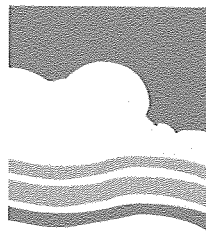


Department of Water Resources
Michael L. Peterson, Director



SACRAMENTO COUNTY
WATER AGENCY

Including service to the Cities of
Elk Grove and Rancho Cordova

March 18, 2014

Mike Motroni
Wood Rodgers
3301 C Street, Bldg. 100-B
Sacramento, CA 95816

Re: Elk Grove South East Policy Area Water Study

Mr. Motroni,

Sacramento County Water Agency (SCWA) staff has reviewed the water study prepared by Wood Rodgers for the South East Policy Area (SEPA) in the City of Elk Grove (City). SCWA staff determines that the identified major water supply facilities in the SEPA at build-out are consistent with the current Zone 40 Water Supply Infrastructure Plan (WSIP) and ongoing WSIP update efforts.

SCWA staff also recognizes that this water study is prepared to assist the City's CEQA reviewing process for the SEPA. Therefore, individual water studies may still be required by SCWA for each subdivision by the project applicant based on the latest WSIP during the plan check process in the future.

If you have any questions, please contact me at 874-5039.

Sincerely,

A handwritten signature in dark ink, appearing to read "Darrell Eck".

Darrell Eck
Senior Civil Engineer, SCWA

cc: Ping Chen, SCWA

Elk Grove Southeast Policy Area Master Water Plan

February 19, 2014

Prepared for



Prepared by



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APPENDICES

Appendix A: Water Demands
Appendix B: System Hydraulic Model Results
Appendix C: Proposed Water System Layout

1.0 Introduction

The purpose of this water study is to identify domestic water needs for the Elk Grove Southeast Policy Area (SEPA) plan area. The report is part of an overall high-level infrastructure analysis. This study will demonstrate it is possible to provide domestic water service for the project and technical compliance with the water purveyor's requirements for water conveyance. The project falls within the jurisdiction of the Sacramento County Water Agency (SCWA).

Existing and planned domestic water facilities border the project area to the north, west and east. It is anticipated that these existing facilities will be extended to provide domestic water service to the plan area. This study has been prepared to present the project build-out domestic water conveyance facilities for the plan area. The study includes transmission main pipe sizes and distribution system sizes of 12-inch where serving multiple land uses. These conveyance facilities will serve as part of the backbone infrastructure to serve SEPA. This study includes a discussion on proposed water demands, point of connection assumptions, and modeling results.

1.1 Southeast Policy Area

Located at the southern end of the City, the Southeast Policy Area is the last large-scale development area within the urbanized portion of Elk Grove. It lies directly south of the Laguna Ridge Specific Plan area and west of Lent Ranch/Elk Grove Promenade and the approved Sterling Meadows development.¹

Location

The SEPA project encompasses approximately 1,200 acres and is located in the southeast portion of the City of Elk Grove. In general the project area is located east of Bruceville Road, north of Kammerer Road, east of Big Horn Boulevard, and south of Poppy Ridge Road. The Laguna Ridge Specific Plan borders the project on the north and west. Proposed Sterling Meadows project borders the project directly to the east.

See **Figure 1-1: Vicinity Map** for a vicinity map of the project site.

Topography and Vegetation

The site currently consists of a mix of farm and ranch land with a number of residential structures on large lots spread throughout the plan area. The existing topography varies from elevation 39-feet to 22-feet and falls from the northeast to the southwest. Bisecting the project is a drainage canal flowing from east to west.

Land Use

The project area is currently zoned in the City's general plan as a special planning area. Therefore, specific polices are required to guide development within this area. The proposed land use will consist of residential (very low, low, medium and high density), mixed use, commercial, office, light industrial / flex space, schools, parks, and open space. The proposed land use for SEPA includes a total of 4,790 dwelling units from residential and mixed use land uses. See **Table 1-1: Proposed Project Land Use** for detailed project land uses and **Figure 1-2: Land Use Plan** for an exhibit showing the proposed land use, within the project area.

¹ Project description per City of Elk Grove, planning department website, 1 October 2013.



Table 1-1: Proposed Project Land Use

Source: Land use spreadsheet provided by City of Elk Grove, September 10, 2013

Land Use		Area ² (acres)	Estimated Dwelling Units (DU)
ER	Estate Residential	62.6	288
LDR	Low Density Residential	212.0	1341
MDR	Medium Density Residential	95.2	1324
HDR	High Density Residential	60.7	1511
MUR	Mixed Use Residential	14.0	267
COM	Commercial	14.2	-
MUV	Mixed Use Commercial	27.3	58
ES	Elementary School	27.6	-
OFF	Office	279.9	-
LI/FS	Light Industrial / Flex Space	108.2	-
P/OS	Park / Open Space	56.8	-
Greenway	Greenway	35.5	-
Basin	Basin	49.4	-
Drainage	Drainage Channel	1.7	-
Channel	Channel	65.3	-
	Right of Way ³	84.4	-
Total		1,195	4,790

1.2 Existing & Future Water Studies

Sacramento County Water Agency

The project area falls within the jurisdiction of the Sacramento County Water Agency (SCWA). The project area is located in SCWA's south service area. The SCWA Zone 40 Water System Infrastructure Plan (WSIP), dated April 2006 was utilized as the basis for SCWA conveyance facilities discussed in this study. The April 2006 WSIP identified transmission conveyance facilities to serve SEPA. These transmission mains are included as part of this study.

At time of this study SCWA is preparing an update to the WSIP. It is anticipated that the design as presented in this study will be consistent with the WSIP update.

Existing Water Studies

There were a number of existing studies completed to date that were reviewed as part of this report. These studies are referenced below and discussed further within the study.

² Acreage values are approximate and reflect high-level master planning. Acreages are subject to change through subsequent development processing in keeping with the policies and procedures provided in the City's Special Planning Area document.

³ Assumed to be internal roadways per the land use plan, plus fifty feet of right of way adjacent to SEPA boundary except 100 feet along future Lotz Parkway.



- Laguna Ridge Specific Plan, Water Study, by Wood Rodgers, Inc., dated January 30, 2003, hereon referred as “LRSP plan”.
- Elk Grove Promenade, Master Water Study, by Wood Rodgers, Inc., dated January 2006, hereon referred as “EGP plan”.
- Zone 40 Water System Infrastructure Plan, by Sacramento County Water Agency, dated April 2006, hereon referred as “WSIP”.

Future Water Studies

This study has been prepared to identify the backbone conveyance facilities required to convey domestic water to serve the project area. It does not identify sources of domestic water supply. There is an opportunity to within the plan area provide recycled water to parks, landscaping, and greenways. This study assumes that all land uses will be supplied by domestic water and does not take into account recycled water use. Future studies will be required as subsequent planning and phasing is solidified and prior to improvement plan approval.

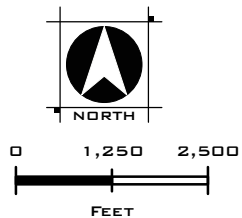
Recycled Water

Recycled water was not evaluated as part of this master plan. The 2003 Zone 40 Recycled Water Master Plan dated 2003 and revised in 2006 did not consider recycled water for the Southeast Policy Area. The existing and planned recycled water use is limited to Laguna West, Lakeside, Laguna Stonelake, East Franklin, and Laguna Ridge.



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Elk Grove Southeast Policy Area
 Vicinity Map - Figure 1-1
 Elk Grove, California
 February 19, 2014



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ELK GROVE SOUTHEAST POLICY AREA

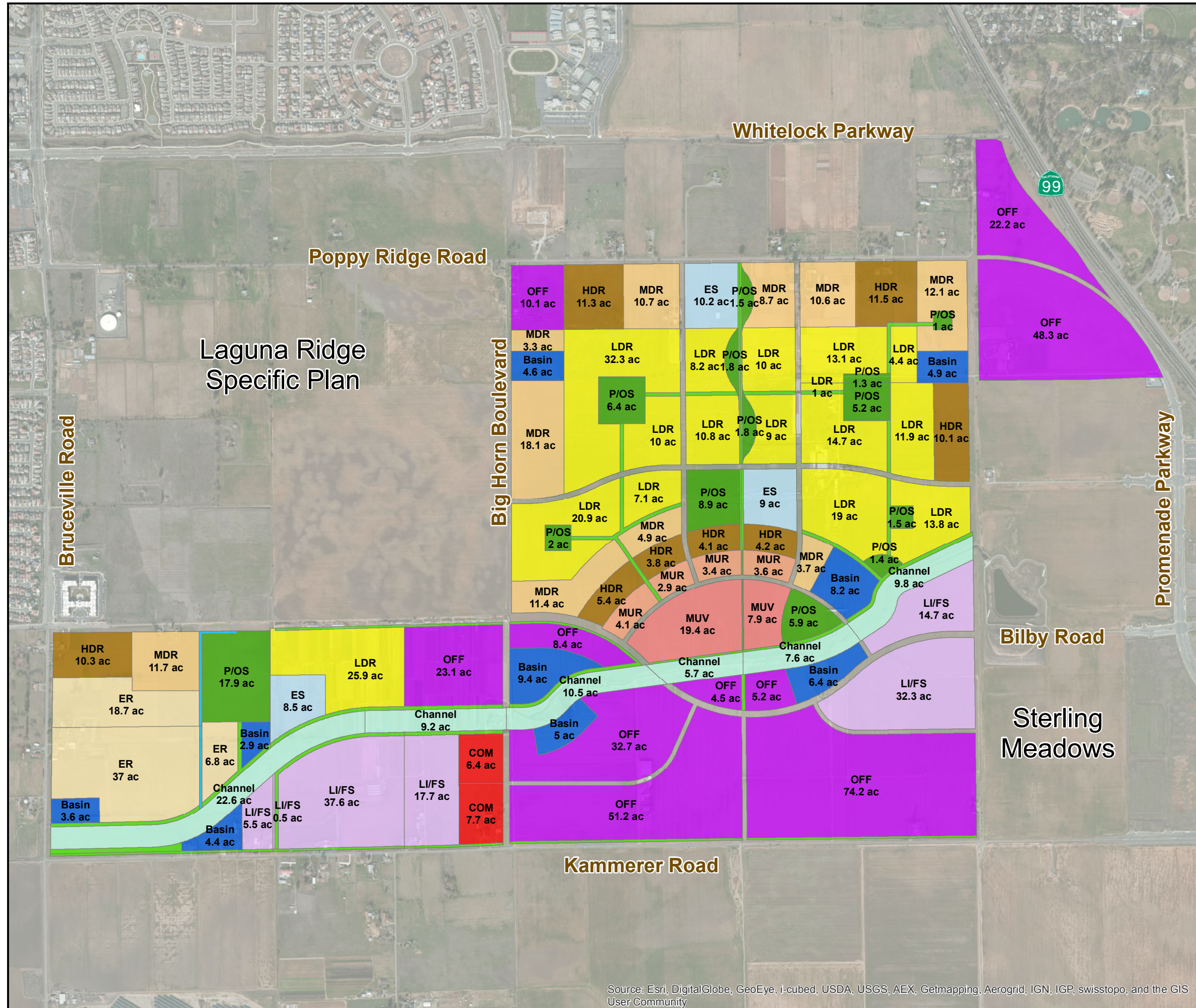
LAND USE PLAN - FIGURE 1-2

ELK GROVE, CALIFORNIA

FEBRUARY 19, 2014



Not to Scale



Laguna Ridge
Specific Plan

Land Use

- Estate Residential
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Mixed Use Residential
- Mixed Use Commercial
- Commercial
- Office
- Light Industrial / Flex Space
- Elementary School
- Parks / Open Space
- Greenway
- Channel
- Basin
- Drainage Channel

Note: Acreage values are approximate and reflect high-level master planning. Acreages are subject to change through subsequent development processing in keeping with the policies and procedures provided in the City's Special Planning Area document.



WOOD RODGERS

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2.0 Project Water Demands

Project water demands were determined based on land use area. The project water demands were determined by multiplying an annual demand factor by the land use area. Annual demand factors utilized in this study are shown in **Table 2-1: Land Use Demand Factors and Annual Water Demand**. The WSIP demand factors were utilized as the basis of determining annual demand. Some land uses as proposed are not explicitly referenced in the WSIP. To maintain consistency and in general conformance, assumptions for annual demand were consistent with the WSIP.

Table 2-1: Land Use Demand Factors and Annual Water Demand

Source: Sacramento County Water Agency, WSIP, dated April 2006.

Land Use		Annual Demand Factor per WSIP (acre/feet)	Annual Demand Factor ⁴ (acre/feet)	Annual Demand ⁴ (acre/feet)
ER	Estate Residential	1.33	1.43	89.5
LDR	Low Density Residential	2.89	3.11	658.5
MDR	Medium Density Residential	3.70	3.98	378.5
HDR	High Density Residential	4.12	4.43	268.8
MUR	Mixed Use Residential	4.12 ⁵	4.43	62.0
COM	Commercial	2.75	2.96	41.9
MUV	Mixed Use Commercial	2.75 ⁶	2.96	80.8
ES	Elementary School	3.46	3.72	102.8
OFF	Office	2.75 ⁶	2.96	827.4
LI/FS	Light Industrial / Flex Space	2.71	2.91	315.2
P/OS	Park / Open Space	3.46	3.72	211.4
Greenway	Greenway	3.46 ⁷	3.72	132.0
Basin	Basin	- ⁸	-	-
Drainage	Drainage Channel	- ⁸	-	-
Channel	Channel	- ⁸	-	-
	Right of Way		0.23	19.1
Total				3,188

⁴ Includes 7.5% system losses.

⁵ WSIP does not contain a unit demand factor for mixed use residential. This study assumes the same demand factor as high density residential land use.

⁶ WSIP does not contain a unit demand factor for mixed use commercial or office. This study assumes the same demand factor as commercial land use.

⁷ WSIP does not contain a unit demand factor for greenways. This study assumes the same demand factor as public recreation land use.

⁸ Per City of Elk Grove some water demand via drip irrigation may be required to establish plantings. Ultimate water demand will be zero.

It is important to note that the City is pursuing recycled water for non-domestic uses relating to landscaping. There may be opportunities for several land uses to take advantages of this availability. For planning purposes, this study does not take into account recycled water demand.

2.1 Hydraulic Water Demands

The hydraulic water demands utilized for modeling are shown in below **Table 2-2: Proposed Water Demands**. The average annual demand was determined by multiplying the land use area by the demand factor as indicated in **Table 2-1**. The average day demand is calculated by taking the average annual demand and converting it into gallons per minute. Average day demand is representative of the average daily demand based on 365 days in a year.

Per the WSIP, the maximum day demand is the highest demand expected on any given day throughout the year. Typically this demand occurs in July where temperatures are excessively warm. The maximum day demand is assumed to be twice the average day demand. Maximum day demand is also utilized for fire flow scenarios and analysis.

Peak hour demand is the highest expected demand for any given hour throughout the year. This demand is four times the average day demand

Table 2-2: Proposed Water Demands

	Land Use	Area (acres)	Average Annual Demand (acre/feet)	Average Day Demand (gpm)	Maximum Day Demand (gpm)	Peak Hour Demand (gpm)
ER	Estate Residential	62.6	89.5	55	111	222
LDR	Low Density Residential	212.0	658.5	408	817	1633
MDR	Medium Density Residential	95.2	378.5	235	469	939
HDR	High Density Residential	60.7	268.8	167	333	667
MUR	Mixed Use Residential	14.0	62.0	38	77	154
COM	Commercial	14.2	41.9	26	52	104
MUV	Mixed Use Commercial	27.3	80.8	50	100	200
ES	Elementary School	27.6	102.8	64	128	255
OFF	Office	279.9	827.4	513	1026	2052
LI/FS	Light Industrial / Flex Space	108.2	315.2	195	391	782
P/OS	Park / Open Space	56.8	211.4	131	262	524
Greenway	Greenway	35.5	132.0	82	164	327
Basin	Basin	49.4	-	-	-	-
Drainage	Drainage Channel	1.7	-	-	-	-
Channel	Channel	65.3	-	-	-	-
	Right of Way	84.4	19.1	12	24	47
Total		1,195	3,188	1,976	3,953	7,906

3.0 Service Description and System Criteria

Proposed water distribution mains are to be designed to provide required flow deliveries while maintaining acceptable service pressures to all customers within the plan area. Description of the proposed water system, operating goals, and facility sizing requirements are discussed in this section.

3.1 Service Description

Figure 3-1: Water System Layout and **Appendix C** show the proposed water conveyance facilities for the plan area. The proposed water system layout is representative of both transmission mains and 12-inch distributions mains that will serve as the plan area's backbone infrastructure. The basis of the proposed domestic water backbone infrastructure layout through the plan area is in general conformance with the 2006 WSIP. Included in this study are copies of the 2006 WSIP maps relating to the SEPA plan area. See **Figure 3-2** and **Figure 3-3**. Further discussion regarding connection and extension into the project area is included below.

Bruceville Road Extension

There is an existing 20-inch transmission main in Bruceville Road conveying water from the Poppy Ridge Water Treatment Plant south where it turns west in Bilby Road. The WSIP and this study assume an extension of the 20-inch transmission main within Bruceville Road to Kammerer Road. Eventually the WSIP identifies this water main extending to the Rio Consumnes Correctional Center.

Bilby Road Extension

Currently an existing 20-inch transmission main runs from west to east in Bilby Road adjacent to the East Franklin Specific Plan. This existing transmission main terminates in Bilby Road approximately 750 feet east of the Bilby Road and Bruceville Road intersection. From the current termination point, per the WSIP and this study, the 20-inch main is to extend along the future Bilby Road alignment within the plan area boundary at future Lotz Parkway.

The EGP plan and subsequent construction of the "Elk Grove Promenade – Major Roads" improvement provided a 20-inch transmission main from Promenade Parkway to the project boundary of Sterling Meadows. The Sterling Meadows project will complete the 20-inch transmission main within Bilby Road between SEPA and the existing stub where the transmission main terminates in Bilby Road.

Big Horn Boulevard Extension

In the LRSP plan, a 16-inch transmission main is proposed to extend along the LRSP boundary to Bilby Road. However, in the WSIP this transmission main is shown as 20-inch. This study proposes a 20-inch transmission main extending from Whitelock Parkway to Kammerer Road as shown in the WSIP and this study.

Kammerer Road Extension

Existing in Kammerer road, constructed as part of the "Elk Grove Promenade – Major Roads" is a 20-inch transmission main. This study proposes extending, a 16-inch transmission main within Kammerer Road between Bruceville Road and Lotz Parkway per the ongoing WSIP update. From Lotz Parkway to the 20-inch stub, adjacent to Sterling Meadows, a 20-inch transmission main is proposed.

Lotz Parkway Extension

Per the ongoing WSIP update, a 24-inch transmission main in future Lotz Parkway will be extended south from Whitelock Parkway to Kammerer Road.

3.2 System Criteria

The WSIP outlines system criteria for both distribution and transmission main design. Included in **Table 3-1: Design Criteria** are each design criteria and operating goal for design of domestic water conveyance systems.

Water Main Design System Criteria

The responsibility for operation and maintenance of the water supply facilities within SEPA is by SCWA Zone 41, the retail zone of SCWA. SCWA has developed minimum operating goals to be used in the planning of new water distribution systems. These goals apply to water studies that analyze subdivision level developments. The goals help ensure adequate pressure and flow are available to serve customers on a daily basis and also during emergency fire flow situations. The goals used in this study for the water distribution lines are listed in **Table 3-1: Design Criteria**.

Table 3-1: Design Criteria

Source: Sacramento County Water Agency, Zone 40 Water System Infrastructure Plan, April 2006

Criteria	Goal
Maximum System Pressure	75 psi
Minimum pressure in transmission main	40 psi
Minimum pressure in domestic main	35 psi
Minimum pressure at fire flow	25 psi
Maximum pipe flow velocity at MDD	5 fps
Maximum pipe flow velocity at PHD	7 fps
Maximum pipe velocity at fire flow	10 fps

Fire Flow System Criteria

Fire flow is assumed to occur during maximum day demand conditions. Fire flow is assumed at 4,000 gpm for all new industrial land uses⁹. Smaller fire flows are typical for single family residential. Greater fire flows may be required for larger buildings as defined by the California Fire Code and the local fire authority. This study utilizes 4,000 gpm fire flow as a conservative approach for the entire plan area.

System Assumptions

The following assumptions were utilized in the hydraulic models:

- Model demands do not take into account demands outside the boundary of the project area.
- The system must be able to accommodate the delivery of domestic water through the transmission facilities as identified in WSIP.
- Pipe losses are reflected with a Hazen-William "C" value of 125 to represent all pipe material, included ductile iron, welded steel, concrete cylinder, and polyvinyl chloride mains.

⁹ Sacramento County Water Agency, Zone 40 Water System Infrastructure Plan, April 2006.

ELK GROVE SOUTHEAST POLICY AREA

WATER SYSTEM LAYOUT

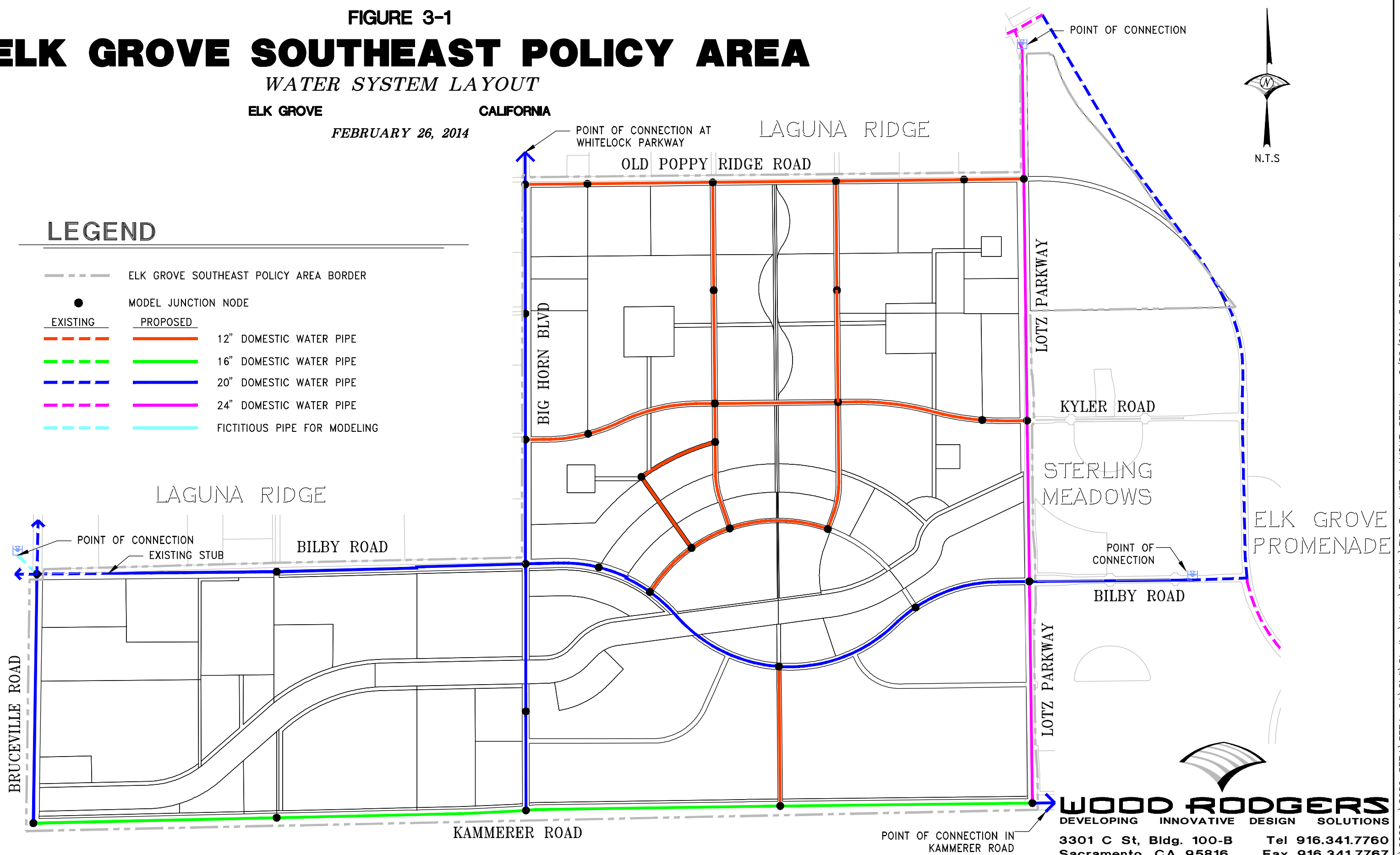
ELK GROVE

CALIFORNIA

FEBRUARY 26, 2014

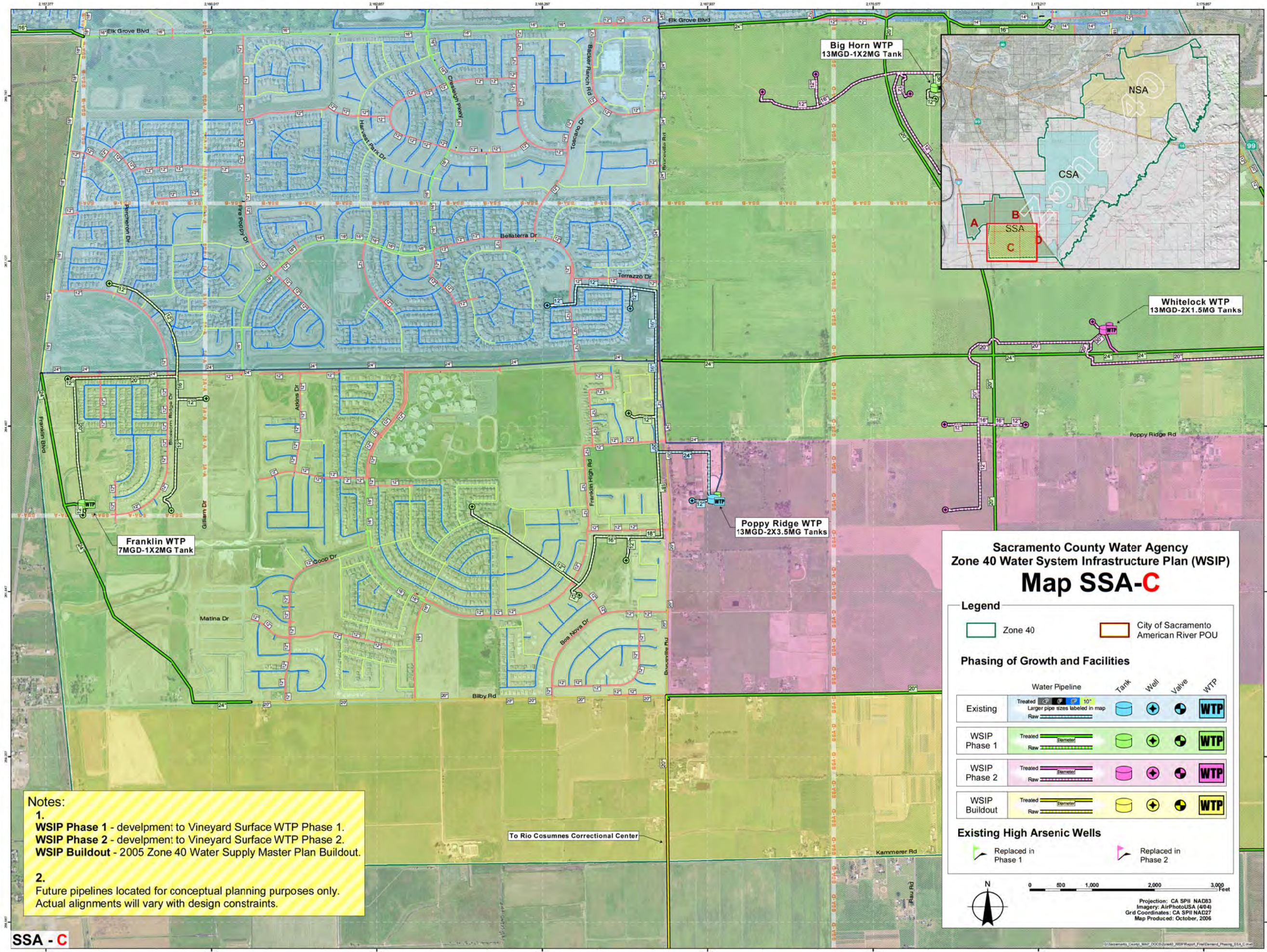
LEGEND

- ELK GROVE SOUTHEAST POLICY AREA BORDER
- MODEL JUNCTION NODE
- EXISTING**
- PROPOSED**
- 12" DOMESTIC WATER PIPE
- 12" DOMESTIC WATER PIPE
- 16" DOMESTIC WATER PIPE
- 16" DOMESTIC WATER PIPE
- 20" DOMESTIC WATER PIPE
- 20" DOMESTIC WATER PIPE
- 24" DOMESTIC WATER PIPE
- 24" DOMESTIC WATER PIPE
- FICTITIOUS PIPE FOR MODELING
- FICTITIOUS PIPE FOR MODELING



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J:\2000-s\2956_SEPA\SEPA-0A\Civil\Studies\Water\Exhibits\FIG-3-1-WTR-LAYOUT-SEPA.dwg 2/26/2014 3:50 PM Tyler Kaushogen



Sacramento County Water Agency
 Zone 40 Water System Infrastructure Plan (WSIP)
Map SSA-C

Legend

Zone 40 (Green outline) City of Sacramento American River POU (Orange outline)

Phasing of Growth and Facilities

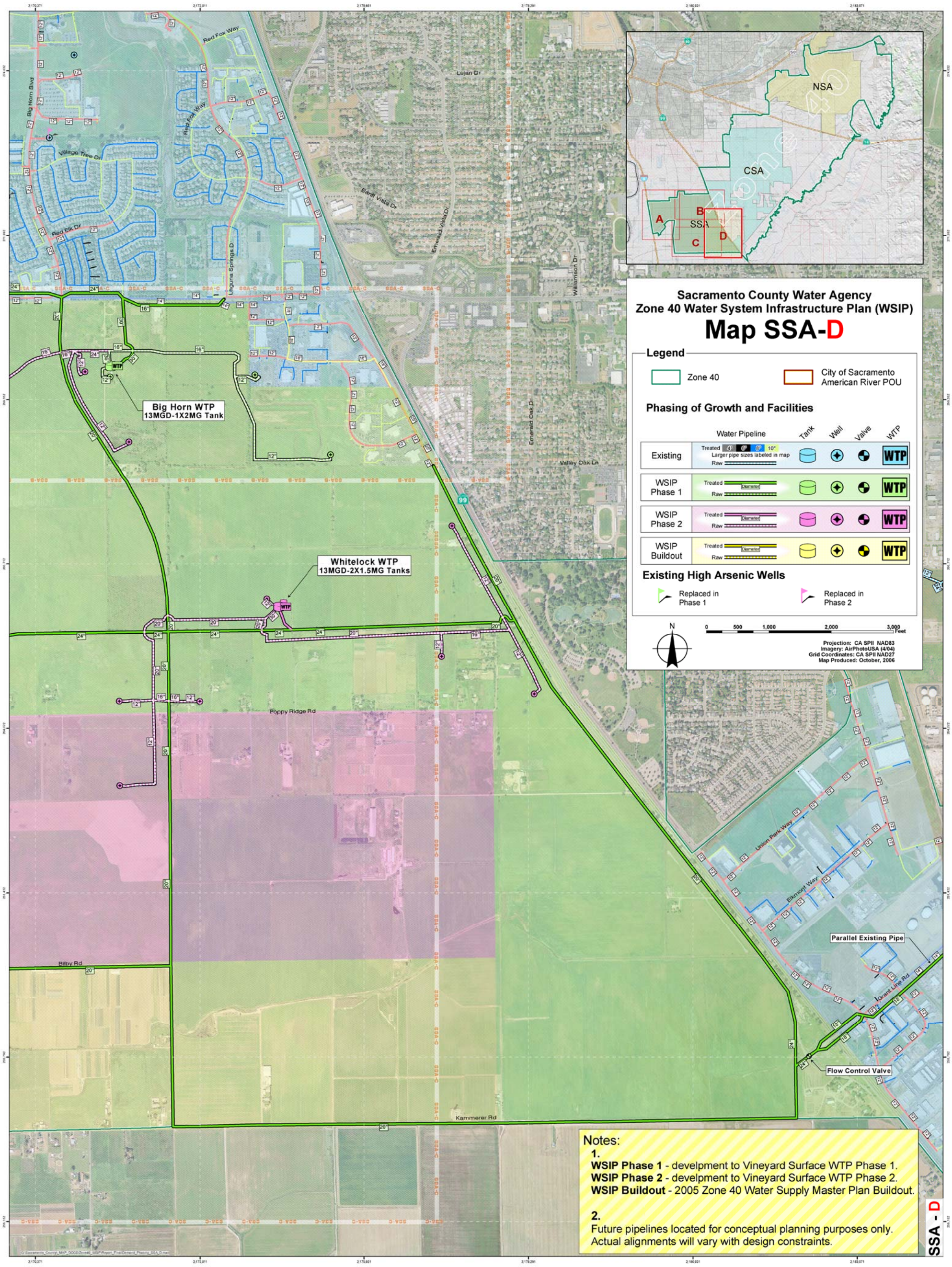
	Water Pipeline	Tank	Well	Valve	WTP
Existing	Treated: 12", 18", 24", 30", 36", 42", 48", 54", 60", 66", 72", 78", 84", 90", 96", 102", 108", 114", 120" Larger pipe sizes labeled in map Raw: 12", 18", 24", 30", 36", 42", 48", 54", 60", 66", 72", 78", 84", 90", 96", 102", 108", 114", 120"	Blue cylinder	Blue circle with cross	Blue circle with cross	Blue square with 'WTP'
WSIP Phase 1	Treated: Green line Raw: Green dashed line	Green cylinder	Green circle with cross	Green circle with cross	Green square with 'WTP'
WSIP Phase 2	Treated: Purple line Raw: Purple dashed line	Purple cylinder	Purple circle with cross	Purple circle with cross	Purple square with 'WTP'
WSIP Buildout	Treated: Yellow line Raw: Yellow dashed line	Yellow cylinder	Yellow circle with cross	Yellow circle with cross	Yellow square with 'WTP'

Existing High Arsenic Wells

Replaced in Phase 1 (Green triangle) Replaced in Phase 2 (Pink triangle)

Notes:

1. WSIP Phase 1 - development to Vineyard Surface WTP Phase 1.
 WSIP Phase 2 - development to Vineyard Surface WTP Phase 2.
 WSIP Buildout - 2005 Zone 40 Water Supply Master Plan Buildout.
2. Future pipelines located for conceptual planning purposes only.
 Actual alignments will vary with design constraints.



Sacramento County Water Agency
 Zone 40 Water System Infrastructure Plan (WSIP)
Map SSA-D

Legend

- Zone 40
- City of Sacramento American River POU

Phasing of Growth and Facilities

	Water Pipeline	Tank	Well	Valve	WTP
Existing	Treated 10" Larger pipe sizes labeled in map Raw 				WTP
WSIP Phase 1	Treated Raw 				WTP
WSIP Phase 2	Treated Raw 				WTP
WSIP Buildout	Treated Raw 				WTP

Existing High Arsenic Wells

- Replaced in Phase 1
- Replaced in Phase 2

0 500 1,000 2,000 3,000 Feet
Projection: CA SPT1 NAD83
 Imagery: AirPhotoUSA (4/04)
 Grid Coordinates: CA SPT1 NAD27
 Map Produced: October, 2006

Notes:

1. **WSIP Phase 1** - development to Vineyard Surface WTP Phase 1.
WSIP Phase 2 - development to Vineyard Surface WTP Phase 2.
WSIP Buildout - 2005 Zone 40 Water Supply Master Plan Buildout.
2. Future pipelines located for conceptual planning purposes only. Actual alignments will vary with design constraints.

4.0 Hydraulic Model Results

Wood Rodgers developed a hydraulic model of the SEPA plan area to size facilities within the plan area as shown in **Figure 3-1: Water System Layout** and **Appendix C**. The model was developed utilizing the hydraulic model program H2ONet (version 8.5) developed by Innovyze. Upon request, an electronic copy of the water model is available.

Point of Connection and Boundary Conditions

To serve the project area, domestic water will be conveyed from SCWA treatment plants through proposed transmission mains as outlined in the WSIP and this study. Some of these transmission mains are currently in service while others will be built to partially serve the plan area.

SCWA guarantees that a pressure of 40 psi is available in system transmission mains. As a result, output pressure at SCWA operated transmission main facilities may require boosting to meet SCWA's operating goals. Further analysis of SCWA operational procedures is outside the scope of this study.

The model developed for this project utilizes five points of connection to transmission facilities, both existing and proposed per the WSIP. These stubs were utilized to simulate the system pressure boundary conditions. The modeled HGL was calculated by assuming a minimum pressure of 40 psi at the connection point with the highest elevation. Based on proposed ground elevations, the highest connection point is in the northeast at the Whitelock Parkway and future Lotz Parkway intersection. The resulting HGL was then applied to all boundary condition locations. See **Table 4-1: Point of Connection Boundary Conditions** for locations of each point of connection and associated boundary conditions.

Table 4-1: Point of Connection Boundary Conditions

Point of Connection	Transmission Main Size	Elev.	Pressure	Hydraulic Grade Line	Modeled HGL
Bruceville Road & Bilby Road	20 inch	26.8 feet	40 psi	119.1 feet	133.2 feet
Big Horn Blvd. & Whitelock Pkwy.	24 inch	30.5 feet	40 psi	122.8 feet	133.2 feet
Whitelock Pkwy. & Lotz Pkwy	20 inch	40.9 feet	40 psi	133.2 feet	133.2 feet
Bilby Road (West of Promenade Pkwy)	20 inch	37.3 feet	40 psi	129.6 feet	133.2 feet
Kammerer Road (West of Promenade Pkwy)	20 inch	40.7 feet	40 psi	133.0 feet	133.2 feet

Applied Water Demands

Water demands as previously discussed in this study are distributed to modeled nodes or junctions throughout the plan area. Demand loading on each node is representative of the water demand of the adjacent land uses. For right of ways the water demand loading is evenly applied to all nodes with the SEPA plan area.

See **Appendix A: Water Demands** for detailed junction loading by land use.

Model Results

Three modeling demand scenarios were analyzed in this study: maximum day, peak hour, and maximum day plus fire flow. Additionally, three of the weakest fire flow junctions were modeled as separate scenarios.

Utilizing the boundary conditions outlined in this study, along with SCWA's criteria for transmission and distribution main systems, pipe sizes were assigned to the proposed backbone domestic water system. Model results for the project area are summarized in **Table 4-2: Hydraulic Model Results** below.



Detailed model results for each scenario are included in **Appendix B**. The results indicate that the proposed system, as previously discussed, is adequate to meet SCWA's operating goals.

Table 4-2: Hydraulic Model Results

Demand Scenario	Minimum Pressure	Maximum Velocity
Maximum Day Demand	39.3 psi	1.8 fps
Peak Hour Demand	37.5 psi	3.5 fps
MDD + 4,000gpm Fire Flow @ EGJ680	31.6 psi	6.4 fps
MDD + 4,000gpm Fire Flow @ EGJ390	31.3 psi	6.3 fps
MDD + 4,000gpm Fire Flow @ EGJ330	26.9 psi	6.5 fps



5.0 Conclusion

This study has been prepared with the intent of providing supporting documentation for specific plan level planning for domestic water conveyance facilities within the Elk Grove Southeast Policy Area. The study indicates that the proposed water conveyance facilities as shown in **Appendix C: Proposed Water System Layout** are sufficiently sized to hydraulically convey domestic water within the project area to serve the proposed land use.

The hydraulic model developed as part of this study is based on a number of assumptions that may change as new and updated information becomes available. Information that may considerably change the assumptions and hydraulic modeling results found in this study include SCWA's WSIP update and ability to provide water supply to the project area. It is important to note that the proposed conveyance facilities only assume conveyance to and within the proposed plan area. It is anticipated that the WSIP will account for conveyance through the plan area to serve adjacent planning areas. Subsequent studies should update assumptions and boundary conditions as development proposals progress within the plan area.

Appendix A Water Demands

Appendix Attachments

1. Annual Demand Factors
2. Demands by Land Use
3. Demands by Model Junction

ELK GROVE SOUTHEAST POLICY AREA
Annual Unit Demand Factors

Updated: 10/31/2013

Land Use Designation	Project Land Use	Land Use Category	Annual Demand (acre/feet)	System Losses	Annual Demand ⁵ (acre/feet)	Footnote
Basin	Basin	Public Recreation	---	---	---	6.
COM	Commercial	Commercial	2.75	7.50%	2.96	1.
	Drainage Channel	Public Recreation	---	---	---	6.
ER	Estate Residential	Rural Estates	1.33	7.50%	1.43	1.
ES	Elementary School	Public Recreation	3.46	7.50%	3.72	1.
	Greenway	Public Recreation	3.46	7.50%	3.72	4.
HDR	High Density Residential	MF (High Density)	4.12	7.50%	4.43	1.
LDR	Low Density Residential	Single Family	2.89	7.50%	3.11	1.
LI/FS	Light Industrial / Flex Space	Industrial	2.71	7.50%	2.91	1.
MDR	Medium Density Residential	MF (Low Density)	3.70	7.50%	3.98	1.
OFF	Office		2.75	7.50%	2.96	2.
P/OS	Park / Open Space	Public Recreation	3.46	7.50%	3.72	1.
MUR	Mixed Use Residential		4.12	7.50%	4.43	3.
MUC	Mixed Use Commercial		2.75	7.50%	2.96	2.
Channel	Channel		---	---	---	6.
ROW	Right of Way		0.21	7.50%	0.23	1.

Footnotes:

1. Source: Sacramento County Water Agency, Zone 40 Water System Infrastructure Plan, April 2006.
2. For mixed use commercial land use annual demand assumes the same demand factor as commercial land use
3. Assumes mixed use residential demand is equal to high density residential land use
4. For Basins, drainage channels, and greenways public recreation is assumed for annual demand.
5. Includes 7.5% system losses.
6. Per City of Elk Grove (email dated 10/17/2013) these land uses will ultimately have zero water demand

**ELK GROVE SOUTHEAST POLICY AREA
Annual and Hydraulic Water Demand**

Updated: 10/31/2013

City Designation	Land Use	Area ³ (acres)	Demand Factor ² (AFY/acre)	Annual Demand (AFY)	ADD (gpm)	MDD (gpm)	PHD (gpm)
Basin	Basin	49.4	---	---	---	---	---
COM	Commercial	14.2	2.96	41.9	26.0	52.0	104.0
Drainage Channel	Drainage Channel	1.7	---	---	---	---	---
ER	Estate Residential	62.6	1.43	89.5	55.5	111.0	222.0
ES	Elementary School	27.6	3.72	102.8	63.8	127.5	255.0
Greenway	Greenway	35.5	3.72	132.0	81.8	163.6	327.3
HDR	High Density Residential	60.7	4.43	268.8	166.7	333.3	666.7
LDR	Low Density Residential	212.0	3.11	658.5	408.3	816.5	1,633.0
LI/FS	Light Industrial / Flex Space	108.2	2.91	315.2	195.4	390.9	781.7
MDR	Medium Density Residential	95.2	3.98	378.5	234.6	469.3	938.6
OFF	Office	279.9	2.96	827.4	513.0	1,025.9	2,051.8
P/OS	Park / Open Space	56.8	3.72	211.4	131.0	262.1	524.2
MUR	Mixed Use Residential	14.0	4.43	62.0	38.4	76.9	153.8
MUV	Mixed Use Commercial	27.3	2.96	80.8	50.1	100.2	200.3
Channel	Channel	65.3	---	---	---	---	---
	Right of Way ¹	84.4	0.23	19.1	11.8	23.6	47.2
Total		1,195		3,188	1,976	3,953	7,906

Footnotes:

1. Internal roadways + 50' of R/W along perimeter of SEPA boundary but 100' along Sterling Meadows.
2. See demand factor spreadsheet for source of demand and assumptions. (Includes 7.5% system losses)
3. Based on GIS shape file received from City of Elk Grove on 9/10/2013.

ELK GROVE SOUTHEAST POLICY AREA
Domestic Water Demand

Updated: 10/18/2013

Source: Per land use GIS shape files provided by City of Elk Grove, dated 9/10/2013.

Model Node / Junction	Total Acreage (acres)	Land Uses															Elevation		Demands			
		Basin (acres)	Commercial (acres)	Drainage Channel (acres)	Estate Residential (acres)	Elementary School (acres)	Greenway (acres)	High Density Residential (acres)	Low Density Residential (acres)	Light Industrial / Flex Space (acres)	Medium Density Residential (acres)	Office (acres)	Park / Open Space (acres)	Mixed Use Residential (acres)	Mixed Use Commercial (acres)	Channel (acres)	Right of Way ¹ (acres)	Average Elevation (ft)	Average Annual (AFY)	Average Day (gpm)	Maximum Day (gpm)	Peak Hour (gpm)
EGJ100	87.6	3.55			55.77		1.58	10.31			11.73						4.69	27	179	111	222	444
EGJ150	73.8	2.88		1.66	6.84	8.48	5.42		25.87						17.94		4.69	28	210	130	260	520
EGJ200	27.8														23.08		4.69	31	69	43	86	172
EGJ230	4.7																4.69	35	1	1	1	3
EGJ235	40.9								20.89		18.05			2.00			4.69	35	144	89	179	357
EGJ270	12.6	4.59									3.31						4.69	33	14	9	18	35
EGJ300	14.8												10.07				4.69	36	31	19	38	76
EGJ310	16.0							11.29									4.69	36	51	32	63	127
EGJ330	25.5					10.19					10.66						4.69	39	81	50	101	202
EGJ335	44.3						1.95		40.47					1.83			36	140	87	173	347	
EGJ340	34.9						0.50		27.90					6.45			36	113	70	140	279	
EGJ345	14.0						0.96	4.10						8.94			38	55	34	68	136	
EGJ350	23.5						0.68								3.37	19.44	35	75	46	93	186	
EGJ370	25.5										19.34		1.50				4.69	41	84	52	104	207
EGJ375	32.5						2.04		24.03				6.45				38	106	66	132	263	
EGJ380	53.5					9.00			42.69				1.84				40	173	107	214	429	
EGJ390	38.6	8.24					3.67	4.19			3.65		7.37	3.58	7.88		36	113	70	140	281	
EGJ395	39.6	4.88					0.97	11.53	4.40		12.09		1.01				4.69	40	121	75	150	301
EGJ400	75.2												70.54				4.69	38	210	130	260	520
EGJ450	4.7																4.69	38	1	1	1	3
EGJ460	38.7						1.35	10.12	25.73				1.49				38	135	84	168	336	
EGJ500	4.7																4.69	37	1	1	1	3
EGJ600	4.7																4.69	39	1	1	1	3
EGJ620	133.1						3.00						125.42				4.69	35	383	237	475	950
EGJ640	4.7																4.69	32	1	1	1	3
EGJ660	71.2	5.03	14.18				1.66				17.65		32.7				30	196	122	243	487	
EGJ680	55.9	4.41					3.26				43.56						4.69	26	140	87	174	347
EGJ700	73.1						3.14										4.69	24	13	8	16	32
EGJ800	10.1						0.38						9.71				33	30	19	37	75	
EGJ825	53.4	6.43									47.00						33	137	85	170	340	
EGJ840																	32					
EGJ850	7.1													7.05			34	31	19	39	77	
EGJ860	28.1						2.57	9.16			16.32						35	115	71	143	285	
EGJ880	20.1	9.36					2.36						8.37				32	34	21	42	83	
Overall Total	1,195	49.4	14.2	1.7	62.6	27.7	35.5	60.7	212.0	108.2	95.2	279.9	56.8	14.0	27.3	65.3	84.4	3,188	1,976	3,953	7,906	

Notes:

1. Internal roadways, plus 50' of R/W along perimeter of SEPA boundary but 100' along Sterling Meadows. Acreage is equally distributed along demands around perimeter of SEPA boundary.

Appendix B System Hydraulic Model Results

Appendix Attachments

1. Maximum Day Demand
2. Peak Hour Demand
3. Maximum Day Demand plus Fire Flow
4. Fire Flow at Junction EGJ330
5. Fire Flow at Junction EGJ390
6. Fire Flow at Junction EGJ640

ELK GROVE - SOUTHEAST POLICY AREA
MAXIMUM DAY DEMAND MODEL OUTPUT

Updated: February 19, 2014

JUNCTION REPORT				
JUNCTION NODE ID	DEMAND (gpm)	ELEVATION (feet)	HEAD (feet)	PRESSURE (psi)
EGJ100	222	27	133.2	46.0
EGJ150	260	28	133.0	45.5
EGJ200	86	31	132.9	44.1
EGJ230	1	35	132.9	42.4
EGJ235	179	35	132.5	42.3
EGJ270	18	33	133.0	43.3
EGJ300	38	36	133.1	42.1
EGJ310	63	36	133.1	42.1
EGJ330	101	39	132.3	40.4
EGJ335	173	36	132.2	41.7
EGJ340	140	36	132.3	41.7
EGJ345	68	38	132.3	40.9
EGJ350	93	35	132.3	42.2
EGJ370	104	41	132.4	39.6
EGJ375	132	38	132.3	40.9
EGJ380	214	40	132.3	40.0
EGJ390	140	36	132.3	41.7
EGJ395	161	40	132.5	40.1
EGJ400	260	38	133.1	41.2
EGJ450	1	38	133.0	41.2
EGJ460	168	38	132.7	41.1
EGJ500	1	37	133.1	41.6
EGJ600	1	39	133.1	40.8
EGJ620	475	35	132.8	42.4
EGJ640	1	32	132.9	43.7
EGJ660	243	30	132.9	44.6
EGJ680	174	26	132.9	46.3
EGJ700	16	24	133.1	47.3
EGJ800	37	33	132.9	43.3
EGJ825	170	33	133.0	43.3
EGJ840	0	32	132.9	43.7
EGJ850	39	34	132.4	42.6
EGJ860	143	35	132.3	42.2
EGJ880	42	32	132.9	43.7

PIPE REPORT									
PIPE ID	FROM NODE	TO NODE	LENGTH (ft)	DIAMETER (in)	ROUGHNESS (C-value)	FLOW (gpm)	VELOCITY (ft/s)	HEADLOSS (ft)	HL/1000 (ft/kft)
EGP01	EGJ700	EGJ100	2637	20	125	-335.63	0.34	0.08	0.03
EGP03	EGJ100	EGJ150	2538	20	125	620.27	0.63	0.24	0.09
EGP05	EGJ150	EGJ200	2650	20	125	360.27	0.37	0.09	0.03
EGP07	EGJ200	EGJ230	1316	20	125	-116.88	0.12	0.01	0.00
EGP09	EGJ230	EGJ270	1334	20	125	-516.97	0.53	0.09	0.07
EGP11	EGJ270	EGJ300	1366	20	125	-534.97	0.55	0.10	0.07
EGP13	EGJ300	EGJ310	659	12	125	63.00	0.18	0.01	0.02
EGP15	EGJ330	EGJ370	1304	12	125	-151.98	0.43	0.11	0.08
EGP17	EGJ370	EGJ395	1357	12	125	-184.79	0.52	0.16	0.12
EGP19	EGJ400	EGJ450	2559	24	125	233.73	0.17	0.02	0.01
EGP21	EGJ450	EGJ500	1703	24	125	-226.32	0.16	0.01	0.01
EGP23	EGJ500	EGJ600	2347	24	125	-224.73	0.16	0.01	0.01
EGP25	EGJ600	EGJ620	2668	16	125	325.19	0.52	0.22	0.08
EGP27	EGJ620	EGJ640	2692	16	125	-66.56	0.11	0.01	0.00
EGP29	EGJ640	EGJ680	2640	16	125	-145.63	0.23	0.05	0.02
EGP31	EGJ680	EGJ700	2577	16	125	-319.63	0.51	0.21	0.08
EGP33	EGJ200	EGJ660	1561	20	125	164.93	0.17	0.01	0.01
EGP35	EGJ660	EGJ640	1049	20	125	-78.07	0.08	0.00	0.00
EGP37	EGJ200	EGJ880	778	20	125	226.23	0.23	0.01	0.01
EGP39	EGJ880	EGJ840	616	20	125	184.23	0.19	0.01	0.01
EGP41	EGJ840	EGJ800	1620	20	125	-282.06	0.29	0.04	0.02
EGP43	EGJ800	EGJ825	1627	20	125	-402.30	0.41	0.07	0.04
EGP45	EGJ825	EGJ500	1259	20	125	-572.30	0.58	0.10	0.08
EGP47	EGJ840	EGJ850	645	12	125	466.29	1.32	0.43	0.66
EGP49	EGJ850	EGJ860	920	12	125	179.87	0.51	0.10	0.11
EGP51	EGJ860	EGJ345	868	12	125	36.87	0.10	0.01	0.01
EGP53	EGJ850	EGJ350	456	12	125	247.42	0.70	0.09	0.21
EGP55	EGJ350	EGJ345	937	12	125	65.21	0.19	0.02	0.02
EGP57	EGJ345	EGJ340	408	12	125	34.08	0.10	0.00	0.01
EGP59	EGJ230	EGJ235	669	12	125	399.08	1.13	0.33	0.50
EGP61	EGJ235	EGJ340	1393	12	125	220.08	0.62	0.23	0.17
EGP63	EGJ340	EGJ380	1304	12	125	-7.86	0.02	0.00	0.00
EGP65	EGJ350	EGJ390	1058	12	125	89.21	0.25	0.03	0.03
EGP67	EGJ390	EGJ380	1361	12	125	-50.79	0.14	0.01	0.01
EGP69	EGJ380	EGJ460	1544	12	125	-291.05	0.83	0.43	0.28
EGP71	EGJ460	EGJ450	475	12	125	-459.05	1.30	0.31	0.64
EGP73	EGJ380	EGJ375	1184	12	125	18.40	0.05	0.00	0.00
EGP75	EGJ375	EGJ370	1157	12	125	-113.60	0.32	0.06	0.05
EGP77	EGJ340	EGJ335	1199	12	125	122.02	0.35	0.07	0.06
EGP79	EGJ335	EGJ330	1142	12	125	-50.98	0.14	0.01	0.01
EGP81	EGJ800	EGJ620	1476	12	125	83.24	0.24	0.04	0.03
EGP83	EJRES01	EGJ100	286	99	125	1177.91	0.05	0.00	0.00
EGP87	EJRES03	EGJ300	1391	20	125	635.97	0.65	0.14	0.10
EGP89	EJRES04	EGJ400	1379	24	125	1024.56	0.73	0.13	0.10
EGP91	EGJ500	EJRES05	1729	20	125	-574.90	0.59	0.14	0.08
EGP93	EJRES06	EGJ600	1687	20	125	550.92	0.56	0.13	0.08
EGP95	EGJ370	EGJ395	1357	12	125	-184.79	0.52	0.16	0.12
EGP97	EGJ395	EGJ400	633	12	125	-530.82	1.51	0.53	0.84

ELK GROVE - SOUTHEAST POLICY AREA
PEAK HOUR DEMAND MODEL OUTPUT

Updated: February 19, 2014

JUNCTION REPORT				
JUNCTION NODE ID	DEMAND (gpm)	ELEVATION (feet)	HEAD (feet)	PRESSURE (psi)
EGJ100	444	27	133.2	46.0
EGJ150	520	28	132.3	45.2
EGJ200	172	31	132.0	43.8
EGJ230	3	35	132.0	42.0
EGJ235	357	35	130.8	41.5
EGJ270	35	33	132.4	43.1
EGJ300	76	36	132.7	41.9
EGJ310	127	36	132.7	41.9
EGJ330	202	39	129.8	39.4
EGJ335	347	36	129.8	40.6
EGJ340	279	36	130.0	40.7
EGJ345	136	38	130.0	39.9
EGJ350	186	35	130.1	41.2
EGJ370	207	41	130.2	38.7
EGJ375	263	38	130.0	39.9
EGJ380	429	40	130.0	39.0
EGJ390	281	36	130.0	40.7
EGJ395	301	40	130.8	39.4
EGJ400	520	38	132.7	41.0
EGJ450	3	38	132.7	41.0
EGJ460	336	38	131.6	40.5
EGJ500	3	37	132.7	41.5
EGJ600	3	39	132.7	40.6
EGJ620	950	35	131.9	42.0
EGJ640	3	32	132.0	43.3
EGJ660	487	30	132.0	44.2
EGJ680	347	26	132.2	46.0
EGJ700	32	24	132.9	47.2
EGJ800	75	33	132.1	42.9
EGJ825	340	33	132.3	43.0
EGJ840	0	32	132.0	43.3
EGJ850	77	34	130.4	41.8
EGJ860	285	35	130.1	41.2
EGJ880	89	32	132.0	43.3

PIPE REPORT										
PIPE ID	FROM NODE	TO NODE	LENGTH (ft)	DIAMETER (in)	ROUGHNESS (C-value)	FLOW (gpm)	VELOCITY (ft/s)	HEADLOSS (ft)	HL/1000 (ft/kft)	
EGP01	EGJ700	EGJ100	2637	20	125	-670.83	0.69	0.29	0.11	
EGP03	EGJ100	EGJ150	2538	20	125	1240.10	1.27	0.86	0.34	
EGP05	EGJ150	EGJ200	2650	20	125	720.10	0.74	0.33	0.12	
EGP07	EGJ200	EGJ230	1316	20	125	-236.13	0.24	0.02	0.02	
EGP09	EGJ230	EGJ270	1334	20	125	-1033.56	1.06	0.32	0.24	
EGP11	EGJ270	EGJ300	1366	20	125	-1068.56	1.09	0.35	0.26	
EGP13	EGJ300	EGJ310	659	12	125	127.00	0.36	0.04	0.06	
EGP15	EGJ330	EGJ370	1304	12	125	-307.00	0.87	0.40	0.31	
EGP17	EGJ370	EGJ395	1357	12	125	-373.80	1.06	0.60	0.44	
EGP19	EGJ400	EGJ450	2559	24	125	472.07	0.33	0.06	0.02	
EGP21	EGJ450	EGJ500	1703	24	125	-446.37	0.32	0.04	0.02	
EGP23	EGJ500	EGJ600	2347	24	125	-446.81	0.32	0.05	0.02	
EGP25	EGJ600	EGJ620	2668	16	125	650.53	1.04	0.81	0.30	
EGP27	EGJ620	EGJ640	2692	16	125	-132.84	0.21	0.04	0.02	
EGP29	EGJ640	EGJ680	2640	16	125	-291.83	0.47	0.18	0.07	
EGP31	EGJ680	EGJ700	2577	16	125	-638.83	1.02	0.75	0.29	
EGP33	EGJ200	EGJ660	1561	20	125	331.00	0.34	0.05	0.03	
EGP35	EGJ660	EGJ640	1049	20	125	-156.00	0.16	0.01	0.01	
EGP37	EGJ200	EGJ880	778	20	125	453.23	0.46	0.04	0.05	
EGP39	EGJ880	EGJ840	616	20	125	364.01	0.37	0.02	0.03	
EGP41	EGJ840	EGJ800	1620	20	125	-563.53	0.58	0.13	0.08	
EGP43	EGJ800	EGJ825	1627	20	125	-805.16	0.82	0.25	0.15	
EGP45	EGJ825	EGJ500	1259	20	125	-1145.16	1.17	0.37	0.29	
EGP47	EGJ840	EGJ850	645	12	125	927.54	2.63	1.53	2.37	
EGP49	EGJ850	EGJ860	920	12	125	357.87	1.02	0.37	0.41	
EGP51	EGJ860	EGJ345	868	12	125	72.87	0.21	0.02	0.02	
EGP53	EGJ850	EGJ350	456	12	125	492.67	1.40	0.34	0.73	
EGP55	EGJ350	EGJ345	937	12	125	128.83	0.37	0.06	0.06	
EGP57	EGJ345	EGJ340	408	12	125	65.69	0.19	0.01	0.02	
EGP59	EGJ230	EGJ235	669	12	125	794.42	2.25	1.19	1.78	
EGP61	EGJ235	EGJ340	1393	12	125	437.42	1.24	0.82	0.59	
EGP63	EGJ340	EGJ380	1304	12	125	-17.88	0.05	0.00	0.00	
EGP65	EGJ350	EGJ390	1058	12	125	177.85	0.50	0.12	0.11	
EGP67	EGJ390	EGJ380	1361	12	125	-103.15	0.29	0.06	0.04	
EGP69	EGJ380	EGJ460	1544	12	125	-579.43	1.64	1.53	0.99	
EGP71	EGJ460	EGJ450	475	12	125	-915.43	2.60	1.10	2.31	
EGP73	EGJ380	EGJ375	1184	12	125	29.40	0.08	0.00	0.00	
EGP75	EGJ375	EGJ370	1157	12	125	-233.60	0.66	0.21	0.18	
EGP77	EGJ340	EGJ335	1199	12	125	242.00	0.69	0.24	0.20	
EGP79	EGJ335	EGJ330	1142	12	125	-105.00	0.30	0.05	0.04	
EGP81	EGJ800	EGJ620	1476	12	125	166.63	0.47	0.15	0.10	
EGP83	EJRES01	EGJ100	286	99	125	2354.94	0.10	0.00	0.00	
EGP87	EJRES03	EGJ300	1391	20	125	1271.56	1.30	0.49	0.35	
EGP89	EJRES04	EGJ400	1379	24	125	2040.67	1.45	0.48	0.35	
EGP91	EGJ500	EJRES05	1729	20	125	-1147.72	1.17	0.51	0.29	
EGP93	EJRES06	EGJ600	1687	20	125	1100.34	1.12	0.46	0.27	
EGP95	EGJ370	EGJ395	1357	12	125	-373.80	1.06	0.60	0.44	
EGP97	EGJ395	EGJ400	633	12	125	-1048.60	2.97	1.88	2.98	

ELK GROVE - SOUTHEAST POLICY AREA
MAXIMUM DAY DEMAND + FIRE FLOW MODEL OUTPUT

Updated: February 19, 2014

JUNCTION ID	STATIC DEMAND (gpm)	STATIC PRESSURE (psi)	STATIC HEAD (feet)	FIRE FLOW DEMAND (gpm)	RESIDUAL PRESSURE (psi)	AVAILABLE FLOW AT HYDRANT (gpm)	AVAILABLE FLOW PRESSURE (psi)
EGJ100	222.00	46.00	133.2	4,000	46.00	2,106,439	29.50
EGJ150	260.00	45.50	133.0	4,000	44.20	22,434	20.00
EGJ200	86.00	44.10	132.9	4,000	43.30	30,934	20.00
EGJ230	1.00	42.40	132.9	4,000	41.30	23,149	20.00
EGJ235	179.00	42.30	132.5	4,000	36.70	9,071	20.00
EGJ270	18.00	43.30	133.0	4,000	42.10	21,602	20.00
EGJ300	38.00	42.10	133.1	4,000	41.10	23,816	20.00
EGJ310	63.00	42.10	133.1	4,000	30.60	5,816	20.00
EGJ330	101.00	40.40	132.3	4,000	29.00	5,723	20.00
EGJ335	173.00	41.70	132.2	4,000	30.70	6,129	20.00
EGJ340	140.00	41.70	132.3	4,000	37.50	10,896	20.00
EGJ345	68.00	40.90	132.3	4,000	35.90	9,487	20.00
EGJ350	93.00	42.20	132.3	4,000	36.90	9,454	20.00
EGJ370	104.00	39.60	132.4	4,000	33.80	8,381	20.00
EGJ375	132.00	40.90	132.3	4,000	32.10	6,764	20.00
EGJ380	214.00	40.00	132.3	4,000	35.30	9,813	20.00
EGJ390	140.00	41.70	132.3	4,000	32.70	6,831	20.00
EGJ395	161.30	40.10	132.5	4,000	35.10	9,172	20.00
EGJ400	260.00	41.20	133.1	4,000	40.70	38,819	20.00
EGJ450	1.00	41.20	133.0	4,000	40.60	33,023	20.00
EGJ460	168.00	41.10	132.7	4,000	36.50	9,836	20.00
EGJ500	1.00	41.60	133.1	4,000	41.20	43,622	20.00
EGJ600	1.00	40.80	133.1	4,000	40.20	32,512	20.00
EGJ620	475.00	42.40	132.8	4,000	39.90	14,809	20.00
EGJ640	1.00	43.70	132.9	4,000	42.00	18,495	20.00
EGJ660	243.00	44.60	132.9	4,000	43.00	20,321	20.00
EGJ680	174.00	46.30	132.9	4,000	42.40	11,834	20.00
EGJ700	16.00	47.30	133.1	4,000	45.20	16,731	20.00
EGJ800	37.00	43.30	132.9	4,000	42.10	22,887	20.00
EGJ825	170.00	43.30	133.0	4,000	42.20	23,985	20.00
EGJ840	0.00	43.70	132.9	4,000	42.50	24,321	20.00
EGJ850	39.00	42.60	132.4	4,000	38.30	10,776	20.00
EGJ860	143.00	42.20	132.3	4,000	34.30	7,457	20.00
EGJ880	42.00	43.70	132.9	4,000	42.60	24,988	20.00

ELK GROVE - SOUTHEAST POLICY AREA
MAXIMUM DAY DEMAND + FIRE FLOW AT NODE EGJ390 MODEL OUTPUT

Updated: February 19, 2014

JUNCTION REPORT				
JUNCTION NODE ID	DEMAND (gpm)	ELEVATION (feet)	HEAD (feet)	PRESSURE (psi)
EGJ100	222.0	27.0	133.20	46.02
EGJ150	260.0	28.0	132.44	45.25
EGJ200	86.0	31.0	131.94	43.74
EGJ230	1.0	35.0	131.93	42.00
EGJ235	179.0	35.0	129.47	40.93
EGJ270	18.0	33.0	132.32	43.03
EGJ300	38.0	36.0	132.72	41.91
EGJ310	63.0	36.0	132.71	41.90
EGJ330	101.0	39.0	126.49	37.91
EGJ335	173.0	36.0	125.91	38.96
EGJ340	140.0	36.0	125.69	38.86
EGJ345	68.0	38.0	125.25	37.80
EGJ350	93.0	35.0	123.51	38.35
EGJ370	104.0	41.0	127.49	37.48
EGJ375	132.0	38.0	125.89	38.08
EGJ380	214.0	40.0	124.78	36.74
EGJ390	4140.0	36.0	111.57	32.74
EGJ395	150.0	40.0	129.16	38.63
EGJ400	260.0	38.0	132.60	40.99
EGJ450	1.0	38.0	132.52	40.95
EGJ460	168.0	38.0	130.33	40.00
EGJ500	1.0	37.0	132.61	41.43
EGJ600	1.0	39.0	132.69	40.60
EGJ620	475.0	35.0	132.01	42.03
EGJ640	1.0	32.0	132.01	43.33
EGJ660	243.0	30.0	131.95	44.18
EGJ680	174.0	26.0	132.34	46.08
EGJ700	16.0	24.0	132.97	47.22
EGJ800	37.0	33.0	131.97	42.89
EGJ825	170.0	33.0	132.28	43.02
EGJ840	0.0	32.0	131.64	43.17
EGJ850	39.0	34.0	125.94	39.84
EGJ860	143.0	35.0	125.46	39.19
EGJ880	42.0	32.0	131.77	43.23

PIPE REPORT										
PIPE ID	FROM NODE	TO NODE	LENGTH (ft)	DIAMETER (in)	ROUGHNESS (C-value)	FLOW (gpm)	VELOCITY (ft/s)	HEADLOSS (ft)	HL/1000 (ft/kt)	
EGP01	EGJ700	EGJ100	2837.00	20	125	-596.16	0.61	0.23	0.09	
EGP03	EGJ100	EGJ150	2638.00	20	125	1166.76	1.19	0.76	0.30	
EGP05	EGJ150	EGJ200	2650.00	20	125	906.76	0.93	0.50	0.19	
EGP07	EGJ200	EGJ230	1316.00	20	125	-41.12	0.04	0.00	0.00	
EGP09	EGJ230	EGJ270	1334.00	20	125	-1136.35	1.16	0.38	0.29	
EGP11	EGJ270	EGJ300	1366.00	20	125	-1154.35	1.18	0.40	0.30	
EGP13	EGJ300	EGJ310	659.00	12	125	63.00	0.18	0.01	0.02	
EGP15	EGJ330	EGJ370	1304.00	12	125	-504.85	1.43	1.00	0.77	
EGP17	EGJ370	EGJ395	1357.00	12	125	-651.00	1.85	1.67	1.23	
EGP19	EGJ400	EGJ450	2559.00	24	125	580.19	0.41	0.09	0.03	
EGP21	EGJ450	EGJ500	1703.00	24	125	-749.06	0.53	0.09	0.05	
EGP23	EGJ500	EGJ600	2347.00	24	125	-578.22	0.41	0.08	0.03	
EGP25	EGJ600	EGJ620	2668.00	16	125	591.96	0.94	0.68	0.25	
EGP27	EGJ620	EGJ640	2692.00	16	125	-38.55	0.06	0.00	0.00	
EGP29	EGJ640	EGJ680	2640.00	16	125	-406.16	0.65	0.33	0.13	
EGP31	EGJ680	EGJ700	2577.00	16	125	-580.16	0.93	0.63	0.24	
EGP33	EGJ200	EGJ660	1561.00	20	125	-200.71	0.21	0.02	0.01	
EGP35	EGJ660	EGJ640	1049.00	20	125	-443.71	0.45	0.05	0.05	
EGP37	EGJ200	EGJ880	778.00	20	125	980.36	1.00	0.17	0.22	
EGP39	EGJ880	EGJ840	616.00	20	125	938.36	0.96	0.12	0.20	
EGP41	EGJ840	EGJ800	1620.00	20	125	-948.92	0.97	0.33	0.21	
EGP43	EGJ800	EGJ825	1627.00	20	125	-907.51	0.93	0.31	0.19	
EGP45	EGJ825	EGJ500	1259.00	20	125	-1077.51	1.10	0.33	0.26	
EGP47	EGJ840	EGJ850	645.00	12	125	1887.28	5.35	5.70	8.84	
EGP49	EGJ850	EGJ860	920.00	12	125	412.44	1.17	0.49	0.53	
EGP51	EGJ860	EGJ345	868.00	12	125	269.45	0.76	0.21	0.24	
EGP53	EGJ850	EGJ350	456.00	12	125	1435.84	4.07	2.43	5.33	
EGP55	EGJ350	EGJ345	937.00	12	125	-811.32	2.30	1.73	1.85	
EGP57	EGJ345	EGJ340	408.00	12	125	-609.88	1.73	0.45	1.09	
EGP59	EGJ230	EGJ235	669.00	12	125	1176.46	3.34	2.46	3.68	
EGP61	EGJ235	EGJ340	1393.00	12	125	997.46	2.83	3.78	2.71	
EGP63	EGJ340	EGJ380	1304.00	12	125	478.43	1.36	0.91	0.70	
EGP65	EGJ350	EGJ390	1058.00	12	125	2154.16	6.11	11.94	11.29	
EGP67	EGJ390	EGJ380	1361.00	12	125	-1985.84	5.63	13.22	9.71	
EGP69	EGJ380	EGJ460	1544.00	12	125	-1160.25	3.29	5.54	3.59	
EGP71	EGJ460	EGJ450	475.00	12	125	-1328.25	3.77	2.19	4.61	
EGP73	EGJ380	EGJ375	1184.00	12	125	-561.16	1.59	1.11	0.93	
EGP75	EGJ375	EGJ370	1157.00	12	125	-693.16	1.97	1.60	1.38	
EGP77	EGJ340	EGJ335	1199.00	12	125	-230.85	0.65	0.22	0.18	
EGP79	EGJ335	EGJ330	1142.00	12	125	-403.85	1.15	0.58	0.51	
EGP81	EGJ800	EGJ620	1476.00	12	125	-78.41	0.22	0.04	0.02	
EGP83	EJRES01	EGJ100	286.00	99	125	1984.92	0.08	0.00	0.00	
EGP87	EJRES03	EGJ300	1391.00	20	125	1255.35	1.28	0.48	0.34	
EGP89	EJRES04	EGJ400	1379.00	24	125	2292.20	1.63	0.60	0.43	
EGP91	EGJ500	EJRES05	1728.50	20	125	-1249.35	1.28	0.59	0.34	
EGP93	EJRES06	EGJ600	1686.92	20	125	1171.18	1.20	0.51	0.30	
EGP95	EGJ370	EGJ395	1357.00	12	125	-651.00	1.85	1.67	1.23	
EGP97	EGJ395	EGJ400	633.00	12	125	-1452.00	4.12	3.44	5.44	

ELK GROVE - SOUTHEAST POLICY AREA
MAXIMUM DAY DEMAND + FIRE FLOW AT NODE EGJ680 MODEL OUTPUT

Updated: February 19, 2014

JUNCTION REPORT				
JUNCTION NODE ID	DEMAND (gpm)	ELEVATION (feet)	HEAD (feet)	PRESSURE (psi)
EGJ100	222.0	27.0	133.20	46.02
EGJ150	260.0	28.0	132.49	45.27
EGJ200	86.0	31.0	132.03	43.78
EGJ230	1.0	35.0	132.17	42.10
EGJ235	179.0	35.0	131.91	41.99
EGJ270	18.0	33.0	132.48	43.10
EGJ300	38.0	36.0	132.80	41.95
EGJ310	63.0	36.0	132.79	41.94
EGJ330	101.0	39.0	131.77	40.20
EGJ335	173.0	36.0	131.73	41.48
EGJ340	140.0	36.0	131.76	41.49
EGJ345	68.0	38.0	131.76	40.63
EGJ350	93.0	35.0	131.77	41.93
EGJ370	104.0	41.0	131.95	39.41
EGJ375	132.0	38.0	131.82	40.65
EGJ380	214.0	40.0	131.81	39.78
EGJ390	140.0	36.0	131.76	41.49
EGJ395	150.0	40.0	132.21	39.95
EGJ400	260.0	38.0	132.94	41.14
EGJ450	1.0	38.0	132.85	41.10
EGJ460	168.0	38.0	132.45	40.93
EGJ500	1.0	37.0	132.85	41.53
EGJ600	1.0	39.0	132.86	40.67
EGJ620	475.0	35.0	131.62	41.87
EGJ640	1.0	32.0	130.73	42.78
EGJ660	243.0	30.0	131.16	43.83
EGJ680	4174.0	26.0	123.92	42.43
EGJ700	16.0	24.0	130.79	46.27
EGJ800	37.0	33.0	132.17	42.97
EGJ825	170.0	33.0	132.50	43.11
EGJ840	0.0	32.0	132.05	43.35
EGJ850	39.0	34.0	131.81	42.38
EGJ860	143.0	35.0	131.76	41.93
EGJ880	42.0	32.0	132.04	43.35

PIPE REPORT										
PIPE ID	FROM NODE	TO NODE	LENGTH (ft)	DIAMETER (in)	ROUGHNESS (C-value)	FLOW (gpm)	VELOCITY (ft/s)	HEADLOSS (ft)	HL/1000 (ft/kft)	
EGP01	EGJ700	EGJ100	2637.00	20	125	-2122.31	2.17	2.41	0.91	
EGP03	EGJ100	EGJ150	2638.00	20	125	1124.00	1.15	0.71	0.28	
EGP05	EGJ150	EGJ200	2650.00	20	125	864.00	0.88	0.46	0.17	
EGP07	EGJ200	EGJ230	1316.00	20	125	-662.24	0.68	0.14	0.11	
EGP09	EGJ230	EGJ270	1334.00	20	125	-1012.86	1.03	0.31	0.23	
EGP11	EGJ270	EGJ300	1366.00	20	125	-1030.86	1.05	0.33	0.24	
EGP13	EGJ300	EGJ310	659.00	12	125	63.00	0.18	0.01	0.02	
EGP15	EGJ330	EGJ370	1304.00	12	125	-196.14	0.56	0.17	0.13	
EGP17	EGJ370	EGJ395	1357.00	12	125	-238.99	0.68	0.26	0.19	
EGP19	EGJ400	EGJ450	2559.00	24	125	579.72	0.41	0.09	0.03	
EGP21	EGJ450	EGJ500	1703.00	24	125	48.25	0.03	0.00	0.00	
EGP23	EGJ500	EGJ600	2347.00	24	125	-126.31	0.09	0.00	0.00	
EGP25	EGJ600	EGJ620	2668.00	16	125	817.97	1.31	1.23	0.46	
EGP27	EGJ620	EGJ640	2692.00	16	125	684.88	1.09	0.90	0.33	
EGP29	EGJ640	EGJ680	2640.00	16	125	2067.69	3.30	6.80	2.58	
EGP31	EGJ680	EGJ700	2577.00	16	125	-2106.31	3.36	6.87	2.67	
EGP33	EGJ200	EGJ660	1561.00	20	125	1626.80	1.66	0.87	0.56	
EGP35	EGJ660	EGJ640	1049.00	20	125	1383.80	1.41	0.43	0.41	
EGP37	EGJ200	EGJ880	778.00	20	125	-186.56	0.19	0.01	0.01	
EGP39	EGJ880	EGJ840	616.00	20	125	-228.56	0.23	0.01	0.01	
EGP41	EGJ840	EGJ800	1620.00	20	125	-564.48	0.58	0.13	0.08	
EGP43	EGJ800	EGJ825	1627.00	20	125	-943.40	0.96	0.33	0.20	
EGP45	EGJ825	EGJ500	1259.00	20	125	-1113.40	1.14	0.35	0.28	
EGP47	EGJ840	EGJ850	645.00	12	125	335.92	0.95	0.23	0.36	
EGP49	EGJ850	EGJ860	920.00	12	125	126.04	0.36	0.05	0.06	
EGP51	EGJ860	EGJ345	868.00	12	125	-16.96	0.05	0.00	0.00	
EGP53	EGJ850	EGJ350	456.00	12	125	170.89	0.48	0.05	0.10	
EGP55	EGJ350	EGJ345	937.00	12	125	37.14	0.11	0.01	0.01	
EGP57	EGJ345	EGJ340	408.00	12	125	-47.82	0.14	0.00	0.01	
EGP59	EGJ230	EGJ235	669.00	12	125	349.62	0.99	0.26	0.39	
EGP61	EGJ235	EGJ340	1393.00	12	125	170.62	0.48	0.14	0.10	
EGP63	EGJ340	EGJ380	1304.00	12	125	-95.07	0.27	0.05	0.03	
EGP65	EGJ350	EGJ390	1058.00	12	125	40.74	0.12	0.01	0.01	
EGP67	EGJ390	EGJ380	1361.00	12	125	-99.26	0.28	0.05	0.04	
EGP69	EGJ380	EGJ460	1544.00	12	125	-362.47	1.03	0.64	0.42	
EGP71	EGJ460	EGJ450	475.00	12	125	-530.47	1.50	0.40	0.84	
EGP73	EGJ380	EGJ375	1184.00	12	125	-45.85	0.13	0.01	0.01	
EGP75	EGJ375	EGJ370	1157.00	12	125	-177.85	0.50	0.13	0.11	
EGP77	EGJ340	EGJ335	1199.00	12	125	77.86	0.22	0.03	0.02	
EGP79	EGJ335	EGJ330	1142.00	12	125	-95.14	0.27	0.04	0.03	
EGP81	EGJ800	EGJ620	1476.00	12	125	341.92	0.97	0.55	0.37	
EGP83	EJRES01	EGJ100	286.00	99	125	3468.31	0.14	0.00	0.00	
EGP87	EJRES03	EGJ300	1391.00	20	125	1131.86	1.16	0.40	0.28	
EGP89	EJRES04	EGJ400	1379.00	24	125	1467.71	1.04	0.26	0.19	
EGP91	EGJ500	EJRES05	1728.50	20	125	-939.85	0.96	0.35	0.20	
EGP93	EJRES06	EGJ600	1686.92	20	125	945.28	0.97	0.34	0.20	
EGP95	EGJ370	EGJ395	1357.00	12	125	-238.99	0.68	0.26	0.19	
EGP97	EGJ395	EGJ400	633.00	12	125	-627.99	1.78	0.73	1.15	

ELK GROVE - SOUTHEAST POLICY AREA
MAXIMUM DAY DEMAND + FIRE FLOW AT NODE EGJ330 MODEL OUTPUT

Updated: February 19, 2014

JUNCTION REPORT				
JUNCTION NODE ID	DEMAND (gpm)	ELEVATION (feet)	HEAD (feet)	PRESSURE (psi)
EGJ100	222.0	27.0	133.20	46.02
EGJ150	260.0	28.0	132.52	45.29
EGJ200	86.0	31.0	132.10	43.80
EGJ230	1.0	35.0	132.09	42.07
EGJ235	179.0	35.0	129.67	41.02
EGJ270	18.0	33.0	132.42	43.08
EGJ300	38.0	36.0	132.78	41.93
EGJ310	63.0	36.0	132.77	41.93
EGJ330	4101.0	39.0	106.04	29.05
EGJ335	173.0	36.0	114.90	34.19
EGJ340	140.0	36.0	125.97	38.98
EGJ345	68.0	38.0	126.67	38.42
EGJ350	93.0	35.0	127.14	39.93
EGJ370	104.0	41.0	123.22	35.63
EGJ375	132.0	38.0	124.49	37.48
EGJ380	214.0	40.0	126.36	37.42
EGJ390	140.0	36.0	126.64	39.28
EGJ395	150.0	40.0	126.37	37.42
EGJ400	260.0	38.0	132.50	40.95
EGJ450	1.0	38.0	132.48	40.94
EGJ460	168.0	38.0	130.70	40.17
EGJ500	1.0	37.0	132.61	41.43
EGJ600	1.0	39.0	132.70	40.60
EGJ620	475.0	35.0	132.15	42.09
EGJ640	1.0	32.0	132.15	43.39
EGJ660	243.0	30.0	132.10	44.24
EGJ680	174.0	26.0	132.43	46.12
EGJ700	16.0	24.0	132.99	47.23
EGJ800	37.0	33.0	132.13	42.95
EGJ825	170.0	33.0	132.36	43.05
EGJ840	0.0	32.0	131.91	43.29
EGJ850	39.0	34.0	128.13	40.79
EGJ860	143.0	35.0	127.19	39.95
EGJ880	42.0	32.0	131.98	43.32

PIPE REPORT										
PIPE ID	FROM NODE	TO NODE	LENGTH (ft)	DIAMETER (in)	ROUGHNESS (C-value)	FLOW (gpm)	VELOCITY (ft/s)	HEADLOSS (ft)	HL/1000 (ft/kt)	
EGP01	EGJ700	EGJ100	2637.00	20	125	-562.34	0.57	0.21	0.08	
EGP03	EGJ100	EGJ150	2638.00	20	125	1092.84	1.12	0.68	0.27	
EGP05	EGJ150	EGJ200	2650.00	20	125	832.84	0.85	0.43	0.16	
EGP07	EGJ200	EGJ230	1316.00	20	125	111.36	0.11	0.01	0.00	
EGP09	EGJ230	EGJ270	1334.00	20	125	-1055.17	1.08	0.33	0.25	
EGP11	EGJ270	EGJ300	1366.00	20	125	-1073.17	1.10	0.35	0.26	
EGP13	EGJ300	EGJ310	659.00	12	125	63.00	0.18	0.01	0.02	
EGP15	EGJ330	EGJ370	1304.00	12	125	-2341.70	6.64	17.18	13.18	
EGP17	EGJ370	EGJ395	1357.00	12	125	-916.45	2.60	3.15	2.32	
EGP19	EGJ400	EGJ450	2559.00	24	125	262.07	0.19	0.02	0.01	
EGP21	EGJ450	EGJ500	1703.00	24	125	-923.86	0.66	0.14	0.08	
EGP23	EGJ500	EGJ600	2347.00	24	125	-618.96	0.44	0.09	0.04	
EGP25	EGJ600	EGJ620	2668.00	16	125	532.44	0.85	0.56	0.21	
EGP27	EGJ620	EGJ640	2692.00	16	125	14.15	0.02	0.00	0.00	
EGP29	EGJ640	EGJ680	2640.00	16	125	-372.34	0.59	0.28	0.11	
EGP31	EGJ680	EGJ700	2577.00	16	125	-546.34	0.87	0.56	0.22	
EGP33	EGJ200	EGJ660	1561.00	20	125	-142.48	0.15	0.01	0.01	
EGP35	EGJ660	EGJ640	1049.00	20	125	-385.48	0.39	0.04	0.04	
EGP37	EGJ200	EGJ880	778.00	20	125	777.97	0.79	0.11	0.14	
EGP39	EGJ880	EGJ840	616.00	20	125	735.97	0.75	0.08	0.13	
EGP41	EGJ840	EGJ800	1620.00	20	125	-774.66	0.79	0.23	0.14	
EGP43	EGJ800	EGJ825	1627.00	20	125	-768.37	0.78	0.23	0.14	
EGP45	EGJ825	EGJ500	1259.00	20	125	-938.37	0.96	0.25	0.20	
EGP47	EGJ840	EGJ850	645.00	12	125	1510.63	4.29	3.77	5.85	
EGP49	EGJ850	EGJ860	920.00	12	125	587.60	1.67	0.94	1.02	
EGP51	EGJ860	EGJ345	868.00	12	125	444.60	1.26	0.53	0.61	
EGP53	EGJ850	EGJ350	456.00	12	125	884.03	2.51	0.99	2.17	
EGP55	EGJ350	EGJ345	937.00	12	125	403.11	1.14	0.47	0.51	
EGP57	EGJ345	EGJ340	408.00	12	125	779.72	2.21	0.70	1.72	
EGP59	EGJ230	EGJ235	669.00	12	125	1165.53	3.31	2.42	3.62	
EGP61	EGJ235	EGJ340	1393.00	12	125	986.53	2.80	3.70	2.66	
EGP63	EGJ340	EGJ380	1304.00	12	125	-306.06	0.87	0.40	0.30	
EGP65	EGJ350	EGJ390	1058.00	12	125	387.92	1.10	0.50	0.47	
EGP67	EGJ390	EGJ380	1361.00	12	125	247.92	0.70	0.28	0.21	
EGP69	EGJ380	EGJ460	1544.00	12	125	-1016.93	2.88	4.34	2.81	
EGP71	EGJ460	EGJ450	475.00	12	125	-1184.93	3.36	1.77	3.73	
EGP73	EGJ380	EGJ375	1184.00	12	125	744.79	2.11	1.87	1.58	
EGP75	EGJ375	EGJ370	1157.00	12	125	612.79	1.74	1.27	1.10	
EGP77	EGJ340	EGJ335	1199.00	12	125	1932.30	5.48	11.07	9.23	
EGP79	EGJ335	EGJ330	1142.00	12	125	1759.30	4.99	8.86	7.76	
EGP81	EGJ800	EGJ620	1476.00	12	125	-43.29	0.12	0.01	0.01	
EGP83	EJRES01	EGJ100	286.00	99	125	1877.18	0.08	0.00	0.00	
EGP87	EJRES03	EGJ300	1391.00	20	125	1174.17	1.20	0.42	0.30	
EGP89	EJRES04	EGJ400	1379.00	24	125	2504.98	1.78	0.70	0.51	
EGP91	EGJ500	EJRES05	1728.50	20	125	-1244.27	1.27	0.59	0.34	
EGP93	EJRES06	EGJ600	1686.92	20	125	1152.40	1.18	0.50	0.29	
EGP95	EGJ370	EGJ395	1357.00	12	125	-916.45	2.60	3.15	2.32	
EGP97	EGJ395	EGJ400	633.00	12	125	-1982.91	5.63	6.13	9.68	



Appendix C Proposed Water System Layout

ELK GROVE SOUTHEAST POLICY AREA

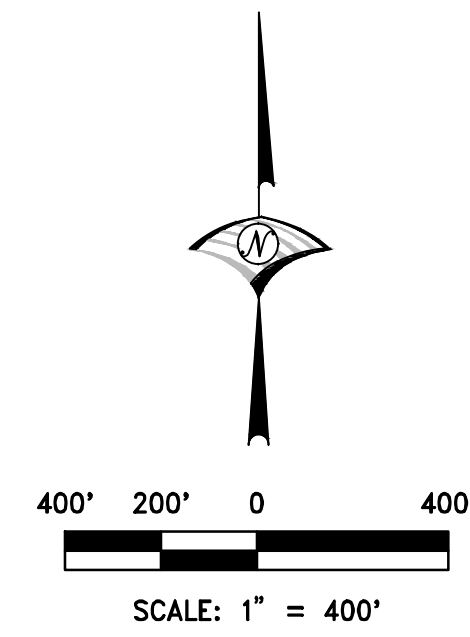
PROPOSED WATER SYSTEM LAYOUT

ELK GROVE CALIFORNIA

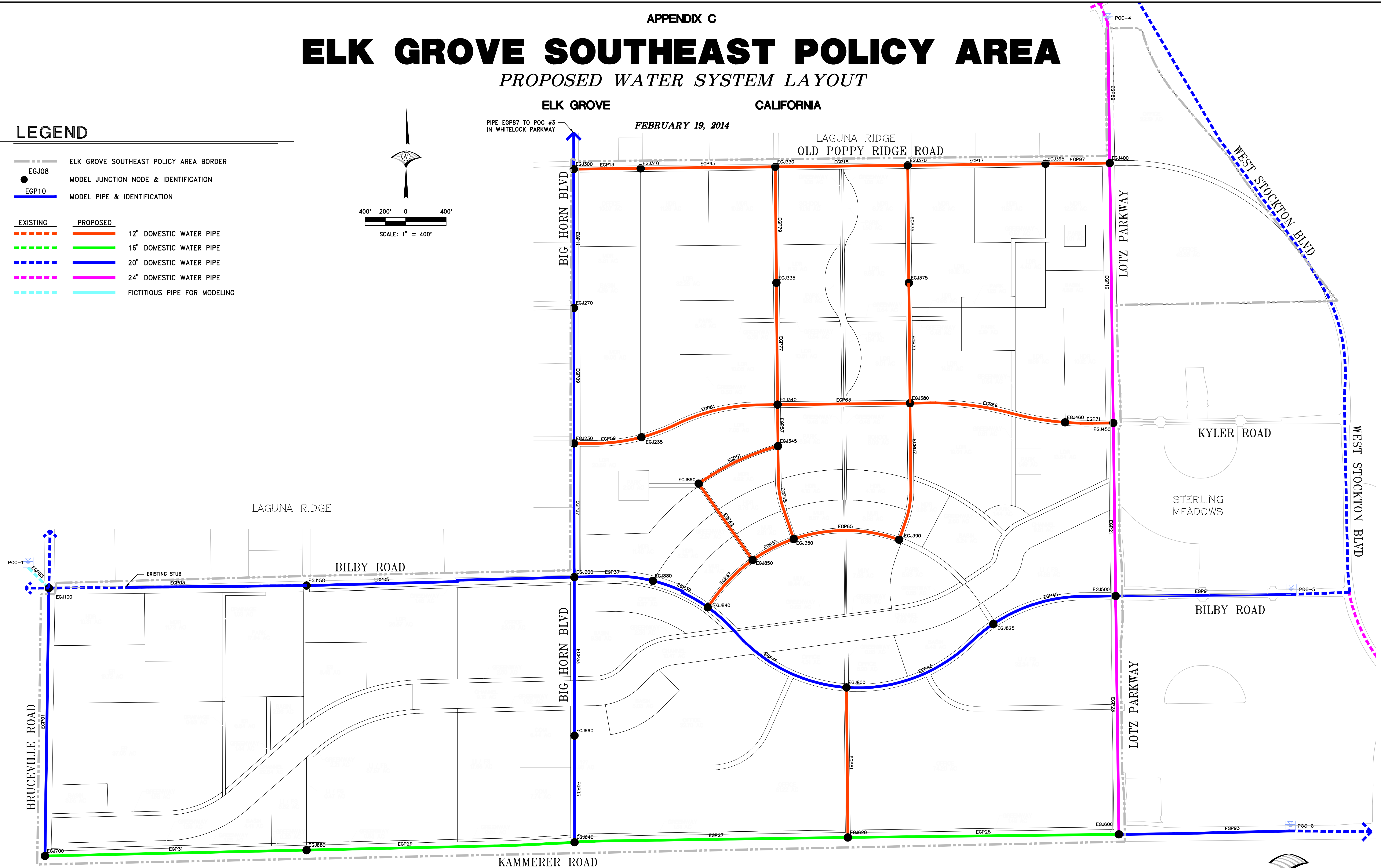
FEBRUARY 19, 2014

LEGEND

- ELK GROVE SOUTHEAST POLICY AREA BORDER
 - EGJ08 MODEL JUNCTION NODE & IDENTIFICATION
 - EGP10 MODEL PIPE & IDENTIFICATION
- | EXISTING | PROPOSED | |
|----------|----------|------------------------------|
| --- | — | 12" DOMESTIC WATER PIPE |
| --- | — | 16" DOMESTIC WATER PIPE |
| --- | — | 20" DOMESTIC WATER PIPE |
| --- | — | 24" DOMESTIC WATER PIPE |
| --- | — | FICTITIOUS PIPE FOR MODELING |



PIPE EGP87 TO POC #3 IN WHITELOCK PARKWAY



J:\2008-s\2856_SSPA\SEPA-CA\Civil\Studies\Water\Exhibits\APP-C-WTR-LAYOUT-SEPA.dwg 2/26/2014 3:52 PM Tyler Kaushagen