhouse gas emissions associated with replacing the building are much smaller than the cumulative impacts of building related energy use.

There are many variants that could be explored—different construction types for the new building, deep energy retrofits for the existing building, etc. From the carbon perspective, it doesn't matter if you keep or tear down the existing buildings. What really impacts lifecycle carbon emissions for this project is building energy efficiency. It does not matter whether this is achieved through deep retrofits, or new construction.

[19] Same square footage, but with a wider aspect ratio typical of what would likely be built

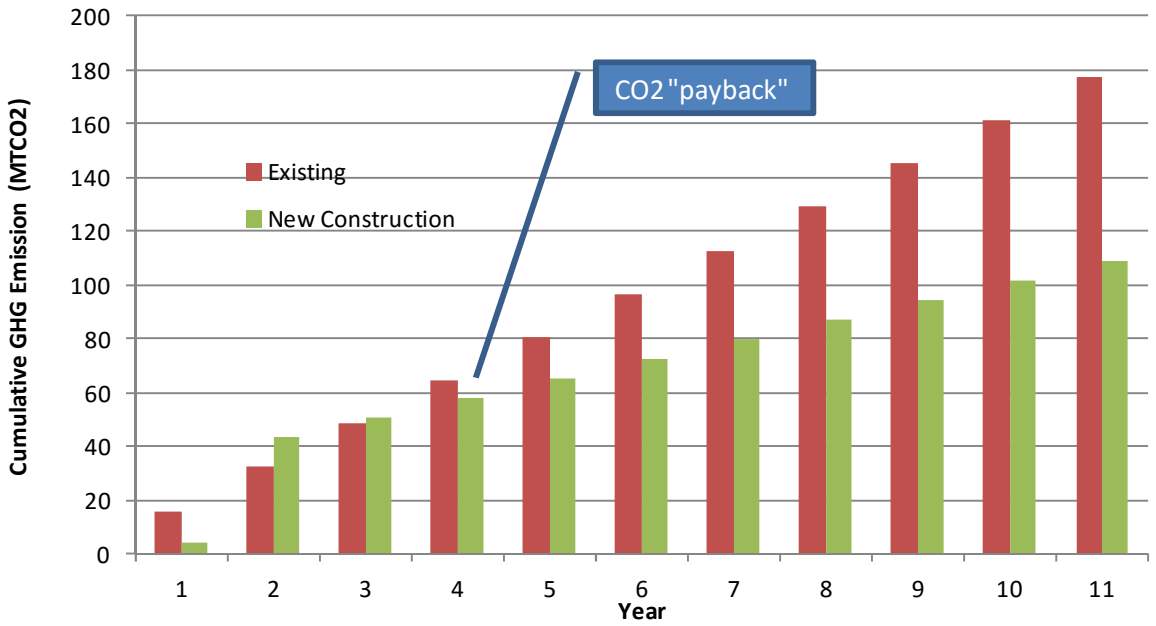


Figure 26: Comparison of cumulative GHG emissions for continued use of the existing DeWitt barrack building versus replacing it with new construction

3.2.1 Methodology and Analysis Details

A life cycle analysis (LCA) study has been performed using the Athena Institute's "Athena Impact Estimator for Buildings" software tool. This is a whole building, life cycle based environmental assessment tool that compares the relative environmental effects or trade-offs across alternative building design solutions at the conceptual design stage. The Athena Impact Estimator for Buildings is the only software tool in use in North America that evaluates whole buildings and assemblies based on internationally recognized life cycle assessment (LCA) methodology. It has extensive regional data on building material and building life cycle phase carbon and other LCA impacts. The Impact Estimator analyzes the environmental impacts of:

- Material manufacturing, including resource extraction and recycled content
- Related transportation
- On-site construction
- Regional variation in energy use, transportation and other factors
- Building type and assumed lifespan
- Maintenance, repair and replacement effects
- Demolition and end-of-life disposition
- Operating energy emissions and pre-combustion effects

Table 14 summarizes key life cycle emission sources that are included in the analysis.

Table 14: Summary of key elements included in the Life Cycle Analysis

Life Cycle Element	Supports?	Processes Included
A1 Raw material supply	Y	Primary resource harvesting and mining
A2 Transport	Y	All transportation of materials up to manufacturing plant gate
A3 Manufacturing	Y	Manufacture of raw materials into products
A4 Transport	Y	Transportation of materials from manufacturing plant to site, and construction equipment to site
A5 Construction-installation process	Y	Construction equipment energy use, and A1-A4, C1, C2, C4 IM effects of construction waste
B1 Installed product in use	N	n/a
B2 Maintenance	Partial	Painted surfaces are maintained (i.e. repainted), but no other maintenance aspects are included
B3 Repair	N	n/a
B4 Replacement	Y	Modules A1-A5 effects of replacement materials, and C1, C2, C4 includes effects of replaced materials based on expected material lifetimes
B5 Refurbishment	N	n/a
B6 Operational energy use	Y	Energy primary extraction, production, delivery, and use. Regional energy supply system carbon intensities are used.
B7 Operational water use	N	n/a
C1 De-construction demolition	Y	Demolition equipment energy use
C2 Transport	Y	Transportation of materials from site to landfill
C3 Waste Processing	N	n/a
C4 Disposal	Y	Disposal facility equipment energy use and landfill site effects
D Benefits and loads beyond the system boundary (Beyond Building Life)	Partial	Steel recycling and carbon sequestration of wood products

Additional LCA analysis details are available from the Athena Institute.

4 Climate Change, Resiliency and Vulnerabilities Assessment

4.1 Executive Summary and Key Findings

California's climate is already changing. This is resulting in noticeable and significant impacts at both local and State levels. This climatic changes will continue—and increase—during the PCGCMP planning horizon. Furthermore, many of the decisions made during this master planning effort will endure well beyond the current planning horizon and will influence how the PCGC fares in even more extreme climate changes projected for the latter part of this century. Impacts include increased temperatures, heat storms, significantly reduced snowpack, increased wildfire, insect and pest migration, stress on landscaping and greater ecosystem, impaired water supplies, etc.

The purpose of this study is to provide the master planning team and stakeholders with the most current information on projected climate change and related impacts and vulnerabilities to inform the PCGC master planning process as part of the Plan's sustainability master planning efforts.

The following key climatic changes are projected:

- Average and peak day/night temperatures are increasing. Average annual temperatures are projected to increase by 3.8 to 6.7ºF by the end of the century. Peak day/night temperatures are increasing as well. This will increase energy use and costs for A/C. It may make some passive and low energy strategies that are currently effective in the PCGC's current climate (i.e., strategies that take advantage of cool night temperatures) more challenging in the future. It will stress landscaping and the environment. It is likely that new varieties of pests and disease will appear as the climate becomes more hospitable to them. One of the most disquieting data points is that Auburn and Placer County mountain areas are projected to undergo the largest annual temperature rise of anywhere in the state!

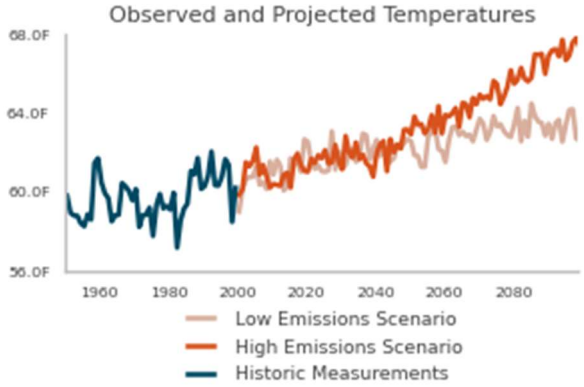


Figure 27: Average Annual temperature projections for Auburn

- Extreme heat events (heat waves, heat storms) are projected to increase significantly. The historical average of 3-5 extreme heat days is already being exceeded significantly. By 2030 there may be years with over 30 extreme heat days, and this could double in the latter part of the century.

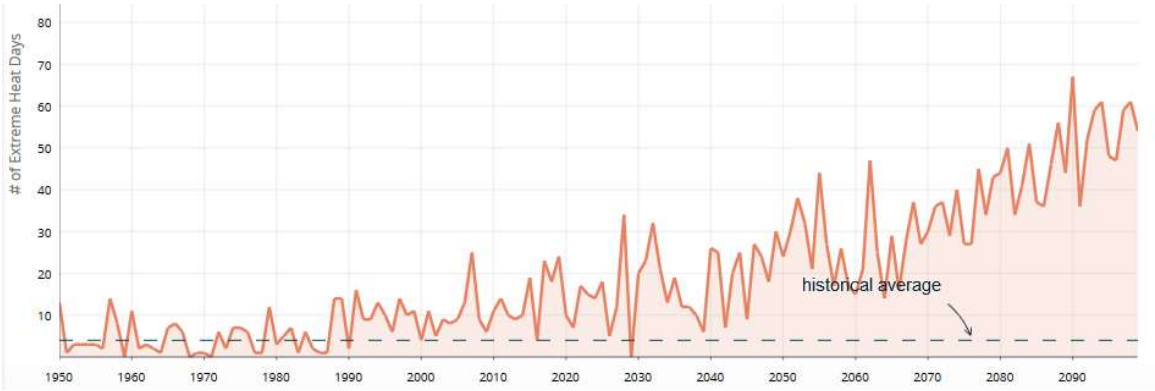
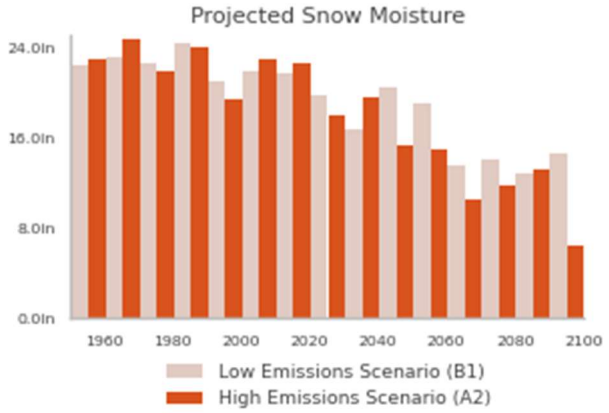


Figure 28: Projected number of Extreme Heat Days per year for Auburn

- One of the most significant climate change impacts is a large projected reduction of Sierra snowpack in Placer County, with snowpack projected to decrease by 46-65%, depending on future greenhouse gas emissions reductions. This decline in snowpack will have significant impacts on water supply, among other things.



- Relatively small changes in annual precipitation are projected, although projections show decreased summer precipitation.
- Wildfire risk is increasing.

These projected changes will have significant impacts on the region and the PCGC. The PCGC master plan update presents a unique opportunity for the County to serve in a leadership role for how the County as a whole should consider and address a wide variety of climate mitigation, adaptation, and resiliency initiatives.

4.2 Introduction and Purpose

California's climate is already changing. The purpose of this study is to provide the master planning team and stakeholders with the most current information on projected climate changes and related impacts and vulnerabilities to inform the PCGC master planning process as part of the Plan's sustainability initiatives. This will help the team understand key vulnerabilities and proactively address a range of mitigation, adaptation and resiliency issues.

Section 3 provides details on the expected climatic changes expected for Auburn and the PCGC.

4.3 Projected Climatic and Environmental Changes Impacting the PCGC

This section presents projections for PCGC's future climate change impacts through the rest of this century.

Data presented here is primarily from Cal-Adapt (www.cal-adapt.org). Cal-Adapt aggregates and synthesizes existing California climate change scenarios and climate impact research for beneficial use by local decision-makers. The site has been developed by UC Berkeley's Geospatial Innovation Facility (GIF) with funding and advisory oversight by the California Energy Commission's Public Interest Energy Research (PIER) Program, and advisory support from Google.org. The data used by Cal-Adapt have been gathered from California's scientific community, and represent the most current data available wherever possible.

It is not yet clear whether we—as a society—will aggressively reduce our greenhouse gas emissions to avoid the worst-case climate change scenarios, or whether we will continue on a business-as-usual trajectory that will take us into uncharted territory and more extreme climate change. Therefore, much of the data presented here is bracketed by "low" and "high" greenhouse gas (GHG) emissions scenarios[20]. The low emissions scenario assumes very aggressive reductions in our GHG emissions, while the high emission scenario represents a business-as-usual trajectory. Refer to Cal-Adapt.org for more details on the emissions scenarios.

[20] Note that in some cases, we present only the higher emissions scenario to simplify the interpretation and analysis. Complete data is available on Cal-Adapt.org

4.3.1 Average Annual Temperature Rise

For the PCGC, the average annual temperature is expected to rise between 3.8°F to nearly 7°F, depending on our GHG emissions. The figure below shows the projected difference in temperature between a baseline time period (1961-1990) to the end of the 21st century. Note that peak monthly temperatures and extremes may be higher than the annual average (see the next section). **Auburn and the mountains of Placer County are projected to experience the largest increase in temperatures statewide**. This will have impacts on water supply, snowpack, wildfire, energy, recreation, and other activities.

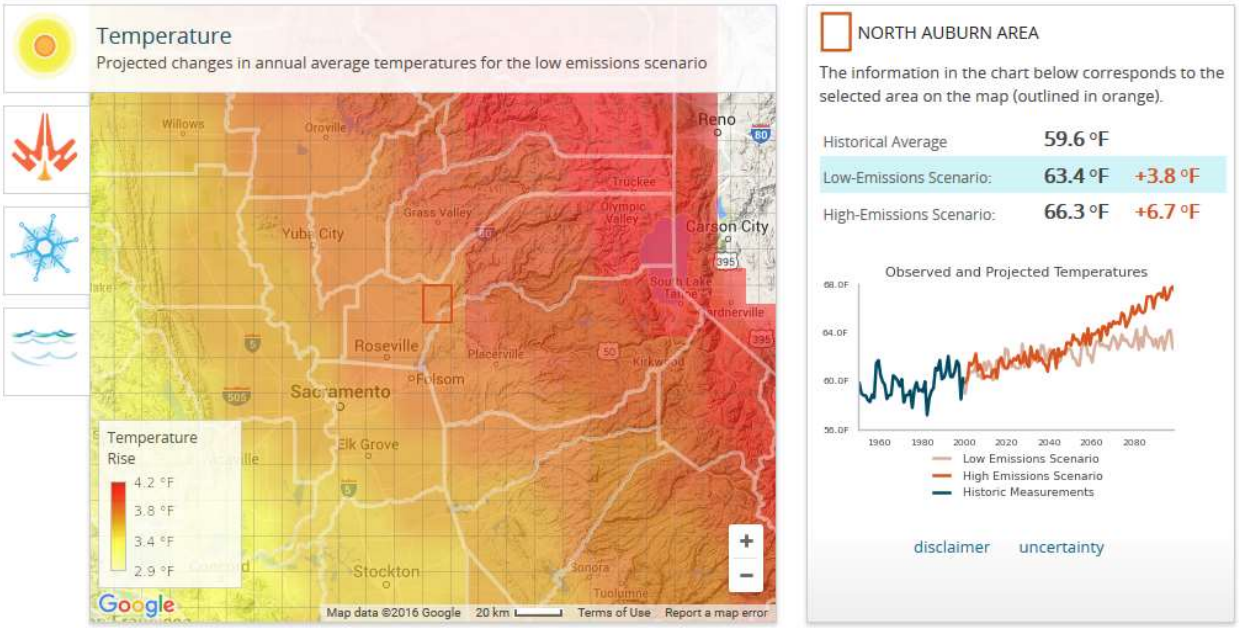


Figure 29: Annual average temperature change for the PCGC (low emission scenario)

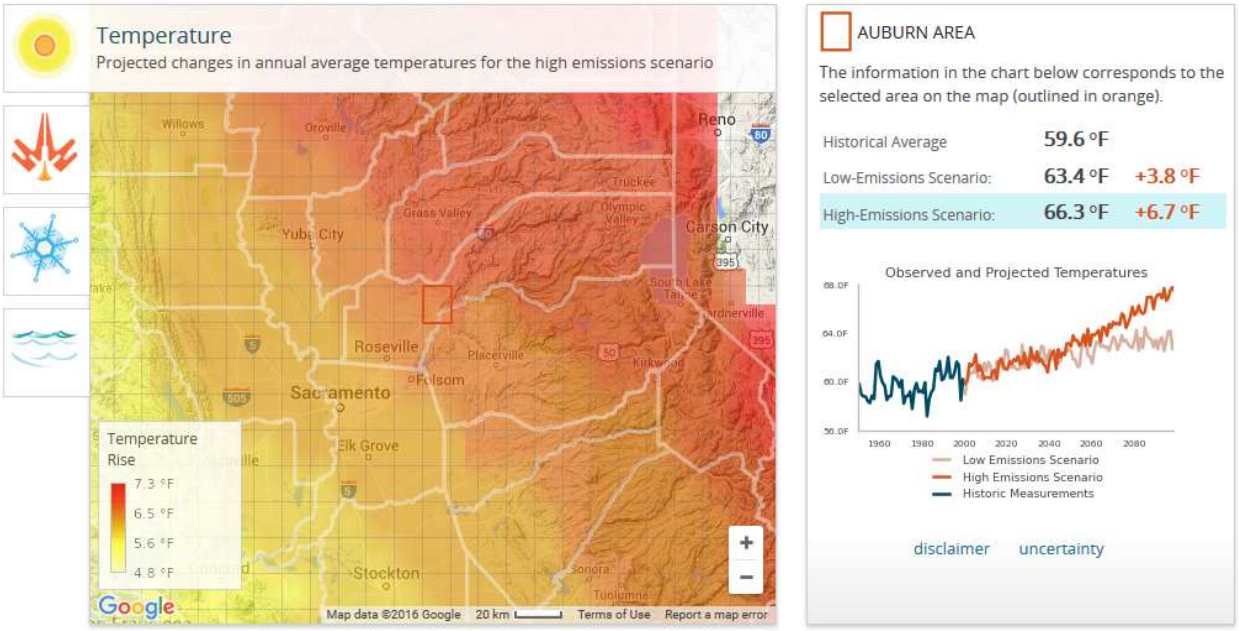


Figure 30: Annual average temperature change for the PCGC (high emission scenario)

4.3.2 Summer High Temperature Trends

The following two figures show historical (dark blue) and projected (multi-color). summer day and night monthly peak temperatures for the high emissionscenario. (The multi-color lines represent various climate models.)

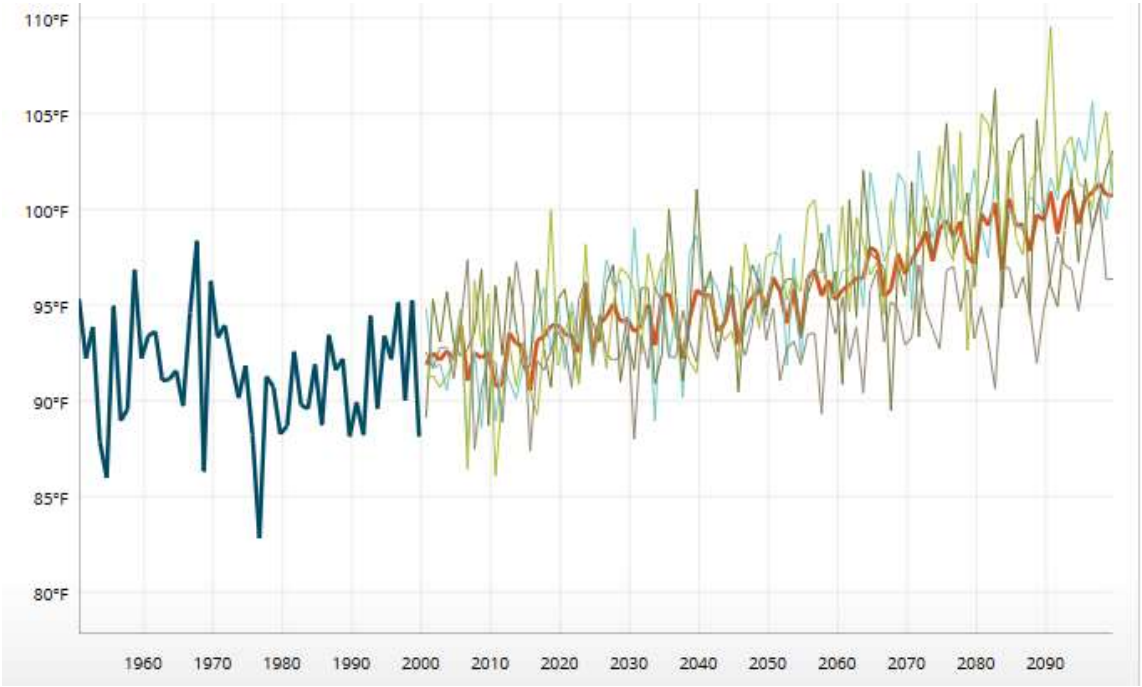


Figure 31: August daytime temperature peaks (high emission scenario) for PCGC

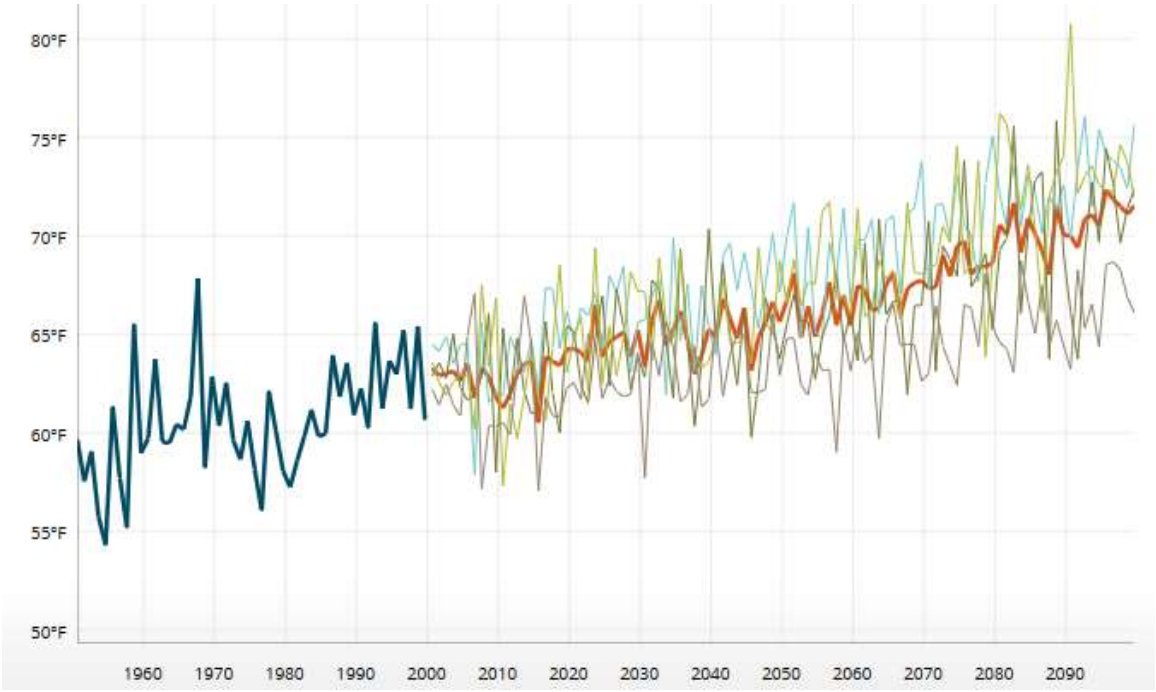


Figure 32: August night temperature peaks (high emission scenario) for PCGC

August high temperatures are projected to increase from highs of 90-95°F to over 100°F. Likewise monthly low temperatures will increase from ~60-65°F and approach 70 or 75°F. Note that these are the monthly highs, not the average daily highs. These changes will have significant impacts, including increasing daytime A/C use (and increasing related electricity consumption, peak demand; and costs); it will reduce the ability to cool homes and buildings down in the evenings and nights with natural ventilation or whole house fans (and related night time flush strategies for commercial buildings); it likely will adversely impact trees, landscaping and crops; and it will likely have human health impacts.

4.3.3 Winter High Temperature Trends

January high and low temperature projects do not change as much as summer temperatures, but do show a warming trend.

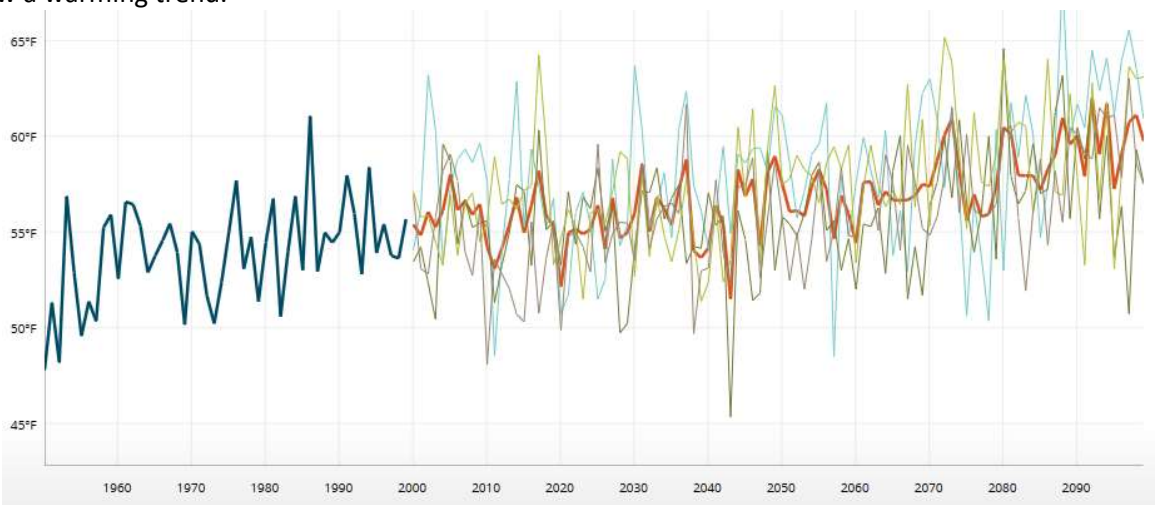


Figure 33: January daytime temperature peaks (high emission scenario)

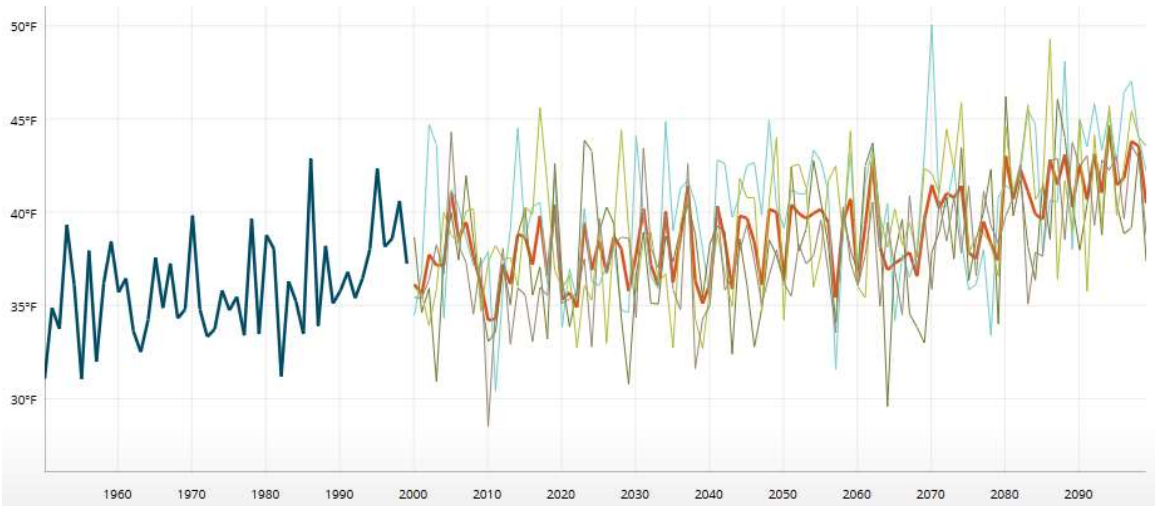


Figure 34: January night temperature peaks (high emission scenario)

4.3.4 Day and Night High Temperatures (2010 and 2030)

The following set of graphs show data similar to the preceding figures. The preceding figures show the trends for how summer/winter and day/night high temperatures are increasing over time. They show the hottest temperatures monthly. The following two graphs show daily high and temperatures (for both daytime and nighttime) for a single year, for the hottest day of the month. This provides a little more insight for how the climate is changing on a daily basis, not just the hottest days of the month. Graphs for 2010 and 2030 are shown. Overlaid on the charts are extreme heat day and warm night thresholds. These graphs provide insight into how high and low temperatures are changing throughout the entire year. The data shows that (1) there are increasing numbers of days passing the extreme heat day threshold, (2) increasing nights exceeding the warm night threshold, and (3) extreme heat days/warm nights are increasing occurring outside the typical summer warm periods.

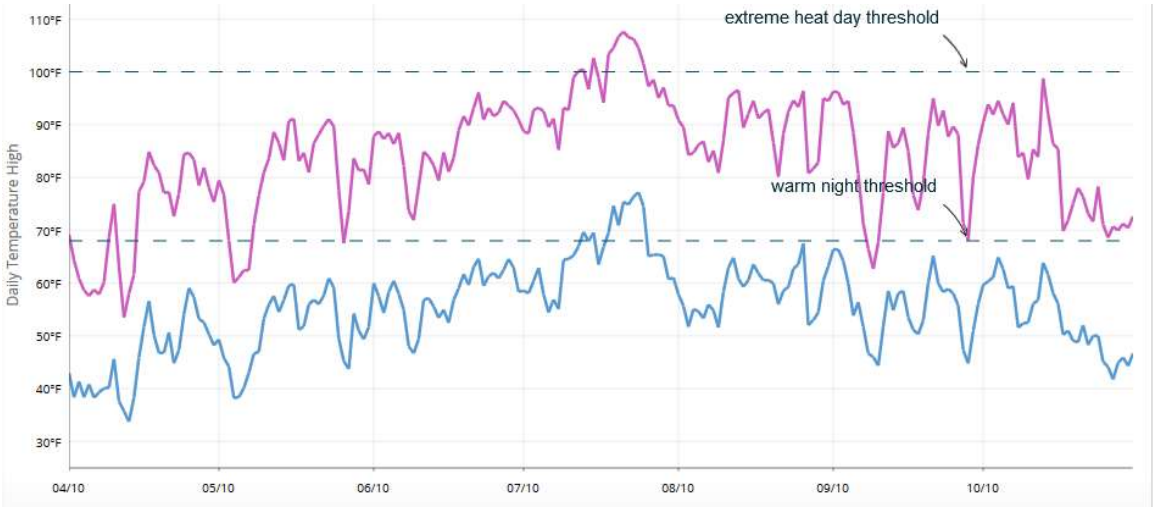


Figure 35: Daily high temperatures for daytime and nighttime, 2010 (high emissions scenario)

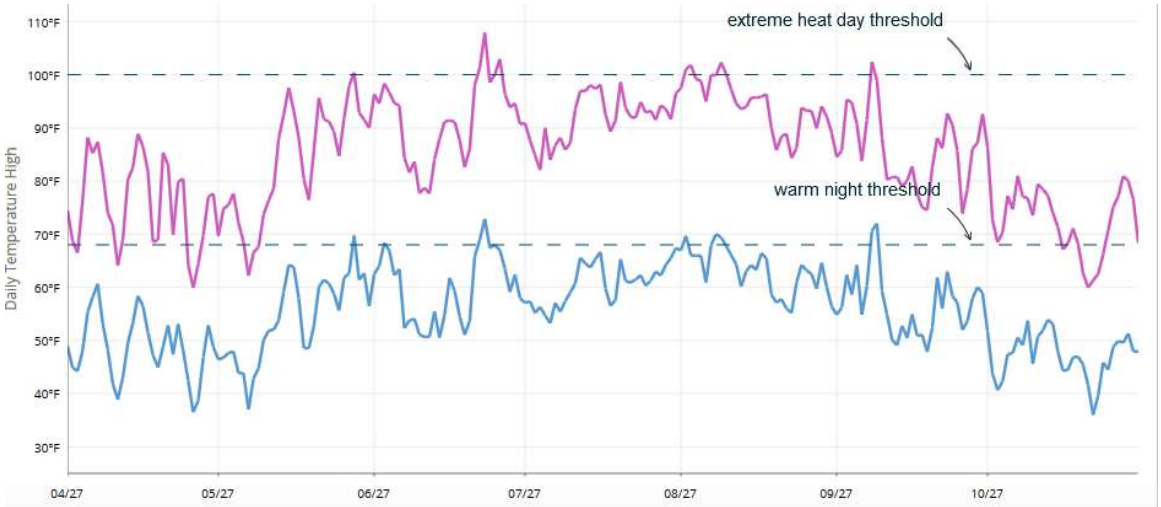


Figure 36: Daily high temperatures for daytime and nighttime, 2030 (high emissions scenario)

4.3.5 Extreme Heat

Extreme heat events are projected to increase significantly for Auburn. The following sets of graphs present a number of different ways to measure extreme heat events. Extreme heat can be deadly. It can also be costly due to increased A/C, peak demand spikes resulting in brown-outs and black-outs, etc.

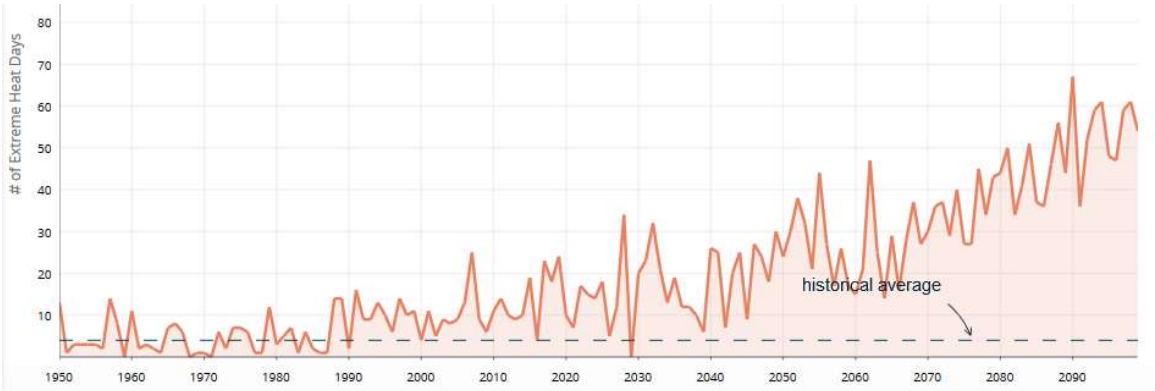


Figure 37: Number of Extreme Heat Days per year

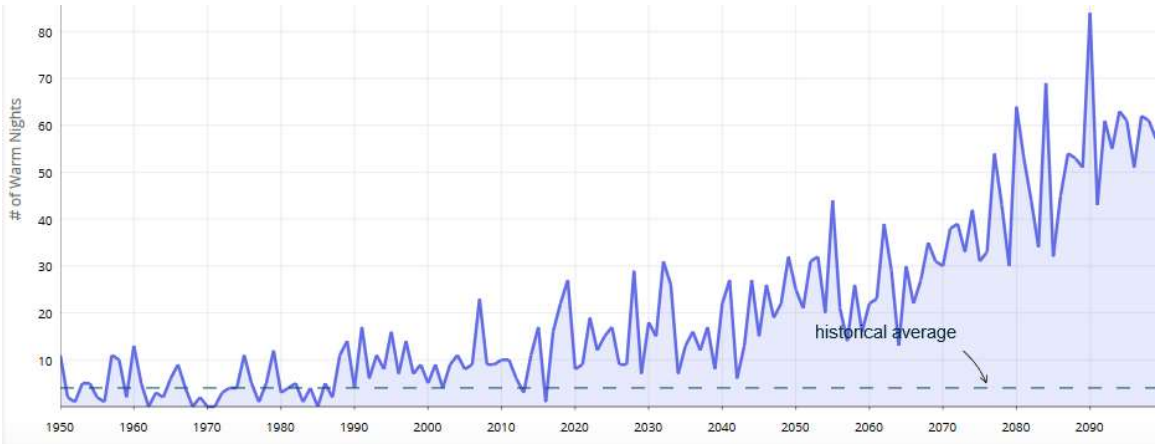


Figure 38: Number of Warm Nights per year

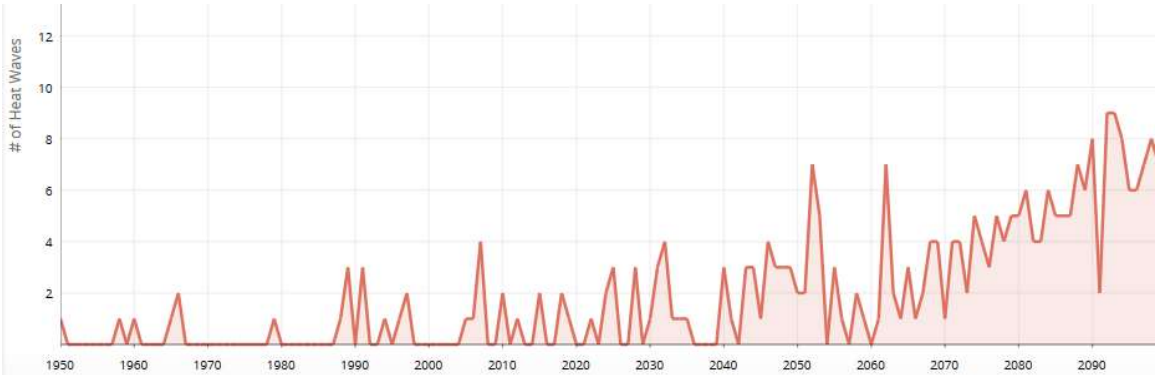


Figure 39: Number of Heat Waves by Year

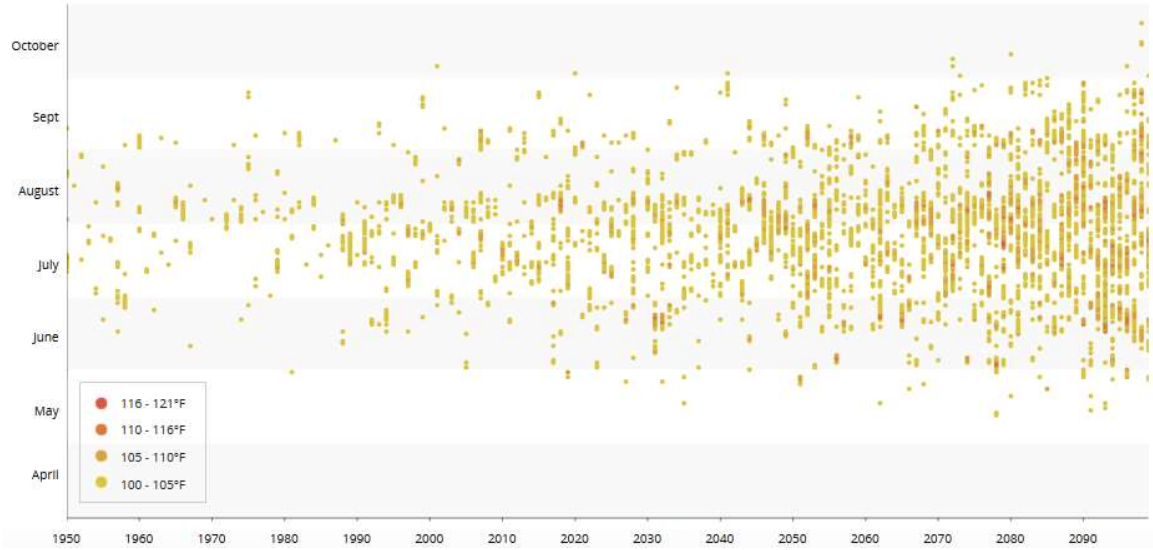


Figure 40Timing of Extreme Heat Days by year

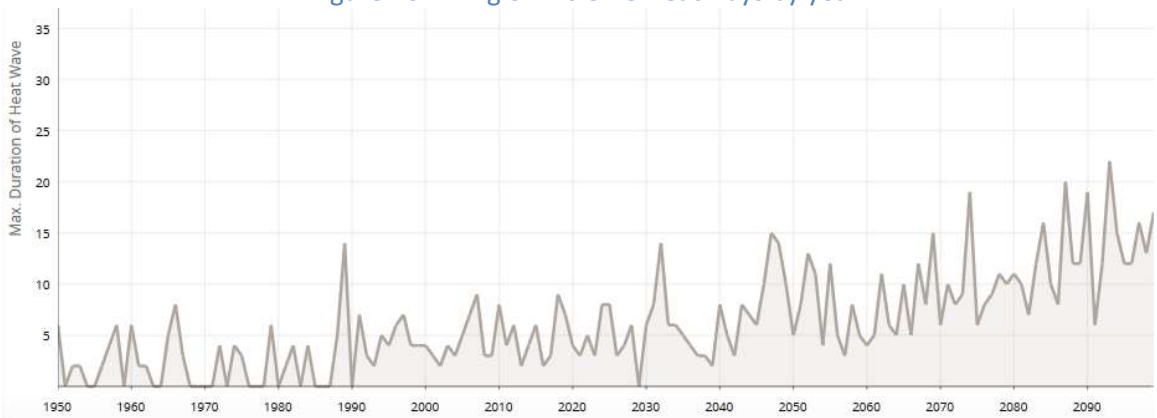


Figure 41: Maximum duration of heat waves by year

4.3.6 Snowpack

The following figure shows projected changes in Sierra snowpack, measured as a decrease in snow water equivalency from the baseline period of 1961-1990. The figure displays data for eastern Placer County in the mountain peaks. Snowpack in the high mountain region of Placer County are projected to decrease by 46-65%. This is an alarming decrease and will undoubtedly impact Placer County water supplies. Conflict with downstream communities who depend on Sierra water will likely increase as well.

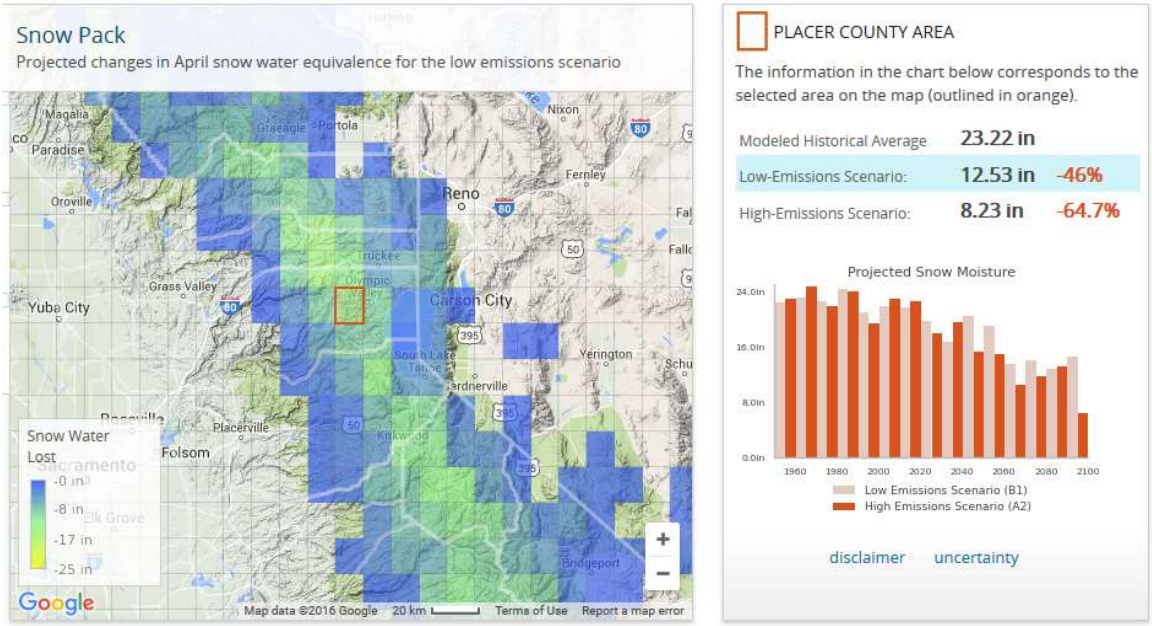


Figure 42: Projected changes in Placer County Sierra snowpack

4.3.7 Precipitation

The following figure shows projected changes in precipitation for Auburn for both the high and low emission scenario. Projections show a modest decrease in precipitation over time.

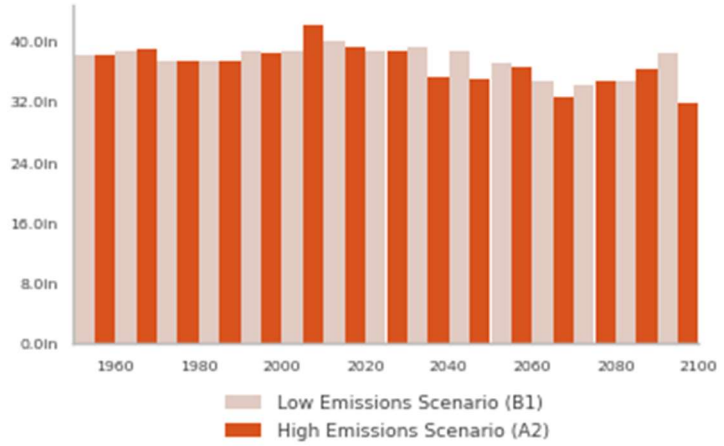


Figure 43: Projected changes in annual precipitation for Auburn

The following figure shows January precipitation projects. The projections show some variability but do not show a significant trend.

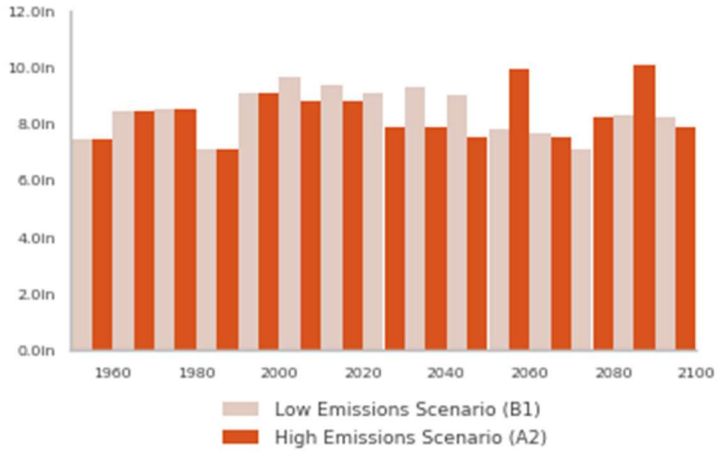


Figure 44: Projected changes in winter (January) precipitation for Auburn

The following figure shows summer (September) precipitation projections. It shows a significant precipitation reduction trend, although there is high variability.

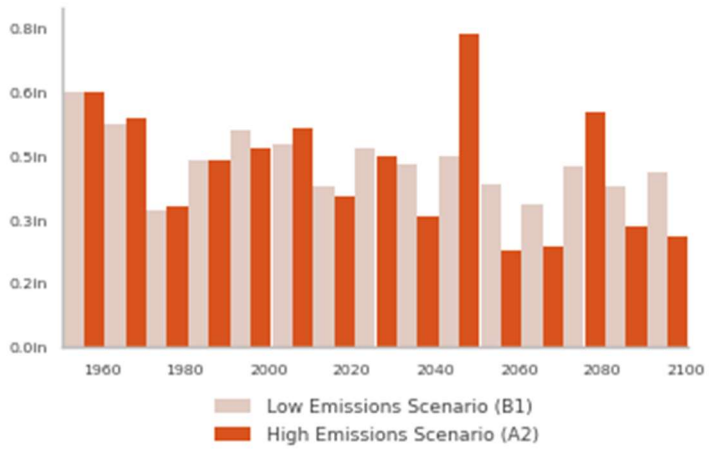


Figure 45: Projected changes in summer (September) precipitation for Auburn

4.3.8 Wildfire

Auburn and surrounding areas are projected to experience increased risk of wildfire. The following figure shows the projected increase in area burned from wildfire for the high emissions scenario for Auburn.

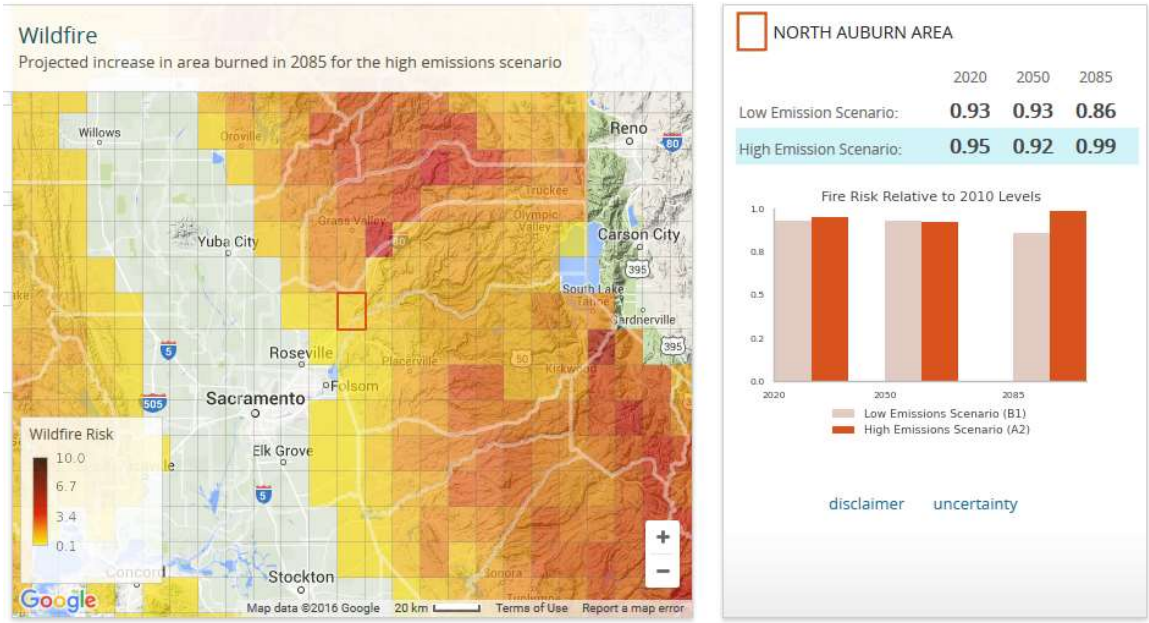


Figure 46: projected increase in area burned, low emission strategy, Auburn

Note that wildfire risk increase is very high on the northern border of Placer County in the Grass Valley vicinity. The following graph shows the increased fire risk in this area. While this may not directly impact the PCGC, it will indirectly impact the PCGC and Placer County through smoke and air pollution, impaired water catchment areas, impaired storm water, etc.

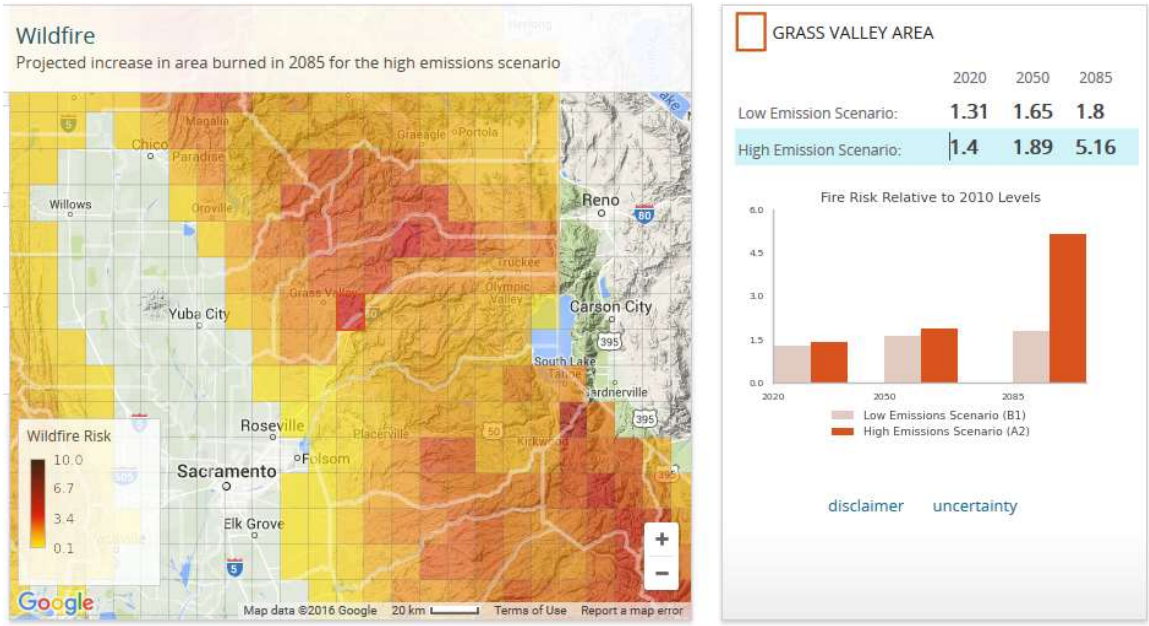


Figure 47: projected increase in area burned, high emission strategy

APPENDIX I: BIOLOGICAL RESOURCES ASSESSMENT

DUDEK

853 LINCOLN WAY, SUITE #208
AUBURN, CALIFORNIA 95603
T 530.887.8500 F 530.885.8372

October 31, 2018 9635

Greg Tonello
Williams + Paddon Architects
2237 Douglas Boulevard, Suite 160
Roseville, California 95661

Subject: Biological Resources Assessment for the Placer County Government Center Master Plan Update in Placer County, California

Dear Mr. Tonello:

This biological resources assessment describes the existing conditions for the Placer County Government Center site in Auburn, California (Figure 1). This report provides a preliminary assessment of the biological resources observed or potentially present on the site, potential constraints associated with development of the site, and related regulatory requirements.

The County is currently undertaking a planning process to update the Master Plan for the County's facilities and land at the Placer County Government Center. It is expected that development under the Master Plan update may involve demolition of existing structures, new construction, expansion of current facilities, and landscaping and hardscape improvements. Proposed development of the site and potential impacts to special-status species and/or biological resources are analyzed in the context of the California Environmental Quality Act (CEQA) to support preparation of an Environmental Impact Report for the Master Plan update. This report describes the project site, results of the biological reconnaissance survey, special-status biological resources present or potentially present on-site, a preliminary assessment of expected regulatory requirements related to biological resource impacts of the potential project, and potential constraints to development that may be posed by biological resources on the site.

1. SITE LOCATION AND DESCRIPTION

The approximately 198-acre project site is located west of the City of Auburn and consists of five parcels: APNs 051-120-061-000, 051-120-010-000, 051-120-064-000, 051-120-065-000, and 051-120-066-000 (Figure 2). The site is located south of Bell Road, west of State Highway 49, north of Atwood Road and east of Deseret Drive (Figure 3). The site occurs in Section 32, Township 13 North, and Range 8 East of the U.S. Geological Survey (USGS) Auburn 7.5' quadrangle. The approximate center of the site corresponds to 38°56'17.92" north latitude and 121°06'33.22" west longitude.

The site is mostly developed, but there are several undeveloped lots that have been managed (mowed or disked) or have been turned into open space (such as parks or fields). Upon review of historical aerial photographs, many of these lots were previously developed with buildings constructed in the early 1940s. Several buildings were demolished between 2005 and 2008 as part of the County's implementation of the 2003 DeWitt Government Center Facility Plan (2003 – 2010), which was the prior Master Plan Update for the site.

Elevation varies from approximately 1,380 feet above mean sea level (MSL) to 1,425 feet above MSL. Vegetation consists mostly of a mixture of non-native annual grasses and weedy dicots, along with deciduous and evergreen tree species, as well as ornamental plantings and landscaping scattered throughout the site (described further in Section 4.1 below). There is a canal that runs north to south along the eastern boundary of the site that delivers water from the Ophir Canal. It runs underground south of the site.

According to the Natural Resources Conservation Service (USDA 2015), three soil types are mapped within the project site and include: Auburn silt loam, 2-15% slopes; xerorthents, cut and fill areas; and Auburn-Rock outcrop complex, 2-30% slopes. Auburn silt loam soils are well-drained residuum weathered from metamorphic rock. Xerorthents consist of mechanically removed and mixed soil material in which horizons are no longer discernable. These soils are typically well-drained. Auburn-Rock outcrop complex soils are found on rocky side slopes of metamorphic rock foothills and are shallow and well drained (Figure 4).

2. PRELIMINARY SITE EVALUATION

2.1 Special-Status Species

Special-status biological resources present or potentially present were identified through a literature search using the following sources: U.S. Fish and Wildlife Service (USFWS) Information, Planning and Conservation (IPaC) Trust Resource Report (USFWS 2016); the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB 2016); and the California Native Plant Society (CNPS) online Inventory of Rare and Endangered Vascular Plants (CNPS 2016). Historical aerial photography was used to determine areas of the site that could potentially contain jurisdictional Waters of the U.S. or Waters of the State.

The CNDDB and CNPS records searches were conducted for the Auburn USGS 7.5-minute quadrangle and the surrounding eight quadrangles. The CNPS records search included only those

plant species with a California Rare Plant Rank (CRPR) of 1 or 2. The IPaC Trust Resources Report was created from the USFWS database and included a 5-mile radius around the site.

Following these records searches, Dudek determined the potential for each species to occur within the site based on a review of vegetation communities and available land cover types observed on aerial imagery, species requirements for particular soils or elevations, as well as the known geographic range of each species. A table summarizing this information and the potential for each special status species to occur onsite is provided in Appendix A. Species were assumed to have no likelihood of occurrence if the site was clearly outside the known geographic range of the species or if there was no suitable habitat for the species on or adjacent to the site.

3. FIELD RECONNAISSANCE AND METHODS

A field assessment was conducted at the site on July 1, 2016 by Dudek biologist Lisa Achter. The field assessment included mapping vegetation communities and land cover types present within the approximately 180-acre site, evaluating potentially jurisdictional wetlands or waters, and further determining the potential for special-status species to occur within the project site.

3.1 Vegetation Community and Land Cover Mapping

The survey was conducted on foot to visually cover the entire site, using an aerial photograph with an overlay of the property boundary.

Vegetation communities and land covers were mapped on that aerial imagery during the site assessment, and observable biological resources including perennial plants and conspicuous wildlife (i.e., birds, mammals) commonly accepted as regionally sensitive by CDFW and USFWS were also recorded on the field map. The vegetation community and land cover mapping conducted follows the classifications described by Sawyer and Keeler-Wolf (2009). Section 4, Results, provides an overview of the resources identified during the field survey.

3.2 Flora

All plant species encountered during the field survey were identified and recorded directly into a field notebook. Common and scientific names for plant species with a California Rare Plant Rank (CRPR, formerly CNPS List) follow the CNPS On-Line Inventory of Rare, Threatened, and Endangered Plants of California (CNPS 2016). A list of plant species observed during the field survey is presented in Appendix B. No special-status plant species were identified on the project site during the field survey.

3.3 Fauna

Wildlife species detected during the field survey by sight, calls, tracks, scat, or other signs were recorded directly into a field notebook. The site was scanned with and without binoculars to aid in the identification of wildlife. In addition to species detected during the surveys, expected wildlife use of the site was determined by known habitat preferences of local species and knowledge of their relative distributions in the area. No special-status wildlife species were observed during the field survey.

3.4 Jurisdictional Wetlands

Dudek conducted an analysis of potentially jurisdictional waters and wetlands, reviewed current and historical aerial photography, and then identified potentially jurisdictional features based on review of aerial photographs and field observations. The analysis considers criteria by the following agencies:

- Waters of the U.S., including wetlands, under the jurisdiction of the U.S. Army Corps of Engineers (ACOE) pursuant to Section 404 of the federal Clean Water Act (CWA).
- Wetlands under the jurisdiction of the Regional Water Quality Control Board (RWQCB) pursuant to Section 401 of the Clean Water Act and the Porter-Cologne Act.
- Wetlands under the jurisdiction of CDFW, pursuant to Section 1602 of the California Fish and Game Code.

Subsequent to the preliminary analysis of potentially jurisdictional waters completed during the reconnaissance survey, a wetland delineation was performed by Dudek botanist Laura Burris and is provided under separate cover.

4. RESULTS

The following sections provide quantification of the biological resources present within the project site, including habitats and species.

4.1 Vegetation Communities and Land Cover Types

Four land cover types exist within the site (Figure 5). The majority of the site is considered developed/disturbed and consists of paved roads, parking areas, and buildings that make up the Placer County Government Center. Patches of native and non-native annual grassland that include

native and non-native weedy species (ruderal vegetation) occur throughout the center and eastern portion of the site.. The remaining acreage consists of blue oak woodland and ornamental landscaping. Several aquatic features also exist within the site boundary. These land cover types are described in more detail below.

Annual Grasslands. Annual grassland is present throughout approximately 17.36 acres of the site. Annual grassland within the site is dominated by a dense to sparse cover of annual, non-native grasses and forbs. Common species include brome (*Bromus* spp.), Italian ryegrass (*Lolium multiflorum*), wild oat (*Avena fatua*), barley (*Hordeum* spp.), filarees (*Erodium* spp.), and others. However, native species are also often present in this grassland, including bulbs, legumes, and some grasses, such as desert fescue (*Festuca microstachys*). Ruderal species are also often present in grasslands, especially along the margins of grasslands and in areas that have been historically disturbed. All of the grass species are dormant during the dry summer months.

Dominant species observed on-site within the grassland community included: wild oat, ripgut brome (*Bromus diandrus*), and soft brome (*Bromus hordeaceus*). Several other native and non-native species were also present, including black mustard (*Brassica nigra*) and yellow star thistle (*Centaurea solstitialis*).

Blue Oak Woodland Alliance. Blue oak (*Quercus douglasii*) woodland alliance includes at least 50% canopy coverage by blue oak, with other hardwoods and conifers intermixed. The tree canopy is intermittent to continuous and the shrub layer is sparse to intermittent. This association is found in valley bottoms, foothills, and rocky outcrops, where the soils are shallow and moderately to excessively drained. It is typically found at elevations ranging from 300 to 6,200 feet.

This association was observed on the southwestern, northeastern and eastern portions of the site, totaling approximately 25.05 acres.

Developed/Disturbed. Developed/disturbed areas are those dominated by manmade structures or areas frequently managed by means of mowing, disking, etc. Within the project site, about 143.38 acres of developed/disturbed areas consist of roadways, government buildings, parking lots, empty lots, and storage areas. Vegetation in these areas is sparse to absent, consisting primarily of cultivated plants in planters.

Riparian/Aquatic. Riparian areas are described as the interface between land and a fresh water feature, such as a steam, river or wetland. They are generally characterized as containing hydrophitic plants such as cottonwood (*Populus* sp.), willow (*Salix* sp.) and sedges (*Carex* sp.). They are ecologically diverse and can contain wet meadows, brushy understory, and a sparse tree

canopy. Because of this, they are often home to a wide range of flora and fauna. Approximately 6.35 acres within the project site are characterized as riparian/aquatic. Aquatic areas include canals and ponds described in Section 4.2.

4.2 Aquatic Habitats and Jurisdictional Wetlands and Waters

A wetland delineation was performed on August 10, 2016 by Dudek botanist Laura Burris, but has not yet been verified. The delineation and report are provided under separate cover. The delineation and report identify the following wetlands and other waters of the U.S. within the study area: three detention basins, the Ophir canal, two ephemeral drainages, two freshwater emergent wetlands, five seasonal wetlands, a vegetated swale and a small pond also exist within the site boundary, and the area surrounding the pond provides a relatively amount of riparian habitat. These features cover 4.54 acres and 2,063.00 linear feet. These are described in more detail below and in the jurisdictional delineation.

Ophir Canal

A single unlined canal runs through the western side of the study area along the perimeter directly adjacent to 1st Street for the majority of the project boundary. The canal flows above ground from Bell Road along 1st Street to Professional Road, where is goes underground until reemerging just south of Willow Creek Drive. The canal is approximately 1,832.33 linear feet within the study area and is approximately 8 feet wide at the OHWM and 16 feet wide at the top of the bank. The canal is classified as riverine by the National Wetland Inventory (NWI) and has an established bed and bank. This canal has connectivity to other waterways above and below the study area, and therefore, is considered a relatively permanent water that drains to other waters of the United States and is potentially jurisdictional.

Ephemeral Drainage 01 (ED-01)

ED-01 is approximately 161.82 linear feet and leaves the study area through a culvert adjacent to SW-01 (Figure 5). It appears that the channel collects water during storm events and transports it off site. The channel is largely unvegetated except at its termination in SW-01, where there is a very sparse herbaceous layer. The channel is bounded by an intermittent riparian zone consisting of Gooding's willow (*Salix gooddingii*), Oregon ash (*Fraxinus latifolia*), and blue oak (*Quercus douglasii*). The channel at OHWM has an approximate width of 2.5 feet. The channel is approximately 7 feet wide at the top of the bank and tapers down to approximately 1 foot wide. Exposed roots, wracking, and undercut banks at the OHWM evidence flow. The substrate of the drainage was rocky and devoid of vegetation. At the time of the field survey, this feature was

completely dry. Due to the likelihood that ED-01 eventually drains to a more permanent waterway downstream, this drainage is considered a non-relatively permanent water that drains to a water of the United States and is potentially jurisdictional.

Ephemeral Drainage 02 (ED-02)

ED-02 is approximately 68.85 linear feet and terminates in SW-01 (Figure 5). Similar to ED-01, it appears that the channel collects water during storm events and transports it off site. The channel is unvegetated except at its termination in SW-01, where there is a very sparse herbaceous layer. The OHWM for the channel was evidenced by an incised channel and is approximately 1 foot wide with a rocky substrate. At the time of the field survey, this feature was completely dry. This ephemeral drainage enters SW-01 and then a culvert, where is goes underground. Due to the likelihood that ED-02 drains to a more permanent waterway downstream, this drainage is considered a non-relatively permanent water that drains to a water of the United States and is potentially jurisdictional.

Wetlands

Five seasonal wetlands (SW-01 through SW-05) were identified within the study area. One is located in the northeastern part of the study area, and the other four are located within a previously developed lot near the center of the study area (Figure 5).

Seasonal Wetland 01 (SW-01)

SW-01 is approximately 0.02 acre and is fed by water runoff from ED-01 and ED-02. This wetland is primarily discernable based on the distinct vegetation differences between the mostly barren upland and the vegetated wetland, surface soil cracks visible within the boundary of the wetland, hydric soil, and clearly evident hydrologic features leading to the wetland. Dominant plant species found within this seasonal wetland include Canada horseweed (*Erigeron canadensis*), barnyardgrass (*Echinochloa crus-galli*), and Jersey cudweed (*Pseudognaphalium luteoalbum*). Two soil pits were dug at this location: one upland and one wetland. The wetland sampling point (SP-01) contained evidence of hydric soils, hydrophytic vegetation, and hydrology (refer to Appendix C). As mentioned previously, this seasonal wetland is found at the termination of both ED-01 and ED-02. This seasonal wetland drains into a culvert where the water then goes underground. Due to the likelihood that this feature drains to a more permanent waterway downstream, this drainage is considered a wetland adjacent to a non-relatively permanent water tributary to a water of the United States and is potentially jurisdictional.

Seasonal Wetlands 02 through 05 (SW-02, SW-03, SW-04, and SW-05)

SW-02 through SW-05 are located within a vacant lot that used to contain buildings and now has constructed depressions where the buildings previously resided. The total combined acreage of these four seasonal wetlands is approximately 0.22 acre. The depressions and terraces within the vacant field are clearly visible; there is a distinct change in vegetation from the seasonal wetlands to the upland habitat surrounding them, and surface soil cracks were present within all four wetlands when surveyed. Due to the similarity of these features, a single wetland sampling point (SP-03) and a single upland sampling point (SP-04) were dug at this location and are representative of all four seasonal wetlands (Appendix C).

These seasonal wetlands were largely unvegetated during the field survey. What vegetation was present consisted of hyssop loosestrife (*Lythrum hyssopifolia*) and pale spikerush (*Eleocharis macrostachya*). The substrate in the seasonal wetlands was extremely rocky soil, likely fill from previous construction activity. The fill appeared to have acted as an impermeable layer, causing the seasonal wetlands to develop similar hydrology to vernal pools. In SW-03, the biologists observed a biotic crust of copepod carapaces, and in SW-04, biologists observed a layer of dried filamentous algae. The presence of aquatic invertebrates and a remnant algal mat indicates that these pools pond for sufficient lengths of time to support aquatic wildlife.

These seasonal wetlands present similarly to vernal pools, which are considered special aquatic sites as described in Section 230.3(q-1) of Section 404 of the CWA; therefore, these seasonal wetlands are potentially jurisdictional.

Vegetated Swale

A single vegetated swale that is 106.59 linear feet was observed in the center of the study area. There was no distinct change in vegetation from surrounding upland to swale, and it did not have a defined bed and bank. Plant species identified include Italian rye grass (*Festuca perennis*), Bermudagrass (*Cynodon dactylon*), seaside barley (*Hordeum marinum*), and smooth cat's ear (*Hypochaeris glabra*). Water potentially pools in the swale during rain events, but not for sufficient periods for hydrophytic vegetation, hydric soils, or hydrology to form. Thus, this feature is likely not jurisdictional.

Detention Basins 01 through 03 (DB-01, DB-02, and DB-03)

Three detention basins are present within the study area (Figure 5). The first is located adjacent to 1st Street on the western side of the study area (DB-01). DB-01 is approximately 0.18 acre and has an outlet in the center. Vegetation within DB-01 was dominated by species similar to those

described for California annual grassland. The grassland species were replaced by broadleaf cattail (*Typha latifolia*), willow (*Salix* sp.), and Fremont cottonwood (*Populus fremontii)* deeper into the basin near the outlet. Standing water was present in a channel at the deepest portion of the basin during the site survey. The deepest portion of the basin appears to hold water longer than the surrounding area and functions as a seasonal wetland.

DB-02 is 0.62 acres and is located below Willow Road in the southeastern portion of the study area. This detention basin has an outlet leading directly to the adjacent canal at the southeastern corner of the basin; an inlet at the northwestern corner of the basin appears to channel rainwater runoff from the surrounding area to the detention basin. A small area at the inlet pipe contains water for longer periods, functioning as a seasonal wetland. This area contained hydrophytic vegetation at the time of the survey, including tall flatsedge and analogue sedge (*Carex simulata*). The basin floor was dominated by Italian rye grass, and species identified by the outlet included Fremont cottonwood, coyotebrush (*Baccharis pilularis*), valley oak, and interior live oak. This location is characterized as a freshwater pond by the NWI and is classified as palustrine, unconsolidated bottom, and permanently flooded under the under the Cowardin code (USFWS 2016b); however, during the field survey, the location was not flooded and functioned as a detention basin and not a freshwater pond.

DB-03 is 0.12 acre and is located directly to the west of DB-02 across 1st Avenue in the southeastern portion of the study area. This detention basin was dominated by California annual grassland, with a single Fremont cottonwood in the center of the basin. There was a central drain in this detention basin that likely drains directly into the adjacent canal. This location is characterized as a freshwater pond by the NWI and is classified as palustrine, unconsolidated bottom, and permanently flooded under the Cowardin code (USFWS 2016b); however, during the field survey, the location was not flooded, did not contain hydrophytic vegetation, and functioned as a seasonally flooded detention basin and not a freshwater pond. This feature is unlikely to be considered jurisdictional.

DB-01 and DB-03 drain into the adjacent canal, which would make any wetlands associated with DB-01 and DB-03 potentially jurisdictional.

Freshwater Pond

A single freshwater pond is located in the southwestern corner of the study area south of B Avenue and is surrounded by undeveloped land on the southern and western sides and ongoing development on the eastern side. The pond is 2.95 acres and is classified under the Cowardin code as palustrine, unconsolidated bottom, and permanently flooded (USFWS 2016b). Water was present in this feature

at the time of the field survey. Species observed included willow, Fremont cottonwood, broadleaf cattail, floating primrose-willow (*Ludwigia peploides*), and common rush (*Juncus effusus*). This pond appears to drain south into additional freshwater wetlands and eventually into riverine habitat; due to this connectivity, this pond is potentially jurisdictional.

Freshwater Emergent Wetland 01 (FEW-01)

FEW-01 is a linear wetland feature located north of the freshwater pond across B Avenue and consists of 147.75 linear feet within the study area. This wetland drains directly into the freshwater pond through a large culvert. Species observed included willow, Fremont cottonwood, broadleaf cattail, floating primrose-willow, and common rush. This wetland is classified in the NWI as freshwater emergent wetland and as palustrine, emergent, and temporarily flooded under the Cowardin code (USFWS 2016b). At the time of the field survey, the soil within the wetland was saturated and there was a minimal amount of standing water. This wetland drains directly into the freshwater pond below and is potentially jurisdictional.

Freshwater Emergent Wetland 02 (FEW-02)

FEW-02 is located in the southwestern portion of the study area directly below the freshwater pond; is 0.43 acre in size; and is classified as palustrine, scrub-shrub, and seasonally flooded under the Cowardin code (USFWS 2016b). The wetland is heavily forested and dominated by broadleaf cattail. The wetland appears to potentially drain south into additional wetlands identified by the NWI (USFWS 2016a). Due to the high likelihood of connectivity, this wetland is potentially jurisdictional. No work is anticipated to take place in the vicinity of this wetland for this project..

4.3 Plants and Wildlife

A total of 23 native and non-native species of vascular plants were recorded during the field survey, none of which are special-status species (Appendix B). Several unknown ornamental species were observed within the landscaping throughout the site.

Thirteen wildlife species were recorded on the site during the survey, none of which are special-status species. These were western scrub jay (*Aphelocoma californica*), turkey vulture (*Catharthes aura*), black phoebe (*Sayornis nigricans*), mourning dove (Zenaida macroura), tree swallow (*Tachycineta bicolor*), cliff swallow (*Petrochelidon pyrrhonota*), European starling (*Sturnus vulgaris*), red-shouldered hawk (*Buteo lineatus*), and northern mockingbird (*Mimus polyglottos*), rock pigeon (*Columba livia*), and sign of black-tailed jackrabbit (*Lepus californicus*), Botta's pocket gopher (*Thomomys bottae*) and mule deer (*Odocoileus hemionus*) was present throughout the site.

4.4 Special-Status Species and Sensitive Resources

Special-Status Wildlife

Results of the CNDDB and USFWS searches revealed seventeen listed or special-status species or species proposed for listing as rare, threatened, or endangered by either the CDFW or the USFWS. Of these, ten were removed from consideration due to lack of suitable habitat within or adjacent to the project site. These were valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), steelhead-Central Valley Distinct Population Segment (DPS, *Oncorhynchus mykiss irideus*), delta smelt (*Hypomesus transpacificus*), bald eagle (*Haliaeetus leucocephalus*), bank swallow (*Riparia riparia*), and fisher (*Pekania pennanti*). No elderberry bushes or streams occur on site; therefore, valley elderberry longhorn beetle, Delta smelt and steelhead would not be expected to occur. Furthermore, the site lacks suitable bodies of water for bald eagle, cliff habitat for bank swallow and conifer forest for fisher.

Three special-status species have moderate potential to occur on the project site: loggerhead shrike (*Lanius ludovicianus*), Townsend's big-eared bat (*Corynorhinus townsendii*), and California black rail (*Laterallus jamaicensis coturniculus*). There is foraging and nesting habitat for loggerhead shrike, and Townsend's big-eared bat could utilize the buildings throughout the site for roosting and the entire site for foraging. California black rail could utilize the pond on the western portion of the site.

Three special-status species have a low potential to occur on the site. These are vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*) and California red-legged frog (*Rana draytonii*). If a wetland delineation determines vernal pools or wetlands exist on the site, they could be utilized by vernal pool tadpole shrimp and vernal pool fairy shrimp, although the management practices and level of disturbance in these areas likely precludes these species from occurring on the site. California red-legged frog (CRLF) surveys were conducted in 2004 and 2005 and none were observed on the project site; however, CRLF could potentially utilize the pond and the canal, but these features are of low quality for this species and it is unlikely California red-legged frog would occur on the site.

All raptor species found in California are protected by the federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code 3503.5 and may use the site for nesting or foraging. Two raptor species were observed flying over the site or perched during the field survey: turkey vulture and red-shouldered hawk. Several suitable nesting trees are present on the site that could be utilized by a variety of raptor species, as well as other native bird species protected by the MBTA. Most bird species likely to nest on the site could also utilize the entire site for foraging.

Special-Status Plants

Results of the CNDDB, IPaC and CNPS searches revealed five special-status plant species that have potential to occur in the vicinity of the project site. All but one of the special-status plant species were removed from consideration because suitable habitat is not present on the site, or because the site is outside of the species' known range. Suitable habitat for Bogg's lake hedge-hyssop occurs around the pond in the western portion of the site, although no known occurrences of this species exist in the Auburn USGS quad, and therefore there is a low potential for this species to be found on the site. No special-status plants were observed during the field survey and no special-status plant species are expected to be present within the project site due to the generally disturbed nature and past management practices on the site.

Sensitive Resources and/or Habitats

The riparian habitat surrounding the pond on the western boundary of the site is considered sensitive by CDFW. According to the California Manual of Vegetation (Sawyer and Keeler-Wolf 2009), *Salix gooddingi - Populus fremontii* alliance has a Global rank of 4 and a State rank of 3 (G4 S3). Alliances ranked S1-S3 are considered special concern by CDFW and impacts to these habitats are considered during CEQA analysis. The site is not located within or adjacent to any preserve or conservation area.

4.5 Wildlife Corridors and Habitat Linkages

Wildlife corridors are linear features that connect large patches of natural open space and provide avenues for animal movement. Habitat linkages are small patches that join larger blocks of habitat and help reduce the adverse effects of habitat fragmentation; they may be continuous habitat or discrete habitat islands that function as stepping stones for wildlife dispersal.

Because the project site is a non-linear feature and bound by existing roads and development, it has little value as a potential wildlife corridor or habitat linkage; however, it could potentially be used by mule deer and small urban-adapted mammals such as raccoon (*Procyon lotor*) and black-tailed jackrabbit for daily, local movement patterns.

5. POTENTIAL CONSTRAINTS TO DEVELOPMENT

This section addresses potential impacts to special-status species or sensitive resources that could result from buildout of the Master Plan update. For purposes of this constraints analysis, it is assumed that the site's biological resource values would be fully removed by future development.

5.1 Vegetation

Impacts from implementation of the Master Plan update would occur to all vegetation communities/land covers types present on the site. Project impacts to blue oak woodland vegetation community may require permits or other approvals through Placer County. Mitigation could require replacement of any protected oak trees lost due to project activities.

5.2 Jurisdictional Waters of the U.S. or State

As described in Section 4.2, drainage from the site appears to collect in several places by way of curb and gutter systems and natural drainages that all empty into storm drains throughout the site. Additionally, several depressions that indicate potential wetland features were observed in the empty vegetated lots throughout the site. A wetland delineation was performed on August 10, 2016 by Dudek botanist Laura Burris, but has not yet been verified. The delineation and report are provided under separate cover.

5.3 Special-Status Plants

No special-status plant species or suitable habitat for these species were observed on the site during the field survey; therefore, future construction should not impact special-status plants or constrain development of the site. As of the writing of this report, no impacts to the pond in the western portion of the site are anticipated; therefore impacts to riparian vegetation and potentially occurring special-status plants would not occur.

5.4 Special-Status Animals

No special-status animals were detected during this survey. However, all native birds in California are protected by the federal MBTA, and Section 3503.5 of the California Fish and Game Code, which specifically protects raptors such as those observed at the site.

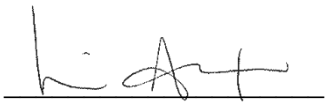
Dudek recommends a nesting bird survey be completed by a qualified biologist two weeks prior to construction during the nesting season (February 1-September 30) to determine if any native birds are nesting on or near the site (including a 300 foot buffer for raptors). If any active nests are observed during surveys, a suitable avoidance buffer will be determined and flagged by the qualified biologist based on species, location and planned construction activity. These nests would be avoided until the chicks have fledged and the nests are no longer active. Dudek also recommends removing any habitat (i.e., trees) outside of the breeding bird season.

All buildings throughout the site could potentially be occupied by Townsend's big-eared bat, which is a candidate threatened species and Species of Special Concern in California. Dudek

recommends that a pre-construction bat survey be performed 30 days prior to construction by a qualified biologist to assess whether roosting bats occur in these areas of the project site. If roosting bats are detected, Dudek recommends consultation with CDFW to identify appropriate measures to be taken to avoid and/or minimize impacts to the species, which can include approval to exclude any bats potentially found on the project site before demolition of or work in the vicinity of any buildings.

If you have any questions regarding this report, please call 530.217.8952 or email lachter@dudek.com.

Sincerely,



Lisa Achter
Wildlife Biologist

Att.: Appendix A, Special-Status Species with Known or Potential Occurrence in the Vicinity of the DeWitt Center Project in Auburn, California
Appendix B, List of Vascular Plant Species Recorded Within the Site

REFERENCES CITED

16 U.S.C. 703–712. Migratory Bird Treaty Act, as amended.

CDFW (California Department of Fish and Game). 2016. "Special Animals (900 taxa)." California Natural Diversity Database. CDFG, Biogeographic Data Branch. Website http://www.dfg.ca.gov/wildlife/nongame/list.html

CDFW (California Department of Fish and Wildlife). 2016. California Natural Diversity Database (CNDDB). Rarefind, Version 5 (Commercial Subscription). Sacramento, California. Website https://map.dfg.ca.gov/rarefind/Login.aspx?ReturnUrl =%2frarefind%2fview%2fRareFind.aspx

California Native Plant Society (CNPS), Rare Plant Program. 2016. Inventory of Rare and Endangered Plants (online edition, v8-02). California Native Plant Society, Sacramento, CA. Website http://www.rareplants.cnps.org/advanced.html (accessed June 2016).

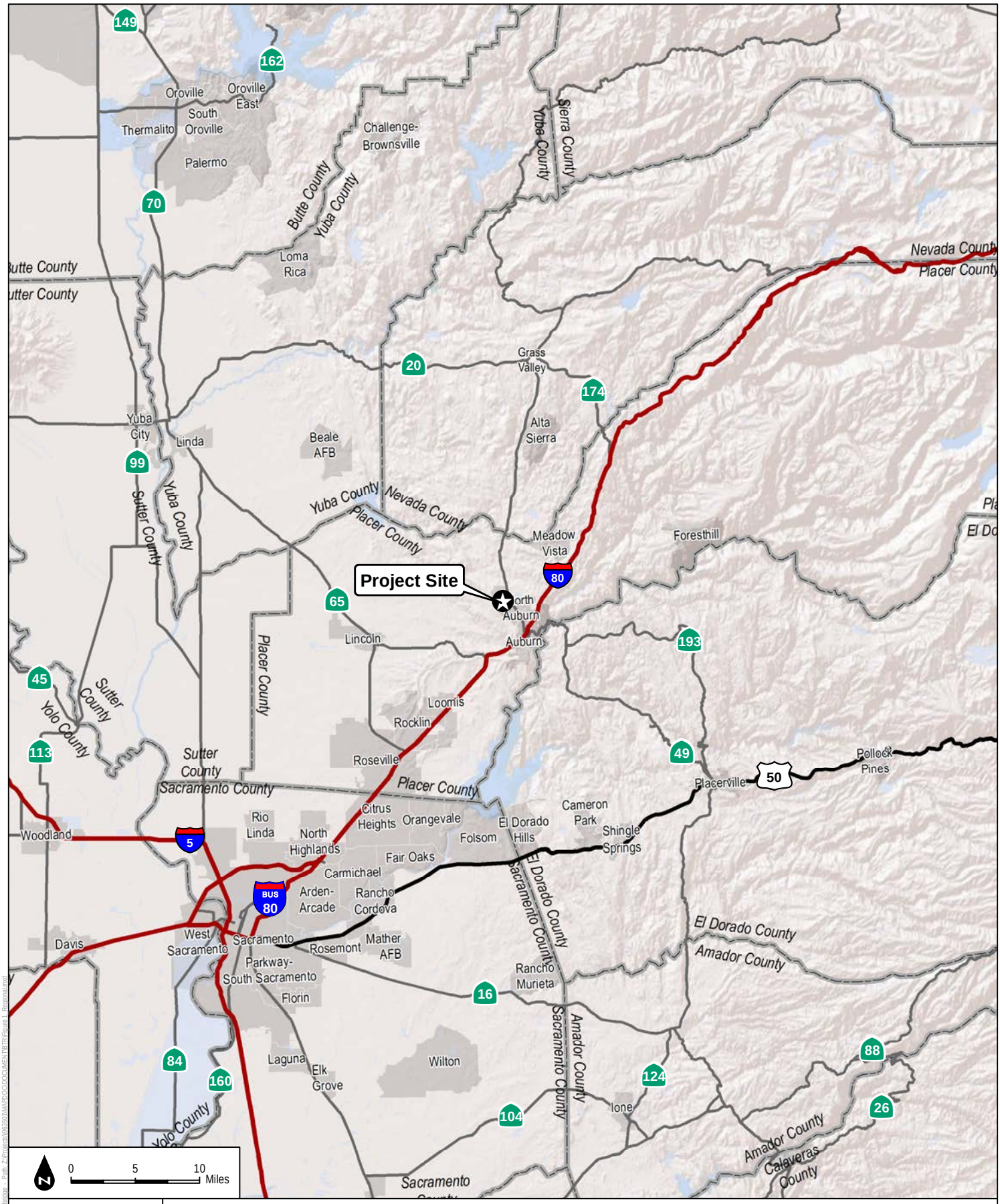
Google Earth V 7.1.5.1557. (May 20, 2015). Auburn, California. 38°54'25.31"N, 121°05'15.75" W, Eye alt 6438 feet. Digital Globe 2016. http://www.earth.google.com [June 1, 2016].

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society, Sacramento. 1300 pp.

U.S. Army Corps of Engineers (ACOE). 1987. *Corps of Engineers Wetlands Delineation Manual.* Wetlands Research Program Technical Report Y-87- 1.

USDA (U.S. Department of Agriculture). 2016. Natural Resources Conservation Service (NRCS). Web Soil Survey. Accessed April 2016. http://websoilsurvey.sc.egov.usda.gov/ App/HomePage.htm

INTENTIONALLY LEFT BLANK



DUDEK

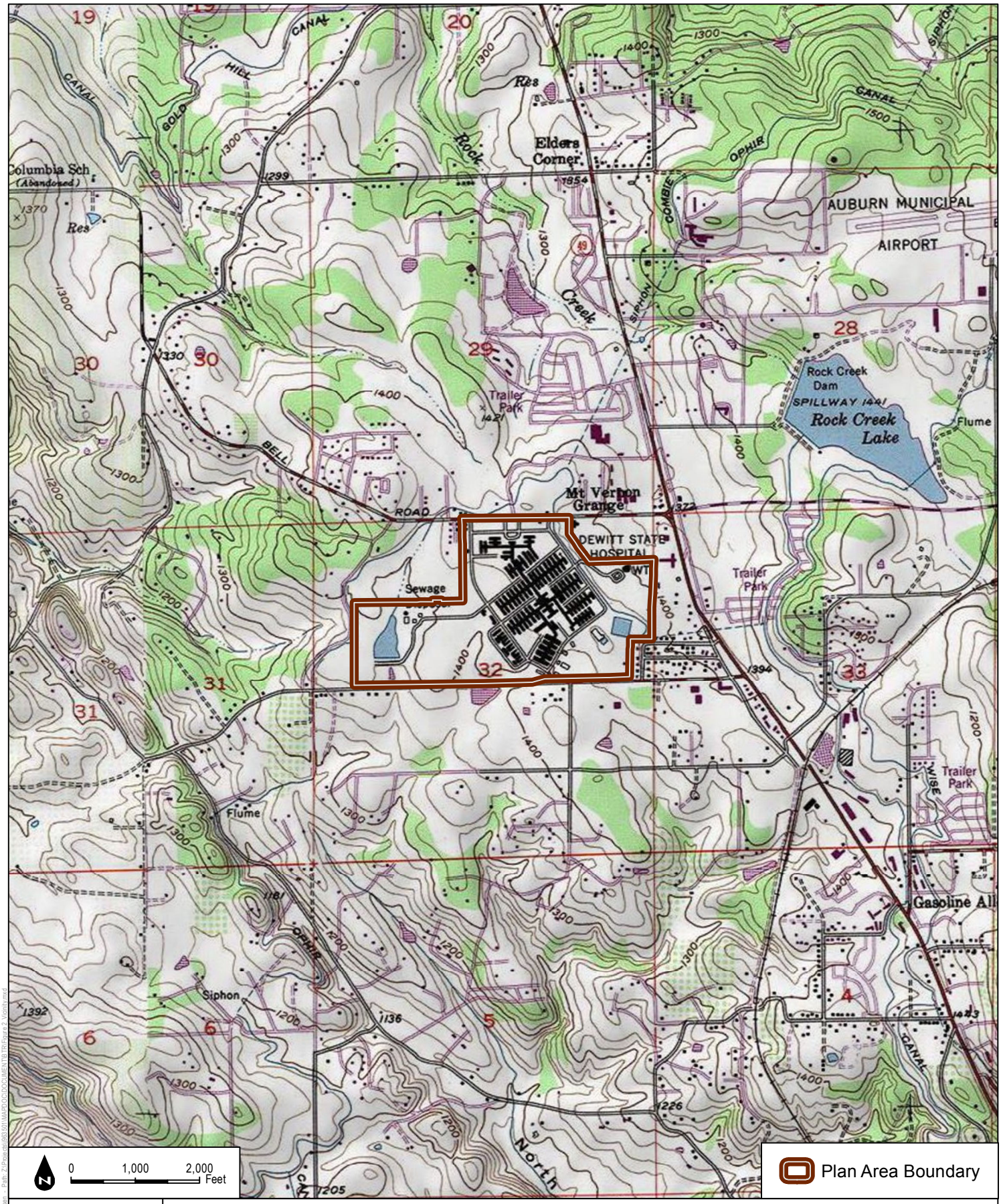
FIGURE 1

Regional Map

Placer County Government Center Master Plan Update

Biological Technical Report

INTENTIONALLY LEFT BLANK



SOURCE: USGS 7.5 Minute Series Auburn Quadrangle

FIGURE 2

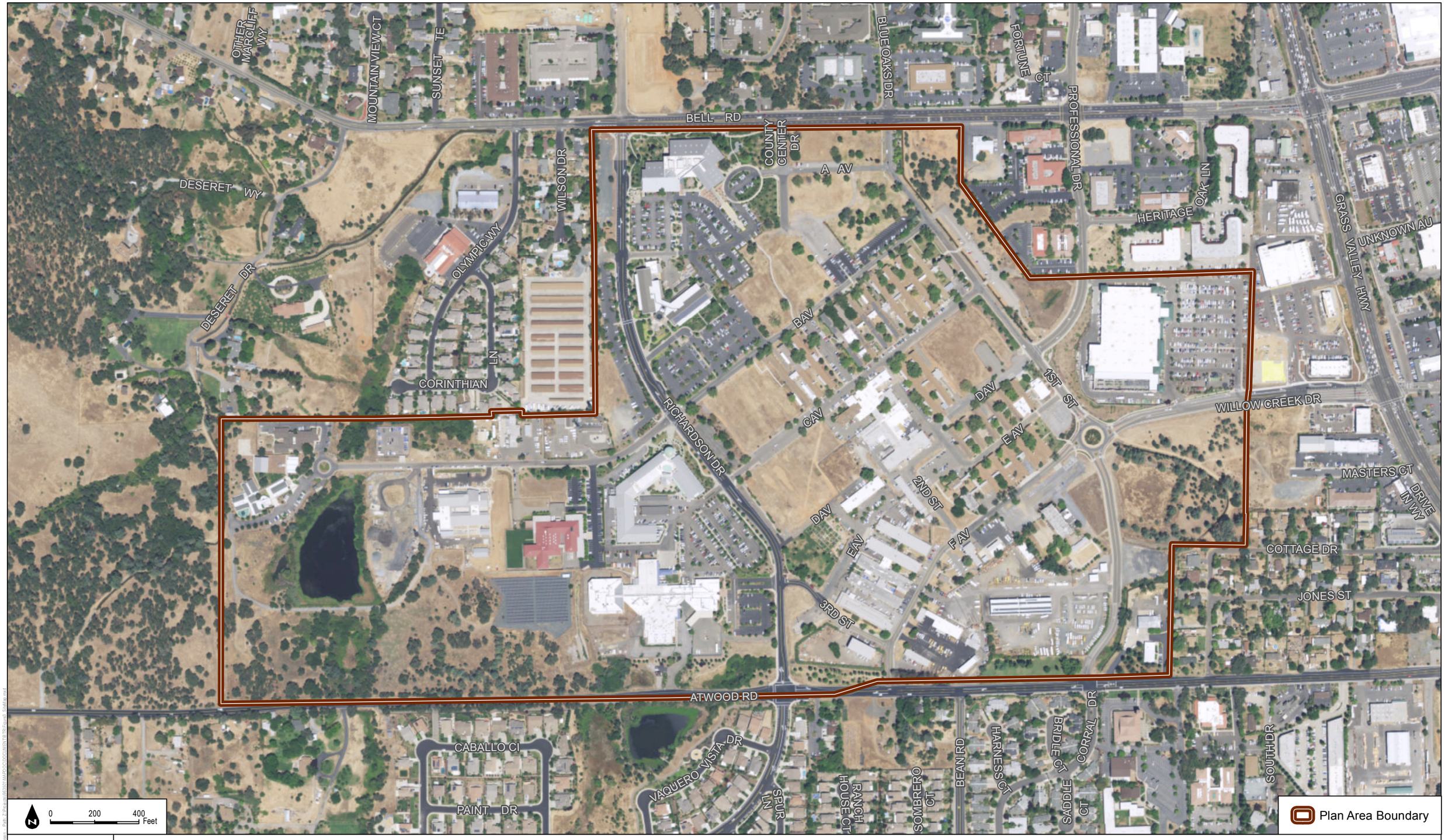
Vicinity Map

DUDEK

Placer County Government Center Master Plan Update

Biological Technical Report

INTENTIONALLY LEFT BLANK



DUDEK

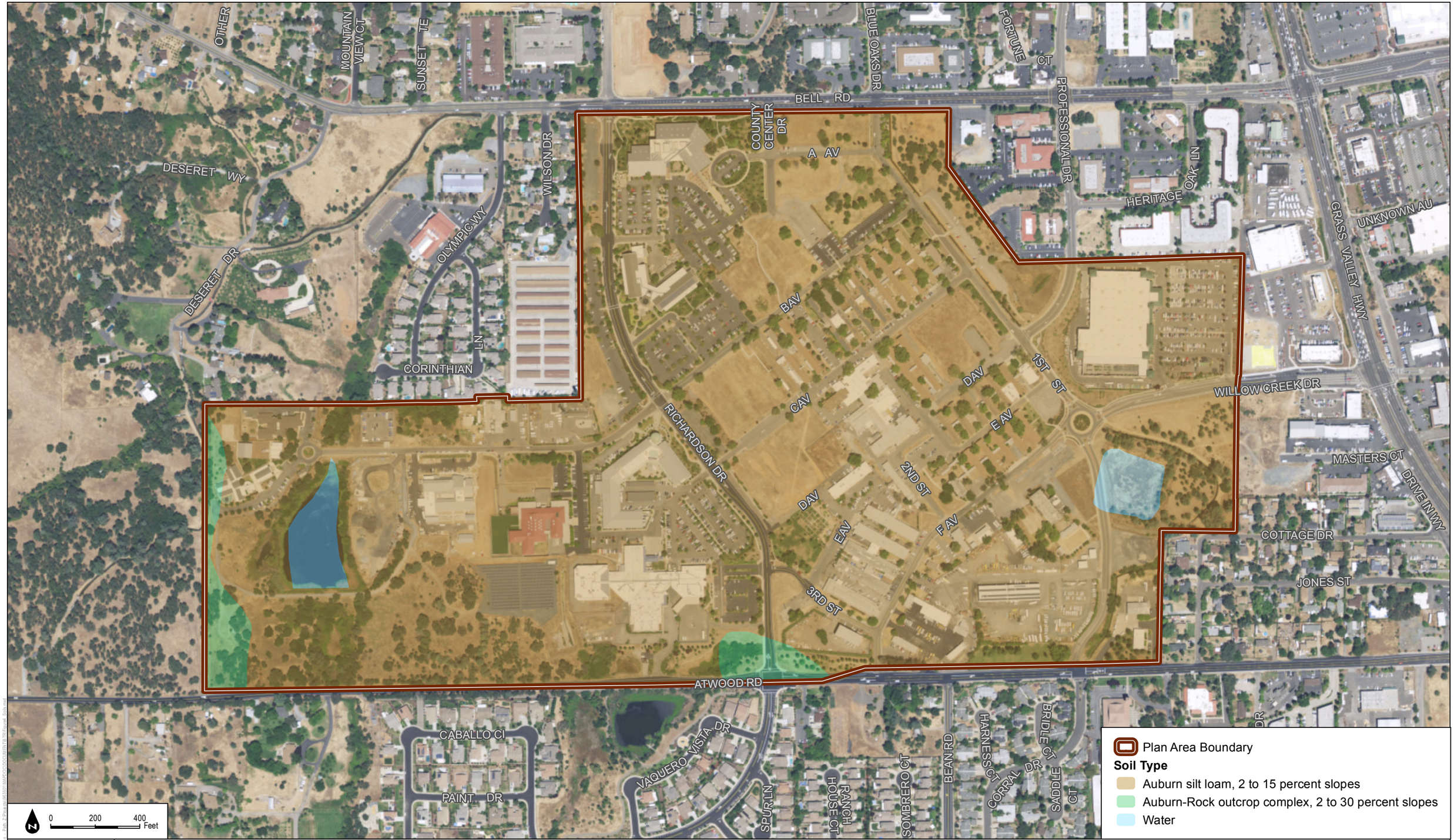
SOURCE: Bing (Accessed 2016), County of Placer 2016

FIGURE 3
Site Map

Placer County Government Center Master Plan Update

Biological Technical Report

INTENTIONALLY LEFT BLANK



DUDEK

SOURCE: Bing (Accessed 2016), County of Placer 2016, USDA

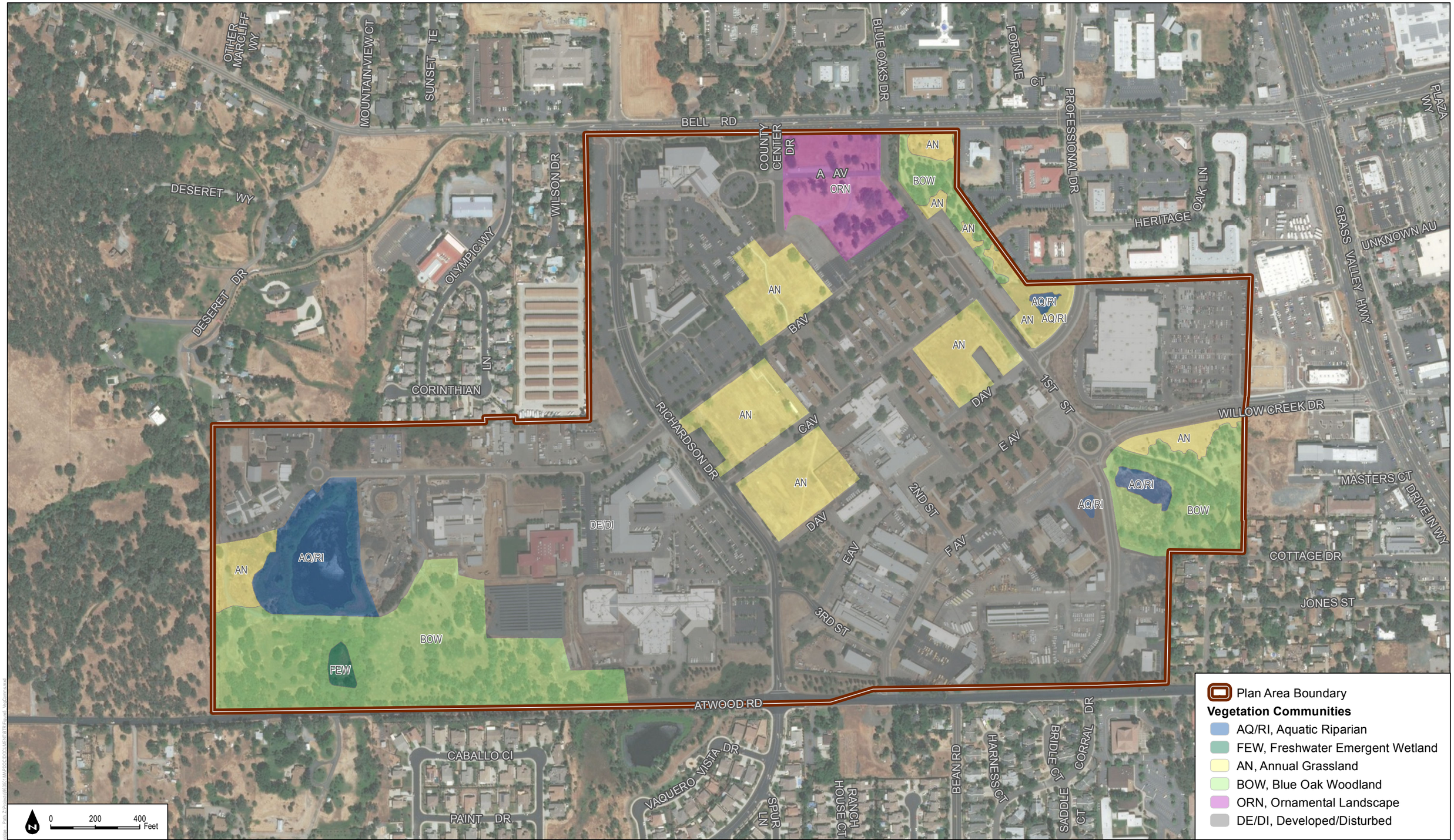
FIGURE 4

Soils

Placer County Government Center Master Plan Update

Biological Technical Report

INTENTIONALLY LEFT BLANK



DUDEK

SOURCE: ESRI Basemaps (Accessed 2016), County of Placer 2016

FIGURE 5

Vegetation Communities

Placer County Government Center Master Plan Update

Biological Technical Report

INTENTIONALLY LEFT BLANK

APPENDIX A

Special-Status Species with Known or Potential Occurrence in the Vicinity of the DeWitt Center Project in Auburn, California

APPENDIX B

List of Vascular Plant Species Recorded Within the Site

APPENDIX J: PRELIMINARY JURISDICTIONAL DELINEATION

PLACER COUNTY GOVERNMENT CENTER MASTER PLAN UPDATE PRELIMINARY JURISDICTIONAL DELINEATION PLACER COUNTY, CALIFORNIA

Prepared for:

Williams + Paddon Architects
Contact: Greg Tonello

Prepared by:

DUDEK
853 Lincoln Way, Suite 208
Auburn, California 95603
Contact: Katherine Waugh
KWaugh@dudek.com
530.863.4642

NOVEMBER 2018

Printed on 30% post-consumer recycled material.

TABLE OF CONTENTS

Section **Page No.**

ACRONYMS AND ABBREVIATIONS III

1 INTRODUCTION 1
1.1 Project Location 1
1.2 Directions to the Study Area 1

2 PROJECT DESCRIPTION 3

3 REGULATORY BACKGROUND 5
3.1 Federal Statutes and Regulations – U.S. Army Corps of Engineers 5
3.2 State of California 9

4 METHODOLOGY 11
4.1 Literature Review 11
4.2 Jurisdictional Delineation 11
4.3 Flora 11
4.4 Field Visit 11

5 PHYSICAL CHARACTERISITICS 13
5.1 Land Uses 13
5.2 Soils and Topography 13
5.3 Watershed and Hydrology 13

6 RESULTS OF SURVEY 15
6.1 Jurisdictional Delineation 15
6.2 Jurisdictional Wetlands and Waters 20

7 CONCLUSIONS 23

8 REFERENCES CITED 25

APPENDICES

A Representative Photographs
B Plant Species Observed
C Data Sheets
D Aquatic Resources Spreadsheet

TABLE OF CONTENTS (CONTINUED)

Page No.

FIGURES

Figure 1 Regional Map 27
Figure 2 Vicinity Map 29
Figure 3 Soils 31
Figure 4 Potentially Jurisdictional Features 33

TABLES

1 Wetlands and Waters within the Study Area 20
2 Jurisdictional Data Station Results 21

ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
ACOE	U.S. Army Corps of Engineers
County	Placer County
CWA	Clean Water Act
DB-	Detention Basin
ED-	Ephemeral Drainage
FEW-	Freshwater Emergent Wetland
NWI	National Wetland Inventory
OHWM	ordinary high water mark
PCGC	Placer County Government Center
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
SP-	Sampling Point
SW-	Seasonal Wetland
TNW	traditional navigable waters

INTENTIONALLY LEFT BLANK

1 INTRODUCTION

This report documents the results of a preliminary jurisdictional delineation conducted for the Placer County Government Center Master Plan Update (project) located at the Placer County Government Center (PCGC), Placer County, California. The results of this delineation are preliminary until verified by the Sacramento District of the U.S. Army Corps of Engineers (ACOE).

1.1 Project Location

The project site (study area) is located west of State Highway 49 between Bell Road and Atwood Road and east of Deseret Drive in Placer County, California. The study area occurs in Section 32, Township 13 North, and Range 8 East of the U.S. Geological Survey Auburn 7.5' quadrangle. The approximate center of the study area corresponds to 38°56′17.92″ north latitude and 121°06′33.22″ west longitude (Figure 1).

The study area consists of approximately 180 acres of mostly developed land with several undeveloped lots that have been managed (mowed or disked) or turned into open space (such as parks or fields). Upon review of historical aerial photographs, many of these lots were previously developed with buildings constructed in the early 1940s. Several buildings were demolished between 2005 and 2008 as part of Placer County's (County's) implementation of the 2003 DeWitt Government Center Facility Plan (2003–2010), which was the prior master plan update for the study area.

1.2 Directions to the Study Area

The study area can be accessed from Bell Road off of State Highway 49. From Sacramento, travel east on Interstate 80 for 37 miles to Auburn, California. Take exit 119B from Interstate 80 onto State Highway 49. Travel 3.6 miles on State Highway 49, then turn left onto Bell Road, and then turn left onto 1st Street, where the entrance to the study area is located.

INTENTIONALLY LEFT BLANK

2 PROJECT DESCRIPTION

The project proposes to update the 1993 Master Plan for the PCGC and to establish a long-term vision and ongoing facilities planning guide, which the County intends to employ for capital improvement projects on the PCGC campus with a 20-year planning horizon. The PCGC Master Plan Update will include a campus vision, development context and guiding principles, site and facilities assessment, facility utilization study, transportation and circulation planning, infrastructure and utilities planning, landscape and open space planning, an economic development study, site and facilities planning, zero net energy and water planning, and a phasing and implementation plan.

INTENTIONALLY LEFT BLANK

3 REGULATORY BACKGROUND

3.1 Federal Statutes and Regulations – U.S. Army Corps of Engineers

Any person or public agency proposing to discharge dredged or fill material into waters of the United States, including jurisdictional wetlands, must obtain a permit from the ACOE.

As defined in Title 33 of the Code of Federal Regulations, Section 328.3, waters of the United States include all waters subject to interstate or foreign commerce, including tidal waters, interstate waters and wetlands, many intrastate waters, impoundments, tributaries, the territorial seas, and adjacent wetlands. Specifically, Section 328.3 of Title 33 of the Code of Federal Regulations defines waters of the United States as follows:

a. For purposes of the Clean Water Act, 33 U.S.C. 1251 et seq. and its implementing regulations, subject to the exclusions in paragraph (b) of this section, the term "waters of the United States" means:

    1) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

    2) All interstate waters, including interstate wetlands;

    3) The territorial seas;

    4) All impoundments of waters otherwise identified as waters of the United States under this section;

    5) All tributaries, as defined in paragraph (c)(3) of this section, of waters identified in paragraphs (a)(1) through (3) of this section;

    6) All waters adjacent to a water identified in paragraphs (a)(1) through (5) of this section, including wetlands, ponds, lakes, oxbows, impoundments, and similar waters.

b. The following are not "waters of the United States" even where they otherwise meet the terms of paragraphs (a)(4) through (8) of this section.

    1) Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act.

    2) Prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

For non-tidal waters of the United States, the lateral limits of ACOE jurisdiction extend to the ordinary high water mark (OHWM) when no adjacent wetlands are present. Defined in the Code of Federal Regulations, Title 33, Section 328.3(e), the OHWM is "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." If adjacent wetlands are present, the jurisdiction extends to the limit of wetlands.

Wetlands are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3). Wetlands are jurisdictional if they meet this definition and the definition of waters of the United States. ACOE predominantly uses the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (ACOE 2008a) methodology to determine the presence of wetlands. According to the manual (ACOE 2008a), three criteria must be satisfied to classify an area as a wetland: (1) a predominance of plant life that is adapted to life in wet conditions (hydrophytic vegetation); (2) soils that saturate, flood, or pond long enough during the growing season to develop anaerobic conditions in the upper part (hydric soils); and (3) permanent or periodic inundation or soils saturation, at least seasonally (wetland hydrology). Further guidance for determining jurisdictional limits in ephemeral riverine systems in the Arid West is detailed in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (ACOE 2008b).

In the last two decades, two major court cases have affected the jurisdictional reach of Section 404 of the Clean Water Act (CWA): (1) *Solid Waste Agency of Northern Cook County v. United States Corps of Engineers*, and (2) *Rapanos v. United States* and *Carabell v. United States Army Corps of Engineers.*

Solid Waste Agency of Northern Cook County v. United States Corps of Engineers

In 1986, in an attempt to clarify the reach of its jurisdiction, ACOE stated that Section 404(a) of the CWA extends to intrastate waters (51 FR 41217):

a. which are or would be used as habitat by birds protected by Migratory Bird Treaties; or

b. which are or would be used as habitat by other migratory birds which cross state lines; or

c. which are or would be used as habitat for endangered species; or

d. used to irrigate crops sold in interstate commerce.

In 2001, the U.S. Supreme Court, in its judgment on the *Solid Waste Agency of Northern Cook County* case, held that Code of Federal Regulations, Title 33, Section 328.3(a)(3), as clarified and applied to the *Solid Waste Agency of Northern Cook County* site pursuant to the Migratory Bird Rule (51 FR 41217), exceeded the authority granted to ACOE under Section 404(a) of the CWA. Therefore, ACOE may not rely on the Migratory Bird Rule to establish a "significant nexus" to interstate or foreign commerce. In additional language, the U.S. Supreme Court majority opinion reasoned that these types of waters required some nexus to navigable waters. Although no formal guidance was issued by ACOE interpreting the extent to which the *Solid Waste Agency of Northern Cook County* decision would limit jurisdictional determinations, in practice, ACOE considers intrastate waters as waters of the United States where there is an appropriate connection to navigable water or other clear interstate commerce connection (*Solid Waste Agency of Northern Cook County v. United States Corps of Engineers* 2001).

Rapanos v. United States and Carabell v. United States Army Corps of Engineers

In 2006, the U.S. Supreme Court again issued an opinion on to what extent ACOE had jurisdiction over certain waters under Section 404 of the CWA. The *Rapanos-Carabell* consolidated decisions addressed the question of jurisdiction over attenuated tributaries to waters of the United States, as well as wetlands adjacent to those tributaries (*Rapanos v. United States* 2006).

ACOE and the U.S. Environmental Protection Agency issued guidance related to the *Rapanos* decision on June 5, 2007. The guidance identifies the waters the agencies (i.e., ACOE and the U.S. Environmental Protection Agency) will assert jurisdiction over categorically and on a case-by-case basis, based on the reasoning of the *Rapanos* opinions. In summary, ACOE will continue to assert jurisdiction over the following:

- Traditional navigable waters (TNWs) and their adjacent wetlands.
- Non-navigable tributaries of TNWs that are relatively permanent (e.g., tributaries that typically flow year-round or have a continuous flow at least seasonally) and wetlands that directly abut such tributaries (e.g., not separated by uplands, berm, dike, or similar feature).

  Note: Relatively permanent waters do not include ephemeral tributaries, which flow only in response to precipitation, and intermittent streams, which do not typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months).
- Non-relatively permanent waters, if determined (on a fact-specific analysis) to have a significant nexus with a TNW, including non-navigable tributaries that do not typically flow year-round or have continuous flow at least seasonally, wetlands adjacent to such tributaries, and wetlands adjacent to but that do not directly abut a relatively permanent, are non-navigable tributary. Absent a significant nexus, jurisdiction is lacking.

A significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or an insubstantial effect on the chemical, physical, and/or biological integrity of a TNW. Principal considerations when evaluating significant nexus include volume, duration, and frequency of the flow of water in the tributary and the proximity of the tributary to a TNW, including hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands. Certain ephemeral waters in the Arid West are distinguishable from the geographic features described previously, where such ephemeral waters are tributaries and have a significant nexus to downstream TNWs. For example, these ephemeral tributaries may serve as a transitional area between the upland environment and the TNW. These ephemeral tributaries may provide habitat for wildlife and aquatic organisms in downstream TNWs and support nutrient cycling, sediment retention and transport, pollutant trapping and filtration, and improvement of water quality.

Swales or erosional features (e.g., gullies and small washes characterized by low-volume, infrequent, or short-duration flow) are generally not considered waters of the United States because they are not tributaries or they do not have a significant nexus to downstream TNWs. In addition, ditches (including roadside ditches) excavated wholly in and draining only uplands, and that do not carry a relatively permanent flow of water, are generally not considered waters of the United States because they are not tributaries or they do not have a significant nexus to downstream TNWs. Even when not jurisdictional under Section 404 of the CWA, these features may still be jurisdictional at state or local levels, such as under Section 401 of the CWA, the Porter-Cologne Water Quality Control Act (Porter-Cologne Act), and/or Section 1602 of the California Fish and Game Code.

Prior to the *Rapanos* guidance, ACOE required its regional districts to request concurrence for only those jurisdictional determinations where the district was planning to assert jurisdiction over a non-navigable, intrastate isolated water and/or wetland. The agencies now require that all determinations for non-navigable, isolated waters be evaluated for ACOE and U.S. Environmental Protection Agency headquarters review prior to the district making a final decision on the jurisdictional determination.

U.S. Army Corps of Engineers–Regulated Activities

ACOE regulates activities under Section 404 of the CWA that involve a discharge of dredged or fill material, including but not limited to grading, placing riprap for erosion control, pouring concrete, laying sod, and stockpiling excavated material into waters of the United States. Activities that generally do not involve a regulated discharge (if performed specifically in a manner to avoid discharges) include driving pilings, providing some drainage channel maintenance activities, and excavating without stockpiling.

3.2 State of California

California Department of Fish and Wildlife

Pursuant to Section 1602 of the California Fish and Game Code, the CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake that supports fish or wildlife.

In Title 14 of the California Code of Regulations, Section 1.72, the California Department of Fish and Wildlife defines a "stream" (including creeks and rivers) as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation."

In Title 14 of the California Code of Regulations, Section 1.56, the California Department of Fish and Wildlife's definition of "lake" includes "natural lakes or man-made reservoirs." Diversion, obstruction, or change to the natural flow or bed, channel, or bank of any river, stream, or lake that supports fish or wildlife requires authorization from CDFW by means of entering into an agreement pursuant to Section 1602 of the Fish and Game Code.

California Regional Water Quality Control Board

Pursuant to Section 401 of the federal CWA, the Regional Water Quality Control Board regulates discharging waste, or proposing to discharge waste, within any region that could affect a "water of the state" (California Water Code, Section 13260(a)), pursuant to provisions of the Porter-Cologne Act. Waters of the state are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state" (California Water Code, Section 13050(e)). Before ACOE will issue a CWA Section 404 permit, applicants must receive a CWA Section 401 Water Quality Certification from the Regional Water Quality Control Board. If a CWA Section 404 permit is not required for the project, the Regional Water Quality Control Board may still require a permit (i.e., Waste Discharge Requirement) for impacts to waters of the state under the Porter-Cologne Act.

INTENTIONALLY LEFT BLANK

4 METHODOLOGY

4.1 Literature Review

Prior to conducting fieldwork, the following available resources were reviewed to assess the potential for jurisdictional features:

- 1:200-scale aerial photograph (Bing Maps 2016; Google Earth 2016)
- U.S. Geological Survey 7.5-minute topographic quadrangle (USGS 2016)
- U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey (USDA 2016a)
- National Wetland Inventory (USFWS 2016a)

4.2 Jurisdictional Delineation

Potential wetland waters of the United States were delineated based on methodology described in the 1987 *Corps of Engineers Wetlands Delineation Manual* (ACOE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (ACOE 2008a). Non-wetland waters of the United States are delineated based on the presence of an ordinary high water mark (OHWM), as determined using the methodology in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (ACOE 2008b). Dudek biologists collected photographic records that represent the on-site habitats and wetlands (Appendix A).

4.3 Flora

All plant species encountered during the field surveys were identified and recorded. Those species that could not be immediately identified were brought into the laboratory for further investigation. Latin names follow the *Jepson Interchange List of Currently Accepted Names of Native and Naturalized Plants of California* (Jepson Flora Project 2016), and common names follow the U.S. Department of Agriculture Natural Resources Conservation Service Plants Database (USDA 2016b). Appendix B contains a complete list of plant species observed during the field surveys.

4.4 Field Survey

The study area was surveyed on August 10, 2016, by Dudek Biologists Laura Burris and Tera Stoddard to document current site conditions and assess potential wetlands and other waters of the United States. Sample points were taken when necessary to assess the potential for hydric soils, hydrophytic vegetation, and hydrology. The results are presented in Section 6, Results of Survey.

INTENTIONALLY LEFT BLANK

5 PHYSICAL CHARACTERISITICS

5.1 Land Uses

The study area is bounded on the east by residential and commercial developments and State Highway 49. It is bounded on the north by Bell Road and developed and undeveloped land. To the southwest, the study area abuts undeveloped open space, and to the south, it is bounded by Atwood Road (Figure 2). The study area includes the perimeter of the PCGC, which is managed by the County and encompasses a wide variety of County facilities.

5.2 Soils and Topography

According to the U.S. Department of Agriculture Natural Resources Conservation Service (2016a), three soil types are mapped within the study area and include Auburn silt loam, 2% to 15% slopes; xerorthents, cut and fill areas; and Auburn-Rock outcrop complex, 2% to 30% slopes (Figure 3). The majority of the study area consists of Auburn silt loam, and these soils are well-drained residuum weathered from metamorphic rock. Xerorthents consist of mechanically removed and mixed soil material in which horizons are no longer discernable. These soils are typically well drained. Auburn-Rock outcrop complex soils are found on rocky side slopes of metamorphic rock foothills and are shallow and well drained; the U.S. Department of Agriculture Natural Resources Conservation Service considers this soil type hydric (USDA 2016a).

The study area slopes slightly to the southwest, with a change in topography from approximately 1,380 feet above mean sea level to 1,425 feet above mean sea level. The lowest point in elevation occurs at the lake in the southwestern corner of the study area, and the highest point is in the center of the study area near the swale. There is a slight downward slope from the swale to the east.

5.3 Watershed and Hydrology

The study area is part of the Upper Coon-Upper Auburn watershed Hydrologic Unit Code 18020127 and the sub-watershed Dutch-Ravine-Auburn-Ravine Hydrologic Unit Code 180201610102. Hydrology on site has been altered over the years to channel rainwater and surface runoff through a series of storm drains. Water appears to travel from these storm drains to various detention basins located throughout the study area. Additionally, there is a constructed canal along the eastern edge of the study area that conveys water from south to north. Further discussion of these features is presented in Section 6.

INTENTIONALLY LEFT BLANK

6 RESULTS OF SURVEY

6.1 Jurisdictional Delineation

The dominant vegetation community within the study area consists of California annual grassland, most of which is disturbed. The remaining on-site acreage consists primarily of mixed oak woodland and developed/disturbed habitat. Wetland features within the study area include one canal, two ephemeral drainages, several seasonal wetlands, three detention basins, one freshwater pond, and two freshwater emergent wetlands (Figure 4). The areas surrounding several of these features provide a limited amount of riparian habitat. These land cover types and wetland types are described in more detail in the following discussion.

Upland Habitats

California Annual Grassland

California annual grassland is present throughout approximately 13.76 acres of the study area. Dominant species observed on-site within the grassland community included wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), and soft brome (*Bromus hordeaceus*). Several other native and non-native species were also present, including black mustard (*Brassica nigra*) and yellow star-thistle (*Centaurea solstitialis*).

Mixed Oak Woodland

Mixed oak woodland is present within the study area in the vicinity of Ephemeral Drainage 01 (ED-01), Ephemeral Drainage 02 (ED-02), Seasonal Wetland 01 (SW-01), and Freshwater Emergent Wetland 02 (FEW-02) (Figure 4). This included a variety of oak species and a sparse understory of vegetation. Species observed include valley oak (*Quercus lobata*), interior live oak (*Quercus wislizeni*), and blue oak (*Quercus douglasii*).

Other Waters of the United States

Ophir Canal

A single unlined canal runs through the western side of the study area along the perimeter directly adjacent to 1st Street for the majority of the project boundary. The canal flows above ground from Bell Road along 1st Street to Professional Road, where is goes underground until reemerging just south of Willow Creek Drive. The canal is approximately 1,832.33 linear feet within the study area and is approximately 8 feet wide at the OHWM and 16 feet wide at the top of the bank. The canal is classified as riverine by the National Wetland Inventory (NWI) and has an established bed and

bank. This canal has connectivity to other waterways above and below the study area; however, it is not is not considered potentially jurisdictional because it is an irrigation and water service facility constructed in uplands and maintained regularly by the Nevada Irrigation District. The Nevada Irrigation District monitors and maintains vegetation growth and debris, regulates water flow through the canal, and has the ability to limit or stop flow (C. Close, personal communication, November 6, 2018). Thus, under 40 CFR 230.3 (o)(2)(iii), this canal is likely not jurisdictional.

Ephemeral Drainage 01 (ED-01)

ED-01 is approximately 161.82 linear feet and leaves the study area through a culvert adjacent to SW-01 (Figure 4). It appears that the channel collects water during storm events and transports it off site. The channel is largely unvegetated except at its termination in SW-01, where there is a very sparse herbaceous layer. The channel is bounded by an intermittent riparian zone consisting of Gooding's willow (*Salix gooddingii*), Oregon ash (*Fraxinus latifolia*), and blue oak (*Quercus douglasii*). The channel at OHWM has an approximate width of 2.5 feet. The channel is approximately 7 feet wide at the top of the bank and tapers down to approximately 1 foot wide. Exposed roots, wracking, and undercut banks at the OHWM evidence flow. The substrate of the drainage was rocky and devoid of vegetation. At the time of the field survey, this feature was completely dry. Due to the likelihood that ED-01 eventually drains to a more permanent waterway downstream, this drainage is considered a non-relatively permanent water that drains to a water of the United States and is potentially jurisdictional.

Ephemeral Drainage 02 (ED-02)

ED-02 is approximately 68.85 linear feet and terminates in SW-01 (Figure 4). Similar to ED-01, it appears that the channel collects water during storm events and transports it off site. The channel is unvegetated except at its termination in SW-01, where there is a very sparse herbaceous layer. The OHWM for the channel was evidenced by an incised channel and is approximately 1 foot wide with a rocky substrate. At the time of the field survey, this feature was completely dry. This ephemeral drainage enters SW-01 and then a culvert, where is goes underground. Due to the likelihood that ED-02 drains to a more permanent waterway downstream, this drainage is considered a non-relatively permanent water that drains to a water of the United States and is potentially jurisdictional.

Wetlands

Five seasonal wetlands (SW-01 through SW-05) were identified within the study area. One is located in the northeastern part of the study area, and the other four are located within a previously developed lot near the center of the study area (Figure 4).

Seasonal Wetland 01 (SW-01)

SW-01 is approximately 0.02 acre and is fed by water runoff from ED-01 and ED-02. This wetland is primarily discernable based on the distinct vegetation differences between the mostly barren upland and the vegetated wetland, surface soil cracks visible within the boundary of the wetland, hydric soil, and clearly evident hydrologic features leading to the wetland. Dominant plant species found within this seasonal wetland include Canada horseweed (*Erigeron canadensis*), barnyardgrass (*Echinochloa crus-galli*), and Jersey cudweed (*Pseudognaphalium luteoalbum*). Two soil pits were dug at this location: one upland and one wetland. The wetland sampling point (SP-01) contained evidence of hydric soils, hydrophytic vegetation, and hydrology (refer to Appendix C). As mentioned previously, this seasonal wetland is found at the termination of both ED-01 and ED-02. This seasonal wetland drains into a culvert where the water then goes underground. Due to the likelihood that this feature drains to a more permanent waterway downstream, this drainage is considered a wetland adjacent to a non-relatively permanent water tributary to a water of the United States and is potentially jurisdictional.

Seasonal Wetlands 02 through 05 (SW-02, SW-03, SW-04, and SW-05)

SW-02 through SW-05 are located within a vacant lot that used to contain buildings and now has constructed depressions where the buildings previously resided. The total combined acreage of these four seasonal wetlands is approximately 0.22 acre. The depressions and terraces within the vacant field are clearly visible; there is a distinct change in vegetation from the seasonal wetlands to the upland habitat surrounding them, and surface soil cracks were present within all four wetlands when surveyed. Due to the similarity of these features, a single wetland sampling point (SP-03) and a single upland sampling point (SP-04) were dug at this location and are representative of all four seasonal wetlands (Appendix C).

These seasonal wetlands were largely unvegetated during the field survey. What vegetation was present consisted of hyssop loosestrife (*Lythrum hyssopifolia*) and pale spikerush (*Eleocharis macrostachya*). The substrate in the seasonal wetlands was extremely rocky soil, likely fill from previous construction activity. The fill appeared to have acted as an impermeable layer, causing the seasonal wetlands to develop similar hydrology to vernal pools. In SW-03, the biologists observed a biotic crust of copepod carapaces, and in SW-04, biologists observed a layer of dried filamentous algae. The presence of aquatic invertebrates and a remnant algal mat indicates that these pools pond for sufficient lengths of time to support aquatic wildlife.

These seasonal wetlands present similarly to vernal pools, which are considered special aquatic sites as described in Section 230.3(q-1) of Section 404 of the CWA; therefore, these seasonal wetlands are potentially jurisdictional.

Vegetated Swale

A single vegetated swale that is 106.59 linear feet was observed in the center of the study area. There was no distinct change in vegetation from surrounding upland to swale, and it did not have a defined bed and bank. Plant species identified include Italian rye grass (*Festuca perennis*), Bermudagrass (*Cynodon dactylon*), seaside barley (*Hordeum marinum*), and smooth cat's ear (*Hypochaeris glabra*). Water potentially pools in the swale during rain events, but not for sufficient periods for hydrophytic vegetation, hydric soils, or hydrology to form. Thus, this feature is likely not jurisdictional.

Detention Basins 01 through 03 (DB-01, DB-02, and DB-03)

Three detention basins are present within the study area (Figure 4). The first is located adjacent to 1st Street on the western side of the study area (DB-01). DB-01 is approximately 0.18 acre and has an outlet in the center. Vegetation within DB-01 was dominated by species similar to those described for California annual grassland. The grassland species were replaced by broadleaf cattail (*Typha latifolia*), willow (*Salix* sp.), and Fremont cottonwood (*Populus fremontii)* deeper into the basin near the outlet. Standing water was present in a channel at the deepest portion of the basin during the site survey. The deepest portion of the basin appears to hold water longer than the surrounding area and functions as a seasonal wetland.

DB-02 is 0.62 acres and is located below Willow Road in the southeastern portion of the study area. This detention basin has an outlet leading directly to the adjacent canal at the southeastern corner of the basin; an inlet at the northwestern corner of the basin appears to channel rainwater runoff from the surrounding area to the detention basin. A small area at the inlet pipe contains water for longer periods, functioning as a seasonal wetland. This area contained hydrophytic vegetation at the time of the survey, including tall flatsedge and analogue sedge (*Carex simulata*). The basin floor was dominated by Italian rye grass, and species identified by the outlet included Fremont cottonwood, coyotebrush (*Baccharis pilularis*), valley oak, and interior live oak. This location is characterized as a freshwater pond by the NWI and is classified as palustrine, unconsolidated bottom, and permanently flooded under the under the Cowardin code (USFWS 2016b); however, during the field survey, the location was not flooded and functioned as a detention basin and not a freshwater pond.

DB-03 is 0.12 acre and is located directly to the west of DB-02 across 1st Avenue in the southeastern portion of the study area. This detention basin was dominated by California annual grassland, with a single Fremont cottonwood in the center of the basin. There was a central drain in this detention basin that likely drains directly into the adjacent canal. This location is characterized as a freshwater pond by the NWI and is classified as palustrine, unconsolidated

bottom, and permanently flooded under the Cowardin code (USFWS 2016b); however, during the field survey, the location was not flooded, did not contain hydrophytic vegetation, and functioned as a seasonally flooded detention basin and not a freshwater pond. This feature is unlikely to be considered jurisdictional.

The detention basins could potentially drain into the adjacent canal, which would make any wetlands associated with DB-01 and DB-03 potentially jurisdictional.

Freshwater Pond

A single freshwater pond is located in the southwestern corner of the study area south of B Avenue and is surrounded by undeveloped land on the southern and western sides and ongoing development on the eastern side. The pond is 2.95 acres and is classified under the Cowardin code as palustrine, unconsolidated bottom, and permanently flooded (USFWS 2016b). Water was present in this feature at the time of the field survey. Species observed included willow, Fremont cottonwood, broadleaf cattail, floating primrose-willow (*Ludwigia peploides*), and common rush (*Juncus effusus*). This pond appears to drain south into additional freshwater wetlands and eventually into riverine habitat; due to this connectivity, this pond is potentially jurisdictional.

Freshwater Emergent Wetland 01 (FEW-01)

FEW-01 is a linear wetland feature located north of the freshwater pond across B Avenue and consists of 147.75 linear feet within the study area. This wetland drains directly into the freshwater pond through a large culvert. Species observed included willow, Fremont cottonwood, broadleaf cattail, floating primrose-willow, and common rush. This wetland is classified in the NWI as freshwater emergent wetland and as palustrine, emergent, and temporarily flooded under the Cowardin code (USFWS 2016b). At the time of the field survey, the soil within the wetland was saturated and there was a minimal amount of standing water. This wetland drains directly into the freshwater pond below and is potentially jurisdictional.

Freshwater Emergent Wetland 02 (FEW-02)

FEW-02 is located in the southwestern portion of the study area directly below the freshwater pond; is 0.43 acre in size; and is classified as palustrine, scrub-shrub, and seasonally flooded under the Cowardin code (USFWS 2016b). The wetland is heavily forested and dominated by broadleaf cattail. The wetland appears to potentially drain south into additional wetlands identified by the NWI (USFWS 2016a). Due to the high likelihood of connectivity, this wetland is potentially jurisdictional. No work is anticipated to take place in the vicinity of this wetland for this project.

6.2 Jurisdictional Wetlands and Waters

The study area does not support TNWs, interstate waters, or waters that support interstate commerce (33 CFR 328.3(a) parts 1–4); therefore, potential ACOE jurisdiction was determined based on connectivity or adjacency to off-site waters of the United States (CFR 328.3(a) part 5).

Figure 4 depicts the geographic extent of wetland features within the study area, and Table 1 includes the total acreage of wetland features. An aquatic resources table in accordance with ACOE format is presented in Appendix D.

Table 1
Wetlands and Waters within the Study Area

Feature	Jurisdiction	Acres	Linear Feet
Wetlands			
Seasonal Wetland 01	Jurisdictional	0.02	N/A
Seasonal Wetland 02	Jurisdictional	0.02	N/A
Seasonal Wetland 03	Jurisdictional	0.09	N/A
Seasonal Wetland 04	Jurisdictional	0.09	N/A
Seasonal Wetland 05	Jurisdictional	0.02	N/A
Vegetated Swale	Non-jurisdictional	N/A	106.59
Detention Basin 01	Jurisdictional	0.18	N/A
Detention Basin 02	Non-jurisdictional	0.62	N/A
Detention Basin 03	Jurisdictional	0.12	N/A
Freshwater Pond	Jurisdictional	2.95	N/A
Freshwater Emergent Wetland 01	Jurisdictional	N/A	147.75
Freshwater Emergent Wetland 02	Jurisdictional	0.43	N/A
	Total	**4.54**	**254.34**
Other Waters			
Ophir Canal	Non-jurisdictional	N/A	1,832.33
Ephemeral Drainage 01	Jurisdictional	N/A	161.82
Ephemeral Drainage 02	Jurisdictional	N/A	68.85
	Total	**N/A**	**2,063.00**

Note: N/A = not applicable

Data Stations

Vegetation, hydrology, and soils were examined at eight sampling points within the study area to determine the extent of potentially jurisdictional resources (Figure 4).

The vegetation in upland data points consisted of dry annual grasses and low-growing herbaceous vegetation. Drought conditions prevalent in previous years in California may have contributed to the composition of vegetation in the study area. Additionally, soils were influenced by human activity; rocky fill material was present at two of the eight locations. Table 2 lists the results of these data stations in terms of the three criteria that determine jurisdiction: vegetation, hydrology, and soils. For more detailed information regarding the presence or absence of wetland indicators, refer to the completed ACOE data sheets in Appendix C.

Table 2
Jurisdictional Data Station Results

Data Station	Wetland Vegetation	Wetland Hydrology	Wetland Soils	Determination
SP-01	Present	Present	Present	Jurisdictional
SP-02	Absent	Absent	Absent	Non-jurisdictional
SP-03	Present	Present	Present	Jurisdictional
SP-04	Absent	Absent	Absent	Non-jurisdictional
SP-05	Present	Present	Present	Jurisdictional
SP-06	Absent	Absent	Absent	Non-jurisdictional
SP-07	Present	Present	Present	Jurisdictional
SP-08	Present	Absent	Absent	Non-jurisdictional

Note: SP = sampling points

INTENTIONALLY LEFT BLANK

7 CONCLUSIONS

The study area supports a total of 4.54 acres of wetlands and 230.67 linear feet of other waters that are anticipated to meet the criteria for jurisdictional waters of the United States, including wetlands based on an analysis of the three parameters for wetlands (soils, hydrology, and vegetation), and connectivity/proximity to known waters of the United States.

All features identified during the field survey are potentially jurisdictional with the exception of the vegetated swale that is likely not jurisdictional and is not included in the calculations.

INTENTIONALLY LEFT BLANK

8 REFERENCES CITED

33 CFR 328.1–328.5. Definition of Waters of the United States.

51 FR 41217. Final Rule. "Migratory Bird Rule." November 13, 1986.

ACOE (U.S. Army Corps of Engineers). 1987. *Corps of Engineers Wetland Delineation Manual.* Online ed. Environmental Laboratory, Wetlands Research Program Technical Report Y-87-1. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. January 1987. Accessed June 2015. http://www.fedcenter.gov/Bookmarks/index.cfm?id=6403&pge_id=1606.

ACOE. 2008a. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).* Environmental Laboratory, ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center. September 2008. Accessed June 2012. http://el.erdc.usace.army.mil/elpubs/pdf/trel08-28.pdf.

ACOE. 2008b. *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States.* Accessed August 2016. http://www.dtic.mil/dtic/tr/fulltext/u2/a486603.pdf.

Bing Maps. 2016. [aerial photograph]. 1:200 scale.

California Water Code, Section 13000–16104. Porter-Cologne Water Quality Control Act, as amended. Prepared by the State Water Resources Control Board, with additions and amendments (shown as tracked changes) effective January 1, 2011. Accessed January 17, 2011. http://www.swrcb.ca.gov/laws_regulations/.

Close, C. 2018. Phone conversation between Chip Close, Operations Manager for Nevada Irrigation District with Laura Burris of Dudek. November 6, 2018

Google Earth. 2016. [aerial photograph]. 1:200 scale.

Jepson Flora Project. 2016. *Jepson eFlora*. Berkeley, California: University of California. Accessed April 2016. http://ucjeps.berkeley.edu/cgi-bin/get_JM_name_data.pl.

Rapanos et ux., et al. v. United States. 547 U.S. 715 (2006); no. 04-1034. Supreme Court decision on *Rapanos v. United States* and *Carabell v. U.S. Army Corps of Engineers*. Accessed January 9, 2012. http://www.epa.gov/owow/wetlands/pdf/Rapanos_SupremeCourt.pdf.

Solid Waste Agency of Northern Cook County v. United States Corps of Engineers et al., 531 U.S. 159 (2001), no. 99–1178.

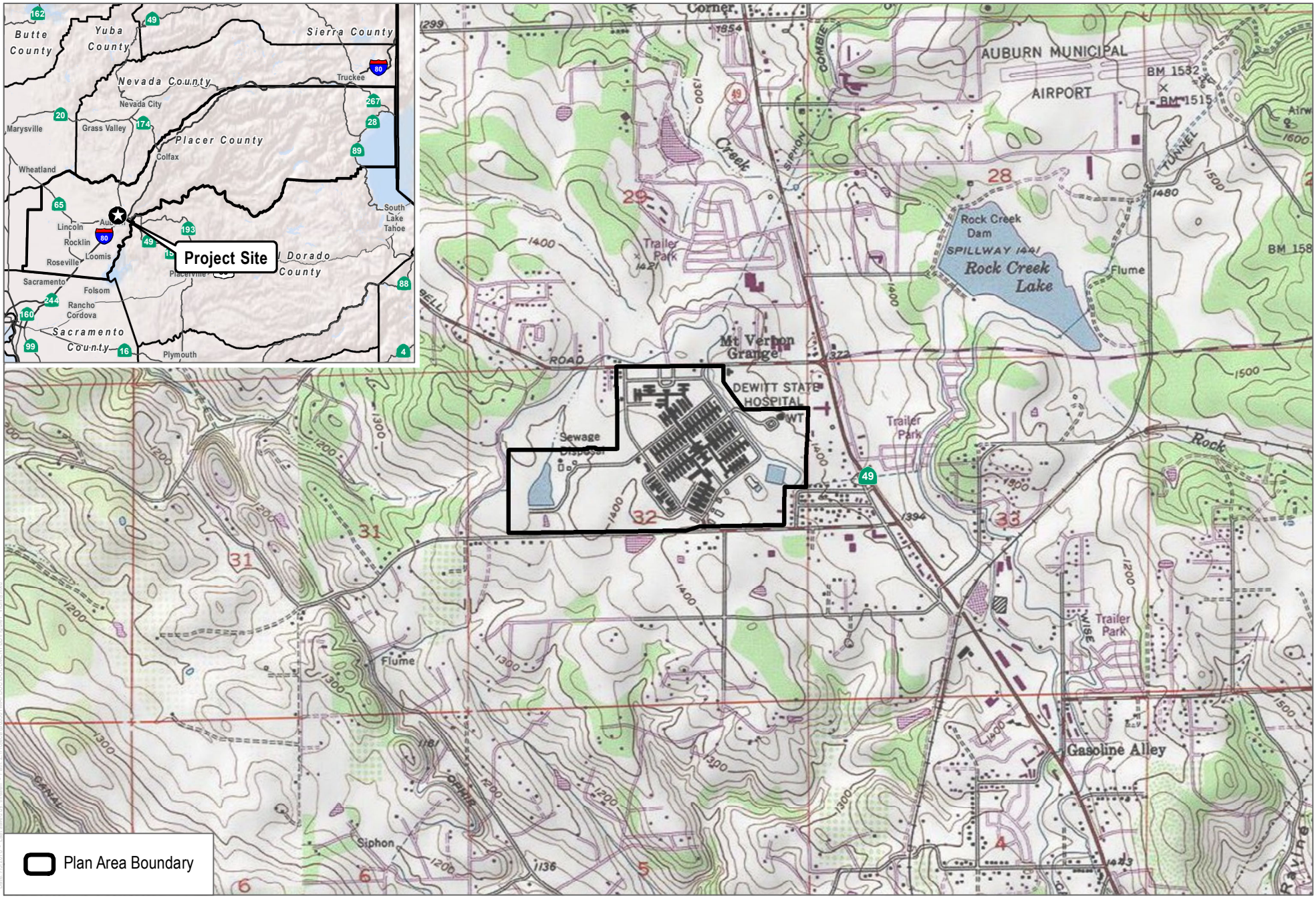
USDA (U.S. Department of Agriculture). 2016a. Web Soil Survey. USDA Natural Resources Conservation Service, Soil Survey Staff. Accessed March 25, 2015. http://websoilsurvey.nrcs.usda.gov/.

USDA. 2016b. PLANTS database. USDA Natural Resources Conservation Service. Last updated August 15, 2016. Accessed August 2016. http://plants.usda.gov/java/.

USFWS (U.S. Fish and Wildlife Service). 2016a. *National Wetlands Inventory*. Accessed August 2016. fws.gov/wetlands/NWI/index.html.

USFWS. 2016b. "Wetland Classification Codes." Last updated July 26, 2016. Accessed August 32016. https://www.fws.gov/wetlands/Data/Wetland-Codes.html.

USGS (U.S. Geological Survey). 2016. "Auburn, CA" [map]. 7.5-Minute Series (Topographic). Accessed August 2016. http://store.usgs.gov/b2c_usgs/b2c/usgs/netfile?file=// igskahcigssap05/MOD/StoreFiles/DenverPDFs/24K/CA/CA_Auburn_1981.pdf.



SOURCE: USGS 7.5-Minute Series Auburn Quadrangle

DUDEK

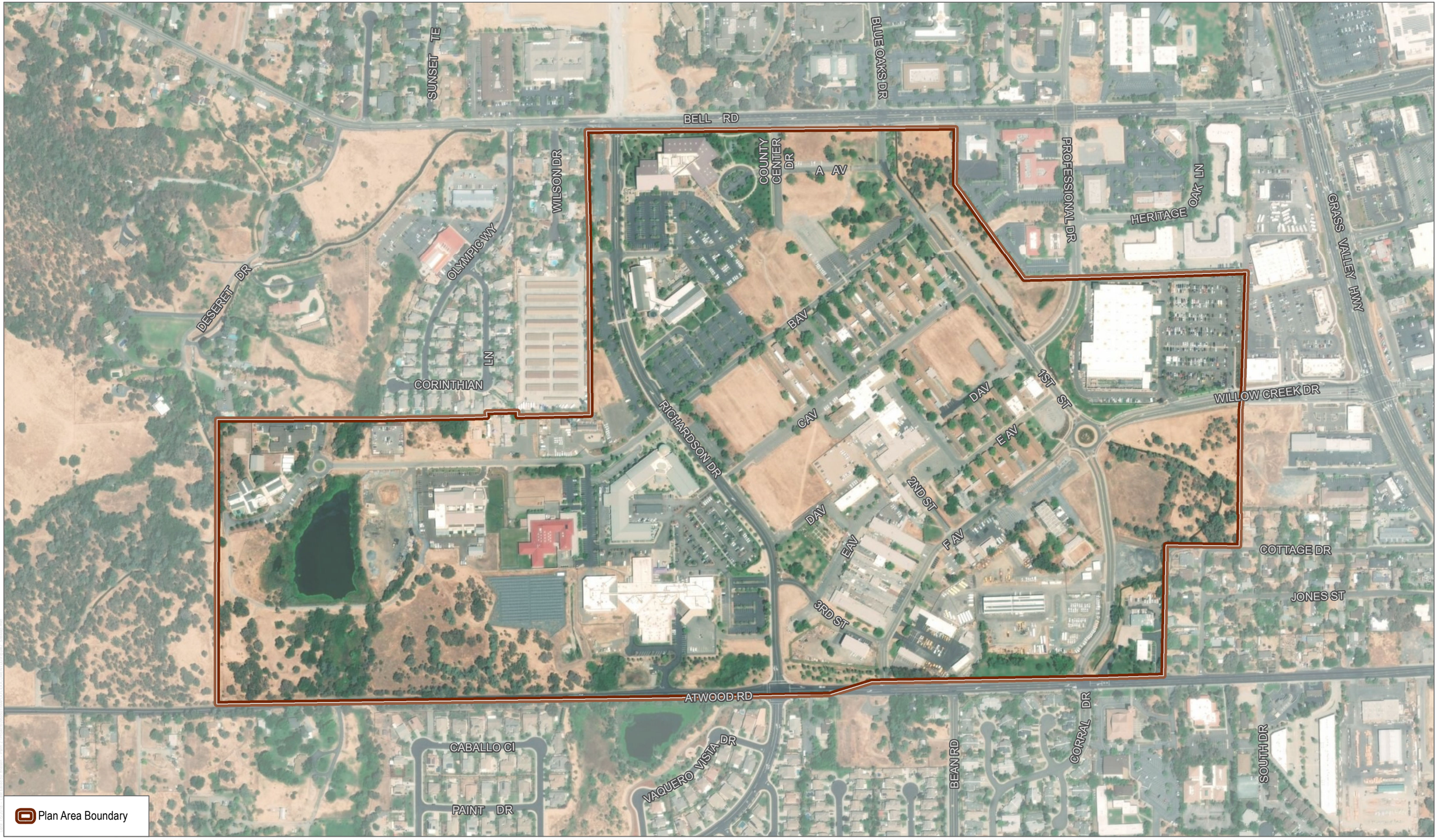
0 1,000 2,000 Feet

FIGURE 1

Project Location

Placer County Government Center Master Plan Update - Preliminary Jurisdictional Delineation Report

INTENTIONALLY LEFT BLANK



SOURCE: ESRI 2018, County of Placer 2016

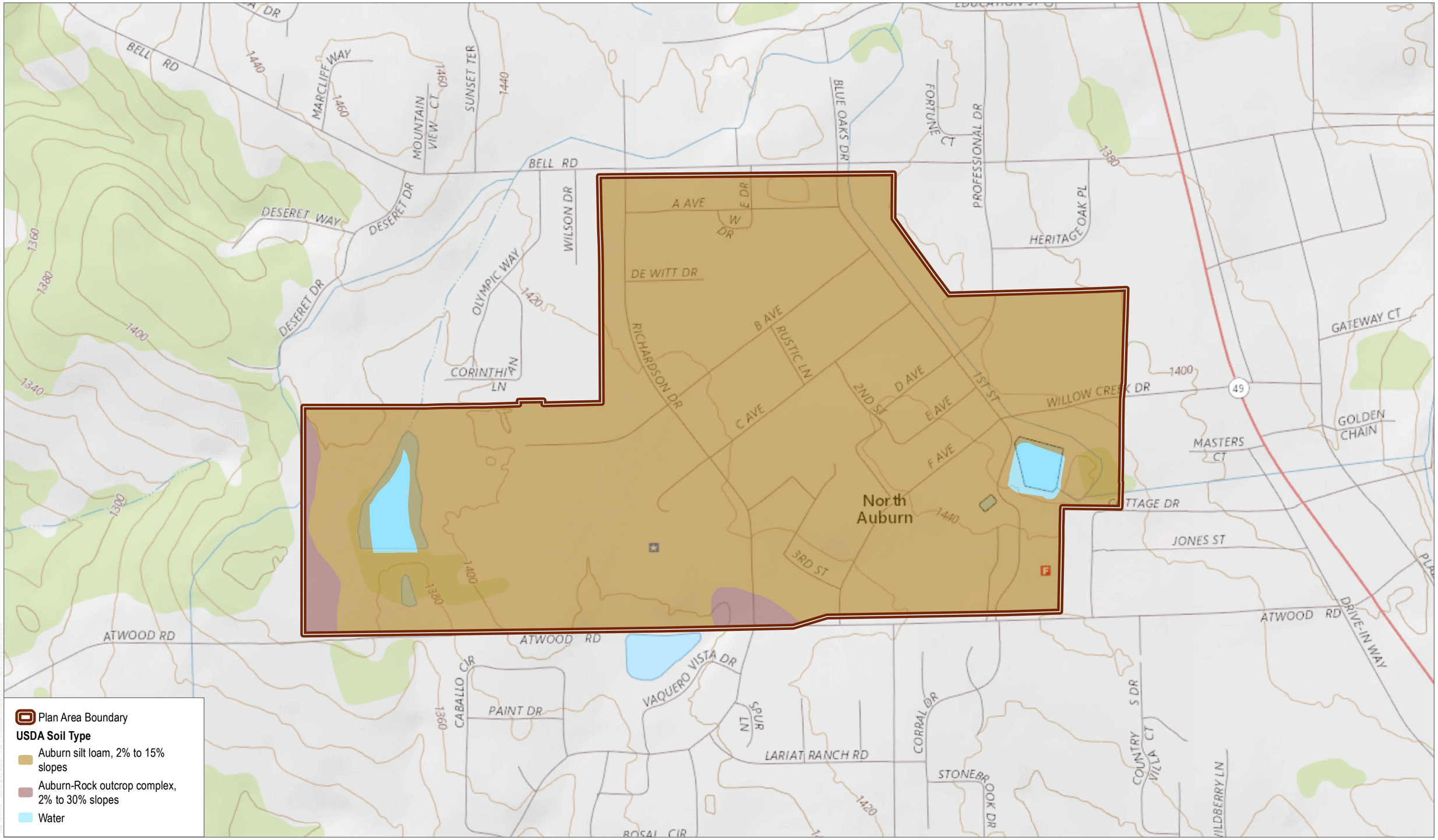
DUDEK 0 200 400 Feet

FIGURE 2

Project Site

Placer County Government Center Master Plan Update - Preliminary Jurisdictional Delineation Report

INTENTIONALLY LEFT BLANK



SOURCE: USGS 7.5-Minute Series Auburn Quadrangle, County of Placer 2016, USDA 2007

DUDEK

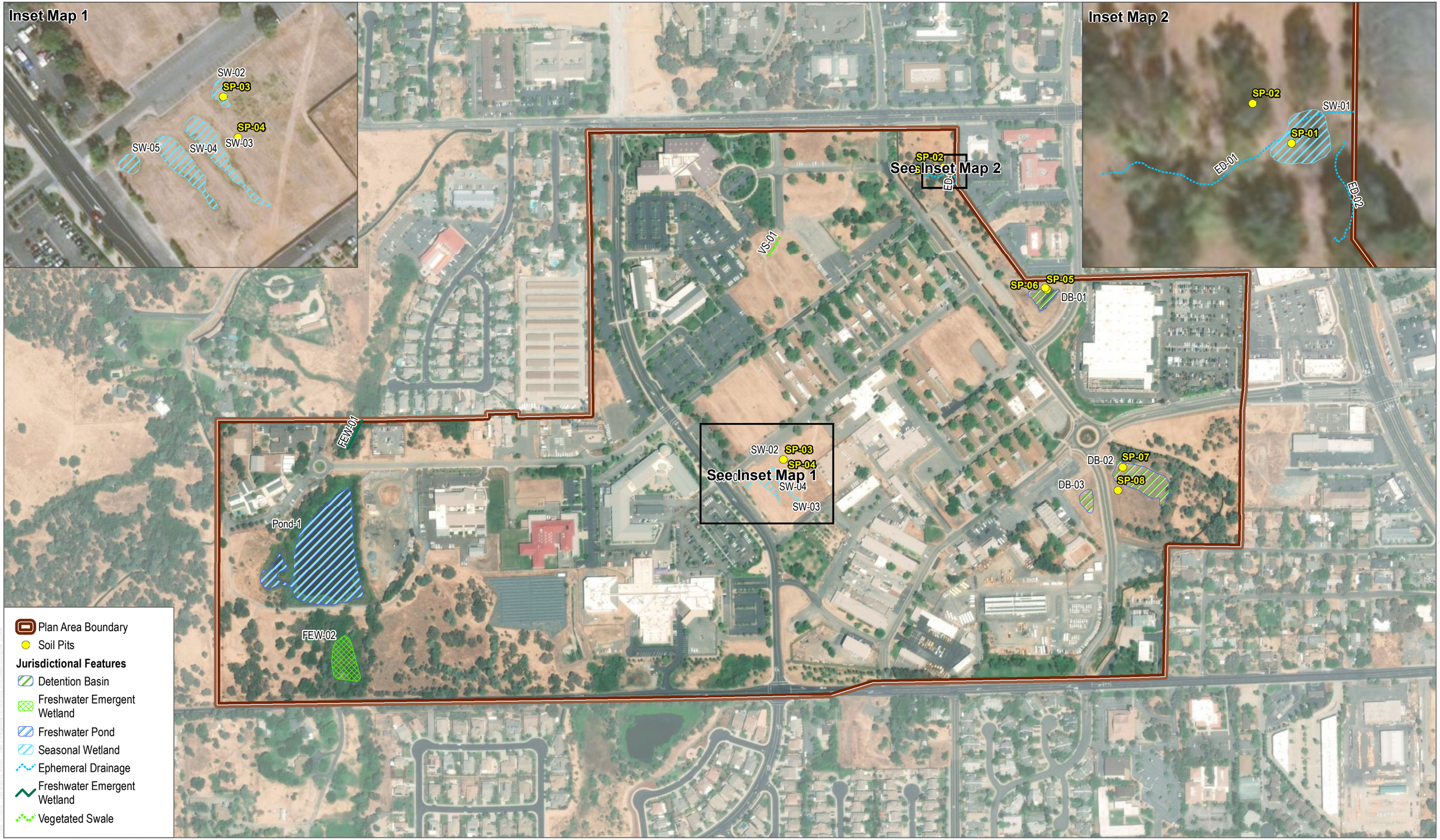
0 250 500 Feet

FIGURE 3

Soils

Placer County Government Center Master Plan Update - Preliminary Jurisdictional Delineation Report

INTENTIONALLY LEFT BLANK



SOURCE: ESRI 2018, County of Placer 2016

DUDEK

0 200 400 Feet

FIGURE 4

Potentially Jurisdictional Features

Placer County Government Center Master Plan Update - Preliminary Jurisdictional Delineation Report

INTENTIONALLY LEFT BLANK

APPENDIX A

Representative Photos

APPENDIX A
Representative Photos

Photo 1: View of Ophir Canal, facing southeast. August 10, 2016

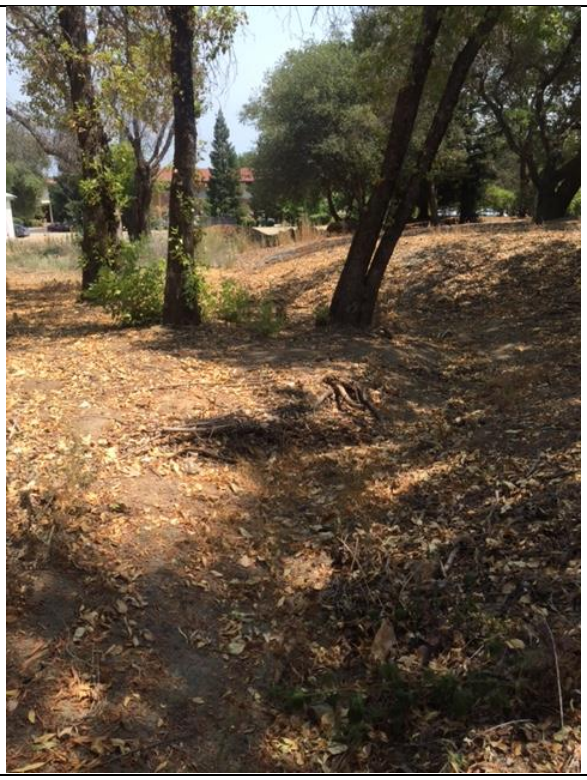


Photo 2: Ephemeral Drainage 01 (ED-01), facing east. August 10, 2016.

Photo 3: Seasonal Wetland 01 (SW-01) and ED-01, facing west. August 10, 2016.

Photo 4: Seasonal Wetland 02 (SW-02), looking south. August 10, 2015

Photo 5: Seasonal Wetland 04 (SW-04) with filamentous algae crust, facing south. August 10, 2016.

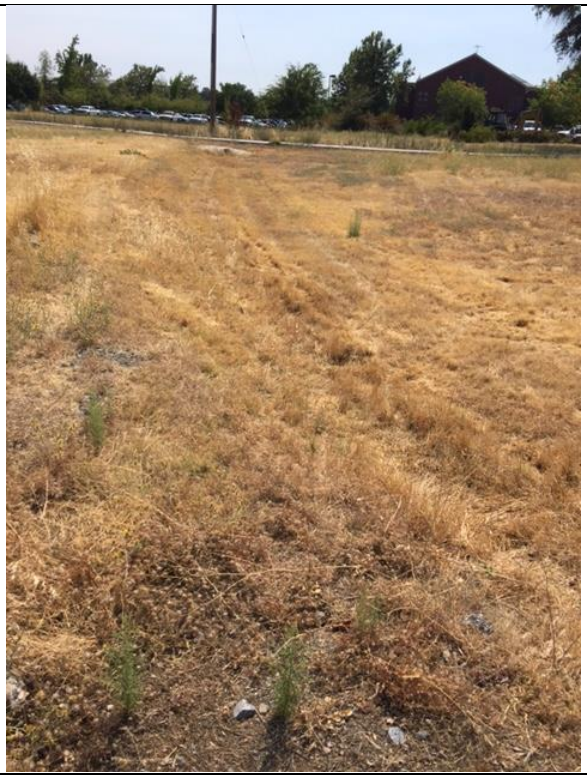


Photo 6: Vegetated swale, facing southwest. August 10, 2016.

Photo 7: Detention Basin 01 (DB-01), facing southeast. August 10, 2016.

Photo 8: Detention Basin 02 (DB-02), facing northeast. August 10, 2015.

Photo 9: Freshwater pond and surrounding riparian vegetation, looking south. August 10, 2016.

Photo 10: Freshwater Emergent Wetland 01 (FEW-01), facing northwest. August 10, 2016.

INTENTIONALLY LEFT BLANK

APPENDIX B

Plant Species Observed

APPENDIX B
Plant Species Observed

VASCULAR SPECIES

GYMNOSPERMS AND GNETOPHYTES

PINACEAE—PINE FAMILY

Pinus sabiniana—California foothill pine (NL)

MONOCOTS

POACEAE—GRASS FAMILY

* *Avena fatua*—wild oat (NL)
* *Bromus diandrus*—ripgut brome (NL)
* *Bromus hordeaceus*—soft brome (FACU)
* *Cynodon dactylon*—Bermudagrass (FACU)
* *Echinochloa crus-galli*—barnyardgrass (FACW)
* *Festuca arundinacea*—tall fescue (NL)
* *Festuca perennis*—Italian ryegrass (FAC)
* *Hordeum marinum*—seaside barley (FAC)

TYPHACEAE—CATTAIL FAMILY

Typha angustifolia—narrowleaf cattail (OBL)
Typha latifolia—broadleaf cattail (OBL)

EUDICOTS

ASTERACEAE—SUNFLOWER FAMILY

Baccharis pilularis—coyotebrush (NL)
* *Carduus pycnocephalus*—Italian plumeless thistle (NL)
* *Centaurea solstitialis*—yellow star-thistle (NL)
* *Hypochaeris glabra*—smooth cat's ear (NL)
* *Lactuca serriola*—prickly lettuce (FACU)
* *Pseudognaphalium luteoalbum*—Jersey cudweed (FAC)

BRASSICACEAE—MUSTARD FAMILY

* *Brassica nigra*—black mustard (NL)

CHENOPODIACEAE—GOOSEFOOT FAMILY

* *Salsola australis*—Russian thistle (NL)

EUPHORBIACEAE—SPURGE FAMILY

Croton setiger—dove weed (NL)

FABACEAE—LEGUME FAMILY

Acmispon americanus—no common name (UPL)
* *Trifolium glomeratum*—clustered clover (NL)
* *Trifolium hirtum*—rose clover (NL)
* *Vicia villosa*—winter vetch (NL)

FAGACEAE—OAK FAMILY

Quercus douglasii—blue oak (NL)
Quercus lobata—valley oak (FACU)
Quercus wislizeni—interior live oak (NL)

GERANIACEAE—GERANIUM FAMILY

* *Erodium cicutarium*—redstem stork's bill (NL)

LYTHRACEAE—LOOSESTRIFE FAMILY

* *Lythrum hyssopifolia*—hyssop loosestrife (OBL)

OLEACEAE—OLIVE FAMILY

Fraxinus latifolia—Oregon ash (FACW)

ONAGRACEAE—EVENING PRIMROSE FAMILY

Epilobium ciliatum—fringed willowherb (FACW)
* *Ludwigia peploides*—floating primrose-willow (OBL)

PLANTAGINACEAE—PLANTAIN FAMILY

* *Plantago lanceolata*—narrowleaf plantain (FAC)

PLATANACEAE—PLANE TREE, SYCAMORE FAMILY

* *Platanus × hispanica*—London planetree (NL)

POLYGONACEAE—BUCKWHEAT FAMILY

* *Rumex crispus*—curly dock (FAC)

ROSACEAE—ROSE FAMILY

* *Rubus armeniacus*—Himalayan blackberry (FAC)

SALICACEAE—WILLOW FAMILY

Salix exigua—narrowleaf willow (FACW)
Salix gooddingii—Goodding's willow (FACW)
Salix laevigata—red willow (FACW)
Salix lasiandra—Pacific willow (FACW)
Populus fremontii—Fremont cottonwood (FAC)

* signifies introduced (non-native) species

INTENTIONALLY LEFT BLANK

APPENDIX C

Data Sheets

APPENDIX D

Aquatic Resources Spreadsheet

APPENDIX K: NATURAL GAS UTILITY SERVICE

Placer County Government Center

Master Plan Update

Natural Gas Utility Service

The existing Placer County Government Center campus is fed from PG&E natural gas lines entering the site area at three locations. There is an 18-inch main in Atwood road, with an existing 2-inch branch and a 4-inch branch entering the southern portion of the site area at F Avenue. There is a 4-inch line that extends along Willow Creek Drive and enters the site from the east. And finally, there is a 4-inch main that runs in Bell Road with a 4-inch branch line that enters the site from the north at Richardson Drive.

The existing buildings at the outer edges of the campus would continue to be served from existing gas lines to avoid any disruption in service. The buildings at the south end of the campus between E and F Avenues, the jail complex, along with any gas loads associated with the new buildings *Corporation Yard/Admin/Training Center-F*, and *Parks and Ground-K3* would continue to be served from the 4-inch main extending up from the south.

The existing buildings along the west side of the campus along B Avenue, along with the existing *Justice Center* and *Juvenile Detention* building, and also including the new buildings *Warehouse-D and E*, *Probation Support-G*, *Dive Unit-K1* and *Data Center Expansion-2*; would continue to be served the existing mains extending from Richardson Drive.

The new *Admin Services-1* and *Health and Human Services-A* buildings would be served from a new line extended from the 4-inch gas branch near the north side of the Finance and Administration building. This will allow these early phase buildings to be constructed without running long new gas mains prior to the construction of new roadways.

The remainder of the master plan buildout new buildings would be served from a new gas main extending along 1st Street from Atwood Road to Bell Road. This new main could also be connected to the branch from the east along Willow Creek Drive to allow multiple feeds into the campus for reliability and pressure equalization. The new 1st street main would be extended as roadways are improved and new buildings are brought online.

The new *Community Events Center-M*, *Agricultural Commissioner and Farm Advisor-C*, *Utilities Department-K2* and *Hotel-H* buildings proposed along County Center Drive would be served from a new branch gas main connected to the new line in 1st Street along the new roadway (currently D Avenue). There is too much gas load for these buildings to be connected to the branch in Richardson Drive being extended to the Health and Human Services-A building.

The existing building complex that is between B and C avenue that will remain is fed gas from the existing line in 1st Street. It is proposed to reconnect the complex to the new line proposed to be installed at 1st Street. Consideration will be needed to phase the new gas line construction to maintain service to the existing complex.