RESOLUTION NO. 2014-152

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ELK GROVE DECLARING ITS INTENT TO ADOPT A GENERAL PLAN AMENDMENT; ADOPT A COMMINUTY PLAN; ADOPT AN ORDINANCE ESTABLISHING THE SOUTHEAST POLICY AREA SPECIAL PLANNING AREA AND REZONING PROPERTIES IN THE SPECIAL PLANNING AREA; AND ACCEPTING THE MASTER WATER PLAN, LEVEL II SEWER STUDY, AND DRAINAGE STUDY FOR THE SOUTHEAST POLICY AREA, PROJECT NO. PL0016

WHEREAS, on November 19, 2003, the City Council adopted Resolution 2003-217 adopting the General Plan of the City of Elk Grove as required by State law; and

WHEREAS, the General Plan included Policy LU-32 establishing the Southeast Policy Area, as a future growth area of the City; and

WHEREAS, the City Council has directed the preparation of a strategic plan for the Southeast Policy Area as a City project; and

WHEREAS, the Southeast Policy Area Strategic Plan is a "project" under the California Environmental Quality Act (CEQA); and

WHEREAS, in compliance with Public Resources Code §21080.4, a Notice of Preparation (NOP) was prepared by the City of Elk Grove and was distributed to the State Clearinghouse, Office of Planning and Research, responsible agencies and other interested parties on April 19, 2013 with the comment period ending on May 20, 2013; and,

WHEREAS, the City of Elk Grove distributed a Notice of Availability for the Project's Draft EIR on March 21, 2014, which started the 45-day public review period, ending on May 5, 2014; and,

WHEREAS, on June 19, 2014, the Planning Commission held a duly-noticed public hearing as required by law to consider all of the information presented by staff and public testimony presented in writing and at the meeting; and

WHEREAS, on July 9, 2014 the City Council held a duly-noticed public hearing as required by law to consider all of the information presented by staff and public testimony presented in writing and at the meeting; and

WHEREAS, the City Council directed that:

1. Text be added to page 4-6 of the draft Special Planning Area calling for dedication and/or reservation of additional area along Kammerer Road for future improvements in keeping with the intent of the Capital Southeast Connector as determined by the City; and

2. That the building form diagrams in Chapter 4 of the Special Planning Area be updated to correct the street forms for consistency with the common street form used for that building form.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Elk Grove hereby declares its intent to adopt or approve the following based upon the findings listed below:

1) Amend the Introduction, Circulation Element, and Land Use Element of the General Plan as provided in Exhibit A;
2) Adopt the Southeast Policy Area Community Plan, as provided in Exhibit B, as a Community Plan in the General Plan;
3) Adopt the Southeast Policy Area Special Planning Area, as provided in Exhibit C, as a new special purpose zoning district in Title 23 of the Elk Grove Municipal Code (Zoning);
4) Rezone the properties in the Southeast Policy Area to the Southeast Policy Area Special Planning Area as illustrated in Exhibit D; and
5) Accept the Master Water Plan, Level II Sewer Study, and Drainage Study for the Southeast Policy Area as provided in Exhibits E, F, and G, respectively.

General Plan Amendment

Finding: The General Plan Amendment is consistent with the goals and policies of the Elk Grove General Plan.

Evidence: The proposed General Plan Amendment would update two figures in the Circulation Element and would update Land Use Policy LU-32 consistent with the planning for the Southeast Policy Area. The changes to the circulation figures clarify the alignment of future light rail and of arterial and collector roadways, consistent with Policies CI-9 and CI-10. The changes to Policy LU-32 provide a reference to the Southeast Policy Area Community Plan; this amendment is internally consistent with the balance of the General Plan as it only relates to the Southeast Policy Area and does not affect other policy areas of the General Plan (e.g., circulation, open space, conservation, safety, noise).

Community Plan

Finding: The community plan is consistent with the General Plan goals, policies, and implementation programs

Evidence: The proposed Southeast Policy Area Community Plan is consistent with and implements the goals and polices of the General Plan by providing detailed policy and planning for new development in this area. Specifically, the proposed Community Plan implements the following General Plan goals and policies: Guiding Goal 1 and subsequent focused Goals 1-2, 1-3, 1-5, 1-6, 1-7, 1-

8, and 1-9; Guiding Goal 2 and subsequent focused Goals 2-1, 2-2, 2-3, and 2-4; Guiding Goal 3 and subsequent focused Goals 3-1 and 3-3; Guiding Goal 4 and subsequent focused Goal 4-2; Policies CI-9 (light rail alignment), CI-10 (arterial and collector roads), LU-4 (conformity of subsequent planning to the General Plan), LU-10 (jobs-housing ratio), LU-32 (Southeast Policy Area implementation), PF-2 (service agency coordination), PF-3 (water demand planning and delivery), PF-8 (sewer service and availability), PF-19 (infrastructure phasing), and PF-20 through PF-25 (infrastructure financing).

Special Planning Area Establishment

Finding #1: That the proposed special planning area is consistent with the goals, policies, and objectives of the General Plan.

Evidence: The proposed Southeast Policy Area Special Planning Area is consistent with the goals and policies of the General Plan, specifically implementing the direction of Policy LU-32 and its program the Southeast Policy Area Community Plan.

Finding #2: That the proposed special planning area meets the requirements set forth in EGMC Title 23.

Evidence: Title 23 of the Municipal Code requires that a special planning area contain, at a minimum, a list of allowed uses, development standards for development, other design standards as appropriate, and identification of reasons for establishment of the special planning area. Chapter 3 of the Southeast Policy Area Special Planning Area identifies the allowed, conditionally allowed, and prohibited uses. Chapter 4 details development standards for streets, buildings, frontages, community spaces, and common features. Chapter 5 provides design protocols (standards and guidelines) for development area-wide, within the private realm, and within the public realm. Chapter 1 identifies the reasons for establishing the Special Planning Area, specifically stating that the "purpose...is to provide unique and imaginative planning standards and regulations, which cannot be provided through the application of the City's standard zoning districts."

Finding #3: That the proposed special planning area is needed because the project is not possible under the existing zoning requirements.

Evidence: As outlined in the purpose of the Special Planning Area, the "purpose...is to provide unique and imaginative planning standards and regulations, which cannot be provided through the application of the City's standard zoning districts." The goals and policies of the Southeast Policy Area, as provided in the Community Plan, call for creating an employment-oriented development with a strong sense of place, quality urban design elements, and a mixed land use plan. To achieve these goals and policies, the City has developed the Special Planning Area as a "modified form-based code, which is an alternative approach to zoning than has traditionally been used in Elk Grove. This code places greater emphasis on the character and function of development than provided in traditional zoning in order to create a more complete and vibrant community. It does this through standards for pedestrian spaces, requirements for building orientation, and design standards for new buildings." Further, the Special Planning Area document address and implements the goals and policies of the Community Plan to correct the disproportionate jobs/housing ratio of the City by specifically allowing higher density employment development within specific, targeted, employment areas.

Rezoning

Finding: The proposed zoning amendment (text or map) is consistent with the General Plan goals, policies, and implementation programs.

Evidence: The zoning of the subject property into the Southeast Policy Area Special Planning Area is consistent with the General Plan as it implements General Plan Policy LU-32 and the corresponding Southeast Policy Area Community Plan.

PASSED AND ADOPTED by the City Council of the City of Elk Grove this 9th day of July 2014

JAMES COOPER, VICE MAYOR of the CITY OF ELK GROVE

ATTEST:

JASON LINDGREN, CITY CLERK

APPROVED AS TO FORM:

JONATHAN P. HOBBS, CITY ATTORNEY

Note to Reader: Proposed changes are shown in ~~strikeout~~/underline with proposed deletions shown with ~~strikeout~~ and additions shown with an underline.

Introduction

The Community Plan discussion on page 16 is amended to read as follows and a discussion of specific plans is added:

~~The Elk Grove~~ Community Plans

~~At the time of incorporation, the Elk Grove~~ Prior to incorporation, the Elk Grove community was governed by the Sacramento County General Plan ~~and Zoning Code were~~ which included ~~accompanied by~~ the Elk Grove Community Plan and the Franklin-Laguna Community Plan planning documents, first approved in the late 1970s. These documents ~~which~~ provided some limited policy direction and a land use map which frequently differed from the land use map of the General Plan or the zoning map— and in some cases were not consistent with either.

With the adoption of ~~this~~ the 2003 General Plan, the need for ~~the~~ these specific Community Plans— ~~adopted by the County in order to provide planning at a more detailed level than was possible at the time the County's community plans were first adopted—is~~ was no longer ~~valid~~ necessary. Therefore, ~~this~~ the General Plan ~~supersedes~~ did not incorporate the Elk Grove Community Plan and the Franklin-Laguna Community Plan, which are no longer in effect.

As the City continues to grow and develop, the City may identify the need to establish new community plans for specific areas where more detailed policies than are available in this General Plan are necessary for successful development. New community plans will be established as part of this General Plan. Specifically, the City has prepared and adopted the Southeast Policy Area Community Plan, which will guide development in the Southeast Policy Area.

Circulation Element

Figure CI-1 is amended to read as follows:

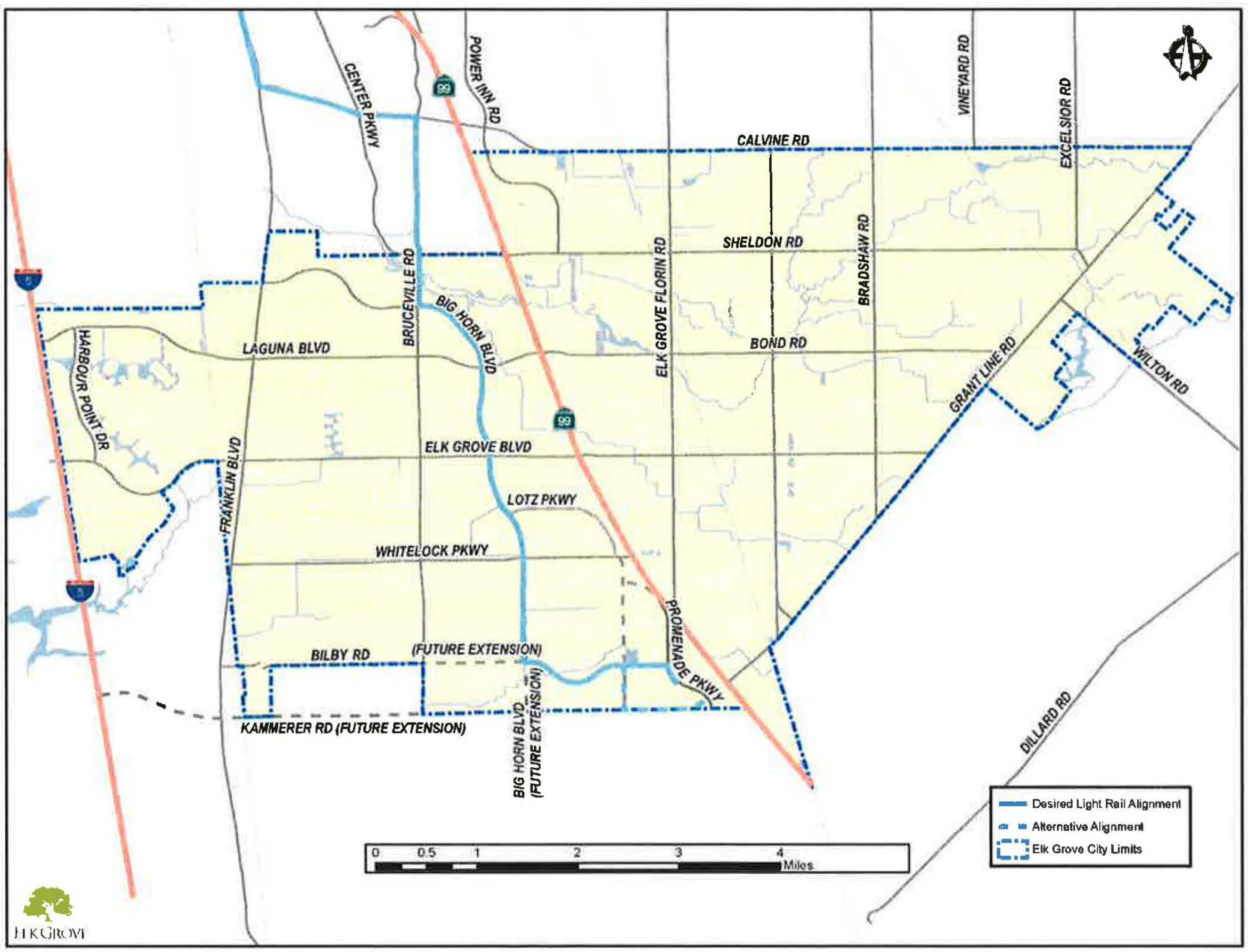
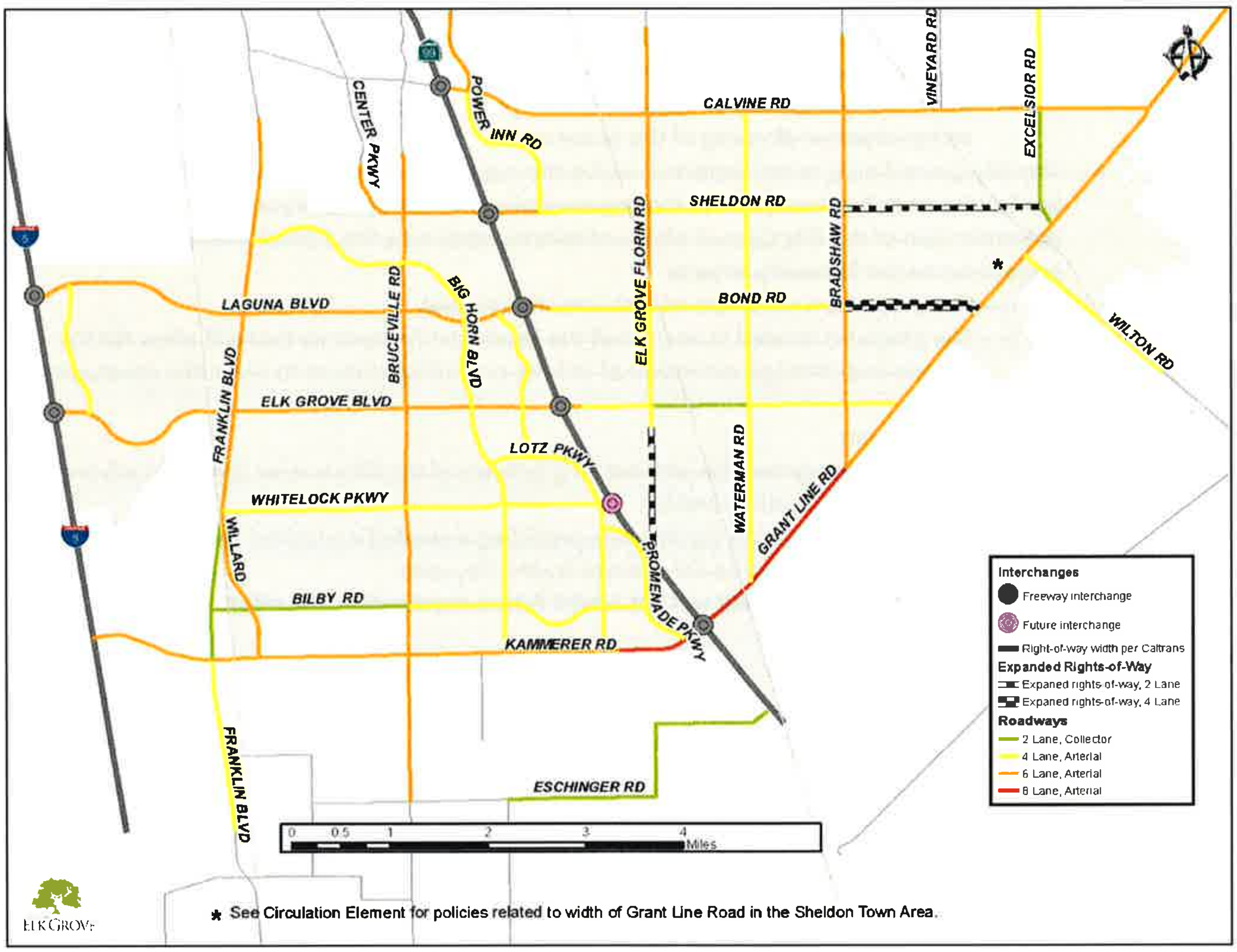


Figure CI-2 is amended to read as follows:



Land Use Element

Policy LU-36 is amended to read as follows:

LAND USE POLICY AREA: SOUTHEAST POLICY AREA

LU-32 Development in the Southeast Policy Area shall comply with the policies and provisions of the Southeast Policy Area Community Plan.

- ~~Development in the Southeast Policy Area shall not occur, and no land use entitlements shall be granted, until a master plan has been prepared and approved by the City.~~
- ~~The master plan shall, at a minimum, include the following specific components:~~
  - ~~Detailed designation of land uses;~~
  - ~~A master plan for key backbone infrastructure (e.g., water, sewer, drainage, roads);~~
  - ~~Architectural standards, development regulations, or other planning that describes the form and function of new development; and~~
  - ~~Other components as directed by the City Council as being necessary for the proper and comprehensive planning of the policy area.~~
- ~~The City Council may, at its discretion, waive the requirement of preparation of a master plan of the Southeast Policy Area prior to the approval of a land use entitlement when, at the determination of the City Council after a recommendation by the Planning Commission, the project meets the following criteria:~~
  - ~~The project is a minimum of 100 acres in size; and~~
  - ~~The project is located in an area of the Southeast Policy Area that will allow for the orderly and strategic extension of utilities and infrastructure to serve the development; and~~
  - ~~The project:~~
    - ~~Will improve the jobs-housing balance of the City and/or stimulate job creation and retention; and/or~~
    - ~~Is of city-wide significance, providing a needed or desired amenity, feature, or other aspect as determined by the City; and~~
  - ~~Approval of the project will not inhibit future master planning efforts.~~

CERTIFICATION
ELK GROVE CITY COUNCIL RESOLUTION NO. 2014-152

STATE OF CALIFORNIA)
COUNTY OF SACRAMENTO) ss
CITY OF ELK GROVE)

I, Jason Lindgren, City Clerk of the City of Elk Grove, California, do hereby certify that the foregoing resolution was duly introduced, approved, and adopted by the City Council of the City of Elk Grove at a regular meeting of said Council held on July 9, 2014 by the following vote:

AYES :	*COUNCILMEMBERS:*	*Cooper, Detrick, Hume, Trigg*
NOES:	*COUNCILMEMBERS:*	*None*
ABSTAIN :	*COUNCILMEMBERS:*	*None*
ABSENT:	*COUNCILMEMBERS:*	*Davis*

Jason Lindgren, City Clerk
City of Elk Grove, California

EXHIBIT B

City of Elk Grove

Southeast Policy Area Community Plan

Adopted

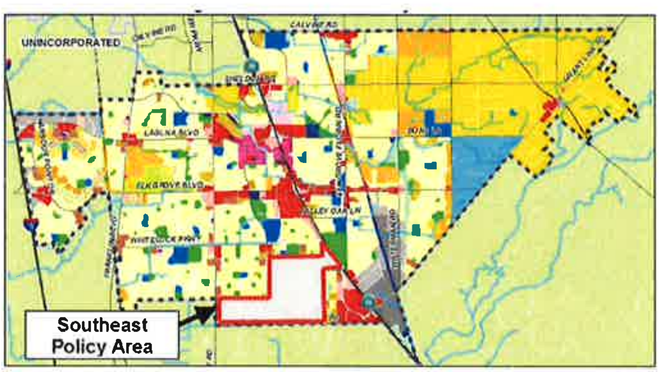
CITY OF
ELK GROVE
PROUD HERITAGE. BRIGHT FUTURE.

Planning Department
July 9, 2014

Southeast Policy Area Community Plan

In November 2003, the City Council adopted the General Plan for the City of Elk Grove. The General Plan is the City's overarching policy document indicating how the community will grow and develop over time. All new development and actions of the City (e.g., zoning) must be consistent with the General Plan.

The General Plan established a series of policy areas—areas of the City that are to be guided by specific land use policies covering topics such as land use type, development pattern, and requirements for development processing. Examples of the policy areas include, but are not limited to, the Rural Residential/Sheldon area, the Elk Grove Triangle, Old Town, East Elk Grove, East Franklin, and Laguna Ridge. A policy area was established for the Southeast Policy Area, so named because it was located in the southeast portion of the west side of the City.



The Southeast Policy Area (SEPA) is the last unplanned new development area in the City. As such, in July 2012, the City Council directed staff to initiate master planning (in the form of a strategic plan) for the Southeast Policy Area. The Council direction specified the preparation of a Community Plan along with high-level supportive infrastructure analysis (including traffic/transportation planning, drainage, water, and wastewater), community design guidelines and standards, and programmatic environmental review.

This document, the Community Plan, forms that overall policy basis for successive programs, regulations, and guidelines for development of the SEPA. All subsequent actions and development approvals must be consistent with this Community Plan, as well as with the overall General Plan and subsequent regulations. To that end, the Community Plan is organized as follows:

- The **Plan Setting** describes the overall context for the SEPA.
- The **Guiding Principles** describe the overall vision for Meridian.
- The **Land Plan** describes the general layout of land uses within Meridian.
- The **Community Policies and Implementation** section identifies area-specific policies that apply to the Plan Area and the actions the City will take to implement the Community Plan and ensure orderly development consistent with the policies.

PLAN SETTING

The Southeast Policy Area measures approximately 1,200 acres and is surrounded by several major existing and planned roadways. Kammerer Road is planned as a six-lane arterial in the General Plan and has further been identified as part of the route for the Capital Southeast Connector (Regional Connector), providing a link between Elk Grove, south Sacramento County, Rancho Cordova, Folsom, and El Dorado County. Light rail service is planned to extend from Cosumnes River College, along Big Horn Boulevard, through the SEPA and on to the mall.

It is also important to note that SEPA is bisected by the Shed C drainage channel. This drainage channel takes storm water from the Lent Ranch area and the detention basin on the Sterling Meadows property and carries it through the agricultural properties to the Stone Lakes National Wildlife Refuge. The Shed C drainage channel is manmade and primarily serves agricultural purposes. A preliminary analysis of the Shed C drainage channel was conducted as part of the City's Storm Drainage Master Plan. Additional analysis and improvement studies are necessary and contemplated in the Storm Drainage Master Plan.

GUIDING PRINCIPLES

In March 2013, the City Council identified a series of Guiding Principles for the SEPA. The Guiding Principles identify the overall objectives of the Community Plan and guide the formulation of the land use plan and the policies and standards contained within the Community Plan and accompanying documents.

Vision Statement

The primary objective for the SEPA is to plan for a range of job opportunities that are supported by a balanced mix of locally oriented retail uses and residential densities. The SEPA will be a regional destination for both employment activities and sports and entertainment. The SEPA will integrate with surrounding land uses through the incorporation of parks and open space, trails, and landscape buffers. A complete transportation network made up of roadways, sidewalks, trails, and transit (including future light rail) will allow for the safe and effective movement of people and goods within the Plan Area and connect them with other parts of the City and region. Development will be of quality design and materials that contribute to the sense of place and identity for the area.

Employment-Oriented Development

At its core, the SEPA is an *employment-oriented development*—that is to say, it is a community that supports and encourages the development of employment uses. It does this by:

- Creating opportunities for a range of employment prospects without predisposing any one use.
- Providing nearby places for employees to live at a variety of price points.
- Providing services for employees, including daily shopping and education.
- Providing recreational opportunities for employees within employment areas and the larger community.
- Providing a feasible range of choices for employees on how to get to work (e.g., car, bus, walking, biking).
- Engaging corporate attention and applying the power of public/private partnerships.
- Creating a total community, not individual, unrelated projects.

Guiding Principles

The following principles provide an overarching development framework for the SEPA.

I. Urban Design/Public And Private Realm Design

- Create a strong sense of identity, community, neighborhood, and development at a personal scale.
- Implement quality urban design elements throughout the Plan Area by incorporating locally and environmentally sensitive landscaping, site amenities (e.g., sidewalk furniture, pedestrian lighting, bike racks), and complementary architectural design.
- Locate land uses in a manner that are complementary to each other, thereby reducing the potential for interface conflicts.

II. Land Use

- Create a plan that provides a mix of land uses, including employment and residential opportunities supported by commercial and neighborhood-oriented uses and services such as parks, pedestrian and bike paths/trails, and recreational opportunities.
- Provide flexibility for the intensity and density of land uses to respond to changes in economic, market, and social factors while maintaining land use compatibility.
- Provide space for a destination that can be both a local and regional draw (e.g., large sports complex and supportive uses).
- **Employment Opportunities/Jobs Development**
    - Designate sufficient employment-oriented land uses to create job opportunities and improve the jobs to housing balance within the City.
    - Locate employment uses throughout the Plan Area to take advantage of transportation corridors and proximity to other land uses.
    - Locate a large block of employment uses that includes both office and industrial/flex space, to provide opportunities for

development of an office park/campus.

- Provide synergy opportunities between employment land uses and supporting retail/commercial and residential uses.

- **Mixed-Use**

  - Encourage mixed-use development (e.g., mixed-use buildings with retail uses on the ground floor and office or residential on upper floors) within a community core that includes a future transit (e.g., light rail) station. Centrally locate the community core in the Plan Area and make it easily accessible by a range of uses and services.

- **Residential Uses**

  - Provide a diverse range of housing densities and product types from low-density estate housing to higher-density multi-family residential opportunities.

  - Multi-family residential uses should be located near transit facilities and, where feasible, near commercial and employment uses.

- **Public Services and Community-Oriented Uses**

  - Locate educational facilities in the most effective locations for successful attendance, usefulness to the community, and utilization of future public transit facilities.

  - Provide landscaped paseos and/or other off-street pedestrian and cycling amenities, increasing walkability and providing pedestrian connectivity throughout the Plan Area as well as into adjacent properties. Provide linkages in an east-west and north-south direction.

  - Create a plan that makes active and passive park facilities available at a level consistent with City and Cosumnes Community Services District (CCSD) policies.

  - Identify the drainage infrastructure within the Plan Area as dual use facilities, incorporating both drainage functions and recreation opportunities as possible. Recreation opportunities could include active trail amenities along the channel, enhanced landscaping, golfing, and other features as feasible.

III. Circulation

- Organize land uses and provide linkages to allow for a significant percentage of Plan Area employees, students, and residents to be located within close proximity of, and easy access to, future transit facilities.

- Provide the sufficient intensity of employment and residential opportunities to attract an appropriate level of public transit services.

- Provide landscaped parkways and pedestrian and bicycle connections throughout the Plan Area to provide linkages between internal land uses and to surrounding areas.

- Provide a circulation system that adequately supports the anticipated level of traffic in the plan area.

IV. Environmental Sensitivity

- Design the Plan Area in a manner which comprehensively addresses drainage and flood control for both on-site and off-site properties.

- Create a self-mitigating plan that, to the extent feasible, incorporates environmental mitigation measures into project design.

- Promote the efficient use of energy and resources.

V. **Contextual Compatibility**

- Develop a plan that recognizes the right of existing uses (both within the Plan Area and adjacent), including agricultural/rural residences, to continue and to minimize impacts upon these uses.

- Create a plan compatible with adjacent properties. Accommodate connectivity of roadways, pedestrian and bicycle access, and recreation facilities across Plan Area boundaries.

- Create a plan that complements existing and planned commercial corridors and centers within the City.

LAND PLAN

The General Plan's Land Use Policy Map is one of the most important functions of the General Plan, as the map and policies will determine the future land uses and character of the City. Similarly, the land plan for the SEPA is equally critical. The Land Plan for the SEPA (Figure SEPA-1) illustrates the planned uses for properties within the Plan Area.

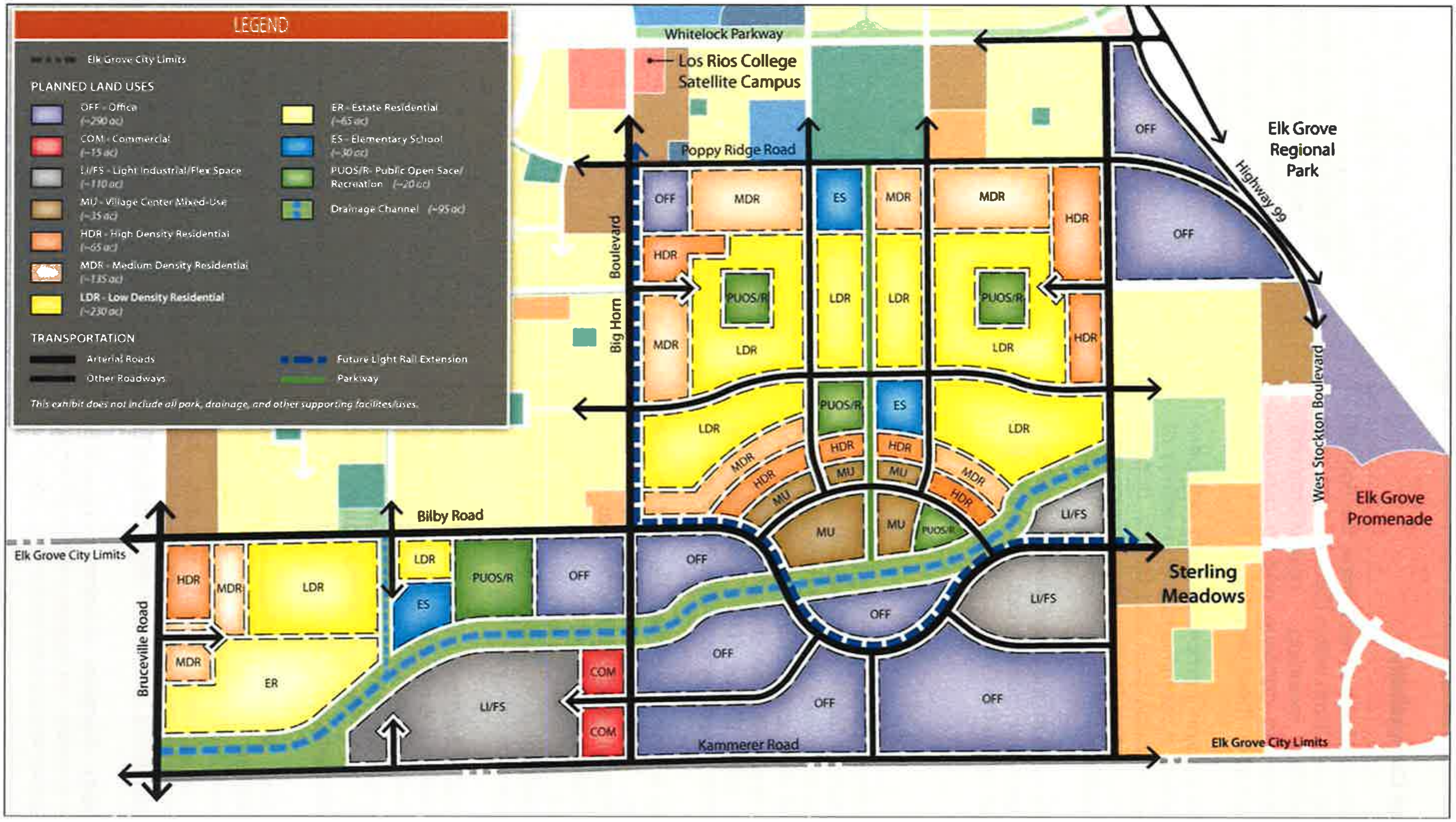
As described in the Land Use Element of the General Plan, the General Plan defers to this Community Plan in establishing land uses for the Plan Area. The Land Plan map, as provided in Figure SEPA-1, is based upon the land use categories described in Policy LU-2, with the following additional categories created:

- An **Industrial/Flex** designation. This designation is a mix of both the Office and Light Industrial designation and is intended to provide opportunities for a range of small office and limited warehouses and manufacturing.

- A new **Village Center Mixed Use** designation, similar to the Commercial/Office/Multi-Family General Plan designation, which supports the integration (both vertically and horizontally) of commercial, office, and residential uses.

- A **Sports Complex** overlay designation, which provides an opportunity to develop a regional-serving destination use oriented toward sports. The complex may include various components, including but not limited to practice fields, tournament fields, and stadium. Note that this use has not been located on the Land Plan; rather, the use is reserved for future use, should a location be identified and this Plan amended to include it.

FIGURE SEPA-1: Southeast Policy Area Community Plan Land Plan



COMMUNITY POLICIES AND IMPLEMENTATION

The Southeast Policy Area Community Plan policies and programs implement the following Goals of the City of Elk Grove:

Guiding Goal 1: A High Quality of Life for All Residents

Focused Goal 1-2: Outdoor recreation opportunities for all residents

Focused Goal 1-3: A balanced and efficient transportation system

Focused Goal 1-5: Excellence in the design of new development

Focused Goal 1-6: Safe and affordable housing for all persons

Focused Goal 1-7: Active and passive park facilities and recreation programs that satisfy the leisure time and recreation needs of all residents

Focused Goal 1-8: Creation and maintenance of a strong, positive community image for Elk Grove

Focused Goal 1-9: A pattern of land use which enhances the community character of Elk Grove, provides employment and shopping opportunities to serve residents and the region, which provides for use of transit, and which protects Elk Grove's unique historical and natural features

Guiding Goal 2: Diversified Economic Base

Focused Goal 2-1: A business community which includes a diversity of industrial and office uses, locally and regionally oriented retail and services, and a diversity of residential types

Focused Goal 2-2: A balance between the numbers and types of workers residing in Elk Grove and opportunities for employment in the City

Focused Goal 2-3: A positive environment for business retention and expansion

Focused Goal 2-4: Creation of Elk Grove as a desirable place to establish a business, particularly major employment-generating uses

Guiding Goal 3: Protection of the Natural Environment

Focused Goal 3-1: Development which recognizes environmental constraints and is designed and operated to minimize impacts on the environment

Focused Goal 3-3: Natural resources managed and protected for the use and enjoyment of current and future generations

Guiding Goal 4: Preservation and Enhancement of Elk Grove's Unique Historic and Natural Features

Goal 4-2: Preservation of the large oak and other tree species which are an important part of the City's historic and aesthetic character

The following policies and action items implement these Goals. These policies and actions are in addition to, and supporting of, the Citywide policies and actions in the General Plan.

CIRCULATION POLICIES

SEPA-1 Develop an efficient roadway network across the Plan Area. Major roadways shall continue the street network established by adjacent developments. Local roads should extend the established roadway pattern to the extent feasible.

SEPA-2 Establish protocols for the timing and phasing of roadway improvements that reflect the level of development that is occurring.

SEPA-2-Action 1 Backbone roads shall be installed concurrent with projected development demands for both on-site (within the Plan Area) and off-site (outside the Plan Area) to meet the City's standards.

SEPA-2-Action 2 The City shall either establish a process for, or require applicants to provide, analysis to ensure adequate infrastructure is in place prior to the demands of the proposed development.

SEPA-2-Action 3 No tentative maps or building permits for projects not requiring tentative maps shall be approved within the Plan Area until such time as off-site infrastructure needs and thresholds have been identified.

SEPA-2-Action 4 All roadways, pedestrian facilities, and bike routes or bikeways shall be constructed in logical and complete segments, connection from intersection to intersection, to provide safe and adequate access with each phase of development as conditioned with the approval of tentative maps.

SEPA-2-Action 5 Roadways shall consist of the full section from curb to curb, streetlights, sidewalks, and median landscaping, where applicable. Phased construction of sidewalks, temporary asphalt sidewalks, and other measures may be allowed at the discretion of the City. Roadside landscaping (and walls where required) shall be installed concurrent with adjacent development consistent with project phasing. The City may allow the design and construction of portions of arterial or thoroughfare roadways to be deferred where capacity associated with such portions is not immediately needed to meet Level of Service goals set forth in the General Plan and/or applicable environmental document(s). If the deferral involves improvements within or adjacent to a development and the improvements are not eligible under the Elk Grove Roadway Fee Program, the City will require the developer to make an in-lieu payment pursuant to Elk Grove Municipal Code Chapter 12.03 or establish and/or participate in a finance mechanism acceptable to the City to fund the differed improvements.

SEPA-2-Action 6 The City shall establish roadside landscaping standards. All development shall comply with these requirements to the satisfaction of the City.

SEPA-3 Provide for the future extension of major transit service (e.g., Light Rail) through the Plan Area via Big Horn Boulevard and Bilby Road.

SEPA-3-Action 1 As provided in General Plan Policy CI-9-Action 2, the City shall require developers to dedicate (in fee title or through irrevocable offers of dedication) sufficient right-of-way along the planned alignment for track, electrical infrastructure, and station platforms.

SEPA-3-Action 2 The City shall identify at least one intermodal station within the Plan Area that provides facilities for boarding/off-loading, park-and-ride, drop off zones, and transfers between public transportation modes (e.g., bus to light rail).

SEPA-3-Action 3 As provided in General Plan Policy CI-9-Action 1, the City shall work with Regional Transit to develop final station location(s) and pursue funding to construct and operate the system.

Please see the Parks, Trails, and Open Space Policies and the Public Facilities and Finance Policies sections of this Plan for additional policies related to circulation.

CONSERVATION AND AIR QUALITY POLICIES

SEPA-4 The realignment of the Shed C drainage channel shall provide area for both drainage of storm water from the Plan Area as well as the restoration (to the extent they currently exist) and creation of aquatic and upland habitat in conformance with requirements of the environmental agencies.

ECONOMIC DEVELOPMENT POLICIES

SEPA-5 The land plan for the SEPA shall make a substantive impact on the jobs-housing ratio in the City by providing acreage for the establishment of one or more business parks.

SEPA-6 Encourage and support the development of jobs-producing uses (e.g., office, industrial) within the Plan Area.

HOUSING POLICIES

SEPA-7 Support a wide range of housing types in the Plan Area. Residential developers are encouraged to be innovative and responsive to the changing lifestyles of future residents and trends toward transit, telecommuting, zero-emissions vehicles, and others.

SEPA-8 Encourage the following housing types so as to incorporate affordable housing opportunities throughout the community: residential units placed above retail uses; live-work housing units; secondary dwelling units; and a mix of duplex and fourplex units within single-family residential areas.

SEPA-9 Encourage residential developers to provide upscale housing through lower densities and additional amenities. Upscale housing is intended to attract move-up home buyers who wish to move to or remain in the Elk Grove area. Homes with custom-style features would help create a more diverse and interesting neighborhood. Custom-style features could include high-quality exterior building materials, larger lot sizes, and varied setbacks. Large lots would include those that are 6,500 square feet or larger. Other features included in upscale housing are architectural variations, quality landscaping, extra vehicle storage, homeowners associations, and other attractive marketing features.

LAND USE POLICIES

SEPA-10 Interpret the land plan, provided in Figure SEPA-1, with sufficient flexibility so as to allow the rearrangement of land uses and provide a more varied mix of densities and/or lot sizes without triggering amendments to the Land Plan. In making this determination, the City shall ensure:

A) Consistency with the vision, guiding principles, and other policies of this Community Plan.

B) Consistency with the overall density and intensity of development contemplated by the land plan.

C) Consistency with the general distribution of land uses as provided in the land plan.

SEPA-11 Ensure that development in the Plan Area is of quality architectural character and contributes to a positive image of the City.

SEPA-11-Action 1 The City shall develop architectural guidelines and standards for all types of planned development.

SEPA-11-Action 2 The City shall require, as part of the Design Review process, all development to comply with the architectural guidelines and standards to the extent applicable.

SEPA-11-Action 3 The City shall develop a streamlined Design Review process for employment uses in the Plan Area that allows projects of all sizes to be approved by the Zoning Administrator.

SEPA-11-Action 4 The City shall develop standards for, and new development shall be required to implement, urban design features in the public realm (e.g., project monumentation/signage, lighting, benches) that visually unify the Plan Area and help establish a sense of place.

SEPA-12 The Land Plan shall include sufficient lands for employment-generating uses that significantly contribute to the City's employment base.

SEPA-12-Action 1 Amendments to the land plan affecting employment-generating land (e.g., office, light industrial/flex) shall:

- Not result in a reduction of acreage for employment-generating land. This does not apply to actions that increase employment acreage after initial adoption of this plan.
- Be located on a site or sites with equal or higher development potential (e.g., along arterials, collectors, and/or transit corridors; land configuration and size allows for efficient and practical development).
- Require a super-majority (4/5) vote of the City Council to approve.

SEPA-13 Encourage employment areas to provide supporting retail service uses, either within a primary use building or within a stand-alone building.

SEPA-13-Action 1 Office-supporting retail and service uses shall be encouraged through reduced development standards when compared to retail uses in commercial areas. Examples include, but are not limited to, reduced parking requirements and relaxed architectural requirements.

SEPA-14 The center of the SEPA shall consist of a community Village Center that includes a mix of uses (commercial, office, residential) and civic spaces and serves as the focal point of the Plan Area.

SEPA-15 Ensure that retail uses located in the Village Center are complementary with the regional retail uses in adjacent projects.

SEPA-16 A sports complex may be developed in the Plan Area with a location to be identified at a future date. The complex may include the following features:

- Tournament-type sports fields (may be natural or synthetic turf, or a combination thereof).
- On-site parking.
- Support facilities, including but not limited to facility maintenance, concession, and player support facilities.
- A stadium.

NOISE POLICIES

SEPA-17 Except as provided herein, all development within the SEPA shall comply with the City's noise standards and policies as outlined in the General Plan and Municipal Code.

SEPA-18 The City recognizes that parks and schools are noise-generating uses, but from a land use perspective are most appropriate when located next to residential uses. As such, the City accepts the potential noise from these facilities and shall not consider Table NO-A of the General Plan (Noise Level Performance Standards for New Projects Affected by or Including Non-Transportation Noise Sources) as being applicable.

PARKS, TRAILS, AND OPEN SPACE POLICIES

SEPA-19 Develop an off-street trail network that connects employment and residential areas with parks, school, mixed-use, and commercial-service areas.

SEPA-19-Action 1 The City shall require backbone trail facilities to be constructed in tandem with backbone infrastructure (e.g., roadway) facilities.

SEPA-19-Action 2 The City shall require, to the extent feasible, trails that cross major roadway (arterial or major collectors) to be grade separated. The City encourages the trail to be placed under roads and to be constructed as part of the roadway system.

SEPA-20 Parks shall be provided within the SEPA at a minimum ratio of five acres per 1,000 population.

SEPA-21 Ensure that parks are developed as an integral part of the community.

SEPA-21-Action 1 Parks shall generally be located in the areas shown on the land use plan. Precise configuration of park sites will be determined at the time of Tentative Subdivision Map approval for each residential project.

SEPA-21-Action 2 Parks and open space areas shall be linked by a pedestrian and bicycle circulation system.

SEPA-21-Action 3 Wherever possible, parks shall, at a minimum, be bordered on two sides by streets in order to facilitate public **access** and surveillance, and on three sides when feasible. The remaining one or two sides may be bordered by other land uses such as schools, open spaces, or residential uses.

SEPA-21-Action 4 Parks shall be designed, and **features** within them oriented, to minimize noise and visual impacts on adjoining development.

SEPA-21-Action 5 Where parks are adjacent to drainage corridors or parkways, the park **shall** include pedestrian connections to these facilities.

SEPA-21-Action 6 Parks adjacent to drainage corridors or parkways shall include **appropriate** fencing or plant buffering to separate active recreation areas within the park from the drainage corridor.

SEPA-21-Action 7 All parklands, paseos, and other open space shall be dedicated to the City. All drainage and publically maintained roadside landscape corridors shall be dedicated to the City.

SEPA-21-Action 8 Provide a process for the consideration of joint use park and drainage facilities on a case-by-case basis. Ultimate designs for these facilities, if approved, shall balance active park land needs with drainage facility design requirements.

PUBLIC FACILITIES AND FINANCE POLICIES

Drainage

SEPA-22 Establish an area-wide drainage infrastructure system, consistent with the Citywide Storm Drainage Master Plan, which reflects natural ecological and hydrological systems.

SEPA-22-Action 1 The City shall prepare a Drainage Master Plan for the Plan Area, based upon the City's Storm Drainage Master Plan, which identifies drainage infrastructure that is consistent with this policy.

SEPA-22-Action 2 The City shall require new development to implement the DMP.

SEPA-23 Ensure that the drainage system will not be designed or approved with a capacity greater than that required to serve the projected population and land uses identified in this Community Plan.

SEPA-24 Review and approve all phased drainage facilities prior to implementation. Phased facilities shall be reviewed to ensure consistency with the concepts in the DMP and successful implementation of the ultimate facilities identified in the DMP.

SEPA-25 Ensure that adequate drainage facilities are in place and operational concurrent with each new increment of development.

Infrastructure Financing

SEPA-26 Support financing opportunities for public infrastructure across the Plan Area.

SEPA-26-Action 1 The City shall consider the preparation and adoption of an area-wide Capital Improvement Program and corresponding funding mechanism (e.g., reimbursement fee, community facilities district) for on-site and off-site backbone roadways.

SEPA-26-Action 2 The City shall consider the preparation and adoption of an area-wide Capital Improvement Program and corresponding funding mechanism (e.g., reimbursement fee, community facilities district) for implementation of the Drainage Master Plan.

SEPA-27 Ensure the long-term financing of public infrastructure.

SEPA-27-Action 1 Prior to approval of a Final Map, or issuance of building permits for projects that do not require a tentative map, the subject property shall be included in a finance district that provides ongoing maintenance funding for the following:

- Public parkways;
- Parks and open space;
- Landscape corridors;
- Trails;
- Landscaped medians;
- Environmental preserves;
- Sound walls and other barrier and property fencing;
- Entryway monuments; and
- A fair-share contribution to the community center

Valuing Public and Quasi-Public Lands

SEPA-28 The land plan for the SEPA depicts four classes of public or quasi-public land uses: schools, parks and trails, drainage facilities, and major transit facilities. A weighted average based on the development of per-acre values for the various property types represented by the universe of developable properties within the SEPA Community Plan shall be utilized as the underlying land use assumption for the purposes of establishing a fair market value during land acquisition.

Water and Sewer Infrastructure

SEPA-29 Support the efficient and timely development of water and sewer infrastructure into the plan area.

SEPA-29-Action 1 Work with the Sacramento County Water Agency (SCWA) and Sacramento Area Sewer District (SASD) to develop a plan for extension of services into the plan area.

SEPA-29-Action 2 Support efforts to design and deliver water and sewer services to all parts of the plan area in a timely fashion, emphasizing employment lands as the priority.

SAFETY POLICIES

SEPA-30 Ensure the safety of employees and residents in the SEPA.

SEPA-30-Action 1 All land uses in the Plan Area should be designed to facilitate access by emergency equipment and personnel.

SEPA-30-Action 2 Streets shall be designed to ensure that emergency response is not impaired.

SEPA-30-Action 3 Buildings and other facilities shall be designed to incorporate the philosophy of "Crime Prevention through Environmental Design" (CPTED).

SEPA-30-Action 4 Prior to approval of a Final Map, or building permits for projects that do not require a tentative map, the subject property shall be included in a finance district that funds a portion of the additional costs for police service.

SEPA-30-Action 5 Prior to approval of a Final Map, or building permits for projects that do not require a tentative map, the subject property shall be included in a finance district that funds a portion of the additional costs for fire service.

SUSTAINABILITY POLICIES

SEPA-31 Development in the Plan Area shall provide opportunities for implementation of sustainable design principles. Design opportunities include, but are not limited to, the following:

- Orienting homes and buildings in an east-west alignment for southern exposure to take advantage of passive or natural heating or cooling.
- Incorporating photovoltaic and other renewable energy systems into building and site design.
- Incorporating Low Impact Development features, such as bio-

swales and permeable materials for paved areas.

- Utilizing a roadway network with a clear, logical hierarchy that is organized on a modified grid. Connectivity to adjacent areas, including potential future development, is encouraged.

SOUTHEAST POLICY AREA

SPECIAL PLANNING AREA

CITY OF ELK GROVE

PROUD HERITAGE. BRIGHT FUTURE.

ADOPTED JULY 2014

ACKNOWLEDGMENTS

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Patrick Hume, *District 2*
Steve M. Detrick, *District 3*
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6. GLOSSARY

CHAPTER 1

INTRODUCTION

SOUTHEAST POLICY AREA

SPECIAL PLANNING AREA

CHAPTER 1
INTRODUCTION

WELCOME TO THE SOUTHEAST POLICY AREA

In 2012, the City Council of the City of Elk Grove took the bold step to create a vision and plan for the development of the last large undeveloped area within the City. Focusing on the City's need to better balance its jobs to housing ratio, this 1,200-acre area has been molded into a unique blend of employment, public space, and residential land uses. From the Council's action, Southeast Policy Area, an Employment Oriented Development, was born.

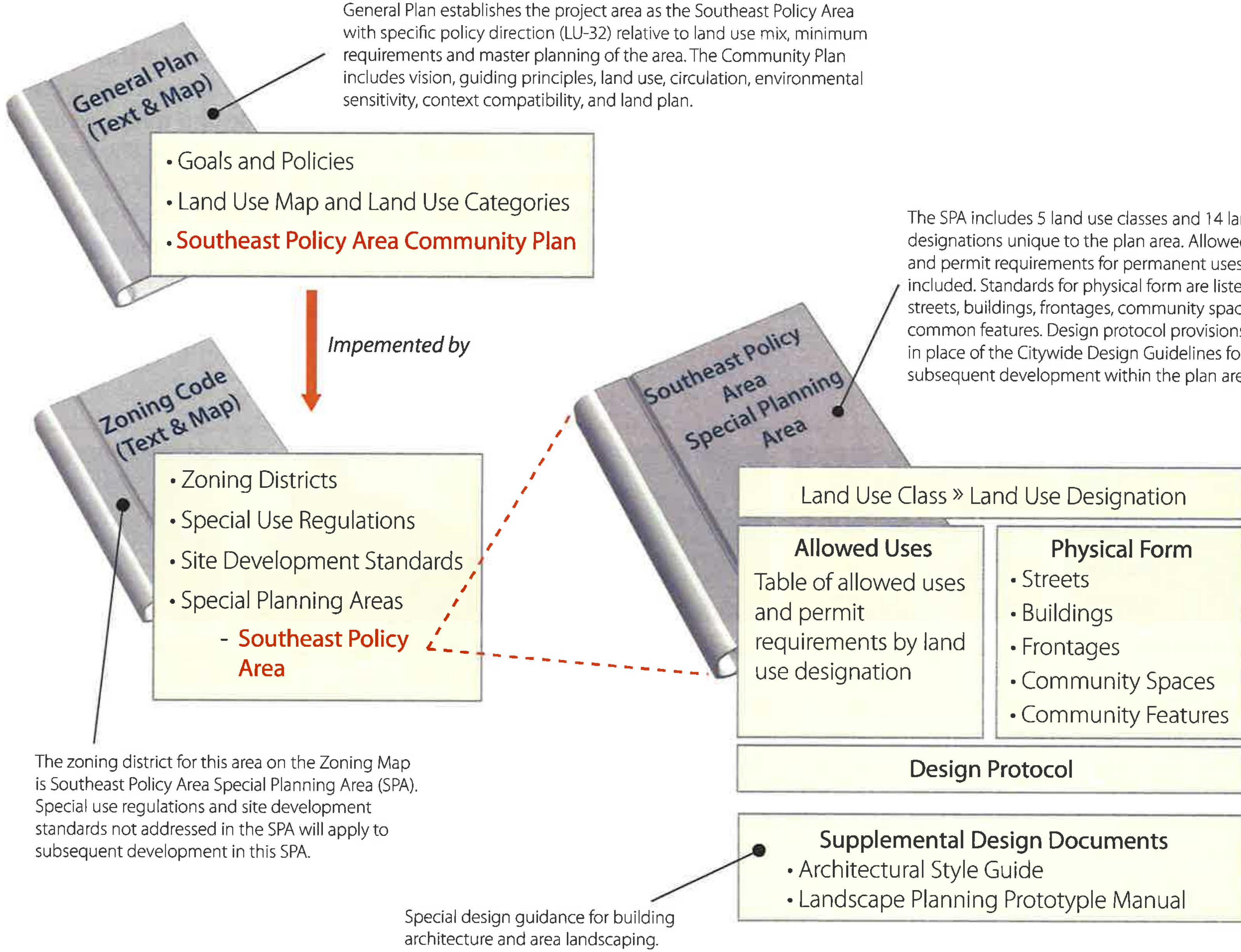
At its core, Southeast Policy Area is a plan for a wide range of job opportunities, supported by a balanced mix of locally oriented retail uses and residential densities. The Southeast Policy Area will be a regional destination for both employment activities and entertainment, such as sports or performing arts. The Southeast Policy Area will integrate with surrounding land uses through the incorporation of parks and open space, trails, and landscaping. A complete transportation network made up of roads, sidewalks, trails, and transit (including light rail) will allow for the safe and effective movement of people and goods within the plan and connect them with other parts of the City and region. Development will be of quality design and materials that contribute to the sense of place and identity for the area and the long-term sustainability for the community.

PURPOSE AND APPLICABILITY

This document implements the City's adopted vision and policies for the Southeast Planning Area as outlined in the General Plan and corresponding Community Plan. More specifically, this document establishes the land use pattern, allowed uses, and development standards for land within the Southeast Policy Area Special Planning Area (the SPA). The purpose of this SPA is to provide unique and imaginative planning standards and regulations, which cannot be provided through the application of the City's standard zoning districts. Therefore, this document functions to replace the citywide zoning regulations for subsequent development of land within the SPA.

The land use requirements and development standards contained in this SPA shall apply to all property within the SPA as delineated on the official zoning map of the City. Where the regulations herein conflict with corresponding regulations in the Citywide Zoning Code, these regulations apply. Where the SPA is silent about special use regulations (e.g., wireless communication facilities), and site development standards (e.g., lighting standards, sign regulations) addressed in the citywide code, the citywide regulations and standards apply.

Document Function and Use



ORGANIZATION

This SPA is set up as a modified form-based code, which is an alternative approach to zoning than has traditionally been used in Elk Grove. This code places greater emphasis on the character and function of development than provided in traditional zoning in order to create a more complete and vibrant community. It does this through standards for pedestrian spaces, requirements for building orientation, and design standards for new buildings. Specifically, development requirements, while regulated by land use class and land use designation, are organized based upon the type of building being developed (e.g., office park, industrial/flex, vertical mixed use). This allows specific standards to be applied to each building form, rather than applying generalized, universal standards to all development in the land use designation. These standards are in addition to typical land use requirements for specific use types (e.g., conditional use permits).

SPA Organization

Chapter 2: Land Plan
Describes the system of land use classes and land use designations that form the basis for the area land plan. This chapter also includes a community character/transect section to illustrate the relationship between various land use designations.

Chapter 3: Allowed Uses
Identifies the allowed land uses in each specific land use designation throughout the plan, along with permit requirements.

Chapter 4: Physical Form
Identifies the regulations for the physical form of development within the plan area across five physical form types: streets, buildings, frontages, community spaces, and common features.

Chapter 5: Design Protocol
Establishes design requirements and guidelines (referred to collectively as design protocols) for development.

Chapter 6: Glossary
Provides definitions for specialized terms used in this SPA.

HOW TO USE THIS DOCUMENT

This SPA is uniquely organized when compared to the Citywide Zoning Code. As such, the following information is provided to help property owners, business owners, and tenants understand how to use this document.

Using This SPA

If you want to subdivide property

Subdivisions are governed by Title 22 of the City's Municipal Code. In addition to the standards and procedures in Title 22, subdivisions must also comply with the regulations in Chapters 4 and 5 of this SPA.

Specifically:

- Street sections and public improvements as provided in Chapter 4
- Requirements for public spaces as provided in Chapters 4 and 5
- Subdivision design as provided in Chapter 5

If you want to develop your property

The development of property in the City first requires the approval of a Design Review Permit. The design of buildings and their layout on the property is governed by the regulations of this SPA. Specifically:

- Chapter 4 identifies the development standards by physical form (e.g., setbacks, building forms, frontage forms)
- Chapter 5 provides design protocols (e.g., architectural design guidelines and standards) for new development

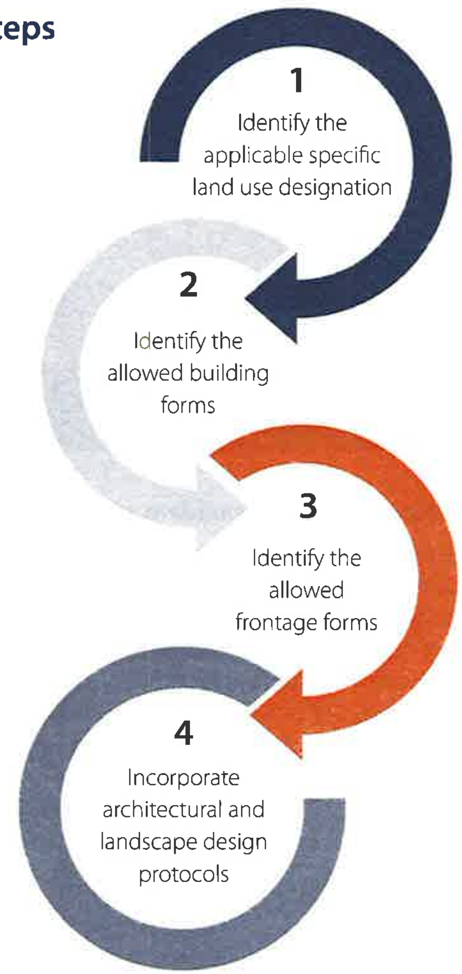
If you want to occupy a building with a use

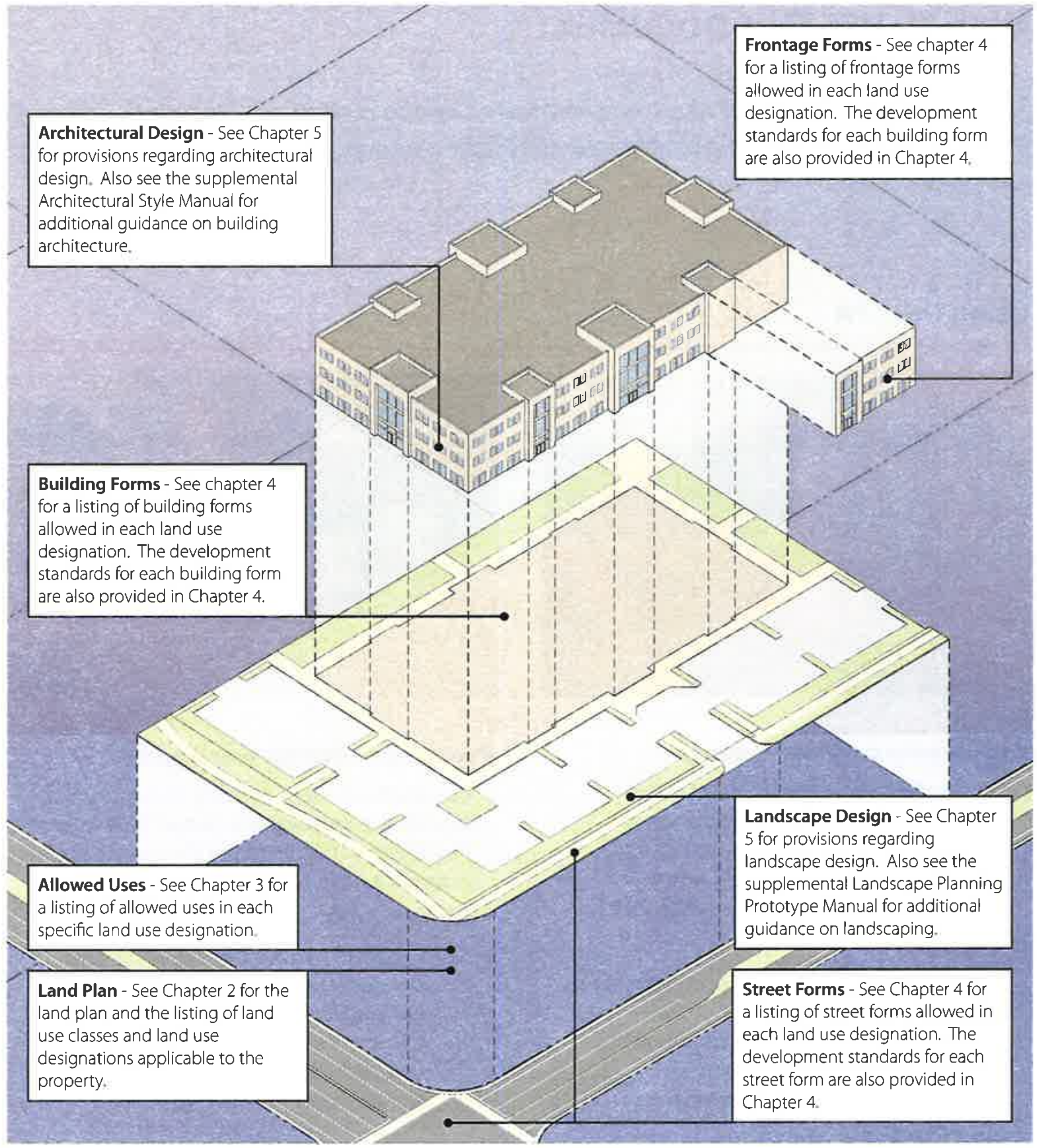
Chapter 3 identifies the allowed uses and permit requirements specific to the use of land by use type. See this chapter for uses that are allowed by right, allowed by a permit, or not allowed based upon land use designation. Uses not specifically listed in this SPA may be permitted if the Planning Director determines that the use is similar to other uses listed.

Organization of Form-Based Regulations

The following diagrams illustrate how the provisions of this SPA are organized with respect to the design and application process.

Steps





ADMINISTRATION

This SPA is adopted, by reference, as part of the City's zoning regulations (Title 23 of the City's Municipal Code, herein after the Zoning Code). The SPA functions as a special purpose zoning district under Chapter 23.40 of the Zoning Code. See page 1-3 of this chapter for an illustration of document function and use.

- **Relationship to Citywide Regulations** – This document is intended to provide the land use and development standards for land within the SPA. However, where this SPA is silent on a matter, the Citywide zoning regulations shall govern. Where there is a conflict between the SPA and the Zoning Code, this SPA shall govern.
- **Permit Requirements and Allowed Uses** – Development within the SPA shall comply with all land use entitlement and permit requirements and procedures as provided in Chapter 23.16 of the Zoning Code. Chapter 3 of this SPA identifies when a land use permit (e.g., conditional use permit) is required.
- **Approving Authority** – The approving authority for land use entitlements and permits required in this SPA shall be as provided in Chapter 23.14 of the Zoning Code; however, the designated approving authority for major design reviews for projects in the Office and Light Industrial/Flex Specific Land Use Types shall be the Zoning Administrator.
- **Appeals** – The process for filing and processing an appeal for a land use entitlement or permit shall be as provided in Chapter 23.14 of the Zoning Code.
- **Interpretation** – The interpretation of the provisions of this SPA shall be governed by the procedures in Chapter 23.12 of the Zoning Code.

CHAPTER 2

LAND PLAN

SOUTHEAST POLICY AREA

SPECIAL PLANNING AREA

CHAPTER 2
LAND PLAN

CHAPTER OVERVIEW

This chapter establishes the overall land plan for subsequent development within the SPA by establishing a range of land use designations (organized into land use classes), which function like zoning districts. Each land use designation is identified in this chapter with a general description and representative visual image. The land use designations for the SPA are then illustrated on a land plan to show the intended land use mix and general configuration and relationship of land uses within the SPA.

This chapter also includes a community character/transect section to visually illustrate the intended relationship between a various land use designations throughout the plan area in keeping with the land plan.

LAND USE CLASSES AND LAND USE DESIGNATIONS

Land within this SPA is organized into a series of land use classes and land use designations. This nomenclature has been selected to differentiate land uses in the SPA from the citywide nomenclature of General Plan land use categories and Zoning Districts. As previously described, the City's Zoning Map designates this plan area as "The Southeast Policy Area Special Planning Area". This designation on the City's Zoning Map directs the reader to the SPA document for more information about the land plan, allowed uses, and development standards.

Land use classes are categories of land use designations, organized by similar type and function. A total of five land use classes is listed below. Within each land use class, there are one or more land use designations which function like zoning districts and are shown on the land plan for this SPA. The fourteen land use designations for this SPA are listed in parenthesis for each land use class below.

1. Employment Hub/Core (Office, Commercial, Light Industrial/Flex)
2. Village Center (Mixed Use Residential, Mixed Use Village Core)
3. Residential Neighborhood (Estate Residential, Low Density Residential, Medium Density Residential, High Density Residential)
4. Public/Semi-Public (School, Drainage Facilities, Parks/Open Space, Greenways)
5. Special (Sports Complex)

As previously described, the land use designations and land plan in this document implement the General Plan vision, policies, land plan, and community plan for this area of the City. See Chapter 1, Document Function and Use graphic for an illustration of these document relationships. The SPA land use classes are listed below with individual descriptions for each land use designation along with a representative image and symbol used on the land plan.

Employment Hub/Core

Office (O)

Designates areas for office and professional land uses, which may include ancillary retail sales and restaurants. This designation includes large-scale office/business parks as well as small professional office spaces. Residential uses are not permitted.

Commercial (C)

Designates areas for retail uses (including restaurants) with supporting/complementary office uses in any mix. Residential uses are not permitted.

Light Industrial/Flex (LI/FX)

Designates area for industrial or manufacturing activities, within an enclosed building. Provides flexibility for research and development facilities and may allow live/work units. Development may include supporting or ancillary retail services. This designation precludes corporation yards and other heavy industrial uses.

Village Center

Mixed Use Residential (MUR)

Designates area for residential development that allows for the integration of compatible office and retail uses. Examples include, but are not limited to, residential with with ground-floor activity spaces, live work units, and ground floor retail or office with residential above. This designation allows for dwelling units ranging from 15.1 to 40.0 units per acre.

Mixed Use Village Core (MUV)

Designates areas for development with vertical or horizontal mixes of uses that feature ground floor commercial retail and office with allowances for residential or office above. Development occurs under a "village center" concept where it serves as a gathering location for area employees and residents. Residential uses as stand-alone buildings may be developed; however, they shall be integrated into the overall site and shall not be the predominant activity within the village center. This area may be developed in phases.

Residential/Neighborhood

Estate Residential (ER)

Designates areas for single-family residential development at a density of 1 to 4.0 units per acre. This designation is primarily intended for detached single-family dwellings.

Low Density Residential (LDR)

Designates areas for single-family residential development at a density of 4.1 to 7.0 units per acre. This designation is mainly intended for detached single-family dwellings, but attached single-family and multiple-family units (e.g., townhomes) may be permitted.

Medium Density Residential (MDR)

Designates areas for attached single-family and multi-family developments. May include small lot or clustered single-family development, and apartment or condominium/townhome-type development. This designation allows for dwelling units ranging from 7.1 to 15.0 units per acre.

High Density Residential (HDR)

Designates areas for developments with a vertical mix of uses (e.g., buildings with retail or restaurants/cafes on the ground floor with office or residential units above). The buildings will range in density and intensity with the high density of development focused around transit stops and major intersections. This designation allows for dwelling units ranging from 15.1 to 40.0 units per acre.

Public/Semi-Public

School (SCH)

Designates areas for public schools.

Drainage Facilities (D)

Designates areas for channels and detention basins.

Parks/Open Space (P/OS)

Designates areas for public parks and plazas owned by public agencies.

Greenways (G)

Designates areas reserved for trails, paseos, and similar features that provide off-street connectivity within the community.

Special

Sports Complex (SC)

This designation serves as an overlay, or alternative designation, allowing for future development of a special use facility, such as a large sports complex or entertainment district and supporting uses. Uses could include a professional sports stadium and practice or tournament fields, theaters, museums, music venues, and supporting commercial uses.

Note that while this land use designation is included in this SPA, a location for the overlay has not been identified on the land plan. A location may be identified at a future date through an amendment to this SPA and corresponding environmental review.

Development Potential	
Jobs	
Office & Industrial/Flex	21,345
Commercial	425
Other	1,640
Total	23,410
Residences	
Estate, Low Density, and Medium Density	2,950
High Density	1,500
Village Center Mixed Use	325
Total	4,790

Resident Population	17,010

NOTE: Development potential is based upon land use plan and assumptions as defined in this SPA and reflects maximum buildout. Potential is subject to change as a result of plan amendments.

LAND PLAN

This is the land plan for The Southeast Policy Area. It illustrates the location and alignment of the land use designations that make up the SPA. All subsequent development within the SPA shall be consistent with this land plan.

This map is not meant to be overlaid with existing parcel lines and does not indicate specific acreage requirements for the specific land use types shown. Rather, the layout has an inherent flexibility and is meant to guide the final configuration of land uses through the approval of subsequent tentative maps. Therefore, each application for a tentative map shall include, on the same exhibit in a form satisfactory to the City, information indicating what specific land use designation is assigned to each proposed lot.

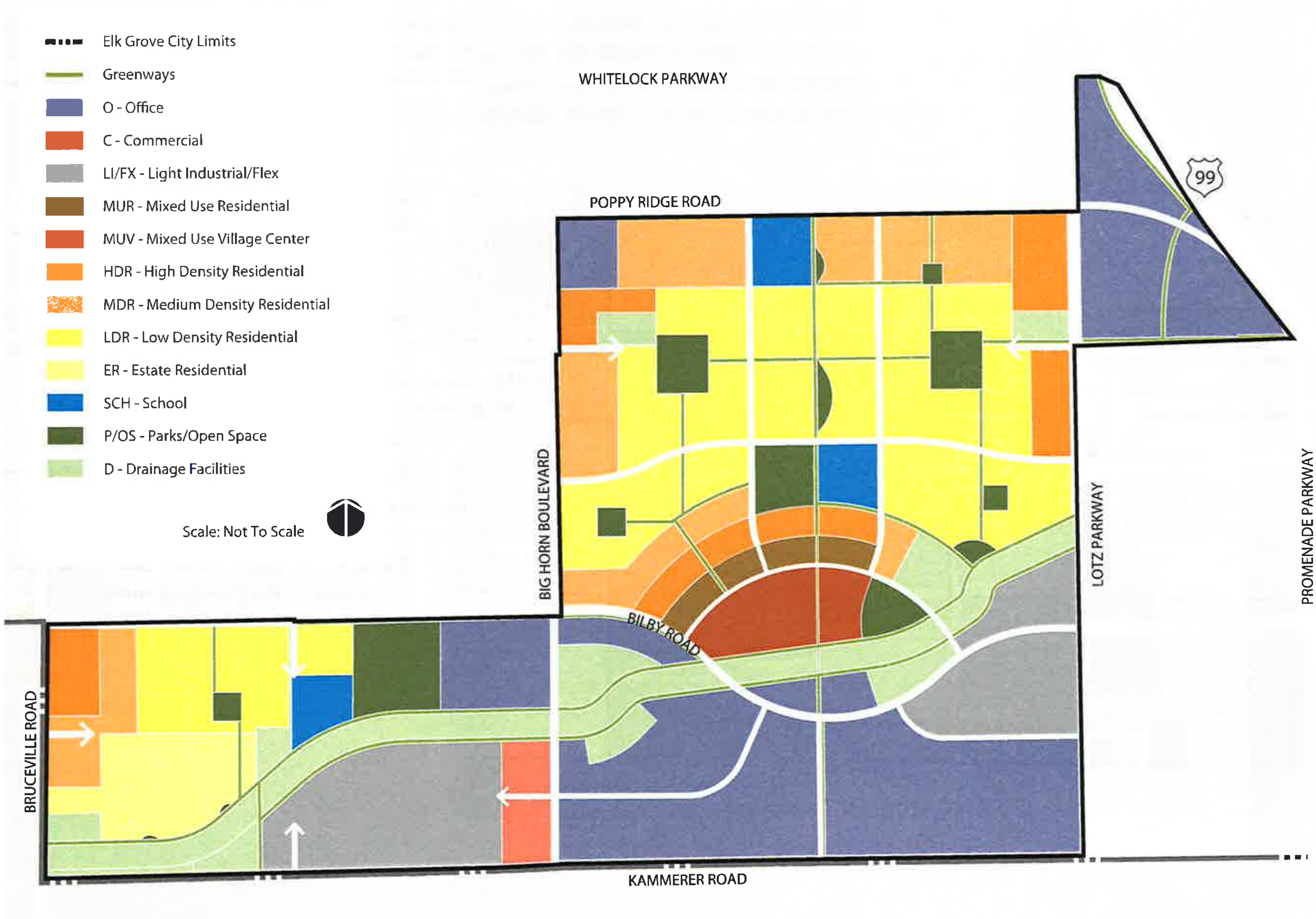
The City shall review tentative map applications in light of this flexibility. The land plan will guide the final configuration of land uses as shown on the tentative maps but will not hold the applicant to precise acreage or dwelling unit counts.

Examples of situations where amendment of the land plan shall be required include, but are not limited to, the following:

- The proposed configuration of specific land use designations is substantially different from that on the land plan.
- The proposed configuration of specific land use designations is not of comparable scale to those shown on the land plan.
- One or more specific land use designations shown on the land plan is absent from the proposal.

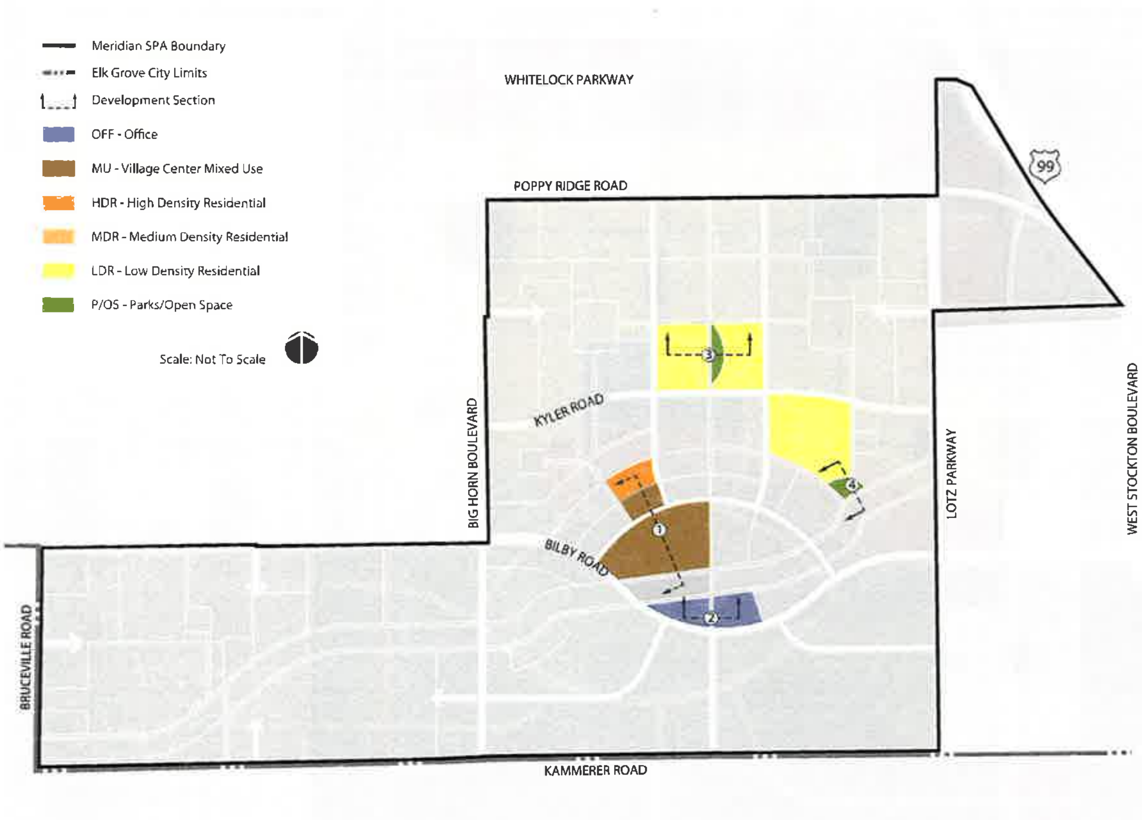
The City shall also review applications for conformance with the The Southeast Policy Area Community Plan. Proposed tentative maps that require a land plan modification may also require a Community Plan Amendment.

Land Plan


Elk Grove City Limits
Greenways
O - Office
C - Commercial
LI/FX - Light Industrial/Flex
MUR - Mixed Use Residential
MUV - Mixed Use Village Center
HDR - High Density Residential
MDR - Medium Density Residential
LDR - Low Density Residential
ER - Estate Residential
SCH - School
P/OS - Parks/Open Space
D - Drainage Facilities
Scale: Not To Scale
WHITELOCK PARKWAY
POPPY RIDGE ROAD
99
BIG HORN BOULEVARD
LOTZ PARKWAY
PROMENADE PARKWAY
BILBY ROAD
BRUCEVILLE ROAD
KAMMERER ROAD

COMMUNITY CHARACTER/TRANSECT

The following graphics illustrate how the various physical forms (streets, buildings, frontages, community spaces, common features) work together to form a complete community. These graphics are provided primarily for illustrative purposes, but also function to guide subsequent development in keeping with the vision for the plan.



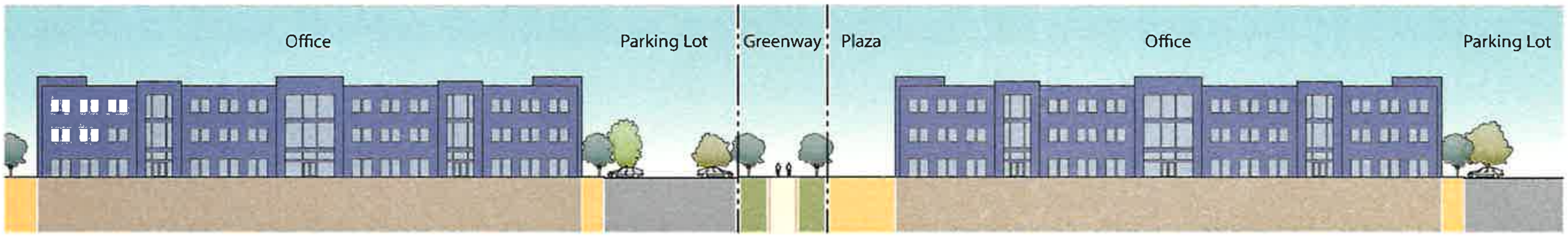
Section 1: Illustrates the Village Center area, including the Mixed Use Residential, Mixed Use Village Core, and Shed C Channel.

Section 2: Shows the development of office uses and adjoining pedestrian connectivity through the network of greenways.

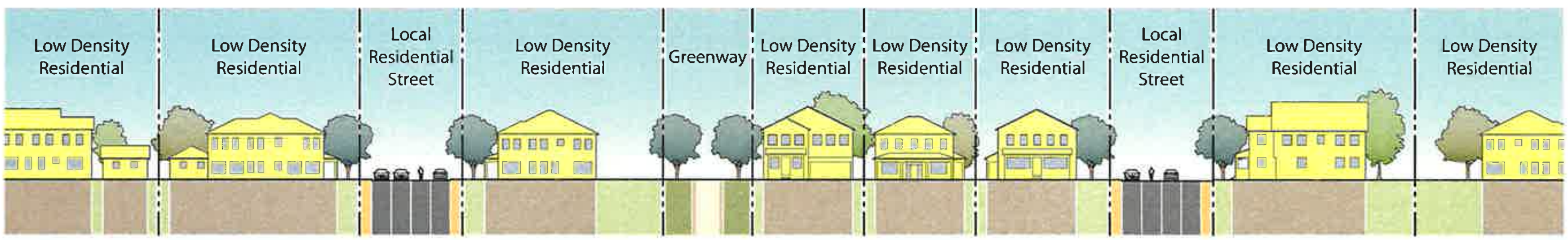
Section 3: Illustrates the residential area of the plan and how these areas integrate with public parks and the greenway system.

Section 4: Shows how parks and trails integrate with the Shed C Channel.

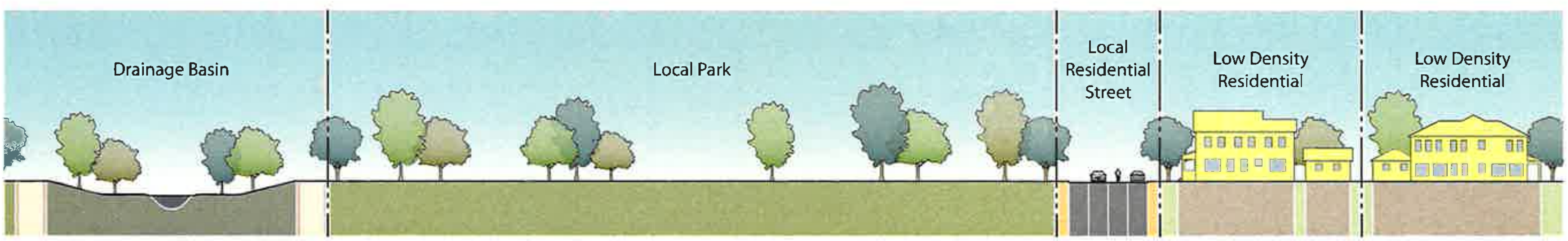
Section 1



Section 2



Section 3



Section 4

CHAPTER 3

ALLOWED USES

SOUTHEAST POLICY AREA

SPECIAL PLANNING AREA

CHAPTER 3
ALLOWED USES

CHAPTER OVERVIEW

This chapter establishes allowed land uses and corresponding permit requirements for each of the fourteen land use designations within the SPA. Allowed land use provisions herein are consistent with and implement the vision, policies, and land use categories in the City's General Plan and Community Plan as applicable. This chapter addresses permanent use regulations only. Temporary use regulations are found in the Citywide Zoning Code.

ALLOWED USES

The following table identifies the allowed uses and requirements for planning entitlements for each of the land use classes and land use designations in this SPA. The uses in these tables are organized into classifications based on common function, product, or compatibility characteristics, such as residential, commercial, office, and industrial. The use classifications and uses identified in the table are the same as those used in the Citywide Zoning Code (Chapter 23.26); see Section 23.26.015 for descriptions of these uses.

Generally, a use is either allowed by right, allowed through issuance of a permit, or not permitted. In addition to the requirements for planning entitlements of this SPA, other permits may be required prior to establishment of the use (e.g., Building Permit or permits required by other agencies). The requirements for planning entitlements identified in the table below include the following:

Permitted by Right (P). A use shown with a "P" indicates that the use is permitted by right in the corresponding land use designation, subject to compliance with all applicable provisions of this SPA and the Municipal Code (e.g., development standards) as well as state and federal law.

Permitted Subject to a Minor Conditional Use Permit (M). A land use shown with an "M" indicates that the land use is permitted in the corresponding land use designation upon issuance of a Minor Conditional Use Permit from the designated approving authority, subject to compliance with all applicable provisions of this SPA and the Municipal Code (e.g., development standards), as well as state and federal law.

Permitted Subject to a Conditional Use Permit (C). A land use shown with a "C" indicates that the land use is permitted in the designated specific land use type upon issuance of a Conditional Use Permit from the designated approving authority, subject to compliance with all applicable provisions of this SPA and the Municipal Code (e.g., development standards) as well as state and federal law.

Not Permitted (-). A land use shown with a "-" in the table, or a land use that is not listed in the table, is not allowed in the corresponding land use designation.

Reference to Specific Use Regulations. References in the table to a specific use regulation refer to the Municipal Code and applicable regulations or development standards for that particular use when allowed by right or subject to a Use Permit.

This SPA includes one overlay land use designation, the Sports Complex overlay. Where the table identifies an allowed use or permit requirement different from the underlying base land use designation, the overlay regulation shall apply. Where the overlay is silent, the base land use designation shall govern. A development may only take advantage of these allowed use and permit requirements when developed as an integrated development as a sports complex.

Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Residential Uses														
Caretaker Housing	P	P	P	-	-	-	-	-	-	-	-	-		
Dwelling														
Multi-Family	-	-	-	P	P	-	-	P	P	-	-	-		
Second Unit	-	-	-	-	-	P	P	P	-	-	-	-		§23.90
Single-Family	-	-	-	P	-	P	P	P	C	-	-	-		
Two-Family	-	-	-	P	-	P	P	P	-	-	-	-		
Employee Housing														
Large	-	-	-	-	-	-	-	-	-	-	-	-		
Small	-	-	-	-	-	P	P	P	-	-	-	-		
Guest House	-	-	-	P	-	P	P	P	-	-	-	-	See base land use type	
Home Occupations	-	-	-	P	P	P	P	P	P	-	-	-		§23.82
Live-Work Facility	-	-	-	P	P	-	-	C	C	-	-	-		
Mobile Home Park	-	-	-	-	-	-	-	-	-	-	-	-		
Organizational Houses	-	-	-	-	-	-	-	C	C	-	-	-		
Rooming and/or Boarding Houses	-	-	-	C	C	-	-	C	C	-	-	-		
Single Room Occupancy (SRO) Facilities	-	-	-	-	-	-	-	-	-	-	-	-		
Supportive Housing	-	-	-	P	P	P	P	P	P	-	-	-		
Transitional Housing	-	-	-	P	P	P	P	P	P	-	-	-		

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Human Services Uses														
Adult Day Health Care Center	-	-	-	-	-	P	P	P	C	-	-	-	See base land use type	
Child Care Facility														
Child Care Center	P	P	P	P	P	P	P	P	P	P	-	P		
Family Day Care Home	-	-	-	P	P	P	P	P	P	-	-	-		
Community Care Facility														
Large	-	C	-	C	C	-	-	-	P	-	-	-		§23.88
Small	-	-	-	P	P	P	P	P	P	-	-	-		
Emergency Shelter	-	-	P	-	-	-	-	-	-	P	-	-		§23.80
Medical Marijuana Cultivation	-	-	-	-	-	-	-	-	-	-	-	-		
Medical Marijuana Dispensary	-	-	-	-	-	-	-	-	-	-	-	-		
Medical Services														
Extended Care	-	-	-	C	M	-	-	-	M	-	-	-		
General (Clinics, Offices, and Labs)	P	P	M	M	P	-	-	-	-	-	-	-		
Hospitals	P	P	-	-	P	-	-	-	-	-	-	-		
Residential Care Facility for the Elderly														
Large	-	C	-	C	C	-	-	-	P	-	-	-		§23.88
Small	-	-	-	P	P	P	P	P	P	-	-	-		
Residential Care Facility for the Chronically Ill														
Large	-	C	-	C	C	-	-	-	P	-	-	-		§23.88
Small	-	-	-	P	P	P	P	P	P	-	-	-		

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Agriculture, Resource, and Open Space Uses														
Animal Husbandry	-	-	-	-	-	-	-	-	-	-	-	-	See base land use type	
Animal Keeping														
Exotic	-	-	-	-	-	-	-	-	-	-	-	-		
Fowl[1]	-	-	-	P	P	P	P	P	P	P	-	-		
Household Pets	-	-	-	P	P	P	P	P	P	P	-	-		
Livestock	-	-	-	-	-	-	-	-	-	-	-	-		
Crop Production	-	-	-	-	-	-	-	-	-	-	-	-		
Equestrian Facility														
Commercial	-	-	-	-	-	-	-	-	-	-	-	-		
Hobby	-	-	-	-	-	-	-	-	-	-	-	-		
Feed Lot	-	-	-	-	-	-	-	-	-	-	-	-		
Hog Farm - Commercial	-	-	-	-	-	-	-	-	-	-	-	-		
Kennels														
Commercial	C	C	P	-	-	-	-	-	-	-	-	-		
Hobby	-	-	-	-	-	-	-	-	-	-	-	-		
Slaughterhouse	-	-	-	-	-	-	-	-	-	-	-	-		
Veterinary Facility	P	P	P	C2	P	-	-	-	-	-	-	-		

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Recreation, Education, and Public Assembly Uses														
Assembly Uses	M	P	M	C	P	C	C	C	C	P	-	-	P	
Cemeteries, Mausoleums	-	-	-	-	-	-	-	-	-	-	-	-	See base land use type	
Community Garden	P	-	P	P	P	P	P	P	P	P	P	P		
Crematories	-	-	C	-	-	-	-	-	-	-	-	-		
Golf Courses/Clubhouse	-	-	-	-	-	C	M	M	M	-	-	C		
Indoor Amusement/Entertainment Facility	C	P	C	-	M	-	-	-	-	-	-	-	P	
Indoor Shooting Range	-	-	C	-	-	-	-	-	-	-	-	-	See base land use type	
Fitness and Sports Facilities	C	P	M	M	P	-	-	-	-	-	-	-	P	
Libraries and Museums	P	P	-	M	P	-	-	-	-	P	-	P	See base land use type	
Mortuaries and Funeral Homes	-	P	-	M	P	-	-	-	-	-	-	-		
Outdoor Commercial Recreation	C	P	C	-	C	-	-	-	-	-	-	-	P	
Parks and Public Plazas	P	P	P	P	P	P	P	P	P	P	P	P	P	
Private Residential Open Space	-	-	-	P	P	P	P	P	P	-	P	P	P	
Recreational Vehicle Parks	-	-	-	-	-	-	-	-	-	-	-	-	See base land use type	
Resource Protection and Restoration	-	-	-	-	-	-	-	-	-	-	P	P		
Resource-Related Recreation	-	-	-	-	-	-	-	-	-	-	P	P		
Schools														
Academic, Charter	C	C	C	C	M	-	-	-	-	P	-	-		
Academic, Private	C	C	C	C	M	-	-	-	-	P	-	-		
Academic, Public	C	P	C	P	P	-	-	-	-	P	-	-		
Colleges and Universities, Private	C	C	C	-	M	-	-	-	-	P	-	-		
Colleges and Universities, Public	C	P	C	P	P	-	-	-	-	P	-	-		
Equipment/Machine/Vehicle Training	M	P	P	-	-	-	-	-	-	-	-	-		
Specialized Education and Training/ Studios	P	P	P	-	M	-	-	-	-	-	-	-		
Theaters and Auditoriums	C	P	C	-	P	-	-	-	-	P	-	-	P	

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Utility, Transportation, and Communication Use Listings														
Airport	-	-	-	-	-	-	-	-	-	-	-	-	See base land use type	
Broadcasting and Recording Studios	P	P	P	C	M	-	-	-	-	-	-	-		
Bus and Transit Shelters	P	P	P	P	P	P	P	P	P	P	P	P		
Fuel Storage and Distribution	C	-	C	-	-	-	-	-	-	-	-	-		
Heliports	C	C	C	-	C	-	-	-	-	-	-	-		
Park and Ride Facility	P	P	P	M	P	-	-	-	-	-	-	-		
Parking Facility	P	P	P	M	P	-	-	-	-	-	-	-		
Public Safety Facility	P	P	P	P	P	P	P	P	P	P	P	P		
Telecommunication Facility	C	C	C	C	C	C	C	C	C	C	C	C		§23.94
Transit Facilities	P	P	P	M	P	-	-	-	-	-	-	-		
Transit Stations and Terminals	P	P	P	M	P	-	-	-	-	-	-	-		
Utility Facility and Infrastructure	P	P	P	P	P	P	P	P	P	P	P	P		

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Retail, Service, and Office Uses														
Adult Oriented Business	-	-	C	-	-	-	-	-	-	-	-	-	See base land use type	§23.70
Agricultural Tourism	-	-	-	-	-	-	-	-	-	-	-	-		
Alcoholic Beverage Sales	C	P	C	C	P	-	-	-	-	-	-	-		
Ambulance Service	M	-	P	-	-	-	-	-	-	-	-	-		
Animal Sales and Grooming	M	P	M	-	P	-	-	-	-	-	-	-		
Art, Antique, Collectable	-	P	-	P	P	-	-	-	-	-	-	-		
Artisan Shops	-	P	-	P	P	-	-	-	-	-	-	-		
Banks and Financial Services	P	P	P	C	P	-	-	-	-	-	-	-		
Bars and Nightclubs	C	P	C	C	P	-	-	-	-	-	-	-	P	§23.86
Bed and Breakfast Inns	-	-	-	M	M	C	C	C	-	-	-	-	See base land use type	
Building Materials Stores and Yards	-	P	C	-	C	-	-	-	-	-	-	-		
Business Support Services	P	P	P	M	P	-	-	-	-	-	-	-		
Call Centers	P	-	P	-	-	-	-	-	-	-	-	-		
Card Rooms	-	C	-	-	C	-	-	-	-	-	-	-		
Convenience Stores	C	P	C	M	P	-	-	-	-	-	-	-		§23.86
Drive-in and Drive-through Sales and Service	M	P	-	-	M^3	-	-	-	-	-	-	-		§23.78
Equipment Sales and Rental	-	C	P	-	-	-	-	-	-	-	-	-		
Garden Center/Plant Nursery	-	P	C	-	M	-	-	-	-	-	-	-		
Grocery Store	-	P	-	-	P	-	-	-	-	-	-	-		

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Retail, Service, and Office Uses *(continued)*														
Hotels and Motels	M	P	-	C	P	-	-	-	-	-	-	-	P	
Liquor Stores	-	P	-	-	C	-	-	-	-	-	-	-	See base land use type	
Maintenance and Repair Service	-	P[2]	P[2]	-	P[2]	-	-	-	-	-	-	-		
Neighborhood Market	-	P	-	-	P	-	-	-	-	-	-	-		
Offices														
Accessory	P	P	P	P	P	-	-	-	-	-	-	-	P	
Building Trade Contractors	M	-	P	-	-	-	-	-	-	-	-	-	See base land use type	
Business and Professional	P	P	P	P	P	-	-	-	-	-	-	-		
Pawn Shop	-	P	-	-	M	-	-	-	-	-	-	-		
Personal Services	-	P	-	P	P	-	-	-	-	-	-	-		
Personal Services, Restricted	-	C	C	-	-	-	-	-	-	-	-	-		
Restaurants	P	P	P	P	P	-	-	-	-	-	-	-	P	
Retail													See base land use type	
Accessory	P	P	P	P	P	-	-	-	-	-	-	-		
General, large format	-	C[4]	-	-	C[4]	-	-	-	-	-	-	-		§23.86
General, medium format	-	C	-	-	C	-	-	-	-	-	-	-		§23.86
General, small format	-	P	-	-	P	-	-	-	-	-	-	-		§23.86
Superstore	-	C[4]	-	-	C[4]	-	-	-	-	-	-	-		§23.86
Superstore, large format	-	-	-	-	-	-	-	-	-	-	-	-		§23.86
Warehouse/club	-	C	-	-	-	-	-	-	-	-	-	-		
Smoke Shops	-	C	-	C	C	-	-	-	-	-	-	-		
Thrift Store	-	P	C	-	P	-	-	-	-	-	-	-		

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Automobile and Vehicle Uses														
Auto and Vehicle Rental	P	P	P	C	P	-	-	-	-	-	-	-	See base land use type	
Auto and Vehicle Sales	-	-	-	-	-	-	-	-	-	-	-	-		
Auto and Vehicle Sales, Wholesale	-	-	P	-	-	-	-	-	-	-	-	-		
Auto and Vehicle Storage	-	-	M	-	-	-	-	-	-	-	-	-		
Auto Parts Sales	-	P[5]	M[5]	-	P[5]	-	-	-	-	-	-	-		
Auto Vehicle Dismantling	-	-	-	-	-	-	-	-	-	-	-	-		
Car Washing and Detailing	-	C	C	-	C	-	-	-	-	-	-	-		
Fueling Station	C	P	M	-	C	-	-	-	-	-	-	-		
Vehicle Services														
Major	-	C[2]	C[2]	-	-	-	-	-	-	-	-	-		
Minor	-	P[2]	P[2]	-	C[2]	-	-	-	-	-	-	-		

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Use	Land Use/Land Use Designation													Specific Use Regulations
	Employment Hub/ Core			Village Center		Residential/Neighborhood				Public/ Semi-Public			Special	
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC	
Industrial, Manufacturing, and Processing Uses														
Agricultural Products Processing	-	-	C	-	-	-	-	-	-	-	-	-	See base land use type	
Freight Yard/Truck Terminal	-	-	C	-	-	-	-	-	-	-	-	-		
Laundry and Dry Clean Plant	-	-	M	-	-	-	-	-	-	-	-	-		
Manufacturing, Major	-	-	M^2	-	-	-	-	-	-	-	-	-		
Manufacturing, Minor	-	-	P^2	-	-	-	-	-	-	-	-	-		
Manufacturing, Small Scale	M^2	-	P^2	-	-	-	-	-	-	-	-	-		
Printing and Publishing	M	-	P	-	-	-	-	-	-	-	-	-		
Recycling Facility														
Collection, Small	-	P	P	-	M	-	-	-	-	-	-	-		
Collection, Large	-	-	P^2	-	-	-	-	-	-	-	-	-		
Processing	-	-	-	-	-	-	-	-	-	-	-	-		
Scrap and Dismantling	-	-	-	-	-	-	-	-	-	-	-	-		
Research and Development	P	-	P	-	-	-	-	-	-	-	-	-		
Storage														
Personal Storage Facility	-	-	P	-	-	-	-	-	-	-	-	-		
Warehouse	M	-	P	-	-	-	-	-	-	-	-	-		
Yards	-	-	C	-	-	-	-	-	-	-	-	-		
Wholesaling and Distribution	-	-	C	-	-	-	-	-	-	-	-	-		
Wineries, Distilleries, and Brewery	-	P^6	M	-	P^6	-	-	-	-	-	-	-		

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Notes:

1. All fowl shall be kept and maintained a minimum distance of 40 feet from any property line. A maximum of six fowl may be kept, maintained, or fed as pets. All birds shall be kept within confined, clean coops or cages. Roosters are not permitted.
2. All activities must be entirely screened from public view.
3. Only allowed for banks and financial institutions, pharmacies, and similar service uses with limited queuing. Restaurant drive-throughs are prohibited.
4. See requirements of Section 23.27.020, footnote 14 for Commercial Zoning Districts.
5. On-site repair of vehicles is prohibited.
6. Limited to "microbreweries" or "microwineries."
7. An agricultural operation allowed through the Williamson Act shall be allowed by right on lands that are under a valid Williamson Act contract.

CHAPTER 4

PHYSICAL FORM

SOUTHEAST POLICY AREA

SPECIAL PLANNING AREA

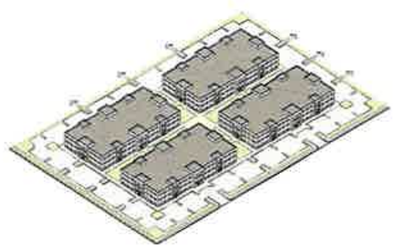
CHAPTER 4
PHYSICAL FORM

CHAPTER OVERVIEW

This chapter identifies the regulations for the physical form of development within the plan area. Five physical forms make up the built environment:

Physical Forms

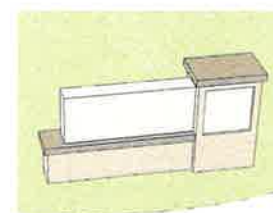
Streets
The types of roadways allowed.



Buildings
The type of structure based on massing, layout, and use.

Frontages
The architectural composition of the front façade of a building; particularly concerning how it relates and ties into the surrounding public realm.

Community Spaces
Non-transportation infrastructure and community uses.



Common Features
Features found throughout the plan area.

This chapter is intended to communicate the desired development patterns for the physical forms within the plan area. It does so by identifying several individual development types in each of the five physical form categories and tells the reader two things:

1. Where the development type is permitted (by land use designation)
2. Rules that apply to each development type, including but not limited to development standards, required elements, and features.

The application of the various development patterns is controlled by an application matrix, which appears at the start of each physical form discussion. Each application matrix identifies where (by land use designation) a particular development pattern may be applied.

Example physical forms found in this chapter.

PHYSICAL FORM: STREETS

This section describes the various street forms, corresponding development standards, and location within the plan area. All public streets in the plan area shall conform to these development standards to the satisfaction of Public Works.

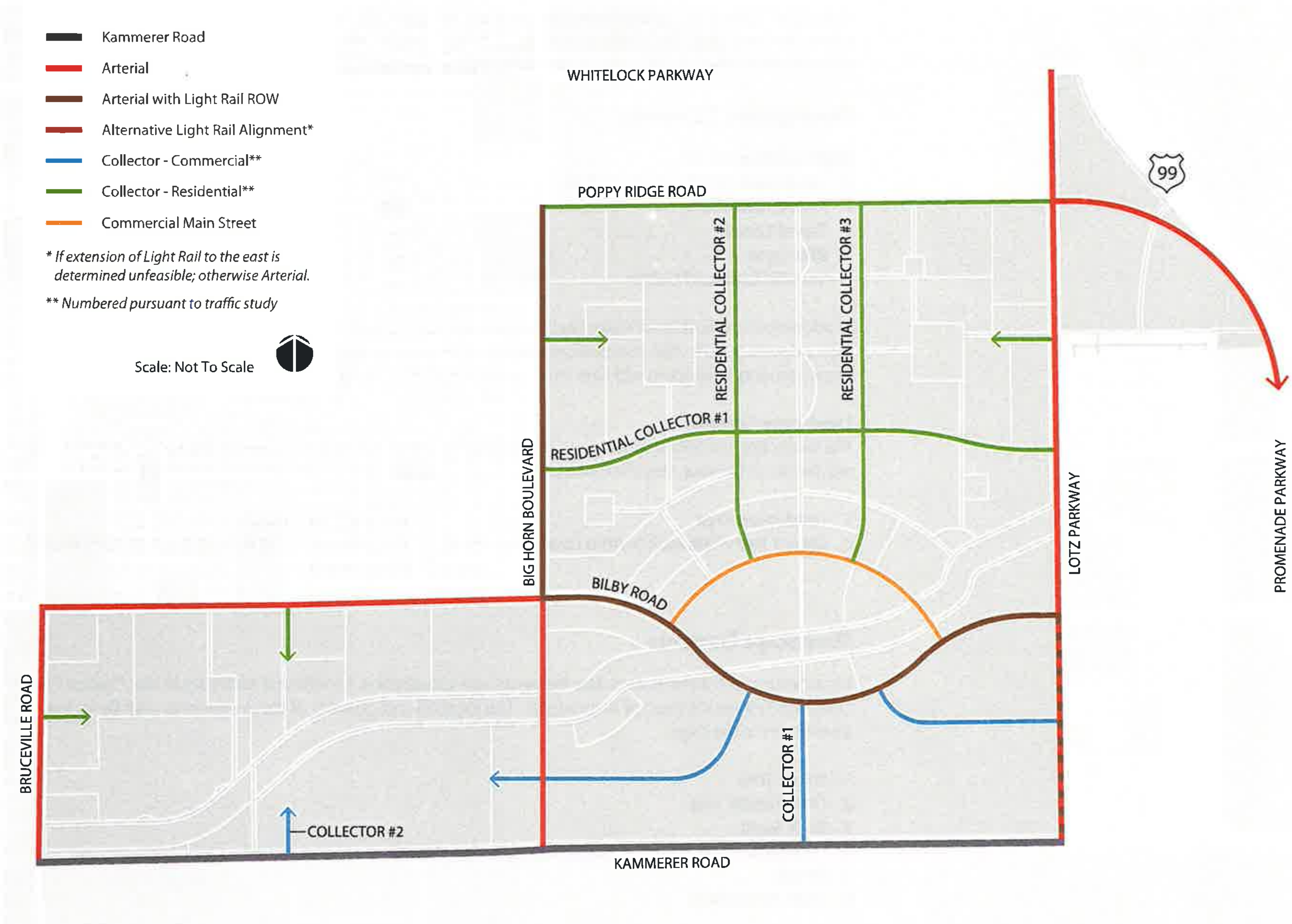
The street forms used in this plan are:

A. Kammerer Road
B. Arterial
C. Arterial with Transit Corridor
D. Collector, Commercial
E. Commercial Main Street
F. Collector, Residential
G. Primary Residential Street
H. Local Residential Street
I. Local Estate Residential Street
J. Alley/Drive Aisle

The street forms shall be applied consistent with the following matrix. An "x" indicates that the street form is allowed in the corresponding land use designation; a "-" indicates that the street form is not allowed in the corresponding land use designation. The application of the street form is further regulated by the Street Layout Map provided on the following page.

	Land Use Classes/Land Use Designations												
	Employment Hub/Core			Village Center		Residential/Neighborhood				Public/Semi-Public			Special
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC
Street Forms													
Kammerer Road	X	X	X	-	-	-	-	-	-	-	X	X	X
Arterial	-	-	-	-	-	-	X	X	X	-	X	X	X
Arterial with Transit Corridor	X	X	X	X	X	-	-	X	X	-	X	X	X
Collector, Commercial	X	X	X	-	-	-	-	-	-	-	X	X	X
Collector, Residential	-	-	-	-	-	-	X	-	-	X	X	X	-
Commercial Main Street	-	-	-	X	X	-	-	-	-	-	X	X	-
Primary Residential Street	-	-	-	-	-	X	X	-	-	X	X	X	-
Local Residential Street	-	-	-	-	-	X	X	-	-	X	X	X	-
Local Estate Residential Street	-	-	-	-	-	X	-	-	-	-	X	X	-
Alley/Drive Aisle	X	X	X	X	X	-	X	X	X	-	-	-	-

Street Layout Map



A. Kammerer Road

Kammerer Road is a specialty thoroughfare roadway type that applies to the portion of Kammerer Road within the plan area. The facility is anticipated to be 6 lanes at buildout, but may be 4 lanes on an interim basis. Intersections shall be spaced no closer than every half mile.

Development Standards

Right-of-Way (96 ft.)

A. Landscape Median/Turn Pocket	**12 ft.**
B. Inside Travel Lane	**12 ft.**
C. Travel Lanes	**11 ft.**
D. Bike Lane	**5 ft.**
E. Vertical Curb and Gutter	**3 ft.**

In addition to dedication of expanded intersections as required by the City's Improvement Standards, future development shall also dedicate and/or reserve additional area for future grade separation and other improvements in keeping with the intent of the Capital Southeast Connector as determined by the City.

Landscape Corridor

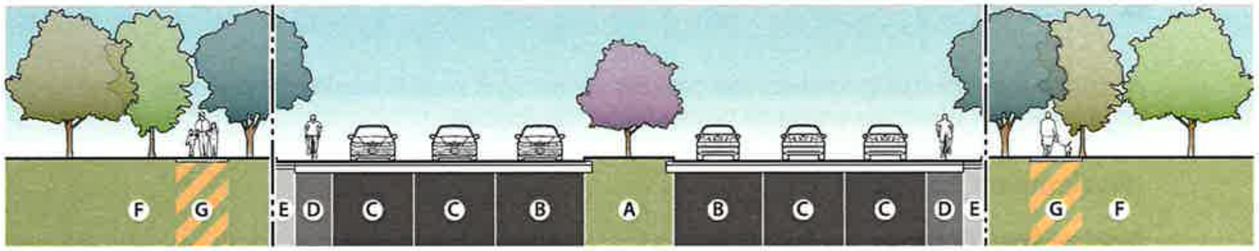
The landscape corridor shall only be a publicly owned and maintained lot when adjacent to single-family residential. Otherwise, this shall be a private landscape area designed to the City's satisfaction.

F. Landscape Area	**36 ft. min. total width**
G. Class 1 Path/Sidewalk (within Landscape Area)	**10 ft. min width, 10 ft. from back of curb, except at intersections**

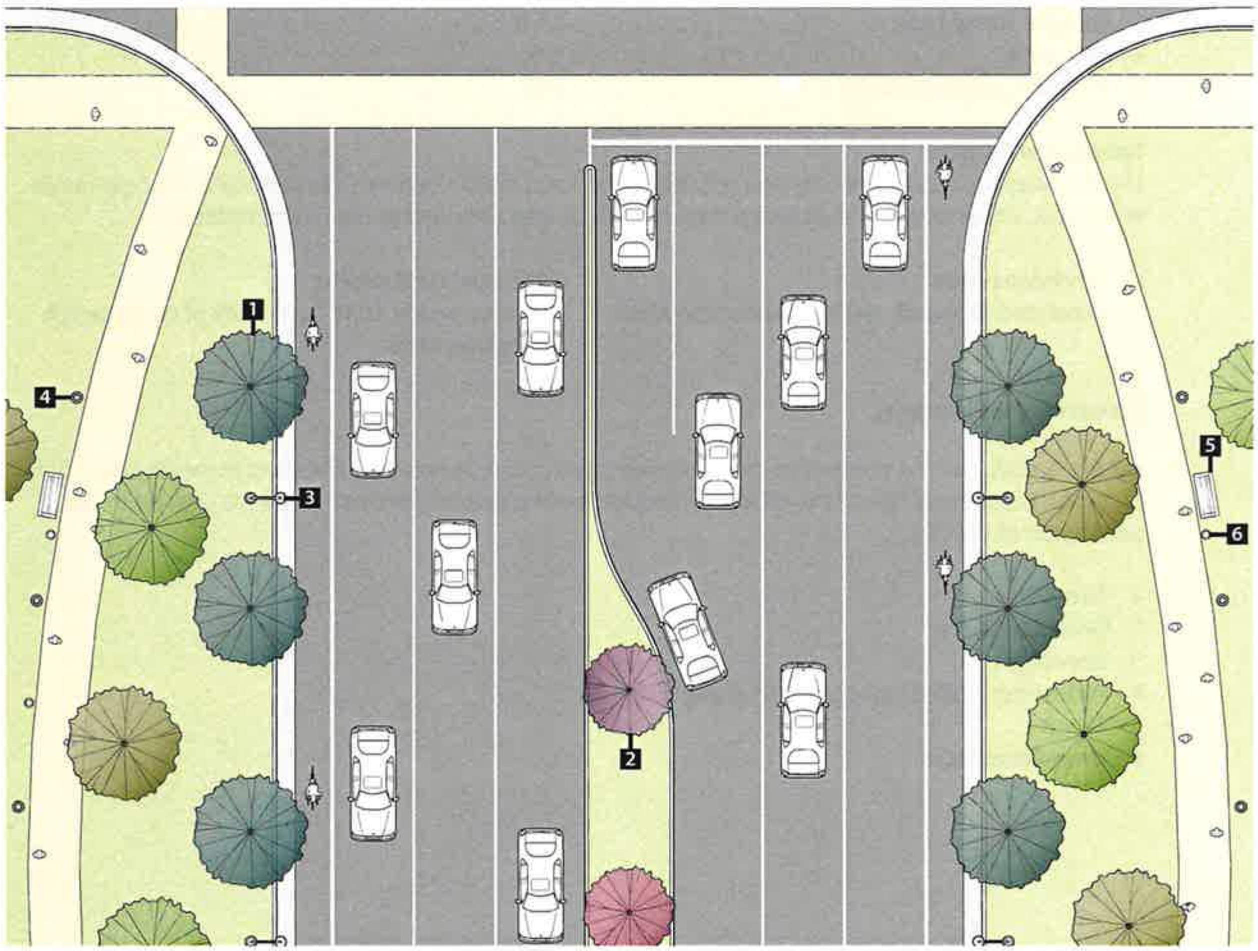
Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. **Street Tree**
2. **Ornamental Tree**
3. **Streetlight**
4. **Pedestrian-Scaled Light Located Along Path/Sidewalk**
5. **Bench**
6. **Trash Receptacle**



Section View



Plan View

Not to scale

B. Arterial

An arterial is a high-cpacity roadway that provides connections to areas outside the plan area. These roads provide for high-speed movement and wide intersection spacing.

Development Standards

Right-of-Way (74 ft.)

A. Landscape Median/Turn Pocket	12 ft.
B. Inside Travel Lane	12 ft.
C. Outside Travel Lane	11 ft.
D. Bike Lane	5 ft.
E. Vertical Curb and Gutter	3 ft.

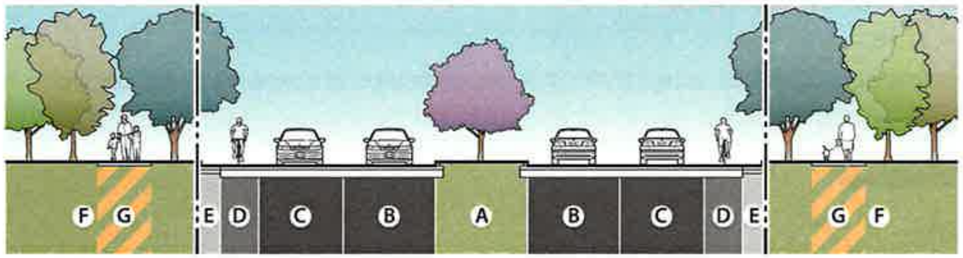
Landscape Corridor
The landscape corridor shall only be a publicly owned and maintained lot when adjacent to single-family residential. Otherwise, this shall be a private landscape area designed to the City's satisfaction.

F. Landscape Area	24 ft. min. total width
G. Separated Sidewalk (within Landscape Area)	8 ft. min. width, 10 ft. from back of curb, except at intersections

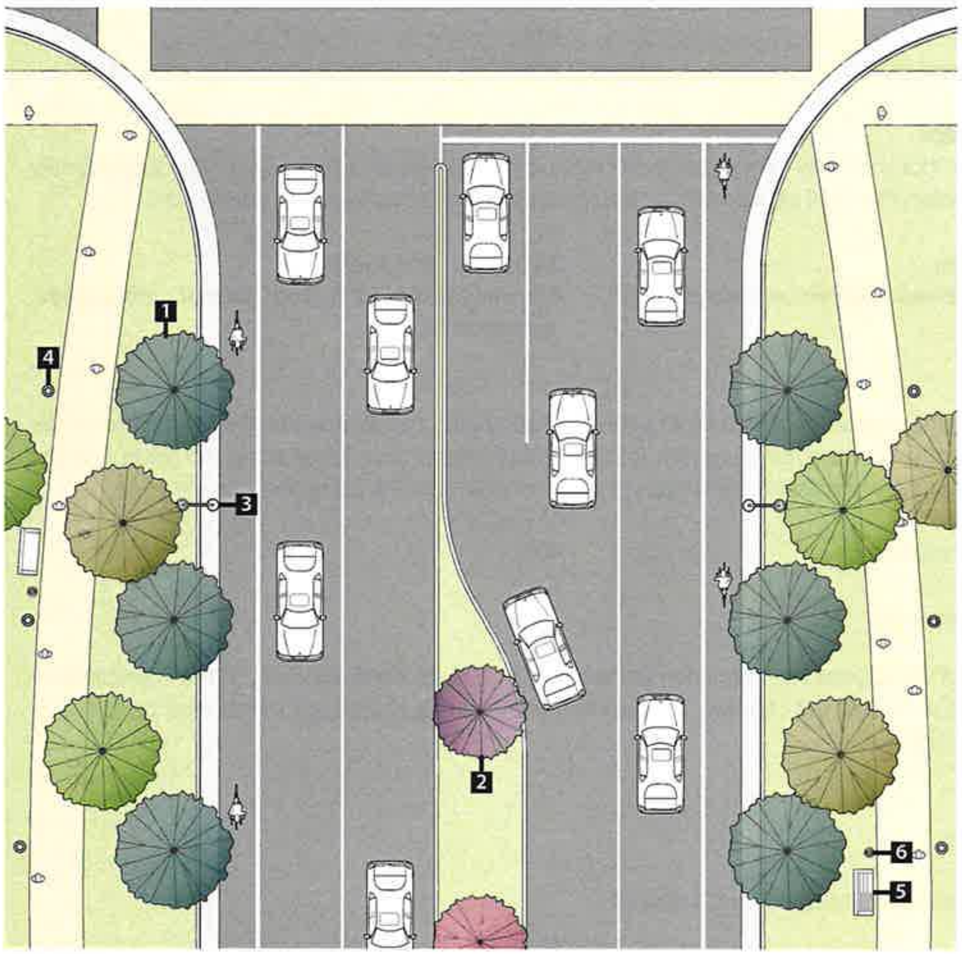
Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. Street Tree
2. Ornamental Tree
3. Streetlight
4. Pedestrian-Scaled Light Located Along Sidewalk
5. Bench
6. Trash Receptacle



Section View



Plan View

Not to scale

C. Arterial with Transit Corridor

This type is similar to the general arterial, except that it includes dedication of a separate transit corridor along one side.

Development Standards

Right-of-Way (74 ft.)

A. Landscape Median/Turn Pocket	**12 ft.**
B. Inside Travel Lane	**12 ft.**
C. Outside Travel Lane	**11 ft.**
D. Bike Lane	**5 ft.**
E. Vertical Curb and Gutter	**3 ft.**

Landscape Corridor
The landscape corridor shall only be a publicly owned and maintained lot when adjacent to single-family residential. Otherwise, this shall be a private landscape area designed to the City's satisfaction.

F. Landscape Area	**24 ft. min. total width**
G. Separated Sidewalk (within Landscape Area)	**8 ft. min., width, 10 ft. from back of curb, except at intersections**

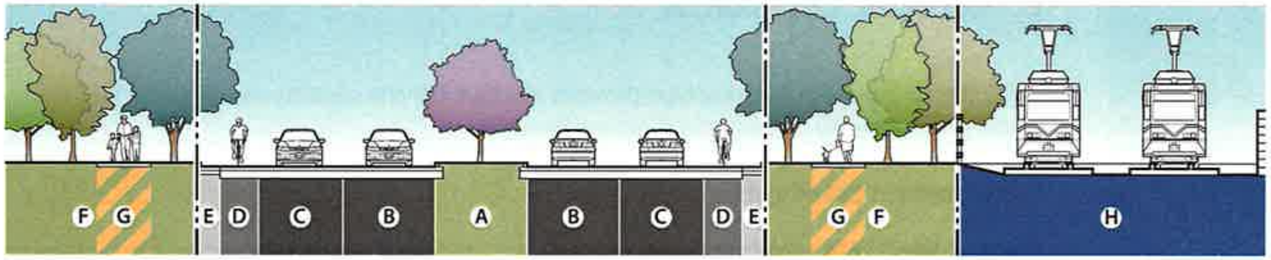
Transit Corridor
In advance of construction of the transit facility, this corridor shall be landscaped to the satisfaction of the City. Upon development of the transit system, it shall include a decorative fence along the street side and a solid masonry wall, consistent with the design requirements of this SPA, along the outside edge.

H. Dedicated Right-of-Way	40 ft.

Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter.. The location and quantity of these elements shall be to the satisfaction of the City.

1. Street Tree
2. Ornamental Tree
3. Streetlight
4. Pedestrian-Scaled Light Located Along Sidewalk
5. Bench
6. Trash Receptacle



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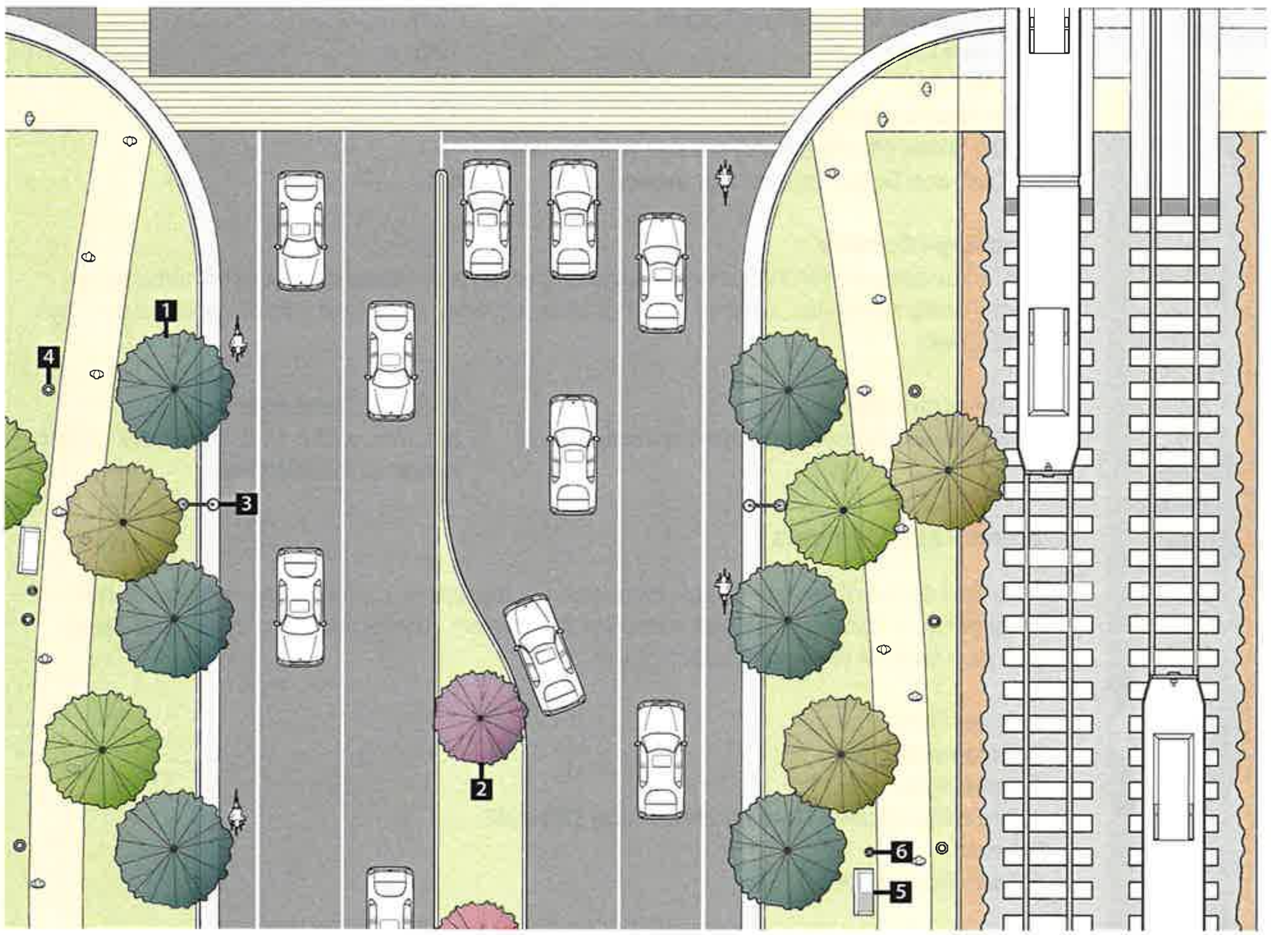
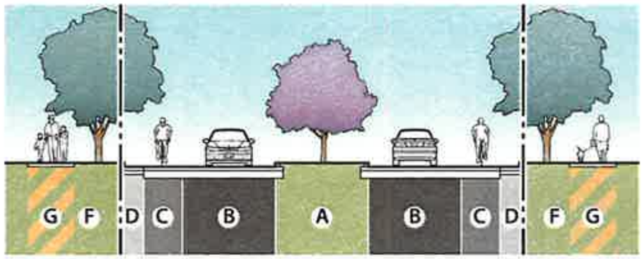
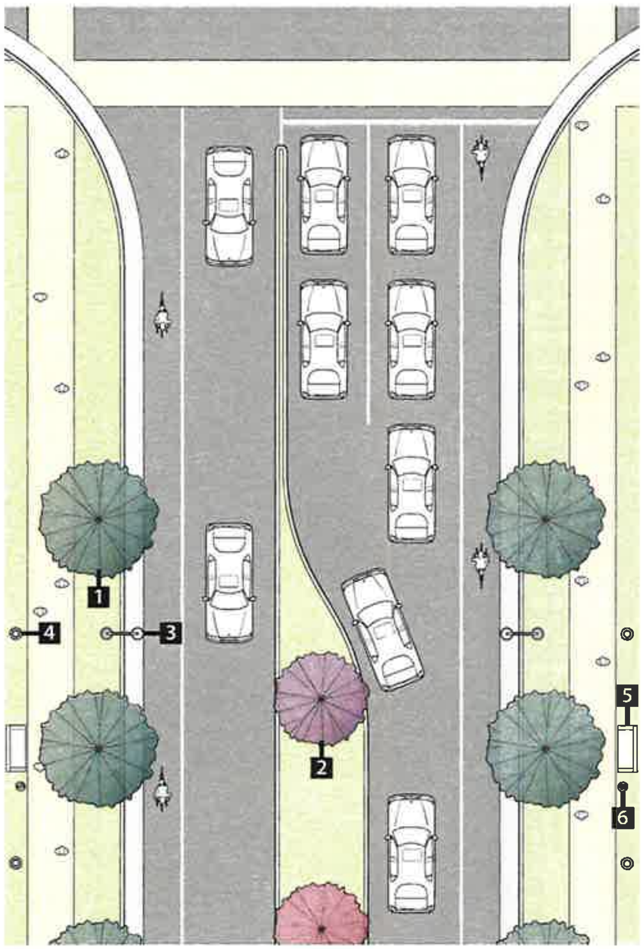


Plan View

Not to scale



Section View



Plan View

Not to scale

D. Collector, Commercial

As a collector road, this roadway type provides low to moderate capacity moving vehicles from employment areas to arterials and thoroughfares.

Development Standards

Right-of-Way (54 ft. – 64 ft.)
This street type may be built either with or without on-street parking as described below.

A. Landscape Median/Turn Pocket	12 ft.
B. Travel Lane	12 ft.
C. Bike Lane	5 ft.
D. Vertical Curb and Gutter	3 ft.
E. On-Street (Parallel) Parking Lane with Vertical Curb and Gutter (option not shown)	8 ft.

Landscape Corridor
The landscape corridor shall only be a publicly owned and maintained lot when adjacent to single-family residential. Otherwise, this shall be a private landscape area designed to the City's satisfaction.

F. Landscape Area	15 ft. min. total width
G. Separated Sidewalk (within Landscape Area)	6 ft. min. width 10 ft. from back of curb, except at intersections

Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. Street Tree
2. Ornamental Tree
3. Streetlight
4. Pedestrian-Scaled Light Located Along Sidewalk
5. Bench
6. Trash Receptacle

E. Commercial Main Street

The main street roadway type provides space for a variety of travel modes, including vehicular, bicycle, and pedestrian. Narrower streets allow for on-street parking, and wider sidewalks facilitate greater pedestrian activity.

Development Standards

Right-of-Way (48 ft. – 86 ft.)
This street type may be built with either parallel or angled on-street parking.

A. Landscape Median/Turn Pocket (where required)	12 ft.
B. Travel Lane	11 ft.
C. Diagonal Parking Lane	18 ft.
D. Parallel Parking Lane with Vertical Curb and Gutter	8 ft.
E. Bike Lane	5 ft.
F. Vertical Curb and Gutter	3 ft.

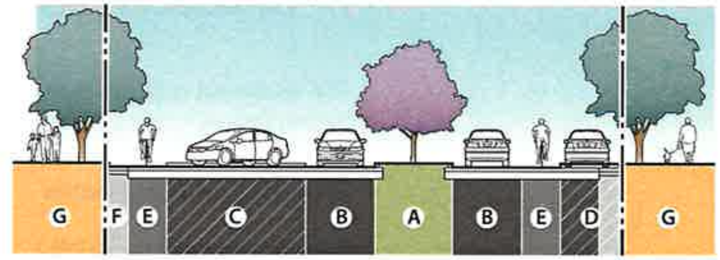
Pedestrian Corridor

G. Sidewalk	12 ft. min.; may be reduced to 5 ft min. when adjacent to parking areas

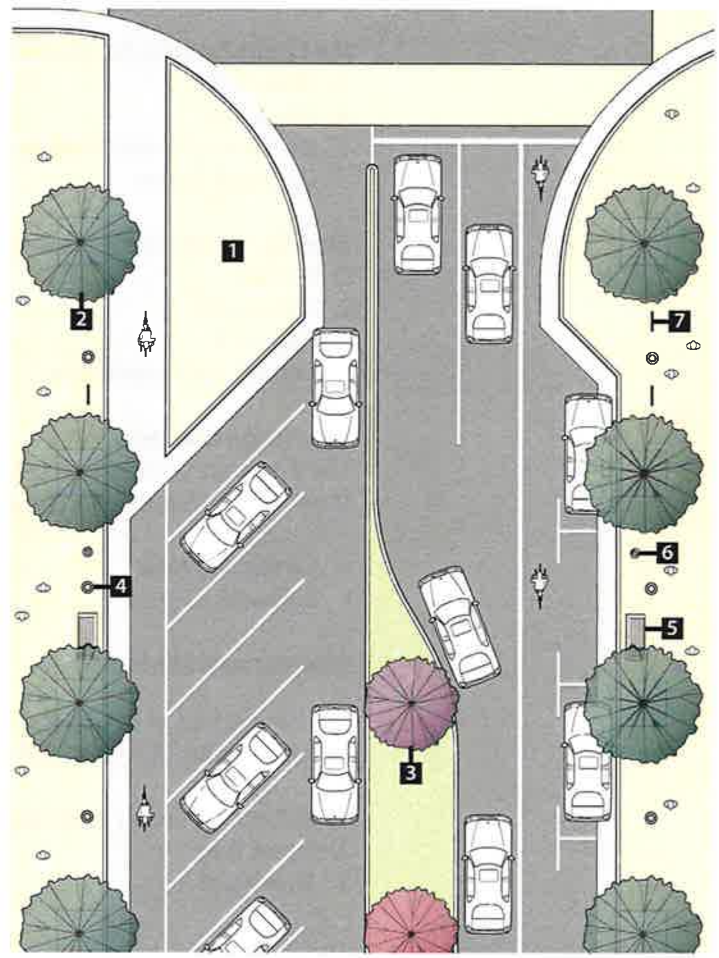
Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. Bulbout
2. Street Tree
3. Ornamental Tree
4. Pedestrian-Scaled Street Light
5. Bench
6. Trash Receptacle
7. Bike Rack



Section View



Plan View

Not to scale

F. Collector, Residential

The residential collector type provides low to moderate capacity moving residents from neighborhoods to arterials and thoroughfares.

Development Standards

Right-of-Way (50 ft. – 52 ft.)
This street type may be built in one of two conditions – either without a median but with on-street parking or with a median but without on-street parking. When a median is provided, the residential driveways shall not open onto the street.

On-Street Parking, No Median

A. Travel Lane	12 ft.
B. Bike Lane	5 ft.
C. On-Street (Parallel) Parking Lane with Vertical Curb and Gutter	8 ft.

Median, No On-Street Parking

D. Median	12 ft.
E. Travel Lane	12 ft.
F. Bike Lane	5 ft.
G. Vertical Curb and Gutter	3 ft.

Landscape Corridor
The landscape corridor shall only be a publicly owned and maintained lot when single-family residential backs onto the street. Otherwise, this shall be a private landscape area maintained by the homeowner and designed to the City's satisfaction.

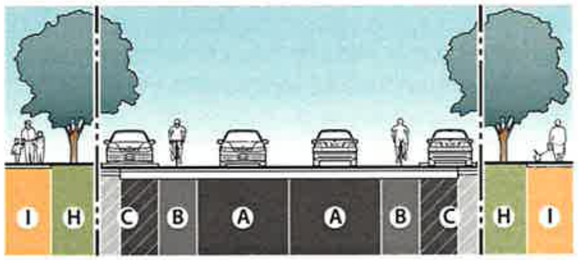
H. Landscape Area	8 ft.
I. Sidewalk	5 ft.; 8 ft. along parks and schools

Streetscape Elements

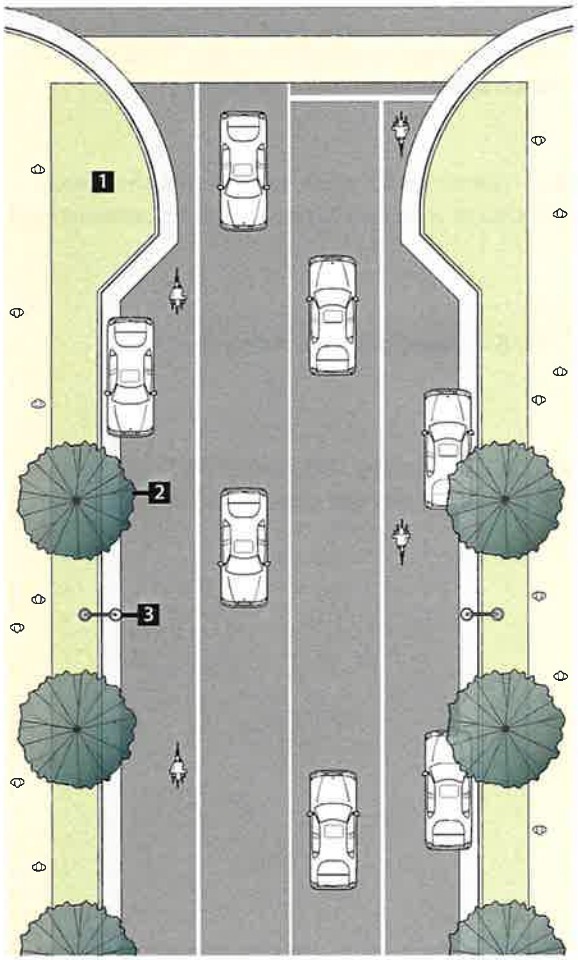
For a description of the streetscape elements, see section subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. Bulbout (when on-street parking is provided)
2. Street Tree
3. Streetlight

On-Street Parking, No Median



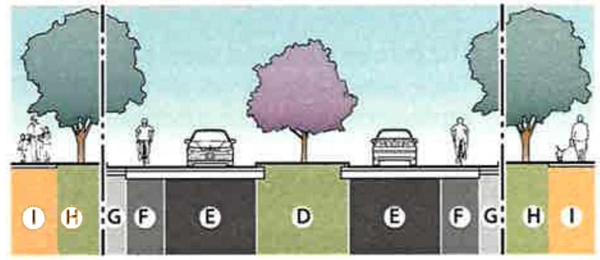
Section View



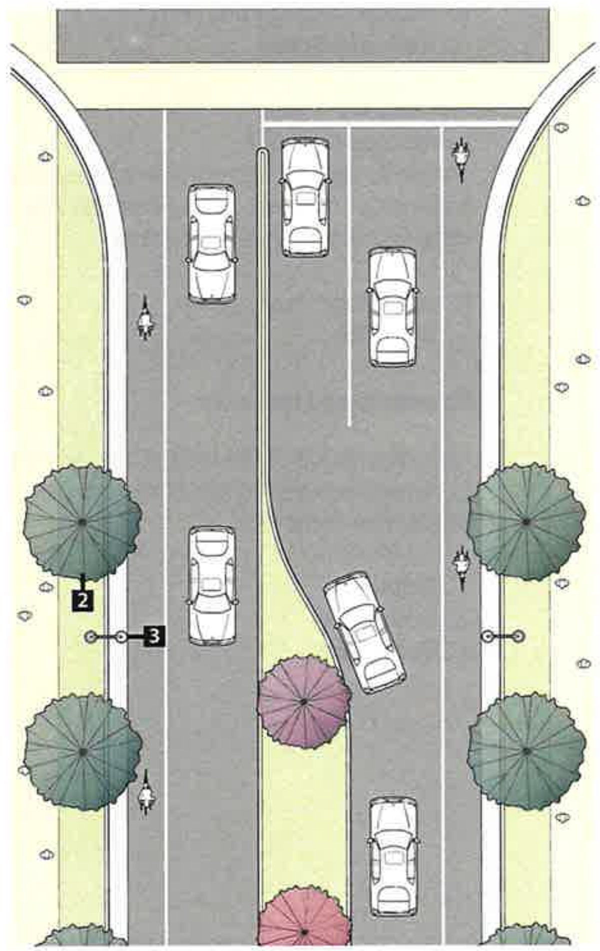
Plan View

Not to scale

Median, No On-Street Parking



Section View



Plan View

Not to scale

G. Primary Residential Street

The primary residential street is a type of local road that provides access into and through neighborhoods. These street types are not identified on the roadway sizing diagram and will be located with the preparation of tentative subdivision maps.

Development Standards

Right-of-Way (40 ft.)

A. Travel Lane	12 ft.
B. Parallel Parking Lane with Curb and Gutter	8 ft.; curb may be rolled when lots "front on", otherwise vertical curb is required

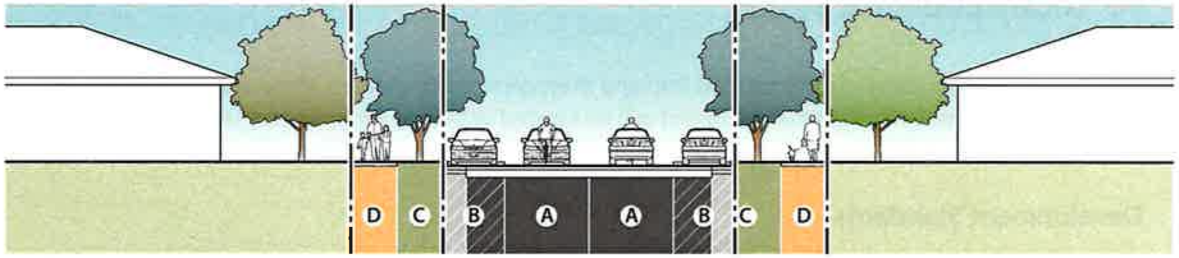
Landscape Corridor
The landscape corridor shall only be a publicly owned and maintained lot when single-family residential backs onto the street. Otherwise, this shall be a private landscape area maintained by the homeowner and designed to the City's satisfaction.

H. Landscape Area	6 ft.
I. Sidewalk	5 ft.; 8 ft. along parks and schools

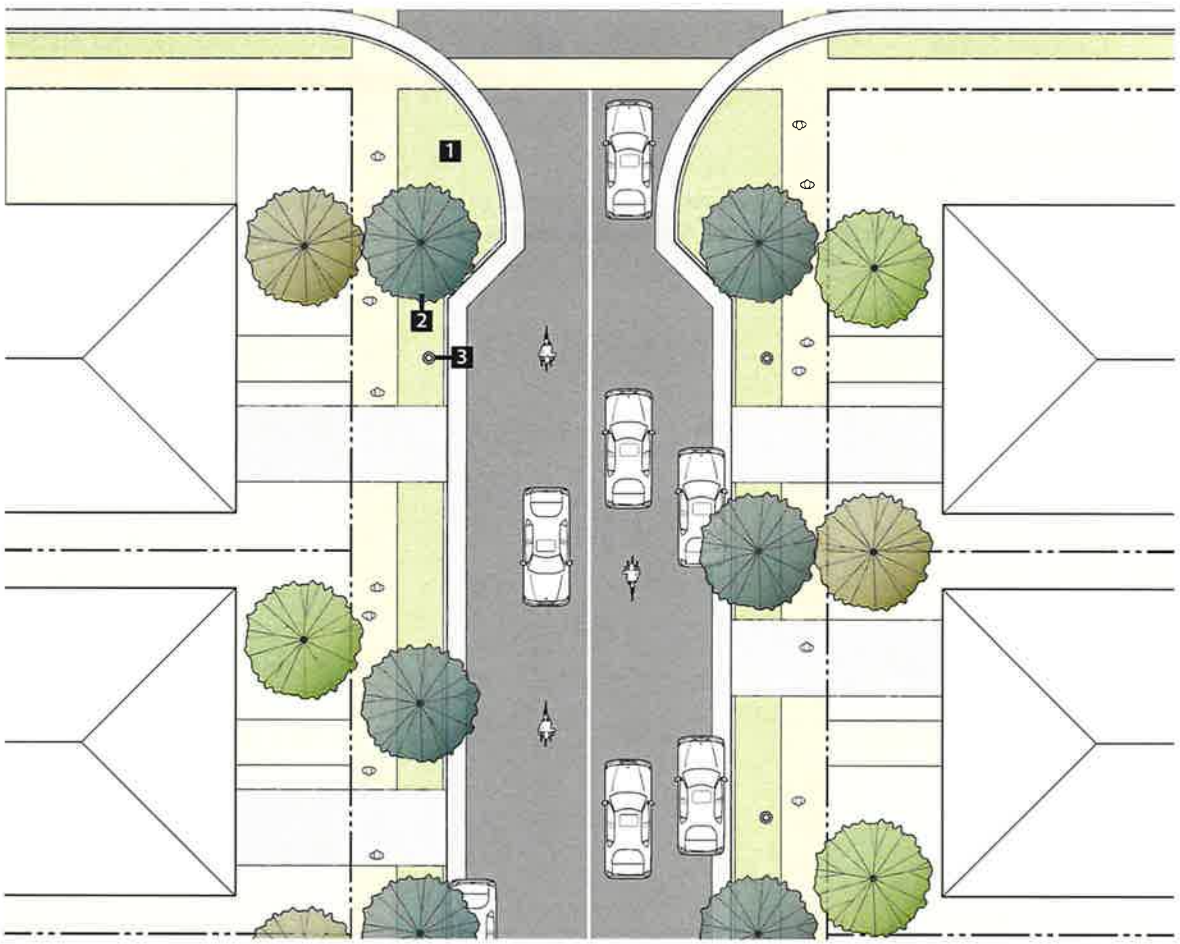
Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. Bulbout
2. Street Tree
3. Streetlight



Section View



Plan View

Not to scale

H. Local Residential Street

The local residential street provides access into and through neighborhoods. These street types are not identified on the roadway sizing diagram and will be located with the preparation of tentative subdivision maps.

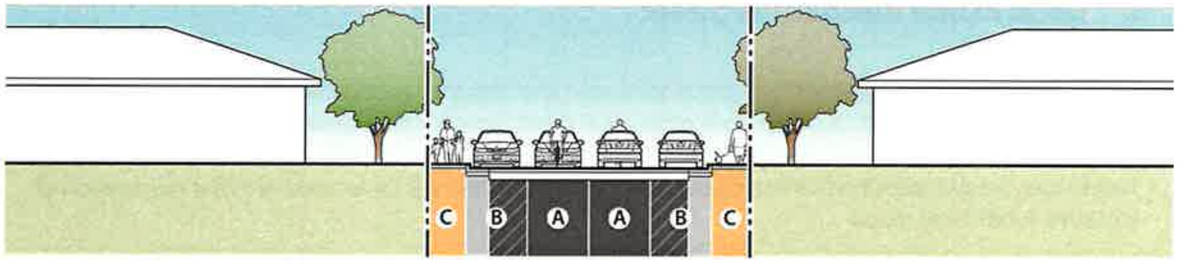
Development Standards

Right-of-Way (42 ft. – 48 ft.)	
A. Travel Lane	**8 ft.**
B. Parallel Parking Lane with Curb and Gutter	**8 ft.**
C. Sidewalk	**5 ft.; 8 ft. along parks and schools**

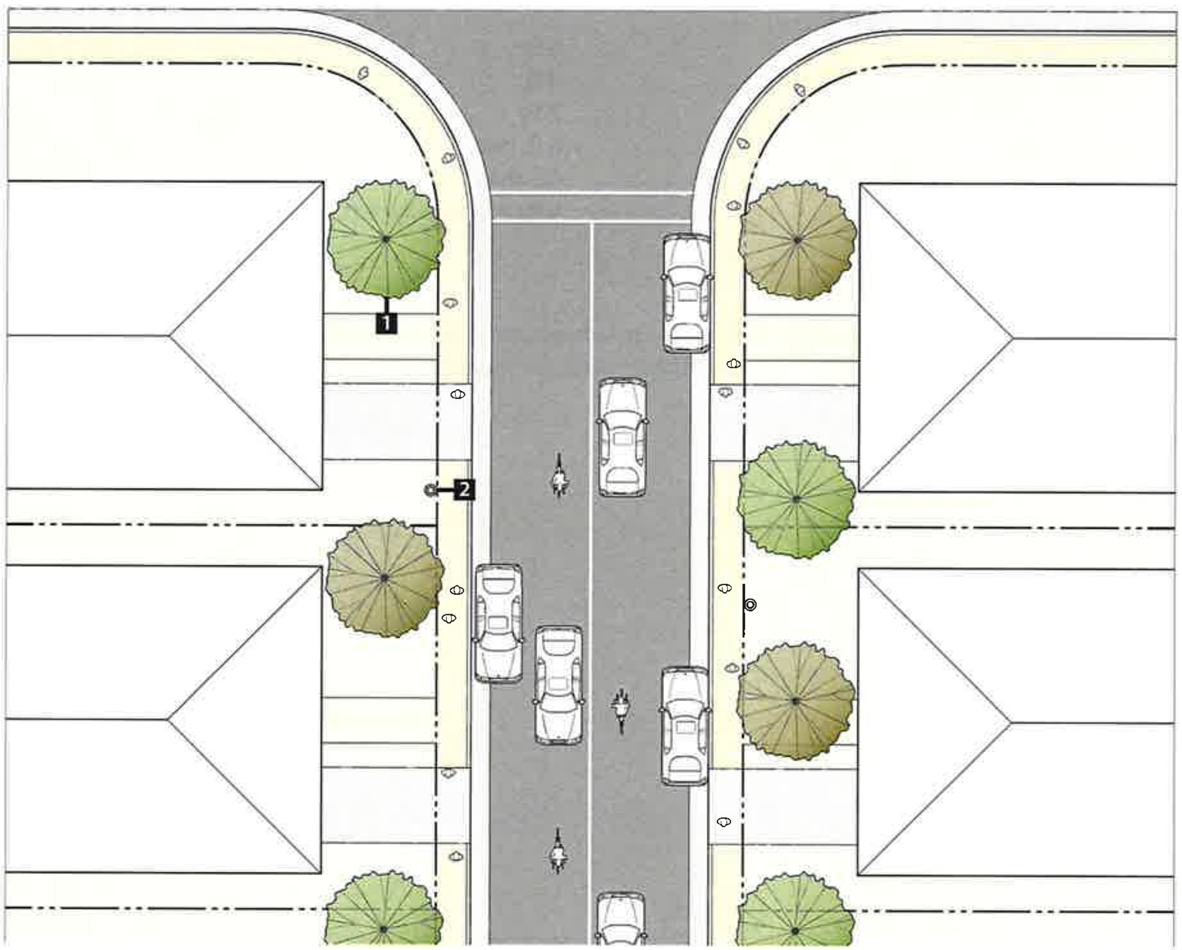
Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. **Street Tree**
2. **Streetlight**



Section View



Plan View

Not to scale

I. Local Estate Residential Street

The local estate residential street is a type of local road that provides access into and through estate residential neighborhoods. It differs from other local street types in that sidewalks are only provided on one side and drainage is facilitated through roadside bioswales, rather than piped infrastructure. These street types are not identified on the roadway sizing diagram and will be located with the preparation of tentative subdivision maps.

Development Standards

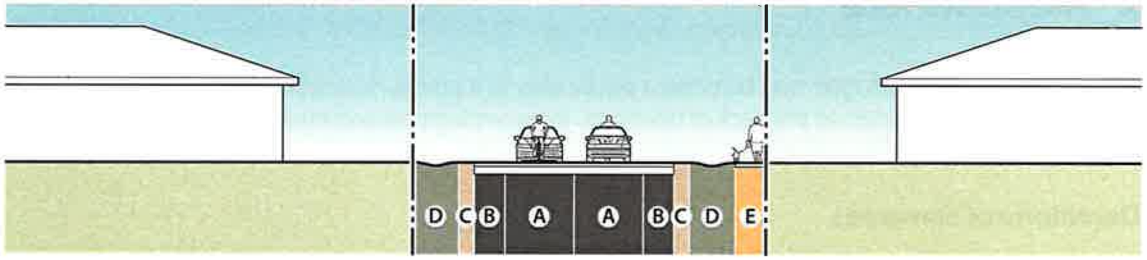
Right-of-Way (47 ft. – 50 ft.)

A. Travel Lane	9 ft.
B. Paved Shoulder	4 ft.
C. Unpaved Shoulder/Transition	2 ft.
D. Bioswale	6 ft. min.
Bioswale side slope	4:1 max.
E. Sidewalk	5 ft., 1 side only; 8 ft. along parks and schools

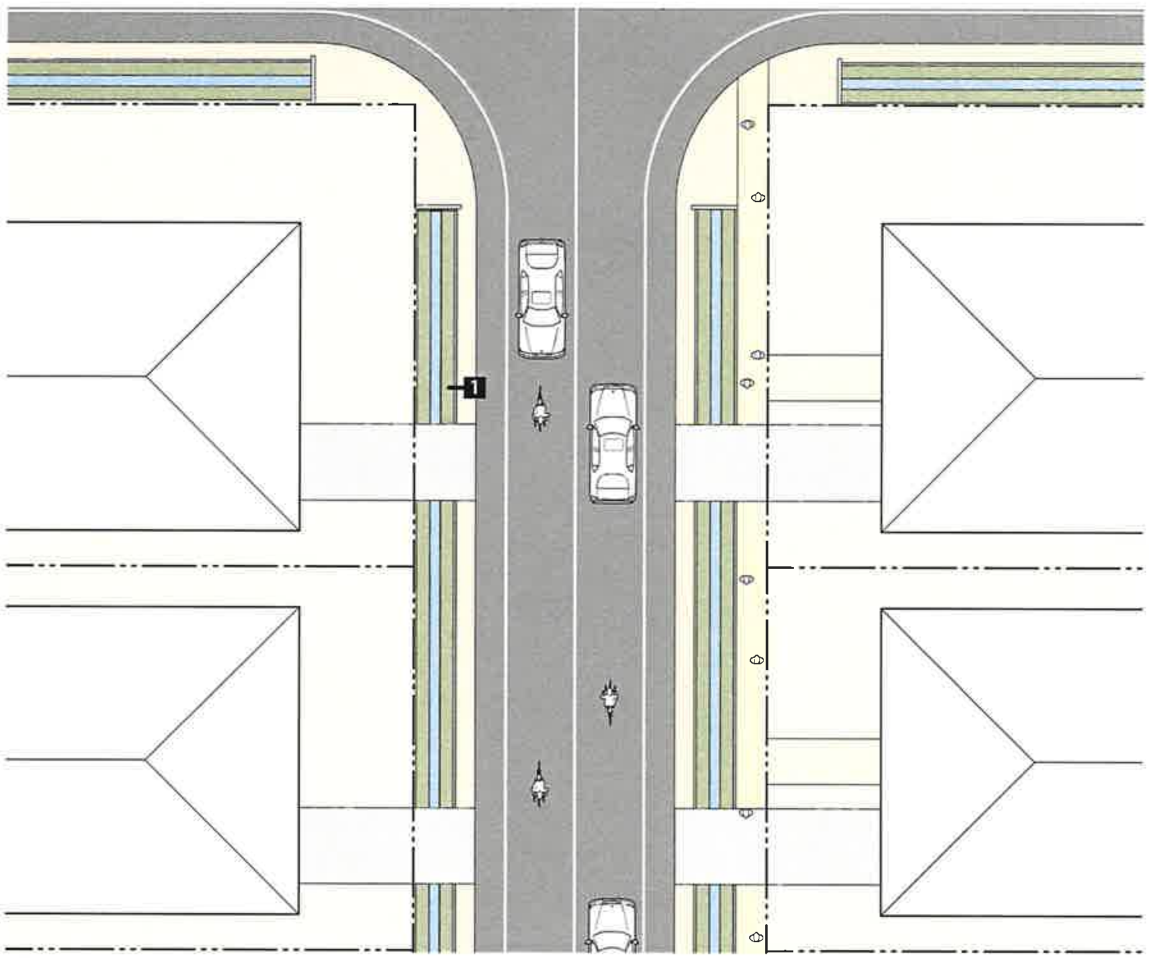
Streetscape Elements

For a description of the streetscape elements, see subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter. The location and quantity of these elements shall be to the satisfaction of the City.

1. **Native Plantings**
2. **Street Light at Intersections**



Section View



Plan View

Not to scale

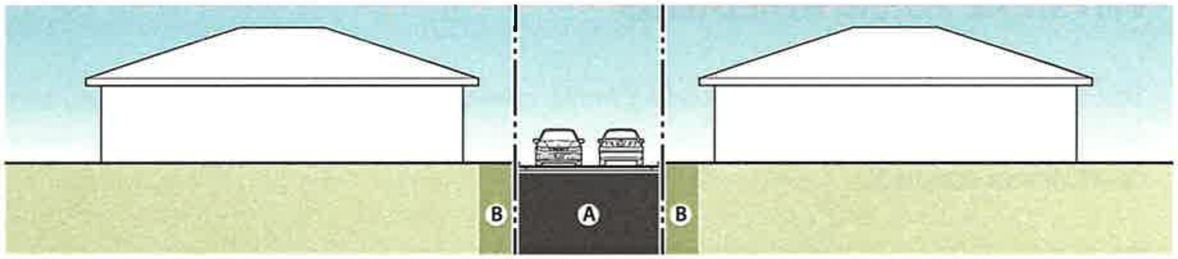
J. Alley/Drive Aisle

The alley/drive aisle street type may be either a public alley or a private drive aisle. As alleys, they provide vehicular and service access to the back of buildings. In non-residential and mixed use environments, they serve as private drive aisles connecting streets to parking fields.

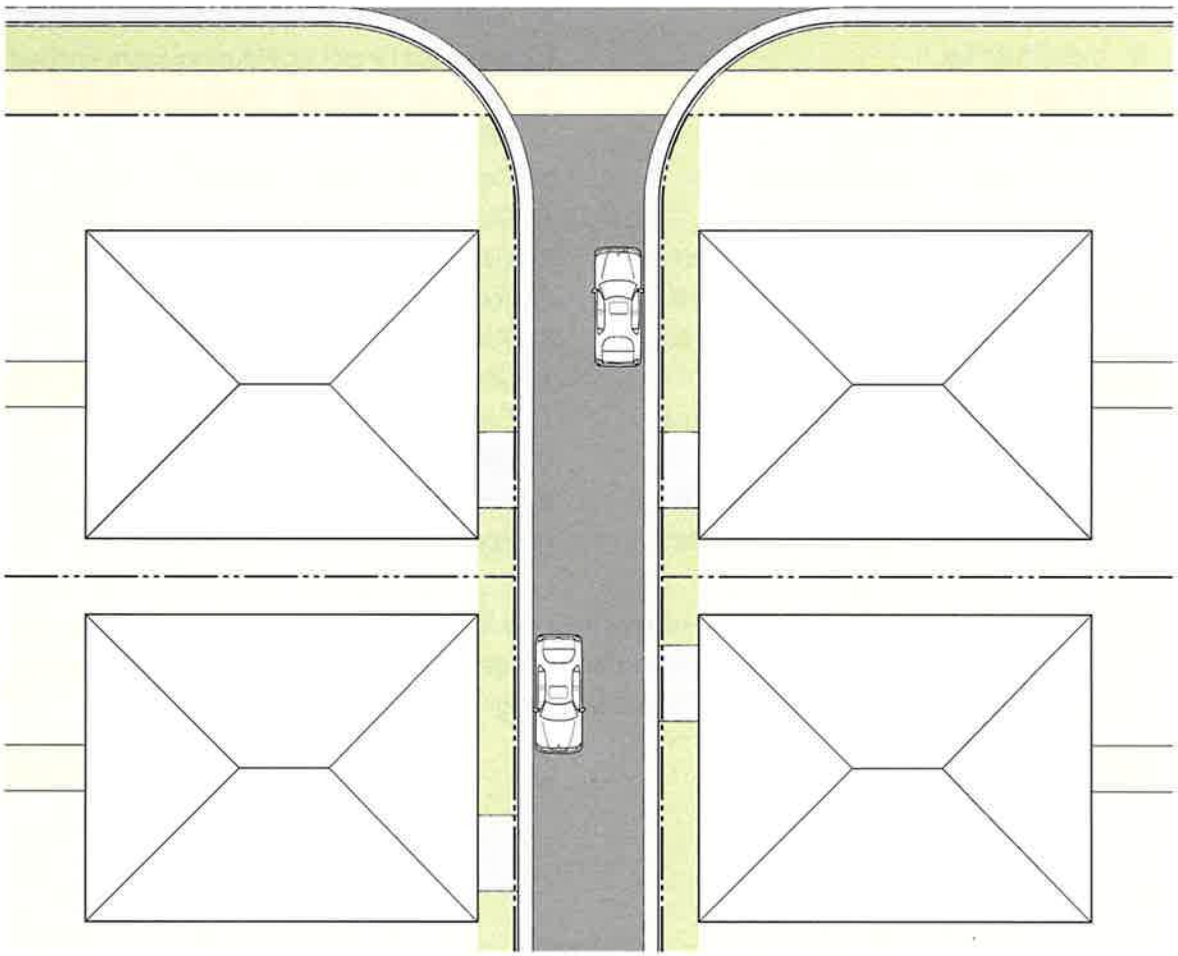
Development Standards

Right-of-Way (20 ft.)

A. Travel Lane and curb	**20 ft.**
B. Setback	**Varies with building form**



Section View



Plan View

Not to scale

PHYSICAL FORM: BUILDINGS

This section describes the various building forms, corresponding development standards, and permitted locations within the plan area. All buildings in the plan area shall conform to these development standards.

The building forms used in this plan are:

A. Office Park
B. Industrial/Flex
C. Village Commercial
D. Suburban Commercial
E. Vertical Mixed Use, Residential over Commercial
F. Vertical Mixed Use, Office over Commercial
G. Executive Lot, Single-Family Residential
H. Standard Lot, Single-Family Residential, Rear-Loaded
I. Standard Lot, Single-Family Residential, Front-Loaded
J. Standard Lot, Single-Family Residential, Front-Loaded, Recessed and Detached
K. Small-Lot Detached Housing, Rear-Loaded
L. Small-Lot Detached Housing, Front-Loaded
M. Small-Lot Detached Housing, Zero-Lot-Line
N. Detached Cluster Housing
O. Duet Housing
P. Garden Homes
Q. Townhouses, Detached Garage
R. Townhouses, Tuck-Under Garage
S. Green Court Townhomes/Apartments
T. Garden-Style Condominiums/Apartments
U. Drive-Through
V. Fueling Station
W. Sports Complex

The building forms shall be applied consistent with the following matrix. An "x" indicates that the building form is allowed in the corresponding land use designation; a "-" indicates that the building form is not allowed in the corresponding land use designation.

	Land Use Classes/Land Use Designations												
	Employment Hub/Core			Village Center		Residential/Neighborhood				Public/Semi-Public			Special
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC
Building Forms													
Office Park	X	-	X	-	-	-	-	-	-	-	-	-	-
Industrial/Flex	X	-	X	-	-	-	-	-	-	-	-	-	-
Village Commercial	-	-	-	-	X	-	-	-	-	-	-	-	-
Suburban Commercial	-	X	-	-	-	-	-	-	-	-	-	-	-
Vertical Mixed Use, Residential over Commercial	-	-	-	X	X	-	-	-	-	-	-	-	-
Vertical Mixed Use, Office over Commercial	-	-	-	-	X	-	-	-	-	-	-	-	-
Executive Lot, Single-Family Residential	-	-	-	-	-	X	-	-	-	-	-	-	-
Standard Lot, Single-Family Residential, Rear-Loaded	-	-	-	-	-	-	X	-	-	-	-	-	-
Standard Lot, Single-Family Residential, Front-Load	-	-	-	-	-	-	X	-	-	-	-	-	-
Standard Lot, Single-Family Residential, Front-Loaded, Recessed and Detached	-	-	-	-	-	-	X	-	-	-	-	-	-
Small-Lot Detached Housing, Rear-Loaded	-	-	-	-	-	-	X	X	-	-	-	-	-
Small-Lot Detached Housing, Front-Loaded	-	-	-	-	-	-	X	X	-	-	-	-	-
Small-Lot Detached Housing, Zero-Lot-Line	-	-	-	-	-	-	X	X	-	-	-	-	-
Detached Cluster Housing	-	-	-	-	-	-	X	X	-	-	-	-	-
Duet Housing	-	-	-	-	-	-	X	X	-	-	-	-	-

	Land Use Classes/Land Use Designations												
	Employment Hub/Core			Village Center		Residential/Neighborhood				Public/Semi-Public			Special
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC
Building Forms													
Garden Homes	-	-	-	-	-	-	-	X	X	-	-	-	-
Townhouses, Detached Garage	-	-	-	-	-	-	-	X	X	-	-	-	-
Townhouses, Tuck-Under Garage	-	-	-	X	X	-	-	X	X	-	-	-	-
Green Court Townhomes/ Apartments	-	-	-	X	X	-	-	X	X	-	-	-	-
Garden-Style Condominiums/ Apartments	-	-	-	X	X	-	-	X	X	-	-	-	-
Drive-Through	-	X	-	-	X	-	-	-	-	-	-	-	-
Fueling Station	-	X	-	-	X*	-	-	-	-	-	-	-	-
Sports Complex	-	-	-	-	-	-	-	-	-	-	-	-	X

***See allowed use restrictions in Chapter 3.**

Example building forms found in this section.

A. Office Park

Lot Standards

Lot Coverage

Building Coverage	40% max.
Landscape Coverage	20% min.

Setback Requirements

Setback requirements are for the overall property. If a property is subdivided, setback standards shall be established through design review.

A. Front	20 ft. min., 100 ft. max. maby be reduced to 10 ft. when adjacent to greenway
B. Interior Side	20 ft. min.; may be reduced to 10 ft. when adjacent to greenway
C. Street Side	20 ft. min., 100 ft. max.
D. Rear	10 ft. min.

Height

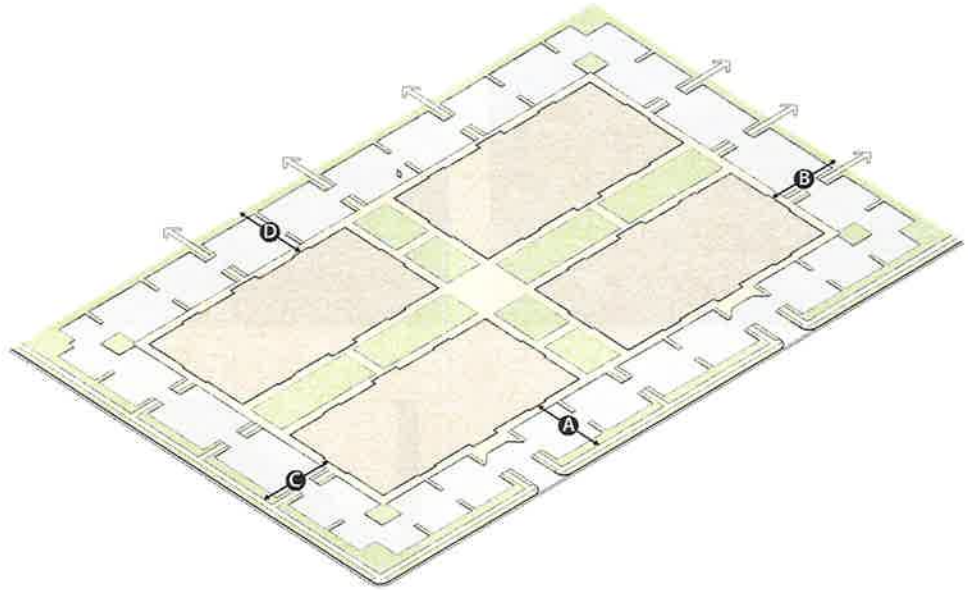
E. Building Height	90 ft. max.

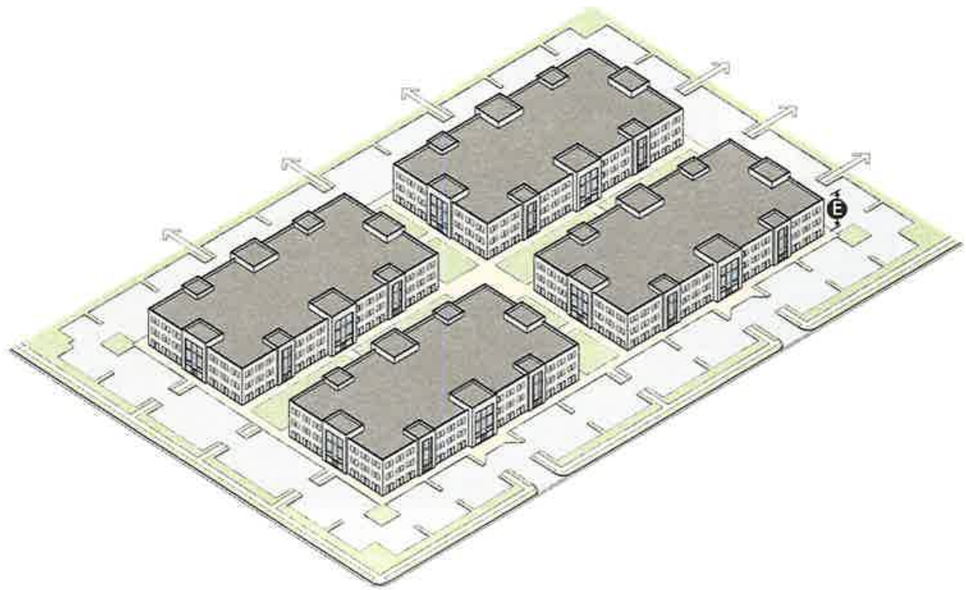
Parking

Minimum	3.5 spaces per 1,000 sq ft. of net floor area or 1 space for every 2 occupants, whichever is less

End-of-Trip Facilities

Clothes Lockers	1 per 4 employees
Showers	1 per 80 employees





The images above illustrate acceptable examples of the Office Park building form.

B. Industrial/Flex

Lot Standards

Lot Coverage

Building Coverage	40% max.
Landscape Coverage	20% min.

Setback Requirements

Setback requirements are for the overall property. If a property is subdivided, setback standards shall be established through design review.

A. Front	20 ft. min., 100 ft. max. maby be reduced to 10 ft. when adjacent to greenway
B. Interior Side	20 ft. min.; may be reduced to 10 ft. when adjacent to greenway
C. Street Side	20 ft. min., 100 ft. max.
D. Rear	10 ft. min.

Height

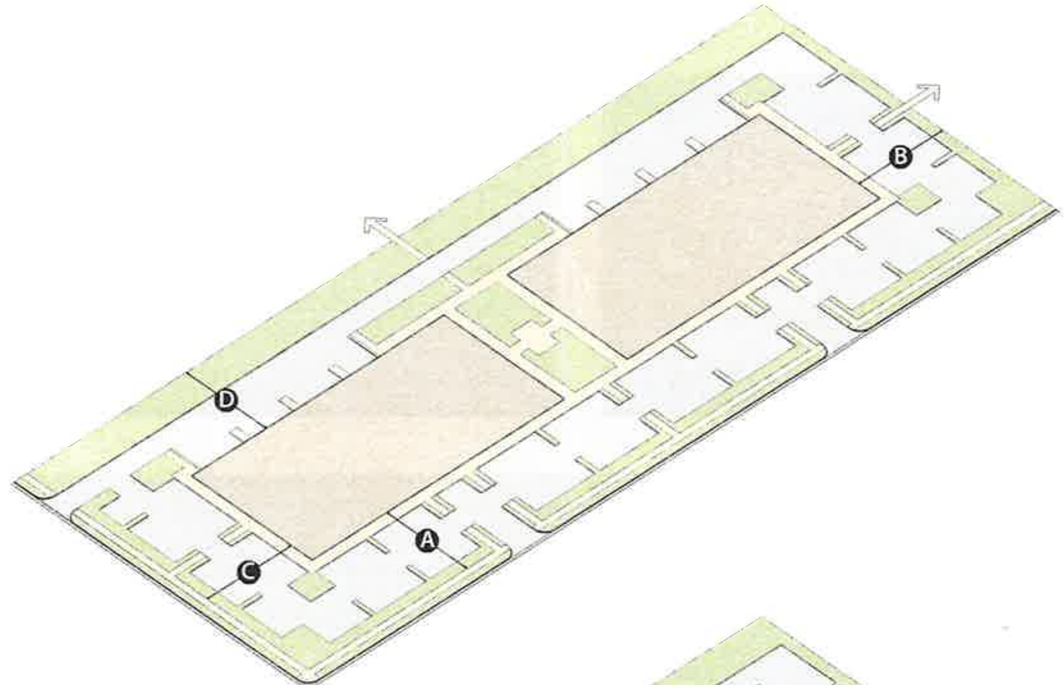
E. Building Height	45 ft. max.

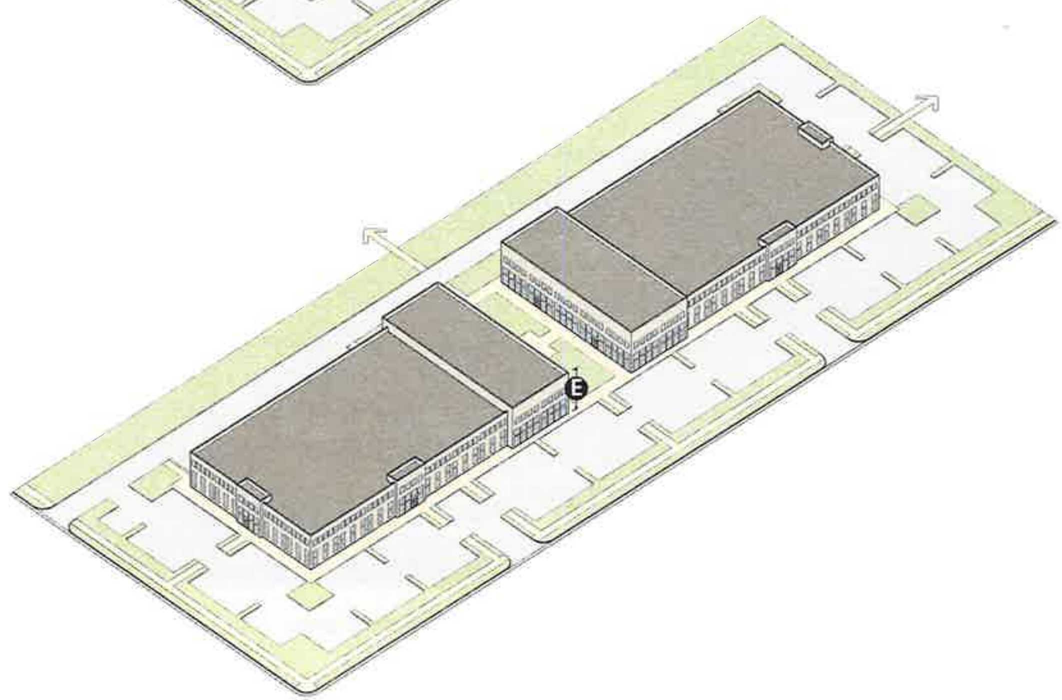
Parking

Minimum	3.5 spaces per 1,000 sq ft. of net floor area or 1 space for every 2 occupants, whichever is less

End-of-Trip Facilities

Clothes Lockers	1 per 4 employees
Showers	1 per 80 employees





The images above illustrate acceptable examples of the Industrial/Flex building form.

C. Village Commercial

Lot Standards

Lot Coverage

Building Coverage	60% max.
Landscape Coverage	20% min.

Setback Requirements

A. Front	0 ft. min.
B. Interior Side	0 ft. min.
C. Street Side	0 ft. min.
D. Rear	0 ft min.

Façade Articulation and Wall Surfaces

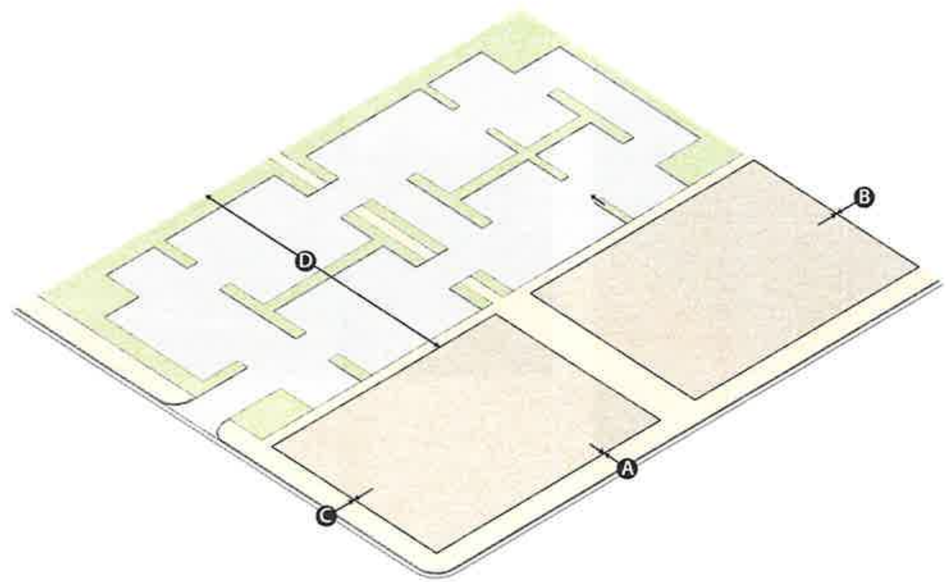
E. Pedestrian-Facing Ground-Floor Façade Transparency Requirement	50% min.
Requirement	75 ft. max.

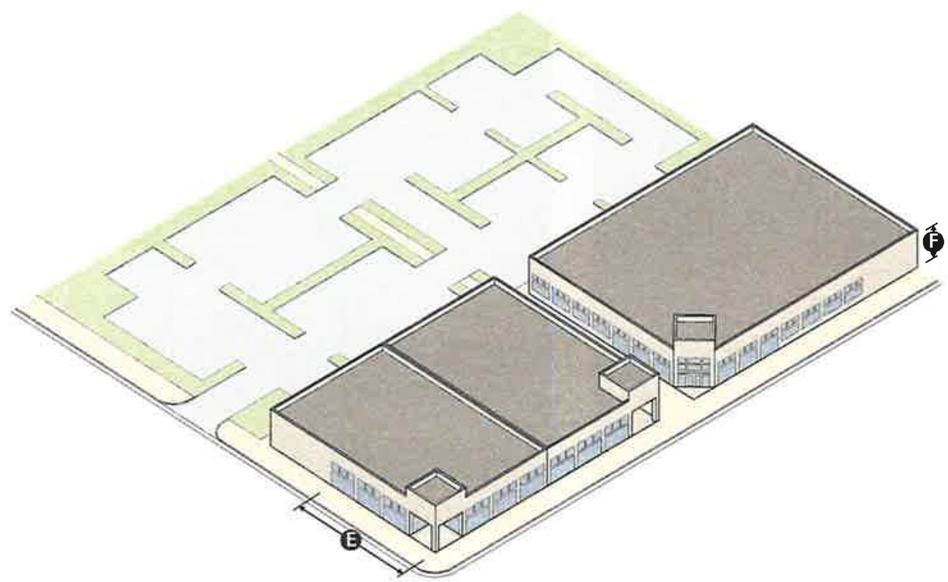
Height

F. Building Height	15 ft. min, 45 ft. max. (1 story)

Parking

Min. Ratio	3.5 spaces per 1,000 sq ft. of gross floor area
Shared Parking	Allowed





Images above illustrate acceptable examples of the Village Commercial building form.

D. Suburban Commercial

Lot Standards

Lot Coverage

Building Coverage	40% max.
Landscape Coverage	25% min.

Setback Requirements

A. Front	20 ft. min.
Interior Side	0 ft. min.
B. Street Side	20 ft. min.
C. Rear	20 ft. min.

Façade Articulation and Wall Surfaces

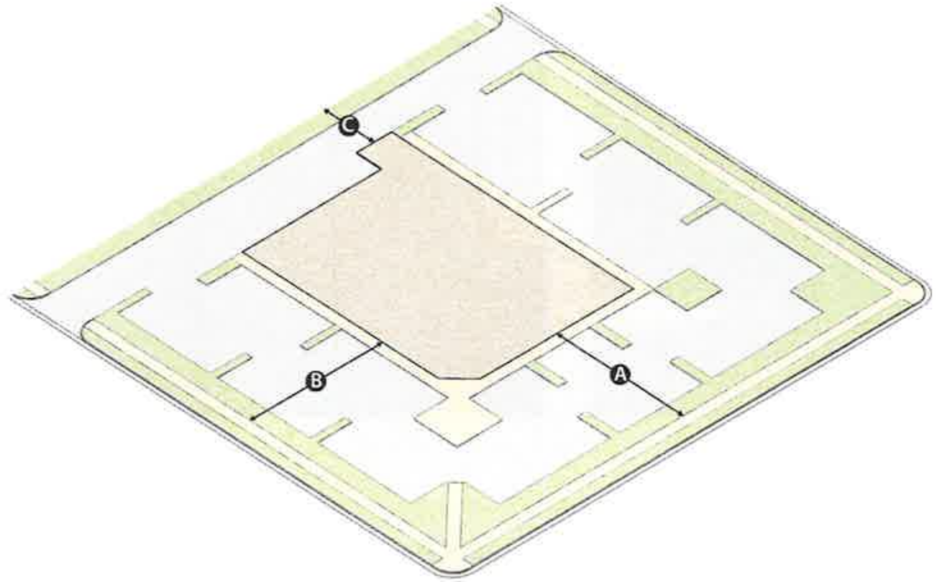
D. Pedestrian-Facing Ground-Floor Façade Transparency Requirement	50% min.

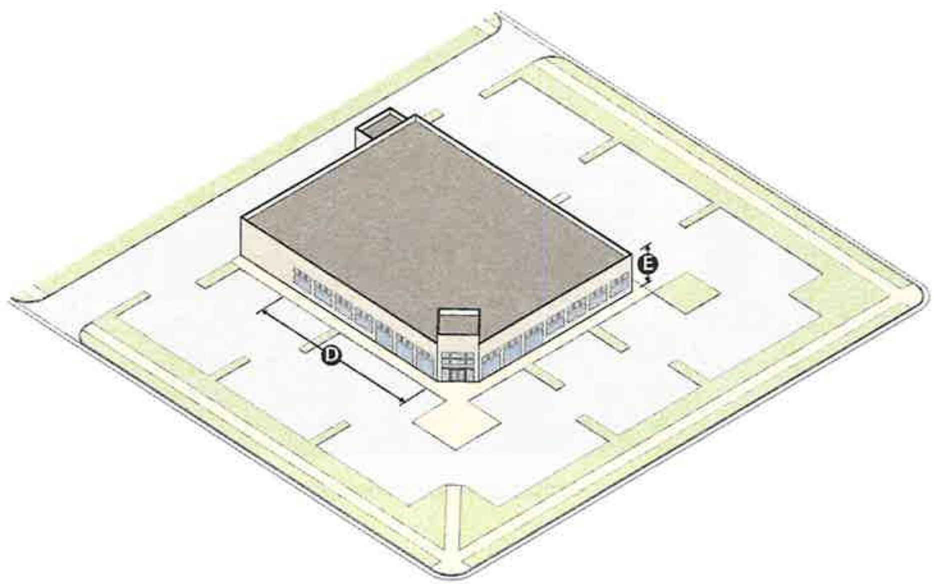
Height

E. Building Height	15 ft min., 45 ft. max. (1 story)

Parking

Min. Ratio	4.5 spaces per 1,000 sq ft. of gross floor area
Shared Parking	Allowed








Images above illustrate acceptable examples of the Suburban Commercial building form.

E. Vertical Mixed Use, Residential over Commercial

Lot Standards

Density 12.1–40.0 du/acre

Lot Coverage

Building Coverage	75% max.
Landscape Coverage	20% min.
Surface Parking Coverage	40% max.

Deviations to the above standards may be allowed through design review for projects that incorporate subterranean parking.

Setback Requirements

A. Streetside	0 ft. min./12 ft. max.
B. Drive Aisle/Alley	3 ft. min. or 18 ft. min. with parking
Rear	10 ft. min. when adjoining residential

Building Separation

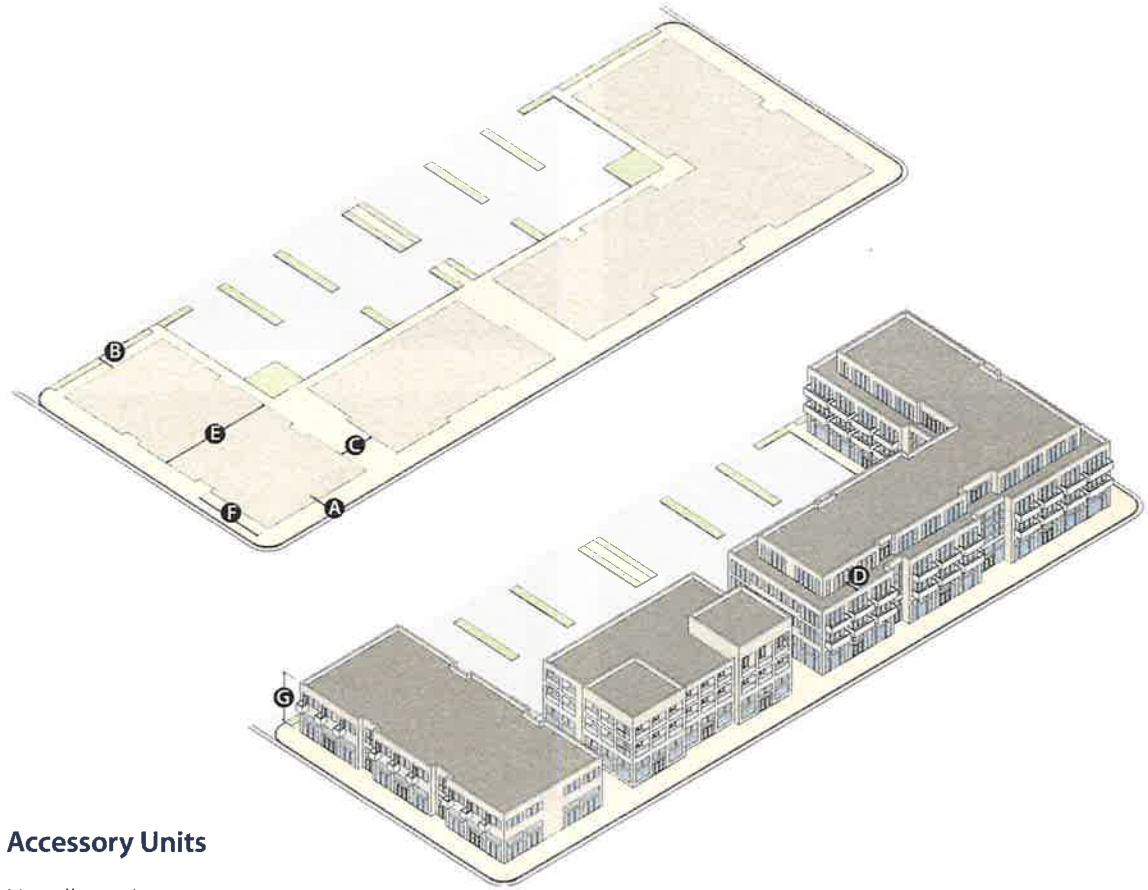
Front-to-Front	20 ft. min.
C. Side-to-Side with openings	20 ft. min.
Side-to-Side without openings	15 ft. min.
Front to Side	20 ft. min.
D. Pedestrian-Facing Ground-Floor Façade Transparency Requirement	50% min.

Façade Articulation and Wall Surfaces

Ground-Floor Transparent Façade	50% min.
E. Façade Setback Variation Requirement	75 ft. max.

Height

F. Building Height	30 ft. min. (2 stories)/ 45 ft. max. (3 stories)



Accessory Units

Nct allowed

Parking

Parking may be surface parking at the side or rear of the building or combined with assigned parking in structures. Shared parking arrangements with commercial space should be considered. Off-street guest parking shall be provided as determined by the City on a case-by-case basis.

Off-Street

Minimum – 1.0 spaces per unit
Maximum – 1.5 spaces per unit

On-Street - Permitted

Images above illustrate acceptable examples of the Mixed Use, Residential over Commercial building form.

F. Vertical Mixed Use, Office over Commercial

Lot Standards

Lot Coverage

Building Coverage	75% max.
Landscape Coverage	20% min.
Surface Parking Coverage	40% max.

Setback Requirements

A. Front	0 ft. min./10 ft. max.
Interior Side	0 ft. min.
B. Street Side	5 ft. min.
Rear	0 ft. min.
Adjacent to Residential Areas	
Side	10 ft. min.
Rear	10 ft. min.

Façade Articulation and Wall Surfaces

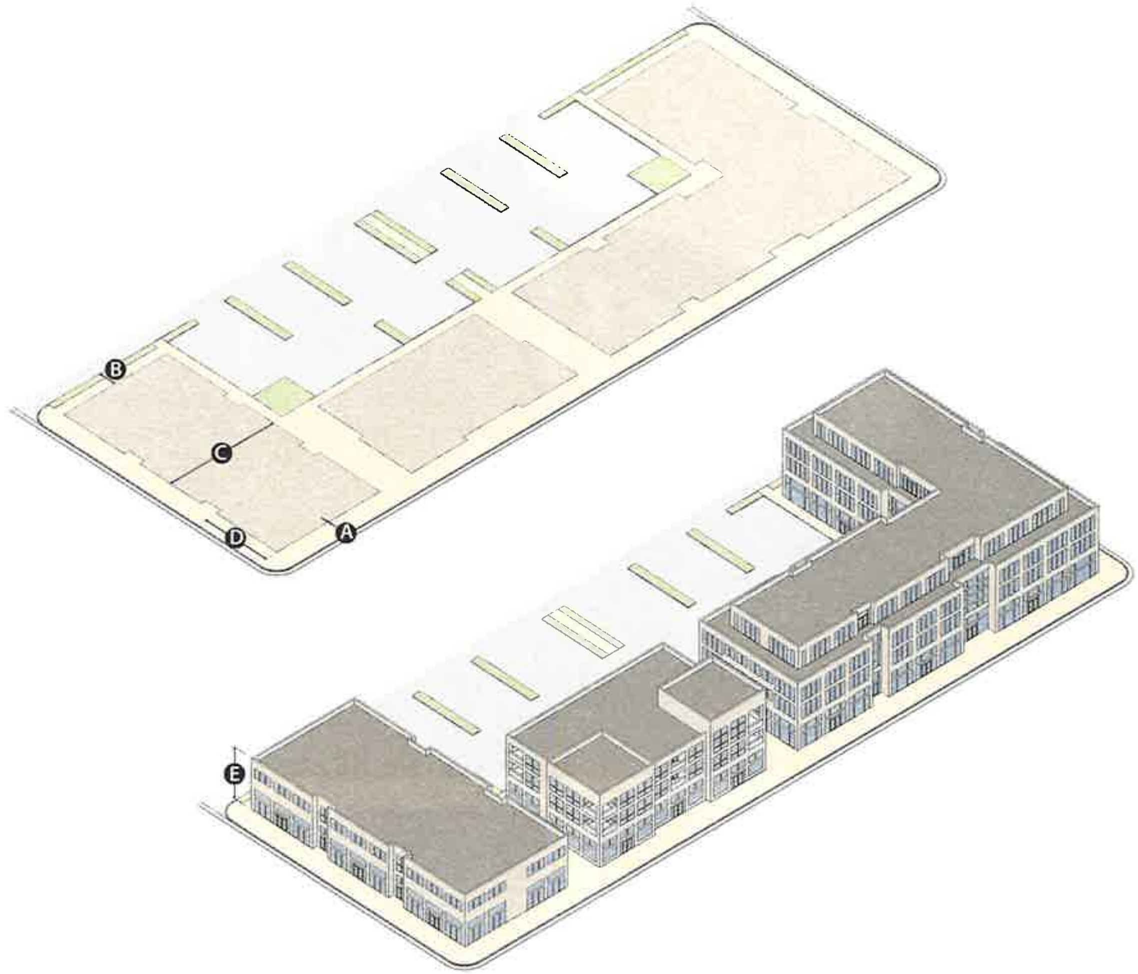
C. Pedestrian-Facing Ground-Floor Façade Transparency Requirement	50% min.
D. Façade Setback Variation Requirement	75 ft. max.

Height

E. Building Height	30 ft. min. (2 stories)/ 45 ft. max. (3 stories)

Parking

Min. Ratio	3.5 spaces per 1,000 sq. ft. of gross floor area
Shared Parking	Allowed



Images above illustrate acceptable examples of the Mixed Use, Office over Commercial building form.

G. Executive Lot, Single-Family Residential

Lot Standards

Density	2.1–4.0 du/acre

Lot Requirements

Lot Size	7,500 sq. ft. min.
A. Lot Width	65 ft. min.
B. Corner Lot Width	80 ft. min.
C. Lot Depth	110 ft. min.
Lot Coverage	50% max.

Setback Requirements

Front Yard	
D. Living Area	15 ft. min.
E. Open Front Porch/Patio	10 ft. min.
F. **Garage**	
Front Facing	25 ft. min.
Swing	20 ft. min.
Side Yard	
G. Interior Side Yard	7.5 ft. min.
H. Street Side Yard	15 ft. min.
I. **Rear Yard**	20 ft. min.
J. Distance between Main Buildings	15 ft. min.

Height

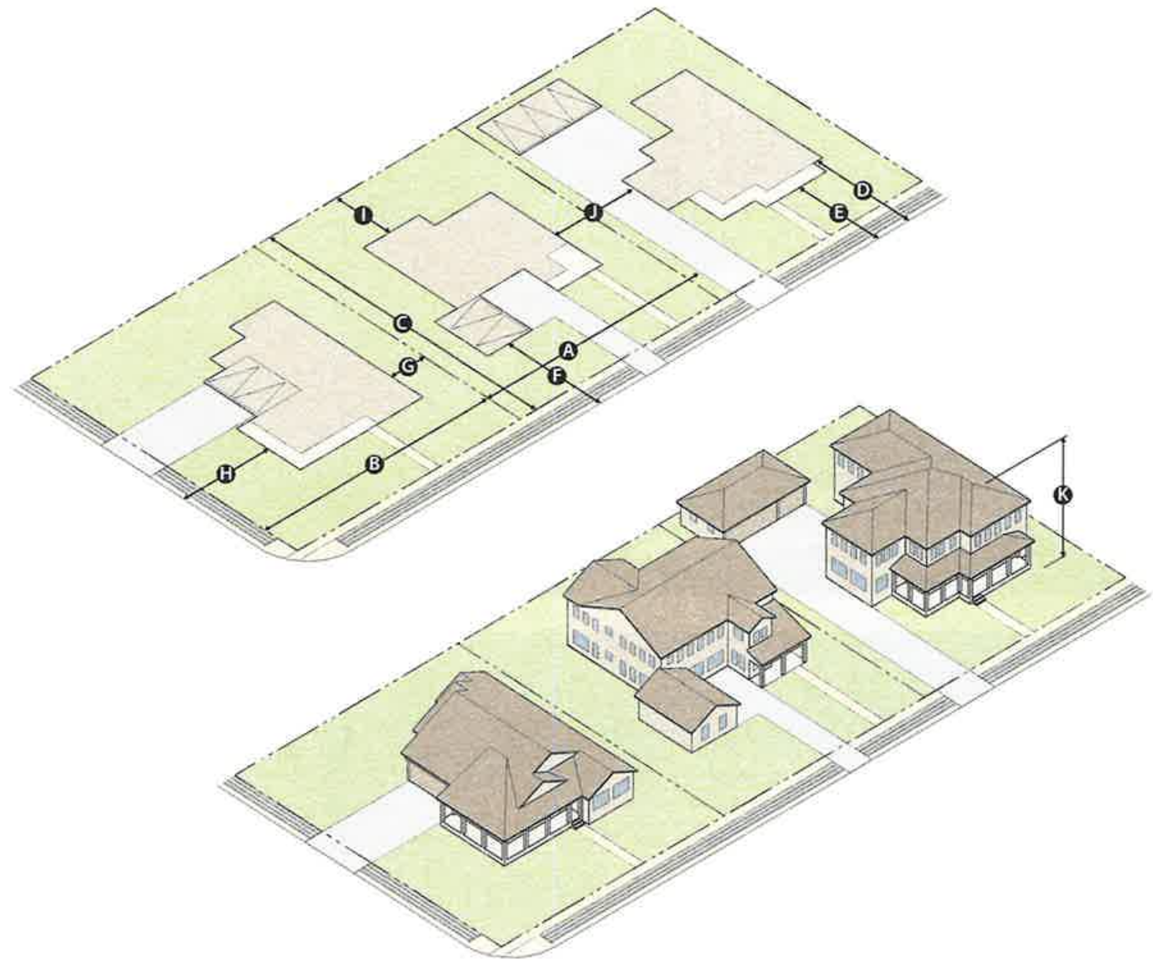
K. Building Height	45 ft. (3 stories)

Second Dwelling Units

Second dwelling units may be permitted subject to the following standards:

Accessory Unit Size	**Living Area 1,200 sq. ft. max.**
Interior Side Yard	5 ft. min.
Rear Yard	5 ft. min.

All other setback and height standards shall be consistent with the primary dwelling.

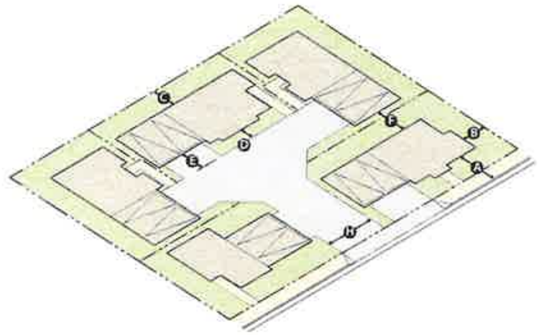


Parking

Off-Street
Min. 2 enclosed spaces per primary unit
Min. 1 enclosed space per accessory unit
On-Street - Permitted
Side access driveways shall not be located adjacent to each other.

Images above illustrate acceptable examples of the Executive Lot, Single-Family Residential building form.

H. Standard Lot, Single-Family Residential, Rear-Loaded



Lot Standards

Density	4.1–6.0 du/acre

Lot Requirements

Lot Size	4,800 sq. ft. min.
A. Lot Width	50 ft. min.
B. Corner Lot Width	60 ft. min.
C. Lot Depth	70 ft. min.
Lot Coverage	75% max.

Setback Requirements

Front Yard	
D. Living Area	15 ft. min.
E. Open Front Porch/Patio	10 ft. min.
Side Yard	
F. Interior Side Yard	5 ft. min.
G. Street Side Yard	12.5 ft. min.
Rear Yard	
H. Living Area	15 ft. min.
I. Alley-Loaded Garage	3 ft. min

Access

Drive Aisle/Alley Width	20 ft. min.

Height

J. Building Height	35 ft. (2 stories)

Second Dwelling Units

Second dwelling units may be permitted subject to the following standards:

Accessory Unit Size	Living Area 1,200 sq. ft. max.
Interior Side Yard	5 ft. min.
From Rear-Loaded Alley	5 ft. min.

All other setback and height standards shall be consistent with the primary dwelling.

Parking

Off-Street
Min. 2 enclosed spaces per primary unit
Min. 1 enclosed space per accessory unit
On-Street - Permitted

Images above illustrate acceptable examples of the Standard Lot, Single-Family Residential, Rear-Loaded building form.

I. Standard Lot, Single-Family Residential, Front-Loaded

Lot Standards

Density .... 4.1–6.0 du/acre

Lot Requirements

Lot Size .... 4,800 sq. ft. min.
A. Lot Width .... 55 ft. min.
B. Corner Lot Width .... 65 ft. min.
C. Lot Depth .... 85 ft. min.
Lot Coverage .... 75% max.

Setback Requirements

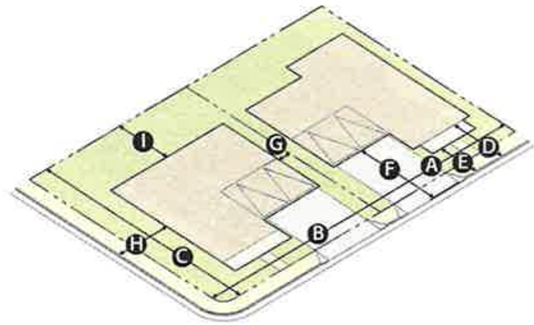
Front Yard
D. Living Area .... 15 ft. min.
E. Open Front Porch .... 10 ft. min.
F. Garage .... 20 ft. min.
Garage, Swing .... 18 ft. min.
Side Yard
G. Interior Side Yard .... 5 ft. min.
H. Street Side Yard .... 12.5 ft. min.
I. **Rear Yard** .... 15 ft. min.

Height

Building Height .... 35 ft. (2 stories)

Second Dwelling Units

Second dwelling units may be permitted subject to the following standards:
Accessory Unit Size **Living Area 1,200 sq. ft. max.**
Interior Side Yard .... 5 ft. min.
Rear Yard .... 5 ft. min.
All other setback and height standards shall be consistent with the primary dwelling.

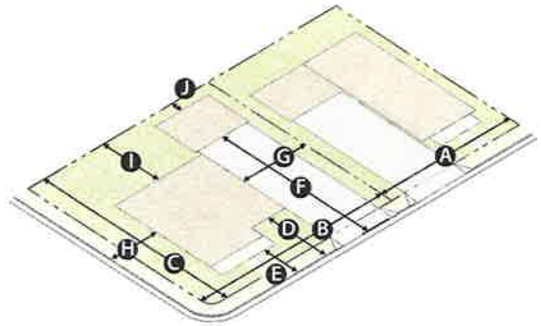


Parking

Off-Street
Min. 2 enclosed spaces per primary unit
Min. 1 enclosed space per accessory unit
On-Street - Permitted

Images above illustrate acceptable examples of the Standard Lot, Single-Family Residential, Front-Loaded building form.

J. Standard Lot, Single-Family Residential, Front-Loaded, Recessed and Detached



Lot Standards

Density	4.1–6.0 du/acre

Lot Requirements

Lot Size	4,800 sq. ft. min.
A. Lot Width	55 ft. min.
B. Corner Lot Width	65 ft. min.
C. Lot Depth	85 ft. min.
Lot Coverage	75% max.

Setback Requirements

Front Yard	
D. Living Area	15 ft. min.
E. Open Front Porch/Patio	10 ft. min.
F. Garage	30 ft. min.
G. Interior Side Yard	5 ft. min.
H. Street Side Yard	12.5 ft. min.
Rear Yard	
I. Living Area	15 ft. min.
J. Garage	5 ft. min.

Height

Building Height	35 ft. (2 stories)

Second Dwelling Units

Second dwelling units may be permitted subject to the following standards:

Accessory Unit Size	Living Area 1,200 sq. ft. max.
Interior Side Yard	5 ft. min.
Rear Yard	5 ft. min.

All other setback and height standards shall be consistent with the primary dwelling.

Parking

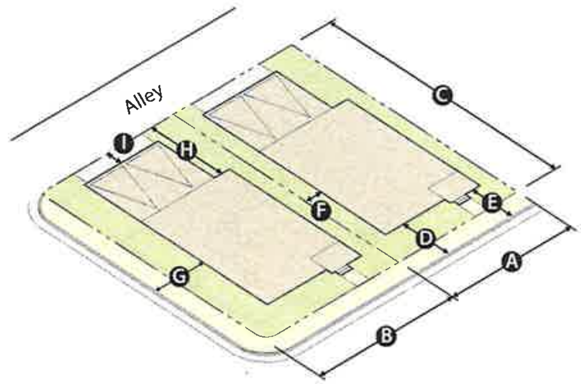
Off-Street

Min. 2 enclosed spaces per primary unit
Min. 1 enclosed space per accessory unit

On-Street - Permitted

Images above illustrate acceptable examples of the Standard Lot, Single-Family Residential, Front-Loaded, Recessed and Detached building form.

K. Small-Lot Detached Housing, Rear Loaded



Lot Standards

Density	6.1–10.0 du/acre

Lot Requirements

Lot Size	2,400 sq. ft. min.
A. Lot Width	40 ft. min.
B. Corner Lot Width	45 ft. min.
C. Lot Depth	70 ft. min.
Lot Coverage	65% max.

Provisions for Condominiums

This product may be "condoized." Lot size requirements for condominiums will be determined through the subdivision process.

Wide-Shallow Lot Alternative

Alternative lot configuration standards may be established through the tentative subdivision map process for wide-shallow lot configurations.

Setback Requirements

Front Yard	
D. Living Area	10 ft. min.
E. Open Front Porch	8 ft. min.
Side Yard	
F. Interior Side Yard	5 ft. min.
G. Street Side Yard	10 ft. min.
Rear Yard	
H. Living Area	10 ft. min.
I. Alley-Loaded Garage	3 ft. min/6 max ft.

Height

J. Building Height	45 ft. (3 stories)

Access

Drive Aisle/Alley Width	20 ft. min.

Second Dwelling Units

Second dwelling units may be permitted subject to the following standards:

Accessory Unit Size	Living Area 1,200 sq. ft. max.
Interior Side Yard	5 ft. min.
Rear Yard	5 ft. min.

All other setback and height standards shall be consistent with the primary dwelling.

Public Utility Easement

The public utility easement may be reduced to 10 feet after consultation with the local utility providers (e.g., SMUD, PG&E, SCWA, SASD).

Outdoor Living Area

Width	10 ft. min.
Size	150 sq ft. min.

Image above illustrate acceptable examples of the Small Lot Detached Housing, Rear-Loaded building form.

Parking

Off-Street

Min. 2 enclosed spaces per primary unit

Min. 1 enclosed space per accessory unit

On-Street - Permitted

L. Small-Lot Detached Housing, Front-Loaded

Lot Standards

Density	6.1–10.0 du/acre

Lot Requirements

Lot Size	3,000 sq. ft. min.
A. Lot Width	40 ft. min.
B. Corner Lot Width	45 ft. min.
C. Lot Depth	70 ft. min.
Lot Coverage	65% max.

Provisions for Condominiums
This product may be "condoized." Lot size requirements for condominiums will be determined through the subdivision process.

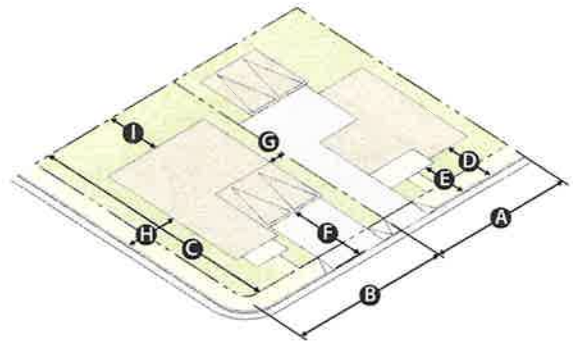
Wide-Shallow Lot Alternative
Alternative lot configuration standards may be established through the tentative subdivision map process for wide-shallow lot configurations.

Setback Requirements

Front Yard	
D. Living Area	10 ft. min.
E. Open Front Porch/Patio	8 ft. min.
F. Garage	18 ft. min.
Side Yard	
G. Interior Side Yard	4 ft. min.
H. Street Side Yard	10 ft. min.
I. **Rear Yard**	10 ft. min.

Height

J. Building Height...............45 ft. (3 stories)



Second Dwelling Units

Second dwelling units may be permitted subject to the following standards:

Accessory Unit Size	Living Area 1,200 sq. ft. max.
Interior Side Yard	5 ft. min.
Rear Yard	5 ft. min.

All other setback and height standards shall be consistent with the primary dwelling.

Public Utility Easement

The public utility easement may be reduced to 10 feet after consultation with the local utility providers (e.g., SMUD, PG&E, SCWA, SASD).

Outdoor Living Area

Width	10 ft. min.
Size	150 sq ft. min.

Image above illustrate acceptable examples of the Small Lot Detached Housing, Front-Loaded building form.

Parking

Off-Street
Min. 2 enclosed spaces per primary unit
Min. 1 enclosed space per accessory unit
On-Street - Permitted

M. Small-Lot Detached Housing, Zero-Lot-Line

Lot Standards

Density	6.1–10.0 du/acre

Lot Requirements

Lot Size	2,400 sq. ft. min.
A. Lot Width	40 ft. min.
B. Corner Lot Width	45 ft. min.
C. Lot Depth	70 ft. min.
Lot Coverage	65% max.

Provisions for Condominiums

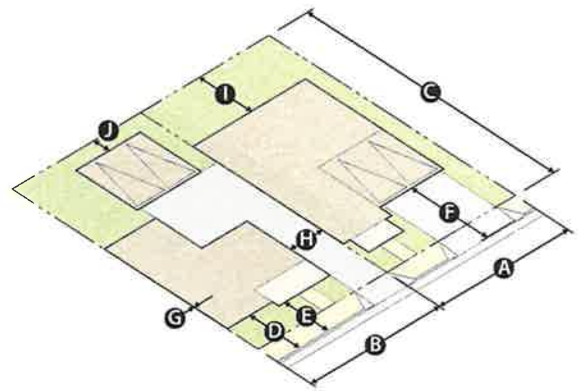
This product may be developed as condominiums. Lot size requirements for condominiums will be determined through the subdivision process.

Wide-Shallow Lot Alternative

Alternative lot configuration standards may be established through the tentative subdivision map process for wide-shallow lot configurations.

Setback Requirements

Front Yard	
D. Living Area	10 ft. min.
E. Open Front Porch	8 ft. min.
F. Garage	18 ft. min.
Side Yard	
Interior Side Yard	
G. Side "A"	0 ft.
H. Side "B"	5 ft. min.
Street Side Yard	10 ft. min.
Rear Yard	
I. Living Area	10 ft. min.
J. Garage	5 ft. min.



Height

K. Building Height	45 ft. (3 stories)

Second Dwelling Units

Second dwelling units may be permitted subject to the following standards:

Accessory Unit Size	Living Area 1,200 sq. ft. max.
Interior Side Yard	5 ft. min.
Rear Yard	5 ft. min.

All other setback and height standards shall be consistent with the primary dwelling.

Public Utility Easement

The public utility easement may be reduced to 10 feet after consultation with the local utility providers (e.g., SMUD, PG&E, SCWA, SASD).

Outdoor Living Area

Width	10 ft. min.
Size	150 sq ft. min.

Image above illustrate acceptable examples of the Small-Lot Detached Housing, Zero-Lot-Line building form.

Parking

Off-Street
Min. 2 enclosed spaces per primary unit
Min. 1 enclosed space per accessory unit
On-Street - Permitted

N. Detached Cluster Housing

Lot Standards

Density 6.1–12.0 du/acre

Lot size configurations will be determined through the subdivision process. This product may be developed as condominiums.

Setback Requirements

Front Yard	
A. Living Area	10 ft. min.
Open Front Porch/Patio	8 ft. min.
B. Interior Side Yard	3 ft. min.
C. Rear Yard	10 ft. min.
From Drive Aisle	
D. Living Area	3 ft. min./6 ft. max.
E. Garage	5 ft. min.
F. From Building to Building	6 ft. min.

Height

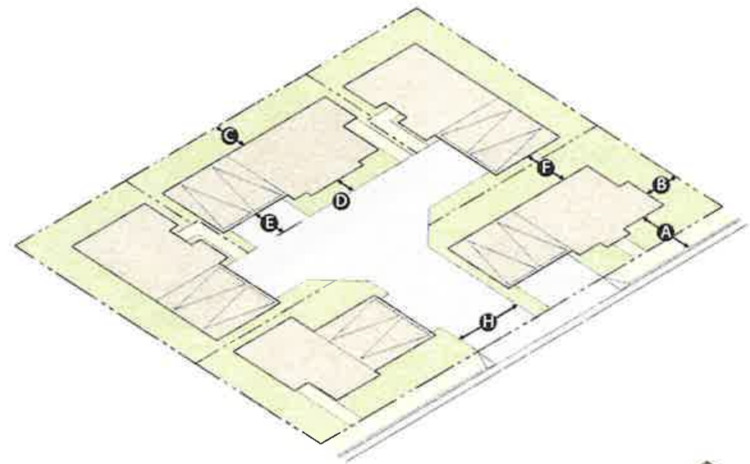
G. Building Height	45 ft. (3 stories)
H. Drive Aisle Width	20 ft. min.

Second Dwelling Units

Not allowed

Outdoor Living Area

Width	10 ft. min.
Size	150 sq ft. min.



Parking

Garages shall be located at the front or side of the unit off the drive aisle. Each unit shall also provide 0.5 guest space per unit.

Off-Street	2 enclosed spaces per unit
On-Street	Permitted

Images above illustrate acceptable examples of the Detached Cluster Housing building form.

O. Duet Housing

Lot Standards

Density	4.1–12.0 du/acre

Lot Requirements (for the half lot)

Lot Size	5,000 sq. ft. min.
A. Lot Width	50 ft. min.
B. Corner Lot Width	65 ft. min.
C. Lot Depth	80 ft. min.
Lot Coverage	80% max.

Setback Requirements

Front Yard	
D. Living Area	10 ft. min.
E. Open Front Porch/Patio	8 ft. min.
F. Garage	18 ft. min.
Side Yard	
G. Interior Side Yard	5 ft. min.
H. Street Side Yard	10 ft. min.
Rear Yard	
I. Living Area	10 ft. min.
Alley-Loaded Garage	3 ft. min. or 18 ft. min. with parking

Height

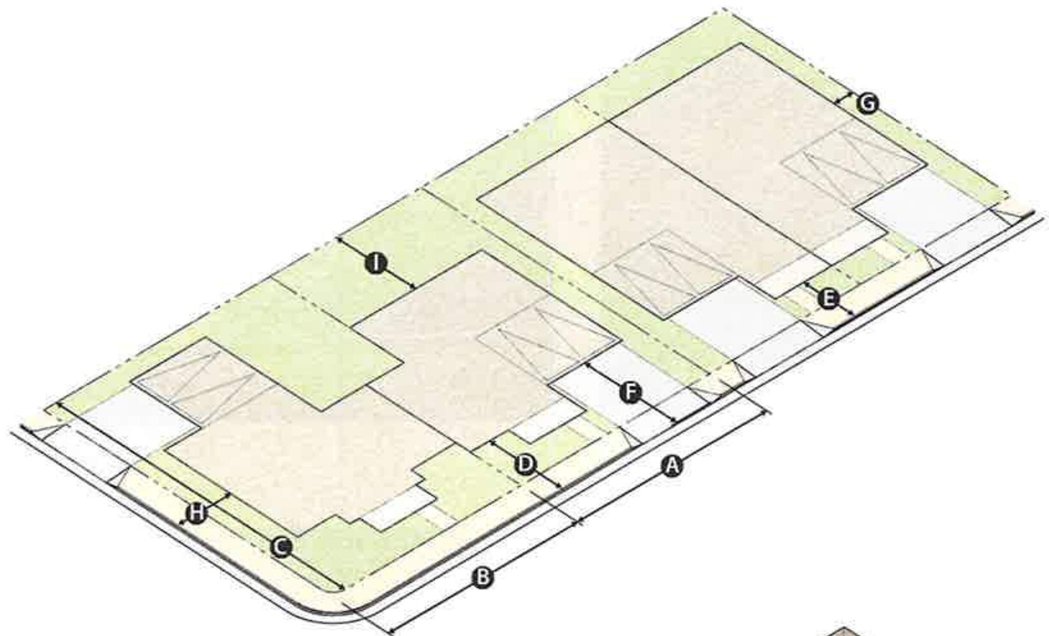
J. Building Height	45 ft. (3 stories)

Second Dwelling Units

Not allowed

Parking

Off-Street	Min. 2 covered spaces per unit
On-Street	Permitted



Images above illustrate acceptable examples of the Duet Housing building form.

P. Garden Homes

Lot Standards

Density	6.1–15.0 du/acre

Lot Requirements

Lot Size	2,000 sq. ft. min.
A. Lot Width	30 ft. min.
B. Corner Lot Width	35 ft. min.
C. Lot Depth	50 ft. min.
Lot Coverage	85% max.

Provisions for Condominiums

This product may be developed as condominiums. Lot size requirements for condominiums will be determined through the subdivision process.

Setback Requirements

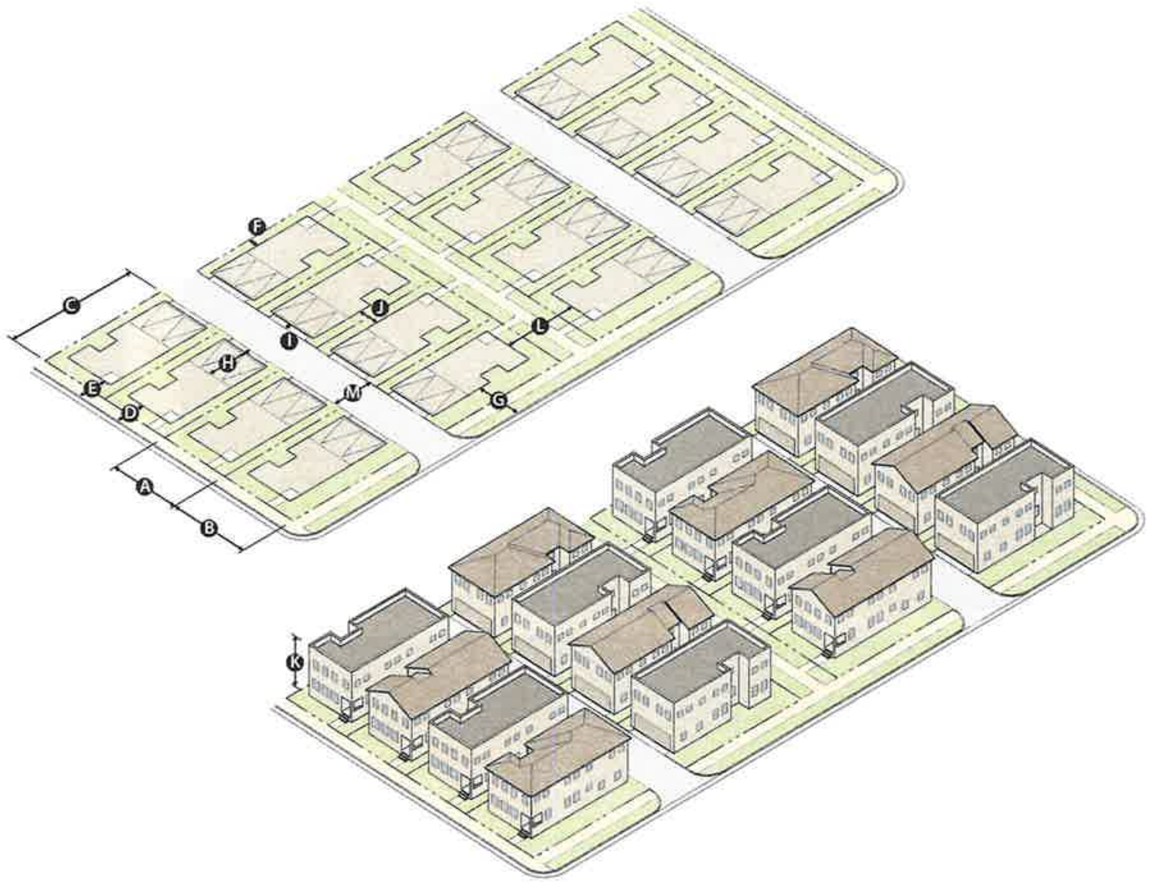
Front Yard	
D. Living Area	8 ft. min.
E. Open Front Porch/Patio	5 ft. min.
Side Yard	
F. Interior Side Yard	3 ft. min.
G. Street Side Yard	8 ft. min. (to back of sidewalk)
From Alley	
H. Living Area	5 ft. min.
I. Garage	3 ft. min./6 ft. max.
J. Building Separation	6 ft. min.

Height

K. Building Height	45 ft. (3 stories)

Access

L. Paseo Width	20 ft. min.
M. Drive Aisle/Alley Width	20 ft. min.



Private Outdoor Living Area

Size	150 sq ft. min.

Second Dwelling Units

Not allowed

Public Utility Easement

The public utility easement may be reduced to 10 feet after consultation with the local utility providers (e.g., SMUD, PG&E, SCWA, SASD).

Parking

Required parking shall be located at the rear of the unit off the alley. Parking spaces should be conveniently distributed in relative proximity to the units they serve. Off-street guest parking shall be provided as determined by the City on a case-by-case basis.

Off-Street	**Min. 2 spaces per unit**
On-Street	**Permitted**

Images above illustrate acceptable examples of the Garden Homes building form.

Q. Townhouses, Detached Garage

Lot Standards

Density	15.0–18.0 du/acre

Lot Requirements

Lot Size	1,600 sq. ft. min.
A. Lot Width	25 ft. min.
B. Corner Lot Width	30 ft. min.
C. Lot Depth	85 ft. min.
Lot Coverage	80% max.

Provisions for Condominiums

This product may be developed as condominiums. Lot size requirements for condominiums will be determined through the subdivision process.

Setback Requirements

Front Yard	
D. Living Area	10 ft. min.
E. Open Front Porch/Patio	8 ft. min.
Side Yard	
F. Interior Side Yard	0 ft.
G. Street Side Yard	5 ft. min.
Rear Yard	
H. Living Area	0 ft.
I. Alley-Loaded Garage	3 ft. min./6 ft. max.

Height

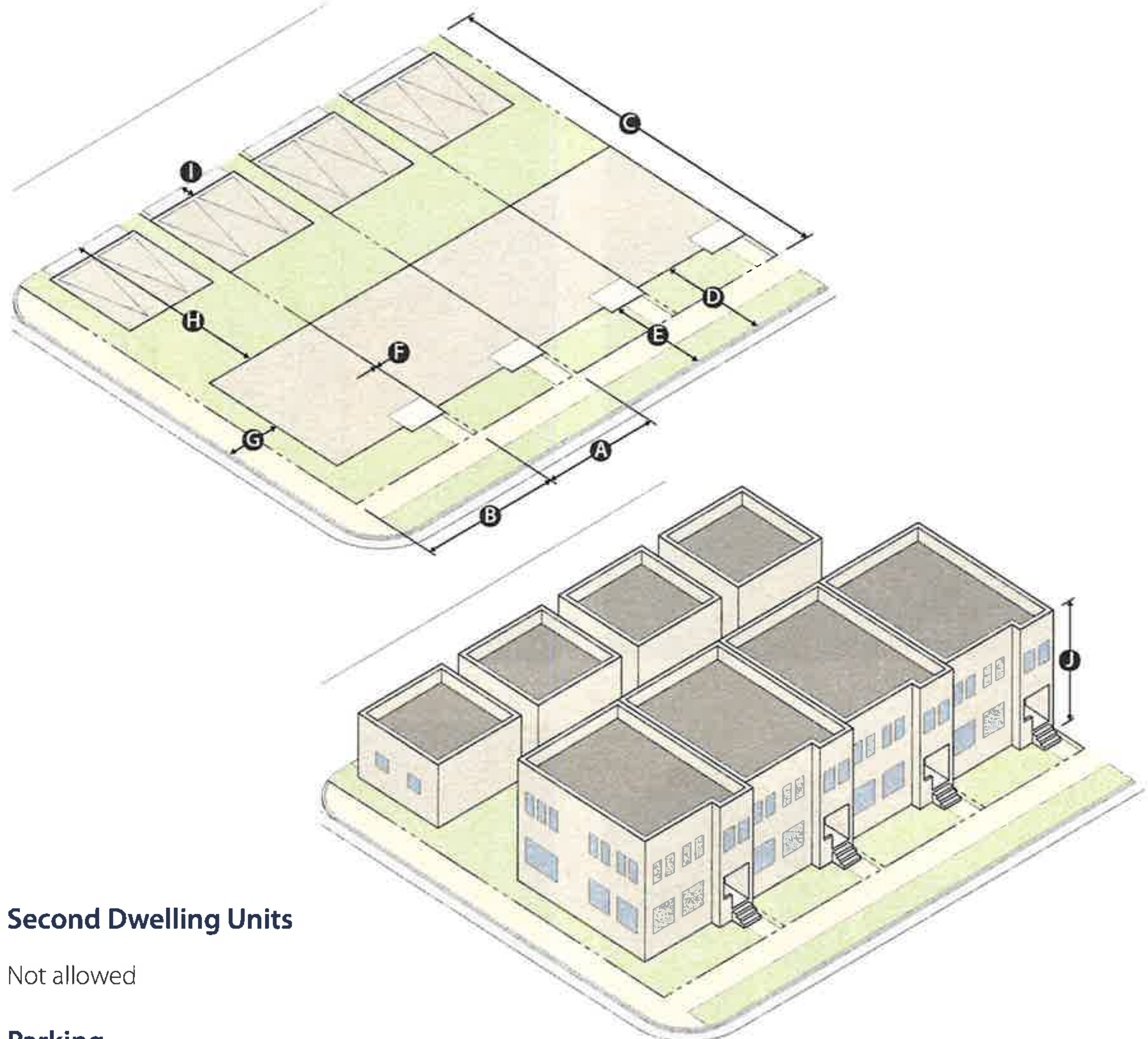
J. Building Height	45 ft. (3 stories)

Access

Drive Aisle/Alley Width	20 ft. min.

Private Outdoor Living Area

Required Area	100 sq ft. min.



Second Dwelling Units

Not allowed

Parking

Required parking shall be located at the rear of the unit off the alley. Off-street guest parking shall be provided as determined by the City on a case-by-case basis.

Off-Street	Min. 2 spaces per unit
On-Street	Permitted

Images above illustrate acceptable examples of the Townhouses, Detached Garage building form.

R. Townhouses, Tuck-Under Garage

Development Standards

Density	12.0–18.0 du/acre

Lot Requirements

Lot Size	1,600 sq. ft. min.
A. Lot Width	25 ft. min.
B. Corner Lot Width	30 ft. min.
C. Lot Depth	65 ft. min.
Lot Coverage	90% max.

Provisions for Condominiums

This product may be developed as condominiums. Lot size requirements for condominiums will be determined through the subdivision process.

Setback Requirements

Front Yard	
D. Living Area	10 ft. min.
E. Open Front Porch/Patio	8 ft. min.
Side Yard	
F. Interior Side Yard	0 ft.
G. Street Side Yard	5 ft. min.
Rear Yard	
H. Living Area	0 ft.
I. Alley-Loaded Garage	3 ft. min./6 ft. max.

Height

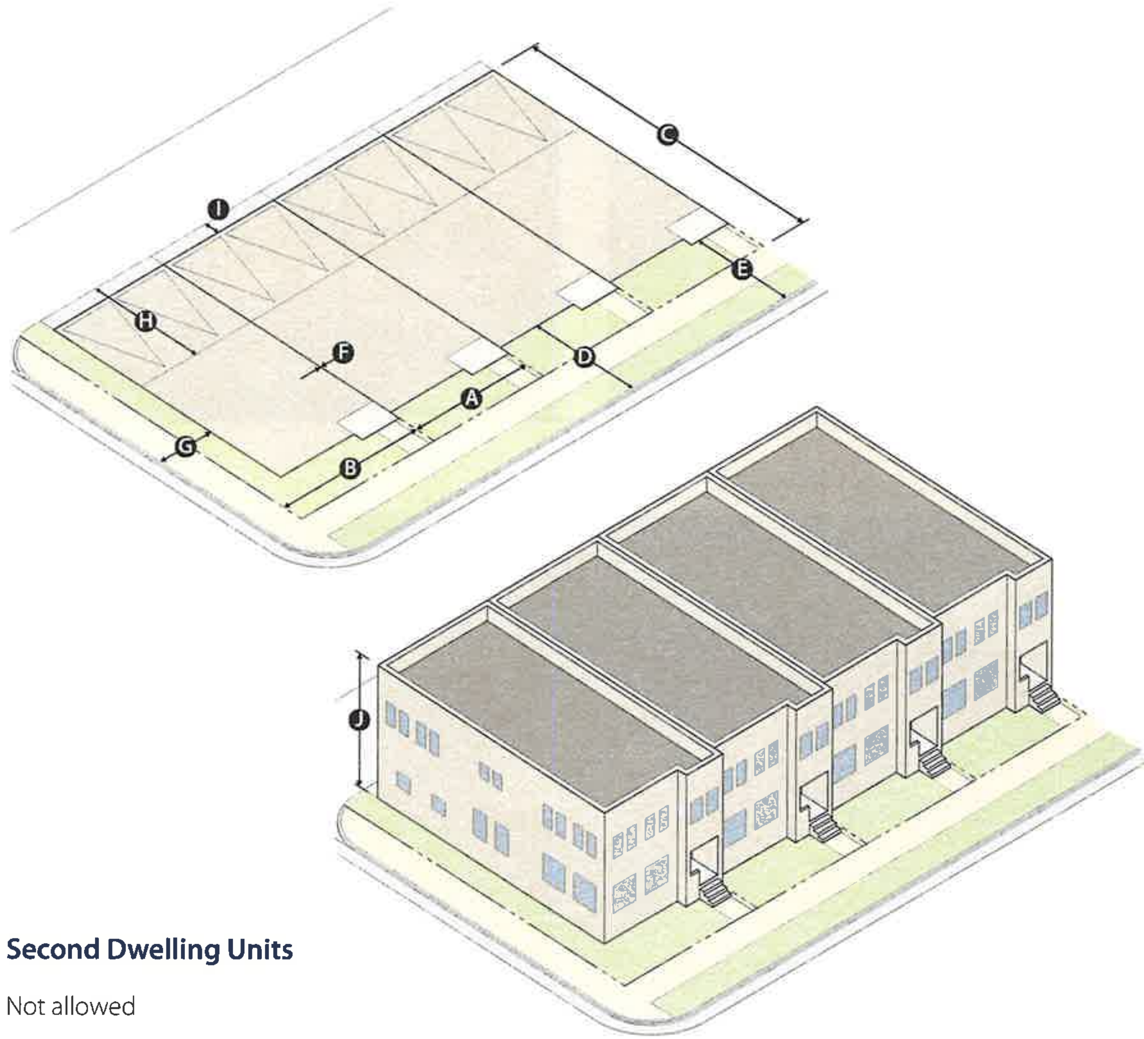
J. Building Height	45 ft. (3 stories)

Access

Drive Aisle/Alley Width	20 ft. min.

Private Outdoor Living Area

Required Area	75sq. ft. min.



Second Dwelling Units

Not allowed

Parking

Required parking shall be located at the rear of the unit off the alley. Off-street guest parking shall be provided as determined by the City on a case-by-case basis.

Off-Street	Min. 2 spaces per unit
On-Street	Permitted

Images above illustrate acceptable examples of the Townhouses, Tuck-Under Garage building form.

S. Green Court Townhomes/ Apartments

Lot Standards

Density	12.0–25.0 du/acre

Setback Requirements

Front Yard	
A. Living Area	10 ft. min.
B. Open Front Porch/Patio	8 ft. min.
Side Yard	
Street Side Yard	5 ft. min.
C. Alley-Loaded Garage	3 ft. min./6 ft. max.
Building Separation	
D. Front-to-Front	20 ft. min.
Side-to-Side with openings	15 ft. min.
Side-to-Side without openings	10 ft. min.
Front to Side	15 ft. min.

Height

E. Building Height	45 ft. (3 stories)

Access

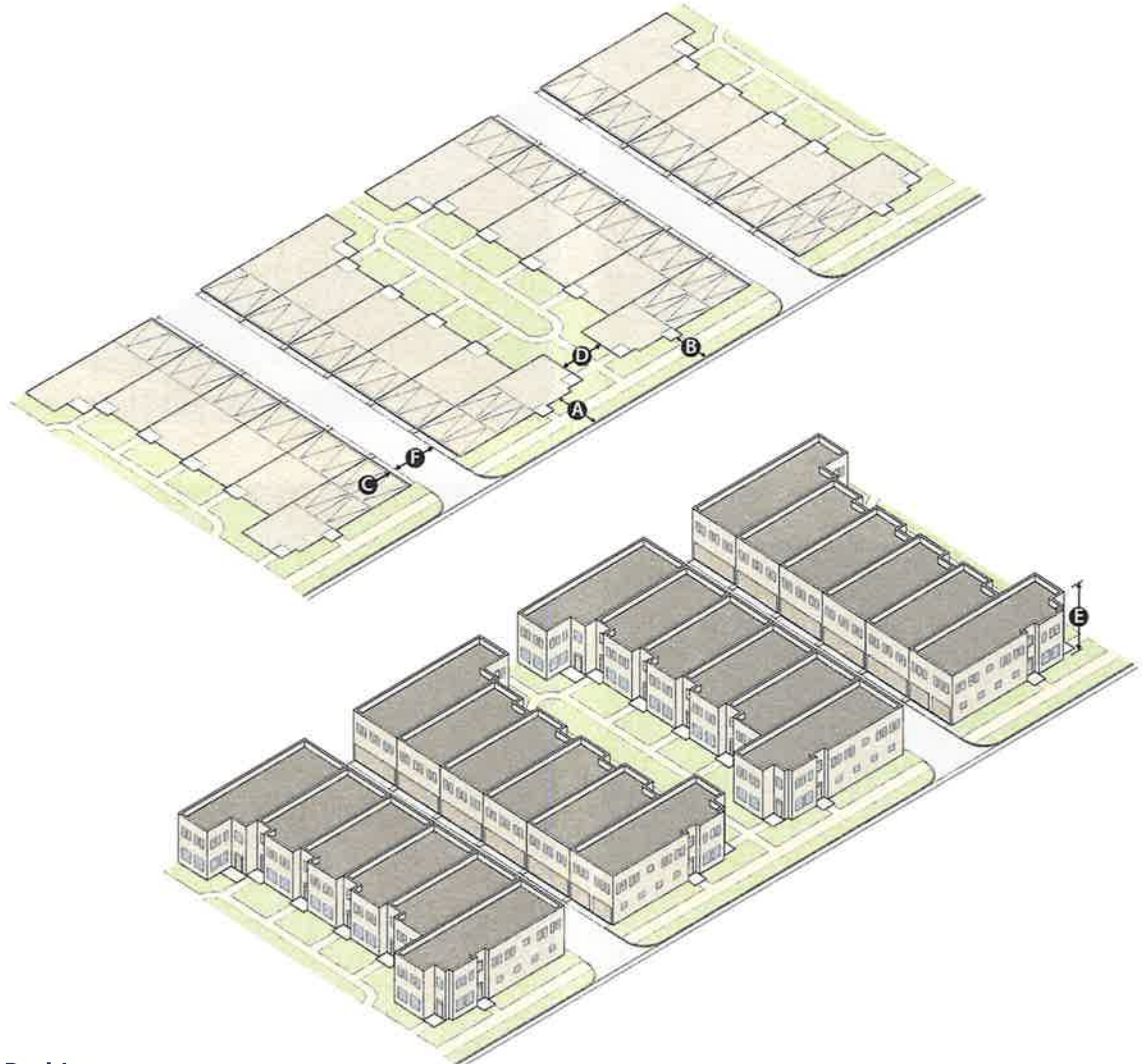
F. Drive Aisle Width	20 ft. min.

Private Outdoor Living Area

Required Area	75sq. ft. min.

Accessory Units

Not allowed



Parking

Required parking may be enclosed or covered and placed within the unit or in designated areas. Off-street guest parking shall be provided as determined by the City on a case-by-case basis.

Off-Street	**Min. 2 spaces per unit**
On-Street	**Permitted**

Images above illustrate acceptable examples of the Green Court Townhomes/Apartments building form.

T. Garden-Style Condominiums/ Apartments

Lot Standards

Density	15.1–40.0 du/acre

Lot Coverage

Building Coverage	60% max.
Landscape Coverage	30% min.

Setback Requirements

A. Arterial	20 ft. min.
B. Other Street	10 ft. min.
C. Drive Aisle/Alley	3 ft. min./6 ft. max.
Building Separation	
Front-to-Front	20 ft. min.
D. Side-to-Side with openings	15 ft. min.
Side-to-Side without openings	10 ft. min.
E. Front to Side	15 ft. min.

Height

F. Building Height	60 ft. (4 stories)

Access

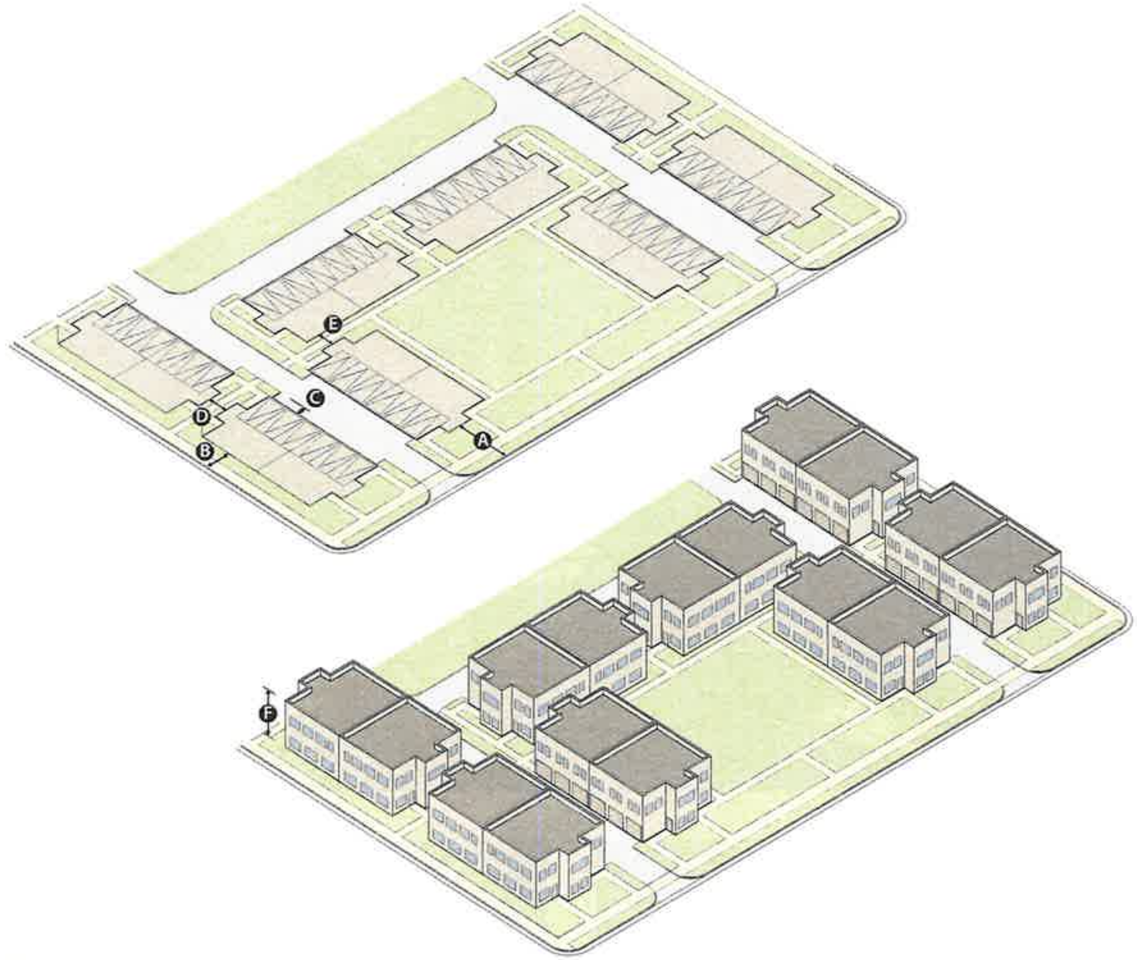
Drive Aisle Width	20 ft. min.

Private Outdoor Living Area

Ground-Level Units	80 sq ft. min.
Upper-Level Units	40 sq ft. min.

Accessory Units

Not allowed



Parking

Required parking may be enclosed or covered and placed within the unit or in designated areas. Off-street guest parking shall be provided as determined by the City on a case-by-case basis.

Off-Street

2+ Bedroom Unit – 2 space

1 Bedroom/Studio Unit – 1 space

On-Street - Permitted

Images above illustrate acceptable examples of the Garden Style Condominiums/Apartments building form.

U. Drive-Through

Lot Standards

Setback Requirements

A. Front	0 ft. min.
Side	
B. Interior	0 ft. min.
C. Street side	0 ft. min.
D. Rear	0 ft. min.

Façade Articulation and Wall Surfaces

Ground Floor Transparent Façade	40% min.

Building Height

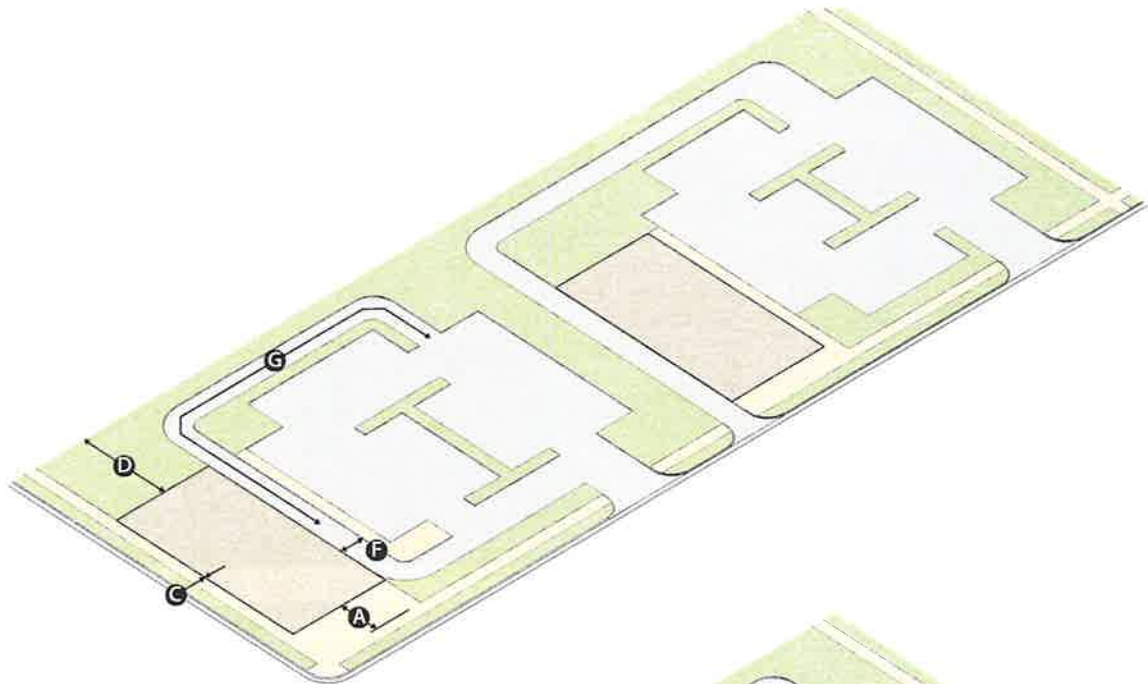
E. Primary Building	45 ft. min. (3 stories)

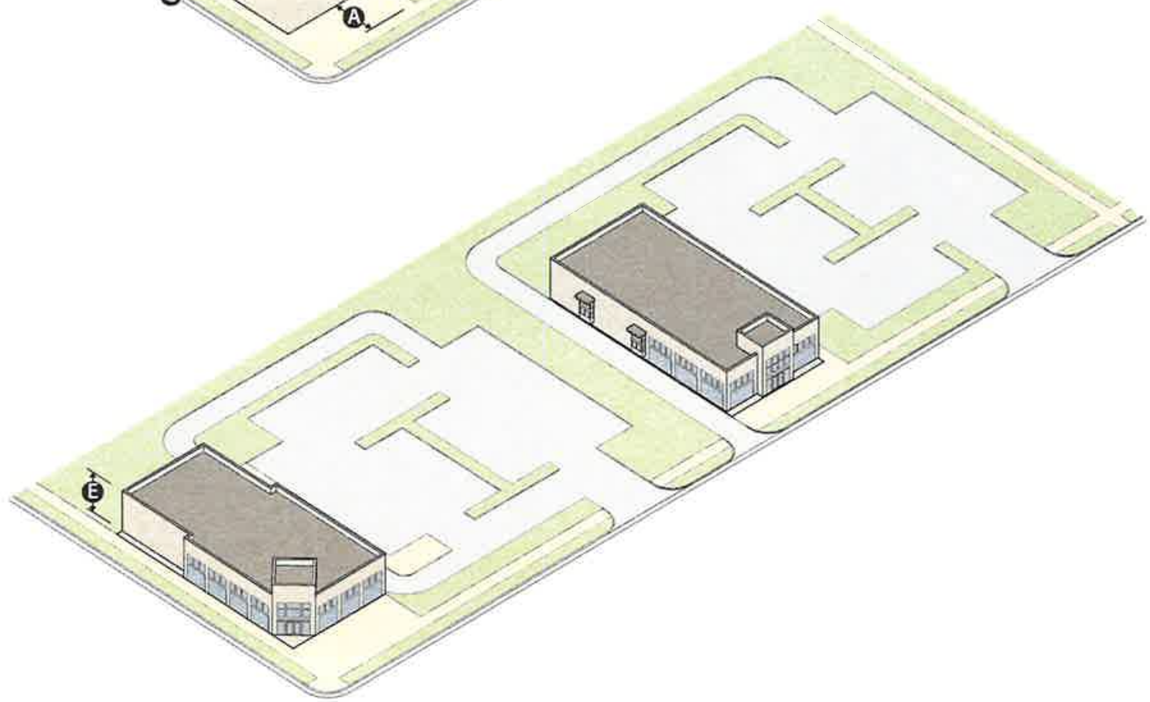
Parking

As required for other restaurants

Design Requirements

- Surface parking shall not be located between the building and any street.
- Drive-through lane shall not be located between the building and any street.
- Drive-through lane width: 12 ft. max (F)
- Drive-through lane shall be screened from public streets and adjoining development with landscaping, decorative wall, or combination with height between 30 in. (min.) and 42 in. (max.).
- Stacking distance
  - Restaurant: 150 ft. min, or as determined by Public Works Director (G)
  - Banks, pharmacy, and similar uses: 50 ft. min., or as determined by Public Works Director





Images above illustrate acceptable examples of the Drive-Through building form.

V. Fueling Station

Setback Requirements

A. Front	0 ft. min.
Side	
B. Interior	0 ft. min.
C. Street Side	0 ft. min.
D. Rear	0 ft.

Façade Articulation and Wall Surfaces

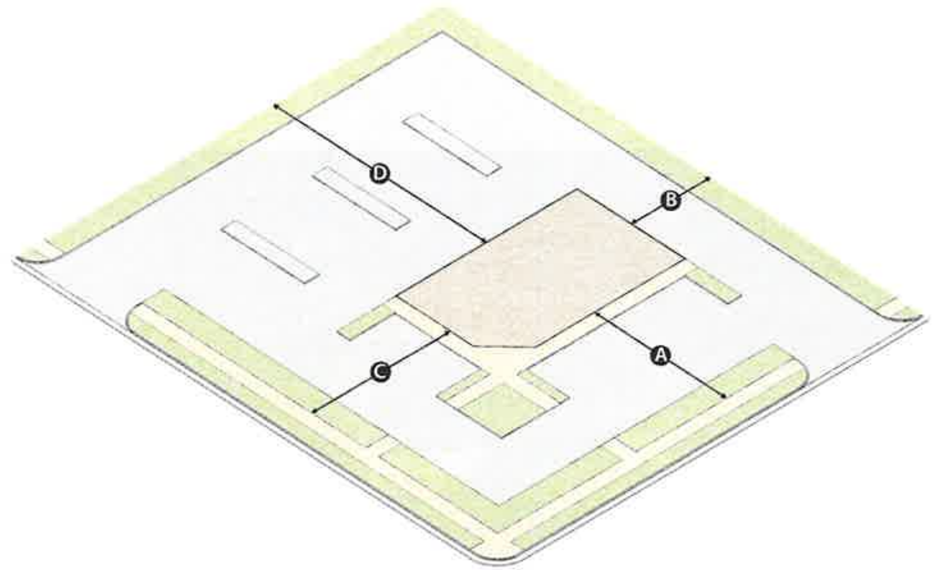
Ground Floor Transparent Façade	40% min

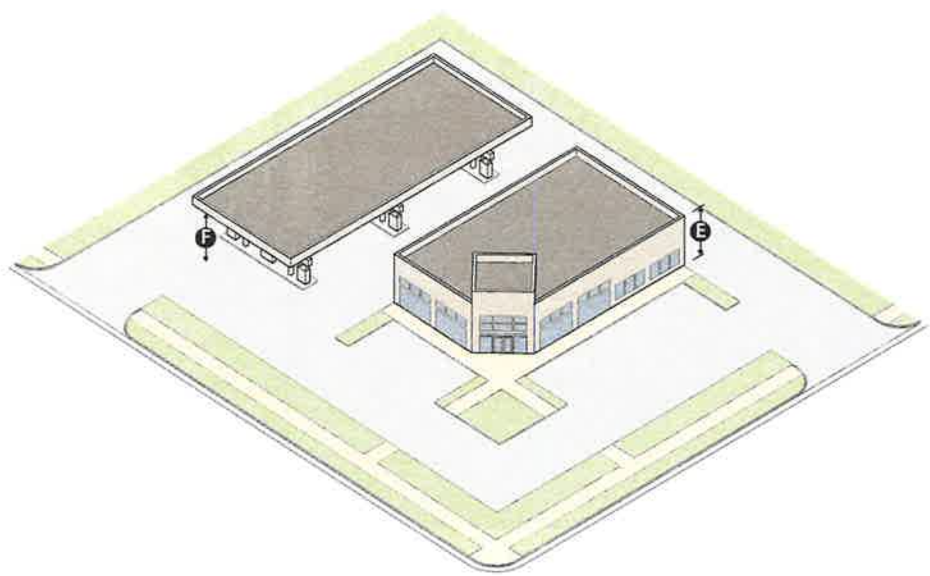
Height

E. Primary Building	25 ft. (1 stories)
F. Canopy	25 ft.

Parking

5 spaces (min.)





Images above illustrate acceptable examples of the Fueling Station building form.

W. Sports Complex

Setback Requirements

To any street	10 ft. min.

Height

Building Height	200 ft.

All other design parameters to be determined through design review.

Images above illustrate acceptable examples of the Sports Complex development form.

PHYSICAL FORM: FRONTAGES

This section describes the various frontage forms, corresponding development standards, and permitted locations within the plan area. All building frontages in the plan area shall conform to these development standards.

The frontage forms used in this plan are:

A. Forecourt
B. Shopfront
C. Gallery-Deck
D. Arcade
E. Common Lawn
F. Porch
G. Stoop
H. Forward Patio

The frontage forms shall be applied consistent with the following matrix. An "x" indicates that the frontage form is allowed in the corresponding land use designation; a "-" indicates that the frontage form is not allowed in the corresponding land use designation.

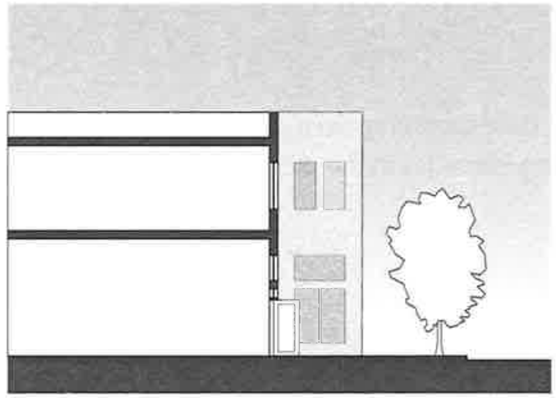
	Community Type/Specific Land Use Type												
	Employment Hub/Core			Village Center		Residential/Neighborhood				Public/Semi-Public			Special
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC
Frontage Types													
Forecourt	X	X	X	X	X	-	-	-	-	-	-	-	-
Shopfront	X	X	X	X	X	-	-	-	-	-	-	-	-
Gallery-Deck	X	X	X	X	X	-	-	-	-	-	-	-	X
Arcade	X	X	X	X	X	-	-	-	-	-	-	-	X
Common Lawn	-	-	-	-	-	X	X	-	-	-	-	-	-
Porch	-	-	-	X	-	X	X	X	-	-	-	-	-
Stoop	-	-	-	X	-	-	-	X	X	-	-	-	-
Forward Patio	-	-	-	X	-	-	X	X	X	-	-	-	-

A. Forecourt

The forecourt frontage is created by setting back a portion of a building façade to create a plaza. Forecourts commonly provide access to the lobby or a larger building and may be paired with other frontage types to provide access to the portions of the building located closer to the sidewalk. Forecourts may be landscaped or paved and provide vehicular access to the building entry.

Development Standards

Height Above Sidewalk Grade	0 ft. min./ 2 ft. max.
A. Width	10 ft. min., 1/3 of overall façade width max.
B. Depth	8 ft. min., equal to or less than width



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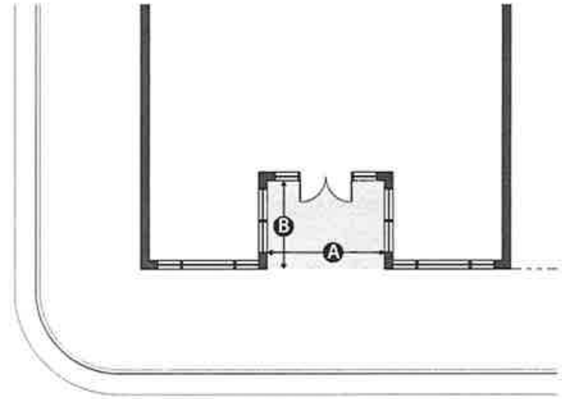

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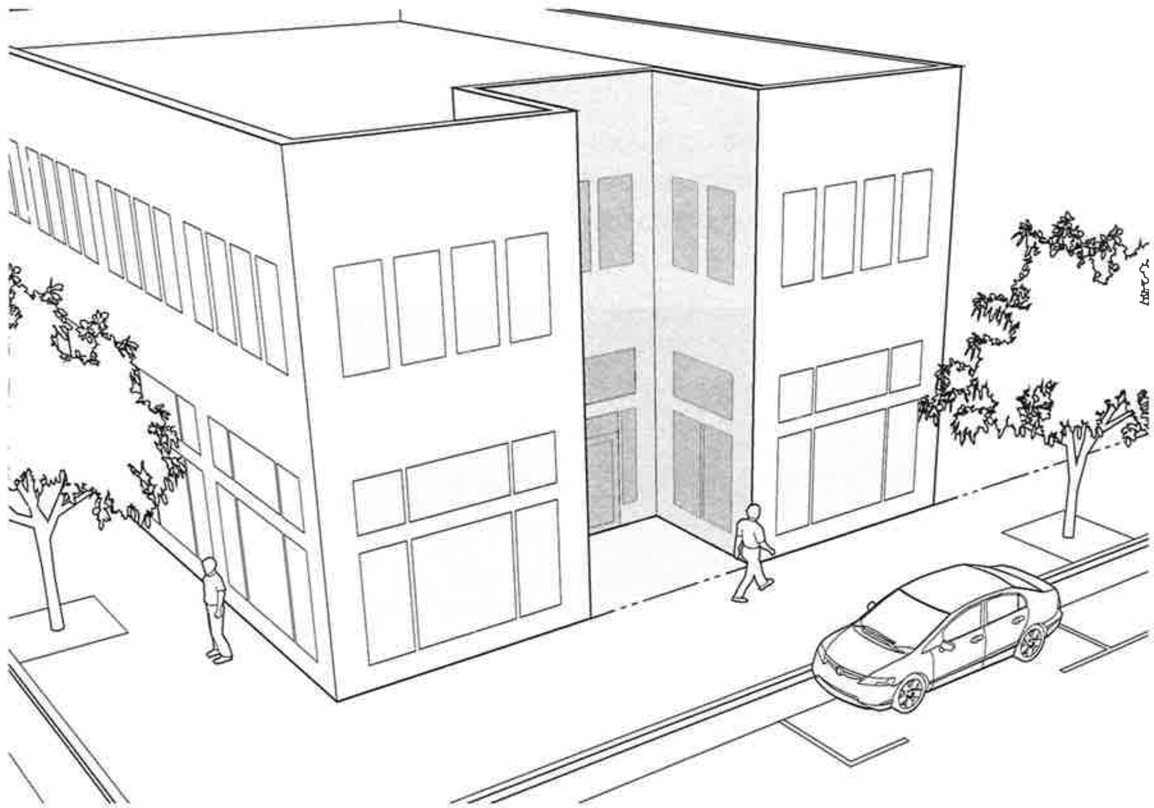
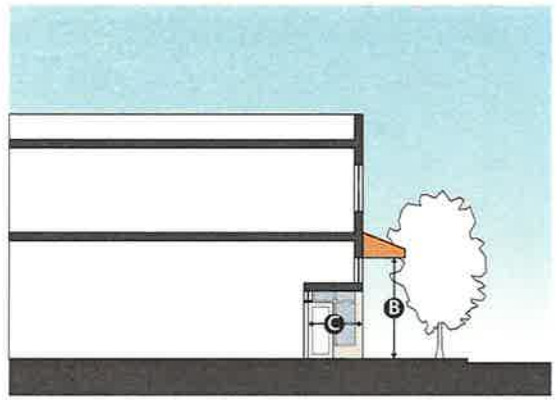


Images above illustrate acceptable examples of the Forecourt frontage form.

B. Shopfront

A shopfront frontage is characterized by a façade which is aligned closely to or directly on the public right-of-way line with the building entrance at sidewalk grade. Shopfront frontages have substantial glazing on the ground floor and provide awnings or canopies cantilevered over the sidewalk. Building entrances may either provide a canopy or awning or alternatively, may be recessed behind the front building façade. Awnings over the public sidewalk require approval of an encroachment agreement.



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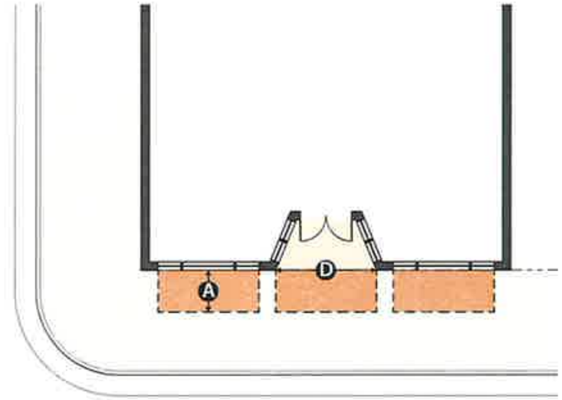


Plan

Development Standards

Awning

A. Depth	3 ft. min.
B. Base Height	8 ft. min.
Doorway	
C. Inset	0 ft. min./12 ft. max.
D. Width	8 ft. min.
Ground-Floor Windows	
E. Width	2 ft. min.
F. Height	5 ft. min.

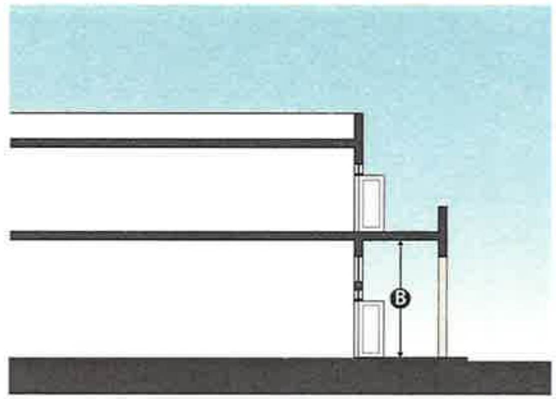
Images above illustrate acceptable examples of the Shopfront frontage form.

C. Gallery-Deck

A gallery-deck frontage is characterized by a façade which is aligned closely to or directly on the build-to line with the building entrance at the sidewalk grade and with an attached colonnade or deck that projects over the public sidewalk and encroaches into the public right-of-way. The sidewalk may be fully absorbed within the colonnade or deck so that a pedestrian may not bypass it. The colonnade or deck may project over the public sidewalk, provided that the upper stories of the building do not also project over the public sidewalk. This frontage is typically appropriate for retail use. An encroachment agreement is needed to construct this frontage type.

Development Standards

Gallery	
A. Depth	8 ft.
B. First Floor Plate Height	10 ft. min.
Building Frontage Coverage	100%
Ground-Floor Doorways	
Inset	0 ft. min./12 ft. max.
C. Width	5 ft. min./11 ft. max.
Ground-Floor Windows	
D. Width	2 ft. min./10 ft. max.
E. Height	5 ft. min./10 ft. max.



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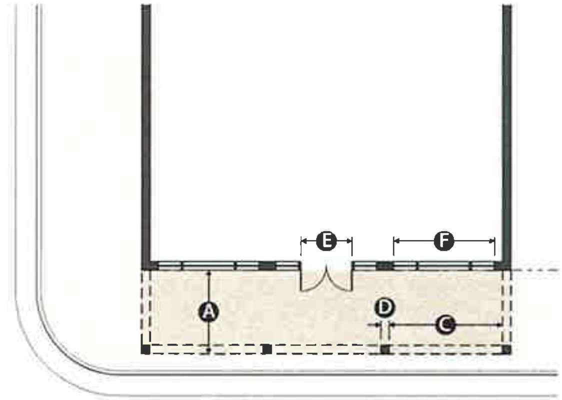

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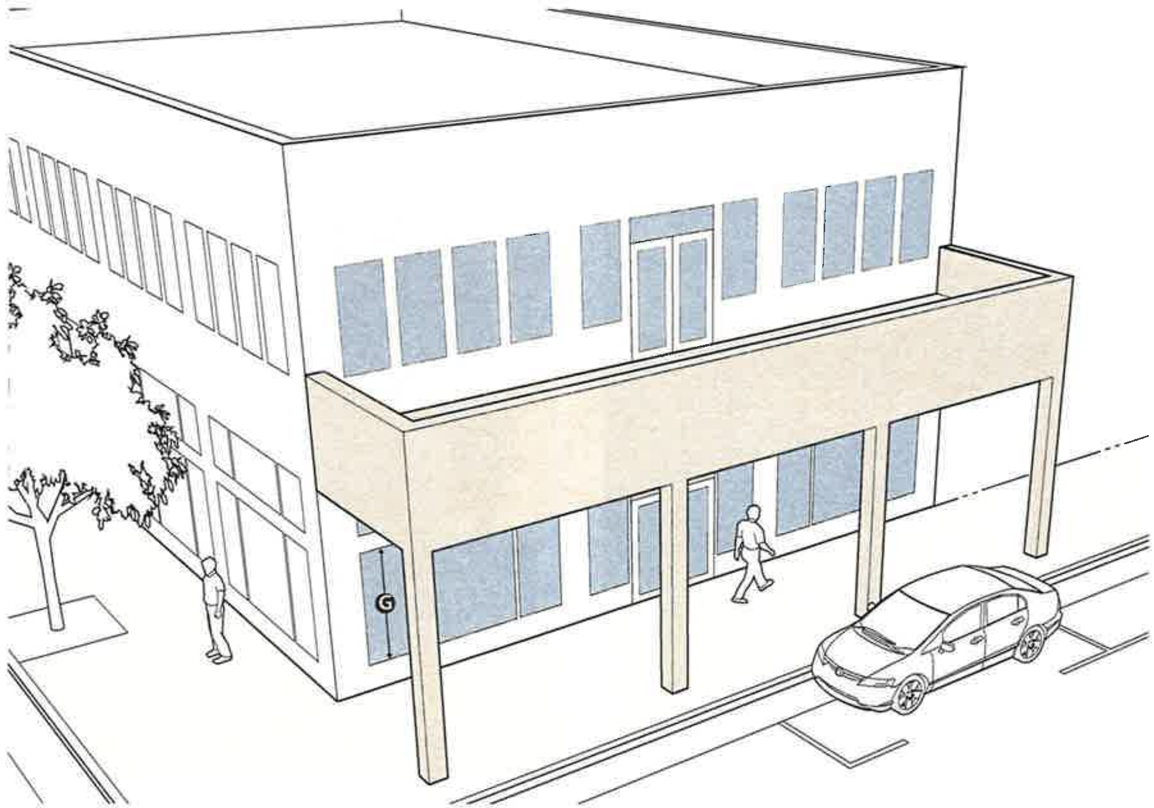
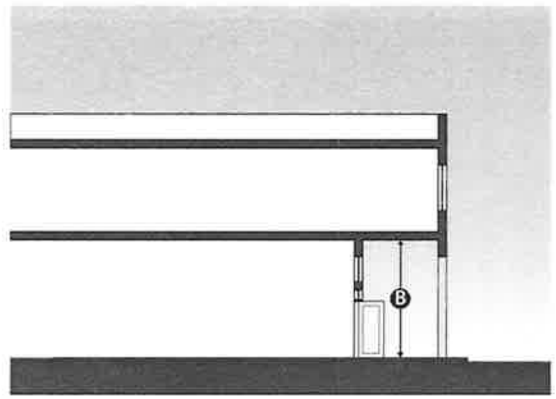


Images above illustrate acceptable examples of the Gallery - Deck frontage form.

D. Arcade

An arcade frontage is characterized by a façade where the first floor aligns directly with the street-facing property line (a zero-foot built-to line) and the floors above project out over, and may fully absorb, the pedestrian space/sidewalk so that a pedestrian may not bypass it. This frontage is typically appropriate for ground-floor retail and restaurant use, with office and residential uses above. An encroachment agreement is needed to construct this frontage type.



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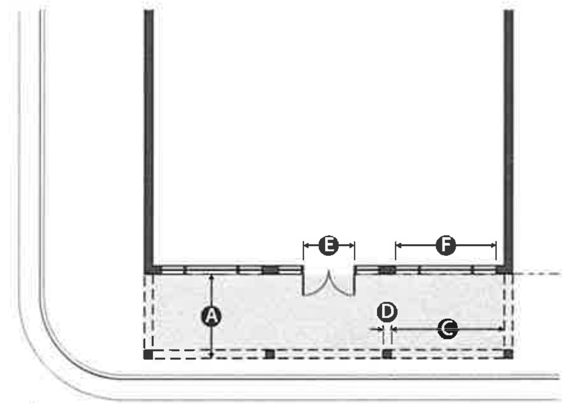

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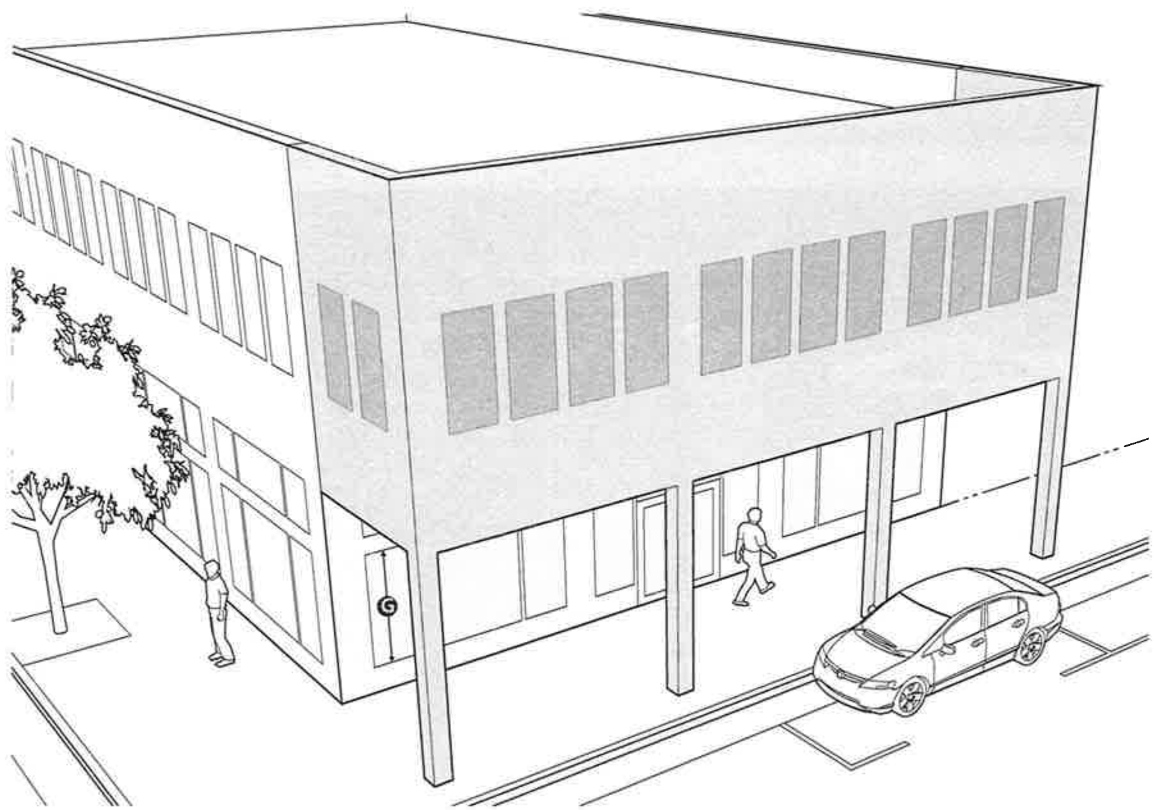


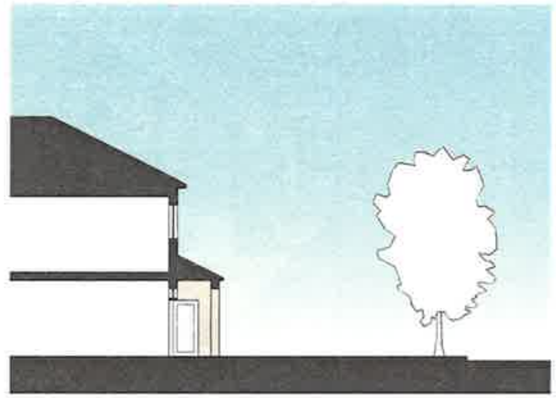
Development Standards

Arcade	
A. Depth	8 ft. min.
B. First Floor Plate Height	10 ft. min.
Building Frontage Coverage	100%
Ground-Floor Doorways	
Inset	0 ft. min./12 ft. max.
C. Width	8 ft. min.
Ground-Floor Windows	
D. Width	2 ft. min.
E. Height	5 ft. min.

Images above illustrate acceptable examples of the Arcade frontage form.

E. Common Lawn

A common lawn frontage is characterized by deep front yard setbacks. The building façade is set back substantially from the front property line. The resulting front yard is unfenced and is visually continuous with adjacent yards, supporting a common landscape.



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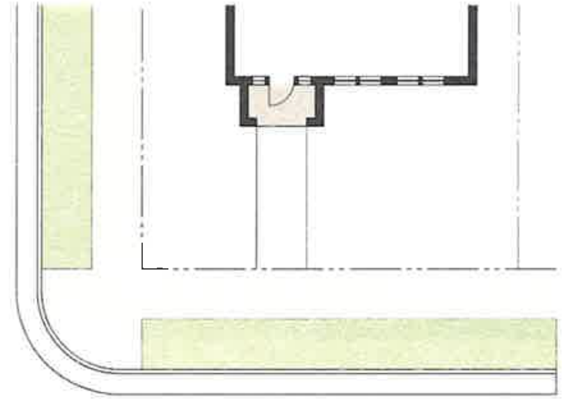


Plan

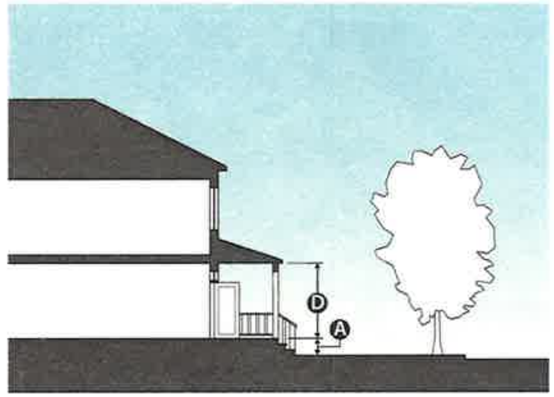
Images above illustrate accceptable examples of the Common Lawn frontage form.

F. Porch

The porch frontage is intended for residential uses. The type is characterized by a covered, active outdoor living space connected to the front of the building. The porch may be raised above the finished grade of the lot or be built at grade. An optional fence along the street facing property line(s) may be constructed to help demarcate the adjoining yard area.

Development Standards

Porch	
A. Height Above Sidewalk Grade	0 ft. min./ 6 ft. max.
B. Width	6 ft. min.
C. Depth	6 ft. min.
Fence/Wall (if provided)	
Setback from Frontage Line	0 ft. min.
Height	3 ft. max



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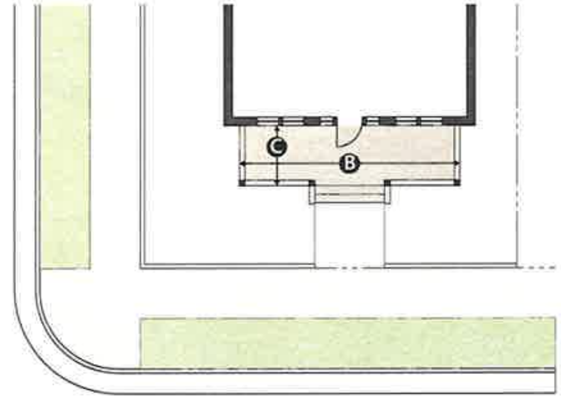
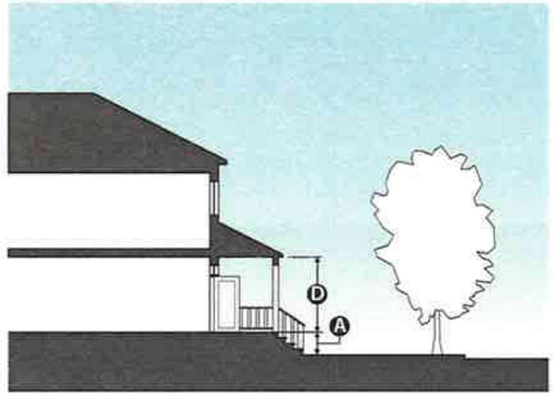


Plan

Images above illustrate acceptable examples of the Porch frontage form.

G. Stoop

The stoop frontage is intended for residential uses. The type is characterized by stairs and a small landing. The stoop is commonly associated with denser building types on narrower lots and placed close to the street-facing property line(s). To accommodate a property's limited yard area, a stoop's stairs may be placed perpendicular or parallel to the property line. The frontage may be covered and may include an optional fence along the street facing property line(s) to help demarcate the adjoining yard area.



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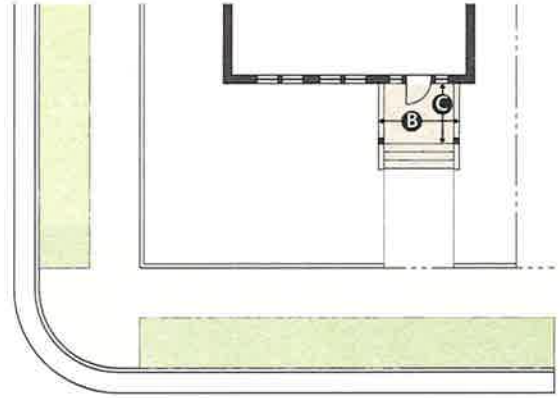

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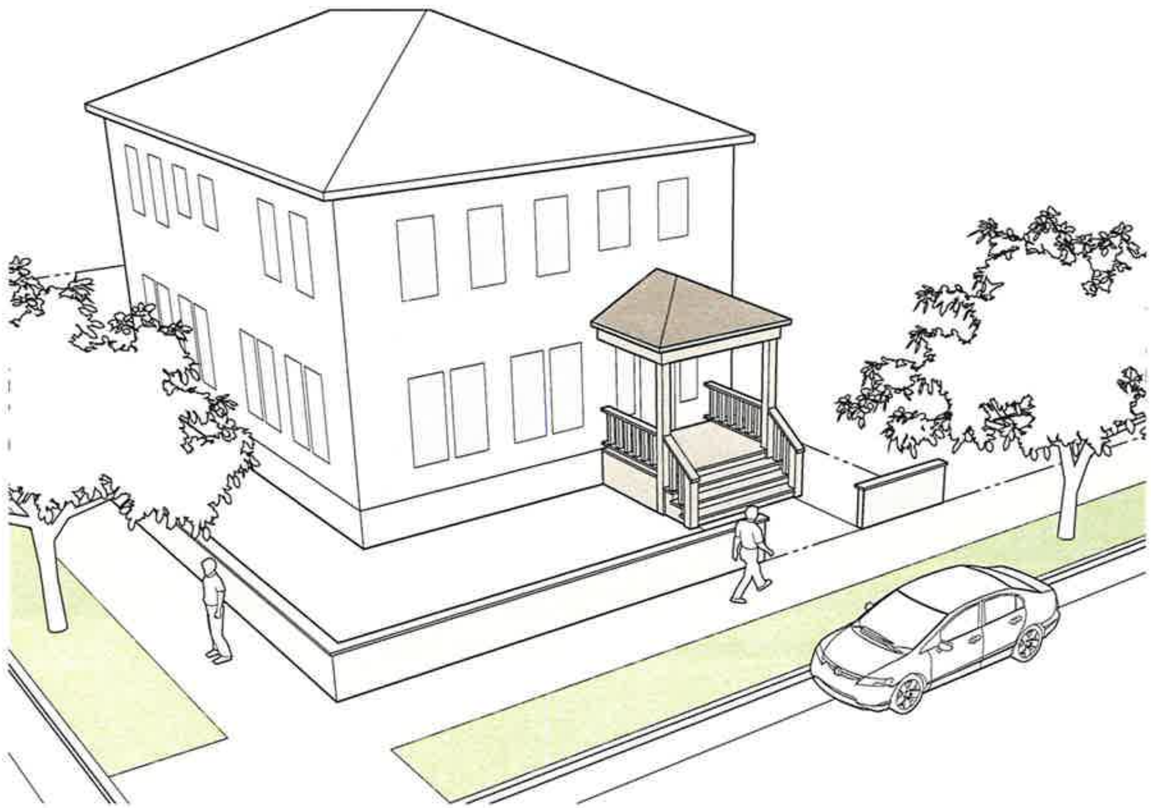
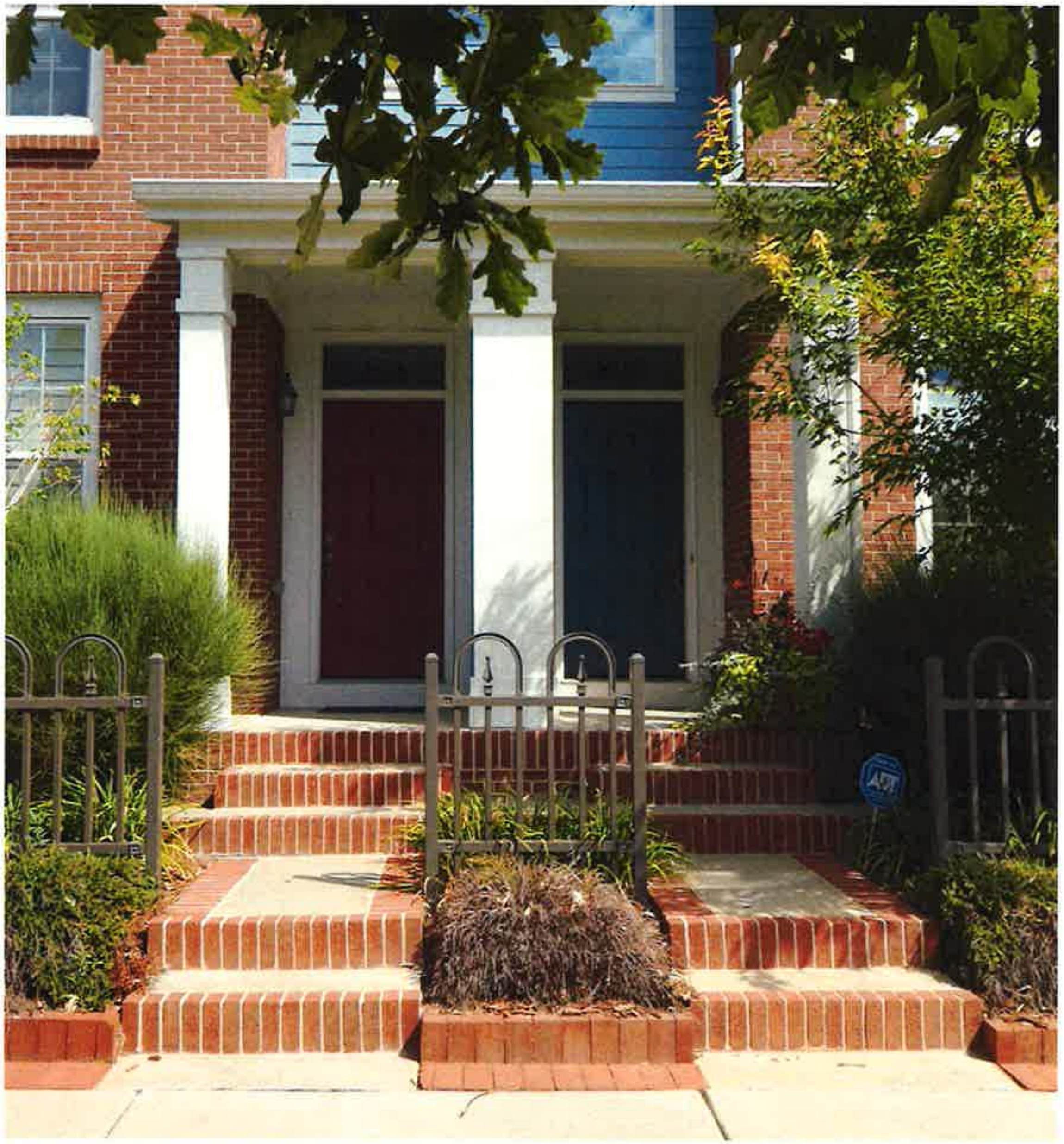


Development Standards

Stoop	
A. Height Above Sidewalk Grade	2 ft. min./ 6 ft. max.
B. Width	4 ft. min.
C. Depth	4 ft. min.
Fence/Wall (if provided)	
Setback from Frontage Line	0 ft. min.
Height	3 ft. max.



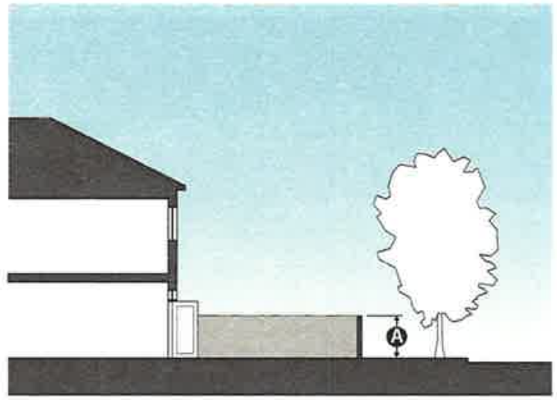
Images above illustrate acceptable examples of the Stoop frontage form."

H. Forward Patio

The forward patio is intended for residential uses. The type is characterized by an enclosed (or semi-enclosed) patio space between the front door and the public sidewalk. In denser building types, this frontage may provide the only outdoor space for the dwelling.

Development Standards

A.	Wall Height	3 ft. max.
B.	Gate (if provided)	36 in. width min.
	Wall Setback from Frontage Line	0 ft. min.



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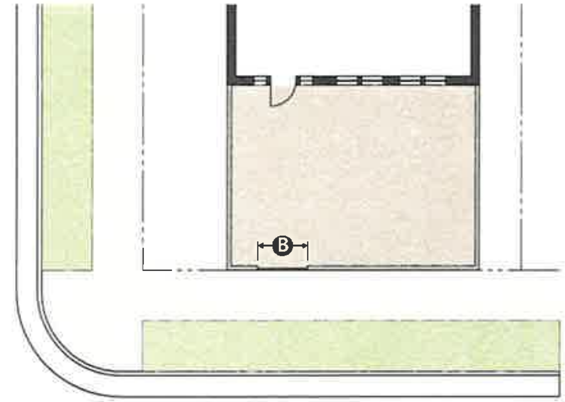

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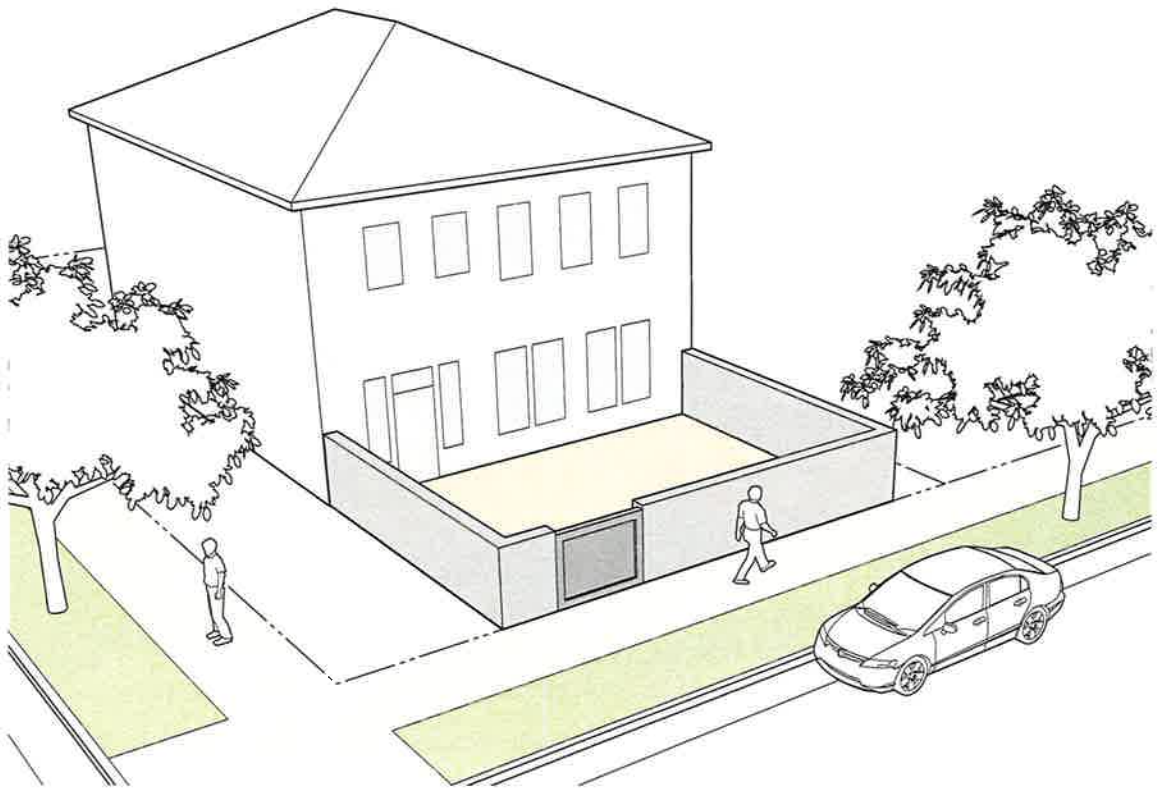


Images above illustrate acceptable examples of the Forward Patio frontage form.

PHYSICAL FORM: COMMUNITY SPACES

This section describes the various community space forms, corresponding development standards, and permitted locations within the plan area. All community spaces in the plan area shall conform to these development standards.

The community space forms used in this plan are:

A. Greenway
B. Major Drainage Channel (Shed C Channel/The Southeast Policy Area Channel)
C. Detention Basin
D. Park/Open Space
E. Joint Use Park/Detention Facility
F. School
G. Bus Stop
H. Major Transit Facility

The community space forms shall be applied consistent with the following matrix. An "x" indicates that the community space form is allowed in the corresponding land use designation; a "-" indicates that the community space form is not allowed in the corresponding land use designation.

	Community Type/Specific Land Use Type												
	Employment Hub/Core			Village Center		Residential/Neighborhood				Public/Semi-Public			Special
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC
Community Facility Types													
Greenway	-	-	-	-	-	-	-	-	-	-	-	X	-
Major Drainage Channel	-	-	-	-	-	-	-	-	-	-	X	-	-
Detention Basin	-	-	-	-	-	-	-	-	-	-	X	-	-
Park/Open Space	-	-	-	-	-	-	-	-	-	-	-	X	-
Joint Use Park/Detention Facility	-	-	-	-	-	-	-	-	-	-	X	X	-
School	-	-	-	-	-	-	-	-	-	X	-	-	-
Bus Stop	X	X	X	X	X	X	X	X	X	X	X	X	X
Major Transit Facility	X	-	-	-	X	-	-	-	-	-	-	-	-

Example community space forms found in this section.

A. Greenway

The greenway is an off-street circulation element or trail, which connects neighborhoods together and provides off-street access to individual parks. It provides spaces for bicycling, walking/jogging, and other forms of recreation. It includes landscaping to buffer the trail from adjoining uses.

Development Standards

A. Overall Width	**40 ft. min**
B. Pavement Width	**10 ft. min**
C. Shoulder	**2 ft. min. each side**
D. Landscaping	**5 ft. min. each side**

Design Requirements

1. Greenways shall comply with City and CCSD Parks Master Plans and Trails Master Plan.
2. Where possible, utilize permeable pavement and/or a high-albedo (high reflective) materials.
3. Where the greenway crosses a street, incorporate special paving materials (e.g., decorative pavers), colors, and/or patterns to make pedestrian crossings more visible and to help foster a unique, desirable identity.
4. Greenway entrances/access points shall be designed to maximize safety and convenience of the trail user, including ADA-compatible design and sufficient width and maneuvering space for a bike with trailer.
5. Greenways shall be designed, to the extent practicable, using sustainable landscape design principles, such as those identified in the "River-Friendly Landscape Guidelines," published by Sacramento County. At a minimum, principles include selective use of turf, inclusion of native and drought-tolerant plants, and low-volume irrigation systems. Landscape design shall also conform to City of Elk Grove Water Efficient Landscape Requirements (EGMC Chapter 14.10).

Pedestrian Amenities

Development shall provide the following amenities along the greenway at key locations, such as entrances to parks, crossings of roads (other than local roads), or neighborhood entries.

1. Bench
2. Picnic table
3. Water fountain
4. Informational kiosk
5. Plaza space or open lawn
6. Enhanced paving
7. Trash receptacles

NOTE: For a description of the streetscape elements see sub-section I. Streetscape Materials under subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter.

Images above illustrate acceptable examples of the Greenway community spaces form.

B. Major Drainage Channel (Shed C Channel)

The major drainage channel is the primary conveyance facility for stormwater drainage through the plan area. It takes flows from the various detention basins and conveys them out of the plan area. It also includes a public trail on at least one side that doubles as a maintenance access road.

Development Standards

Channel

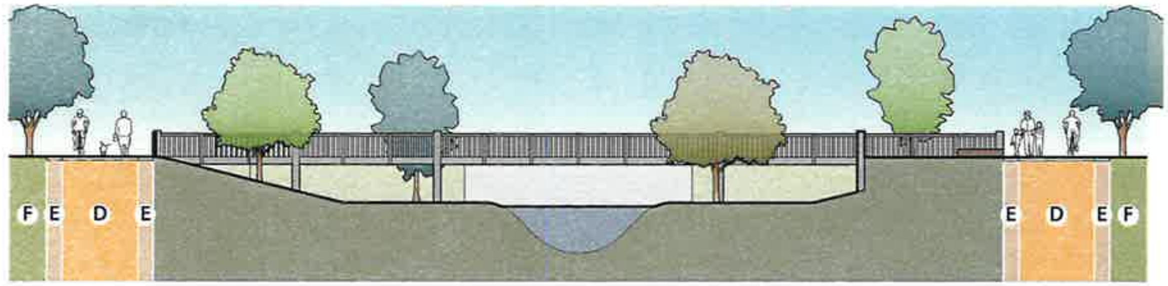
A. Overall Width	Varies, see drainage master plan
B. Low-flow Width	Varies, see drainage master plan
C. Side Slope	4:1 min., 3:1 max.

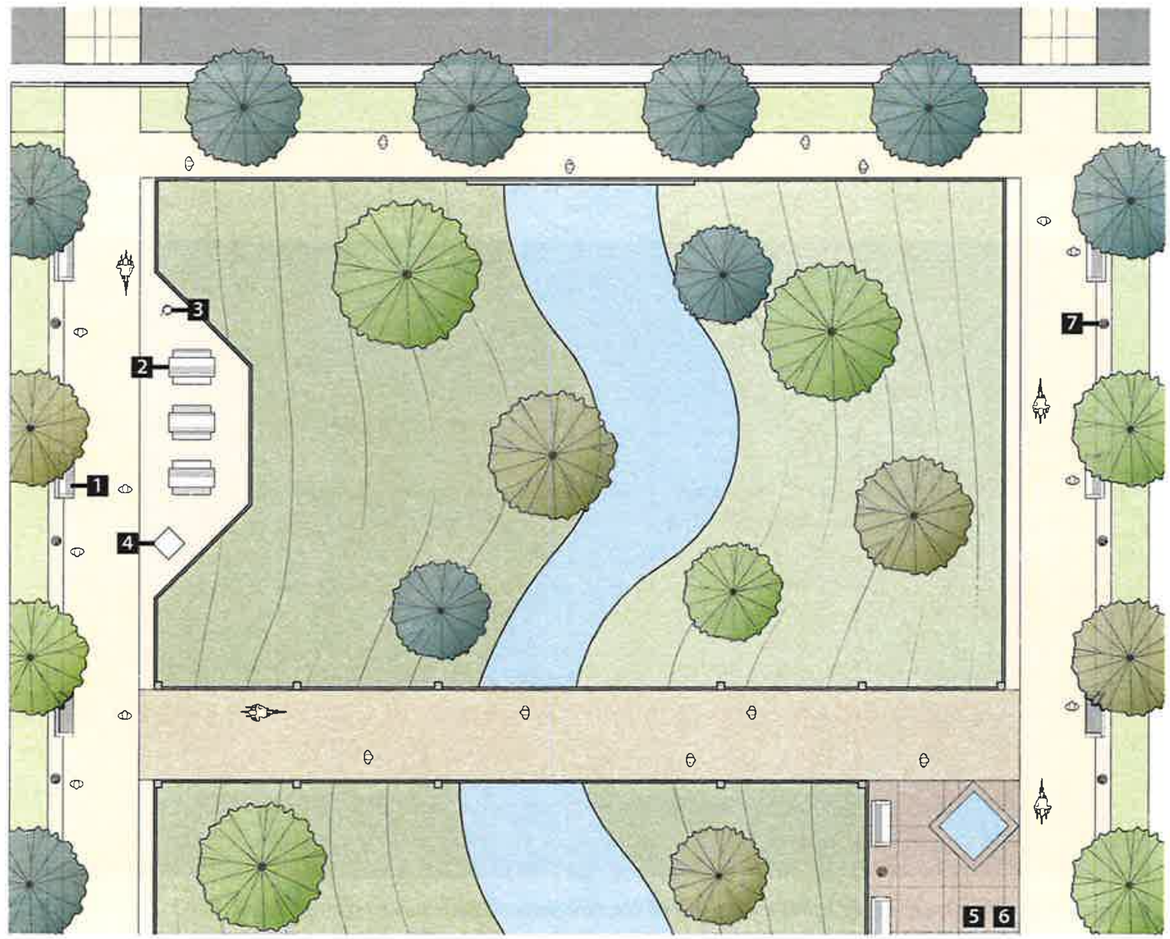
Trail

D. Pavement Width	10 ft. min
E. Shoulder	2 ft. min each side
F. Landscaping	10 ft. min. along outside edge

Design Requirements

1. The low-flow bottom shall have a meander and include native vegetation to the satisfaction of Public Works.
2. Trail landscaping shall be designed, to the extent practicable, using sustainable landscape design principles, such as those identified in the "River-Friendly Landscape Guidelines," published by Sacramento County. At a minimum, principles include selective use of turf, inclusion of native and drought-tolerant plants, and low volume irrigation systems. Landscape design shall also conform to





City of Elk Grove Water Efficient Landscape Requirements (EGMC Chapter 14.10).

3. Ponding may be allowed in sections along the Village Center upon Public Works approval. Ponds shall include measures to limit algae formation and mosquitoes.
4. The trail shall be separated from the channel by a post and cable or post and rail fence.
5. Where possible, utilize permeable pavement and/or a high-albedo (high reflective) materials.
6. Entrances/access points shall be designed to maximize safety and convenience of the trail user, including ADA-compatible design and sufficient width and maneuvering space for a bike with trailer.

Pedestrian Amenities

Development shall provide the following amenities along the Major Drainage Channel at key locations, such as entrances, crossings of roads (other than Local roads), or neighborhood entries.

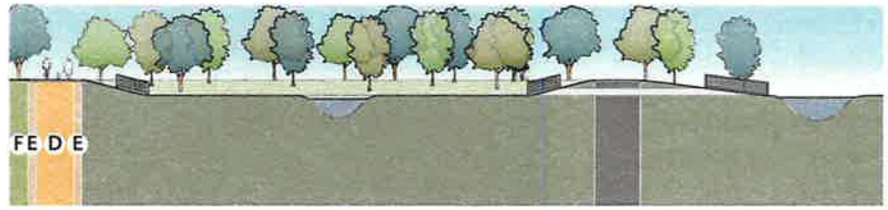
1. Bench
2. Picnic table
3. Water fountain
4. Informational kiosk
5. Plaza space or open lawn
6. Enhanced paving
7. Trash receptacles

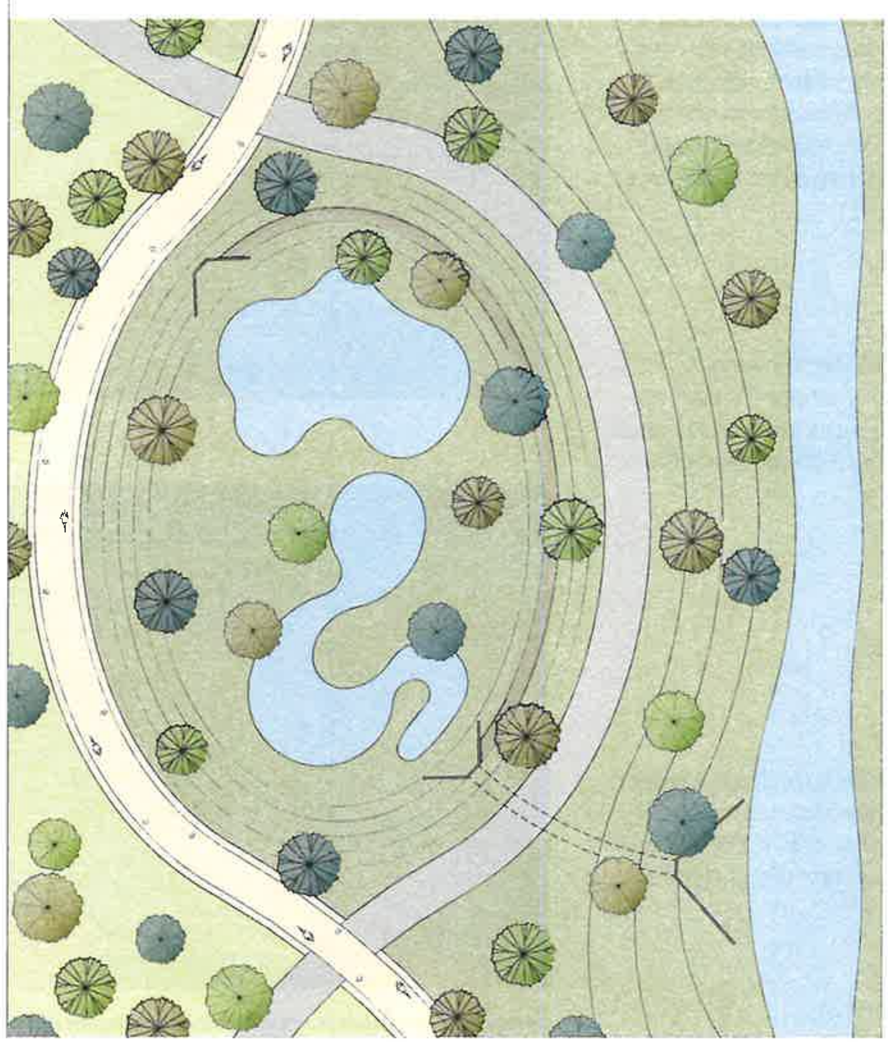
NOTE: For a description of the streetscape elements see sub-section I. Streetscape Materials under subsection I, Streetscape Materials, in the Physical Form: Common Features section of this chapter.

Images above illustrate appropriate examples of the Major Drainage Channel community spaces form.

C. Detention Basin

A detention basin is a stormwater storage facility that holds stormwater and gradually releases it into the major drainage channel. The detention basin also acts as a water quality feature. It also includes a public trail on at least one side, with a maintenance road on the other. Stormwater outfalls from the facility into the major drainage channel through both a low-flow culvert (accommodating flows less than or equal to the 10-year event) and an overland release across the maintenance road that accommodates larger flows.





Development Standards

Greenway

A. Overall Width	Varies, see Drainage Master Plan
B. Low-Flow Width	Varies, see drainage Master Plan
C. Side slop	4:1 min., 3:1 max.

Trail

D. Pavement Width	10 ft. min
E. Shoulder	2 ft. min each side
F. Landscaping	10 ft. min. along outside edge

Design Requirements

1. The low-flow bottom shall have a meander and include native vegetation to the satisfaction of Public Works.
2. A post and cable or post and rail fence shall be installed around the outside of the basin.
3. Include viewing areas (e.g., vistas, outlooks) along the edge of the basin along the trail. Include benches and information kiosks at the viewing areas.

4. Landscaping shall be designed, to the extent practicable, using sustainable landscape design principles, such as those identified in the "River-Friendly Landscape Guidelines," published by Sacramento County. At a minimum, principles include selective use of turf, inclusion of native and drought-tolerant plants, and low-volume irrigation systems. Landscape design shall also conform to City of Elk Grove Water Efficient Landscape Requirements (EGMC Chapter 14.10).
5. Where possible, utilize permeable pavement and/or a high-albedo (high reflective) materials.

Images above illustrate acceptable examples of the Detention Basin community spaces form.

D. Park/Open Space

A Park/Open Space is an area dedicated to active and passive recreation.

Development Standards

Lot Size	Varies, see Parks Master Plan Design Principles

Design Requirements

Each park/open space shall include active and passive recreational and open space amenities consistent with the provisions of the Parks Master Plan and to the satisfaction of the City and the Cosumnes Community Services District.

1. Provide amenities that draw people into the space, such as water features, public art, gathering areas, shade, drinking fountains, etc.
2. Provide seating, based on park size, in the form of benches, planters, or seat walls.
3. Use landscaping to create a series of identifiable spaces, views, and landmarks.
4. Provide shade trees or shade structures to protect from sun and rain.
5. Situate parks and playgrounds so that they take advantage of natural features such as adjacency to the drainage channel.
6. Locate parks and playgrounds in proximity to residential areas with adequate visibility from streets, residences, and sidewalks for safety and security. Consult the Parks Master Plan for an adequate distance between uses to reduce noise impacts.
7. Design parks so that they are well lit with pedestrian-scale light fixtures, with particular attention to safety and security.

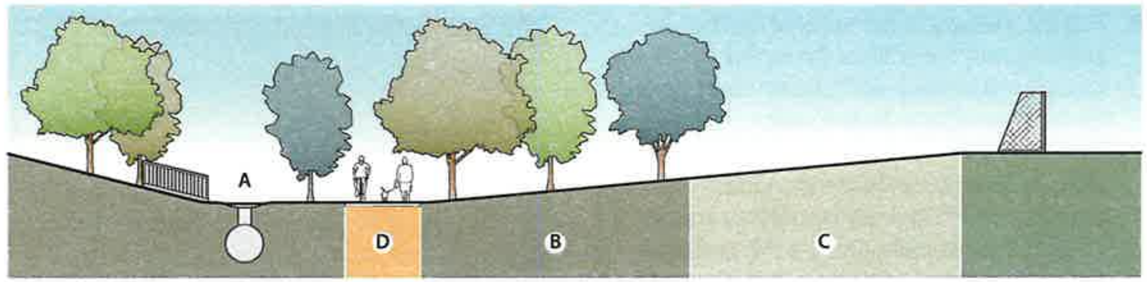
Images above illustrate acceptable examples of Parks/Open Space community space forms

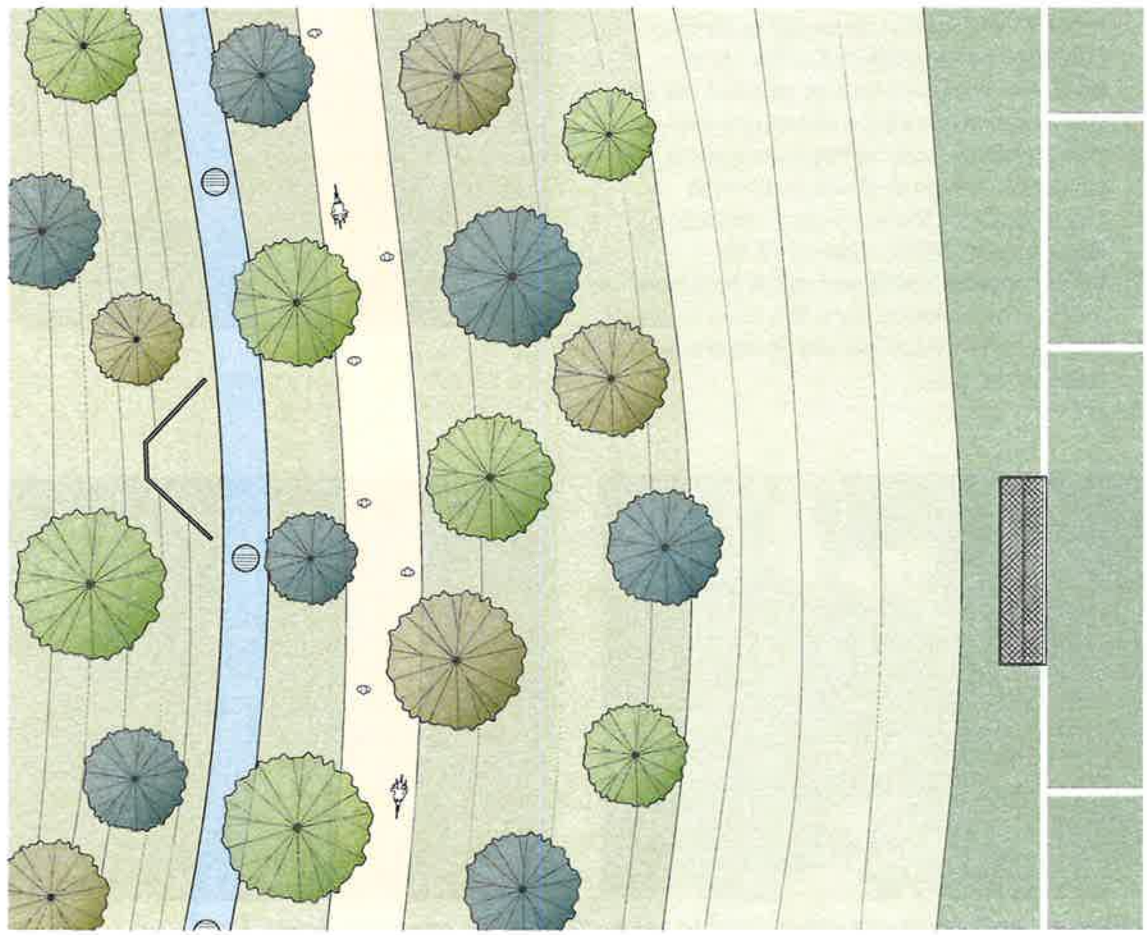
8. Provide a variety of recreational facilities, in keeping with the scale of the facility, for all age groups and physical abilities and be designed for both active and passive uses.
9. Incorporate all-weather trails in linear parkways that are adequate in width for pedestrians and bicyclists which logically link nearby activity centers, such as parks and the Village Center.
10. Landscaping shall be designed, to the extent practicable, using sustainable landscape design principles, such as those identified in the "River-Friendly Landscape Guidelines," published by Sacramento County. At a minimum, principles include selective use of turf, inclusion of native and drought-tolerant plants, and low-volume irrigation systems. Landscape design shall also conform to City of Elk Grove Water Efficient Landscape Requirements (EGMC Chapter 14.10).
11. Where possible, utilize permeable pavement and/or a high-albedo (high reflective) materials.
12. Park design shall comply with Parks Master Plan Design Principles.

Images above illustrate acceptable examples of Park/Open Space community spaces form.

E. Joint Use Park/Detention Facility

This community facility allows for the combination of parks and detention basins on a limited basis. The detention portion functions as a modified joint greenway/minor drainage channel that may spill into the park area after the adjoining detention basin has first been utilized.





Development Standards

Detention Facility

A. Low-Flow Channel — Width varies
Design Capacity — 10-year event

B. Overflow Area "1" – Width varies
- Design Capacity: 10–50-year event
- Vegetation: Native plantings
- Programming: Passive spaces
- Quimby Credit (outside of low-flow channel or any trail component): 25% of acreage
- Side slope: 4:1 max.

C. Overflow Area "2"
- Width: Varies
- Design Capacity: 50–100-year event
- Vegetation: Sod
- Programming: Non-programmed active spaces
- Quimby Credit (outside of low-flow channel, any trail component, or Overflow Area "1"): 50% of acreage
- Side slope: 4:1 max.; 5:1 max allowed if vegetative material is sod

Trail (if provided)

D. Pavement width - 10 ft. min

Design Requirements

1. The low-flow bottom shall have a meander and include native vegetation to the satisfaction of Public Works.
2. Developer shall provide a master plan of the joint use facility and adjacent park for City and CCSD review and approval prior to any entitlement approvals. Park/detention facilities shall be contiguous with other unencumbered parks/open space.
3. Park design shall comply with Parks Master Plan Design Principles.
4. Landscaping shall be designed, to the extent practicable, using sustainable landscape design principles, such as those identified in the "River-Friendly Landscape Guidelines," published by Sacramento County. At a minimum, principles include selective use of turf, inclusion of native and drought-tolerant plants, and low-volume irrigation systems. Landscape design shall also conform to City of Elk Grove Water Efficient Landscape Requirements (EGMC Chapter 14.10).
5. Where possible, utilize permeable pavement and/or a high-albedo (high reflective) materials.

Images above illustrate acceptable examples of the Joint Use Park/Detention Facility community spaces form.

F. School

Educational facilities are provided by the Elk Grove Unified School District; therefore, these facilities are outside the purview of this document.

G. Bus Stop

Bus stops provide connections to the City's public transit services. The provisions below are specific to stops that include shelters. All stops other than those along local roads shall include bus stop shelters to the satisfaction of the City.

Development Standards

Bus Stop Pad	7 ft. by 28 ft. min.
Sidewalk in front of pad	6 ft. min.
Bus Turnout	See City Improvement Standards

Design Requirements

1. Work with e-tran to design visually iconic, energy-efficient, and user-friendly bus shelters. Consider the use of solar panels to power lighting and monitors, require ADA accessibility, and ensure maximum transparency to enhance safety. Ensure that bus shelters do not obstruct pedestrian circulation. Require a minimum of 6-foot sidewalk clearance for the pedestrian passage-way.
2. Shelters shall be provided, consistent with the following design characteristics:
   - Color: Black
   - Roof Style: Hip or barrel vault
   - Seating: 3 min.
   - Lighting: LED
   - Side Panels: Plexi or decorative metal panels
3. Provide an informational kiosk as part of the shelter.
4. Where possible, utilize permeable pavement and/or a high-albedo (high reflective) materials.

Images above illustrate appropriate examples of the Bus Stop community spaces form.

H. Major Transit Facility

A major transit facility is reserved for light rail/ bus rapid transit station(s). The ultimate siting, design, and configuration of the facility shall be determined in coordination with the applicable service provider(s).

Design Requirements

1. The station(s) shall consist of multiple amenities, including but not limited to shelters in both directions, benches, static and real-time passenger information panels, passenger signage, ticket machines, and ADA-accessible ramps.
2. Shelters shall be designed such that they:
    - Match with surrounding land uses and architectural design features to reflect the unique character and features of the community.
    - Provide appropriate transit information to passengers.
    - Are oriented toward pedestrian movements and accessibility.
3. Shelters shall be designed to meet all ADA requirements.
4. Shelters shall be designed to meet peak loading volumes in both directions.
5. Bicycle parking shall be provided.
6. Platforms shall be sufficiently long to accommodate maximum vehicle configurations.
7. Platforms shall be wide and spacious enough for peak passenger flows and queues.

8. The station(s) shall be designed to meet all ADA requirements and possess appropriate facilities for at-station transfers to other vehicles and modes. This may include:
    - Appropriate signage and transfer information.
    - Pedestrian crossings, transfer corridors, and walking paths.
    - Passenger queuing areas.
    - Loading/unloading curb space for buses.
    - Layover bays.
9. The station(s) shall have direct pedestrian and bicycle links to nearby development.
10. The station(s) shall include:
    - Sufficient facilities to meet park and ride demand. Joint use agreements with adjoining development may be implemented for reduced construction costs.
    - Drop-off facilities with curb space and sidewalk width for pick-up and drop-off zones.

Images above illustrate acceptable examples of the Major Transit Facility community spaces form.

PHYSICAL FORM: COMMON FEATURES

This section describes the various common feature forms, corresponding development standards, and permitted locations within the plan area. All common features in the plan area shall conform to these development standards.

The common feature forms used in this plan are:

A. Parking Lot (Surface)
B. Parking Structure
C. Bicycle Parking
D. Signage
E. Trash Enclosure
F. Residential Accessory Structure
G. Entry Monument
H. Fences and Walls
I. Streetscape Materials

The common feature forms shall be applied consistent with the following matrix. An "x" indicates that the common feature form is allowed in the corresponding land use designation; a "-" indicates that the common feature form is not allowed in the corresponding land use designation.

	Land Use Classes/Land Use Designations												
	Employment Hub/Core			Village Center		Residential/Neighborhood				Public/Semi-Public			Special
	O	C	LI/FS	MUR	MUV	ER	LDR	MDR	HDR	SCH	D	P/OS	SC
Parking Lot (Surface)	X	X	X	X	X	-	-	X	X	X	-	X	X
Parking Structure	X	X	X	X	X	-	-	-	X	-	-	-	X
Bicycle Parking	X	X	X	X	X	-	-	X	X	X	-	X	X
Signage	X	X	X	X	X	X	X	X	X	X	X	X	X
Trash Enclosure	X	X	X	X	X	-	-	X	X	X	X	X	X
Residential Accessory Structure	-	-	-	-	-	X	X	X	-	-	-	-	-
Entry Monument	X	X	X	X	X	X	X	X	X	X	X	X	X
Fences and Walls	X	X	X	X	X	X	X	X	X	X	X	X	X
Streetscape Materials	X	X	X	X	X	X	X	X	X	X	X	X	x

A. Parking Lot (Surface)

Parking lots provide ground-level (surface) parking for vehicles.

Development Standards

Stall Dimensions	See Zoning Code
Drive Aisle Dimensions	See Zoning Code

Design Requirements

1. Pedestrian circulation/walkways shall be designed to provide circulation through parking lots from public sidewalks to primary building entryways. Sidewalks shall be designed to ensure that vehicles which may overhang or intrude into the sidewalk system do not reduce the minimum required sidewalk width of 4 feet.
2. Parking areas shall be designed to connect with parking areas on adjacent sites to eliminate the necessity of utilizing the public right-of-way for cross movements. Joint or shared access, internal circulation, or parking is encouraged with adjacent uses.
3. Include parking lot signage and well-designed locations for ingress and egress that reduce conflicts with pedestrian movement.
4. Landscaping within the parking field shall be provided pursuant to the requirements of the Zoning Code.
5. Locate parking lots, driveways, and loading areas to the rear of the property or internal to the block to maximize active pedestrian edges.
6. Provide preferred parking for alternative energy vehicles and charging stations for electric powered vehicles, per CalGreen provisions. Provide dedicated parking for car-share vehicles.
7. Where possible, utilize permeable pavement and/or a high-albedo (high reflective) materials.

Images above illustrate acceptable examples of the Parking Lot (Surface) common features form.

B. Parking Structure

Parking structures provide a higher number of parking stalls within a smaller land footprint. They support the densification of land uses and major transit facilities

Design Requirements

1. Incorporate passive safety design features in parking structures such as glass for pedestrian stairways and adequate interior lighting to create a secure facility.
2. Encourage retail at the ground floor of parking structures to activate the street edge and intersections. If retail is not feasible, locate stairwells and elevators of parking structures at building corners visible from the street to increase transparency between the structure and the public realm.
3. Design façades of parking structures to reduce adverse effects on the pedestrian environment where alternative ground-floor uses are not possible, with green-screens, landscaping, public art, lighting, and semi-opaque windows. Mitigate any required blank walls with plantings, murals, architectural articulation, faux façades, etc.
4. Reduce the bulk of large parking structures by breaking up façades with articulated fronts, varying rooflines, architectural details, and upper-story stepbacks.




Images above illustrate acceptable examples of the Parking Structure common features form.

C. Bicycle Parking

Design Requirements

1. Bicycle racks and/or lockers shall be located at key commercial and mixed use locations and transit nodes within 50 feet from the primary building entrance.
2. Ensure that bicycle racks are placed in highly visible locations and consider ease of entry and exit when placing bike racks or other furnishings with the potential for pedestrian/bicycle conflict. See Zoning Code Section 23.58.100, Bicycle Parking Requirements, for minimum bike parking requirements.
3. Bicycle parking may be located within a building if access is readily available from an outdoor entrance.
4. Bicycle parking shall be integrated into the overall site plan and not installed as an afterthought. Racks and lockers should not be located within 50 feet of a trash enclosure.
5. Bike racks shall be of such design as to hold the bicycle frame (not just the wheel), accommodate a U-shape shackle lock, a wide range of cycle sizes, wheel sizes, and types, and be covered with a protective powder-coated paint material to avoid damaging the bicycle in a complementary color to the adjacent building.
6. Bicycle parking areas are encouraged to include a bench, water fountain, and/or other amenities.
7. Bicycle parking and bicycle racks shall be located to avoid conflicts with pedestrian movement and accessibility requirements.
8. Bicycle parking spaces are encouraged to be sheltered from precipitation. Sheltering may be achieved by, but is not limited to, roof extensions, overhangs, awnings, arcades, carports, roofed enclosures, lockers, or indoor bicycle rooms.

Images above illustrate acceptable examples of the Bicycle Parking common features form.

D. Signage

Design Requirements

1. Design all signage pursuant to the provisions of Chapter 23.62, Signs on Private Property, of the City's Municipal Code and the protocols contained in this section, including compliance with the Clear Visibility Triangle at corners and driveways.
2. Incorporate sign design into the development applications for buildings.
3. Integrate the method of sign attachment to a building into the overall design of the sign.
4. Signs that represent the type of business through design, color, form, or graphic combination and complement the architectural style and scale of the building are encouraged.
5. Locate building-mounted signs on wall areas or architectural features that are specifically designed for them. Appropriate architectural features include recessed wall areas, towers, turrets, or parapets.
6. High-quality hanging signage that is perpendicular to the building façade to target pedestrians is encouraged. Hanging signage can be wall-mounted with brackets or suspended from awnings above the sidewalk.
7. Wall-mounted façade signs that are individually lettered (e.g., channel letters, reverse channel letters, push-pin letters) are encouraged. Signs painted directly onto building walls are discouraged.
8. Signage may protrude up to 5 feet in depth into the public right-of-way along sidewalks.
9. Projecting signs shall be at least 9 feet above the sidewalk.

10. External spotlights for sign illumination are encouraged. Lighting shall be directed to minimize glare.
11. Create signs that are modestly scaled to fit the casual visual character of alleys and rear parking areas.
12. Minimize energy consumption of signs and their illumination systems through the use of energy-saving design techniques, equipment, and materials.

Images above illustrate acceptable examples of the Signage common features form.

E. Trash Enclosure

Design Requirements

1. Refuse containers shall be screened from public view and adjoining public streets and rights-of-way and residential zoned areas.
2. The method of screening shall be architecturally compatible with other on-site development in terms of colors, materials, and architectural style. Exceptions may be permitted for sites with unique characteristics (e.g., shallow lot depth, adjacency to single-family residential).
3. Trash enclosures shall comply with the City's Space Allocation and Enclosure Design Guidelines for Trash and Recycling.

Images above illustrate acceptable examples of the Trash Enclosure common features form.

F. Residential Accessory Structure

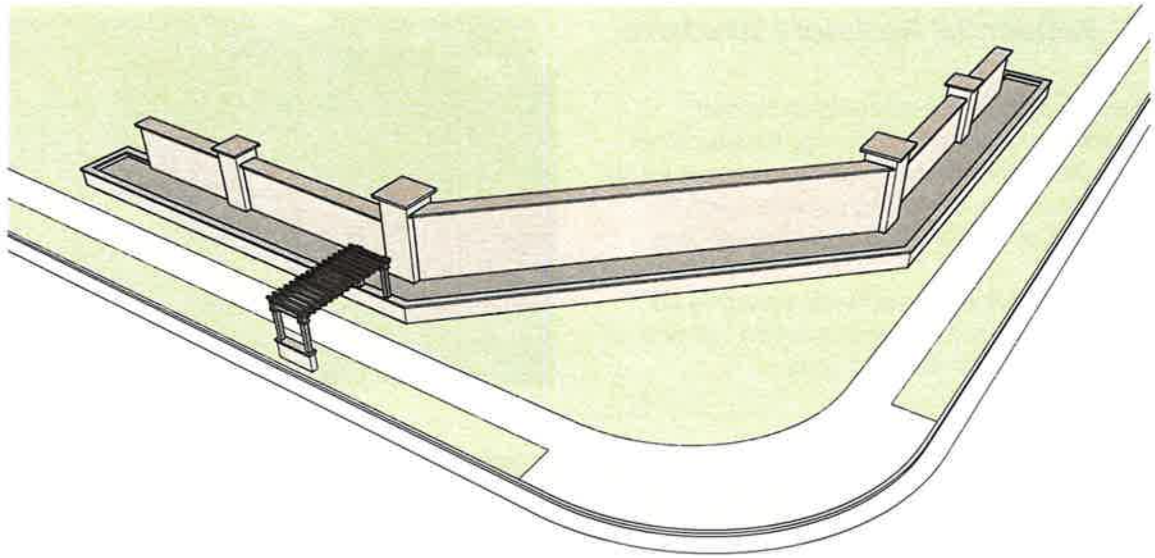
Residential accessory structures (other than detached garages, which are regulated as part of the building form and lot type standards previously defined) shall be developed consistent with the standards of Chapter 23.46 of the Zoning Code.

Except as provided herein, second dwelling units shall be developed consistent with the standards of Chapter 23.90 of the Zoning Code.

Images above illustrate acceptable examples of the Residential Accessory Structure common features form.

G. Entry Monument

Two types of entry monuments shall be required as provided below.



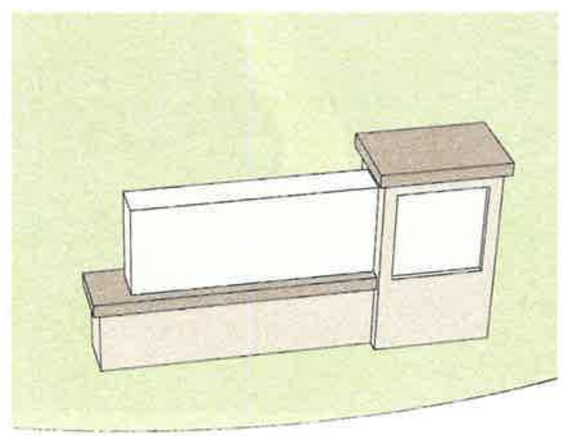
Major Entry Monuments

These monuments shall be provided at major entrances to the plan area, including:

- Intersections along Kammerer Road
- Southeast corner of Bruceville Road and Bilby Road
- Southeast corner of Big Horn Road and Poppy Ridge Road
- Southwest corner of Whitelock Parkway and Lotz Pakway

Design Requirements
As specified in the Landscape Planning Prototype Manual

Materials
As specified in the Landscape Planning Prototype Manual



Minor Entry Monuments

Minor entry monuments shall be provided at minor entrances into neighborhoods from arterials and collectors.

Design Requirements
As specified in the Landscape Planning Prototype Manual

Materials
As specified in the Landscape Planning Prototype Manual

Images above illustrate acceptable examples of the Entry Monument common features form.

H. Fences and Walls

Neighborhood Walls

Masonry walls shall be constructed along arterials and other major roadways as determined through noise analysis. Additionally, lots that back onto parks and schools shall be separated by a masonry wall or combination masonry wall/tubular steel.

Height 6 ft. max, or as required by noise study

Materials
As specified in the Landscape Planning Prototype Manual

Neighborhood Fence

This fence type consists of those used in neighborhoods for single-family homes. Fences in this area shall comply with the requirements of Chapter 23.52 of the Zoning Code.

Commercial Fences/Walls

Fences between commercial, office, or industrial uses and residential uses shall be provided. They shall consist of pre-cast concrete panels, textured and colored to resemble wood fences, to the satisfaction of the Planning Director.

Height 6 ft. max (additional height may be required if supported by a noise study)

Post and Cable Fence

This fence type shall be used to separate trails from non-trail areas.

Post Height	2.5 ft.
Post Size	6 in. x 6 in.
Separation Between Posts	10 ft.

Post and Rail Fence

This fence type shall be used to separate trails and other areas from drainage features and canals. Material shall be pre-cast concrete.

Post Height	3–4 ft.
Post Size	5 in. x 5 in.
Rails	2–3, equally spaced
Separation Between Posts	5 ft.

Images above illustrate acceptable examples of the Fences and Walls common features forms.

I. Streetscape Material

Streetscape elements include sidewalk furniture (e.g., benches, bike racks, trash receptacles, and pedestrian-scaled lighting) that enhance the pedestrian experience along a sidewalk. These elements also include landscaping such as street trees to introduce a buffer between the sidewalk and the street and provide shade. A detailed description of the design quality and standards of the streetscape elements can be found in the Public Realm Protocol section of Chapter 5.

Streetscape Standards

Sidewalk Amenities
Provide the following amenities along the sidewalk of key corridors throughout the plan area. Quantity and location shall be as approved by the City through the development entitlement process or subsequent improvement plans.

1. Streetlight
2. Pedestrian Light
3. Sidewalk Bench
4. Trash and Recycling Receptacles
5. Bike Racks
6. Newspaper Stands
7. Informational Kiosk

Landscape Elements

1. Large Canopy Street Tree
2. Accent Tree
3. Potted Plants

Images above and right illustrate acceptable examples of the Streetscape Furniture common features forms.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CHAPTER 5

DESIGN PROTOCOL

SOUTHEAST POLICY AREA

SPECIAL PLANNING AREA

CHAPTER 5
DESIGN PROTOCOL

CHAPTER OVERVIEW

This chapter establishes design requirements and guidelines (referred to collectively as design protocols) for development in the The Southeast Policy Area. These design protocols take the place of the Citywide Design Guidelines, rather than supplement them.

These design protocols are organized as follows:

- **Area-wide Design Protocol:** These provisions apply universally to all development and are organized into subsections as follows:
  A. Community Design
  B. Site Layout and Building Orientation
  C. Alleys and Service Access
  D. Walls/Fencing/Screening
  E. Drainage Channel Corridor Interface

   F. Sustainable Site and Building Design Elements
   G. Stormwater Management and Water Efficiency

- **Private Realm Design Protocol:** These provisions apply specifically to private development in the plan area and are organized as follows:
   A. Employment Hub/Core Provisions
   B. Village Center Provisions
   C. Single-Family Residential Provisions
   D. Multi-Family Residential Provisions

- **Public Realm Design Protocol:** These provisions apply to areas that are in the public domain, such as streets and sidewalks, and are organized as follows:
   A. Street Design
   B. Crosswalks and Bulb outs
   C. Sidewalk and Street Furnishings
   D. Street and Pedestrian Lighting
   E. Street Trees and Landscaping
   F. Public Signage and Gateway Features

There are two categories or types of design protocols used in this chapter. Mandatory protocols are identified with words like "shall," "must," "design," and "ensure." Flexible provisions are identified with words like "should," "may," or "encouraged to," and shall be subject to City review as part of development review.

In support of these design protocols and the other requirements of this SPA, the Planning Director is directed to prepare, implement, and maintain the following supplemental documents. New development shall comply with these provisions.

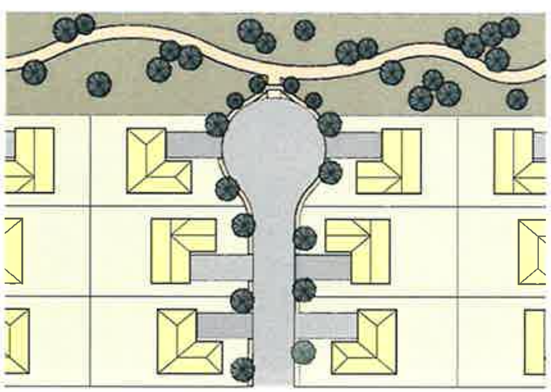
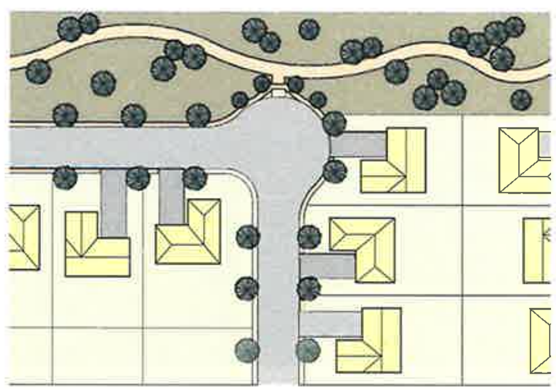
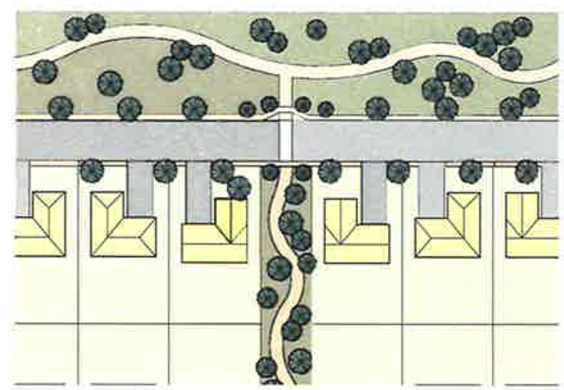
- **Architectural Style Manual:** An architectural style manual documenting appropriate architectural pallets in the plan area, including minimum requirements for each style.
- **Landscape Planning Prototypes:** Schematic plans that provide prototypical designs for public areas, including, but not limited to, street landscaping, greenway landscaping, and entry monuments, as well as a plant pallet for the area.

1. AREA-WIDE DESIGN PROTOCOL

A. Community Design

The layout of and circulation network for new development shall be based upon the following principles (referred to collectively as a "modified grid"):

1. Arterial and collector streets shall be aligned at right angles (or near right angles), extending from the overall grid pattern of the City as illustrated on the Street Layout Map in Chapter 4.
2. Local streets interconnect with the arterial/collector system and other local streets. The layout of streets may include a mixture of grid, cul-de-sacs, or curvilinear alignments as long as the pattern is logical and comprehensible, minimizing circuitous routes.
3. Overlap the roadway network with both on- and off-street pedestrian and bicycle routes (e.g., greenways) that link employment areas, retail and service areas, neighborhoods, and parks together.
4. The use of cul-de-sacs should be limited, with their application generally constrained to addressing unique layout circumstances. Where used, and to the extent feasible, cul-de-sacs shall provide pedestrian connections to neighboring developments or the greenway system.
5. Provide connections or linkages to the greenway system wherever possible. This includes:
   a. Placing streets parallel to greenways (e.g., loop streets) and connecting the sidewalk to the greenway at intersections and street elbows. In this example, buildings "front" onto the greenway, rather than "back" onto the greenway.
   b. Providing pedestrian linkages from the bulbs of cul-de-sacs to adjoining greenways.
6. Ensure that the circulation network provides safe spaces for pedestrian and bicycle users.

Example cul-de-sac and trail connections

B. Site Layout and Building Orientation

1. Orient buildings so that primary façades and key pedestrian entries face major streets. Buildings should define, connect, and activate sidewalks and public spaces.
2. Design building entries so that they are visible from the street, so that each building has an entrance along the front of the building facing the sidewalk where the majority of the public will be entering.
3. Accentuate corner buildings through height, articulation, and unique roof silhouettes to emphasize their presence. Encourage end and corner units to be visual anchors by orienting primary façades toward major streets.
4. Locate semi-private open spaces, such as common courtyards, to face major streets, activating the corridor and providing "eyes on the street."

Primary façade and entries face street

Corner building accentuated with tower

C. Alleys and Service Access

1. Encourage shared alleys and service access for multiple properties to minimize curb cuts and space used for service and provide better flow and safety for pedestrian, bicycle, and automobile traffic.
2. Design private alleys to provide access for service and parking.
3. Incorporate loading areas within the building, where possible, to minimize adverse traffic impacts and street activities.
4. Ensure safety in alleys and service areas through adequate lighting.
5. Use special paving materials or patterns for alleys to indicate a shared-use zone that serves as both auto access and pedestrian connections.
6. Include tree plantings and landscaped buffers along alleys to screen and mitigate the impact of multi-story buildings.
7. Install traffic-calming devices, where necessary, in alleys and service areas to reduce vehicular travel speed.
8. Provide transparent windows and balconies looking over alleys and service areas to provide visual connections from the building to the street to enhance visibility and safety.
9. Screen loading and waste storage areas from adjacent uses with vegetation, landscaping, and well-designed screening structures. The design of screening structures should complement the architectural design/character of the corresponding development and be designed from a solid material.
10. Locate garbage service as far away as possible from pedestrian pathways and public gathering places. Views of, and offensive odors associated with, these services should be minimized.

Residential alley and service area

D. Walls/Fencing/Screening

1. Construct fences and walls of durable materials. Preferred materials for walls are brick, concrete, masonry units, pour-in-place concrete, tile, or stucco. Preferred materials for fencing are steel mesh, tubular steel/wrought iron, pre-cast concrete, and treated wood.
2. Discourage fencing and/or walls from blocking public views to open space and other public use areas. Encourage open fencing with views to adjacent open space and other public areas.
3. Maintain and trim landscaping to maximize visibility.
4. Encourage landscaping or low, well-designed fences for residential uses that can be used to delineate between the public and private realms.

Tubular steel fencing

E. Drainage Channel Corridor Interface

1. Orient buildings where practical to positively define the drainage channel, public street, and open space network, with articulated façades aligned parallel to adjoining street and drainage channel frontages.
2. Development along the drainage channel shall incorporate materials that are complementary or similar to those along the channel.
3. Step down building heights as they approach the drainage channel, or integrate stepbacks into drainage channel-fronting development to create a human scale, to prevent "walling in" the drainage channel, and to protect solar access.
4. Create a consistent, urban-style street frontage in the commercial core or Village Center by providing the maximum amount of building face along the drainage channel build-to line.
5. Define the boundaries of open space in the more dense urban portions of the drainage channel corridor with buildings rather than parking areas.
6. Encourage mid-block breaks between buildings along the drainage channel (e.g., along a drainage channel promenade). These breaks should be occupied by pedestrian-oriented spaces such as plazas, paseos, or courtyards.
7. Encourage buildings and/or shops to provide direct pedestrian access to paths along the drainage channel where applicable.
8. Orient service areas so that they are not along the drainage channel.
9. Ensure uninterrupted waterfront access that is inviting and clearly open to the public.
10. Include a wide variety of design elements and amenities to activate development along the drainage channel such as outdoor dining and a variety of other types of seating and access to water and play areas.
11. Use energy dissipaters to drain water in order to reduce erosion.

Building oriented to drainage channel

Seating along the drainage channel

Boundaries of drainage channel in urban areas defined by buildings

Incorporate shade trees

F. Sustainable Site and Building Design Elements

1. Configure building where appropriate, to create internal courtyards to trap warm air in cool weather months and increase natural ventilation to cool buildings in warm weather months, while still encouraging interaction with surrounding streets and open spaces.
2. Encourage buildings to be oriented southward to receive optimal natural light and maximize passive solar heating during cool seasons.
3. Articulate building façades to increase surface areas for windows and opportunities for natural lighting. Incorporate light shelves, where possible, to draw light into buildings.
4. Encourage the use of adjustable exterior shades and shade screens on east-, west- and south-facing windows as flexible methods for blocking glare and reducing solar heat gain during hot periods.
5. Provide operable windows wherever possible to allow passive ventilation, heating, and cooling.
6. Incorporate shade trees and vegetated roofs and walls, where possible, to maintain and help regulate internal temperatures.

Awnings to block glare

Draw natural light into buildings

7. Consider cool and/or green roofs to reduce the heat island effect and thereby reduce the heat transferred into the building below. Cool roofs consist of materials that effectively reflect the sun's energy. Alternatively, green roofs achieve the same purpose and include vegetation to harvest rainwater for reuse and diminish runoff.
8. Building materials should be selected based on the following characteristics:
   - Durability
   - Reparability
   - Low toxicity
   - Recycled content
   - Rapidly renewable
   - Locally sourced
   - Ability to be recycled or reused
   - Ease of maintenance
9. Orient buildings to provide opportunities for photovoltaic or other alternative on-site energy generation. Also consider the use of solar panels as shade structures in plazas, in parking lots, and on roof-decks of parking structures.

Integrated solar roof panels

Recycled content tiles

Landscaped stormwater planters

G. Stormwater Management and Water Efficiency

1. Require Low Impact Development (LID) or sustainable stormwater management techniques to infiltrate, store, detain, evapotranspire, and/or biotreat stormwater runoff close to its source.
2. Encourage that landscaping be irrigated through a drip system and, where appropriate and available, using recycled water when possible.
3. Where feasible, minimize impervious surfaces such as concrete, asphalt, and other hardscaping. Utilize permeable joint or modular pavers, porous concrete and asphalt, reinforced grass pavement (turfcrete or grasscrete), cobblestone block pavement, and other similar materials that allow water to infiltrate.
4. Encourage the use of permeable pavers around tree wells instead of impervious materials to increase infiltration of stormwater runoff.
5. Where feasible, use permeable paving materials or porous asphalt along parking lanes and surface parking areas.
6. Use shared curb cuts, driveways and alleyways to reduce impervious surfaces.
7. Ensure adequate tree canopies in the front setbacks of private development and in parking lots, greenways, parks, and plazas to slow and reduce the amount of rainfall that falls to the ground.
8. Reduce stormwater runoff by implementing features that promote groundwater infiltration (e.g., bioswales) and reuse of stormwater (e.g., rainwater harvesting with cisterns and rain barrels to capture water from the building for reuse) for non-potable uses to the extent feasible. Landscaping in bioswales can also help in reducing pollutants.
9. Install naturally drained, landscaped stormwater planters (contained vegetated area that collects and treats stormwater by directing it into the planter strips to irrigate landscaping while filtering and reducing runoff) where possible, including along sidewalks and in medians, bulbouts, parks and plazas, and traffic circles. Stormwater planters also provide opportunities for educational and interpretive signage.

2. PRIVATE REALM DESIGN PROTOCOL

A. Employment Hub/Core Provisions

1. Site Design

a. Provide pedestrian amenities that increase safety and comfort. Opportunities include, but are not limited to, the following:
   - Provide a direct connection between the public sidewalk and the front entrance to all site buildings.
   - Illuminate walkways leading to parking areas.
   - Identify pedestrian routes with grade-separated pathways, use of special pavers, scored surfaces, planter strips, and/or bollards.
   - Provide additional sidewalk width at building entries.
   - Provide weather protection over sidewalks (awnings, building overhangs, freestanding shelters, canopy trees over walkways, etc.).
   - Integrate transit stops into the development and provide direct access from the transit stop to the primary building entrance.

b. Large office developments should feature plazas, central greens, and/or gardens which link office buildings together and provide a place for workers to gather. Public spaces shall be meaningful places that contribute to the overall sense of place and site identity.

c. Office buildings should help define and enhance street corners and street edges with building placement, entrances, public plazas, or small parks that tie the building to the public street. Special attention should be paid to the design of project and building corners as an opportunity to create visual interest and provide easy access to adjacent properties for the pedestrian.

d. Place office buildings to accommodate the pedestrian user, relate to the public street, and provide connection to adjacent properties by:
   - Orienting front doors of office buildings to public streets.
   - Using the area between the right-of-way and building to create a plaza court (e.g., forecourt), planter area, bicycle parking, or other amenity (storage and utilities prohibited).
   - Avoiding excessive setbacks that create gaps or voids along the street's architectural edge.
   - Providing frontages and entries detailed with architectural elements for improved wayfinding.

Pedestrian pathway

Central green

Building defines street edge and street corner

2. Building Form

a. Design all sides of the building with consistent architectural and façade elements.

b. Break up the roofline silhouette through the use of large cornices, changes in parapet heights or other techniques.

c. Use relief, windows, structural articulation, building offset, and other techniques to add distinction to the façade of the structure.

d. Design entries to be clearly visible from the street and provide visual interest, as follows:

- Main building entries shall be accented with strong architectural definition to attract pedestrian.
- Secondary entrances should have minor detailing that adds architectural distinction to that portion of the façade. Space entries in larger buildings at appropriate intervals for the pedestrian.
- Accentuated entries from the overall building façade by differentiated roof, awning or portico, trim details, recessed entries, doors and doorway with design details, decorative lighting, or other techniques.

Façade articulation

Variation in roofline silhouette

Consistent façade elements on multiple sides of building

Entrance enhanced with decorative awning

Main street concept with on-street parking

Mixed-use building with upper-story stepbacks

Special architectural treatment at corner lot

B. Village Center Provisions

1. Site Design

a. Development should be based on the street grid "Main Street" concept that allows on-street parking in front of buildings, provides meaningful pedestrian areas in front of store fronts and businesses, and provides parking consolidated behind, under, or within the building.

2. Building Form, Mass, and Scale

a. Taller buildings (e.g., three stories) should be located in the mixed-use Village Center. This approach will help to create an identifiable image and sense of place for the center and accommodate a vertical mix of uses.

b. Respect the scale and privacy of adjacent lower-scale properties bordering the Village Center by varying the massing within the center, stepping back upper stories, and varying sizes of elements to transition to smaller-scale buildings. Stepping back upper stories will also minimize shadows cast on public amenities such as sidewalks, parks, and greenways, and lessens privacy concerns with adjoining lots/neighbors.

C. Encourage upper-story stepbacks fronting major streets to encourage active uses, such as balconies or roof gardens, which provide additional open spaces for residents and add more "eyes on the street."

d. Create a clear delineation of the private realm, for residential units on the street level, with well-designed elements such as low and/or open (allow transparency) fences that distinguish private open spaces while preserving "eyes on the street." Encourage the use of open fences, railings, and/or windscreens to define the semi-private space.

e. Encourage development on highly visible corner parcels to experiment with special architectural features such as gables, turrets, towers, loggias, rounded or cut corners, grand corner entrances, corner roof features, special shop windows, and special base designs.

Fountain accentuates open space and arch frames entrance to paseo

f. Use open spaces, walkways, and alleys to break up building mass, provide access through developments, and create visual breaks.

g. Incorporate distinct open space(s) into larger mixed-use developments that are accessible to the public. Appropriate spaces include courtyards, paseos, and plazas. These spaces should be accompanied by special building forms (e.g., towers) and site improvements (e.g., fountains or sculptures) to help organize and accent spaces by framing entrances, terminating views, and highlighting central focal points.


Open space provides access through developments

3. Building Build-to Lines and Setbacks

a. Utilize building setbacks and arcaded or galleried spaces for ground-floor retail uses for spillover activity and adequate space for pedestrian movement. This space can be used for outdoor seating, street furniture, landscaping, and public art that can enliven the streetscape. Use special paving patterns, short well-designed fences, railings, and/or windscreens to define the semi-private space.

b. Build commercial and mixed-use development at the front edge of the property line unless outdoor dining or a recessed entry is proposed.

c. Respect rear yard setback requirements for any development abutting residential parcels.

Outdoor seating and planters within setback

Arcaded space with outdoor dining located in setback

Outdoor dining within front setback


All building sides have glazing, projections and recessed elements


Awnings and varied materials add visual interest

4. Building Façade Articulation

a. Incorporate architectural elements on all façades to prevent blank walls. Break up the mass of large-scale buildings with articulation in form, design details, changes in materials and colors, and other similar elements. Though the highest level of articulation will occur on front façades, all exposed sides of a building should be designed to:
   - Ensure all sides include glazing, awnings, projecting and recessed elements, or other details to add visual interest.
   - Use a combination of windows, entrances, murals, lighting, or other visually appealing façade treatments to break up the façade. Blank walls along street-fronting façades are prohibited.
   - Incorporate architectural elements and details such as adding notches, grouping windows, adding arcades/galleries or dormers, or varying cornices and rooflines.
   - Vary materials and colors to enhance key components of a building's façade (e.g. window trims, entries, projecting elements). Material changes should occur preferably at the inside corners of changing wall planes.

b. Design balconies with open railings on upper-floor residential uses to enhance natural lighting and maximize "eyes on the street."


Articulation and variation in color along the façade


Varied rooflines and balconies with open railings


Glazing, lighting and awnings enhance facade

c. Utilize architectural elements such as cornices, lintels, sills, balconies, awnings, porches, and stoops to enhance building façades. Frame south- or southwest-facing windows with protruding vertical or horizontal shading devices such as lintels, sills, and awnings to provide adequate protection from glare.
d. Ground-floor commercial uses are required to have transparent glass windows fronting onto sidewalks to connect with the pedestrian environment and provide pedestrians with views into the interior of the storefront.
e. Clearly define entrances to second-story residential uses in mixed-use buildings, so that they are easily approachable from a public street or sidewalk.
f. Select building materials with the objectives of quality and durability as well as to produce a positive effect on the pedestrian environment through scale, color, and texture.
g. Incorporate materials such as architectural metals, cast-in-place concrete, brick, concrete masonry units, tile, glass, and glass block systems, among others, into building design.
h. Ensure that durable and highly resistant building base materials are selected, such as precast concrete, brick, stone masonry, and commercial grade ceramic, to withstand pedestrian traffic.
i. Consider color and texture when selecting material for exterior walls. If the building's exterior design is complicated with many articulation, columns, and design features, the wall texture should be simple and subdued. If the building design is relatively simple, a finely textured material, such as patterned masonry, should be used to enrich the building's overall character.
j. Design ground-floor building façades (especially those associated with a storefront) with clear or lightly tinted glass. Opaque, reflective, or dark-tinted glass is not permitted.


Transparent glass with views into the building


Consider color and texture when selecting materials


Use durable building base materials

Use of stone tile building materials

5. Roof Forms

a. Break up long horizontal rooflines on buildings with flat or low-pitched roofs by incorporating architectural elements such as parapets and varying cornices and rooflines. Rooflines should be broken at intervals no greater than 50 feet long by changes in height or roof form.

b. Deep roof overhangs are encouraged to create shadows and add depth to façades.

c. Screen all roof-mounted equipment through architectural detailing including decorative parapets, cornices, or similar structural feature(s), that are an integral part of the building's architectural design.

Cornices and varied rooflines add interest

Broken rooflines

Varying cornices and rooflines

6. Canopies/Awnings

a. Awnings, overhangs, and arcades are encouraged where pedestrians are expected to walk and shop to provide overhead protection and to create significant entrances.
b. Awnings are encouraged as a way to provide a distinctive identity and visual interest along the street level.
c. Design awnings to relate to the window or door opening in shape and scale. Barrel-shaped awnings are only to be used to complement arched windows, while square awnings should be used on rectangular windows.
d. Design façades into distinct structural bays (sections defined by vertical architectural elements such as masonry piers). Awnings should be placed within the vertical elements rather than overlapping them. The awning design should respond to the scale, proportion, and rhythm created by these structural bay elements and nestle into the space created by the structural bay.
e. Project awnings over doors and windows and not over blank walls.
f. Mount awnings so as to respect the architecture and character of a building and its function.
g. Fasten awnings above the display windows and below the storefront cornice or sign panel.
h. Encourage awning mountings that prevent or limit the casting of excess shadow.
i. Incorporate canvas, fire-resistant acrylic, glass, and metal materials for awnings. Vinyl, plastic, plasticized fabric, and fiberglass awnings are strongly discouraged.
j. Ensure regular maintenance and periodic replacement of canvas awnings as they are prone to fading and deteriorating over time.
k. Consider awnings with a single color or two-color stripes. Lettering, trim, and use of other colors is allowed, but will be considered as sign area.

Awnings over entrances and windows

Single color awning with sign

Canvas material awning projecting over sidewalk

Variation in color schemes

Living rooms front the street

Variation in floor plans

C. Single-Family Residential (Estate, Low Density, and Medium Density Residential) Provisions

1. General Home Design

a. Master home plans for each subdivision shall include a minimum number of floor plans and elevations based on the number of units within the subdivision, as described in the table below, to provide variation. The requirements below include the City's standard approach, as well as an alternative minimum that may be selected by builders. The Planning Director shall make provisions for use of master home plans within multiple subdivisions.

Master Home Plan Requirements

Units	Standard Minimum		Alternative Minimum	
	Minimum Number of Required Floor Plans	Minimum Number of Required Elevations or Architectural Styles per Floor Plan	Minimum Number of Required Floor Plans	Minimum Number of Required Elevations or Architectural Styles per Floor Plan
<100	3	3	4	2
100 to 150	4	3	5	2
151 to 200	4	3	6	2
>200	4	4	7	2

Note: Under the alternative minimum, a single plan/elevation may not be used on more than 20 percent of the applicable lots. The intent is to achieve product diversity within the subdivision. This requirement does not apply to the standard minimum.

b. The City encourages color variety among homes within a neighborhood. To that end, each architectural style within a master home plan series shall include at least three color schemes. The intent is to have distinct color palettes for elevation types with similar architectural styles among floor plans in the master home plan series.

c. Development should provide one living/family/community living room at the front of each home facing onto the street.

d. Each home plan within the master home plan series should have a distinct footprint in terms of the placement and relationship of the garage, interior living space, and any designated outdoor living space or entry feature. The intent is to create structural and spatial variety along residential streetscapes by creating distinct configurations of garages and livable spaces between homes along the street.

e. Each home within a master home plan series shall be designed to ensure substantial variety. Compliance with the design provisions below reduces the possibility of streetscape monotony and "sameness."

- Design rooflines with changes in ridgeline direction and configuration to ensure variation in rooflines between structures. Each floor plan within the master home plan series shall include a different roofline.
- All homes should be oriented to the street by utilizing floor plans that de-emphasize garage fronts and encourage living room forward home designs.
- The majority of homes in a master home plan series shall have designated outdoor living areas (e..g, porch, forward patio).

Variation in garage placement

Variation in roofline configuration

Garage set back behind living room

Varied floor plans

Buildings fronting an internal paseo

Main entrances oriented to public street

2. Home Siting and Layout

a. All approved floor plans and elevations shall be utilized throughout the subdivision.

b. No two identical floor plans and elevations shall be placed on lots within a group of five adjacent lots. For purposes of this section, "adjacent lots" shall mean those lots on either side of a subject lot and those three lots directly across the street from the subject lot (referred to as a "six pack").

c. The front yard setback of adjacent homes shall have a minimum 2-foot stagger between adjacent lots.

d. Homes along greenways shall be sited to promote the idea of "eyes on activities." This can be achieved by:
- Facing homes directly onto or backing onto the greenway.
- Fencing side yards that abut walkways with simple wrought iron or tubular steel fencing.
- Creating "T" intersections at trailheads where a dwelling unit looks directly at the entrance to the trail.

e. Orient the main entrance to the public street in order to promote an active street.

3. Architectural Design

a. Each home shall exhibit a clear and consistent architectural style. A wide array of architectural styles are allowed within the The Southeast Policy Area area – see the Architectural Style Guide for more details.
- Architectural styles utilized within a subdivision shall provide a variety of roof designs along the street-scene, including height variation.
- Color schemes shall be historically appropriate to the selected architectural style.
- Window trim and grids (e.g., muntins) shall be style specific.

b. Architectural treatments (e.g., eave trim, window grids, window trim) and paint schemes shall be reflective of the selected style and shall be provided on all elevations, achieving 360° articulation, or four-sided architecture. The following minimum requirements shall be observed:
- Wrap façade materials (e.g., siding, stone) a minimum of 4 feet or to the fencing, whichever is greater, on side elevations.
- Except as otherwise provided in this section, the treatment between front and rear elevations need not be the exact same, but is encouraged. Incorporate character elements of the architectural style around the building. Examples include, but are not limited to, the following.

- Accent siding
- Exposed rafter trails and beams
- Window recesses, shutters, and detailing
- Decorative hood and brackets over entries
- Dormers

- The same level of details and character elements of the front elevation shall continue around the corner onto street side elevations. They shall also be provided on other elevations, including rear, that face arterials, collectors, and primary residential streets; greenways, parks, and other similar public spaces; or areas that are not obscured by privacy fencing.
- Window trim and grids shall not vary from front to side to rear. The same style and level of detail shall be expressed on all sides.
- Colors shall wrap around details and not stop at corners of wood, stucco, or composite materials.

c. Design of individual homes should provide interest and balance of bulk and mass. Design techniques include:
   - Use of horizontal elements (e.g., offsets, bays, balconies, overhangs, recesses) to soften vertical ones in an elevation.
   - Minimize use of tall or two-story-high design elements with no architectural relief.
   - Keep second-floor exterior wall heights as low as possible.
   - Use roof forms that reduce bulk (e.g., minimum number of hips and valleys).
   - Avoid massive, tall chimneys (locate them either on an internal wall or centered on a gable end when possible).
   - Step-back or recess portions of the second floor.

d. Ensure that openings in the façade contribute to the overall design of the building and promote a relationship to the human scale, such as through the following methods:
   - Use window molding, shaped frames and sills, and other techniques to enhance openings with additional architectural relief;
   - Frame all windows with a minimum of 4-inch trim and inset into façade to provide depth and shadow lines.

Architectural elements on all facades fronting public street

Enhanced window openings

Architectural details on all sides of building


Garage set back behind living area


Garage with architectural details – windows


Alternative location of garage located behind primary building

e. Roof form shall be consistent in character and scale to the selected architectural style. To that end:
   - Roof pitches and materials shall be consistent with the specific architectural style used.
   - Two-story homes shall include a minimum of two, fundamentally different, types of roof framing (e.g. front-to-back ridge, side-to-side ridge, or hip). Slight variations or build-outs will not be sufficient.
   - Consider breaks in rear eave lines to prevent uninterrupted second level eaves that run along several homes. These breaks may take the form of plan setbacks of stacked areas, second level setbacks from first level, overhanging bays, or gable breaks through the eave.

4. Garage Design

a. Within a master home plan series that utilizes front-loaded garages (rather than alley-load), there shall be a variety of garage placements to avoid dominating the streetscape with garage doors. To achieve this, the following standards shall apply:
   - Only one in three of the master home plans are permitted to have a garage door that extends beyond the primary living area of the home.
   - For all garages, one or more of the following techniques shall be used to minimize the visual impact of the garage door:
     - For corner lots, encourage access to the garage from the side street.
     - Recess the garage behind the living area of the home or behind the designated outdoor living area of the home (e.g., porch or patio). The City encourages a minimum recess of 3 feet.
     - Cantilever the second story (or project a portion thereof) out over the garage.
     - Utilize a tandem garage so that the appearance from the street is that of a single-car garage.
     - Articulate garage doors with windows, paneling, or other high quality detailing.
     - Recess the garage door frame a minimum of 1 foot from the building face and paint the door a contrasting color.
     - For swing garages, the street facing elevation shall include windows.
     - No more than one home in a master home plan series may have a side-on garage.

b. The appearance of three or more garage spaces facing the street should be avoided or minimized. To that end, all homes with three or more car garages shall be designed using one of the following techniques:
   - Shift the orientation of the garage so that one or more of the garage doors do not face the street (e.g., side-on garage that is not perpendicular to the street). The front yard setback requirement for side-on garages may be reduced by a maximum of 5 feet from the property line as part of master home plan design review. The street-facing elevation shall include windows. When a side-on garage is developed in conjunction with a garage facing the street, the design shall include an announcement of entry to the livable portion of the home. Entry treatments may include a trellis, arbor, gate, landscape, and/or enhanced pavement.
   - Place active living areas at the front of the house with windows on the street limiting the garage projections.
   - Create tandem parking spaces so that a maximum two-car garage faces the street.
   - Design a single garage door that is offset or separated from the face of the two-car garage.
   - Use other creative design alternatives that serve the functional equivalent of minimizing the appearance of three garage doors facing the street.

Garage recessed behind livable portion of the building

c. Garage door width facing the street shall not exceed 50 percent of the width of the home. Subdivisions with lot widths less than 50 feet may increase this proportion to a maximum of 60 percent.

Garage width less than 50% of building width

Proportions and alignment appropriate to the style

Shutters sized to match window width

Exterior lighting along pedestrian pathway

5. Technical Requirements

a. *Doors*

- Entry doors shall be of wood, composite fiberglass, MDF or metal.
- Design of doors shall be consistent with the architectural style.
- Entry and garage doors expressing a level of detail appropriate to the style of the dwelling are encouraged.
- Maximum garage door height shall be 8 feet.
- Garage doors are to be recessed a minimum of 12 inches.
- Garage door windows shall be consistent with the architectural style of the home.

b. *Windows*

- Proportions and alignment shall be appropriate to the style.
- No highly reflective glazing shall be used.
- Full window trim is encouraged on all elevations (front, rear, and sides).
- Shutters shall be sized to match window width and height and have appropriate hardware.
- Windows and window projecting detailing patterns are to be compatible in scale with the home.

c. *Exterior Lighting*

Emphasis will be placed on reducing ambient light within the plan area.

- Lighting used on walls and walkways shall focus light down and provide appropriate down-casting hardware to minimize glare.
- Surface-mounted lights shall not be permitted in garage soffits; lighting fixtures shall be appropriate to the selected architectural style.
- Ambient light shall be cast downward to reduce impact.
- Light design shall be included as part of the architectural review package.
- Exterior lighting is to be indirect and shielded to prevent spill-over onto adjacent homesites.
- All exterior lighting (including landscape and security lighting) will be reviewed and approved by the City.

d. Building/Site Equipment and Elements

i. Vents
- All vent stacks and pipes must be colored to match the adjacent roof or wall material.
- Vent stacks should be grouped on the roof where least seen from view.
- Vents should not extend above the ridge line.

ii. Solar
- Solar panels are to be integrated into the roof design.
- Natural aluminum frames are prohibited.
- Solar equipment is to be screened from the view of adjacent homesites and public streets to the greatest extent possible.

iii. Flashing and Sheet Metal
- All flashing and sheet metal must be colored to match adjacent material.

iv. Gas, Water, and Electric Meters
- Meters are to be located in enclosed cabinets, within recesses, or behind screen walls as part of the architecture and must conform with utility company standards.
- Utility meters must be located in side yards of the home and hidden from street view.
- Landscape screens are acceptable.
- Gas meters shall not be located behind locked fences, walls, or gates.
- All utilities must be located so as not to detract from the architecture and must be screened from view.
- Special attention is required for placement of utilities within multi-family housing, applying the same location and screening techniques applied to single-family detached homes.

v. Trash Containers
- Each homesite must have a walled trash container area, designed to be screened from view of all neighbors and the street.
- Not permitted to be located in the front yard setback.

vi. Mechanical Equipment
- Air conditioning, heating equipment, soft water tanks and pool equipment must be screened from view.
- Required to be insulated for sound attenuation.
- Air conditioning units shall not be mounted on roofs or in windows.


Apartments with townhome feel


Units face the public street


Play equipment and picnic tables

D. Multi-Family (High Density) Residential Provisions

1. Site Design and Layout

a. Multi-family projects should be integrated into the public street and sidewalk systems, reflecting a more community-oriented layout. Techniques to achieve this include, but are not limited to, the following:
  - Continue the local (public) street system through the multi-family development, in lieu of (private) drive aisles. Give apartment complexes more of a townhome feel.
  - Site buildings so that the front of individual units faces and accesses the public street.
  - Provide direct connections from individual and common entries to the public sidewalk system.

b. Utilize special paving, landscaping, walls, and other design elements to alert vehicles to pedestrian areas and add visual interest.

c. Incorporate common open space into the site plan as a primary design feature and not just as remnant pieces of land used as open space. Centrally locate and position the open space within view of the nearest units, allowing residents to watch over the area. Common open space associated with ownership units (i.e., townhomes) may be located in private yard areas.

d. Multi-family projects shall provide one or more amenities for residents as listed below. These amenities may be counted toward open space requirements:
  - Tot lot/play structure
  - Community garden
  - Picnic tables and BBQ area (with shade structure(s))
  - Swimming pool
  - Indoor recreation facility
  - Sports courts (e.g., tennis, basketball, volleyball)
  - Natural open space area with benches/viewing areas and/or trails
  - Other active or passive recreation area that meets the intent of this provision

e. Buffer residential units from the parking lot by:
   - Providing a landscaped screen with a minimum height of 3 feet (berm, hedge, wall, or other); and/or
   - Providing a minimum 10-foot-wide landscaped area between parking areas and residential units.

f. Use a combination of on-street and off-street parking for multi-family development. Parallel parking along local streets within a multi-family project is strongly encouraged.

g. Trash enclosures should be conveniently located for collections and maintenance and shall be enclosed with durable materials that are architecturally compatible with the design of the buildings. The enclosure area shall be paved, bermed, and graded in order to drain into the sanitary sewer system. Where trash enclosures are located adjacent to landscape planters, landscaping shall be incorporated around the trash enclosures to provide screening that is more effective.

Paved and landscaped trash enclosure

2. Architecture

a. Projects shall be designed with a consistent architectural theme or style, which may include a complementary family of styles. The style shall be reflected in building form, decorative features, materials, and colors.

b. The City requires color variety within multi-family projects. To that end, a minimum of two colors per elevation plus a trim and roof color shall be utilized. Color accents shall vary throughout the project and shall be complementary.

c. Buildings shall be designed with structural and spatial variety along the front façade and staggered roof planes. The intent is to avoid a monotonous or institutional appearance.

d. The structural massing of larger residential buildings shall be broken down into smaller component parts representative of individual dwelling units or homes using the techniques listed below. Exceptions may be granted for multi-family dwellings designed to look like large single-family detached homes. Design techniques to reduce mass include:
   - Articulation such as dormers, overhangs, balconies, wall projections, and porches.
   - Varied roof form as appropriate to the style of the house, such as hipped roofs, gabled roofs, varying roof pitches, and roof dormers.
   - Material changes to create variations.
   - Staggered and jogged unit plans.


Bollard lighting of pedestrian walkway

e. Upper-story units should have balconies or decks sufficient to accommodate two chairs and a small table.
f. Laundry areas are prohibited on balconies or patios.
g. End units shall have articulation such as windows and doors facing onto the sidewalks.
h. Exterior lighting shall be pedestrian in scale with a maximum height of 14 feet. The City encourages use of low-level bollard lighting for illumination of pedestrian walkways.
i. Where proposed, carports and garages shall be designed to complement the project architecture in terms of design, materials, and colors.
j. The design of multi-family buildings shall be varied along the public street in order to create visual interest. Street-oriented façades shall have porches, balconies, stoops, and/or other architectural detailing that encourage a visual relationship with the street on at least the majority of the street-facing units.
k. At a minimum, two different primary building materials shall be used on each building elevation (e.g., stone, wood, masonry, or metal). However, the City may grant exceptions for architectural styles with a single, predominant building material. The materials shall be complementary to the architectural design.
l. Materials selected for multi-family projects shall be durable and low maintenance.
m. Gutters and downspouts should be designed as a continuous architectural feature (e.g., integrated fascia gutter). Exposed downspouts shall be colored to match the surface to which they are attached or to complement such surface.
n. Minimize the visibility of rooftop mechanical equipment by grouping plumbing vents and ducts away from public view. Additionally, roof vents shall be colored to match the dominant color of the structure.


Multiple building materials used on primary façade

3. PUBLIC REALM DESIGN PROTOCOL

A. Street Design

1. Design pedestrian crossings for safety. This can be accomplished by constructing bulbouts to shorten the crossing distance and distinguishing the crossing area from the surrounding pavement. See the Crosswalks and Bulbouts section for specific provisions pertaining to pedestrian crossings.
2. Ensure safe and appealing pedestrian environments by providing a landscaped buffer and/or curbside parking between pedestrian zones and vehicle driving zones.
3. Develop well-designed traffic calming devices, consistent with City standards. These include, but are not limited to, traffic circles, elevated pedestrian crossings, speed tables, and landscaped chicanes. This will help pedestrian and automobile traffic to better coexist with one another and provide additional landscaping opportunity.
4. Create a well-defined pattern of walkable blocks and pedestrian-friendly streets that facilitate walking to and from the neighborhood main street and public parks.

Bulbout at pedestrian crossing

Landscaped buffer and curbside parking between pedestrian and vehicle zones

Traffic circle

Traffic circle


Clearly marked crosswalk


Ramp and warning strip

B. Crosswalks and Bulbouts

1. Design major intersections (e.g., controlled intersections or the intersection of key streets) with clearly marked crosswalks that measure at least 10 feet wide.
2. Employ ramps and warning strips in all crosswalks that comply with ADA standards.
3. Design heavily used pedestrian areas, such as urban plazas, paseos, and crosswalks, to incorporate special paving materials (e.g., decorative pavers), colors, and/or patterns to make pedestrian crossings appear more visible and to help foster a unique, desirable identity.
4. Use of bulbouts is strongly encouraged at intersections and where pedestrian crossings exist or are planned.
5. Bulbouts should maintain a cohesive appearance with the adjoining sidewalk by matching materials, colors, and patterns.
6. Design bulbouts to serve as additional public space and resemble "pocket plazas" to the extent determined to be appropriate by the City, complete with seating, trash receptacles, and bike racks, and/or contain landscaping, and/or contain landscaping.


Landscaped bulbout


Crosswalk with decorative paving

C. Sidewalk and Street Furnishings

1. Provide pedestrian-friendly streetscape amenities—including seating, trash receptacles, and public art—at key nodes along major corridors. Site furnishings so that the public right-of-way remains uncluttered and safe for pedestrian access maintaining a 4-foot-wide pedestrian zone at all times.
2. Design bicycle racks and sidewalk furnishings that are both functional and visually interesting. The sidewalk furnishings must have the following characteristics and are further specified in the Landscape Planning Prototype Manual:
   a. Bicycle rack: Powdercoat steel loop, "L" , or "π" shaped racks consistent with the Bike, Pedestrian, and Trails Master Plan
   b. Bench: Powdercoat steel with arms
   c. Waste receptacle: 32-gallon with powdercoat
   d. Recycle bin: 32-gallon with powdercoat
   e. Bollard: Removable, with powdercoat

Bollard

Bench

Waste and recycling bins

Site furnishings organized to maintain uncluttered pedestrian access

Bicycle Racks

3. Integrate café seating wherever appropriate and where sidewalks are wide enough to support these spaces (e.g., maintain compliance with ADA requirements). Seating areas should be located adjacent to the street or in spaces created by building setbacks.
4. Consider creating a cohesive series of public art pieces either by theme, artist, style, or materials, and install throughout the plan area in medians, bulbouts, pocket plazas, and wide sidewalk spaces.
5. Parklets are encouraged where sidewalks are too narrow to provide gathering spaces.

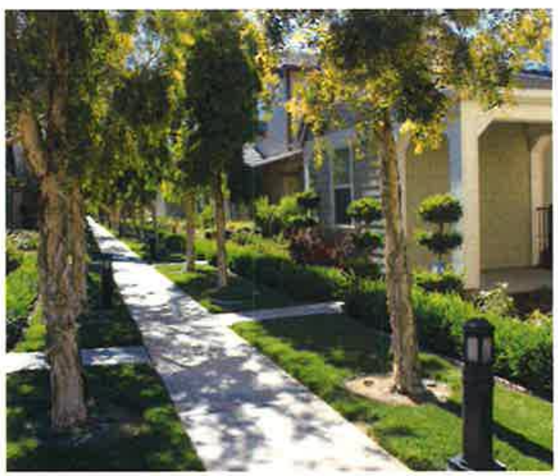
Café seating in setback and adjacent to the street

Public art

Parklet with outdoor seating

D. Street and Pedestrian Lighting

1. Pedestrian- and automobile-oriented street lighting must have the following characteristics:
   a. Design lighting sources to be Dark-Sky compliant and to shield, diffuse, and avoid glare to pedestrians and motorists.
   b. Light parking lots, pedestrian walkways, bicycle paths, plazas, and paseos adequately.
   c. High-efficiency light fixtures are required. Incorporate timers and sensors to prevent unnecessary lighting conditions.



Examples of pedestrian-oriented lighting

Drought-tolerant and native landscaping

E. Street Trees and Landscaping

1. Preserve existing trees if possible and protect in place. See the requirements of Chapter 19.12 of the Municipal Code.
2. Implement the street tree pallet provided in the Landscape Design Protocol Manual.
3. Place trees and landscaping in a manner that does not block access to and views of building entrances, signage, motorists, ADA access, or pedestrian or bicycle circulation.
4. Incorporate drought-tolerant and native landscaping and tree species suitable for the Elk Grove climate that require little irrigation and low maintenance. The Planning Director shall establish a planting list for the The Southeast Policy Area community.
5. Green the drainage channel with a variety of native riparian plant materials that provide aesthetic and ecological benefits, including trees, shrubs, and ground cover and ground cover in conformance with the Drainage Master Plan and Landscape Design Protocol Manual.
6. Use structural soil in place of standard aggregate base. Soil areas must measure 8 feet by 4 feet within a minimum depth of 4 feet.
7. Design street tree grates with a high aesthetic quality and that measure at least 3 feet wide.

Tree grate

8. Encourage the use of planters to provide a flexible, inexpensive method to increase landscaping along the streetscape. They are strongly encouraged along streets that lack and/or cannot accommodate street trees to delineate space. Planters and associated plant heights should not exceed 48 inches in height.
9. Maintain a 10-foot tall canopy clearance from the finished sidewalk elevation for all mature trees for emergency and service access, to allow light penetration, and to maintain visual connections.
10. Space trees approximately 25 feet on center.
11. Site street trees for ease of maintenance, to reduce sidewalk damage, and to provide a sufficiently large, wide canopy to shade the sidewalks.
12. Allow tree wells and planters to be used instead of planter strips in cases where parking or bicycle lanes are located next to sidewalks. Ensure that planters and tree wells are at least 4 feet wide to allow for healthy street trees.
13. Landscape planter strips with shade-providing trees and shrubs. For sidewalks, select tree species that do not obstruct pedestrian circulation.

Landscaped planter along streetscape

Archway identifies entryway

Bicycle wayfinding

Pedestrian informational kiosk

F. Public Signage and Gateway Features

1. Identify major entryways into the project area with special gateway treatments such as public art, architectural elements such as towers, archways, and signage, or enhanced landscaping to announce arrival into the project area.
2. Develop consistent thematically branded wayfinding and signage to maximize visual recognition and contribute to the character of the The Southeast Policy Area plan area.
3. Employ signage for vehicular, pedestrian, and bicyclist wayfinding to the Village Center, major bus stops, and key community amenities such as a light rail station, trails, or waterfront areas.
4. Scale and place directional signage to be visible from both the roadway and along sidewalks/ pedestrian areas. Ensure that letters and numbers are no less than 4 inches tall.5.
   Explore opportunities for educational and interpretive signage along the drainage channel corridor and other areas with important historic significance or unique design features.
5. Provide visually attractive, easy-to-read, and well-located signage to direct vehicles to parking areas.
6. Explore opportunities for artistic design of kiosks and other informational amenities.
7. Place route and wayfinding signage along bike routes and pathways to provide bicyclists with safe passage.
8. Place signs in compliance with the Clear Visibility Triangle at corners and driveways.

Pedestrian directional signage

Automobile and Pedestrian directional signage to landmarks and parking

CHAPTER 6

GLOSSARY

SOUTHEAST POLICY AREA

SPECIAL PLANNING AREA

CHAPTER 6 GLOSSARY

This chapter provides definitions for specialized terms and concepts used in this SPA. These definitions are in addition to those found in Chapter 23.100 of the Zoning Code, incorporated herein by this reference. In the event of a conflict between these definitions and those in the Zoning Code, these definitions shall govern.

Albedo: The measure of an object's reflectivity. Lighter-colored materials absorb less heat and therefore have a higher albedo ratio.

Alley/Drive Aisle: A street form that may be either a public alley or a private drive. As alleys, they provide vehicular and service access to the back of buildings. In non-residential and mixed use environments, they serve as private drive aisles connecting streets to parking fields.

Americans with Disabilities Act (ADA): The Americans with Disabilities Act of 1990, as amended, which establishes standards and requirements for public access for all persons.

Arcade: A frontage characterized by a façade where the first floor aligns directly with the street-facing property line (a zero-foot built-to line) and the floors above project out over, and fully absorb, the pedestrian space/sidewalk so that a pedestrian may not bypass it. This frontage is typically appropriate for ground-floor retail and restaurant use, with office and residential uses above. An encroachment agreement is needed to construct this frontage type.

Arterial: High-capacity roadway that provides connections to areas outside the plan area. These roads provide for high-speed movement and wide intersection spacing.

Arterial with Transit Corridor: Similar to the general arterial, except that it includes dedication for a future transit corridor, separate from the roadway, through the plan area.

Building Form: The type of structure and its corresponding lot configuration based on massing, layout, lot size, and use.

Bulbout: An extension of a roadway curb used to extend the sidewalk, thereby reducing the crossing distance and allowing pedestrians who are about to cross and approaching vehicle drivers to see each other when vehicles parked in a parking lane would otherwise block visibility.

Bus Stop: A designated location where a bus, from time to time, may stop to provide connections to the City's public transit services.

Canopy: A shelter that is supported from the exterior wall of a building and another form of external support, such as columns.

Chicane: A type of horizontal deflection, such as a bulbout, used in traffic calming to reduce the speed of traffic.

Collector, Commercial: A collector road that provides low to moderate capacity moving vehicles from employment areas to arterials and thoroughfares through commercial areas.

Collector, Residential: A collector road that provides low-to-moderate capacity moving vehicles from neighborhoods to arterials and thoroughfares through residential areas.

Colonnade: A series of joined columns used to create a covered walkway.

Commercial Main Street: A roadway type, found in the Village Center, that provides space for a variety of travel modes, including vehicular, bicycle, and pedestrian. Narrower streets allow for on-street parking, and wider sidewalks facilitate greater pedestrian activity.

Common Lawn: A frontage type characterized by deep front yard setbacks. The building façade is set back substantially from the front property line. The resulting front yard is unfenced and is visually continuous with adjacent yards, supporting a common landscape.

Curvilinear Street: A form of street layout, common in conventional subdivision design, where the street curves slightly from left to right, providing the illusion of varied setbacks.

Dark-Sky: The practice of limiting night-time lighting, or light pollution, to make stars more visible at night, reduce the effects of unnatural lighting on the environment, and cut down on energy usage.

Detached Cluster Housing: A single-family detached building form and lot type characterized by smaller lot sizes with clusters of dwellings accessed from "T" court alleys.

Detention Basin: An area dedicated to the detention of stormwater collected from surrounding development and stored prior to release into the main drainage channel.

Drive-Through: A building form and lot type characterized by retail development with uses or services accessible from a vehicle (e.g., restaurant, financial institution, pharmacy).

Duet Housing: A single-family building form and lot type characterized by two dwellings that adjoin along a common property line in compliance with building code requirements. Garages may be accessed from the street in front of the dwellings or from alleys behind the dwellings.

Executive Lot, Single-Family Residential: A single-family detached building form and lot type characterized by a large lot (one-quarter acre or larger).

Façade: The architecturally finished side of a building, typically facing onto a public right-of-way or street.

Fenestration: An opening in the wall of a structure, generally referring to windows. Other types of openings may be utilized, including doors, louvres, vents, wall panels, skylights, storefronts, curtain walls, and slope glazed systems.

Forecourt: A frontage type that is created by setting back a portion (usually the central portion) of a building façade to create a plaza. Forecourts commonly provide access to the lobby or a larger building and may be paired with other frontage types to provide access to the portions of the building located closer to the sidewalk. Forecourts may be landscaped or paved and provide vehicular access to the building entry.

Form-Based Code: A development code emphasizing the regulation of building form, scale, and orientation, rather than zoning and land use.

Frontage Form: The architectural composition of the front façade of a building and how it relates to the surrounding public realm.

Fueling Station: A building form and lot type characterized by retail development that provides opportunities for vehicle fueling.

Gallery-Deck: A frontage type that is aligned close to or directly on the front property line with the building entrance at the sidewalk and with an attached colonnade deck that projects over the public sidewalk and encroaches into the public right-of-way. The sidewalk must be fully absorbed within the colonnade so that a pedestrian may not bypass it. The upper stories of the building do not also project over the public sidewalk. This frontage is typically appropriate for retail use. An encroachment agreement is needed to construct this frontage type.

Garden Home: A single-family detached building form and lot type characterized by very small lot sizes and a garage accessed from an alley behind the dwelling. The front of the dwelling is accessed either from the public street or a common paseo. Dwellings are constructed independent of each other on their own foundations.

Garden-Style Condominiums/Apartments: A multi-family building form and lot type characterized by dwellings oriented around a common yard or garden. The site is designed to mimic the surrounding street pattern, appearing as an extension of the public street system. Dwellings are typically built over garages, with access from the internal street system.

Green Court Townhomes/Apartments: A single-family building form and lot type characterized by very small lot sizes and an attached garage (on the first floor of the dwelling) accessed from an alley behind the dwelling. The front of the dwelling is accessed from a common, wide paseo or green court. Each dwelling is on its own lot, but the dwellings share common walls and foundations consistent with building code requirements.

Greenway: An off-street circulation element or trail, which connects neighborhoods and provides off-street access to individual parks. It provides space for bicycling, walking/jogging, and other forms of recreation. It includes landscaping to buffer the trail from adjoining uses.

Industrial/Flex: A building form and lot type characterized by one or more stories of development dedicated to office and/or industrial use. The building(s) are oriented either to, or very proximate to, the public street. The front and sides of buildings are designed with abundant windows (referred to as fenestration) and pedestrian entrances; rears of buildings may feature roll-up doors and/or loading docks. Multiple buildings are arranged together to form pedestrian plazas and open space between the buildings with amenities for employees.

Joint Use Park/Detention Facility: A community facility that allows for the combination of parks and detention basins on a limited basis. The detention portion functions as a modified joint greenway/minor drainage channel that may spill into the park area after the adjoining detention basin has first been utilized.

Kammerer Road (street type): A specialty thoroughfare roadway type that applies to the portion of Kammerer Road within the plan area. This road is anticipated to be 6 lanes at buildout, but may be 4 lanes on an interim basis. Intersections are spaced no closer than every half mile.

Landscape Coverage: The required minimum amount of landscape area that shall be provided. Areas that count toward this requirement include, but are not limited to, parking lot landscaping (including island planters), frontage landscaping, and private open space/plazas.

Local Estate Residential Street: A street type that provides access into and through estate residential neighborhoods. It differs from other local street types in that sidewalks are only provided on one side and drainage is facilitated through roadside bioswales, rather than piped infrastructure.

Local Residential Street: A street type that provides access into and through neighborhoods.

Main Street (concept): The organization of buildings along a roadway, which includes on-street parking, to resemble and function like the historic retail and civic core in a community.

Major Drainage Channel: The primary conveyance facility for stormwater drainage through the plan area. It takes flows from the various detention basins and conveys them out of the plan area. It also includes a public trail on at least one side that doubles as a maintenance access road.

Major Transit Facility: A transit station within the plan area that provides access to both the local bus system and regional transit services (e.g., light rail, bus rapid transit). The ultimate siting, design, and configuration of the facility shall be determined in coordination with the applicable service provider(s).

Modified Grid System: A layout of streets that are curved slightly to produce the illusion of varied setbacks while maintaining the integrated grid pattern. This form of street layout also narrows the line-of-sight for drivers and encourages them to slow down.

Native Landscaping: Plantings that are selected because they have adapted to thrive in the local environment, usually with limited or no irrigation, fertilizer, or pesticides. These plantings usually also provide stormwater management.

Office Park: A building form and lot type characterized by one or more stories of development dedicated to office use. The building(s) are oriented either to or very proximate to the public street. Multiple buildings are arranged together to form pedestrian plazas and open space between the buildings with amenities for employees. Generally only one row of parking is provided between the public street and the building; however, buildings are encouraged to be at the back of walk.

Park/Open Space: Areas dedicated to active and passive recreation.

Parklet: A small space serving as an extension of the sidewalk to provide amenities and green space for people using the street. It is typically the size of several parking spaces. Parklets typically extend out from the sidewalk at the level of the sidewalk to the width of the adjacent parking space.

Paseo: A local and private pathways serving as pedestrian connections between developments.

Pocket Plazas: A small plaza, or open area, usually including landscaping, seating, and lighting, typically found at a roadway intersection as part of a bulbout.

Pedestrian-Facing Ground-Floor Façade Transparency Requirement: The required minimum area of a building façade along the ground floor that must be developed with openings into the building. Design options include, but are not limited to, windows and doors. This requirement is limited to the sides of the building that are customarily accessible to pedestrians.

Physical Form. The components that make up the built environment, including streets, buildings, frontages, community spaces, and common features.

Porch (frontage): A frontage type intended for residential uses. The type is characterized by a covered, active outdoor living space connected to the front of the building. The porch shall be raised above the finished grade of the lot and adjacent public sidewalk. An optional fence along the street-facing property line(s) may be constructed to help demarcate the adjoining yard area.

Primary Residential Street: A street type that provides access into and through neighborhoods.

Realm, Private: The area within the domain, or realm, of private land owners and interest, including but not limited to office buildings, shops, residences, and private plazas.

Realm, Private: The area within the domain of private landowners, including, but not limited to, office buildings, shops, restaurants, residences, and private plazas.

Realm, Public: The area within the domain of the public, usually open to the public and owned by the City, including, but not limited to, public streets, plazas, or other publicly accessible open space or civic spaces, parks, and trails.

Shopfront (frontage): A frontage characterized by a façade which is aligned close to or directly on the public right-of-way line with the building entrance at sidewalk grade. Shopfront frontages have substantial glazing on the ground floor and provide awnings or canopies cantilevered over the sidewalk. Building entrances may either provide a canopy or awning or alternatively, may be recessed behind the front building façade. Awnings over the public sidewalk require approval of an encroachment agreement.

Small-Lot Detached Housing, Front-Loaded, Recessed: A single-family detached building form and lot type characterized by a smaller lot size and a garage accessed from the street in front of the dwelling. The garage is recessed behind the front face of the dwelling and may even be behind the dwelling.

Small-Lot Detached Housing, Rear-Loaded, Attached: A single-family detached building form and lot type characterized by a smaller lot size and a garage accessed from an alley behind the dwelling. The garage may either be attached or detached to the dwelling.

Small-Lot Detached Housing, Zero-Lot-Line, Front-Loaded: A single-family detached building form and lot type characterized by a smaller lot size and a garage accessed from the street in front of the dwelling. The dwelling is sited such that one wall is located along a side property line. Access to the rear of the lot is provided only on one side.

Sports Complex: A building form and lot type characterized by multiple athletic fields, parking areas, and support services (e.g., field office and shop, restaurant, locker rooms, restrooms). The site may also be developed with a sports stadium.

Standard Lot, Single-Family Residential, Front-Loaded, Detached: A single-family detached building form and lot type characterized by a garage accessed from the street in front of the house. The garage is detached from the main dwelling.

Standard Lot, Single-Family Residential, Front-Loaded, Recessed: A single-family detached building form and lot type characterized by a garage that is recessed behind the living space within the dwelling. The garage may either be attached or detached from the dwelling. The driveway is typically wide enough for one vehicle.

Standard Lot, Single-Family Residential, Front-Loaded: A single-family detached building form and lot type characterized by a garage accessed from the street in front of the dwelling. The garage is attached/integrated into the design of the dwelling.

Standard Lot, Single-Family Residential, Rear-Loaded: A single-family detached building form and lot type characterized by garage access from an alley behind the dwelling. The garage may either be attached or detached to the dwelling.

Stoop (frontage): A frontage type intended for residential uses. The type is characterized by stairs and a small landing. The stoop is commonly associated with denser building types on narrower lots and placed close to the street-facing property line(s). To accommodate a property's limited yard area, a stoop's stairs may be placed perpendicular or parallel to the property line. The frontage may be covered and may include an optional fence along the street facing property line(s) to help demarcate the adjoining yard area.

Suburban Commercial: A building form and lot type characterized by single story retail development. The buildings are generally located in the rear of the site with parking between the building and the public street. Pad buildings located near the public street may also be developed.

Townhouses, Detached Garage: A single-family building form and lot type characterized by very small lot sizes and a detached garage accessed from an alley behind the dwelling. Each dwelling is on its own lot, but the dwellings share a common foundation consistent with building code requirements. The front of the dwelling is accessed from the public street.

Townhouses, Tuck-Under Garage: A single-family building form and lot type characterized by very small lot sizes and an attached garage (on the first floor of the dwelling) accessed from an alley behind the dwelling. Each dwelling is on its own lot, but the dwellings share a common foundation consistent with building code requirements. The front of the dwelling is accessed from the public street, and the front door is typically above street level and accessed by a set of stairs.

Tree, Accent: A small tree that accents the landscaping of an area, usually by virtue of its color, shape, or size.

Tree, Specimen: A tree that is usually the focal point; usually large or makes a big impact on the landscaping of the area in some way.

Tuck-Under Condominiums/Apartments: A multi-family building form and lot type characterized by dwellings that are built over garages, with access from the internal street system.

Vertical Mixed Use, Office over Commercial: A building form and lot type characterized by a mix of uses in one building. Generally, retail uses are constructed on the ground floor with office uses above. Office uses may also be developed on the ground floor, but are not the predominant use at this level. Some residential uses may also be allowed on the uppermost floors. The building is oriented to the public street or an internal circulation system that is an extension of the public system, with parking provided in back. Upper floors are encouraged to be stepped back from the sidewalk/street to provide outdoor spaces.

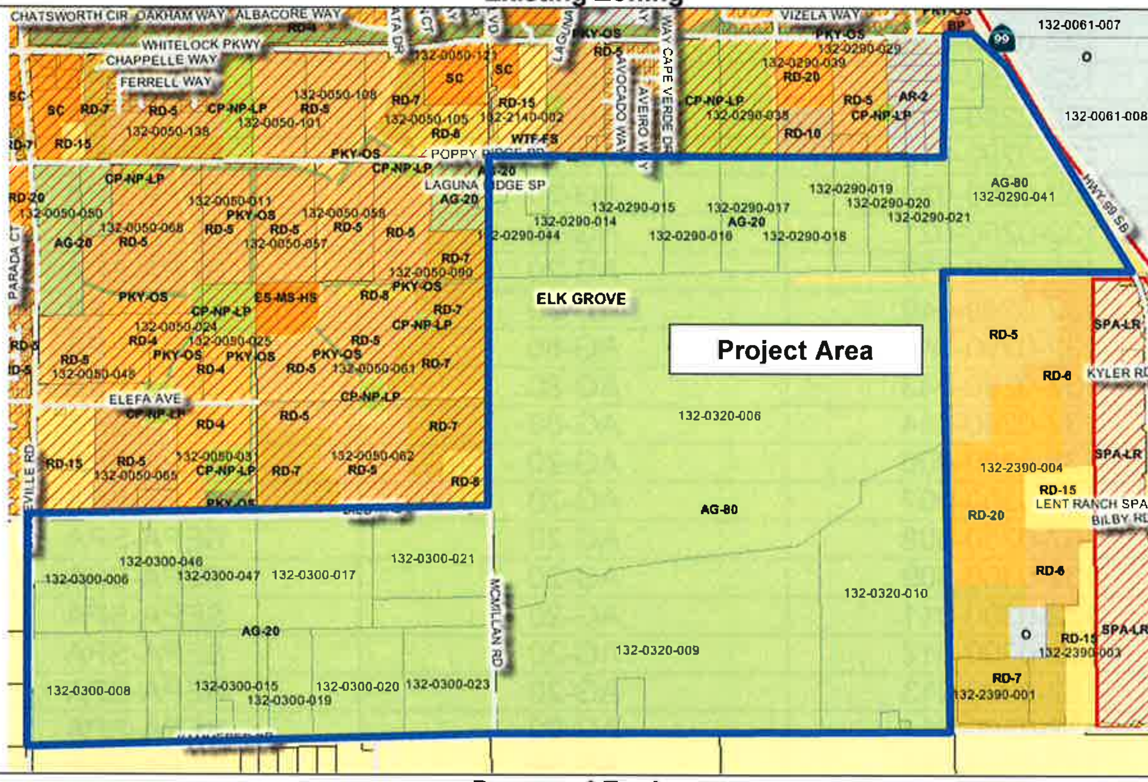
Vertical Mixed Use, Residential over Commercial: A building form and lot type characterized by a mix of uses in one building. Generally, retail uses are constructed on the ground floor with residential uses above. Office uses may also be developed, but are not the predominate use in the building. The building is oriented to the public street or an internal circulation system that is an extension of the public system, with parking provided in back. Upper residential floors are encouraged to be stepped back from the sidewalk/street to provide outdoor spaces for residents and reduce impacts to the dwellings from ground-level activities.

Village Commercial: A building form and lot type characterized by single-story retail development. The building is generally oriented to the public street or an internal circulation system that is an extension of the public system.

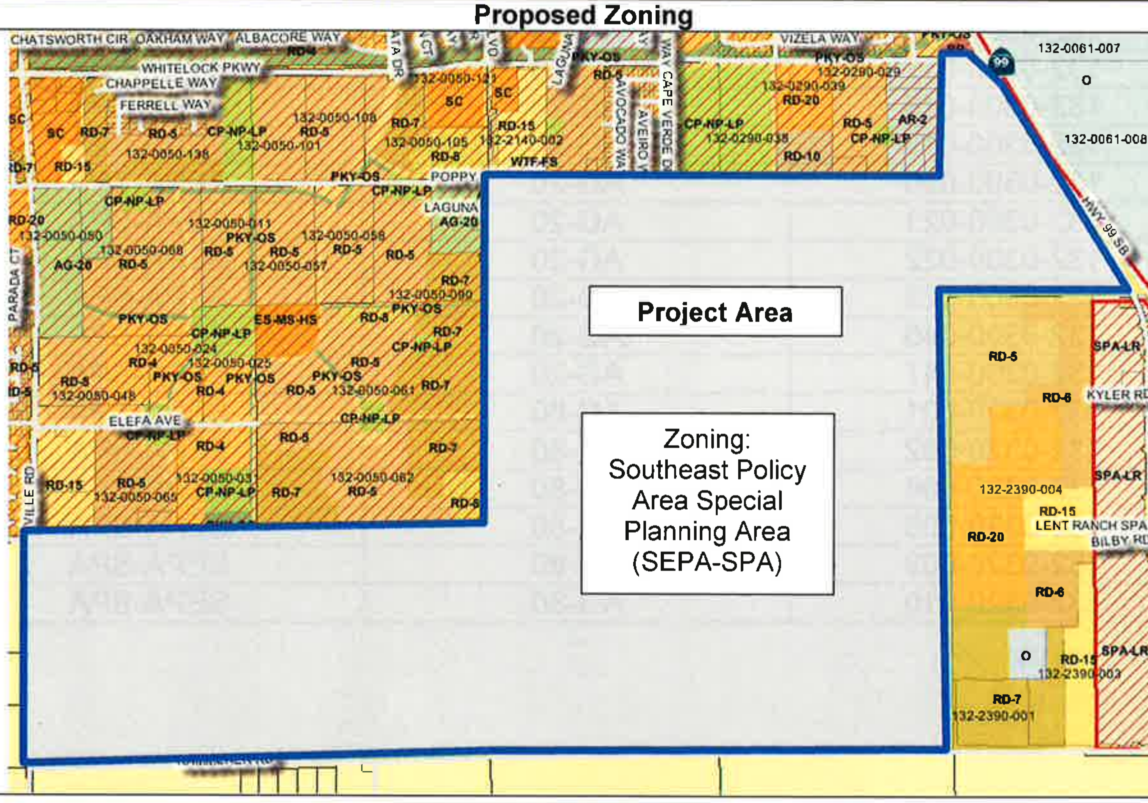
EXHIBIT D

Rezone Exhibit

Existing Zoning



Proposed Zoning



APN	Existing Zoning	Proposed Zoning
132-0290-014	AG-20	SEPA-SPA
132-0290-015	AG-20	SEPA-SPA
132-0290-016	AG-20	SEPA-SPA
132-0290-017	AG-20	SEPA-SPA
132-0290-018	AG-20	SEPA-SPA
132-0290-019	AG-20	SEPA-SPA
132-0290-020	AG-20	SEPA-SPA
132-0290-021	AG-20	SEPA-SPA
132-0290-033	AG-20	SEPA-SPA
132-0290-040	AG-80	SEPA-SPA
132-0290-041	AG-80	SEPA-SPA
132-0290-043	AG-80	SEPA-SPA
132-0290-044	AG-80	SEPA-SPA
132-0300-006	AG-20	SEPA-SPA
132-0300-007	AG-20	SEPA-SPA
132-0300-008	AG-20	SEPA-SPA
132-0300-009	AG-20	SEPA-SPA
132-0300-011	AG-20	SEPA-SPA
132-0300-012	AG-20	SEPA-SPA
132-0300-013	AG-20	SEPA-SPA
132-0300-014	AG-20	SEPA-SPA
132-0300-015	AG-20	SEPA-SPA
132-0300-016	AG-20	SEPA-SPA
132-0300-017	AG-20	SEPA-SPA
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132-0300-046	AG-20	SEPA-SPA
132-0300-047	AG-20	SEPA-SPA
132-0320-001	AG-80	SEPA-SPA
132-0320-002	AG-80	SEPA-SPA
132-0320-006	AG-80	SEPA-SPA
132-0320-008	AG-80	SEPA-SPA
132-0320-009	AG-80	SEPA-SPA
132-0320-010	AG-80	SEPA-SPA

EXHIBIT E

Elk Grove Southeast Policy Area Master Water Plan

February 19, 2014

Prepared for

CITY OF ELK GROVE

PROUD HERITAGE. BRIGHT FUTURE.

Prepared by

WOOD RODGERS

DEVELOPING INNOVATIVE DESIGN SOLUTIONS

3301 C Street, Bldg. 100-B Tel: 916.341.7760

Sacramento, CA 95816 Fax: 916.341.7767

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,

Darrell Eck

Darrell Eck
Senior Civil Engineer, SCWA

cc: Ping Chen, SCWA

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APPENDICES

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.

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[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.

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[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, heron refereed as "EGP plan".
- Zone 40 Water System Infrastructure Plan, by Sacramento County Water Agency, dated April 2006, heron 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.

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

NORTH

0 1,250 2,500
FEET

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DEVELOPING INNOVATIVE DESIGN SOLUTIONS
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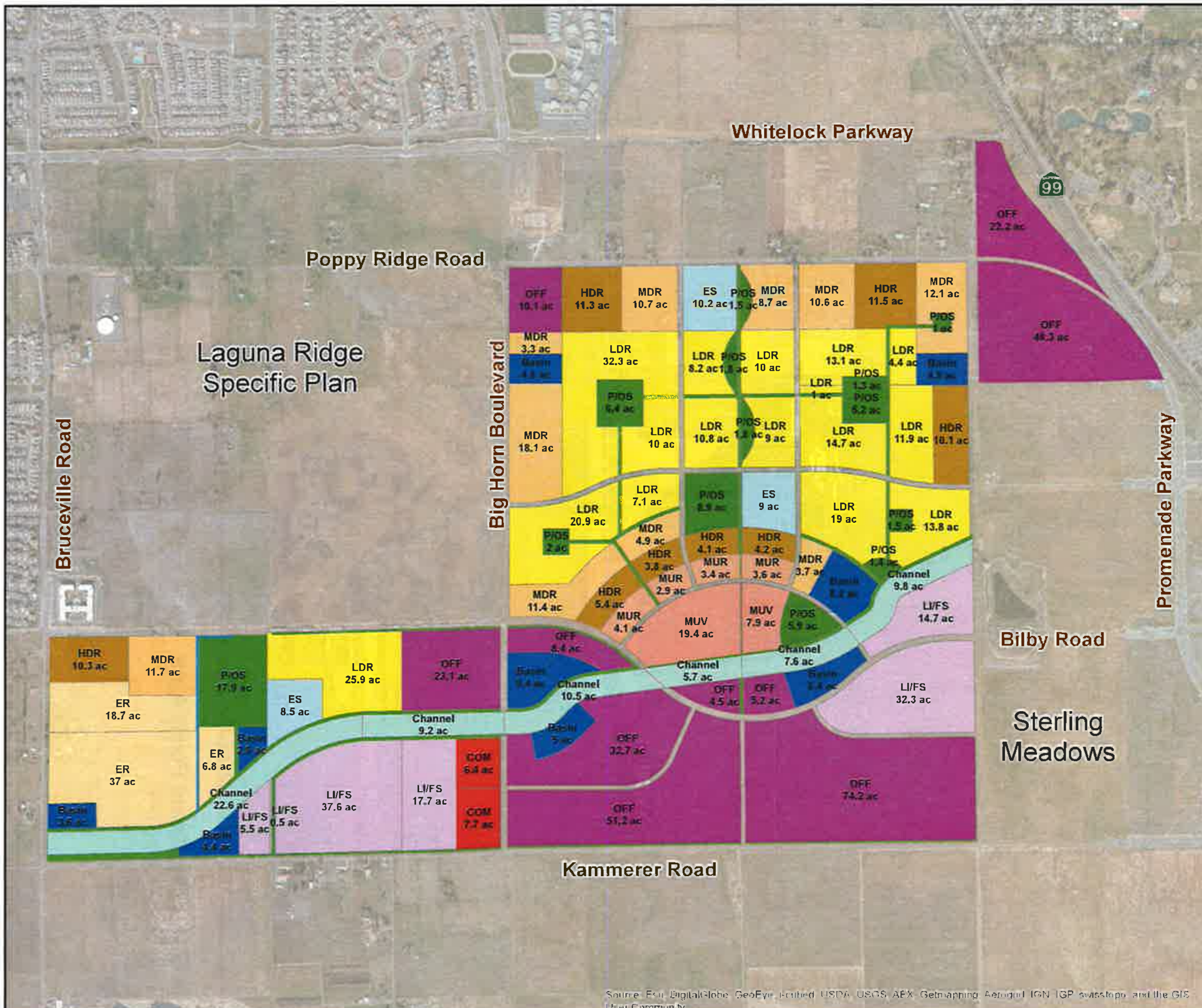
J:\2000-s\2956_SEPA\SEPA-OA\GIS\Tasks\SEPA_WTR_VicMap_20140226_V1.mxd 2/26/2014 1:12:02 PM jbuchanan



ELK GROVE SOUTHEASET POLICY AREA

LAND USE PLAN - FIGURE 1-2
ELK GROVE, CALIFORNIA
FEBRUARY 19, 2014

NORTH
Not to Scale

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

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.

<u>Bruceville Road Extension</u>

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.

<u>Bilby Road Extension</u>

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.

<u>Big Horn Boulevard Extension</u>

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.

<u>Kammerer Road Extension</u>

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.

<u>Lotz Parkway Extension</u>

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 uses[9]. 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.

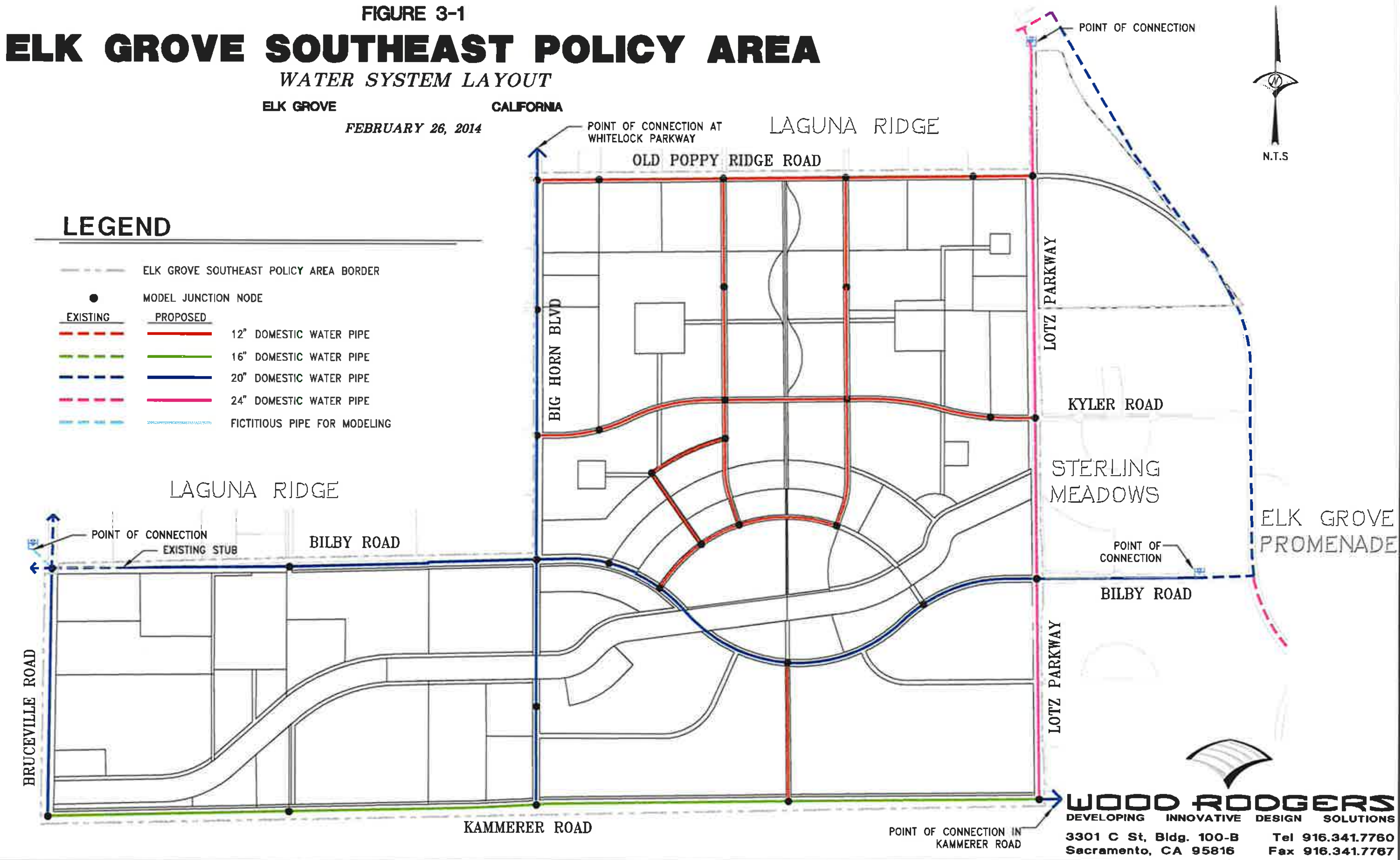
FIGURE 3-1

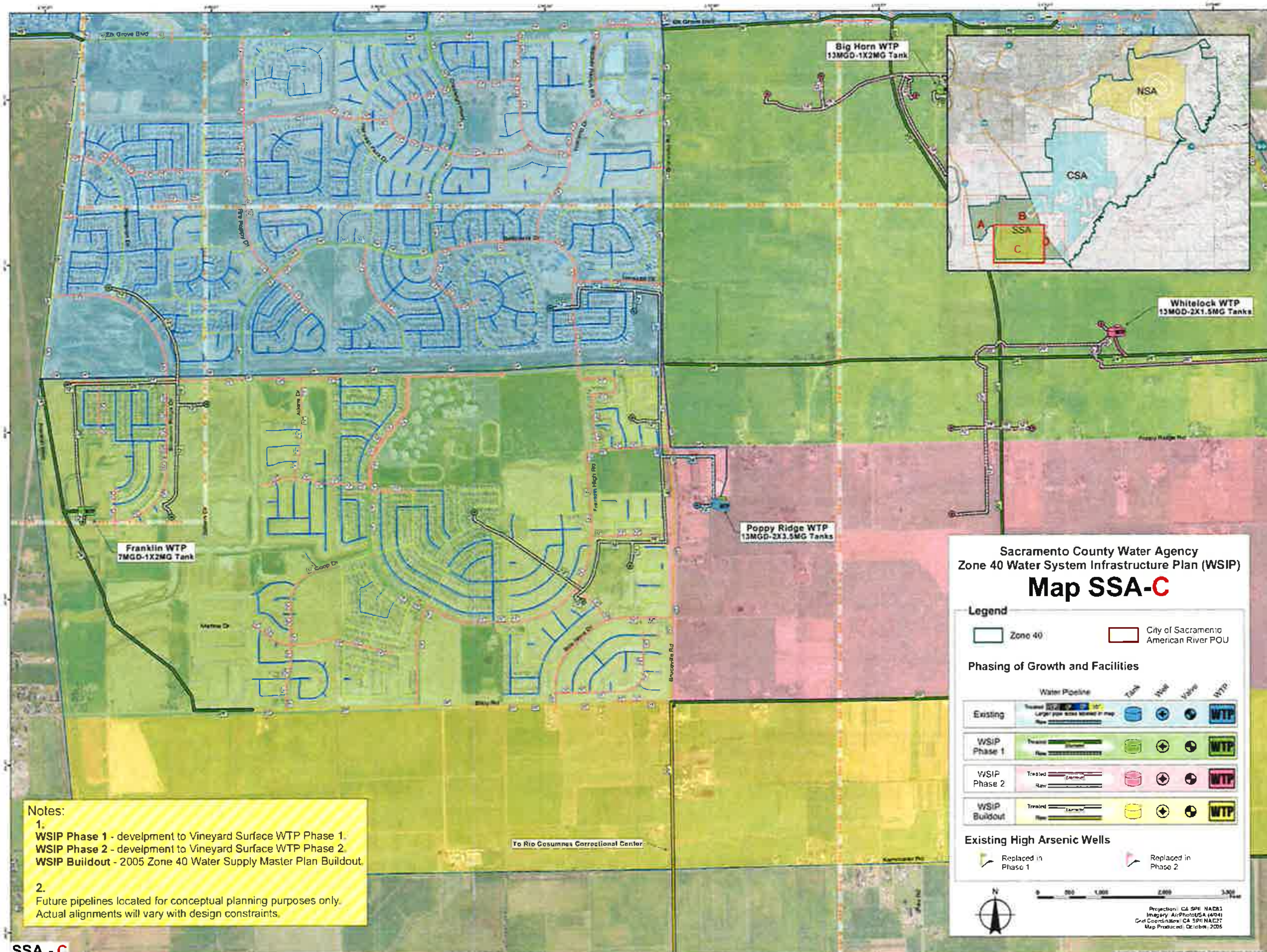
ELK GROVE SOUTHEAST POLICY AREA

WATER SYSTEM LAYOUT

ELK GROVE CALIFORNIA

FEBRUARY 26, 2014



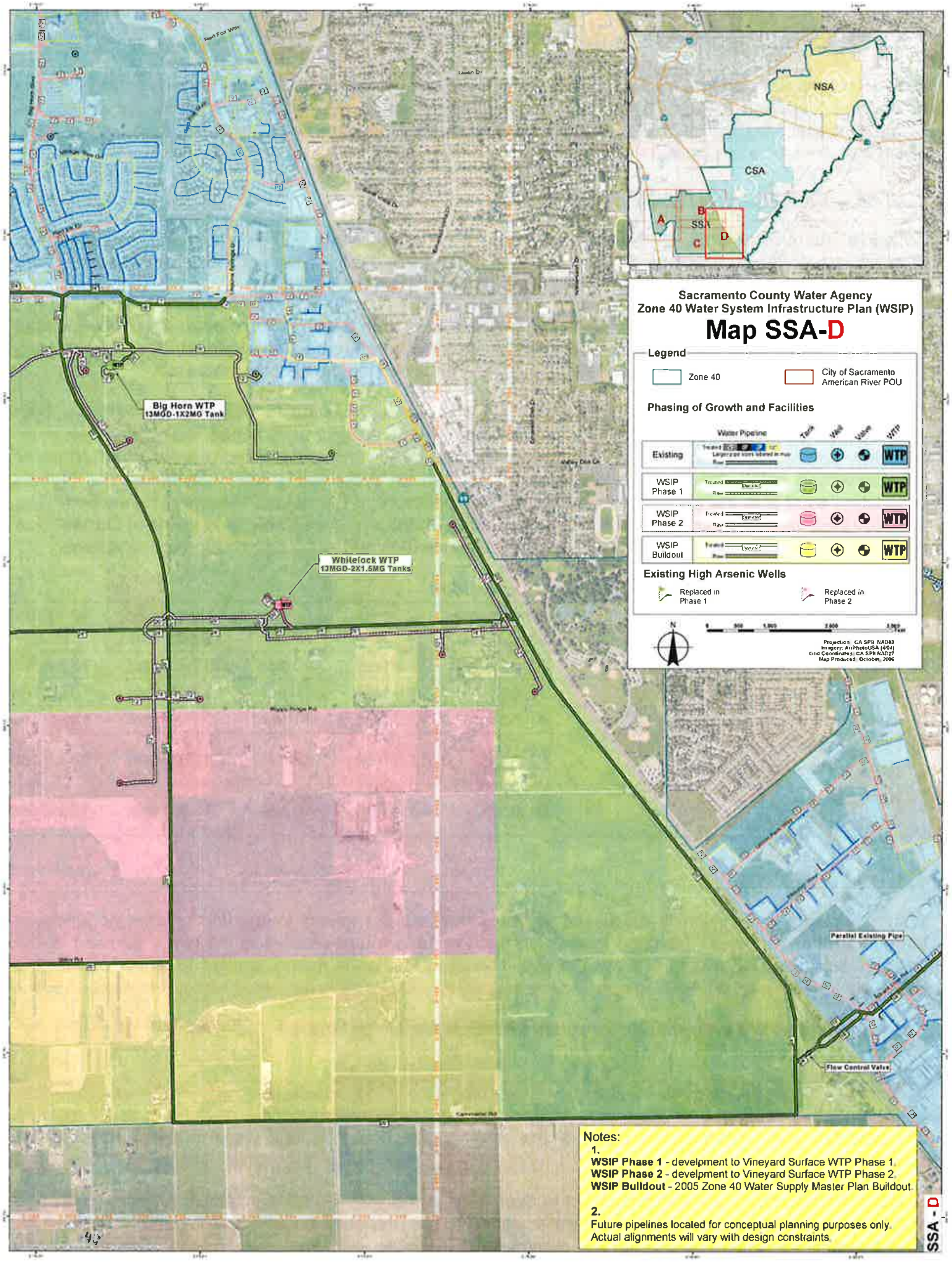


Notes:

1.
WSIP Phase 1 - develpment to Vineyard Surface WTP Phase 1.
WSIP Phase 2 - develpment 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.

SSA - C


NSA
CSA
A
B
SSA
C
D
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
WSIP Phase 1
WSIP Phase 2
WSIP Buildout
Treated
Raw
Existing High Arsenic Wells
Replaced in Phase 1
Replaced in Phase 2
N
Projection: CA SPB NAD83
Imagery: AirPhotoUSA (4/04)
Grid Coordinates: CA SPB NAD27
Map Produced: October, 2006
Big Horn WTP
13MGD-1X2MG Tank
Whitelock WTP
13MGD-2X1.5MG Tanks
Parallel Existing Pipe
Flow Control Valve
Notes:
1.
WSIP Phase 1 - develpment to Vineyard Surface WTP Phase 1.
WSIP Phase 2 - develpment 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.
SSA - D

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 where 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

Wood Rodgers, Inc.
M. Motroni
2/26/2014

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 ultimatly have zero water demand

Wood Rodgers, Inc.
M. Motroni
2/26/2014

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 on9/10/2013.

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	Land Uses																Elevation	Demands			
		Basin	Commercial	Drainage Channel	Estate Residential	Elementary School	Greenway	High Density Residential	Low Density Residential	Light Industrial / Flex Space	Medium Density Residential	Office	Park / Open Space	Mixed Use Residential	Mixed Use Commercial	Channel	Right of Way[1]	Average Elevation	Average Annual	Average Day	Maximum Day	Peak Hour
	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(ft)	(AFY)	(gpm)	(gpm)	(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					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									65.31	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
Overal 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

Wood Rodgers, Inc.
2/26/2014

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/kft)
EGP01	EGJ700	EGJ100	2637.00	20	125	-596.16	0.61	0.23	0.09
EGP03	EGJ100	EGJ150	2538.00	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	2538.00	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	132.38	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/kft)
EGP01	EGJ700	EGJ100	2637.00	20	125	-562.34	0.57	0.21	0.08
EGP03	EGJ100	EGJ150	2538.00	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

APPENDIX C

ELK GROVE SOUTHEAST POLICY AREA

PROPOSED WATER SYSTEM LAYOUT

ELK GROVE CALIFORNIA

FEBRUARY 19, 2014

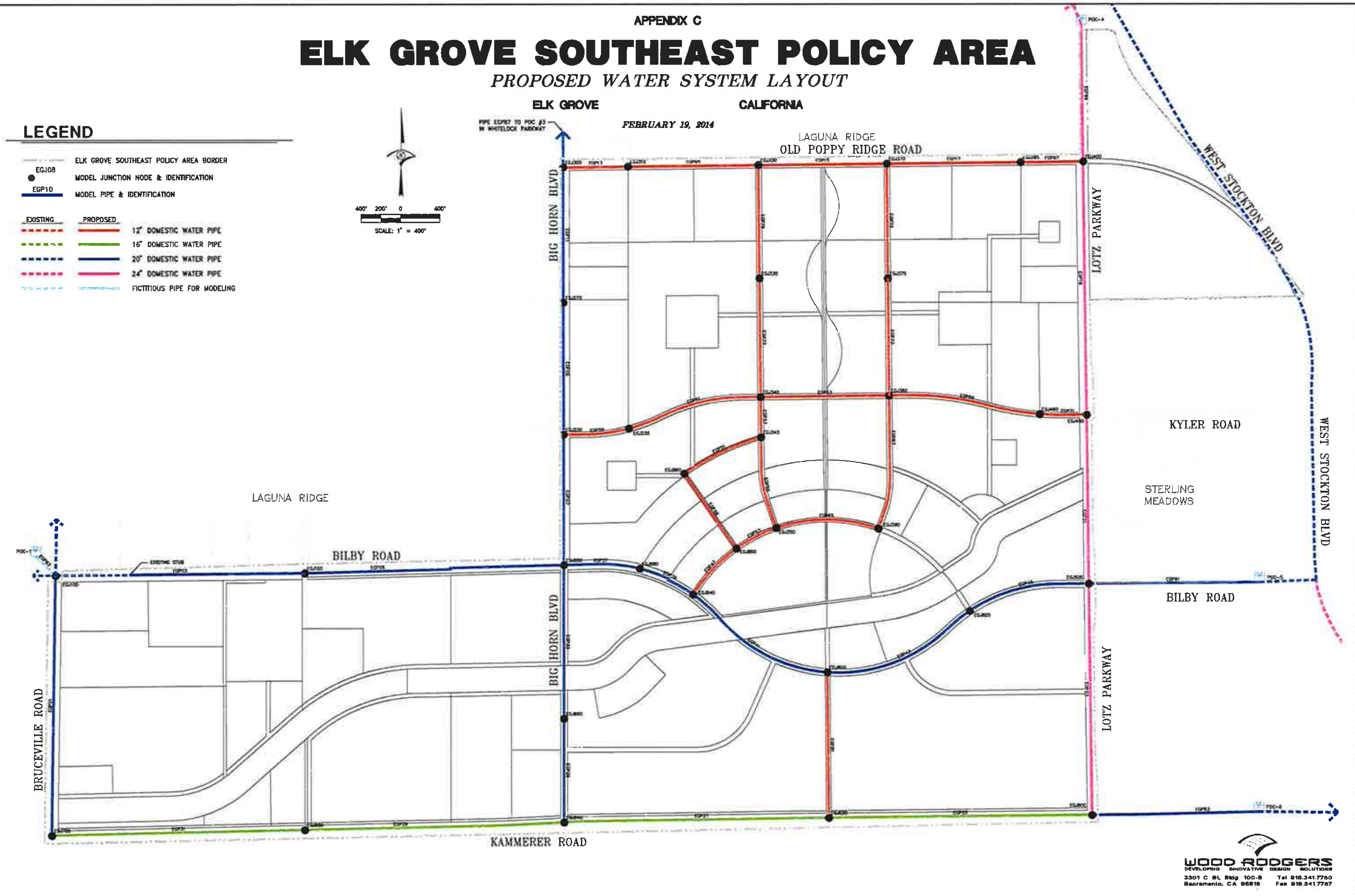


EXHIBIT F

Elk Grove Southeast Policy Area
Level II Sewer Study

March 5, 2014

Prepared for

CITY OF
ELK GROVE
PROUD HERITAGE. BRIGHT FUTURE.

Prepared by

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS
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March 5, 2014

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

Subject: **Elk Grove Southeast Policy Area – Level 2 Sewer Study Approval**

Dear Mr. Motroni:

Sacramento Area Sewer District staff reviewed the subject submittal and finds it sufficiently addresses District requirements and is considered approved. Any significant change in the proposed and/or assumed land use presented in this document, which impacts the sewer design, may require a revision to this study.

If you have any questions regarding these comments, please call me at 916-876-6278, or call Amandeep Singh at 916-876-6296.

Sincerely,

Stephen Moore

Stephen Moore, P.E., M.B.A.
Development Services

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 Executive Summary

Purpose

The purpose of this sewer study is to identify the backbone sewer conveyance facilities for the Elk Grove Southeast Policy Area (SEPA). This report is part of an overall high-level infrastructure analysis for the plan area. This study will demonstrate it is possible to provide sewer service for the project and technical compliance with the sewer district's requirements for sewer conveyance. The project falls within the jurisdiction of the Sacramento Area Sewer District (SASD).

Existing and planned sewer conveyance facilities border the project area to the north, west, and east. It is anticipated that these facilities will be extended to provide sewer service to the project area. This study has been prepared to present the project's ultimate build out sewer conveyance facilities for the plan area. The study includes backbone trunk and collector mains to serve each proposed land use. This study includes a discussion on the proposed project, sewer flows, alignments, and sewer facilities.

Project and Study Characteristics

The plan area encompasses approximately 1,200 acres and will convey 7,904 ESD's. The plan area is located in the south portion of Elk Grove between the Laguna Ridge Specific Plan and Elk Grove Promenade / Lent Ranch Specific Plan. The project proposes a mix of land use including residential, commercial, office, and industrial. The full plan area build out will convey a total of 2.5 mgd and 5.4 mgd during average dry weather flow and peak wet weather flow, respectively.

Findings

This study identifies onsite facilities required to serve the plan area. Design of the Laguna Ridge south lift station will need to provide consideration for planned flows from SEPA during development of level three studies. The existing Elk Grove Promenade lift station and force main will also require analysis at time of level three sewer study to show that these facilities are capable of conveying sewer flow from the plan area, as proposed in this study. These findings are discussed in detail within this study.

2.0 Introduction

Level of Study

This study is a level two study for a community plan level sewer assessment. The focus of this study is on backbone or trunk infrastructure required to serve the plan area. This level of study is not sufficient for design and it is anticipated that a level three study or series of studies will be required prior to improvement plan approval for backbone facilities.

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 2-1: Vicinity Map** for a vicinity map of the project site.

Topography

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.

Detail Description

SEPA 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]

Land Use and Zoning

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 areas. See **Table 2-1: Proposed Project Land Use** for detailed project land uses and **Figure 2-2: 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 2-1: 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	1,341
MDR	Medium Density Residential	95.2	1,324
HDR	High Density Residential	60.7	1,511
MUR	Mixed Use Residential	14.0	267
COM	Commercial	14.2	-
MUV	Mixed Use Commercial	27.3	58
ES	Elementary School	27.7	-
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**

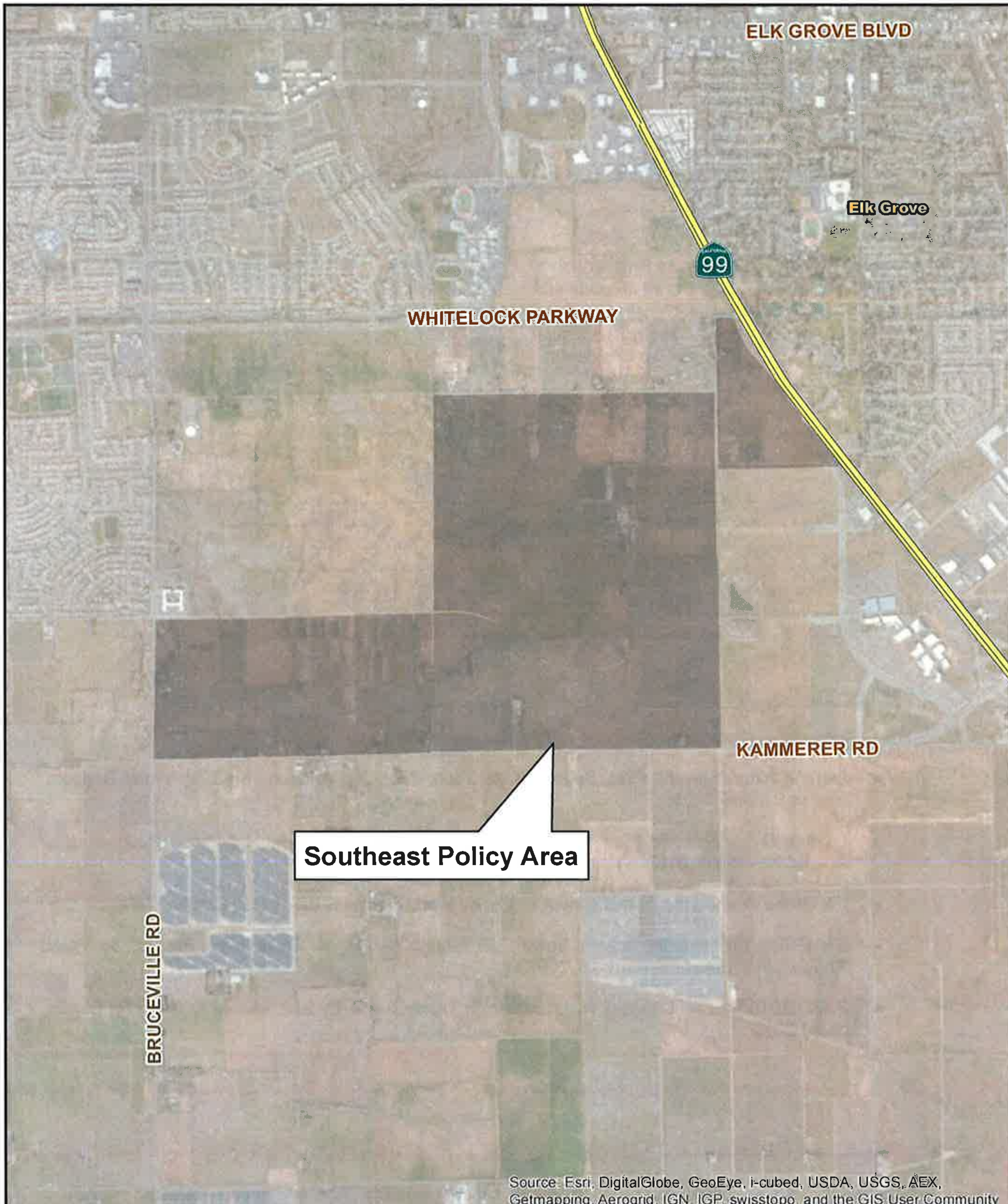
Existing Studies

The following studies were reviewed and referenced within this study.

- Laguna Ridge Specific Plan, Sewer Master Plan, Technical Addendum #2, by Wood Rodgers, Inc., dated May 2005.
- Laguna Ridge Specific Plan, Sewer Master Plan, Figure 5 Exhibit, by Wood Rodgers, Inc., revised November 2012.
- Elk Grove Promenade, Maser Sewer Study, by Wood Rodgers, Inc., dated October 2006.
- Elk Grove Promenade, Interim Sewer Lift Station (S-142) & Force Main Project, by Wood Rodgers Inc., dated February 16, 2007.
- SASD 2010 System Capacity Plan Expansion Trunk Sheds, by Sacramento Area Sewer District, dated 2010.

[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.



Elk Grove Southeast Policy Area
Vicinity Map - Figure 2-1
Elk Grove, California
March 5, 2014

NORTH

0 1,250 2,500
FEET

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS
3301 C Street, Bldg. 100-B Tel: 916.341.7760
Sacramento, CA 95816 Fax: 916.341.7767

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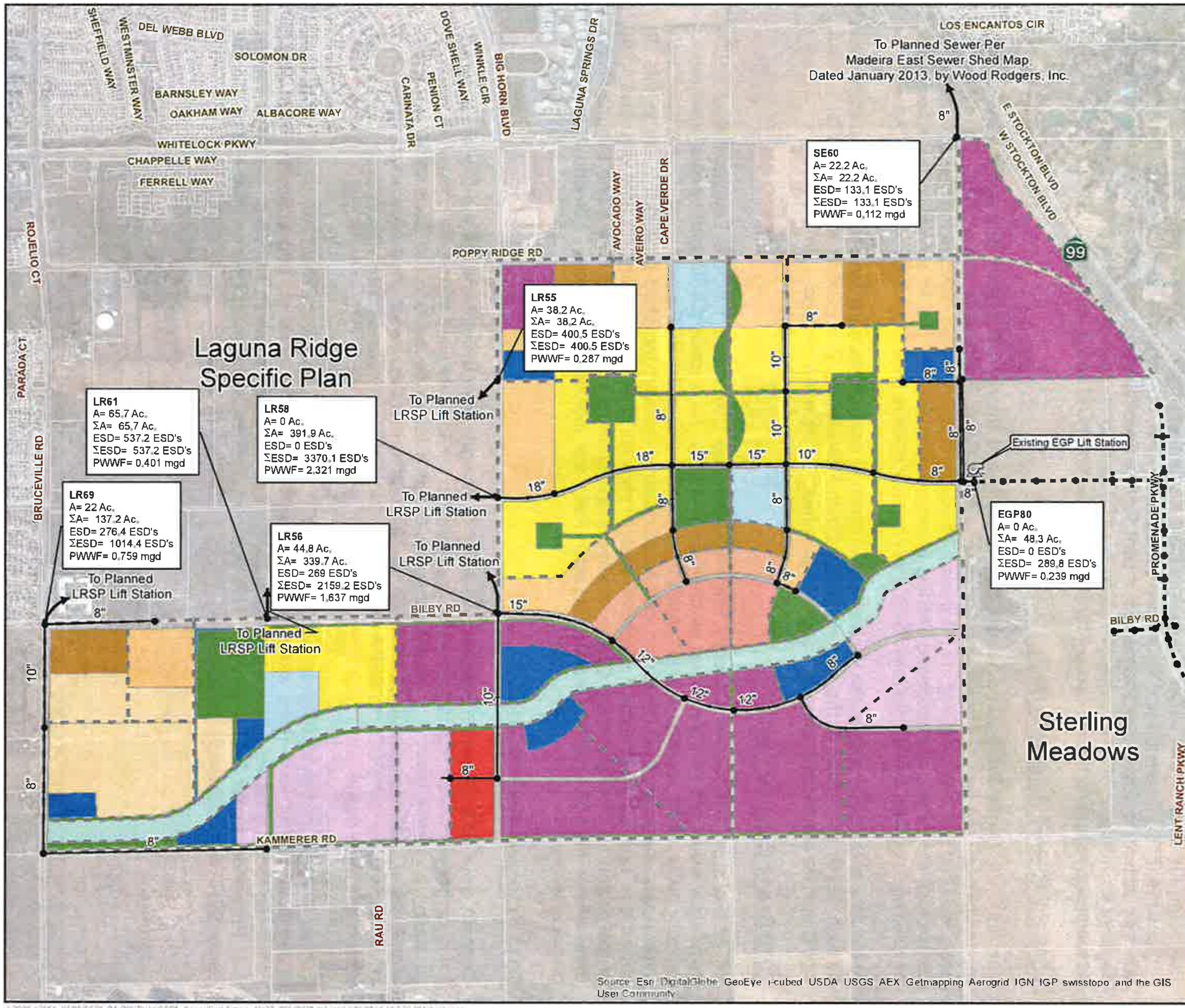

ELK GROVE SOUTHEASET POLICY AREA

LEVEL II SEWER STUDY - FIGURE 3-1
ELK GROVE, CALIFORNIA
APRIL 25, 2014

NORTH
Not to Scale

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
- Existing Sewer Pipes
- SEPA Sewer Sheds
- Manhole
- SEPA Sewer Pipes
- Parcels

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3.0 Design & Sewer Flow Information

The proposed design is included in **Appendix B: Level II Sewer Study** with a reduced copy included as **Figure 3-1: Level II Sewer Study**. The design illustrated in the above referenced exhibits is based upon the subsequent discussion in this section.

3.1 Elk Grove Promenade Trunk Sewer Shed

Preceding the date of this sewer study significant discussions have occurred regarding the Elk Grove Promenade (EGP) lift station and force main (designated as S-142) and available capacity. Development interests within the Elk Grove Promenade / Lent Ranch Specific Plan are working to ensure sufficient capacity for build out of their respective plan areas. The following discusses the different variations and assumptions regarding the Elk Grove Promenade sewer shed and how it relates to SEPA.

2006 Elk Grove Promenade Study

The 2006 Elk Grove Promenade Master Sewer Study and Interim Lift Station and Force Main design report identified the facilities to serve a portion of the Elk Grove Promenade sewer shed. The originally designed shed that would convey via the interim lift station and force main included the mall site, adjacent commercial properties, and proposed Sterling Meadows subdivision. The lift station conveys sewer via an existing force main under Highway 99 to a trunk sewer main in East Stockton Boulevard.

At the time of the 2006 studies the ultimate conveyance of sewer flows from this shed would be conveyed through SEPA and LRSP to the Laguna Ridge South Interceptor. The EGP lift station and force main would then be abandoned, once sufficient gravity infrastructure was in service.

2010 Sewer Capacity Plan

As part of the 2010 Sewer Capacity Plan, SRCSD had determined that the Laguna Ridge South Interceptor would not be constructed as originally planned. As a result SASD staff revised their sewer capacity plans, which resulted in significant changes to the size of the EGP sewer shed. The revised plan makes permanent the EGP lift station and force main. However, the shed area conveying to this lift station was significantly increased to include eastern portions of SEPA immediately to the west and north of the original EGP sewer shed. Copies of shed maps showing both the Elk Grove and Laguna Ridge trunk sheds from the 2010 System Capacity Plan are included as **Figure 3-2** and **Figure 3-3**, respectively.

2013 Proposed Trunk Sheds

Concern among Elk Grove Promenade / Lent Ranch Specific Plan developers and the City of Elk Grove led to further discussion regarding the size and extent of the ultimate shed that would convey via the EGP lift station and force main. The discussions resulted in a reversion back to the EGP sewer shed just slightly larger than originally proposed in 2006. This slightly modified sewer shed adds about 48 acres of office land use for 290 ESD's of SEPA (NE corner) that SASD now plans on serving through the EGP lift station and force main.

Further analysis of the existing capacity of the EGP lift station and force main will be required as a subsequent part of level three sewer studies. This study only looks at, and supports, most flows conveying to the west via SEPA's backbone facilities to the LRSP south lift station as shown in **Figure 3-4: Proposed Trunk Sewer Sheds**. This approach results in the most conservative design for the onsite SEPA trunk and backbone facilities.

3.2 Laguna Ridge South Trunk Sewer Shed

To date, multiple interests have discussed sewer conveyance for the Laguna Ridge South Trunk Sewer Shed. Since SEPA in large part will convey via the LRSP south sewer lift station, this study further discusses conveyance alternatives. Similar to the conversion of a permanent facility for the Elk Grove Promenade sewer lift station (S-142) the two interim sewer lift stations that were planned to serve the Laguna Ridge Specific Plan and surrounding areas are now or will be considered permanent facilities.

Laguna Ridge Specific Plan Sewer Studies

Wood Rodgers prepared the initial sewer study to serve the Laguna Ridge Specific Plan (LRSP) in a study dated May 2005 and revised November 2012. Since then other developers have prepared supplemental level three sewer studies to serve individual projects within LRSP. The study envisioned two lift stations would serve LRSP before regional interceptor facilities would be constructed to serve LRSP and SEPA. To date, only the LRSP north lift station (S-136), as known as the Whitelock Pump Station, is built and operational.

Additionally, SASD has received a number of requests for shed shifts for developments to convey flow from the future south lift station to the operational north lift station. This in large part is because parcels that would otherwise be served by the south lift station are moving ahead with development in advance of the south lift station being operational. SASD provided Wood Rodgers with revised sewer shed boundaries that reflect the current shed boundaries for the south lift station.[4] These flows are discussed in more detail later in this report.

Most SEPA sewer flows will flow directly into the Laguna Ridge development. Approximately 22.2 acres or 133.1 ESD's of office land use will flow to the existing Laguna Ridge north lift station via planned collector mains in Lotz Parkway as part of the Madeira East project. With the exception of those land uses previously discussed as they relate to the Elk Grove Promenade lift station, the remainder of the project will convey flows via the Laguna Ridge south lift station.

3.3 Design

The project sewer study consisted of calculating the sewer flows and designing the sewer system to serve the plan area. The SASD Design Standards, dated June 24, 2013 and Minimum Sewer Study Requirements, dated February 25, 2009 were utilized as the basis for this study.

Assumptions

There were a number of assumptions that are included in the design approach for this level two study. It is understood that as this plan area develops level three sewer studies, these assumptions may require further refinement. These assumptions are stated below:

- Per the sewer study for the Laguna Ridge Specific Plan (LRSP), by Wood Rodgers, dated May 2005 and revised November 2012, proposed sewer mains within LRSP are to provide for sewer service to SEPA. The LRSP study, consistent with trunk sewer sheds at the time, assumed that the EGP sewer shed, served by EGP lift station S142, would convey sewer through SEPA and LRSP to then proposed Laguna Ridge South Interceptor. As previously discussed district staff have indicated the EGP sewer shed will permanently convey flows to the east via force main as it does today. The future LRSP south lift station and associated force main will have to be designed to provide sufficient wet well depth to serve SEPA.

[4] Provided to Wood Rodgers via email from SASD on February 21, 2014.

- There will be no upstream development or significant increase in on-site densities that will affect the planned on-site or off-site sewer facilities.
- Only major nodal manholes are shown in this study. Additional manholes, per SASD Design Guidelines, will be included along the proposed sewer alignments. To allow for the additional manholes, a one-tenth drop is accounted for in the inverts shown in the study, for every 200-feet of pipe length. The slope published on the plans is representative of sewer pipe slope and is irrespective of the additional one-tenth drops. Further study will incorporate additional manholes per SASD Design Guidelines.
- Pipes were sized and flow lines calculated based on the SASD design standards and adhere to SASD "Minimum Sewer Study Requirements" Criteria. Actual alignments will be determined with subsequent level three study design scope.
- At time of this report a grading study of the plan area has not been developed. The existing topographic contours have been utilized as part of this study to determine invert depth.
- The land use plan has designated a number of parcels in the northeast part of the plan area with a sports and entertainment overlay. Flows from an entertainment overlay have not be analyzed and it is assumed that any flows from a stadium or other high peak flow venue would require attenuation onsite before discharging via collector pipes.

Approach

The following general procedure was used in the development of this study.

1. Gross areas based on the proposed Elk Grove Southeast Policy Area land use dated September 10, 2013 were used to calculate sewer flows.
2. Sub sheds areas were defined by topographic elevations, proposed service lines, and land use.
3. Equivalent dwelling units (ESD's) were calculated for each shed based on the underlying land use and shed area.
4. 310 gallons per day is assumed to be the average dry weather flow or a single equivalent single family dwelling unit (ESD).
5. This study does not include lateral mains as onsite street patterns are not defined.
6. Due to the flat terrain, minimum slopes were utilized to calculate inverts and run sewer lines to the upstream portions of the plan area.
7. Minimum sewer depth was set between five to six feet from existing elevation at street centerline.
8. Flows were determined based on the SASD, County Improvement Standards, and on the design criteria and assumptions identified in this study.
9. A schematic backbone trunk and collector system was established.
10. Major sheds were divided into sub-sheds in order to define the areas, which contribute flows to certain points (nodes) on the collection system.
11. To estimate sewage flows, land use boundaries were overlaid on the sub-sheds creating sub-areas of single land use within each sub-shed. The acreages of these sub-areas were determined and multiplied by the average number of equivalent single family dwellings (ESDs) per acre for their particular land use in order to determine the total number of ESDs entering each

pipe system. Pipes were sized and inverts calculated using an iterative process. For hydraulic calculations refer to **Appendix A: Demand & Hydraulic Calculation Table**.

Design Criteria

SASD Standards and Specifications, dated July 24, 2013 were used as the basis for this design. The flows were generated using the information found in Chapter 201 (Capacity Design) of the standards and specifications. The flow criteria used for this report is presented in **Table 3-1: Design Flow Criteria**.

Table 3-1: Design Flow Criteria
Source: Sacramento Area Sewer District

Criteria		Modifier
Flow Generation		
Estate Residential	6 ESD/acre	Not less than 6 ESD/acre for any land use.
Low Density Residential	6 ESD/acre	
Medium Density Residential	10 ESD/acre	
High Density Residential	20 ESD/acre	
Office	6 ESD/acre	
Commercial	6 ESD/acre	
School	6 ESD/acre	
Light Industrial / Flex Space	6 ESD/acre	
Mixed Use	6 ESD/acre	
Open Space / Public Recreation	6 ESD/acre	
Detention Basins	6 ESD/acre	
Peaking Factor	$PF = 3.5 - 1.8 * Q_{ADWF}^{0.05}$ (Minimum PF = 1.2)	
Minimum Velocity	Minimum 2 fps at Peak Dry Weather Flow	
Rainfall Infiltration Factor	Existing Areas: 1,600 gpd per acre New areas: 1,400 gpd per acre	
Hydraulic Grade Line	Maximum HGL at crown of pipe at Peak Wet Weather Flow	
Friction Factor (Manning's n-value)	0.01300	

3.4 Sewer Flow Information

Onsite Sewer Flows

Onsite sewer flows were generated based on design flow criteria identified in **Table 3-1** overlaid with the proposed land use. The project area consists of nearly 1,200 acres with about 1,043 acres generating sewer flow. The balance of the acreage that does not produce sewer flow are drain channels and backbone roadways. These flows, by land use, are shown in **Table 3-3: Sewer Flows by Land Use**. Detailed calculations for flow generation are included in **Appendix A: Demand & Hydraulic Calculation Table**.

For school facilities the SASD standards require an additional analysis to determine the maximum sewer flow to utilize for sewer calculations. This analysis is shown in **Table 3-2: School Sewer Flows**. Method A calculates the sewer flow at 6 ESD's per acre. Method B utilizes the flow rates identified in Table 201-1 and Table 201-2 of the SASD standards and converts the flow to ESD's. The flow rate for middle / junior high schools was utilized. These sites are not anticipated to be high schools.

Table 3-2: School Sewer Flows

School Site	Upstream Node	Method A Area (acres)	Method A Flow (ESD)	Method B Flow (mgd)	Method B Flow (ESD)	Maximum ESD's Utilized
1	SE70	10.2	61.1	0.06	193.5	193.5
2	SE43	9.0	54.0	0.06	193.5	193.5
3	SE61	8.5	50.8	0.06	193.5	193.5

Table 3-3: Sewer Flows by Land Use

	Land Use	Area (acres)	Sewer Flow per Acre (ESD/acre)	Sewer Flow (ESD's)
ER	Estate Residential	62.6	6	375
LDR	Low Density Residential	212.0	6	1,272
MDR	Medium Density Residential	95.2	10	952
HDR	High Density Residential	60.7	20	1,214
MU	Mixed Use	41.3	6	248
COM	Commercial	14.2	6	85
ES	Elementary School	27.7	See footnote 5	581
OFF	Office	279.9	6	1,679
LI/FS	Light Industrial / Flex Space	108.2	6	649
P/OS	Park / Open Space	56.8	6	341
Greenway	Greenway	35.4	6	212
Basin	Basin	49.4	6	296
Drainage	Drainage Channel	1.7	-	-
Channel	Drainage Channel	65.3	-	-
	Right of Way[6]	84.4	-	-
Total		**1,195**		**7,904**

Offsite Sewer Flow

No upstream flows are anticipated to pass through the plan area. Flows generated by SEPA will connect to existing or planned facilities that serve adjacent projects. This study proposes to convey flows through six different points of connection to sewer facilities planned with the Laguna Ridge Specific Plan. One additional connection to the Elk Grove Promenade lift station will also be required to serve the plan area. Onsite sewer flows produced by SEPA will convey via offsite sheds / lift stations identified in **Table 3-4: Onsite Sewer Flows by Conveyance Shed** and shown in **Figure 3-4: Proposed Trunk Sewer Sheds**.

[5] Flow rate for schools determined on a flow rate per school type basis. See **Table 3-2: School Sewer Flows** for additional information.

[6] 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.

Table 3-4: Onsite Sewer Flows by Conveyance Shed

Sewer Shed	Area (acres)	Sewer Flow (ESD's)
To Elk Grove Promenade Lift Station	48.3	289.8
To Laguna Ridge North Lift Station	22.2	133.1
Via Laguna Ridge South Sewer Shed	972.7	7,481.5
Total SEPA Sewer Flows	**1,043.2**	**7,904**

Subsequent level three sewer studies they will provide more detailed analysis and updating of the LRSP sewer study based on known conveyance from SEPA. These updates are not a part of this study and will be required for the LRSP south lift station. Part of the LRSP master sewer plan update should include the permanent location of a planned LRSP lift station that will serve the south portion of Laguna Ridge and SEPA. At time of this study SASD has indicated that an engineering firm is coordinating with them on the level 3 sewer study for the LRSP south area and the permanent Lift Station. It is anticipated that this study will locate the LRSP south lift station and provide conveyance facilities for SEPA flows entering through LRSP.

However, this study does address the total anticipated flows that are to be conveyed via the Laguna Ridge south lift station. As part of this task, SASD provided Wood Rodgers with the shed areas for the Laguna Ridge south sewer shed. The shed as envisioned today by SASD encompasses 355 acres. These flows as provided by SASD are shown in **Table 3-5** below.

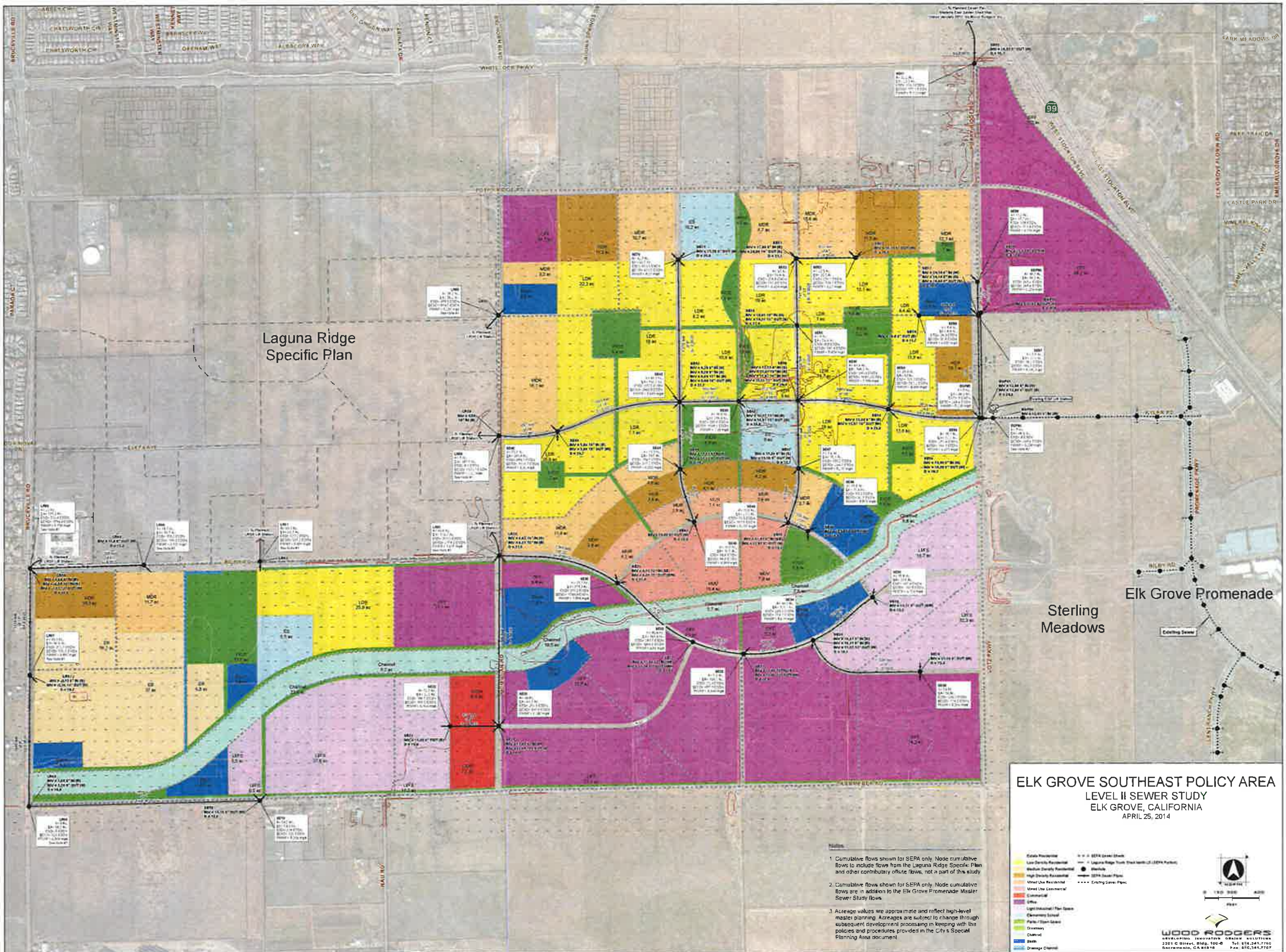
Table 3-5: Laguna Ridge South Sewer Flows
Source: Sacramento Area Sewer District email dated February 7 and February 21, 2014

Planning Area	Land Use	Area (acres)	Sewer Flow per Acre (ESD/acre)	Sewer Flow (ESD's)
LRSP	High Density Residential #1	11.6	20.4	236.6
LRSP	High Density Residential #2	7.9	21.0	165.9
LRSP	All other land uses	315.1	6.0	1,890.6
SEPA	From **Table 3-4**	972.7	varies	7,481.5
Total		**1,307.4**	-	**9,775**

The peak wet weather flows from these areas total 6.7 mgd. The LRSP south sewer lift station should be designed to accommodate these flows either now or in the future with expansion projects. The LRSP south sewer lift station was originally planned to utilize one of the five force mains within Bruceville Road. These force mains convey sewer flows north to Laguna Blvd where they discharge into the Laguna Interceptor and where it will convey to the regional treatment plant. SASD has indicated that these gravity sewer facilities have sufficient capacity to serve LRSP South and SEPA as defined in this study.

Per SASD the existing force mains in Bruceville Road have a current available capacity of 6.5 mgd. There is a dry 12-inch force main that that was installed by the Laguna Ridge Owners Group that was to serve the LRSP south lift station. This existing force main runs from just south of Poppy Ridge Road to the Laguna Interceptor gravity sewer connection in Laguna Boulevard to the north.

The undeveloped areas will generate 6.7 mgd resulting in a need for additional 0.2 mgd in conveyance capacity. This will require an additional 4-inch force main to be installed in Bruceville Rd from the proposed LRSP south sewer lift station to the Laguna Interceptor sewer to accommodate the plan area build out.



ELK GROVE SOUTHEAST POLICY AREA

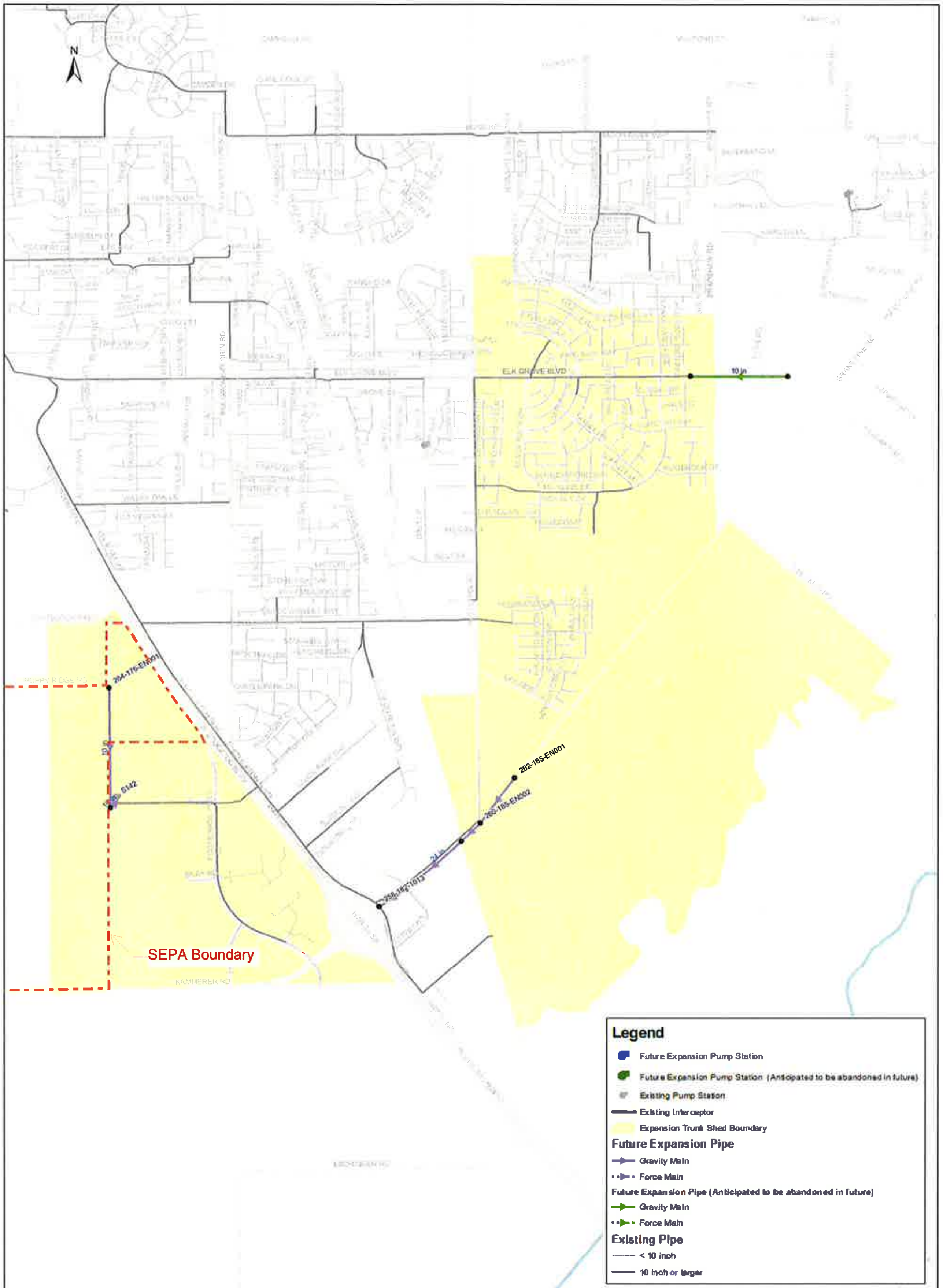
LEVEL II SEWER STUDY
ELK GROVE, CALIFORNIA
APRIL 25, 2014

Notes:

1. Cumulative flows shown for SEPA only. Node cumulative flows to include flows from the Laguna Ridge Specific Plan and other contributory offsite flows, not a part of this study.
2. Cumulative flows shown for SEPA only. Node cumulative flows are in addition to the Elk Grove Promenade Master Sewer Study flows.
3. 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

APPENDIX B



Elk Grove Southeast Policy Area
Level II Sewer Study

March 5, 2014

Figure 3-2

SACRAMENTO AREA SEWER DISTRICT

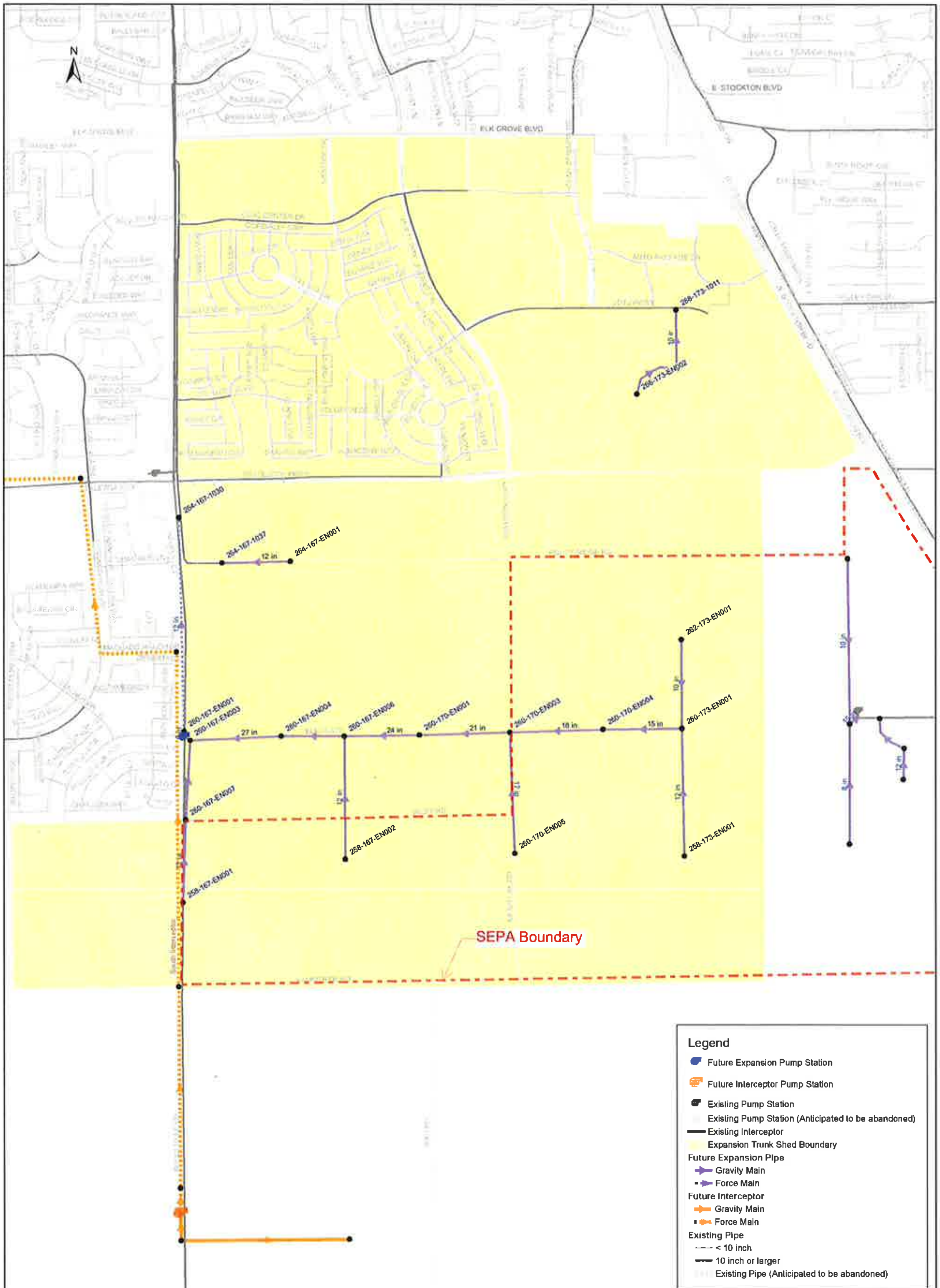
2010 SASD SYSTEM CAPACITY PLAN

LA Elk Grove

Year 2020 Expansion Plan

FIGURE A.14-1

Date last revised: 10/12/2011



Elk Grove Southeast Policy Area
Level II Sewer Study

March 5, 2014

Figure 3-3

SACRAMENTO AREA
SEWER DISTRICT

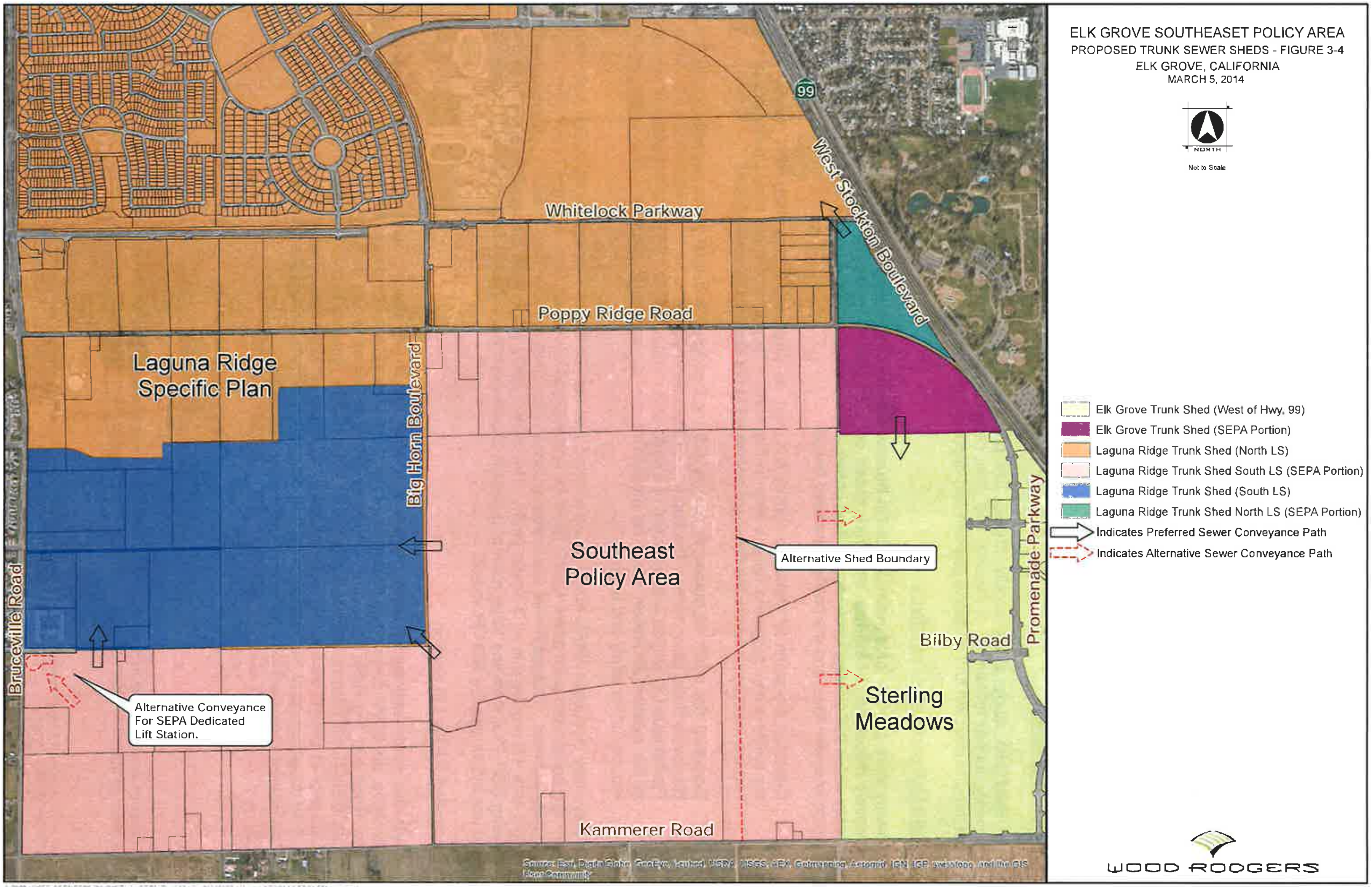
2010 SASD SYSTEM CAPACITY PLAN

LA Laguna Ridge

Buildout Expansion Plan

FIGURE A.15-2

Date last revised:10/12/2011



ELK GROVE SOUTHEASET POLICY AREA
PROPOSED TRUNK SEWER SHEDS - FIGURE 3-4
ELK GROVE, CALIFORNIA
MARCH 5, 2014
NORTH
Not to Scale
Elk Grove Trunk Shed (West of Hwy. 99)
Elk Grove Trunk Shed (SEPA Portion)
Laguna Ridge Trunk Shed (North LS)
Laguna Ridge Trunk Shed South LS (SEPA Portion)
Laguna Ridge Trunk Shed (South LS)
Laguna Ridge Trunk Shed North LS (SEPA Portion)
Indicates Preferred Sewer Conveyance Path
Indicates Alternative Sewer Conveyance Path
WOOD RODGERS
99
West Stockton Boulevard
Whitelock Parkway
Poppy Ridge Road
Laguna Ridge Specific Plan
Big Horn Boulevard
Southeast Policy Area
Alternative Shed Boundary
Bruceville Road
Alternative Conveyance For SEPA Dedicated Lift Station.
Bilby Road
Promenade Parkway
Sterling Meadows
Kammerer Road

4.0 Sewer Alignments and Facilities

Interim Facilities

There are currently no interim facilities proposed with this project. As individual developments move forward with proposals, interim facilities maybe considered and should be evaluated at time of level three sewer study development.

Ultimate Facilities

This level two study schematically shows the proposed trunk and backbone sewer alignments. Ultimately, further refinement of the land use plan, determination of roadway alignments, and additional level three studies will further define position and depth of sewer conveyance facilities.

Offsite Conveyance Alternatives

Currently there are five force mains located in Bruceville Road that convey flows from south to north. As previously discussed, SASD has indicated, based on their internal modeling, that there is 6.5 mgd of capacity within the existing force mains. Two conveyance alternatives have been identified to convey the balance of sewer flows and are briefly discussed below:

- Construct the south lift station to convey 6.7 mgd, as discussed in this study, and convey flows via existing and proposed force mains to the north. These force main would terminate at the Laguna Interceptor where the flows are conveyed to the regional treatment plant.
- Construct the south lift station to convey 6.5 mgd of flows and fully utilize capacity within the Bruceville Road force mains. The balance of flows within SEPA to be conveyed via the Elk Grove Promenade Lift Station with approval of a shed shift through SASD. SASD anticipates the pumps at the existing lift station could be upsized to provide additional capacity. This option would require further study and analysis.

As previously discussed SASD staff has determined that the Elk Grove Promenade lift station and force main are considered permanent SASD facilities and will convey sewer from a larger sewer shed than originally planned. This additional shed area includes office land use identified in SEPA.[7] Development of this area will require a level 3 sewer study. The level 3 study will include the required analysis of the existing EGP lift station and force main and design of conveyance facilities in Lotz Parkway to serve the land use tributary to the EGP lift station.

Dedicated SEPA Lift Station

While this study anticipates connection to the LRSP south lift station, currently in design, as an alternative, the SEPA flows could be directed to a SEPA lift station, located near the future intersection of Bilby Road and Big Horn Boulevard. Flows from this lift station would then run through a force main along Bilby Road west of Bruceville Road. This alternative requires further analysis and support from SASD prior to design, as it would result in additional SASD infrastructure. The intent of this alternative is to allow development of SEPA independent of outside constraints, should the LRSP south lift station not move forward consistent with the development goals of the City.

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[7] This shed area does not include areas that would be conveyed via the EGP lift station in order to reduce flows from the south lift station to within existing capacity of the Bruceville Road force mains.

5.0 Conclusion

This study has been prepared in accordance with SASD design guidelines to identify backbone conveyance facilities to serve the Elk Grove Southeast Policy Area. The study has been prepared as a level two study. **Appendix B: Level II Sewer Study** identifies the required backbone infrastructure through the plan area.

Interim facilities are not proposed with this study. Subsequent level three sewer studies may identify interim facilities as necessary for the conveyance of flow from specific developments.

The total acreage of the project is 1,195 acres and conveys 7,904 ESD's. This equates to a total of 2.5 mgd and 5.4 mgd during average dry weather flow and peak wet weather flow, respectively.

Appendix A
Demand & Hydraulic Calculation Table

Appendix A - Demand and Hydraulic Calculation Table

Wood Rodgers, Inc.
M. Motroni
3/5/2014

Elk Grove Southeast Policy Area

Level II Trunk Sewer Study - Demand & Hydraulic Calculation Table

Updated: *2/26/2014*

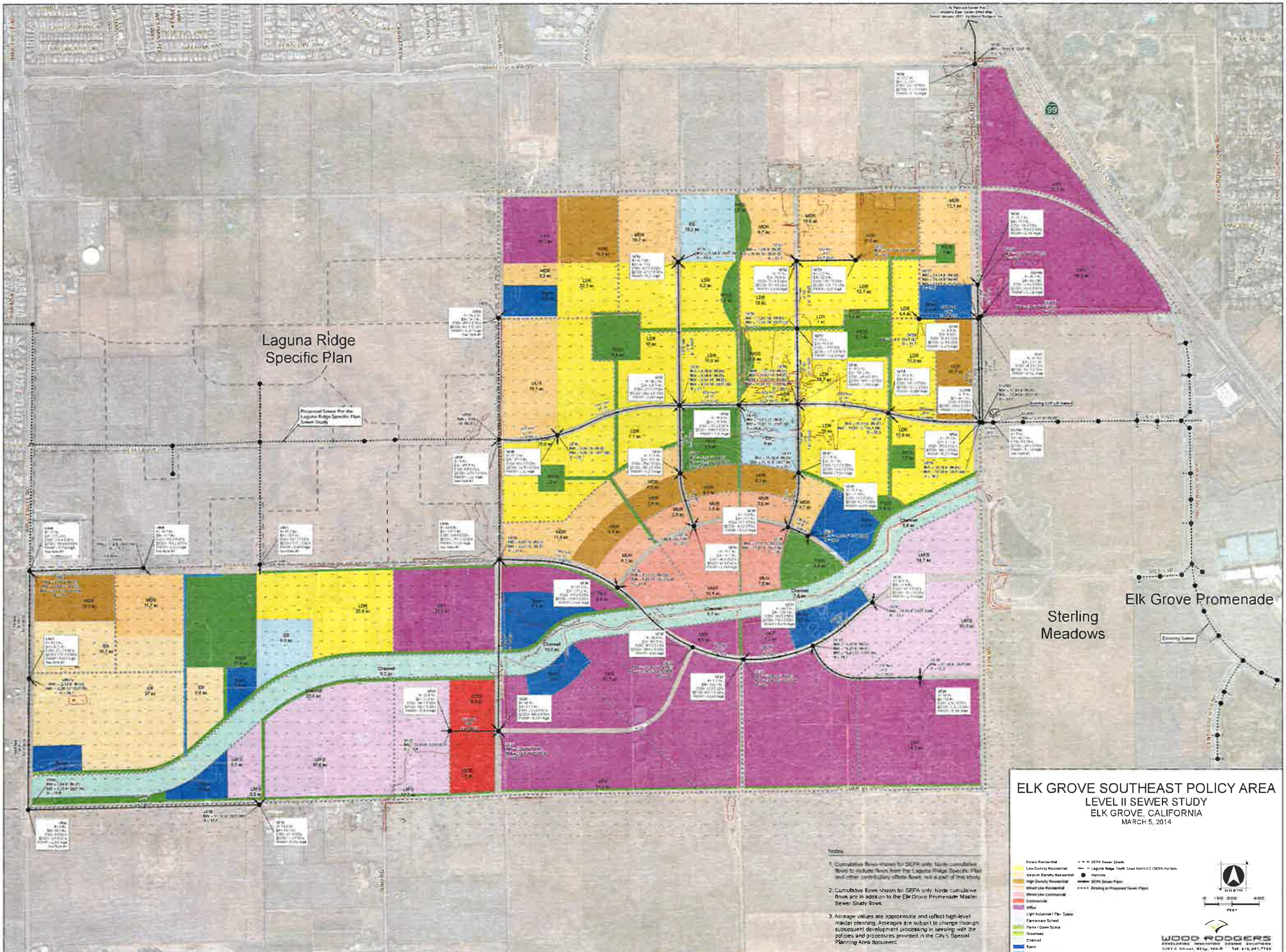
Upstream Node #	Down stream Node #	Estate Residential (acres)	Estate Residential (ESD)	Low Density Residential (acres)	Low Density Residential (ESD)	Medium Density Residential (acres)	Medium Density Residential (ESD)	High Density Residential (acres)	High Density Residential (ESD)	Office (acres)	Office (ESD)	Commerical (acres)	Commerical (ESD)	Light Industrial / Flex Space (acres)	Light Industrial / Flex Space (ESD)	Mixed Use (acres)	Mixed Use (ESD)	Elementary School (acres)	Elementary School (ESD)	Public / Open Space / Rec (acres)	Public / Open Space / Rec (ESD)	Greenway (acres)	Greenway (ESD)	Basin (acres)	Basin (ESD)	Total Shed (acres)	Total Shed (ESD)	Culmulative Sheds (acres)	Culmulative Sheds (ESD)	Average Flows, Q: Q_{ave} (mgd)	Average Flows, Q: Peaking Factor	Infiltration $Q_{I/I}$ (mgd)	Peak Flows, Q_P: Q_{PDWF} (mgd)	Peak Flows, Q_P: Q_{PWWF} (mgd)	Required Pipe Diameter (inch)	Required Pipe Slope (ft/ft)	Required Pipe Velocity (fps)
SE60			0.0		0.0		0.0		0.0	22.2	133.1		0.0		0.0		0.0		0.0		0.0		0.0		0.0	22.2	133.1	22.2	133.1	0.041	1.965	0.031	0.081	0.112	8"	0.0035	1.69
LR55			0.0	8.9	53.6	3.3	33.1	11.3	225.8	10.1	60.4		0.0		0.0		0.0		0.0		0.0		0.0	4.6	27.5	38.2	400.5	38.2	400.5	0.124	1.878	0.053	0.233	0.287			
LR56			0.0		0.0		0.0		0.0	31.5	188.7		0.0		0.0		0.0		0.0		0.0	4.0	24.2	9.4	56.2	44.8	269.0	339.7	2159.2	0.669	1.736	0.476	1.162	1.637			
SE20	LR56		0.0		0.0		0.0		0.0	42.0	251.8		0.0		0.0		0.0		0.0		0.0	2.0	11.9	5.0	30.2	49.0	293.9	81.7	490.4	0.152	1.862	0.114	0.283	0.397	10"	0.0025	2.07
SE22	SE20		0.0		0.0		0.0		0.0		0.0	14.2	85.1	17.7	105.9		0.0		0.0		0.0	0.9	5.5		0.0	32.7	196.5	32.7	196.5	0.061	1.935	0.046	0.118	0.164	8"	0.0035	1.88
SE30	LR56		0.0		0.0	11.4	114.0	5.4	107.6		0.0		0.0		0.0	13.9	83.2		0.0		0.0	1.1	6.5		0.0	31.7	311.2	213.2	1399.9	0.434	1.774	0.298	0.770	1.068	15"	0.0015	2.17
SE32	SE30		0.0		0.0		0.0		0.0	46.5	278.8		0.0		0.0		0.0		0.0		0.0	0.5	2.7		0.0	46.9	281.5	181.4	1088.6	0.337	1.795	0.254	0.606	0.860	12"	0.0020	2.27
SE33	SE32		0.0		0.0		0.0		0.0	5.2	31.2		0.0		0.0		0.0		0.0		0.0	0.2	1.2		0.0	5.4	32.4	134.5	807.1	0.250	1.820	0.188	0.455	0.644	12"	0.0020	2.13
SE34	SE33		0.0		0.0		0.0		0.0	37.1	222.6		0.0		0.0		0.0		0.0		0.0	0.7	4.3	6.4	38.6	44.3	265.5	129.1	774.7	0.240	1.824	0.181	0.438	0.619	12"	0.0020	2.12
SE36	SE34		0.0		0.0		0.0		0.0		0.0		0.0	30.8	185.0		0.0		0.0		0.0		0.0		0.0	30.8	185.0	30.8	185.0	0.057	1.940	0.043	0.111	0.154	8"	0.0035	1.83
SE38	SE34		0.0		0.0		0.0		0.0	37.1	222.6		0.0	16.2	97.0		0.0		0.0		0.0	0.8	4.6		0.0	54.0	324.2	54.0	324.2	0.101	1.895	0.076	0.190	0.266	8"	0.0035	2.12
LR58			0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	0.0	0.0	391.9	3370.1	1.045	1.696	0.549	1.772	2.321			
SE40	LR58		0.0	34.7	208.4	18.1	180.5		0.0		0.0		0.0		0.0		0.0		0.0	2.0	12.0	0.5	3.2		0.0	55.3	404.1	391.9	3370.1	1.045	1.696	0.549	1.772	2.321	18"	0.0012	2.34
SE42	SE40		0.0	27.9	167.4		0.0		0.0		0.0		0.0		0.0		0.0		0.0	15.4	92.3	3.0	17.7		0.0	46.2	277.5	336.5	2966.0	0.919	1.708	0.471	1.570	2.041	18"	0.0012	2.32
SE70	SE42		0.0	17.7	106.1	10.7	106.8		0.0		0.0		0.0		0.0		0.0	10.2	193.5	1.8	11.0	2.3	14.1		0.0	42.7	431.5	42.7	431.5	0.134	1.872	0.060	0.250	0.310	8"	0.0035	2.20
SE43	SE42		0.0	9.0	54.1		0.0		0.0		0.0		0.0		0.0		0.0	9.0	193.5	1.8	11.0		0.0		0.0	19.9	258.6	218.0	1949.8	0.604	1.745	0.305	1.055	1.360	15"	0.0015	2.28
SE44	SE42		0.0		0.0	4.9	49.2	7.9	157.6		0.0		0.0		0.0		0.0		0.0		0.0	0.3	1.7		0.0	13.1	208.5	29.5	307.2	0.095	1.900	0.041	0.181	0.222	8"	0.0035	2.02
SE45	SE44		0.0		0.0		0.0		0.0		0.0		0.0		0.0	16.0	96.0		0.0		0.0	0.5	2.8		0.0	16.5	98.8	16.5	98.8	0.031	1.988	0.023	0.061	0.084	8"	0.0035	1.55
SE46	SE43		0.0	33.7	202.1		0.0		0.0		0.0		0.0		0.0		0.0		0.0	6.6	39.8	1.3	7.6		0.0	41.6	249.4	198.2	1691.2	0.524	1.757	0.277	0.921	1.199	15"	0.0015	2.24
SE47	SE46		0.0		0.0	3.7	36.5	4.2	83.8		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	7.8	120.3	35.1	284.1	0.088	1.906	0.049	0.168	0.217	8"	0.0035	2.03
SE48	SE47		0.0		0.0		0.0		0.0		0.0		0.0		0.0	11.5	68.8		0.0		0.0	0.5	2.7		0.0	11.9	71.5	27.3	163.8	0.051	1.949	0.038	0.099	0.137	8"	0.0035	1.78
SE49	SE48		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	5.9	35.6	1.2	7.3	8.2	49.4	15.4	92.3	15.4	92.3	0.029	1.993	0.022	0.057	0.079	8"	0.0035	1.52
SE50	SE46		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	0.0	0.0	59.4	595.4	0.185	1.846	0.083	0.341	0.424	10"	0.0025	2.09
SE52	SE50		0.0	24.0	144.2	8.7	87.2		0.0		0.0		0.0		0.0		0.0		0.0	2.8	16.6	1.5	8.8		0.0	37.0	256.8	59.4	595.4	0.185	1.846	0.083	0.341	0.424	10"	0.0025	2.09
SE53	SE52		0.0		0.0	10.6	106.2	11.5	230.6		0.0		0.0		0.0		0.0		0.0		0.0	0.3	1.9		0.0	22.5	338.7	22.5	338.7	0.105	1.892	0.031	0.199	0.230	8"	0.0035	2.04
SE54	SE46		0.0	25.7	154.4		0.0		0.0		0.0		0.0		0.0		0.0		0.0	1.5	8.9	2.1	12.8		0.0	29.4	176.1	62.0	562.2	0.174	1.851	0.087	0.323	0.409	10"	0.0025	2.08
SE56	SE54		0.0		0.0		0.0	10.1	202.4		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	10.1	202.4	32.7	386.1	0.120	1.881	0.046	0.225	0.271	8"	0.0035	2.13
SE57	SE56		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	4.9	29.3	4.9	29.3	22.5	183.7	0.057	1.940	0.032	0.110	0.142	8"	0.0035	1.81
SE58	SE57		0.0		0.0	12.1	120.9		0.0		0.0		0.0		0.0		0.0		0.0	1.0	6.1	0.2	1.0		0.0	13.3	128.0	17.7	154.4	0.048	1.954	0.025	0.094	0.118	8"	0.0035	1.71
SE59	SE57		0.0	4.4	26.4		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	4.4	26.4	4.4	26.4	0.008	2.084	0.006	0.017	0.023	8"	0.0035	1.09
LR61		6.8	41.0	25.9	155.2		0.0		0.0		0.0		0.0		0.0		0.0	8.5	193.5	17.9	107.6	3.7	22.5	2.9	17.3	65.7	537.2	65.7	537.2	0.167	1.854	0.092	0.309	0.401			
LR69		11.7	70.2		0.0		0.0	10.3	206.2		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	22.0	276.4	137.2	1014.4	0.314	1.801	0.192	0.566	0.759	12"	0.0020	2.21
LR68	LR69	7.0	42.0		0.0	11.7	117.3		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	18.7	159.3	18.7	159.3	0.049	1.951	0.026	0.096	0.123	8"	0.0035	1.74
LR67	LR69	37.0	222.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	1.6	9.4	3.6	21.3	42.1	252.7	96.5	578.7	0.179	1.848	0.135	0.332	0.467	10"	0.0025	2.14
LR66	LR67		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	0.0	0.0	54.3	326.0	0.101	1.895	0.076	0.192	0.268	8"	0.0035	2.13
SE10	LR66		0.0		0.0		0.0		0.0		0.0		0.0	43.6	261.4		0.0		0.0		0.0	6.4	38.2	4.4	26.5	54.3	326.0	54.3	326.0	0.101	1.895	0.076	0.192	0.268	8"	0.0035	2.13
EGP80																									0.0	0.0	0.0	48.3	289.8	0.090	1.904	0.068	0.171	0.239			
EGP85	EGP80																								0.0	0.0	0.0	48.3	289.8	0.090	1.904	0.068	0.171	0.239	8"	0.0035	2.06
EGP90	EGP85				0.0		0.0			48.3	289.8		0.0		0.0		0.0		0.0		0.0		0.0		0.0	48.3	289.8	48.3	289.8	0.090	1.904	0.068	0.171	0.239	8"	0.0035	2.06
Σ Area		62.5		212.0		95.2		60.7		279.8		14.2		108.2		41.3		27.7		56.8		35.4		49.4		1043.2											
Σ ESD's			375		1272		952		1214		1679		85		649		248		581		341		212		296		7904.4	1043.2	7904.4	2.450	1.618	1.460	3.963	5.424			

Notes:

1. Table based on land use plan provided by the City of Elk Grove 9/10/2013.
2. Node data applies to pipes downstream of subject node.
3. School ESD's cacluated based on type of school not ESD's/acre. Assumed to be Middle Schools.

J:\2000-s\2956_SEPA\SEPA-OA\Civil\Studies\Sewer\Worksheets\SEPA Sewer Study 2014-2-26.xlsx

Appendix B
Level II Sewer Study Exhibit

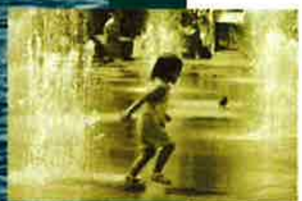

Laguna Ridge
Specific Plan
Elk Grove Promenade
Sterling
Meadows
Existing Sewer
ELK GROVE SOUTHEAST POLICY AREA
LEVEL II SEWER STUDY
ELK GROVE, CALIFORNIA
MARCH 5, 2014
Notes
2 Cumulative flows shown for SEPA only. Node cumulative flows are in addition to the Elk Grove Promenade Master Sewer Study flows.
3 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.
Estate Residential
Low Density Residential
Medium Density Residential
Light Industrial / Flex Space
Elementary School
Parks / Open Space
Greenway
Channel
Basin
Drainage Channel
SEPA Sewer Sheds
Laguna Ridge Trunk Shed North LS (SEPA Portion)
Manhole
NORTH
FEET
WOOD RODGERS

APPENDIX B

Appendix C
Electronic GIS Files

EXHIBIT G

Southeast Policy Area Drainage Study



Prepared for

City of Elk Grove

January 2014

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448-00-12-03

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Southeast Policy Area
Drainage Study

Prepared for

City of Elk Grove

January 2014

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ELK GROVE

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1.0 INTRODUCTION

The Southeast Policy Area (SEPA) in the City of Elk Grove (City) covers approximately 1,200 acres at the southwest corner of the City and is the largest remaining new development area in the City (see Figure 1). The SEPA is also referred to as the Meridian Community Plan Area. Previous drainage planning for this area is described in Chapter 15 of the City of Elk Grove Storm Drainage Master Plan (SDMP) Volume II (June 2011), which was prepared by West Yost Associates (West Yost). The SDMP envisions that a multi-functional drainage corridor will be created to serve the SEPA at buildout. The corridor will provide multiple benefits including flood control, wildlife habitat, wetlands, recreation, and stormwater quality treatment.

The drainage concept plan in the SDMP defines an approximate configuration, alignment, and size for the future drainage channel that will serve the area, and defines approximate locations and sizes of required detention basins to mitigate for increased runoff due to development. The sizing of these facilities was based on runoff rates generated from assumed future land use data based on the available information at that time. Since then, a more comprehensive planning effort has been completed and a new land-use plan has been developed for the SEPA. Using the latest land-use planning information, West Yost has prepared this updated drainage study for the SEPA and this report provides a description of the updated analysis.

2.0 WATERSHED DESCRIPTION

The SEPA lies within Drainage Shed C, which covers nearly 7,900 acres in southern Sacramento County (see Figure 1). Of that total, approximately 2,100 acres lie within the City. The watershed generally slopes from east to west with an average slope of about 0.10 percent. The existing land use within the watershed is agricultural with the exception of the Elk Grove Promenade site, which covers 525 acres in the upstream (eastern) portion of the watershed. Although the Promenade project stalled before completion, many of the site improvements were constructed including roads, parking lots, buildings, and underground utilities including a storm drainage pipe system. The pipe system that collects runoff from the Promenade site delivers it to a detention basin that was constructed on the west side of the future Sterling Meadows project.

Downstream of the existing detention basin, runoff is conveyed through the SEPA in an agricultural drainage channel, which is referred to as the Shed C Channel in this report. The Shed C Channel begins near the western boundary of the future Sterling Meadows project and conveys runoff to the southwest for approximately 12,600 feet until it reaches Bruceville Road. At that point, the channel exits the City and continues west for approximately 22,000 feet where it crosses under Interstate 5 and enters the Stone Lakes National Wildlife Refuge.

3.0 DRAINAGE PLAN CONCEPT

As development occurs in Shed C, drainage system improvements will be required to provide flood protection and mitigation, stormwater quality treatment, and hydromodification mitigation. The preliminary drainage plan included in the SDMP for Shed C was developed with input from the Expert Advisory Committee (EAC) that was formed by the City to help guide the development of the SDMP. The drainage concept for Shed C was developed with consideration of the guiding principles that were developed by the EAC for the drainage SDMP:

1. Stormwater management systems shall be designed to take maximum advantage of the natural hydrological processes of the existing landscape.
2. Alternative stormwater management approaches shall be adopted, wherever and whenever feasible, to complement approaches to traditional stormwater management systems. Alternative approaches may include distributed systems (e.g. low impact development systems), flow duration control basins, and/or instream rehabilitation.
3. Design of stormwater management projects shall balance considerations related to environmental effects, capital and operating costs, property rights, economic development impacts, and recreational opportunities without compromising public safety and/or property protection.
4. Stormwater management systems shall be designed so that the volume, quality, and timing of downstream discharges will minimize impacts to downstream resources, such as the Stone Lakes National Wildlife Refuge.
5. The SDMP shall comply with applicable local, state, and federal laws and regulations.

With these guiding principles in mind, the drainage concept for Shed C includes a multi-functional drainage corridor that will create and enhance the natural stream and habitat values. The multi-functional corridor will include a low flow channel that is stable and self-sustaining and will be designed based on natural processes. The low flow channel will meander within a larger floodplain corridor that will provide flood storage and conveyance as well as an opportunity for the creation of wetlands habitat. Although not specifically defined in this plan, it is anticipated that the corridor will also include an access path that will provide recreational and educational opportunities for the City's residents.

Additional key components of the drainage concept are detention basins that will be included at major inflow points to the drainage corridor. These detention basins will provide flood storage and flow duration control to mitigate for potential flood flow increases and hydromodification effects due to the proposed urban development in the watershed. They will also provide stormwater quality treatment and will provide an opportunity for wetlands creation.

4.0 ANALYSIS APPROACH

As shown on Figure 1, the SEPA lies within the Shed C watershed. The drainage plan for the SEPA must reflect the needs of the entire Shed C watershed. Therefore, the drainage analysis for the SEPA included an analysis of the entire Shed C watershed with a focus on the area located within the City. The Shed C analysis consisted of two major components: 1) a continuous hydrologic analysis; and 2) an event based analysis as described below.

4.1 Continuous Hydrologic Analysis

An important consideration in the Shed C analysis is the potential hydromodification effects of development in the watershed. Hydromodification is the change in runoff characteristics within a watershed caused by land use changes. These altered runoff characteristics can result in increased erosion and sedimentation, degradation of stream habitat, increased flood flows, and other negative impacts. Research has shown that a large percentage of the sediment transport and erosion in a stream system occurs at flow rates less than generated by the 2-year storm (Geosyntec, 2007).

Because of this, traditional hydrologic analyses that focus on individual design storms (e.g. 2-year, 10-year, etc.) are not suitable for hydromodification analyses. To insure that the cumulative effects of all potentially erosive flows are considered, a continuous hydrologic model is required. For the SDMP, a continuous hydrologic simulation was performed using the Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS) software. The model was used to evaluate the long-term rainfall-runoff response for the Shed C watershed for two land-use conditions:

- Base Conditions – this represents existing land-use conditions within the watershed plus proposed projects that already have approved tentative maps. Projects with approved tentative maps will not be required to include hydromodification mitigation. Therefore, these projects were included in the base conditions modeling to provide a reasonable starting point that could be used to assess the potential impacts of development of the SEPA.
- Buildout Conditions – this represents full buildout of City land within Shed C. The results from buildout conditions were compared against those for base conditions to assess the performance of the drainage facilities proposed for hydromodification mitigation.

4.2 Event Based Analysis

A traditional event based analysis was also performed to assess the flood control performance of the proposed system. Single event hydrologic and hydraulic models were prepared for the 10-year and 100-year storms for both pre-development conditions and for mitigated buildout conditions. The results were used to confirm that the ultimate improvements will adequately mitigate for potential impacts to flood flows and to confirm the required size of the flood control channel.

5.0 CONTINUOUS SIMULATION MODEL – BASE CONDITIONS

A continuous simulation model was developed for base conditions using HEC-HMS. The model input data is described below.

5.1 Watershed Boundaries

For the hydrologic modeling, Shed C was divided into the subsheds shown on Figure 2. Watershed areas and other model parameters are listed in Table 1, which can be found at the end of the report text along with the other tables and figures. Note that for the continuous simulation modeling, not all of the subsheds shown on Figure 2 and listed in Table 1 were included in the model. Because of the long model run times and large output files, only the subsheds within, and immediately downstream (west), of the City limits at Bruceville Road were included in the continuous simulation model. This was reasonable because the proposed facilities for the SEPA will be designed to mitigate for potential drainage impacts at the City boundary at Bruceville Road.

5.2 Land Use

For base conditions, the majority of the watershed was assumed to be undeveloped agricultural land. However, there are some exceptions including the Elk Grove Promenade and Sterling Meadows properties at the upstream end of Shed C (Subsheds A1 and A2 on Figure 2). The Promenade project was previously approved by the City and the site improvements were largely completed prior to the project being stalled due to the recent economic recession. The project construction included a large detention basin to serve both the Promenade and Sterling Meadows sites. The Sterling Meadows project has an approved tentative map. Therefore, for the base condition model, full buildout was assumed for the Promenade and Sterling Meadows projects and the existing detention basin that serves these sites was also included.

The other exception is the Laguna Ridge Specific Plan (LRSP) area. Tentative maps and drainage studies have already been approved for the projects within that specific plan. The development of that area will include construction of a detention basin for stormwater quality treatment and flood control and will also include a constructed channel that will convey flows from the project area to the Shed C Channel. Because the proposed drainage approach has already been approved, buildout conditions were assumed for the LRSP area.

5.3 Unit Hydrographs

Unit hydrographs for the continuous simulation model were developed by creating SacCalc models based on the Sacramento City/County Drainage Manual, which has been adopted for use in Elk Grove. These unit hydrographs created with SacCalc were imported into HEC-HMS. The input parameters for the calculation of unit hydrographs in SacCalc are presented in Table 1.

5.4 Precipitation Data

For the continuous simulation analysis, 53 years of hourly precipitation for water years 1957 through 2009 was obtained from various gages in the area as summarized in Table 2. To better represent precipitation in Elk Grove, the rainfall data from the Sacramento Post Office gage was adjusted using a ratio of the average annual rainfall between the Post Office and Elk Grove rain gages. Based on this approach, a factor of 0.94 was applied to the Sacramento Post Office hourly rainfall values.

5.5 Soil Moisture Accounting Parameters

The rainfall loss method was used for this study was the Soil Moisture Accounting method, which was incorporated into HEC-HMS specifically for continuous simulations. This method allows for a continuous accounting of rainfall losses including evapotranspiration, surface storage, infiltration, and interflow. Ideally, the model parameters assigned to represent the various processes would be determined from a calibration analysis based on measured stream flow data. Unfortunately, stream flow records for the Shed C watershed are not available. Therefore, the model input from a calibrated HEC-HMS model for Laguna Creek was used to guide the input choices for this study. The Laguna Creek model was prepared by Geosyntec (Geosyntec, 2007) and the information developed for that study was applied to this one. The soils types within the Shed C watershed were determined using the latest soil survey data from the Natural Resources Conservation Service. Subsheds in the Laguna Creek model with the same soil types as those within Shed C were identified and the Soil Moisture Accounting parameters those subsheds were applied to the Shed C model. Table 3 presents the values used for this study.

6.0 CONTINUOUS SIMULATION MODEL – BUILDOUT CONDITIONS

For buildout conditions, the continuous simulation model parameters were updated to represent full buildout within the City limits. The specific buildout assumptions for the continuous simulation model are discussed below.

6.1 Watershed Boundaries

Subshed boundaries within the City for buildout conditions are shown on Figure 3. The SEPA was divided into nine subsheds (S1a through S8), each of which will drain directly into a detention basin. Watershed boundaries outside of the SEPA were unchanged from base conditions.

6.2 Land Use

For the buildout conditions model, the base conditions model was updated to include full buildout within the SEPA based on the land use plan shown on Figure 4. The other areas within the City were already assumed to be developed for base conditions. Subsheds outside of the City limits were assumed to be unchanged from existing conditions. Table 1 presents the land-use assumed for each subshed for both base and buildout conditions. The assumed imperviousness associated with each land-use type is listed in the table.

6.3 Unit Hydrographs

Unit hydrographs were calculated using a SacCalc model representing buildout conditions. The input parameters for the calculation of unit hydrographs in SacCalc for buildout conditions are presented in Table 1.

6.4 Detention Basins

Detention basins are proposed at inflow points to the drainage corridor. These nine detention basins will provide runoff storage volume that will mitigate for potential increases in peak flood flows and will provide flow duration control to mitigate for the potential hydromodification effects. The basins will also provide stormwater quality treatment and the opportunity to create wetlands to mitigate for potential impacts to existing wetland features in the watershed. The general locations of the detention basins are shown in Figure 4.

For stormwater quality treatment purposes, the detention basins were assumed to be configured as Constructed Wetland Basins per the Sacramento Stormwater Quality Manual (Sacramento Stormwater Quality Partnership, 2007). This configuration assumes that each basin will include a permanent pool of water and will include four zones: a forebay, an open water zone, a wetland zone with aquatic plants, and an outlet zone. An area above the permanent pool will be provided to detain the stormwater quality treatment volume and slowly release it after a storm. Additional storage volume is provided above what is required for stormwater quality treatment to mitigate hydromodification and flood control impacts. A typical detention basin layout is presented on Figure 5.

Wetland detention basins can be community amenities that provide multiple benefits including wildlife habitat, stormwater quality treatment, flood control, and flow duration control. Along with these benefits comes a higher level of maintenance to insure proper function and also the need to provide a supplemental water supply to maintain the permanent pool. It may not be necessary, or desirable, to configure each detention basin as a constructed wetland area. The wetland area required to mitigate for impacts will be determined after a more detailed biological study is performed that defines the existing habitat in the watershed and after discussions with the appropriate permitting agencies are held and the mitigation requirements are determined. At that time, a more informed decision can be made on the exact configuration of each of the proposed detention basins.

The storage volumes required for flood and hydromodification control were determined through a series of model runs using the continuous simulation hydrologic model. Combinations of detention basin volumes and outlet configurations were iteratively tested with the model until the desired results were achieved. The outlets were assumed to consist of a riser pipe with a round orifice at the bottom for low flows and a notch at the top of the riser for larger flows. During large storm events that exceed the design event (100-year) excess flow can spill over the top of the riser. An emergency outlet weir will also be provided in the embankment between the basin and the channel in case the riser becomes plugged. The configuration of the outlet is shown on Figure 5. Tables 4 through 12 provide summaries of the detention basin volumes and outlet sizes. More discussion of the results from the modeling and the effectiveness of the detention basins in providing mitigation is presented later in this report.

For this study, it is assumed that all runoff from developed areas will be directed into a detention basin. As refined drainage and grading studies are prepared with proposed projects in the watersheds, if it is found that runoff from some small, isolated areas cannot be feasibly directed to a detention basin, some direct discharge of runoff into the channel may be allowed. In such cases, separate stormwater quality treatment facilities will be necessary and a detailed study will be required that demonstrates the overall flood control and hydromodification goals for the watershed are still met.

6.5 Stable Channel Design

The existing Shed C Channel is essentially a man-made agricultural ditch that has been highly altered from its natural form. Its original alignment has been straightened and it has numerous 90 degree bends. The channel side slopes are uniform and steep and vegetation has been removed from many reaches. It is desired to create a more naturalized multi-functional channel corridor that will include a low flow channel designed to be stable based on the anticipated flow regime and natural processes. The low flow channel will meander within a larger floodplain corridor that will provide flood storage and conveyance, wetlands habitat, and passive recreation opportunities. The sizing of the channel involved the following steps:

- Develop an alignment for the channel.
- Determine the channel forming discharge and low flow geometry.
- Determine the channel meander dimensions.
- Check to insure that the geometry provides adequate flood conveyance capacity.

6.5.1 Channel Alignment

A channel alignment was developed in consultation with the City during development of the land plan by the City. The proposed channel alignment generally follows the existing channel alignment but provides a more natural, meandering path that eliminates the sharp bends. The channel ties into the fixed points at the upstream end near the existing detention basin and at the downstream end at Bruceville Road. The proposed alignment is shown on Figure 4.

6.5.2 Channel Forming Discharge

The channel forming discharge is the flow rate that is most effective in shaping a stream channel. The channel forming discharge was estimated using the effective work method, which provides a way to estimate the flow magnitude associated with the maximum potential erosion over a long period. First, a histogram was used to create a flow frequency distribution of hourly peak flows (in 10 cfs intervals) from the continuous simulation model results. The potential erosion was determined using the Andrew Simon's effective work equation for consolidated materials:

$$W = \sum_{i=1}^{n} k(\tau_i - \tau_c)^{1.5} \Delta t$$

Where:

W = the total work performed in dimensionless units

k = erodibility coefficient

τ_i = the applied hydraulic shear stress, lbs/sf

τ_c = the critical shear stress that initiates erosion, lbs/sf

The value k was ignored (or assumed to be 1.0) because it is the same for base conditions and buildout conditions and does not affect the results. The applied shear stress was based on the following equation:

$$\tau_i = \gamma DS$$

Where:

γ = the unit weight of water (62.4 lbs/sf)

D = the depth of flow, ft

S = the slope of the channel, ft/ft

The critical shear stress was determined based on Figure 3-1 from Guidance Manual for Design of Multi-Functional Drainage Corridors, County of Sacramento, 2003. That figure is provided as Figure 6. Based on that information, the critical shear stress was estimated to be 0.10 lbs/sf, which is an appropriate value for fairly compact to loose clay soil.

To perform the work calculations, it was necessary to make an initial estimate of the channel forming flow and channel geometry. The channel forming flow was first estimated by determining the flow-frequency relationship in the channel for mitigated buildout conditions. Channel forming discharges typically vary between a 1-year to 2-year event, with a 1.5-year event being a reasonable average (Leopold, 1964). Therefore, the 1.5-year event was used as a starting point to estimate the channel forming discharge.

Using the estimated channel forming discharge, the average width and depth of the low flow channel was determined using the Manning's Equation:

$$d = \left[\frac{Q \times n}{1.49(W / D)\sqrt{S}} \right]^{3/8}$$

Where:

d = the average depth of the low flow channel, ft

Q = the channel forming discharge, cfs

n = Manning's roughness coefficient

W/D = the width the depth ratio of the low flow channel

S = the slope of the channel, ft/ft

To use the equation it is necessary to estimate the width to depth ratio (W/D) for the channel. This ratio is dependent on the ability of the channel to resist erosion, which is a function of soil characteristics and vegetation. Measurements of width to depth ratios for existing creeks in the Sacramento area were performed by Zentner and Zentner and are published in the Guidance Manual for Design of Multi-Functional Drainage Corridors, County of Sacramento, 2003. Laguna Creek near Bradshaw Road, which has the same soil type as those along the Shed C Channel, had a measured W/D ratio between 12 and 14. Therefore, a W/D ratio of 12 was selected for the Shed C Channel.

Using the initial channel dimensions, the effective work method was applied and the channel forming discharge was calculated. If the calculated discharge was different than the original estimate, the new value was used to re-size the channel and the process continued iteratively until the flow value used to size the channel matched the channel forming flow calculated by the effective work method. The reasonableness of the channel forming flow was then checked against the flood frequency curve.

Using the process described above, the preliminary channel forming discharge and low flow channel geometry was determined for four reaches along the channel. The reaches are shown on Figure 4 and are described below.

- Reach 1 – From Lotz Parkway to the outfall from Detention Basin S1a.
- Reach 2 – From the outfall from Detention Basin S1a to extension of Big Horn Boulevard.

- Reach 3 – From the extension of Big Horn Boulevard. to the confluence with the channel from the LRSP area.
- Reach 4 – From the confluence with the LRSP channel to Bruceville Road.

Figures 7 through 10 present the results from the effective work method for the four reaches. As shown on Figure 7, in Reach 1 the large majority of peak flows over the 53 year period of record are 55 cfs or less. However, flows in that range are too small to produce shear stresses above the critical shear stress and therefore those flows do not perform work (i.e. cause erosion) on the channel. It appears the flow rate that produces the most work over the modeled period is approximately 85 cfs. Therefore 85 cfs is selected as the channel forming discharge for Reach 1. The results for Reaches 2, 3, and 4 are shown on Figures 8, 9, and 10, respectively. As shown on those figures, the channel forming discharge is approximately 125 cfs for Reach 2, 115 cfs for Reach 3, and 265 cfs for Reach 4. Figure 11 presents the flow frequency curves for the four reaches. As can be seen on that figure, the return periods of the channel forming flows for the four reaches vary between 0.9 and 2.2 years, which is very close to the 1 to 2 year range that is considered typical.

Using these flows along with Manning's equation and the assumed width to depth ratio as discussed above, the average dimensions of the low flow channel were calculated using a Manning's n of 0.04 and a slope of 0.0001 feet per foot for Reaches 1, 2, and 3 and 0.0006 feet per foot for Reach 4. Because the equation provides the average dimensions based on a rectangular channel, the resultant dimensions were converted to an equivalent trapezoidal shape based on a side slope of 3 to 1 (horizontal to vertical). Table 13 presents an initial estimate of the low flow channel dimensions for each reach.

6.5.3 Channel Meander Dimensions

After determining average low flow channel sizes, the meander dimensions can be estimated. The meander dimensions are based on equations developed from empirical observations. The meander dimensions were estimated using the equations presented in the Stream Corridor Restoration, Principles, Processes, and Practices, Federal Interagency Stream Restoration Group, USDA, 2001. These equations are as follows:

$$B = 3.7w^{1.12}$$

$$M_L = 4.4w^{1.12}$$

$$L = 6.5w^{1.12}$$

$$r_c = 1.3w^{1.12}$$

The variables in the above equations are shown in Figure 12. For this study, because detailed channel design was not performed, the main variable of interest was the meander amplitude (B) also called the belt width. This variable provides an estimate of the required minimum width of the floodway corridor (i.e. the bottom width of the flood control channel). The estimated meander dimensions for the low flow channel are presented in Table 13.

6.6 Effectiveness of Mitigation Measures for Hydromodification

The City, as a member of the Sacramento Stormwater Quality Partnership, has prepared a Hydromodification Management Plan (HMP) that establishes the criteria for assessing the effectiveness of hydromodification mitigation measures. Although, the plan has yet to be approved by State regulators, the plan contains the best available information at this time for compliance criteria. According to the HMP, satisfactory hydromodification mitigation is achieved by meeting specific flow duration control as follows:

- For flow rates ranging from either 25 percent or 45 percent of the pre-project 2-year recurrence interval event ($0.25Q_2$ to $0.45Q_2$) up to the pre-project 10-year runoff event (Q_{10}), the post-project discharge rates and durations shall not deviate above the pre-project rates and durations by more than 10 percent over more than 10 percent of the length of the flow duration curve.

The specific low flow threshold to be used is dependent on the erosion susceptibility of the subject waterway. No susceptibility testing has been performed for the Shed C Channel. According to results from the susceptibility tests that were conducted during preparation of the HMP, most tested waterways in Sacramento County are categorized with medium to very high susceptibility to vertical erosion and high to very high susceptibility to lateral erosion. Based on that, it is assumed for this study that the Shed C Channel would fall in the high susceptibility category and, therefore, the low end of the flow duration assessment of $0.25Q_2$ should be used.

The effectiveness of the proposed mitigation measures for hydromodification were assessed by comparing the flow durations results for base conditions and buildout conditions at the downstream boundary of the City (Bruceville Road). Figure 13 presents a comparison of the flow duration results. As indicated on the figure, the proposed drainage plan provides adequate flow duration control within the critical flow range between $0.25Q_2$ (61 cfs) and Q_{10} (425 cfs). The flow duration curve for buildout conditions is lower than the curve for base conditions for all but the low end of the relevant flow range. Because the increases at the low end of the flow range occur for less than 10 percent of the length of the flow duration curve, the mitigation measures are considered acceptable.

As an additional check on the effectiveness of the hydromodification mitigation, a comparison was made of the cumulative effective work performed in the channel at Bruceville Road. The cumulative effective work was based on Simon's effective work equation presented earlier in this study. For the comparison, the change in erosion potential due to buildout was measured as the ratio of the cumulative effective work for buildout conditions versus base conditions as follows:

$E_p = W_{post}/W_{base}$, where:

E_p = the erosion potential

W_{post} = the cumulative work performed for post project conditions (buildout conditions)

W_{base} = the cumulative work performed for base conditions

As shown on Figure 14, it is estimated that the proposed facilities would decrease the erosion potential at the downstream boundary by approximately 13 percent. This verifies that the proposed facilities provide reasonable mitigation of potential hydromodification effects.

7.0 EVENT BASED ANALYSIS

A traditional event based analysis was performed to assess the flood control performance of the proposed facilities. For flood control purposes, the proposed drainage facilities must accomplish two key objectives:

- Mitigate for potential increases in flood flows downstream from the City (Bruceville Road)
- Safely convey flood flows through the project area

For the event based analysis, hydrologic models were prepared to estimate flood flows into the Shed C Channel (or detention basins) for the 10-year and 100-year storm events. Hydraulic models were used to route the flood flows through the Shed C Channel and to calculate water surface elevations along the channel. These analyses were performed for both pre-development conditions and buildout conditions within the City limits.

7.1 Event Based Analysis – Pre-Development Conditions

7.1.1 Hydrologic Analysis – Pre-Development

Hydrologic models were prepared with SacCalc to determine the 10-year and 100-year flows entering the Shed C Channel for pre-development conditions. These models very similar to the SacCalc models that were used as the starting point for development of base conditions continuous simulation model. The main difference is that the Promenade, Sterling Meadows, and LRSP areas were modeled as undeveloped. Shed C was divided into the 29 subsheds as shown on Figure 2. Table 1 presents the key hydrologic parameters for each subshed for existing conditions. Note that the SacCalc models were used only to calculate the flows from each subshed before they enter collector channels or the Shed C Channel. The flows were then combined and routed through the channel system using a hydraulic model as discussed below.

7.1.2 Hydraulic Analysis – Pre-Development

A hydraulic analysis was performed using HEC-RAS to determine the flows and water surface elevations within the Shed C Channel for the 10-year and 100-year storm events. Descriptions of the various features of the HEC-RAS model are provided below.

7.1.2.1 Channel Geometry and Manning's Roughness Coefficients

The hydraulic model of the Shed C Channel begins just downstream of the existing Promenade detention basin at the west boundary of Subshed A2 (near Lotz Parkway). The model extends downstream to the west side of Interstate 5. The channel geometry was defined using approximately 150 cross sections. The cross section locations within the City limits are shown on Figure 15. For pre-development conditions, the cross sections from the upstream end of the model to approximately 1,000 feet downstream of the future extension of

Big Horn Boulevard (currently McMillan Road at the Shed C Channel crossing) are based on a field survey performed by West Yost in 2009. The remaining cross sections are based on a combination of field survey data collected by Murray Smith & Associates (Murray Smith) in the late 1990's and LIDAR generated topographic mapping. All elevations in this report are based on the National Geodetic Vertical Datum of 1929. The original Murray Smith survey data was unavailable for review, but it is considered adequate for estimating pre-development flood flows and water surface elevations. Manning's roughness coefficients range from 0.04 to 0.06 within the main channel and 0.04 to 0.05 in the overbank areas.

7.1.2.2 Bridges and Culverts

There are nine existing bridge or culvert crossings included in the model. Within the City limits, there are six culvert crossings. Five of these culverts are small pipe culverts used for farm roads that cross the channel. The other set of culverts within the City is located at Bruceville Road, where two 48-inch concrete pipelines cross under the roadway. Downstream of the City there are bridge structures at the Union Pacific Railroad and Interstate 5. At Franklin Boulevard, there are four 15 feet x 4.5 feet concrete box culverts.

7.1.2.3 Downstream Boundary Condition

For the 10-year and 100-year water surface calculations, the water surface elevations at the downstream end of the hydraulic model (near Interstate 5) were set at constant elevations of 7.3 feet and 8.6 feet, respectively. These are the estimated water surface elevations in the Beach Stone Lakes area at the time of peak flows in the local Shed C Channel as determined from hydraulic modeling prepared by for Sacramento County for the Beach Stone Lakes area. Although the values are lower than the peak water surface elevations in the Beach Stone Lakes area, they are considered reasonable for this study because the peak flows from Shed C are expected to occur well before the peak stage occurs in the Beach Stone Lakes area west of Interstate 5. Peak stages in the Beach Stone Lakes area are controlled by flows from the Cosumnes River and Mokelumne River watersheds that back up into the Beach Stone Lakes area. Due to the large size of the Cosumnes and Mokelumne River watersheds, the peak flows from these rivers occur well after the peak flows from Shed C. As a sensitivity test, the downstream stage for the 100-year storm event was increased from 8.6 feet to 12.0 feet. Even with the large increase in the starting downstream water surface elevation, the water surface elevations from the original model and the test model merge at Franklin Boulevard, which is well downstream of the study area. Therefore, the results of this study are not sensitive to variations in the starting water surface elevation at the downstream end of the hydraulic model.

7.2 Event Based Analysis – Buildout Conditions

7.2.1 Hydrologic Analysis – Buildout

For buildout conditions, it was assumed that the entire area within the City limits was developed. The buildout land-use conditions for the event based analysis are exactly the same as those used for the continuous simulation modeling. The subshed boundaries for areas within the City are shown on Figure 3. Subshed limits for areas outside of the City are the same as for pre-development conditions, as shown on Figure 2. Table 1 presents the key hydrologic parameters for each subshed for buildout conditions. The calculated flow hydrographs were input into

HEC-RAS to determine the resultant flows and water surface elevations in the Shed C Channel and detention basins for buildout conditions.

7.2.2 Hydraulic Analysis – Buildout

A hydraulic analysis was performed using HEC-RAS to evaluate the flood control performance of the proposed detention basin and channel improvements proposed for the SEPA and to determine the adequacy of the flood flow mitigation at the downstream limits of the City at Bruceville Road.

7.2.2.1 Channel Geometry and Manning's Roughness Coefficients

For buildout conditions, the cross sections within the City limits were configured to represent the proposed buildout channel geometry. Cross section locations within the City limits for buildout conditions are shown on Figure 16. The general channel configuration is the same for all channel reaches within the City. A typical cross section is shown on Figure 17. The average side slopes of the low flow and flood control channel were set at 3:1 and 4:1, respectively. These are average values and the expectation is that the side slopes will be varied to provide a more natural appearance.

The specific channel dimensions adopted for each reach of the Shed C Channel are listed in Table 14. The limits of each reach can be seen on Figure 16. The low flow channel dimensions are primarily based on the results from the continuous simulation analysis as summarized in Table 13. Some adjustments to the low flow channel dimensions were made in Reaches 2 and 4. For Reach 2, the channel forming flow was estimated to be 125 cfs. Just downstream in Reach 3, the channel forming flow was estimated to be 115 cfs, which is counter-intuitive given that the watershed draining to Reach 3 is larger than that for Reach 2. This result demonstrates the approximate nature of the method for estimating the channel forming flow rate. For consistency, the same low flow channel dimensions were adopted for Reaches 2 and 3 based on a channel forming flow rate of 115 cfs. For Reach 4, the depth of the low flow channel was reduced to allow the flood control bench to be lowered to provide more flood conveyance capacity for this reach.

The channel floodway widths were initially set equal to the belt width (meander amplitude) values in Table 13. An initial model run was made and the floodway bottom width was adjusted where needed based on the flood control requirements. In the lower reaches of the channel (Reaches 3b and 4), which will be relatively shallow, it was necessary to increase the floodway width to 207 feet, which is larger that calculated the belt width value, to provide adequate flood conveyance. Even with the extra width, it is anticipated that fill will be required along the channel banks between cross section 6625 and Bruceville Road to provide adequate freeboard (1 foot minimum) for the 100-year event. The channel is relatively shallow along this reach compared to the upper reaches of the channel due to the need to tie into the existing channel downstream of Bruceville Road. To provide as much depth as possible in this reach, it is proposed that some excavation be performed to deepen the existing channel downstream of Bruceville Road. The excavation will be limited to construction of a small pilot channel to eliminate existing high points in the existing channel. This will allow the proposed SEPA channel to be constructed deeper. The off-site excavation is only intended to provide some extra depth in the on-site channel and is not intended to provide a significant increase in capacity downstream of Bruceville Road. It is estimated that the pilot channel will extend approximately

3,200 feet downstream of Bruceville Road and the average depth of excavation will be approximately 1.8 feet. The limits of the offsite channel deepening are shown on Figure 18.

In the upper reaches, the channel will be deeper and the initial model results showed a significant amount of freeboard during the 100-year storm. Based on that, it was determined that the floodway width in the upper reaches could be reduced from the belt width that was determined from the natural channel design described previously. The belt width value represents the theoretical width of the corridor that the low flow channel can be expected to meander within (see Figure 12). There is a desire to not design a channel that is conservatively large from the flood control and short-term economic perspective. However, there is also a desire not to excessively constrain the channel, which could produce long-term maintenance problems.

To find an appropriate balance between the two competing perspectives, the natural channel design elements were re-evaluated. The belt width value is based on theoretical equations related to the channel forming flow. A larger channel forming flow produces a larger predicted belt width. The channel forming flow typically ranges between the 1-year and 2-year flow event. For the upper reaches of the channel between the Promenade detention basin and Big Horn Boulevard, the channel forming flow for this study ranged between a 1.7-year to 2-year event, which are at the high end of the typical range. Therefore, a smaller predicted belt width for the 1-year storm was used to establish a minimum channel floodway width. This reduced the floodway width of the channel between 11 feet and 17 feet. These reduced widths still provided adequate flood capacity and, therefore, were adopted for this study.

For buildout conditions, the roughness coefficients for the proposed Shed C Channel were set at 0.04 within the low flow channel and 0.08 within the overbank areas. The relatively large value used in the overbank area for buildout conditions is intended to allow for the establishment of significant riparian vegetation which would help reduce maintenance requirements.

A channel will be constructed through the SEPA to convey runoff from a portion of the LRSP area to the Shed C Channel. The general configuration of the channel was established during planning for the LRSP and carried forward to this study. The dimensions of the channel are presented on Table 14. The channel alignment, which is shown on Figure 16, has been modified from that originally conceived during the planning for the LRSP due to land use planning requirements for the SEPA.

7.2.2.2 Bridges and Culverts

There are five road crossings proposed within the SEPA. Box culverts were sized for each of the crossings using the HEC-RAS model. The sizes of the proposed box culverts are shown on Figure 16. During the design of the road crossings, alternative bridge designs may be proposed as long as they do not produce significantly larger head losses than the culverts proposed with this study.

7.2.2.3 Detention Basins

The proposed detention basins that are to be located adjacent to the Shed C Channel were included in the HEC-RAS model. The elevation-storage volume information and outlet configurations assumed for the modeling are presented in Tables 4 through 12. These tables provide the assumed dimensions of each detention basin. The general shape of the detention basins was generally based on the shape of the basins included on the SEPA land use plan. When the basins are designed, they will likely differ from the shapes assumed for this study and this is acceptable as long as the elevation-storage volume relationship is reasonably close. Significant deviations may need to be tested with modeling.

Two detention basins, DETS1a and DET2, are not located adjacent to the channel and backwater from the channel is not expected to affect the outflow characteristics from them. Therefore, these detention basins were not included in the HEC-RAS model. Outflow from these detention basins was calculated with the SacCalc hydrologic model and the resulting hydrographs were input directly into the channel in the HEC-RAS model.

7.3 Results from the Hydrologic and Hydraulic Analyses

7.3.1 Results for Pre-development Conditions

The HEC-RAS model was used to route the inflows from the tributary subsheds through the Shed C Channel and to calculate water surface elevations in the channel using an unsteady-state analysis. For pre-development conditions, the channel and culvert capacities are insufficient to pass the 10-year flows or the 100-year flows and significant overbank flooding is predicted as shown on Figure 15. Figure 19 presents the calculated water surface profiles for pre-development conditions within the City limits. Figure 15 shows the approximate pre-development floodplain limits for the 100-year event. It appears that structure flooding may occur during a 100-year storm near cross sections 5685, 7040, and 9730. The pre-development modeling and floodplain mapping was previously prepared for the City's SDMP and was not revised during this study. The floodplain mapping is considered approximate. Detailed output tables from the HEC-RAS model for pre-development conditions are provided in Attachment A.

7.3.2 Results for Buildout Conditions

For buildout conditions, the proposed detention basins and channel improvements will provide adequate storage and conveyance to protect the SEPA form flooding and mitigate for potential flood flow increases downstream. Figure 20 presents the calculated water surface profiles in the Shed C Channel for buildout conditions within the City limits. Figure 21 presents the same information for the channel from the LRSP area. Detailed output tables from the HEC-RAS model for buildout conditions are provided in Attachment B. Table 15 lists the calculated peak flood flows at the downstream end of the City (Bruceville Road). As shown in the table, the peak flood flows for the 10-year and 100-year storms are predicted to be reduced slightly at that location.

8.0 SUMMARY OF RECOMMENDED FACILITIES

It is recommended that a multi-functional drainage system be constructed in the SEPA to accommodate future development in the watershed and to create and enhance the natural stream and habitat values. The multi-functional corridor should include a low flow channel that is stable and self-sustaining, and meanders within a larger floodway corridor that will provide flood conveyance as well as wetlands habitat. At key points along the corridor, detention basins should be constructed as defined by this study to provide storage volume to mitigate for potential flood flow and hydromodification impacts. The channel and detention basins will also provide the opportunity to establish riparian habitat. Specific drainage facilities that are proposed with the plan are summarized below.

8.1 Channel Improvements

8.1.1 On-Site Channel and Culvert Improvements

A new channel will be constructed between Lotz Parkway and Bruceville Road. The approximate alignment of the channel is shown on Figure 16. The channel includes five reaches, which are also shown on Figure 16. Within each reach, the channel cross section will have the same general configuration, but with different dimensions. The specific dimensions of each channel reach are presented in Table 14.

Based on discussions with engineers representing future development projects, there is a desire to use the channel corridor to create water features that would be an amenity to the surrounding area. These features may include creation of permanent water features within the stream corridor or within widened areas along the corridor. The permanent pools would be created by either excavating a deeper area within the channel corridor or by constructing a berm to back up flow. These types of features are acceptable and even desirable in that they provide variation along the corridor and utilize the stream corridor as a public amenity, which is a goal of this drainage plan. Specific proposals will be reviewed on a case by case basis to insure that they do not compromise flood protection or the natural channel features within the corridor.

Box culverts are proposed at the five road crossings within the SEPA. The specific sizes of the culverts are shown on Figure 16. Different culvert or bridge configurations are acceptable as long as the capacities are similar to those proposed by the study.

8.1.2 Off-site Channel Improvements

The downstream end of the proposed channel, especially Reach 4 (see Figure 16), is relatively shallow. To provide as much depth as possible in this reach of the channel, it is proposed that some excavation be performed to deepen the existing channel downstream of Bruceville Road. The excavation will be limited to construction of a small pilot channel to eliminate existing high points in the existing channel. This will allow the proposed SEPA channel to be constructed deeper. The off-site excavation is only intended to provide some extra depth in the on-site channel and is not intended to provide a significant increase in capacity downstream of Bruceville Road. It is estimated that the pilot channel will extend approximately 3,200 feet downstream of Bruceville Road and the average depth of excavation will be approximately 1.8 feet.

8.2 Detention Basins

Runoff from the SEPA will be directed into one of nine detention basins proposed with the drainage plan. The general locations and approximate areas of the basins are shown on Figure 16. Tables 4 through 12 present the assumed dimensions, elevations, and storage volumes for the detention basin. When the basins are designed, they will likely differ from the shapes assumed for this study and this is acceptable as long as the elevation-storage volume relationship is reasonably close. Significant deviations may need to be tested with modeling. Figure 22 shows a typical outlet configuration for a basin.

Underground pipe systems will convey runoff from small to moderate storms to the detention basins. During large events that exceed the capacity of the pipe systems, excess flow will be conveyed overland through streets and open space. It will be important to ensure that the grading plans for the proposed projects in the SEPA are designed in such a way to direct all overland flow into the detention basins. During the design of individual projects, if it is found that runoff from some small, isolated areas cannot be feasibly directed to a detention basin, some direct discharge of runoff into the channel may be allowed. In such cases, separate stormwater quality treatment facilities will be necessary and a detailed study will be required that demonstrates the overall flood control and hydromodification goals for the watershed are still met.

9.0 REFERENCES

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Table 1. Hydrologic Parameters

Subshed	Area, acres	Mean Elevation, ft, NGVD29	Basin Length, ft	Basin Centroid Length, ft	Basin Slope, ft/ft	Land-use, acres: Ag. 2%	Park, Open Space, Rec 5%	Estate Res. 30%	LDR 40%	School, Res. 6-8 du/ac 50%	Res. 8-10 du/ac 60%	MDR 70%	Light Industrial/ Flex 75%	HDR 80%	Mixed Use 85%	Office, Comm. 90%	Watershed Impervious Percent
Pre-Development Conditions																	
A1	319.2	42	5,547	1,324	0.0008	319.2	0	0	0	0	0	0	0	0	0	0	2.0
A2	202.4	40	5,800	1,600	0.0008	202.4	0	0	0	0	0	0	0	0	0	0	2.0
A4	118.0	39	3,720	2550	0.0013	118	0	0	0	0	0	0	0	0	0	0	2.0
A4A	290.7	39	4,700	1,500	0.0008	290.7	0	0	0	0	0	0	0	0	0	0	2.0
A4B	215.5	39	4,800	1,400	0.0008	215.5	0	0	0	0	0	0	0	0	0	0	2.0
A4C	93.6	39	2,200	1,100	0.0008	93.6	0	0	0	0	0	0	0	0	0	0	2.0
A5	247.7	36	4,800	2,000	0.0012	247.7	0	0	0	0	0	0	0	0	0	0	2.0
A5A	222.5	32	4,880	2,446	0.0015	222.5	0	0	0	0	0	0	0	0	0	0	2.0
A5B	91.6	30	4,000	1,700	0.0008	91.6	0	0	0	0	0	0	0	0	0	0	2.0
A5C	184.3	30	3,700	1,840	0.0012	184.3	0	0	0	0	0	0	0	0	0	0	2.0
MA5C	40.5	28	1,200	500	0.0017	40.5	0	0	0	0	0	0	0	0	0	0	2.0
A6	95	27	3,500	1,700	0.0008	95	0	0	0	0	0	0	0	0	0	0	2.0
A8	216.4	27	5,200	2,600	0.0008	216.4	0	0	0	0	0	0	0	0	0	0	2.0
A10	557	20	6,400	1,900	0.0008	557	0	0	0	0	0	0	0	0	0	0	2.0
A11	213.2	19	5,300	1,000	0.0008	213.2	0	0	0	0	0	0	0	0	0	0	2.0
A12	470.8	42	7,400	3,500	0.0008	470.8	0	0	0	0	0	0	0	0	0	0	2.0
A13	257.9	38	5,400	2,700	0.0008	257.9	0	0	0	0	0	0	0	0	0	0	2.0
A14	481.7	38	7,500	1,400	0.0008	481.7	0	0	0	0	0	0	0	0	0	0	2.0
A15	487.3	35	6,900	1,400	0.0008	487.3	0	0	0	0	0	0	0	0	0	0	2.0
A16	723.2	32	10,000	1,300	0.0008	723.2	0	0	0	0	0	0	0	0	0	0	2.0
A17	722.6	28	9,000	1,200	0.0008	722.6	0	0	0	0	0	0	0	0	0	0	2.0
A18	699.3	20	12,000	6,300	0.0008	699.3	0	0	0	0	0	0	0	0	0	0	2.0
A19	223.6	18	5,300	1,200	0.0008	223.6	0	0	0	0	0	0	0	0	0	0	2.0
A20	80.9	16	2,800	600	0.0008	80.9	0	0	0	0	0	0	0	0	0	0	2.0
A21	156.4	14	5,000	2,600	0.0008	156.4	0	0	0	0	0	0	0	0	0	0	2.0
A22	96.7	18	3,600	900	0.0008	96.7	0	0	0	0	0	0	0	0	0	0	2.0
A23	66.6	16	2,900	600	0.0008	66.6	0	0	0	0	0	0	0	0	0	0	2.0
A24	88.5	13	3,700	2,000	0.0008	88.5	0	0	0	0	0	0	0	0	0	0	2.0
A25	219.5	12	5,000	1,900	0.0008	219.5	0	0	0	0	0	0	0	0	0	0	2.0
Base Conditions (These subsheds are assumed to be developed and replace A1, A2, A5A, and A5C from existing conditions, all other subsheds the same as existing conditions)																	
A1	319.2	42	5,547	1,324	0.0008	0	0	0	0	0	0	0	0	0	0	319.2	90.0
A2	202.4	40	5,800	1,600	0.0008	0	0	0	202.4	0	0	0	0	0	0	0	40.0
LRSP1	217.1	31	5,940	3,130	0.0014	0	5.3	0	103.2	95.2	0	13.1	0	0	0	0	45.3
LRSP2	178.7	29	4,450	2,130	0.0019	0.0	24.4	0.0	131.8	0.0	0.0	22.5	0.0	0.0	0.0	0.0	39.0
Buildout Conditions (These subsheds represent the buildout subsheds within the SEPA, all other subsheds are the same as base conditions)																	
S1A	154.4	39	3,000	1100	0.0016	0.0	8.2	0.0	18.5	0.0	0.0	24.7	0.0	11.5	0.0	91.5	75.6
S1B	103.3	38	2,930	1500	0.0010	0.0	19.8	0.0	67.0	0.0	0.0	4.7	0.0	11.8	0.0	0.0	39.2
S2	102.0	36	3,400	1550	0.0021	0.0	10.7	0.0	34.8	11.2	0.0	23.1	0.0	11.3	0.0	10.9	54.0
S3	241.0	36	4,750	1,700	0.0013	0.0	41.1	0.0	77.4	9.8	0.0	39.2	0.0	18.5	45.0	10.0	52.9
S4	147.2	36	2,970	1,310	0.0010	0.0	7.9	0.0	0.0	0.0	0.0	0.0	51.1	0.0	0.0	88.2	80.2
S5	104.5	34	3,000	1,390	0.0019	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.0	84.7
S6	89.7	27	3,630	1,700	0.0013	0.0	23.3	6.8	27.1	8.5	0.0	0.0	0.0	0.0	0.0	24.0	44.5
S7	87.4	25	3,200	1,600	0.0013	0.0	3.5	58.1	0.0	0.0	0.0	13.4	0.0	12.3	0.0	0.0	42.2
S8	86.6	28	3,550	2,120	0.0013	0.0	7.2	0.0	0.0	0.0	0.0	0.0	64.6	0.0	0.0	14.7	71.7
SC1	11.8	33	1,780	730	0.0010	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
SC2	14.8	31.5	2,290	1,370	0.0010	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
SC3	11.9	31	1,770	740	0.0010	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
SC4	24.4	26	3,270	1660	0.0010	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
SC5	21.3	25	2,210	1,100	0.0006	21.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0

Table 2. Summary of Precipitation Data Sources		
Gage ID	Gage Description	Date Range
HPD047630	Sacramento Post Office National Weather Service (Adjusted)	10/1/1956 to 12/3/1962 and 05/9/1974 to 8/4/1974
ElkGroveFD	The Elk Grove Fire Station on Elk Grove Boulevard	12/04/1962 to 5/8/1974
ElkGroveFH	The Elk Grove Fish Hatchery on Bond Road	8/5/1975 to 6/5/1985
ElkGroveFH ALERT	ALERT gage at the Elk Grove Fish Hatchery on Bond Road	6/6/1985 to 11/6/2002
0270td3240	ALERT gage Laguna Creek at Waterman Road	11/7/2002 to 9/30/2009

Table 3. Soil Moisture Accounting Parameters

Subshed	Canopy Storage, in	Surface Storage, in	Maximum Infiltration, in/hr	Imp., %	Soil Storage, in	Tension Storage, in	Soil Percolation, in/hr	Gw 1 Storage, in	Gw 1 Percolation, in	Gw 1 Storage Coeff.
A01	0.08	0.3	0.07	90	6	4.8	0.07	10	0.07	200
A02	0.08	0.3	0.07	40	6	4.8	0.07	10	0.07	200
A04	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
A04A	0.08	0.3	0.07	2	6	4.8	0.07	10	0.08	200
A04B	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
A04C	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
A05	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
A05B	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
LRSP1	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
LRSP2	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
MA5C	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
A06	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
A08	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200
A10	0.08	0.3	0.07	2	6	4.8	0.07	10	0.07	200

Table 4. Detention Basin Data for DETS1a

Hydraulic Data		
Tributary Area	154.4	acres
Outlet Orifice Size	12	inches
Outlet Orifice Elevation	32.3	feet
Main Spillway Width (Notch)	4	feet
Main Spillway Elevation (Notch)	34	feet
Top of Riser Elevation	37.3	feet
Emergency Weir Elevation	37.5	feet
10-Year Peak WSEL	35.9	feet
100-Year Peak WSEL	37.0	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	32.3	0.0	357	571	203918	4.7	0.0	0.0	0.0	0.0
Water Quality Pool (Approx)	33.9	1.6	370	584	215963	5.0	7.7	4.9	0.0	4.9
	34.0	1.7	371	585	216727	5.0	8.2	5.0	0.0	5.0
	35.0	2.7	379	593	224434	5.2	13.3	6.3	11.2	17.5
	36.0	3.7	387	601	232269	5.3	18.5	7.4	31.7	39.1
	37.0	4.7	395	609	240232	5.5	23.9	8.3	58.2	66.5
	38.0	5.7	403	617	248324	5.7	29.5	9.2	89.6	98.8

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 5. Detention Basin Data for DETS1b

Hydraulic Data		
Tributary Area	103.3	acres
Outlet Orifice Size	10	inches
Outlet Orifice Elevation	28.6	feet
Main Spillway Width (Notch)	2.6	feet
Main Spillway Elevation (Notch)	31.0	feet
Top of Riser Elevation	34.5	feet
Emergency Weir Elevation	34.6	feet
10-Year Peak WSEL	32.8	feet
100-Year Peak WSEL	34.1	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	28.6	0.0	304	304	92416	2.1	0.0	0.0	0.0	0.0
Water Quality Pool (Approx)	29.8	1.2	314	314	98345	2.3	2.6	2.9	0.0	2.9
	30.0	1.4	315	315	99351	2.3	3.1	3.2	0.0	3.2
	31.0	2.4	323	323	104458	2.4	5.4	4.1	0.0	4.1
	31.5	2.9	327	327	107060	2.5	6.6	4.5	2.6	7.1
	32.0	3.4	331	331	109482	2.5	7.8	4.9	6.8	11.7
	33.0	4.4	339	339	115057	2.6	10.5	5.6	20.6	26.2
	34.0	5.4	347	347	120548	2.8	13.2	6.2	37.8	44.0
	35.0	6.4	355	355	126167	2.9	16.0	6.8	58.2	65.0

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 6. Detention Basin Data for DETS2

Hydraulic Data		
Tributary Area	102	acres
Outlet Orifice Size	10	inches
Outlet Orifice Elevation	27.7	feet
Main Spillway Width (Notch)	2.7	feet
Main Spillway Elevation (Notch)	29.8	feet
Top of Riser Elevation	33.1	feet
Emergency Weir Elevation	33.2	feet
10-Year Peak WSEL	31.5	feet
100-Year Peak WSEL	32.7	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	27.7	0.0	245	441	108045	2.5	0.0	0.0	0.0	0.0
Water Quality Pool (Approx)	29.0	1.3	255	451	115288	2.6	3.3	3.0	0.0	3.0
	30.0	2.3	263	459	121006	2.8	6.0	4.0	0.7	4.7
	31.0	3.3	271	467	126852	2.9	8.9	4.9	9.9	14.8
	32.0	4.3	279	475	132827	3.0	11.9	5.5	24.7	30.2
	32.7	5.0	285	481	137085	3.1	14.0	6.0	37.3	43.3
	33.7	6.0	293	489	143277	3.3	17.3	6.5	58.2	64.8

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 7. Detention Basin Data for DETS3

Hydraulic Data		
Tributary Area	241	acres
Outlet Orifice Size	15	inches
Outlet Orifice Elevation	24.6	feet
Main Spillway Width (Notch)	5.7	feet
Main Spillway Elevation (Notch)	26.3	feet
Top of Riser Elevation	30.0	feet
Emergency Weir Elevation	30.1	feet
10-Year Peak WSEL	28.4	feet
100-Year Peak WSEL	29.6	feet

Elevation-Volume-Flow Data

Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	24.6	0.0	507	507	257049	5.9	0.0	0.0	0.0	0.0
	25.6	1.0	515	515	265225	6.1	6.0	6.0	0.0	6.0
Water Quality Pool (Approx)	25.9	1.3	517	517	267703	6.1	7.8	6.8	0.0	6.8
	26.3	1.7	521	521	271024	6.2	10.3	7.8	0.0	7.8
	28.5	3.9	538	538	289659	6.6	24.3	11.9	52.1	63.9
	29.5	4.9	546	546	298334	6.8	31.1	13.3	91.4	104.7
	30.5	5.9	554	554	307138	7.1	38.0	14.6	137.4	152.0

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 8. Detention Basin Data for DETS4

Hydraulic Data		
Tributary Area	147.2	acres
Outlet Orifice Size	12	inches
Outlet Orifice Elevation	27.7	feet
Main Spillway Width (Notch)	3.7	feet
Main Spillway Elevation (Notch)	30.0	feet
Top of Riser Elevation	33.4	feet
Emergency Weir Elevation	33.6	feet
10-Year Peak WSEL	31.9	feet
100-Year Peak WSEL	33.1	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	27.7	0.0	240	720	172800	4.0	0.0	0.0	0.0	0.0
	28.7	1.0	248	728	180544	4.1	4.1	3.8	0.0	3.8
Water Quality Pool (Approx)	29.7	2.0	256	736	188416	4.3	8.3	5.4	0.0	5.4
	30.0	2.3	258	738	190803	4.4	9.6	5.8	0.0	5.8
	31.0	3.3	266	746	198841	4.6	14.1	7.0	10.4	17.3
	32.0	4.3	274	754	207007	4.8	18.7	8.0	29.3	37.3
	33.0	5.3	282	762	215302	4.9	23.6	8.9	53.8	62.7
	34.0	6.3	290	770	223724	5.1	28.6	9.7	82.9	92.5

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 9. Detention Basin Data for DETS5

Hydraulic Data		
Tributary Area	104.5	acres
Outlet Orifice Size	10	inches
Outlet Orifice Elevation	24.6	feet
Main Spillway Width (Notch)	2.7	feet
Main Spillway Elevation (Notch)	27.5	feet
Top of Riser Elevation	30.9	feet
Emergency Weir Elevation	31.0	feet
10-Year Peak WSEL	29.2	feet
100-Year Peak WSEL	30.5	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	24.6	0.0	215	516	110940	2.5	0.0	0.0	0.0	0.0
	25.0	0.4	218	519	113289	2.6	1.0	1.7	0.0	1.7
Water Quality Pool (Approx)	26.0	1.4	226	527	119253	2.7	3.7	3.2	0.0	3.2
	26.9	2.3	233	534	124729	2.9	6.2	4.0	0.0	4.0
	27.5	2.9	238	539	128437	2.9	8.0	4.5	0.0	4.5
	29.0	4.4	250	551	137910	3.2	12.6	5.6	13.9	19.5
	30.5	5.9	262	563	147671	3.4	17.5	6.5	39.3	45.8
	31.5	6.9	270	571	154338	3.5	21.0	7.0	60.5	67.5

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 10. Detention Basin Data for DETS6

Hydraulic Data		
Tributary Area	89.7	acres
Outlet Orifice Size	10	inches
Outlet Orifice Elevation	20.7	feet
Main Spillway Width (Notch)	10.3	feet
Main Spillway Elevation (Notch)	22.7	feet
Top of Riser Elevation	24.9	feet
Emergency Weir Elevation	25.1	feet
10-Year Peak WSEL	24.0	feet
100-Year Peak WSEL	24.6	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	20.7	0.0	247	296	73211	1.7	0.0	0.0	0.0	0.0
	21.0	0.3	249	299	74521	1.7	0.5	1.5	0.0	1.5
	22.0	1.3	257	307	78970	1.8	2.3	3.0	0.0	3.0
Water Quality Pool (Approx)	22.3	1.6	260	309	80330	1.8	2.8	3.4	0.0	3.4
	22.7	2.0	263	312	82161	1.9	3.6	3.8	0.0	3.8
	24.0	3.3	273	323	88254	2.0	6.1	4.9	42.7	47.6
	24.5	3.8	277	327	90654	2.1	7.1	5.2	69.6	74.9
	25.5	4.8	285	335	95552	2.2	9.3	5.8	135.1	141.0

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 11. Detention Basin Data for DETS7

Hydraulic Data		
Tributary Area	87.4	acres
Outlet Orifice Size	10	inches
Outlet Orifice Elevation	19.4	feet
Main Spillway Width (Notch)	8.6	feet
Main Spillway Elevation (Notch)	21.0	feet
Top of Riser Elevation	23.5	feet
Emergency Weir Elevation	23.7	feet
10-Year Peak WSEL	22.5	feet
100-Year Peak WSEL	23.2	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	19.4	0.0	193	367	70773	1.6	0.0	0.0	0.0	0.0
	20.0	0.6	198	372	73483	1.7	1.0	2.1	0.0	2.1
Water Quality Pool (Approx)	20.8	1.4	204	378	77167	1.8	2.4	3.2	0.0	3.2
	21.0	1.6	206	380	78101	1.8	2.7	3.4	0.0	3.4
	21.5	2.1	210	384	80458	1.8	3.6	3.9	8.5	12.4
	22.5	3.1	218	392	85269	2.0	5.5	4.7	44.2	48.9
	23.0	3.6	222	396	87722	2.0	6.5	5.1	68.1	73.2
	24.2	4.8	231	405	93740	2.2	9.0	5.8	137.8	143.7

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 12. Detention Basin Data for DETS8

Hydraulic Data		
Tributary Area	87.4	acres
Outlet Orifice Size	10	inches
Outlet Orifice Elevation	19.4	feet
Main Spillway Width (Notch)	8.6	feet
Main Spillway Elevation (Notch)	21.0	feet
Top of Riser Elevation	24.4	feet
Emergency Weir Elevation	24.6	feet
10-Year Peak WSEL	23.4	feet
100-Year Peak WSEL	24.1	feet

Elevation-Volume-Flow Data										
Description	Elevation, ft	Depth, ft	Width, ft	Length, ft	Area, sf	Area, ac	Volume, ac-ft	Outlet Orifice Flow[b][c], cfs	Spill Flow[b][c], cfs	Total Outflow[b], cfs
Bottom or Permanent Pool	19.7	0.0	180	450	81000	1.9	0.0	0.0	0.0	0.0
	21.0	1.3	190	460	87660	2.0	2.5	3.0	0.0	3.0
Water Quality Pool (Approx)	21.75	2.1	196	466	91601	2.1	4.1	3.8	0.0	3.8
	21.8	2.1	197	467	91866	2.1	4.2	3.9	0.0	3.9
	23.0	3.3	206	476	98329	2.3	6.8	4.9	24.7	29.5
	24.0	4.3	214	484	103855	2.4	9.1	5.5	61.2	66.8
	25.0	5.3	222	492	109510	2.5	11.5	6.1	107.4	113.5

Notes:

[a] All elevations are based on NGVD29.

[b] Flow data assumes no backwater effects from the Shed C Channel. This assumption was tested with event modeling using HEC-RAS and found to be reasonable.

[c] An emergency high flow weir or similar feature is required in addition to the outlets shown on this table.

Table 13. Preliminary Estimate of Low Flow Channel Geometry

Reach	Est. Channel Forming Flow, cfs	Approx. Return Period, years	Depth, ft	Average Width w, ft	Trapezoidal Bottom Width, ft	Trapezoidal Top Width, ft	Wave Length L, ft	Belt Width B, ft	Radius of Curvature rc, ft
1.Lotz Parkway to Road near DETS1b Outfall	85	1.7	1.9	23	18	29	222	126	44
2. Roadway near DETS1b Outfall to Big Horn Blvd.	125	2.0	2.3	27	20	34	261	149	52
3. Big Horn Blvd. to LRSP Channel	115	0.9	2.2	26	20	33	252	143	50
4. LRSP Channel to Bruceville Road	265	2.2	3.0	36	27	45	358	204	72

Note: LRSP = Laguna Ridge Specific Plan

Table 14. Proposed Channel Dimensions

Reach	HEC-RAS Cross Section Limits	Approximate Longitudinal Slope	Reach Length, ft	Low Flow Depth, ft	Low Flow Bottom Width, ft	Low Flow Top Width, ft	Flood Control Bottom Width, ft	Approx. Flood Control Top Width, ft
1.Lotz Parkway to Road near DETS1b Outfall	15074 to 13395	0.00102	1,679	1.9	18	29	115	153
2. Road near DETS1b Outfall to Big Horn Blvd.	13341 to 9275	0.00102	4,066	2.2	20	33	126	168
3a. Big Horn Blvd. to Upstream of DETS6	9196 to 6625	0.0010	2,571	2.2	20	33	143	175
3b. Upstream of DETS6 to LRSP Channel	6625 to 5419	0.00102	1,206	2.2	20	33	207	235
4. LRSP Channel to Bruceville Road	5419 to 3696	0.00060	1,723	2.5	27	45	207	237
LRSP Channel	0 to 3510	0.00045	2,446	1.0	8	14	25	55

Note: LRSP = Laguna Ridge Specific Plan

Table 15. Comparison of Flood Flows in cfs

Location	10-Year		100-Year	
	Pre-Development	Buildout	Pre-Development	Buildout
Bruceville Road	504	409	802	772

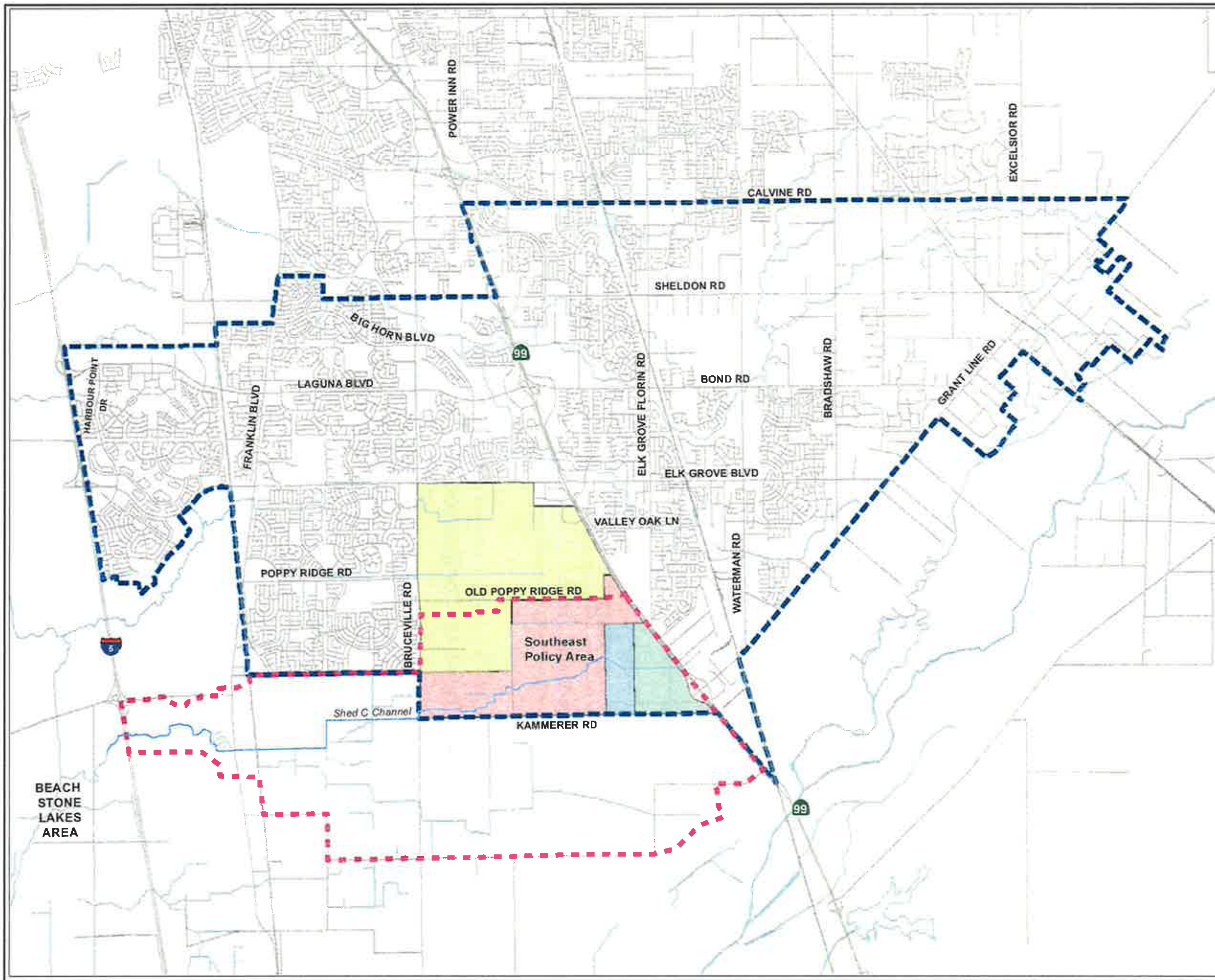

FIGURE 1

City of Elk Grove Southeast Policy Area Drainage Study

LOCATION MAP

0 0.5 1 2
Scale in Miles

NOTES:

LEGEND:

- City Limit
- Shed C Watershed
- Laguna Ridge Specific Plan Area
- Southeast Policy Area
- Sterling Meadows
- Elk Grove Promenade

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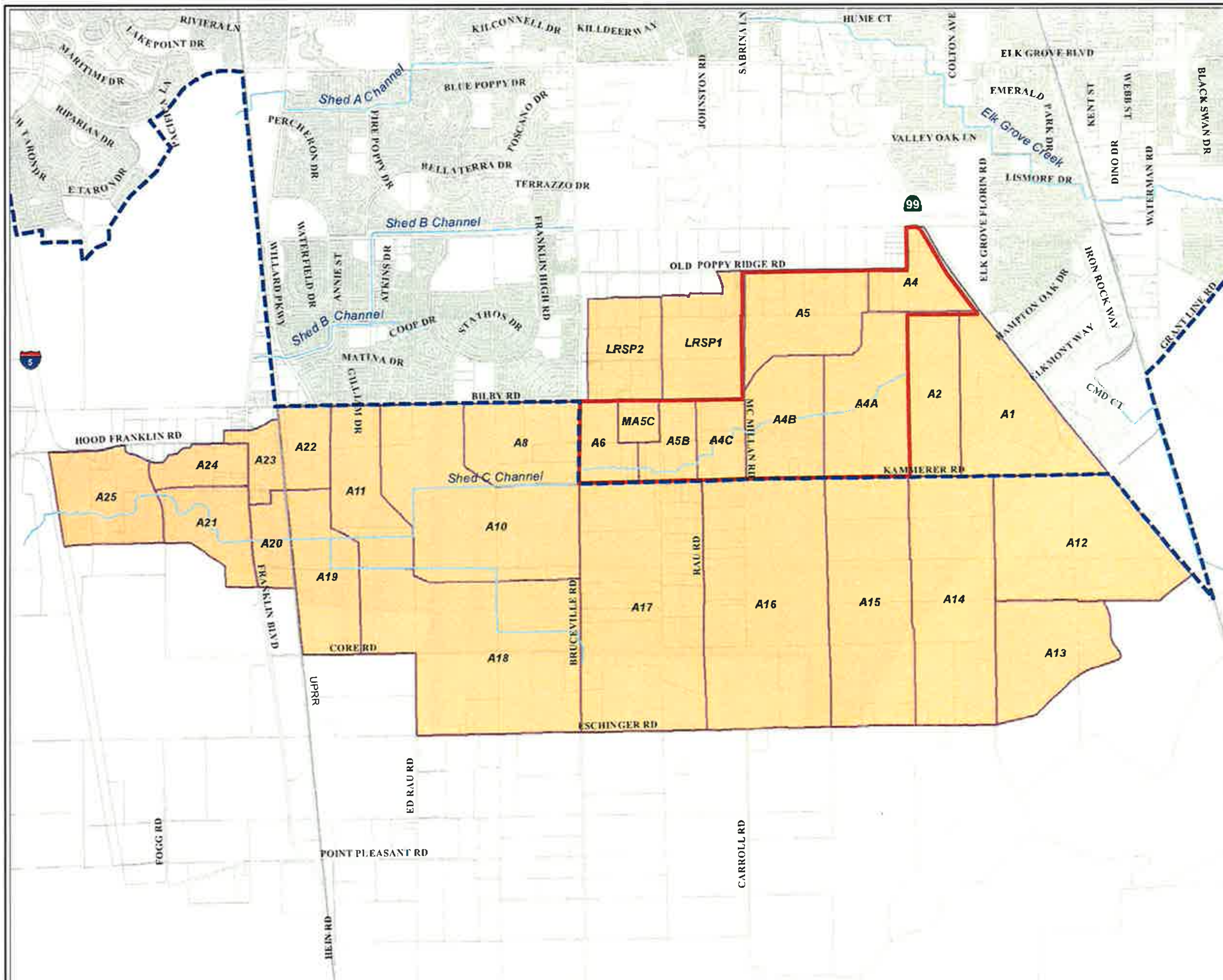
FIGURE 2

City of Elk Grove
Southeast Policy Area
Drainage Study

SUBSHED MAP FOR PRE-DEVELOPMENT AND BASE CONDITIONS



0 3,000 6,000
Feet

LEGEND:
- City Limit
- Southeast Policy Area
- Shed C Subsheds
- Existing Channel

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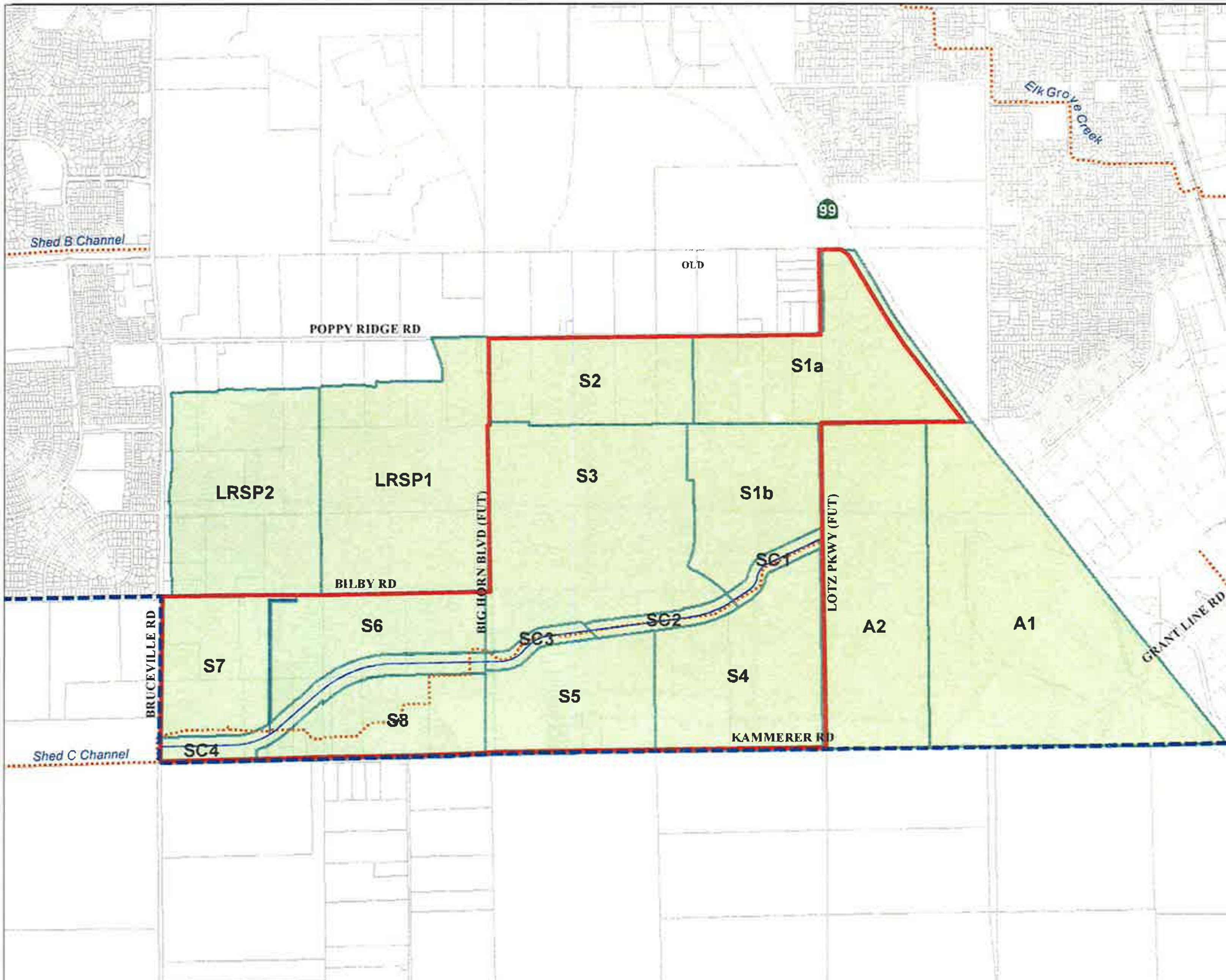

FIGURE 3

City of Elk Grove
Southeast Policy Area
Drainage Study

CITY SUBSHEDS FOR BUILDOUT CONDITIONS

0 750 1,500
Scale in Feet

LEGEND:

- City Limit
- Southeast Policy Area
- Shed C Subsheds Within City Limits
- Existing Channel
- Proposed Channel

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FIGURE 4

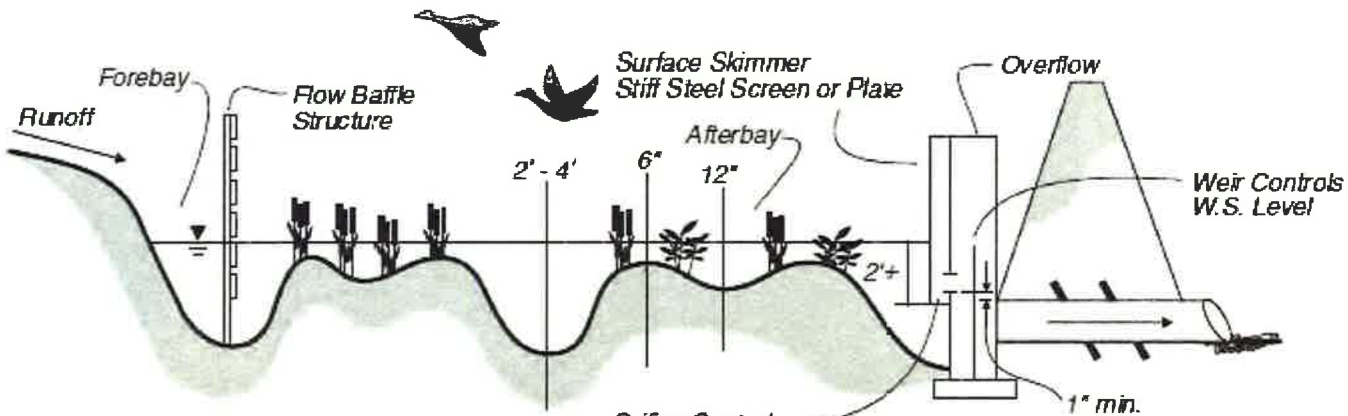
City of Elk Grove
Southeast Policy Area
Drainage Study

PROPOSED LAND USE AND CHANNEL REACHES

0 500 1,000
Scale in Feet

LEGEND

- Detention Basin
- Commercial
- Drainage Channel
- Estate Residential
- School
- Greenway
- High Density Residential
- Low Density Residential
- Light Industrial/Flex
- Medium Density Residential
- Mixed Use Residential
- Mixed Use Villace Center
- Office
- Open Space
- Road



Adapted from UDFCD, 1999

Figure CWB-1. Constructed Wetland Basin

Figure 5. Typical Detention Basin Layout

Note: Adapted from Figure CWB-1 from Stormwater Quality Design Manual for the Sacramento and south Placer Region.

(ASCE Manual No. 77, pg 329)

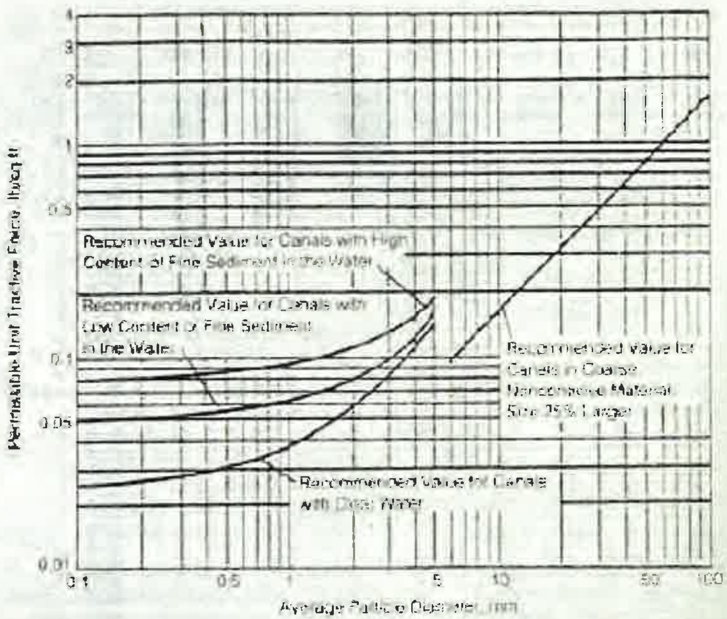


Figure 9.5—Recommended permissible unit tractive forces for canals in noncohesive material (lb/sq ft × 47.88 = Pa) (Chow, 1959)

bridge piers is caused by the vortex resulting from water piling up on the upstream edge and subsequent acceleration of flow around the nose of the pier.

Local scour is a function of a combination of several of the following factors

(a) Slope of the channel

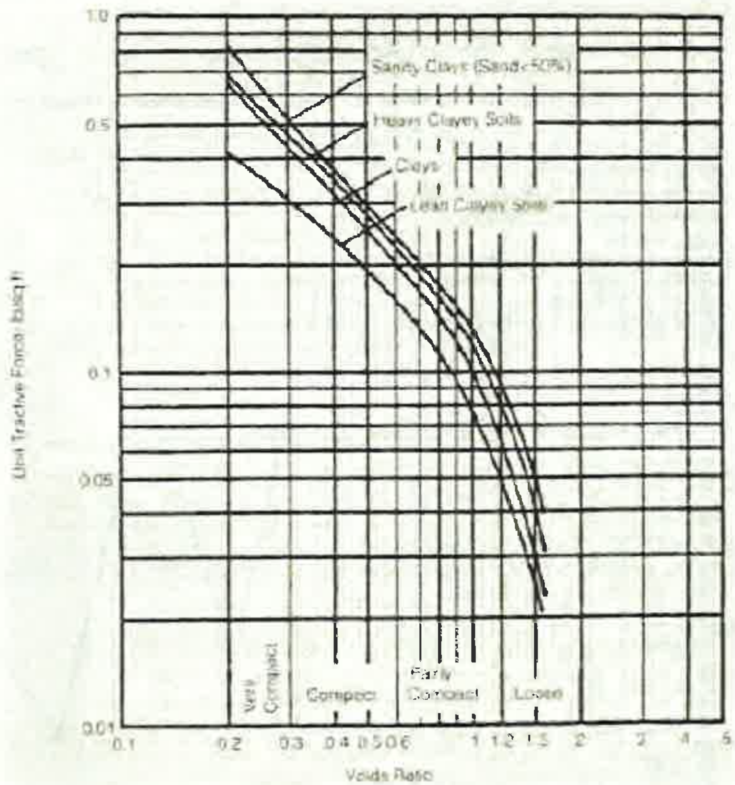


Figure 9.6—Permissible unit tractive forces for canals in cohesive material as converted from data on permissible velocities (lb/sq ft × 47.88 = Pa) (USBR and Hydrotech. Consl., 1936)

Figure 6. Determination of Critical Channel Shear Stress

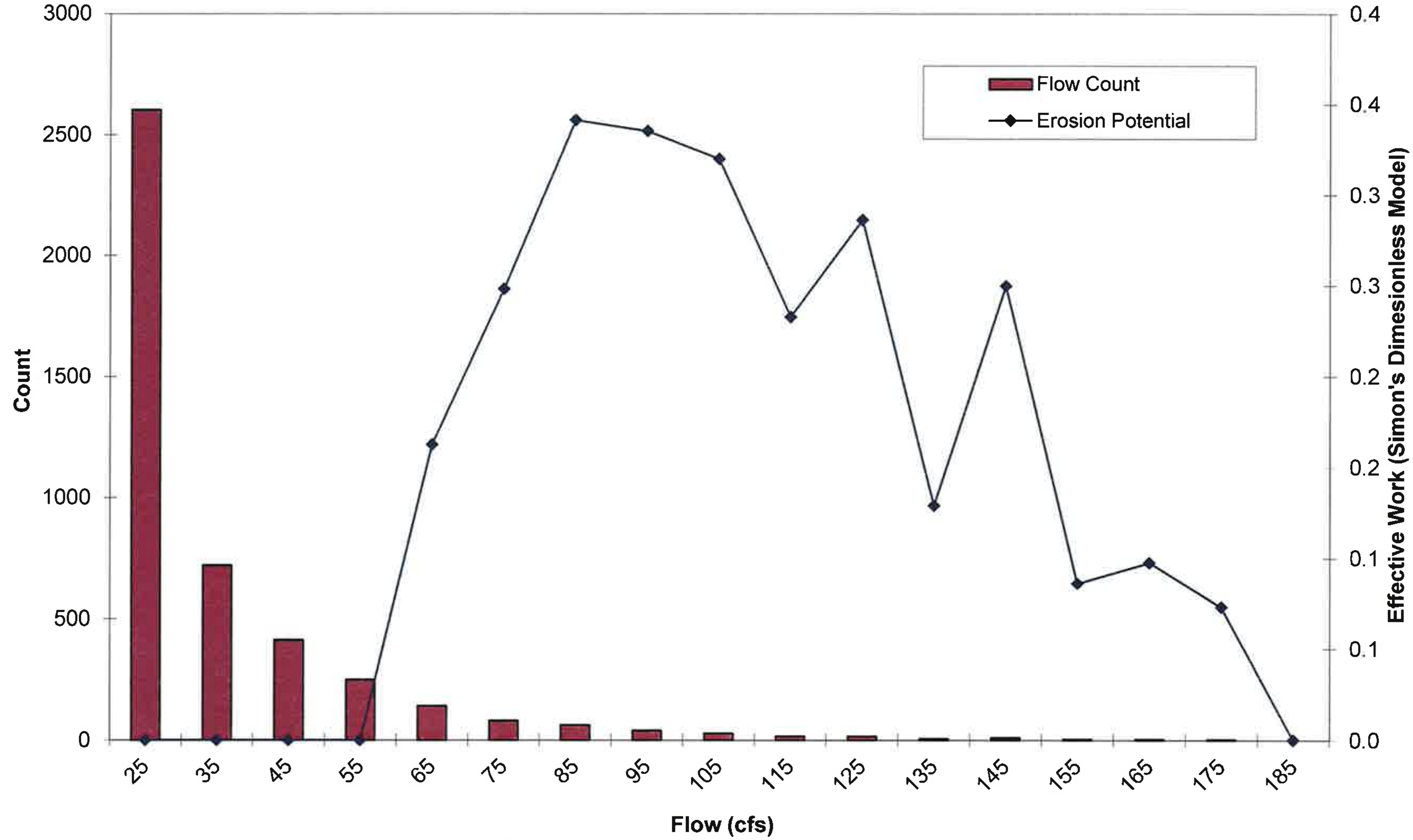


Figure 7

City of Elk Grove

Southeast Policy Area Drainage Study

SHED C CHANNEL REACH 1 – CHANNEL FORMING FLOW CALCULATIONS

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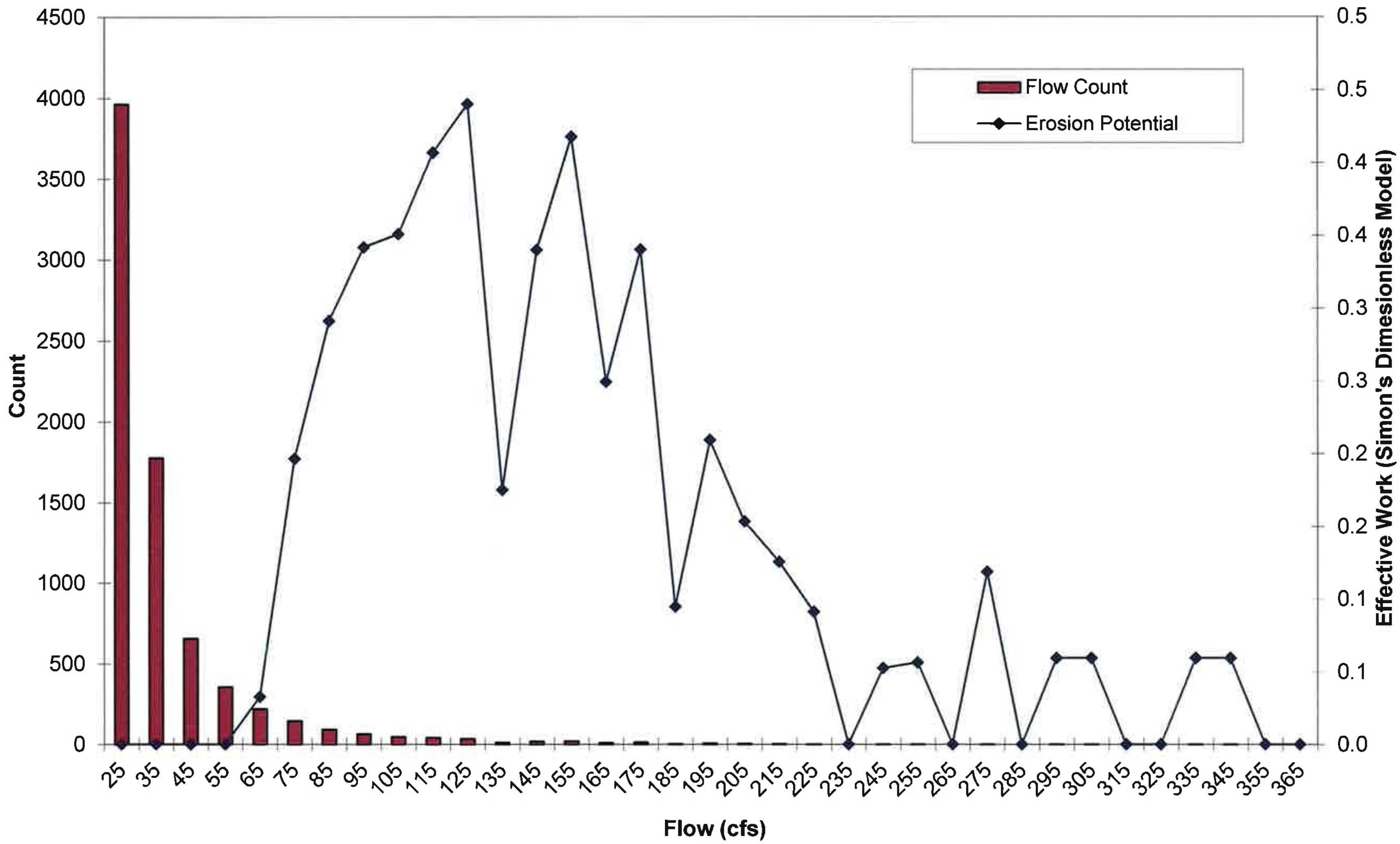

Figure 8

City of Elk Grove

Southeast Policy Area Drainage Study

SHED C CHANNEL REACH 2 – CHANNEL FORMING FLOW CALCULATIONS

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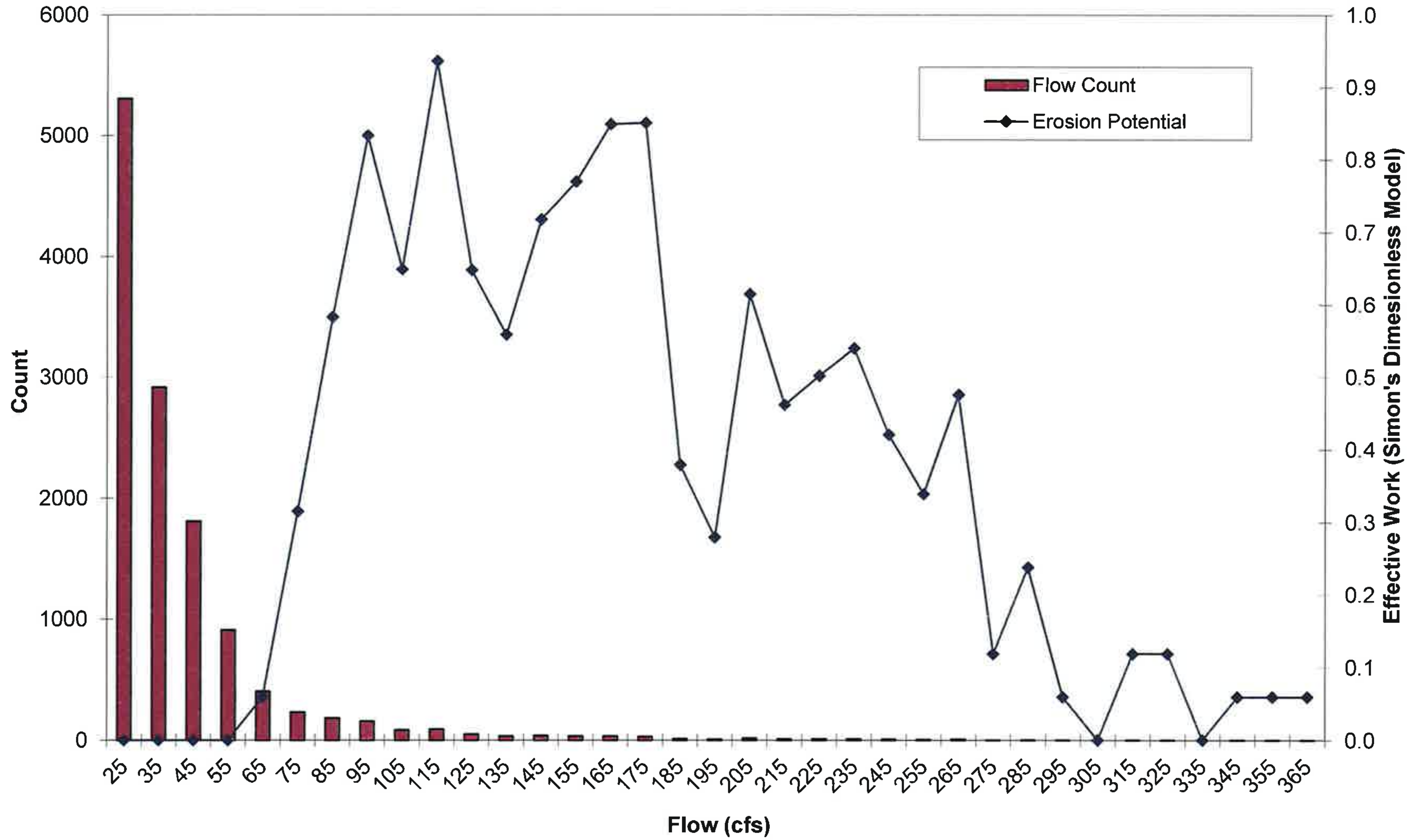

Figure 9

City of Elk Grove

Southeast Policy Area Drainage Study

SHED C CHANNEL REACH 3 – CHANNEL FORMING FLOW CALCULATIONS

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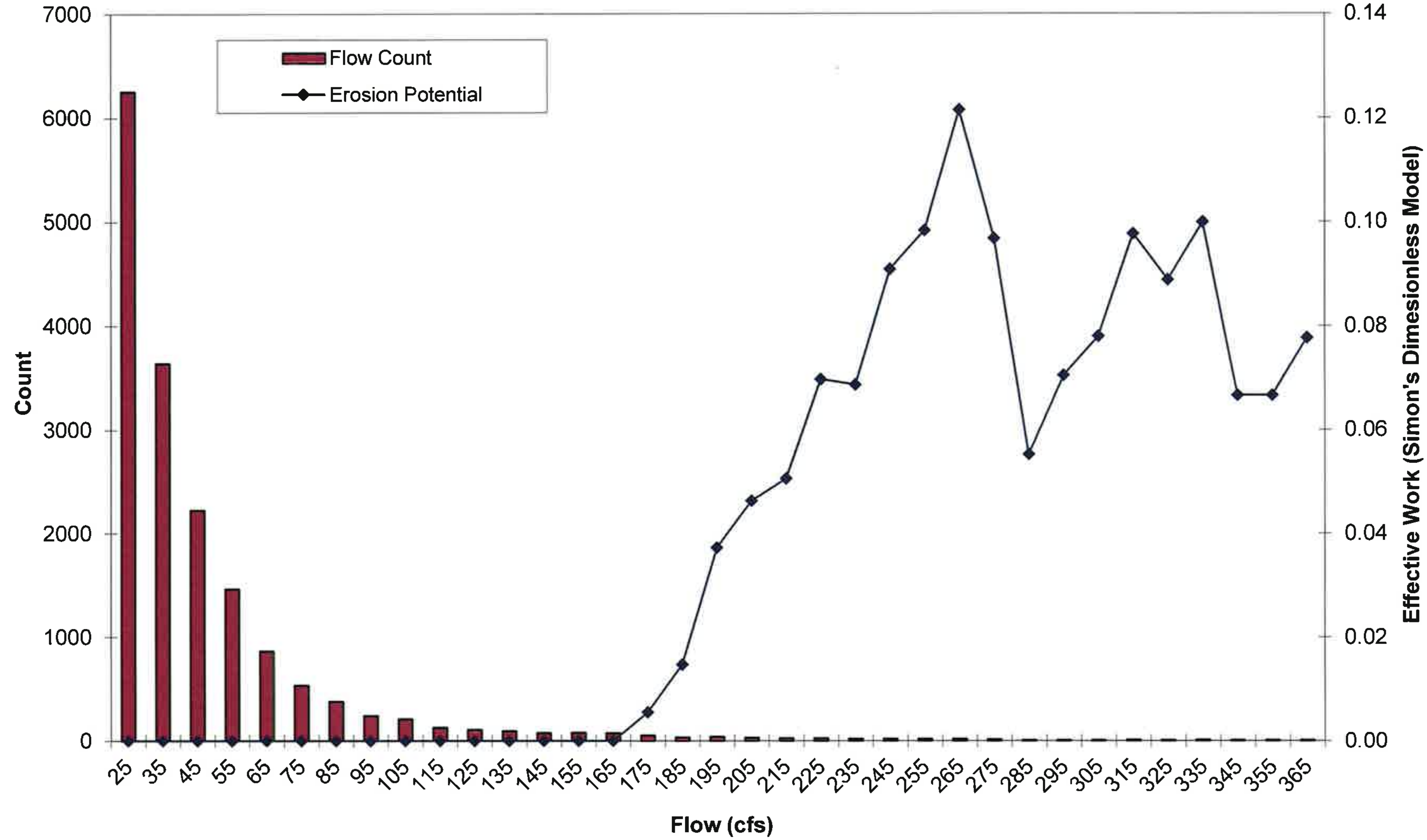

Figure 10
City of Elk Grove
Southeast Policy Area Drainage Study
SHED C CHANNEL REACH 4 – CHANNEL FORMING FLOW CALCULATIONS

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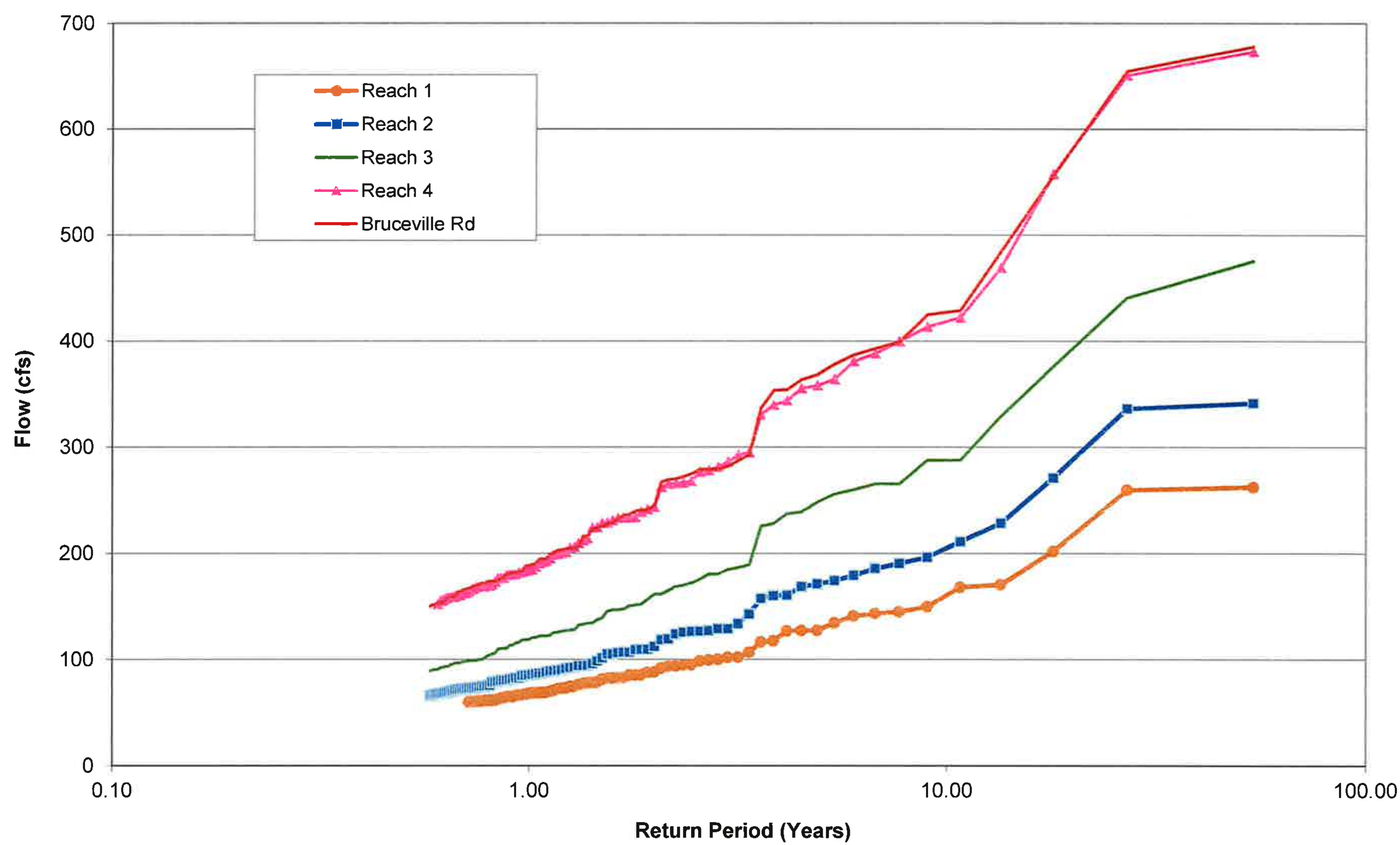

Figure 11
City of Elk Grove
Southeast Policy Area Drainage Study
FLOW FREQUENCY FOR SHED C CHANNEL FOR MITIGATED BUILDOUT CONDITIONS

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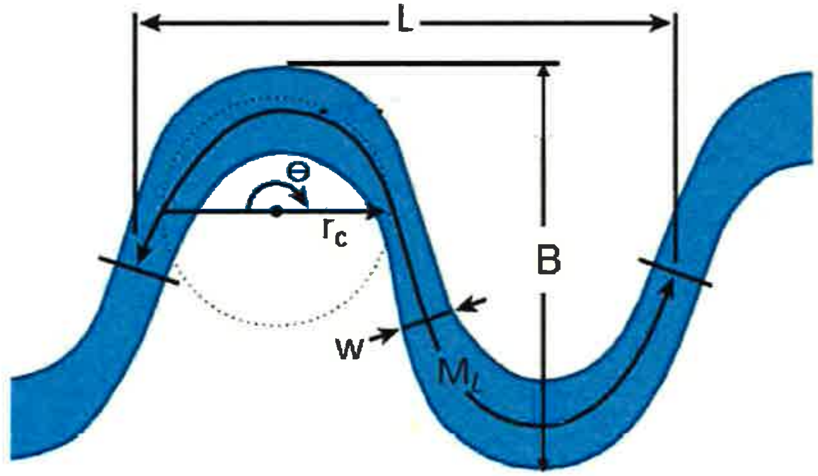

L	meander wavelength
M_L	meander arc length
w	average width at bankfull discharge
B	meander amplitude
r_c	radius of curvature
θ	arc angle

Figure 12. Typical Low Flow Channel Meander Dimensions

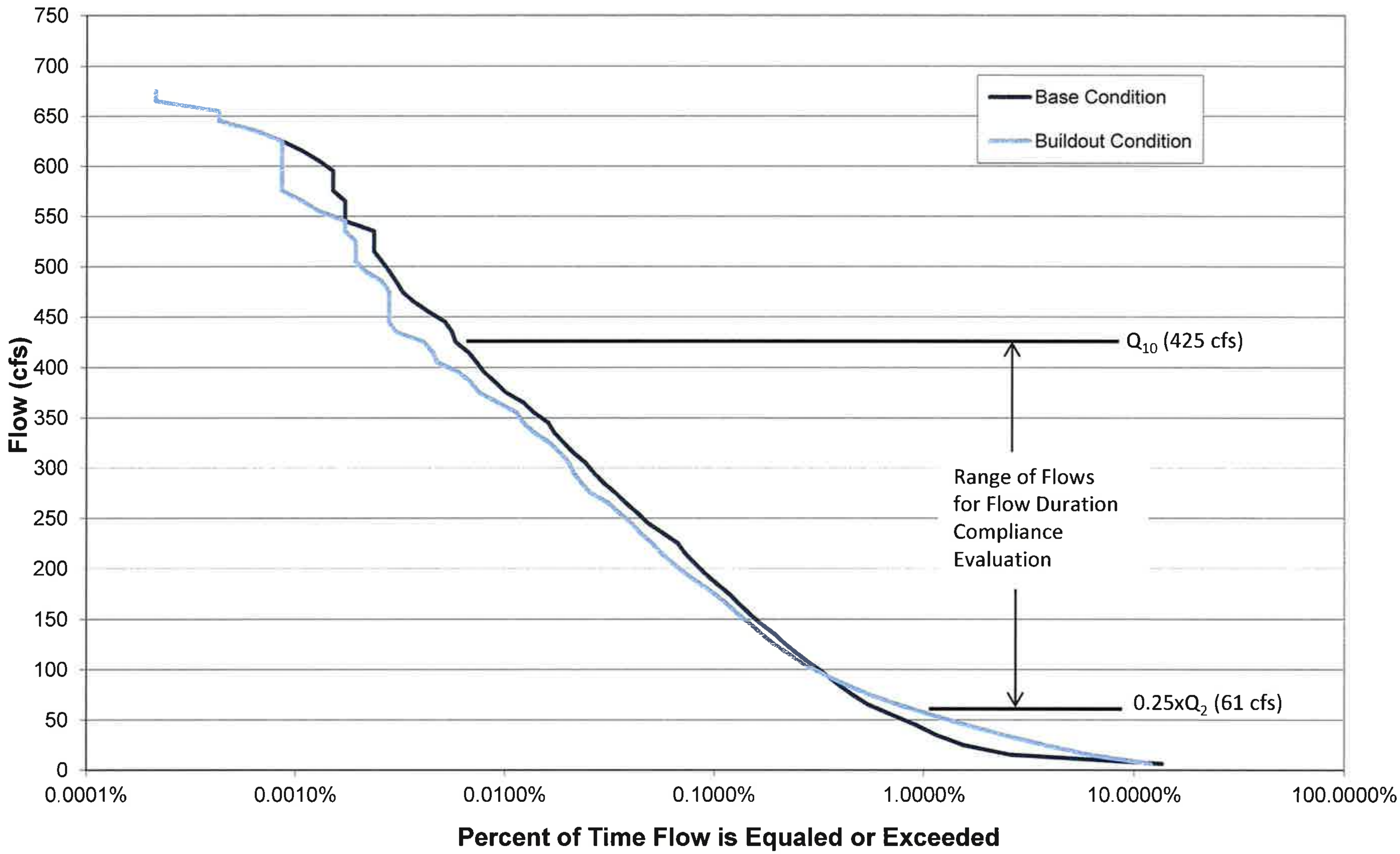

Figure 13

City of Elk Grove

Southeast Policy Area Drainage Study

FLOW DURATION COMPARISON AT BRUCEVILLE ROAD

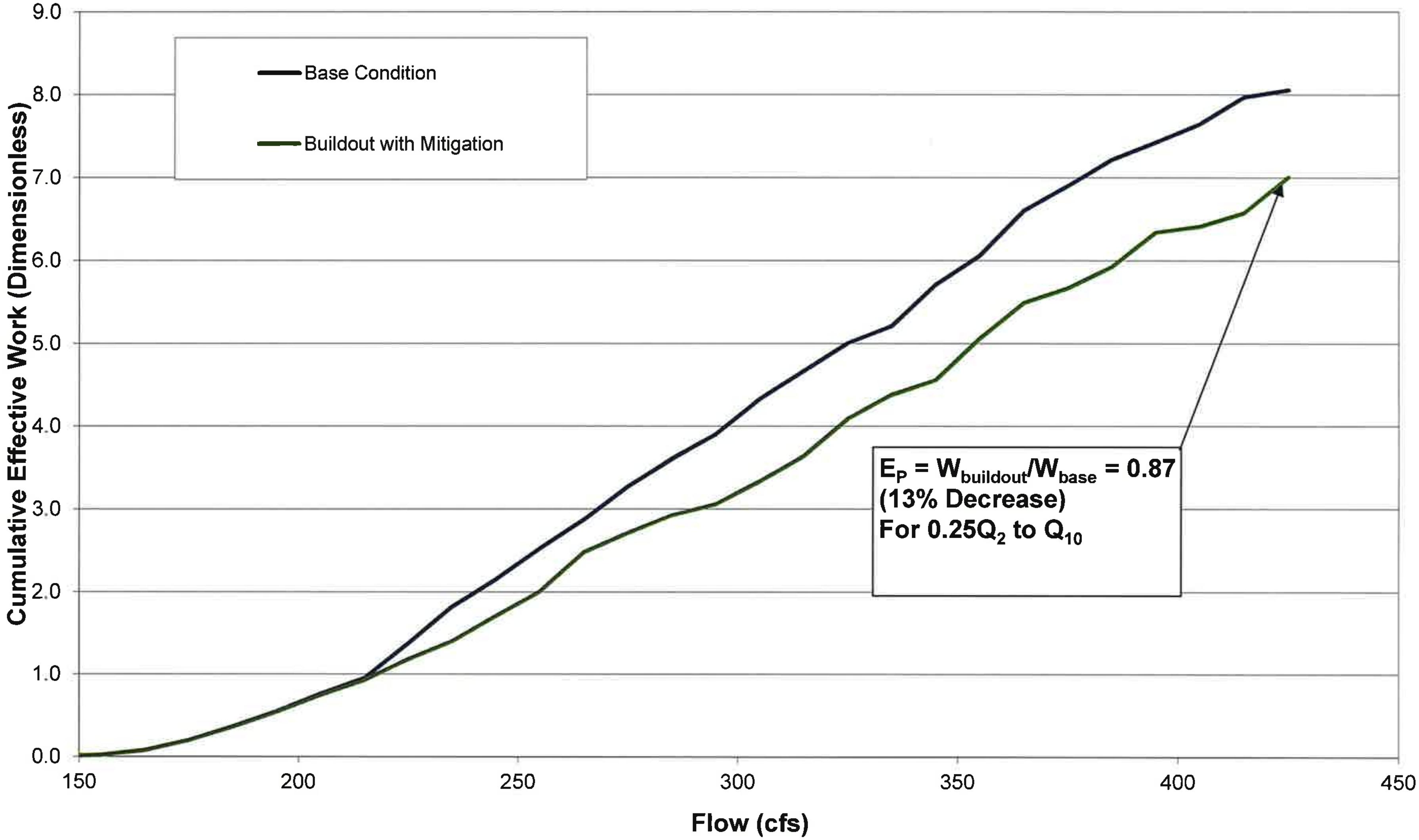

Figure 14

City of Elk Grove

Southeast Policy Area Drainage Study

CUMULATIVE EFFECTIVE WORK AT BRUCEVILLE ROAD

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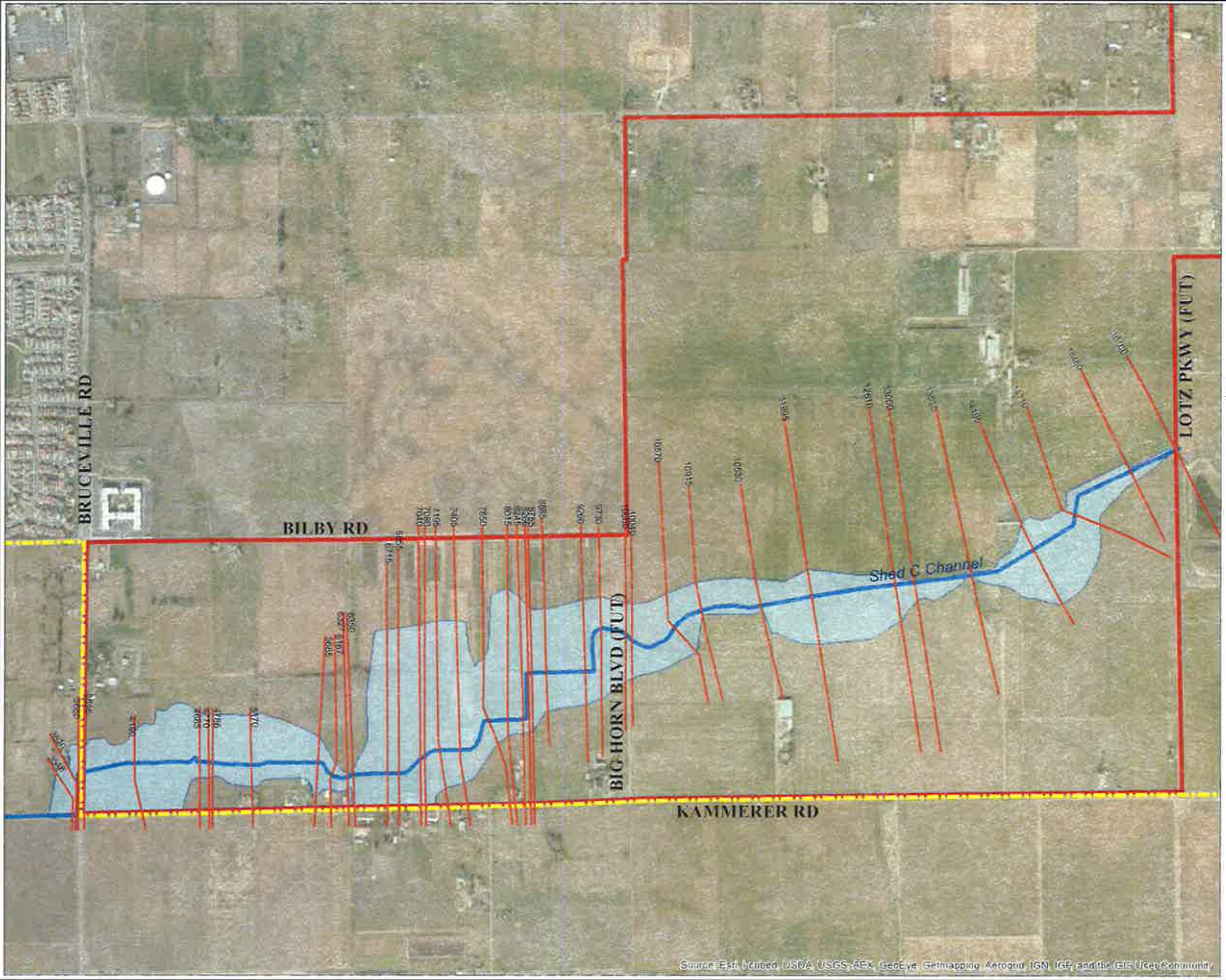

FIGURE 15

City of Elk Grove
Southeast Policy Area
Storm Drainage Study

PRE-DEVELOPMENT
APPROXIMATE 100-YEAR FLOODPLAIN

0 450 900
Scale in Feet

NOTES:

Legend

- HEC-RAS Cross Section
- City Limit
- Southeast Policy Area
- Existing Channel
- Approximate 100-Year Floodplain

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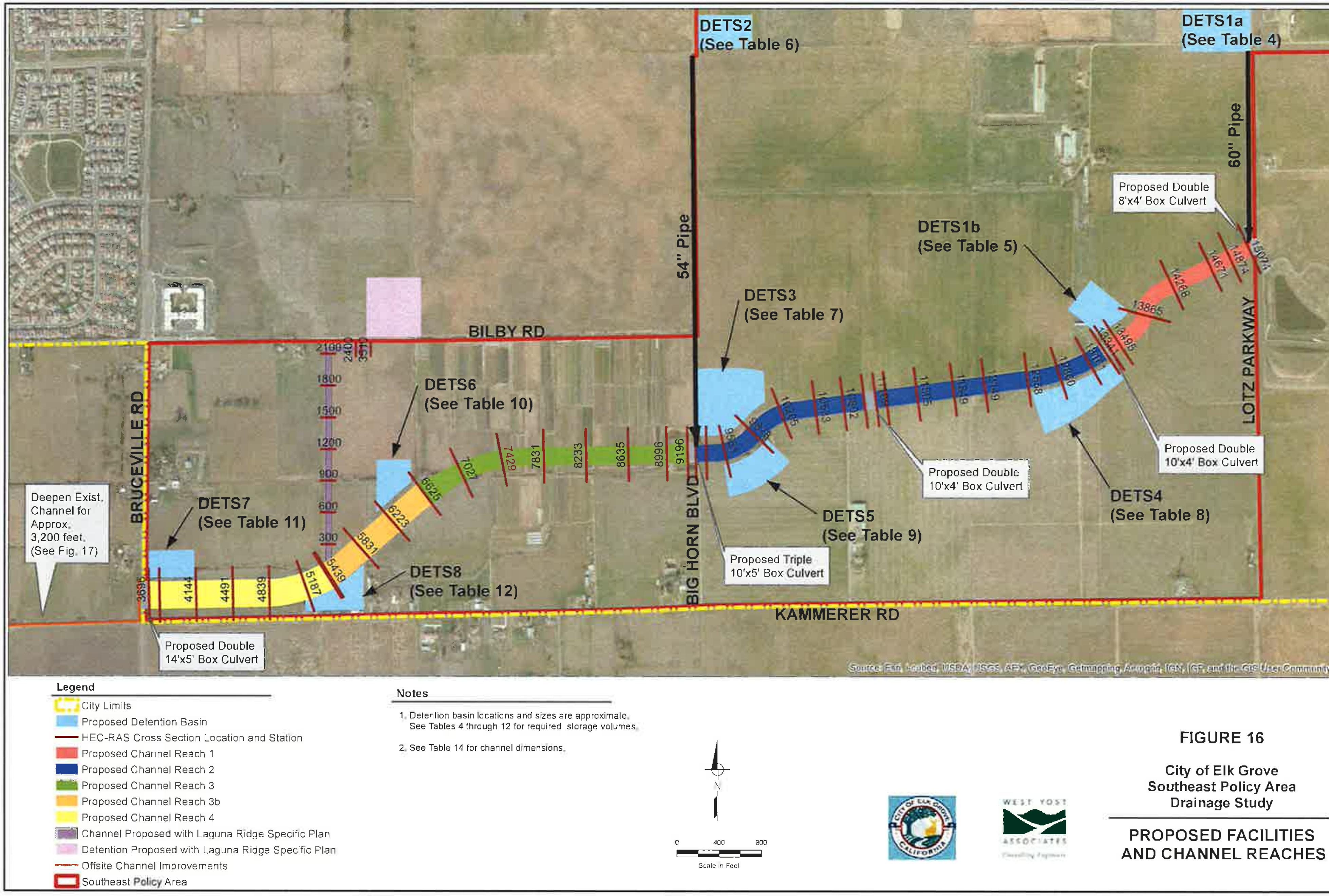


Notes

1. Detention basin locations and sizes are approximate. See Tables 4 through 12 for required storage volumes.
2. See Table 14 for channel dimensions.

FIGURE 16

City of Elk Grove
Southeast Policy Area
Drainage Study

PROPOSED FACILITIES AND CHANNEL REACHES

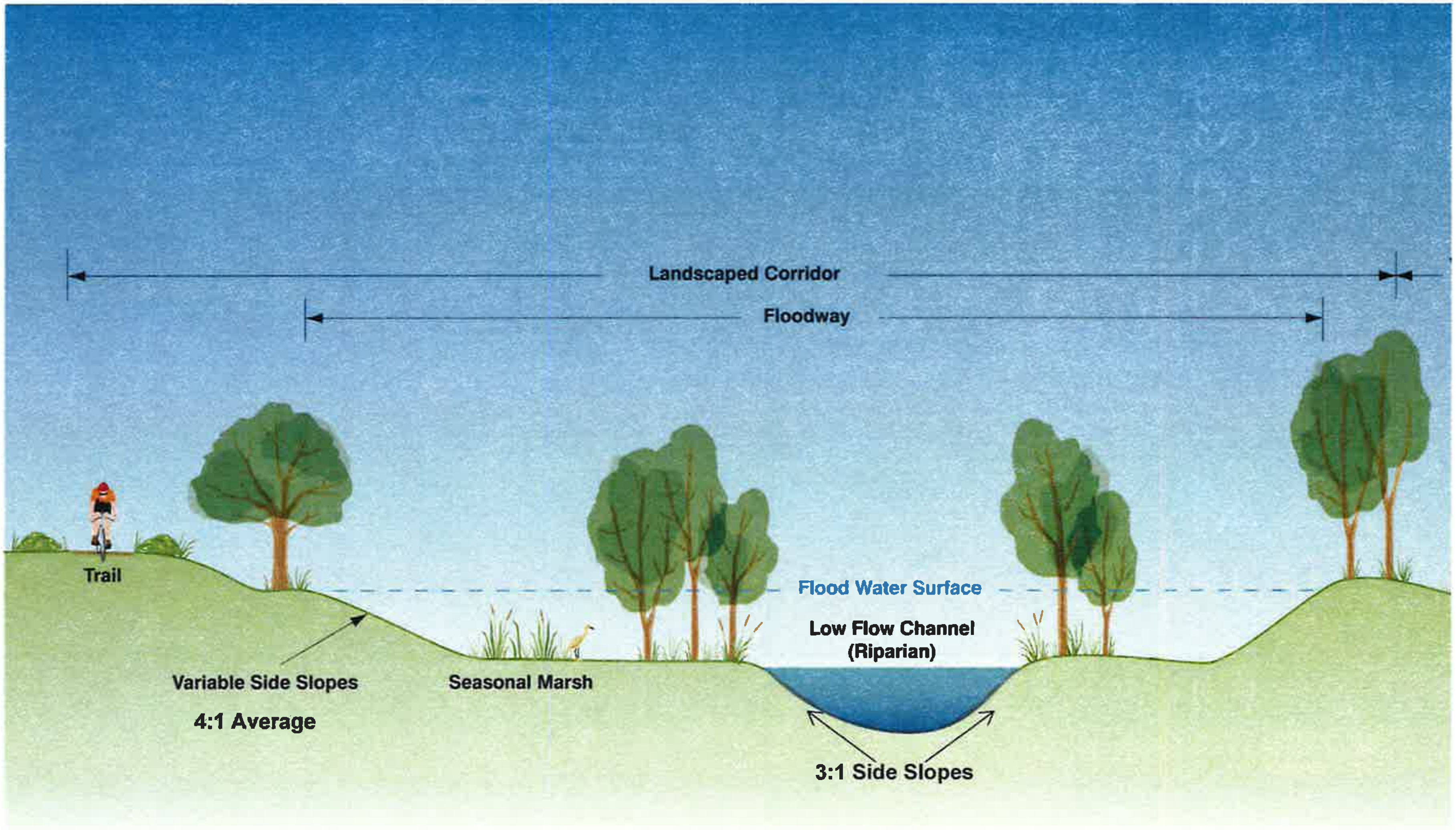
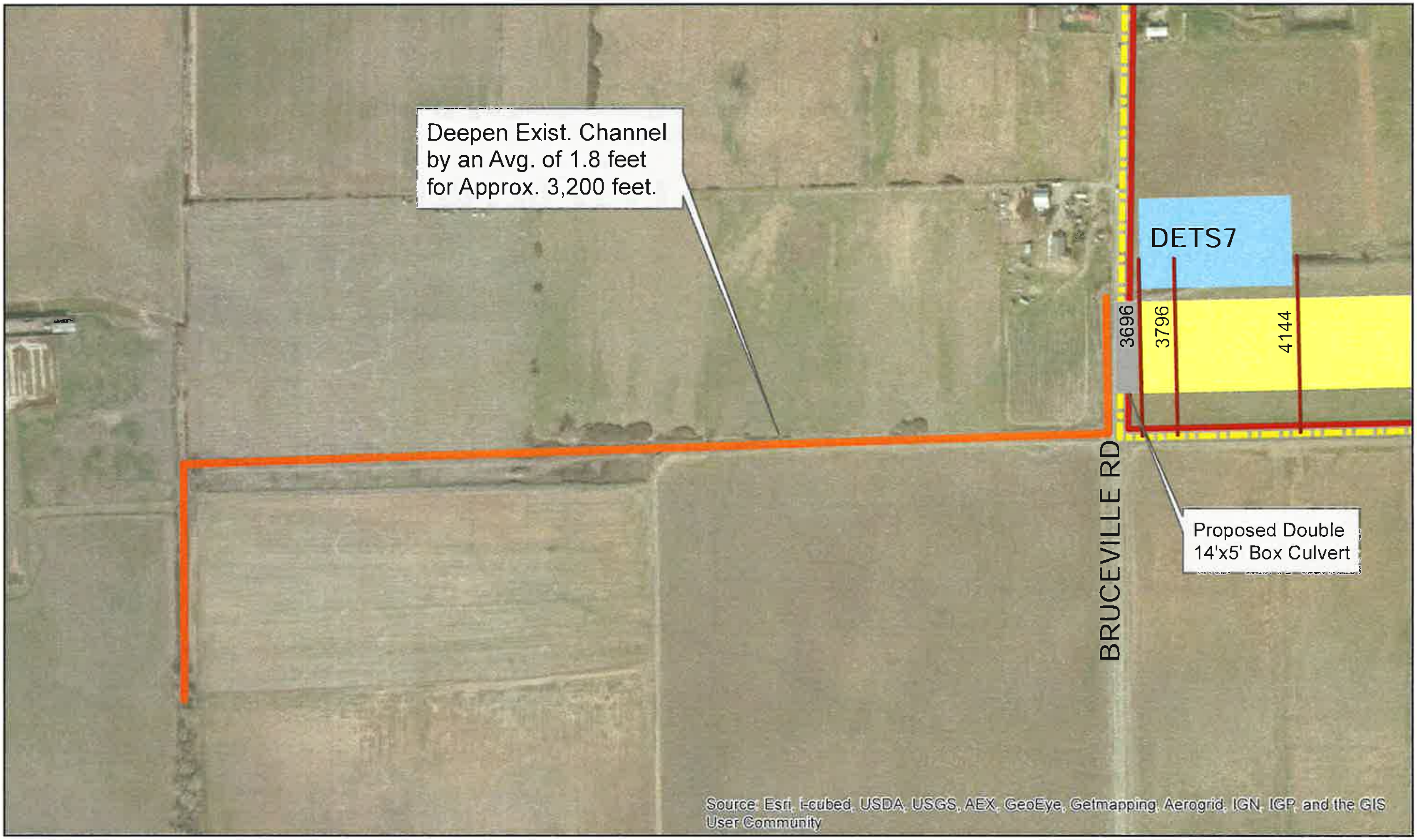


Figure 17. Shed C Channel – Proposed Cross Section



LEGEND

- City Limits
- Proposed Detention Basin
- HEC-RAS Cross Section Location and Station
- Proposed Channel Reach 4
- Offsite Channel Improvements
- Southeast Policy Area

N

0 200 400

Scale in Feet

FIGURE 18

City of Elk Grove
Southeast Policy Area
Drainage Study

PROPOSED OFFSITE
CHANNEL IMPROVEMENTS

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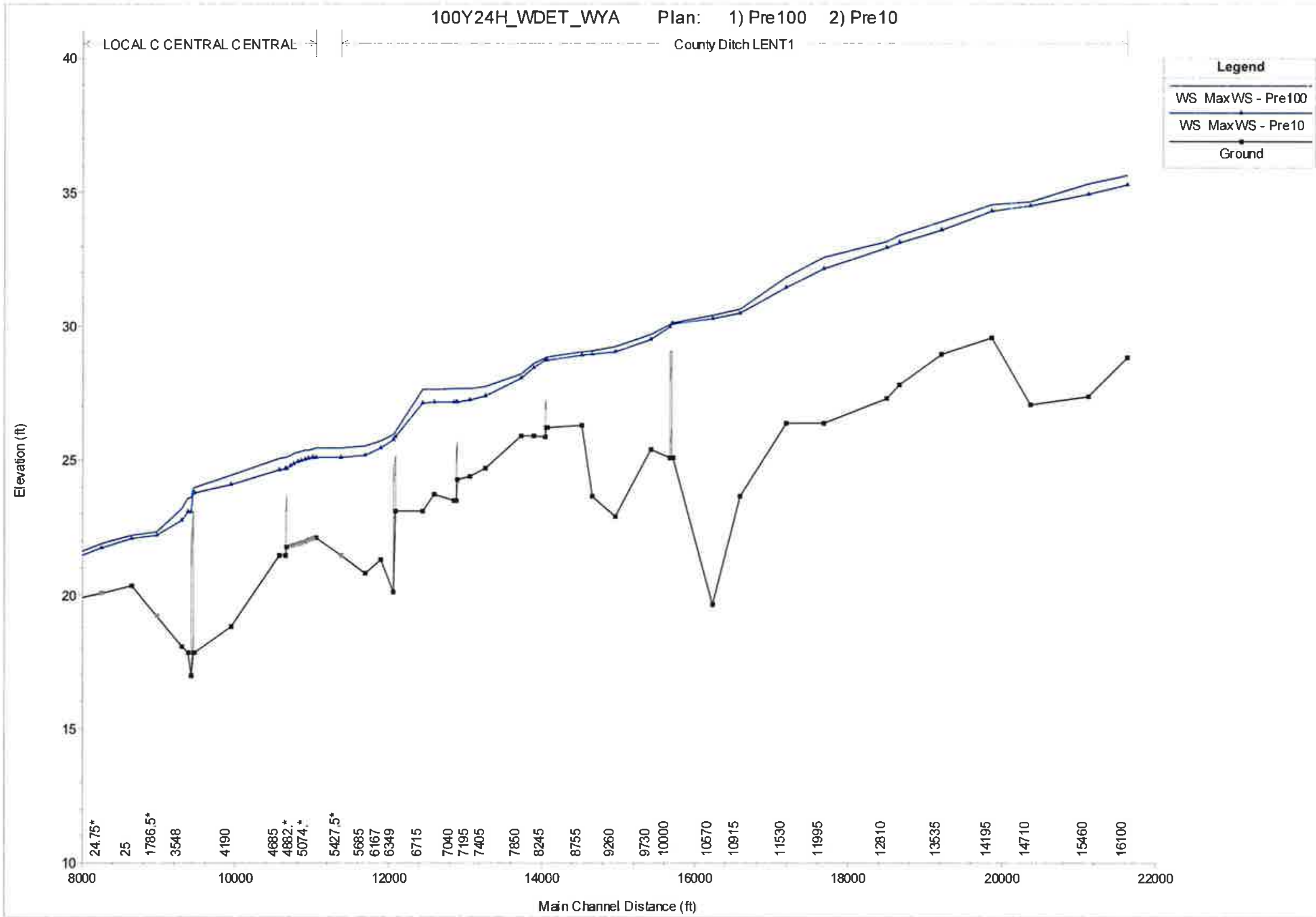


Figure 19. Pre-Development Water Surface Profiles – Shed C Channel

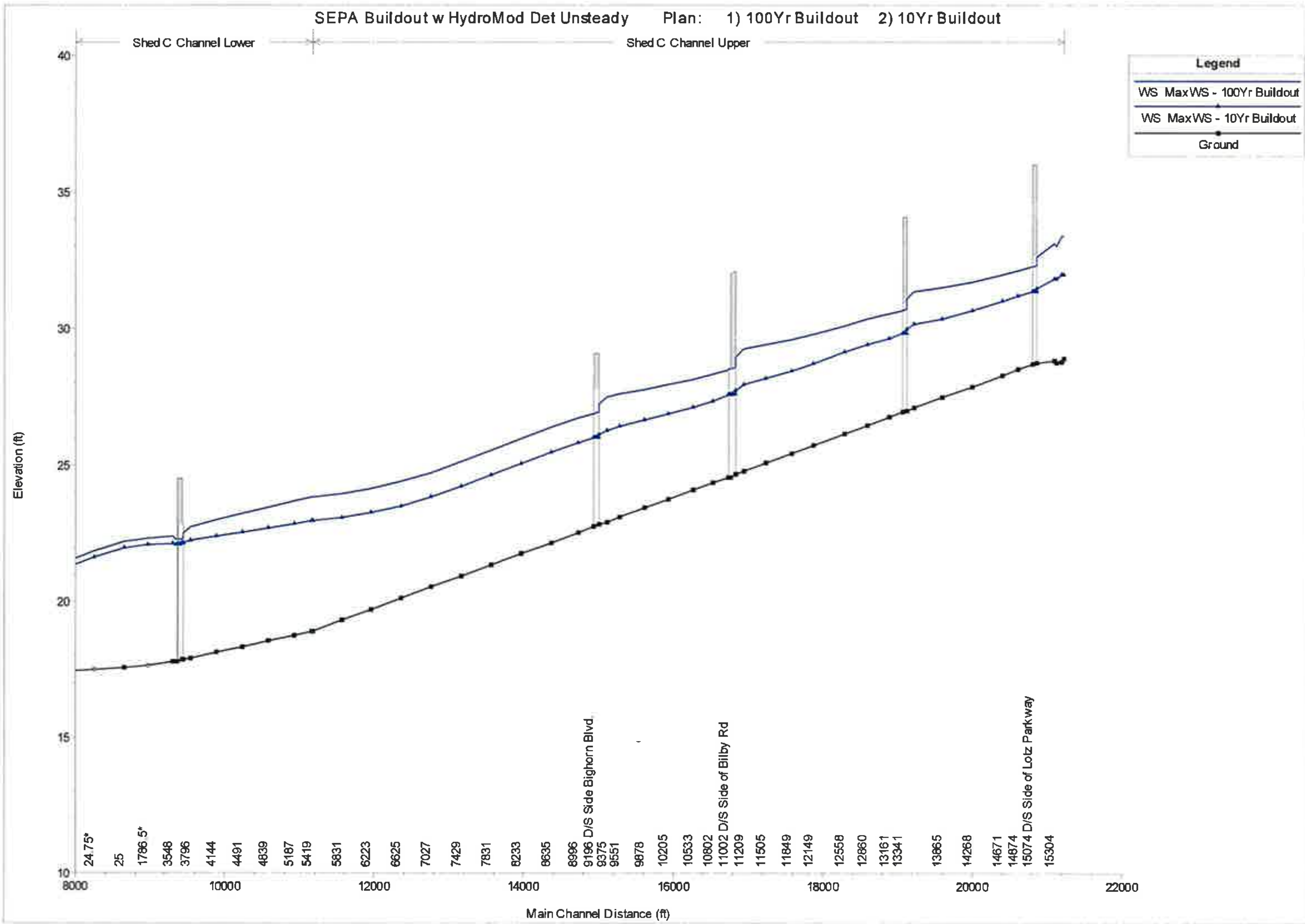


Figure 20. Buildout Water Surface Profiles – Shed C Channel

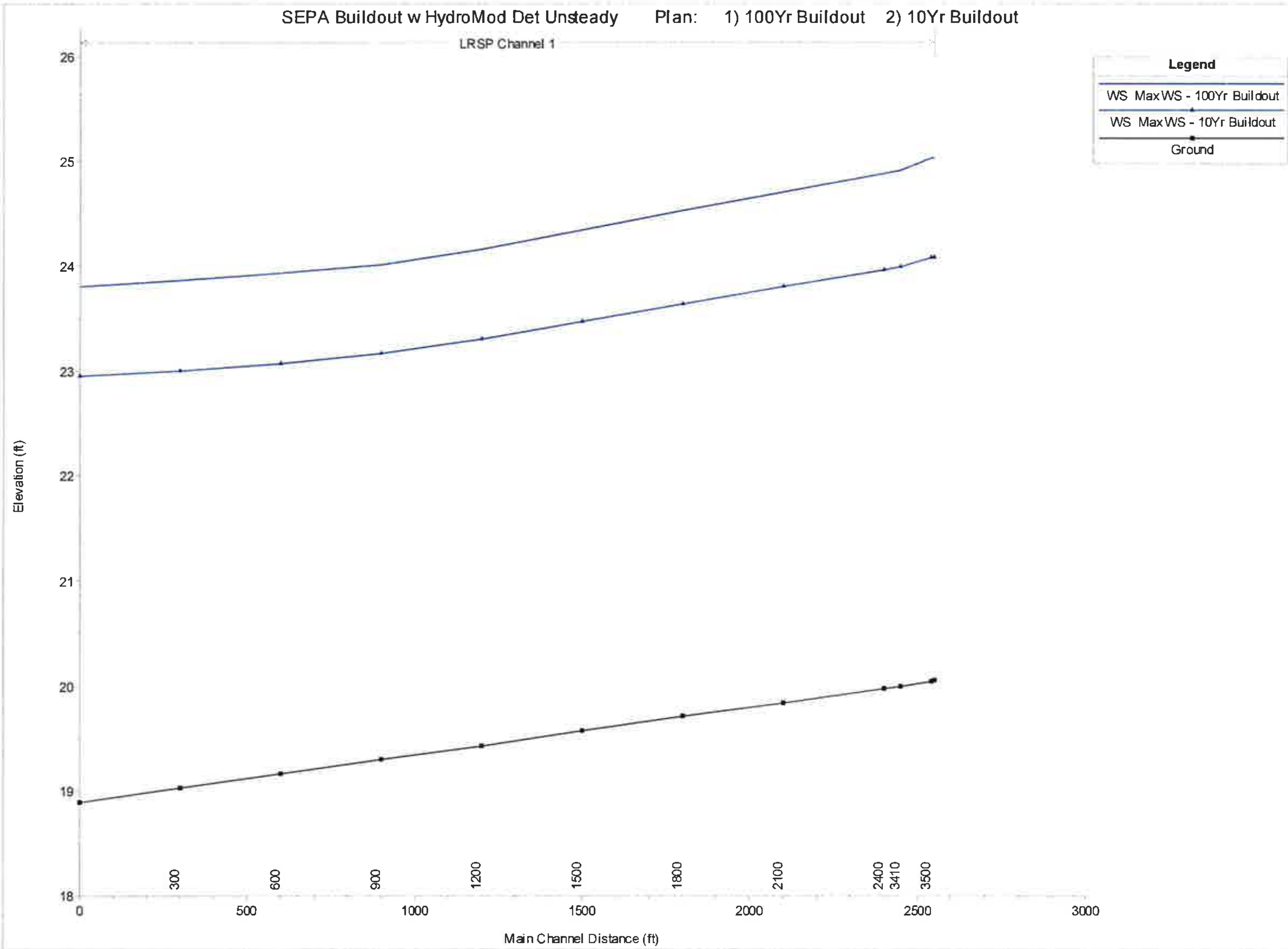
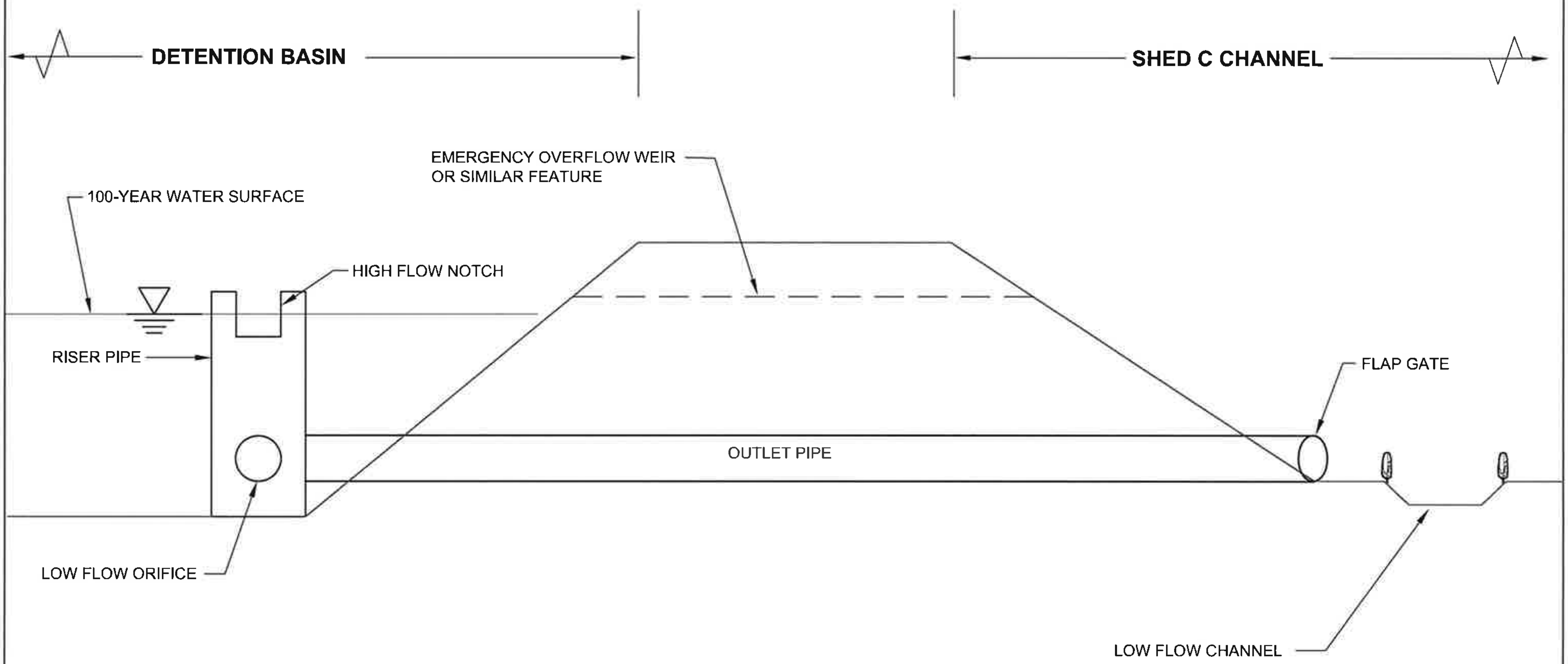


Figure 21. Buildout Water Surface Profiles – Laguna Ridge Specific Plan Channel



City of Elk Grove
SOUTHEAST POLICY AREA
DRAINAGE STUDY
FIGURE 22
TYPICAL DETENTION BASIN OUTLET

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ATTACHMENT A

HEC-RAS Output – Pre-Development Conditions

HEC-RAS Profile: Max WS

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
LOCAL C CENTRAL	CENTRAL	5170	Max WS	Pre100	781.98	22.10	25.42		25.43	0.000439	1.57	1289.16	1463.65	0.16
LOCAL C CENTRAL	CENTRAL	5170	Max WS	Pre10	501.02	22.10	25.10		25.11	0.000509	1.57	858.39	1202.65	0.17
LOCAL C CENTRAL	CENTRAL	5122.*	Max WS	Pre100	781.71	22.06	25.40		25.41	0.000495	1.66	1211.56	1378.73	0.17
LOCAL C CENTRAL	CENTRAL	5122.*	Max WS	Pre10	500.60	22.06	25.07		25.08	0.000578	1.66	802.52	1125.56	0.18
LOCAL C CENTRAL	CENTRAL	5074.*	Max WS	Pre100	781.46	22.02	25.37		25.38	0.000559	1.75	1138.05	1298.37	0.18
LOCAL C CENTRAL	CENTRAL	5074.*	Max WS	Pre10	500.26	22.02	25.04		25.05	0.000659	1.76	749.44	1053.77	0.19
LOCAL C CENTRAL	CENTRAL	5026.*	Max WS	Pre100	781.13	21.98	25.34		25.35	0.000643	1.87	1057.29	1210.25	0.19
LOCAL C CENTRAL	CENTRAL	5026.*	Max WS	Pre10	500.04	21.98	25.00		25.02	0.000759	1.87	691.95	966.79	0.21
LOCAL C CENTRAL	CENTRAL	4978.*	Max WS	Pre100	780.82	21.94	25.30		25.32	0.000732	1.98	987.61	1132.23	0.21
LOCAL C CENTRAL	CENTRAL	4978.*	Max WS	Pre10	499.39	21.94	24.97		24.98	0.000853	1.97	643.26	885.38	0.22
LOCAL C CENTRAL	CENTRAL	4930.*	Max WS	Pre100	780.27	21.89	25.26		25.28	0.000847	2.12	913.94	1050.88	0.22
LOCAL C CENTRAL	CENTRAL	4930.*	Max WS	Pre10	499.25	21.89	24.92		24.94	0.000997	2.11	590.92	814.15	0.24
LOCAL C CENTRAL	CENTRAL	4882.*	Max WS	Pre100	779.60	21.85	25.22		25.24	0.001057	2.36	818.09	954.10	0.25
LOCAL C CENTRAL	CENTRAL	4882.*	Max WS	Pre10	498.56	21.85	24.86		24.89	0.001301	2.39	518.84	736.15	0.27
LOCAL C CENTRAL	CENTRAL	4834.*	Max WS	Pre100	778.68	21.81	25.16		25.19	0.001267	2.56	748.53	887.96	0.27
LOCAL C CENTRAL	CENTRAL	4834.*	Max WS	Pre10	498.50	21.81	24.78		24.82	0.001760	2.74	454.84	684.79	0.31
LOCAL C CENTRAL	CENTRAL	4786	Max WS	Pre100	776.50	21.77	25.08		25.12	0.001722	2.95	646.90	796.31	0.31
LOCAL C CENTRAL	CENTRAL	4786	Max WS	Pre10	494.75	21.77	24.65		24.72	0.003081	3.52	350.44	588.93	0.41
LOCAL C CENTRAL	CENTRAL	4785			Culvert									
LOCAL C CENTRAL	CENTRAL	4770	Max WS	Pre100	776.85	21.47	25.07		25.08	0.000296	1.35	1113.27	828.45	0.13
LOCAL C CENTRAL	CENTRAL	4770	Max WS	Pre10	495.46	21.47	24.65		24.66	0.000270	1.17	800.30	686.08	0.13
LOCAL C CENTRAL	CENTRAL	4685	Max WS	Pre100	776.62	21.47	25.04		25.05	0.000259	0.77	1132.38	1175.84	0.11
LOCAL C CENTRAL	CENTRAL	4685	Max WS	Pre10	494.96	21.47	24.63		24.63	0.000325	0.71	728.83	755.51	0.12
LOCAL C CENTRAL	CENTRAL	4190	Max WS	Pre100	777.07	18.79	24.40		24.49	0.001746	3.60	461.93	577.72	0.33
LOCAL C CENTRAL	CENTRAL	4190	Max WS	Pre10	492.61	18.79	24.08		24.16	0.001351	2.98	334.54	358.85	0.28
LOCAL C CENTRAL	CENTRAL	4000	Max WS	Pre100	775.24	17.84	23.93		23.98	0.000280	1.75	646.77	656.79	0.14
LOCAL C CENTRAL	CENTRAL	4000	Max WS	Pre10	491.94	17.84	23.75		23.76	0.000139	1.21	538.05	555.64	0.10
LOCAL C CENTRAL	CENTRAL	3696	Max WS	Pre100	802.18	17.84	23.93		23.98	0.000302	1.82	643.05	653.59	0.15
LOCAL C CENTRAL	CENTRAL	3696	Max WS	Pre10	504.11	17.84	23.75		23.77	0.000146	1.24	536.74	554.31	0.10
LOCAL C CENTRAL	CENTRAL	3695			Culvert									
LOCAL C CENTRAL	CENTRAL	3660	Max WS	Pre100	801.83	16.98	23.54		23.59	0.000441	2.07	691.94	658.10	0.17
LOCAL C CENTRAL	CENTRAL	3660	Max WS	Pre10	503.75	16.98	23.04		23.08	0.000375	1.76	409.99	432.33	0.16
LOCAL C CENTRAL	CENTRAL	3620	Max WS	Pre100	801.72	17.85	23.55		23.56	0.000228	1.40	1221.95	872.99	0.12
LOCAL C CENTRAL	CENTRAL	3620	Max WS	Pre10	503.79	17.85	23.05		23.06	0.000225	1.27	825.92	703.55	0.12
LOCAL C CENTRAL	CENTRAL	3548	Max WS	Pre100	801.51	18.08	23.16	22.07	23.78	0.005737	6.65	193.36	356.79	0.58
LOCAL C CENTRAL	CENTRAL	3548	Max WS	Pre10	503.65	18.08	22.76		23.16	0.003896	5.12	103.79	93.92	0.47
LOCAL C CENTRAL	CENTRAL	1786.5*	Max WS	Pre100	801.03	19.20	22.33		22.33	0.000033	0.32	2544.01	1571.15	0.04
LOCAL C CENTRAL	CENTRAL	1786.5*	Max WS	Pre10	499.18	19.20	22.19		22.19	0.000017	0.22	2327.90	1513.14	0.03
LOCAL C CENTRAL	CENTRAL	25	Max WS	Pre100	799.14	20.33	22.20		22.21	0.000795	0.55	1326.57	3078.87	0.16
LOCAL C CENTRAL	CENTRAL	25	Max WS	Pre10	496.97	20.33	22.07		22.08	0.000791	0.43	948.49	2914.10	0.15
LOCAL C CENTRAL	CENTRAL	24.75*	Max WS	Pre100	795.18	20.06	21.89		21.90	0.000871	0.65	1212.44	2661.62	0.17
LOCAL C CENTRAL	CENTRAL	24.75*	Max WS	Pre10	494.32	20.06	21.74		21.74	0.001077	0.57	812.96	2437.12	0.18
LOCAL C CENTRAL	CENTRAL	24.5*	Max WS	Pre100	792.28	19.78	21.46		21.47	0.001404	0.82	951.02	2177.34	0.21
LOCAL C CENTRAL	CENTRAL	24.5*	Max WS	Pre10	494.26	19.78	21.28		21.30	0.002193	0.78	589.17	1880.74	0.25
LOCAL C CENTRAL	CENTRAL	24.25*	Max WS	Pre100	790.42	19.51	20.85		20.87	0.002688	1.05	782.42	2100.08	0.29
LOCAL C CENTRAL	CENTRAL	24.25*	Max WS	Pre10	493.23	19.51	20.67		20.69	0.002533	1.13	477.63	1229.52	0.29
LOCAL C CENTRAL	CENTRAL	24	Max WS	Pre100	787.43	19.24	20.42		20.43	0.000557	0.61	1404.28	2395.91	0.14
LOCAL C CENTRAL	CENTRAL	24	Max WS	Pre10	490.74	19.24	20.22		20.23	0.000476	0.58	978.44	1885.64	0.13
LOCAL C CENTRAL	CENTRAL	23.5*	Max WS	Pre100	838.07	18.15	19.93		19.94	0.001711	1.04	810.65	1468.16	0.25
LOCAL C CENTRAL	CENTRAL	23.5*	Max WS	Pre10	513.53	18.15	19.74		19.75	0.001646	0.91	562.21	1188.79	0.23
LOCAL C CENTRAL	CENTRAL	23	Max WS	Pre100	830.29	17.05	19.39		19.40	0.000777	0.80	1144.04	1880.59	0.17
LOCAL C CENTRAL	CENTRAL	23	Max WS	Pre10	511.57	17.05	19.17		19.18	0.000881	0.71	758.86	1622.42	0.17
LOCAL C CENTRAL	CENTRAL	22.75*	Max WS	Pre100	824.21	16.91	19.07		19.08	0.000816	0.87	966.77	1355.93	0.18
LOCAL C CENTRAL	CENTRAL	22.75*	Max WS	Pre10	509.52	16.91	18.82		18.83	0.000906	0.79	658.89	1135.20	0.18
LOCAL C CENTRAL	CENTRAL	22.5*	Max WS	Pre100	819.89	16.78	18.75		18.77	0.000793	0.84	984.23	1411.12	0.17
LOCAL C CENTRAL	CENTRAL	22.5*	Max WS	Pre10	507.72	16.78	18.50		18.51	0.000736	0.76	673.06	1053.09	0.17
LOCAL C CENTRAL	CENTRAL	22.25*	Max WS	Pre100	814.04	16.65	18.49		18.50	0.000824	0.81	1032.00	1471.13	0.16
LOCAL C CENTRAL	CENTRAL	22.25*	Max WS	Pre10	504.78	16.65	18.24		18.24	0.000641	0.71	711.24	1120.98	0.15
LOCAL C CENTRAL	CENTRAL	22	Max WS	Pre100	811.46	16.51	18.32		18.32	0.000300	0.62	1543.30	2026.43	0.11
LOCAL C CENTRAL	CENTRAL	22	Max WS	Pre10	502.36	16.51	18.05		18.06	0.000360	0.56	1035.04	1802.09	0.12
LOCAL C CENTRAL	CENTRAL	21.8571*	Max WS	Pre100	905.56	16.20	18.16		18.17	0.000402	0.73	1431.83	1875.77	0.13

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
LOCAL C CENTRAL	CENTRAL	21.8571*	Max WS	Pre10	544.68	16.20	17.88		17.89	0.000467	0.66	936.65	1636.60	0.13
LOCAL C CENTRAL	CENTRAL	21.7142*	Max WS	Pre100	896.18	15.89	17.98		17.99	0.000471	0.78	1297.14	1716.51	0.14
LOCAL C CENTRAL	CENTRAL	21.7142*	Max WS	Pre10	541.12	15.89	17.67		17.67	0.000558	0.72	807.28	1381.31	0.15
LOCAL C CENTRAL	CENTRAL	21.5714*	Max WS	Pre100	890.02	15.58	17.78		17.79	0.000514	0.82	1182.79	1559.22	0.15
LOCAL C CENTRAL	CENTRAL	21.5714*	Max WS	Pre10	537.58	15.58	17.42		17.43	0.000622	0.78	710.32	1049.11	0.16
LOCAL C CENTRAL	CENTRAL	21.4285*	Max WS	Pre100	882.97	15.26	17.56		17.57	0.000541	0.85	1086.76	1382.74	0.15
LOCAL C CENTRAL	CENTRAL	21.4285*	Max WS	Pre10	533.63	15.26	17.15		17.16	0.000691	0.84	641.57	871.54	0.17
LOCAL C CENTRAL	CENTRAL	21.2857*	Max WS	Pre100	820.43	14.95	17.34		17.35	0.000473	0.81	1038.27	1176.64	0.14
LOCAL C CENTRAL	CENTRAL	21.2857*	Max WS	Pre10	527.47	14.95	16.87		16.88	0.000701	0.88	600.52	710.99	0.17
LOCAL C CENTRAL	CENTRAL	21.1428*	Max WS	Pre100	669.91	14.64	17.19		17.19	0.000252	0.62	1102.52	1161.48	0.10
LOCAL C CENTRAL	CENTRAL	21.1428*	Max WS	Pre10	501.85	14.64	16.59		16.60	0.000591	0.86	583.18	626.39	0.16
LOCAL C CENTRAL	CENTRAL	21	Max WS	Pre100	634.38	14.33	17.10		17.11	0.000156	0.51	1276.93	1292.27	0.08
LOCAL C CENTRAL	CENTRAL	21	Max WS	Pre10	377.78	14.33	16.42		16.43	0.000236	0.59	635.82	597.85	0.10
LOCAL C CENTRAL	CENTRAL	20.6666*	Max WS	Pre100	628.01	13.21	17.06		17.06	0.000046	0.29	2176.22	1809.80	0.05
LOCAL C CENTRAL	CENTRAL	20.6666*	Max WS	Pre10	357.76	13.21	16.35		16.36	0.000077	0.33	1093.90	1088.33	0.06
LOCAL C CENTRAL	CENTRAL	20.3333*	Max WS	Pre100	624.77	12.09	17.05		17.05	0.000014	0.18	3519.18	2632.44	0.03
LOCAL C CENTRAL	CENTRAL	20.3333*	Max WS	Pre10	352.12	12.09	16.33		16.33	0.000025	0.18	1923.51	1992.37	0.03
LOCAL C CENTRAL	CENTRAL	20	Max WS	Pre100	623.52	10.97	17.05		17.05	0.000005	0.12	5373.51	3416.40	0.02
LOCAL C CENTRAL	CENTRAL	20	Max WS	Pre10	351.19	10.97	16.33		16.33	0.000006	0.11	3230.56	2588.00	0.02
County Ditch	LENT1	16100	Max WS	Pre100	338.78	28.80	35.58		35.61	0.000153	1.33	255.17	61.12	0.11
County Ditch	LENT1	16100	Max WS	Pre10	205.63	28.80	35.23		35.24	0.000071	0.88	234.31	58.70	0.08
County Ditch	LENT1	15460	Max WS	Pre100	334.68	27.38	35.29		35.35	0.000916	2.30	236.40	239.16	0.22
County Ditch	LENT1	15460	Max WS	Pre10	196.84	27.38	34.91		35.01	0.001099	2.46	80.16	23.21	0.23
County Ditch	LENT1	14710	Max WS	Pre100	286.71	27.08	34.62		34.70	0.000688	2.34	146.32	89.29	0.20
County Ditch	LENT1	14710	Max WS	Pre10	194.73	27.08	34.47		34.51	0.000369	1.68	133.54	85.00	0.14
County Ditch	LENT1	14195	Max WS	Pre100	230.48	29.56	34.50		34.54	0.000573	1.68	136.90	50.71	0.18
County Ditch	LENT1	14195	Max WS	Pre10	189.49	29.56	34.27		34.30	0.000474	1.51	125.61	47.51	0.16
County Ditch	LENT1	13535	Max WS	Pre100	230.37	28.93	33.89		33.97	0.001717	2.39	96.37	33.40	0.25
County Ditch	LENT1	13535	Max WS	Pre10	189.27	28.93	33.58		33.66	0.001555	2.19	86.47	31.77	0.23
County Ditch	LENT1	13000	Max WS	Pre100	230.33	27.82	33.36		33.39	0.000472	1.48	189.43	105.92	0.13
County Ditch	LENT1	13000	Max WS	Pre10	188.59	27.82	33.09		33.11	0.000473	1.41	162.83	91.04	0.13
County Ditch	LENT1	12810	Max WS	Pre100	227.88	27.31	33.15		33.24	0.001330	2.44	102.75	73.48	0.22
County Ditch	LENT1	12810	Max WS	Pre10	187.44	27.31	32.90		32.98	0.001145	2.19	87.89	47.79	0.20
County Ditch	LENT1	11995	Max WS	Pre100	411.68	26.38	32.54		32.55	0.000268	0.86	680.31	727.57	0.08
County Ditch	LENT1	11995	Max WS	Pre10	319.64	26.38	32.15		32.17	0.000794	1.40	294.15	264.58	0.14
County Ditch	LENT1	11530	Max WS	Pre100	411.37	26.37	31.82		31.95	0.002373	2.86	143.93	36.66	0.25
County Ditch	LENT1	11530	Max WS	Pre10	319.44	26.37	31.43		31.53	0.001883	2.45	130.12	35.07	0.22
County Ditch	LENT1	10915	Max WS	Pre100	406.89	23.64	30.61		30.67	0.001856	2.07	250.99	270.99	0.22
County Ditch	LENT1	10915	Max WS	Pre10	319.35	23.64	30.44		30.49	0.001625	1.91	205.52	235.94	0.20
County Ditch	LENT1	10570	Max WS	Pre100	400.04	19.63	30.39		30.40	0.000008	0.31	1537.50	544.12	0.02
County Ditch	LENT1	10570	Max WS	Pre10	319.31	19.63	30.25		30.25	0.000006	0.26	1458.94	517.81	0.02
County Ditch	LENT1	10040	Max WS	Pre100	532.00	25.08	30.10		30.12	0.001010	1.62	520.52	722.12	0.16
County Ditch	LENT1	10040	Max WS	Pre10	389.92	25.08	30.06		30.08	0.000620	1.26	493.02	705.56	0.13
County Ditch	LENT1	10030			Culvert									
County Ditch	LENT1	10000	Max WS	Pre100	532.92	25.08	30.04		30.07	0.001243	1.77	475.01	681.99	0.18
County Ditch	LENT1	10000	Max WS	Pre10	388.48	25.08	29.94		30.00	0.002543	2.49	245.24	427.05	0.26
County Ditch	LENT1	9730	Max WS	Pre100	530.48	25.38	29.66		29.68	0.001690	1.62	491.00	867.33	0.20
County Ditch	LENT1	9730	Max WS	Pre10	387.32	25.38	29.50		29.52	0.001995	1.67	356.88	750.53	0.21
County Ditch	LENT1	9260	Max WS	Pre100	525.40	22.91	29.20		29.24	0.000888	1.87	415.25	529.97	0.16
County Ditch	LENT1	9260	Max WS	Pre10	379.74	22.91	29.03		29.06	0.000632	1.55	335.96	419.95	0.13
County Ditch	LENT1	8885	Max WS	Pre100	523.23	23.62	29.06		29.07	0.000179	0.72	1019.92	1036.55	0.07
County Ditch	LENT1	8885	Max WS	Pre10	378.03	23.62	28.93		28.94	0.000129	0.60	891.30	959.92	0.06
County Ditch	LENT1	8755	Max WS	Pre100	522.84	26.30	29.02		29.03	0.000446	0.73	898.37	1330.51	0.10
County Ditch	LENT1	8755	Max WS	Pre10	377.78	26.30	28.90		28.90	0.000377	0.63	745.63	1195.96	0.09
County Ditch	LENT1	8266	Max WS	Pre100	522.90	26.20	28.80		28.81	0.000532	0.72	1014.39	2170.13	0.11
County Ditch	LENT1	8266	Max WS	Pre10	371.64	26.20	28.71		28.71	0.000458	0.63	822.77	1938.62	0.10
County Ditch	LENT1	8265			Culvert									
County Ditch	LENT1	8245	Max WS	Pre100	522.90	25.85	28.80		28.81	0.000375	1.34	710.64	560.19	0.15
County Ditch	LENT1	8245	Max WS	Pre10	371.26	25.85	28.71		28.71	0.000235	1.03	660.23	553.58	0.12
County Ditch	LENT1	8015	Max WS	Pre100	522.17	25.90	28.58		28.62	0.002420	2.28	538.10	1567.20	0.34
County Ditch	LENT1	8015	Max WS	Pre10	381.21	25.90	28.43		28.49	0.003235	2.45	333.79	1183.29	0.39

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
County Ditch	LENT1	7850	Max WS	Pre100	517.87	25.90	28.21		28.25	0.002207	2.63	608.17	1889.32	0.34
County Ditch	LENT1	7850	Max WS	Pre10	368.03	25.90	28.03		28.07	0.001988	2.33	365.85	783.82	0.32
County Ditch	LENT1	7405	Max WS	Pre100	427.85	24.67	27.71		27.71	0.000200	0.95	1293.70	2018.88	0.11
County Ditch	LENT1	7405	Max WS	Pre10	364.22	24.67	27.36		27.37	0.000687	1.60	689.61	1456.97	0.19
County Ditch	LENT1	7195	Max WS	Pre100	385.74	24.38	27.67		27.67	0.000159	0.92	953.60	980.00	0.10
County Ditch	LENT1	7195	Max WS	Pre10	336.31	24.38	27.23		27.24	0.000542	1.52	538.61	841.96	0.17
County Ditch	LENT1	7080	Max WS	Pre100	341.06	24.25	27.63		27.64	0.000152	0.92	751.25	616.00	0.09
County Ditch	LENT1	7080	Max WS	Pre10	334.12	24.25	27.13		27.15	0.000695	1.74	442.32	616.00	0.20
County Ditch	LENT1	7079			Culvert									
County Ditch	LENT1	7040	Max WS	Pre100	341.06	23.50	27.63		27.63	0.000005	0.20	3895.33	2900.00	0.02
County Ditch	LENT1	7040	Max WS	Pre10	334.38	23.50	27.14		27.14	0.000023	0.36	2451.34	2900.00	0.04
County Ditch	LENT1	6855	Max WS	Pre100	281.39	23.71	27.63		27.63	0.000007	0.22	2708.09	1750.00	0.02
County Ditch	LENT1	6855	Max WS	Pre10	334.22	23.71	27.13		27.13	0.000033	0.43	1833.76	1750.00	0.04
County Ditch	LENT1	6715	Max WS	Pre100	292.22	23.08	27.62		27.62	0.000039	0.56	1291.88	1100.34	0.05
County Ditch	LENT1	6715	Max WS	Pre10	334.17	23.08	27.11		27.12	0.000146	0.99	818.95	765.83	0.09
County Ditch	LENT1	6350	Max WS	Pre100	547.49	23.08	26.03		26.28	0.008286	5.78	243.31	484.57	0.66
County Ditch	LENT1	6350	Max WS	Pre10	332.87	23.08	25.86		26.07	0.006538	4.87	165.50	388.66	0.58
County Ditch	LENT1	6349			Culvert									
County Ditch	LENT1	6327	Max WS	Pre100	522.87	20.08	25.95		25.98	0.000205	1.42	560.41	379.06	0.12
County Ditch	LENT1	6327	Max WS	Pre10	332.52	20.08	25.74		25.76	0.000108	1.00	483.28	350.97	0.09
County Ditch	LENT1	6167	Max WS	Pre100	513.71	21.29	25.70		25.78	0.002610	3.52	406.94	849.83	0.38
County Ditch	LENT1	6167	Max WS	Pre10	331.55	21.29	25.44		25.56	0.003173	3.63	225.79	558.98	0.41
County Ditch	LENT1	5685	Max WS	Pre100	505.82	20.80	25.49		25.50	0.000182	1.13	1003.30	1018.06	0.11
County Ditch	LENT1	5685	Max WS	Pre10	329.76	20.80	25.17		25.18	0.000152	0.97	715.24	775.44	0.10
County Ditch	LENT1	5427.5*	Max WS	Pre100	492.73	21.45	25.42		25.43	0.000265	1.30	1014.25	1220.86	0.13
County Ditch	LENT1	5427.5*	Max WS	Pre10	342.88	21.45	25.10		25.10	0.000312	1.31	676.95	914.45	0.14

ATTACHMENT B

HEC-RAS Output – Buildout Conditions

HEC-RAS Profile: Max WS

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Shed C Channel	Upper	16230	Max WS	100Yr Final	0.00	28.89	33.37		33.37	0.000000	0.00	80.92	18.12	0.00
Shed C Channel	Upper	16230	Max WS	10Yr Final	0.00	28.89	31.96		31.96	0.000000	0.00	55.46	18.09	0.00
Shed C Channel	Upper	16225	Max WS	100Yr Final	0.00	28.89	33.37		33.37	0.000000	0.00	80.92	18.12	0.00
Shed C Channel	Upper	16225	Max WS	10Yr Final	0.00	28.89	31.96		31.96	0.000000	0.00	55.46	18.09	0.00
Shed C Channel	Upper	16220			Lat Struct									
Shed C Channel	Upper	16200	Max WS	100Yr Final	0.00	28.78	33.37		33.37	0.000000	0.00	82.91	18.13	0.00
Shed C Channel	Upper	16200	Max WS	10Yr Final	0.00	28.78	31.96		31.96	0.000000	0.00	57.45	18.09	0.00
Shed C Channel	Upper	16125	Max WS	100Yr Final	271.26	28.73	32.98		33.18	0.000308	3.53	76.82	18.12	0.30
Shed C Channel	Upper	16125	Max WS	10Yr Final	133.84	28.73	31.78		31.87	0.000201	2.44	54.95	18.08	0.25
Shed C Channel	Upper	15304	Max WS	100Yr Final	271.64	28.80	33.09		33.16	0.000687	2.18	124.41	43.79	0.23
Shed C Channel	Upper	15304	Max WS	10Yr Final	133.88	28.80	31.81		31.86	0.000691	1.81	74.08	34.89	0.22
Shed C Channel	Upper	15128	Max WS	100Yr Final	270.04	28.75	32.60		32.86	0.002050	4.13	65.39	130.57	0.37
Shed C Channel	Upper	15128	Max WS	10Yr Final	133.51	28.75	31.47		31.60	0.001593	2.89	46.23	121.55	0.31
Shed C Channel	Upper	15100			Culvert									
Shed C Channel	Upper	15074	Max WS	100Yr Final	265.21	28.70	32.25		32.55	0.002585	4.40	60.34	128.20	0.41
Shed C Channel	Upper	15074	Max WS	10Yr Final	133.36	28.70	31.33		31.47	0.001776	2.98	44.71	120.84	0.32
Shed C Channel	Upper	14874	Max WS	100Yr Final	263.11	28.50	32.10		32.13	0.000519	1.82	251.85	128.58	0.18
Shed C Channel	Upper	14874	Max WS	10Yr Final	133.11	28.50	31.17		31.20	0.000620	1.59	135.61	121.14	0.18
Shed C Channel	Upper	14671	Max WS	100Yr Final	326.22	28.29	31.95		32.00	0.000735	2.20	259.66	129.04	0.21
Shed C Channel	Upper	14671	Max WS	10Yr Final	169.14	28.29	30.99		31.04	0.000945	1.98	139.06	121.35	0.23
Shed C Channel	Upper	14268	Max WS	100Yr Final	323.18	27.88	31.69		31.73	0.000596	2.04	278.86	130.27	0.19
Shed C Channel	Upper	14268	Max WS	10Yr Final	167.75	27.88	30.63		30.68	0.000830	1.88	146.11	121.84	0.21
Shed C Channel	Upper	13865	Max WS	100Yr Final	321.80	27.47	31.48		31.52	0.000461	1.86	305.40	131.86	0.17
Shed C Channel	Upper	13865	Max WS	10Yr Final	167.16	27.47	30.34		30.38	0.000660	1.74	160.50	122.76	0.19
Shed C Channel	Upper	13495	Max WS	100Yr Final	321.33	27.10	31.33		31.36	0.000356	1.70	335.07	133.66	0.15
Shed C Channel	Upper	13495	Max WS	10Yr Final	166.96	27.10	30.13		30.16	0.000493	1.56	180.70	124.08	0.17
Shed C Channel	Upper	13400			Lat Struct									
Shed C Channel	Upper	13395	Max WS	100Yr Final	363.33	27.00	31.09		31.32	0.001657	3.87	94.00	132.50	0.34
Shed C Channel	Upper	13395	Max WS	10Yr Final	187.16	27.00	29.97		30.09	0.001272	2.74	68.35	123.57	0.28
Shed C Channel	Upper	13368			Culvert									
Shed C Channel	Upper	13341	Max WS	100Yr Final	359.83	26.94	30.66		30.96	0.002429	4.40	81.86	138.14	0.40
Shed C Channel	Upper	13341	Max WS	10Yr Final	186.89	26.94	29.79		29.93	0.001591	2.98	62.72	131.20	0.31
Shed C Channel	Upper	13161	Max WS	100Yr Final	358.58	26.76	30.54		30.60	0.000779	2.28	267.39	138.65	0.22
Shed C Channel	Upper	13161	Max WS	10Yr Final	186.65	26.76	29.64		29.69	0.000882	1.97	145.71	131.43	0.22
Shed C Channel	Upper	12860	Max WS	100Yr Final	356.61	26.45	30.32		30.38	0.000679	2.17	280.72	139.40	0.21
Shed C Channel	Upper	12860	Max WS	10Yr Final	186.34	26.45	29.39		29.44	0.000780	1.89	154.11	131.93	0.21
Shed C Channel	Upper	12670			Lat Struct									
Shed C Channel	Upper	12558	Max WS	100Yr Final	410.41	26.14	30.08		30.14	0.000829	2.43	289.55	139.86	0.23
Shed C Channel	Upper	12558	Max WS	10Yr Final	215.57	26.14	29.11		29.17	0.000999	2.15	157.34	132.12	0.24
Shed C Channel	Upper	12149	Max WS	100Yr Final	405.79	25.73	29.77		29.83	0.000716	2.30	303.61	140.71	0.21
Shed C Channel	Upper	12149	Max WS	10Yr Final	214.36	25.73	28.71		28.77	0.000957	2.11	159.65	132.27	0.23
Shed C Channel	Upper	11849	Max WS	100Yr Final	403.96	25.42	29.57		29.62	0.000618	2.18	319.81	141.61	0.20
Shed C Channel	Upper	11849	Max WS	10Yr Final	213.54	25.42	28.44		28.50	0.000884	2.05	164.86	132.58	0.22
Shed C Channel	Upper	11505	Max WS	100Yr Final	402.95	25.07	29.38		29.43	0.000511	2.04	342.74	142.89	0.18
Shed C Channel	Upper	11505	Max WS	10Yr Final	212.90	25.07	28.16		28.21	0.000778	1.96	174.13	133.13	0.21
Shed C Channel	Upper	11209	Max WS	100Yr Final	402.69	24.77	29.25		29.29	0.000426	1.92	366.51	144.22	0.17
Shed C Channel	Upper	11209	Max WS	10Yr Final	212.69	24.77	27.95		28.00	0.000665	1.85	186.35	133.86	0.20
Shed C Channel	Upper	11109	Max WS	100Yr Final	402.40	24.67	28.93		29.28	0.002341	4.72	85.20	142.47	0.40
Shed C Channel	Upper	11109	Max WS	10Yr Final	212.54	24.67	27.72		27.91	0.001992	3.49	60.97	132.78	0.35
Shed C Channel	Upper	11055			Culvert									
Shed C Channel	Upper	11002	Max WS	100Yr Final	401.66	24.56	28.49		28.89	0.003060	5.11	78.54	139.84	0.45
Shed C Channel	Upper	11002	Max WS	10Yr Final	212.31	24.56	27.55		27.74	0.002129	3.55	59.73	132.30	0.36
Shed C Channel	Upper	10802	Max WS	100Yr Final	401.38	24.36	28.33		28.39	0.000766	2.35	293.42	140.15	0.22
Shed C Channel	Upper	10802	Max WS	10Yr Final	212.07	24.36	27.35		27.40	0.000932	2.09	160.01	132.30	0.23
Shed C Channel	Upper	10533	Max WS	100Yr Final	401.10	24.08	28.13		28.19	0.000686	2.26	305.95	140.85	0.21
Shed C Channel	Upper	10533	Max WS	10Yr Final	211.84	24.08	27.11		27.16	0.000860	2.03	165.74	132.64	0.22

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Shed C Channel	Upper	10205	Max WS	100Yr Final	400.97	23.75	27.93		27.98	0.000589	2.14	323.89	141.85	0.20
Shed C Channel	Upper	10205	Max WS	10Yr Final	211.71	23.75	26.85		26.90	0.000758	1.94	175.34	133.21	0.21
Shed C Channel	Upper	9878	Max WS	100Yr Final	400.96	23.42	27.76		27.80	0.000492	2.01	346.41	143.10	0.18
Shed C Channel	Upper	9878	Max WS	10Yr Final	211.70	23.42	26.63		26.67	0.000629	1.81	190.03	134.08	0.19
Shed C Channel	Upper	9600			Lat Struct									
Shed C Channel	Upper	9551	Max WS	100Yr Final	438.74	23.09	27.59		27.64	0.000494	2.07	369.87	144.47	0.18
Shed C Channel	Upper	9551	Max WS	10Yr Final	230.57	23.09	26.42		26.47	0.000612	1.84	206.67	135.10	0.19
Shed C Channel	Upper	9400			Lat Struct									
Shed C Channel	Upper	9375	Max WS	100Yr Final	532.57	22.91	27.46		27.53	0.000690	2.47	377.20	144.86	0.21
Shed C Channel	Upper	9375	Max WS	10Yr Final	280.28	22.91	26.27		26.33	0.000867	2.20	210.32	135.31	0.23
Shed C Channel	Upper	9275	Max WS	100Yr Final	571.72	22.81	27.22		27.44	0.001462	3.82	149.78	143.67	0.32
Shed C Channel	Upper	9275	Max WS	10Yr Final	299.68	22.81	26.12		26.23	0.001040	2.66	112.59	134.91	0.26
Shed C Channel	Upper	9235			Culvert									
Shed C Channel	Upper	9196	Max WS	100Yr Final	570.76	22.73	26.87		27.13	0.001790	4.05	140.81	158.55	0.35
Shed C Channel	Upper	9196	Max WS	10Yr Final	299.46	22.73	25.97		26.09	0.001112	2.71	110.30	151.36	0.27
Shed C Channel	Upper	8996	Max WS	100Yr Final	570.40	22.52	26.73		26.81	0.001031	2.85	361.55	159.03	0.26
Shed C Channel	Upper	8996	Max WS	10Yr Final	299.22	22.52	25.81		25.87	0.001028	2.36	218.61	151.68	0.25
Shed C Channel	Upper	8635	Max WS	100Yr Final	569.47	22.15	26.36		26.44	0.001027	2.84	361.53	159.05	0.26
Shed C Channel	Upper	8635	Max WS	10Yr Final	298.69	22.15	25.44		25.51	0.001018	2.35	219.15	151.72	0.25
Shed C Channel	Upper	8233	Max WS	100Yr Final	568.50	21.75	25.94		26.02	0.001043	2.86	359.03	158.92	0.26
Shed C Channel	Upper	8233	Max WS	10Yr Final	298.21	21.75	25.03		25.10	0.001030	2.36	217.75	151.65	0.25
Shed C Channel	Upper	7831	Max WS	100Yr Final	567.59	21.34	25.52		25.60	0.001053	2.87	357.35	158.89	0.26
Shed C Channel	Upper	7831	Max WS	10Yr Final	297.81	21.34	24.62		24.68	0.001033	2.36	217.27	151.65	0.25
Shed C Channel	Upper	7429	Max WS	100Yr Final	566.65	20.93	25.09		25.18	0.001072	2.88	354.54	158.72	0.26
Shed C Channel	Upper	7429	Max WS	10Yr Final	297.57	20.93	24.20		24.27	0.001043	2.37	216.23	151.58	0.25
Shed C Channel	Upper	7027	Max WS	100Yr Final	565.52	20.52	24.65		24.74	0.001105	2.91	350.05	158.45	0.27
Shed C Channel	Upper	7027	Max WS	10Yr Final	297.49	20.52	23.78		23.85	0.001066	2.39	214.22	151.45	0.25
Shed C Channel	Upper	6625	Max WS	100Yr Final	564.52	20.11	24.32		24.37	0.000681	2.32	491.31	223.14	0.21
Shed C Channel	Upper	6625	Max WS	10Yr Final	297.45	20.11	23.44		23.48	0.000716	1.99	297.26	216.06	0.21
Shed C Channel	Upper	6250			Lat Struct									
Shed C Channel	Upper	6223	Max WS	100Yr Final	583.85	19.70	24.07		24.11	0.000603	2.24	525.52	224.32	0.20
Shed C Channel	Upper	6223	Max WS	10Yr Final	310.17	19.70	23.18		23.21	0.000601	1.88	329.37	217.22	0.19
Shed C Channel	Upper	5831	Max WS	100Yr Final	583.82	19.30	23.86		23.89	0.000482	2.07	568.74	225.86	0.18
Shed C Channel	Upper	5831	Max WS	10Yr Final	309.27	19.30	22.98		23.01	0.000430	1.66	373.76	218.84	0.16
Shed C Channel	Upper	5439	Max WS	100Yr Final	583.71	18.90	23.69		23.72	0.000372	1.89	622.47	227.75	0.16
Shed C Channel	Upper	5439	Max WS	10Yr Final	306.31	18.90	22.84		22.86	0.000286	1.43	431.83	220.96	0.13
Shed C Channel	Lower	5419	Max WS	100Yr Final	735.01	18.88	23.69		23.75	0.000576	2.35	586.77	225.54	0.20
Shed C Channel	Lower	5419	Max WS	10Yr Final	391.32	18.88	22.84		22.88	0.000453	1.81	398.02	218.73	0.17
Shed C Channel	Lower	5187	Max WS	100Yr Final	734.48	18.74	23.56		23.62	0.000571	2.34	588.34	225.52	0.20
Shed C Channel	Lower	5187	Max WS	10Yr Final	390.82	18.74	22.74		22.78	0.000428	1.77	406.54	219.00	0.17
Shed C Channel	Lower	5185			Lat Struct									
Shed C Channel	Lower	4839	Max WS	100Yr Final	753.80	18.54	23.35		23.41	0.000607	2.41	586.55	225.58	0.20
Shed C Channel	Lower	4839	Max WS	10Yr Final	401.48	18.54	22.60		22.63	0.000422	1.77	417.88	219.49	0.16
Shed C Channel	Lower	4491	Max WS	100Yr Final	753.53	18.33	23.14		23.20	0.000607	2.41	586.28	225.52	0.20
Shed C Channel	Lower	4491	Max WS	10Yr Final	400.78	18.33	22.46		22.49	0.000382	1.71	433.66	220.04	0.16
Shed C Channel	Lower	4144	Max WS	100Yr Final	753.36	18.12	22.93		22.99	0.000607	2.41	586.16	225.47	0.20
Shed C Channel	Lower	4144	Max WS	10Yr Final	400.17	18.12	22.33		22.36	0.000341	1.64	452.73	220.69	0.15
Shed C Channel	Lower	3800			Lat Struct									
Shed C Channel	Lower	3796	Max WS	100Yr Final	760.13	17.91	22.72		22.78	0.000621	2.44	585.20	225.50	0.21
Shed C Channel	Lower	3796	Max WS	10Yr Final	402.26	17.91	22.22		22.25	0.000304	1.58	474.75	221.54	0.14
Shed C Channel	Lower	3696	Max WS	100Yr Final	771.61	17.85	22.48		22.71	0.001551	3.78	203.89	237.07	0.31
Shed C Channel	Lower	3696	Max WS	10Yr Final	407.19	17.85	22.14		22.21	0.000558	2.16	188.84	234.33	0.18
Shed C Channel	Lower	3695			Culvert									
Shed C Channel	Lower	3596	Max WS	100Yr Final	767.57	17.77	22.25		22.51	0.001635	4.08	188.10	242.80	0.34
Shed C Channel	Lower	3596	Max WS	10Yr Final	405.76	17.77	22.08		22.16	0.000520	2.24	180.94	241.43	0.19
Shed C Channel	Lower	3548	Max WS	100Yr Final	770.96	17.77	22.36		22.42	0.000569	2.33	520.43	243.71	0.19

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Shed C Channel	Lower	3548	Max WS	10Yr Final	406.45	17.77	22.11		22.13	0.000229	1.40	459.12	241.69	0.12
Shed C Channel	Lower	1786.5*	Max WS	100Yr Final	769.86	17.62	22.28		22.28	0.000032	0.31	2497.95	1551.72	0.04
Shed C Channel	Lower	1786.5*	Max WS	10Yr Final	405.78	17.62	22.08		22.08	0.000013	0.19	2189.89	1446.05	0.03
Shed C Channel	Lower	25	Max WS	100Yr Final	767.58	17.55	22.17		22.18	0.000761	0.54	1306.33	3043.54	0.15
Shed C Channel	Lower	25	Max WS	10Yr Final	405.21	17.55	21.95		21.95	0.001102	0.45	672.87	2362.82	0.17
Shed C Channel	Lower	24.75*	Max WS	100Yr Final	765.56	17.48	21.84		21.85	0.000996	0.67	1123.40	2597.67	0.18
Shed C Channel	Lower	24.75*	Max WS	10Yr Final	404.73	17.48	21.62		21.63	0.001950	0.62	567.35	2283.57	0.23
Shed C Channel	Lower	24.5*	Max WS	100Yr Final	763.79	17.40	21.41		21.42	0.001672	0.66	868.78	2071.60	0.23
Shed C Channel	Lower	24.5*	Max WS	10Yr Final	404.44	17.40	21.14		21.16	0.003371	0.95	388.21	1252.98	0.31
Shed C Channel	Lower	24.25*	Max WS	100Yr Final	763.22	17.32	20.81		20.83	0.002507	1.05	758.25	1957.84	0.28
Shed C Channel	Lower	24.25*	Max WS	10Yr Final	403.73	17.32	20.50		20.53	0.004140	1.19	338.15	1045.86	0.35
Shed C Channel	Lower	24	Max WS	100Yr Final	763.18	17.24	20.37		20.38	0.000669	0.66	1284.58	2307.85	0.15
Shed C Channel	Lower	24	Max WS	10Yr Final	402.97	17.24	20.09		20.10	0.000695	0.60	742.58	1717.37	0.15
Shed C Channel	Lower	23.5*	Max WS	100Yr Final	815.53	17.15	19.92		19.94	0.001592	1.00	814.08	1463.97	0.24
Shed C Channel	Lower	23.5*	Max WS	10Yr Final	429.21	17.15	19.65		19.66	0.001966	0.92	467.46	1120.82	0.25
Shed C Channel	Lower	23	Max WS	100Yr Final	812.70	17.05	19.40		19.41	0.000866	1.66	1162.35	1868.99	0.21
Shed C Channel	Lower	23	Max WS	10Yr Final	428.32	17.05	19.10		19.11	0.000929	1.53	654.12	1549.46	0.21
Shed C Channel	Lower	22.75*	Max WS	100Yr Final	810.19	16.91	19.06		19.07	0.000813	0.86	956.02	1328.36	0.18
Shed C Channel	Lower	22.75*	Max WS	10Yr Final	427.23	16.91	18.74		18.75	0.000944	0.76	574.10	1079.69	0.18
Shed C Channel	Lower	22.5*	Max WS	100Yr Final	808.34	16.78	18.75		18.76	0.000787	0.83	976.58	1406.25	0.17
Shed C Channel	Lower	22.5*	Max WS	10Yr Final	425.92	16.78	18.42		18.43	0.000726	0.72	589.79	970.47	0.16
Shed C Channel	Lower	22.25*	Max WS	100Yr Final	806.15	16.65	18.49		18.50	0.000618	0.80	1028.35	1467.11	0.16
Shed C Channel	Lower	22.25*	Max WS	10Yr Final	423.36	16.65	18.16		18.17	0.000630	0.67	630.93	1044.01	0.15
Shed C Channel	Lower	22	Max WS	100Yr Final	805.06	16.51	18.32		18.32	0.000296	0.61	1541.58	2025.84	0.11
Shed C Channel	Lower	22	Max WS	10Yr Final	421.58	16.51	17.98		17.99	0.000343	0.53	910.57	1643.71	0.11
Shed C Channel	Lower	21.8571*	Max WS	100Yr Final	905.35	16.20	18.16		18.17	0.000402	0.73	1431.74	1875.73	0.13
Shed C Channel	Lower	21.8571*	Max WS	10Yr Final	468.55	16.20	17.81		17.82	0.000467	0.63	831.43	1515.06	0.13
Shed C Channel	Lower	21.7142*	Max WS	100Yr Final	897.50	15.89	17.98		17.99	0.000474	0.78	1295.97	1718.12	0.14
Shed C Channel	Lower	21.7142*	Max WS	10Yr Final	466.41	15.89	17.60		17.60	0.000551	0.69	716.33	1255.78	0.15
Shed C Channel	Lower	21.5714*	Max WS	100Yr Final	889.89	15.58	17.78		17.79	0.000517	0.82	1179.64	1558.21	0.15
Shed C Channel	Lower	21.5714*	Max WS	10Yr Final	464.55	15.58	17.34		17.35	0.000641	0.76	626.22	974.84	0.16
Shed C Channel	Lower	21.4285*	Max WS	100Yr Final	884.37	15.26	17.56		17.57	0.000549	0.86	1083.34	1378.14	0.15
Shed C Channel	Lower	21.4285*	Max WS	10Yr Final	462.35	15.26	17.05		17.06	0.000734	0.83	556.47	748.60	0.17
Shed C Channel	Lower	21.2857*	Max WS	100Yr Final	838.68	14.95	17.32		17.33	0.000520	0.84	1017.77	1167.80	0.15
Shed C Channel	Lower	21.2857*	Max WS	10Yr Final	459.69	14.95	16.74		16.76	0.000735	0.89	517.79	624.98	0.17
Shed C Channel	Lower	21.1428*	Max WS	100Yr Final	661.52	14.64	17.15		17.16	0.000268	0.63	1064.42	1120.77	0.11
Shed C Channel	Lower	21.1428*	Max WS	10Yr Final	405.60	14.64	16.47		16.48	0.000488	0.79	512.02	539.13	0.14
Shed C Channel	Lower	21	Max WS	100Yr Final	604.43	14.33	17.07		17.07	0.000155	0.50	1232.49	1262.26	0.08
Shed C Channel	Lower	21	Max WS	10Yr Final	347.41	14.33	16.31		16.32	0.000247	0.61	574.18	543.21	0.10
Shed C Channel	Lower	20.6666*	Max WS	100Yr Final	593.95	13.21	17.03		17.03	0.000045	0.28	2114.52	1796.49	0.05
Shed C Channel	Lower	20.6666*	Max WS	10Yr Final	336.18	13.21	16.24		16.24	0.000085	0.34	975.62	969.45	0.06
Shed C Channel	Lower	20.3333*	Max WS	100Yr Final	589.74	12.09	17.02		17.02	0.000013	0.17	3432.72	2482.06	0.03
Shed C Channel	Lower	20.3333*	Max WS	10Yr Final	333.13	12.09	16.21		16.21	0.000031	0.20	1694.79	1839.06	0.04
Shed C Channel	Lower	20	Max WS	100Yr Final	588.73	10.97	17.01		17.01	0.000005	0.11	5259.03	3390.08	0.02
Shed C Channel	Lower	20	Max WS	10Yr Final	332.75	10.97	16.21		16.21	0.000008	0.11	2924.00	2533.18	0.02
LRSP Channel	1	3510	Max WS	100Yr Final	0.00	20.05	25.01		25.01	0.000000	0.00	162.73	48.78	0.00
LRSP Channel	1	3510	Max WS	10Yr Final	0.00	20.05	24.07		24.07	0.000000	0.00	119.25	43.10	0.00
LRSP Channel	1	3500	Max WS	100Yr Final	0.00	20.04	25.01		25.01	0.000000	0.00	163.29	48.87	0.00
LRSP Channel	1	3500	Max WS	10Yr Final	0.00	20.04	24.07		24.07	0.000000	0.00	119.73	43.19	0.00
LRSP Channel	1	3455			Lat Struct									
LRSP Channel	1	3410	Max WS	100Yr Final	260.09	20.00	24.89		24.96	0.000586	2.54	159.27	48.36	0.20
LRSP Channel	1	3410	Max WS	10Yr Final	163.83	20.00	23.97		24.02	0.000532	2.10	117.41	42.85	0.19
LRSP Channel	1	2400	Max WS	100Yr Final	259.79	19.98	24.86		24.93	0.000594	2.49	153.22	48.33	0.20
LRSP Channel	1	2400	Max WS	10Yr Final	163.66	19.98	23.94		23.99	0.000555	2.08	111.50	42.83	0.19
LRSP Channel	1	2100	Max WS	100Yr Final	258.06	19.84	24.68		24.75	0.000606	2.50	151.21	48.06	0.20
LRSP Channel	1	2100	Max WS	10Yr Final	162.76	19.84	23.78		23.82	0.000565	2.09	110.26	42.63	0.19
LRSP Channel	1	1800	Max WS	100Yr Final	256.06	19.71	24.49		24.56	0.000626	2.52	148.56	47.74	0.21
LRSP Channel	1	1800	Max WS	10Yr Final	161.67	19.71	23.60		23.65	0.000583	2.11	108.44	42.39	0.19

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
LRSP Channel	1	1500	Max WS	100Yr Final	253.05	19.57	24.30		24.37	0.000639	2.53	146.10	47.41	0.21
LRSP Channel	1	1500	Max WS	10Yr Final	160.05	19.57	23.42		23.48	0.000595	2.11	106.83	42.14	0.20
LRSP Channel	1	1200	Max WS	100Yr Final	247.53	19.43	24.11		24.18	0.000633	2.50	145.11	47.87	0.21
LRSP Channel	1	1200	Max WS	10Yr Final	156.27	19.43	23.25		23.30	0.000587	2.08	106.06	42.50	0.19
LRSP Channel	1	900	Max WS	100Yr Final	200.70	19.30	23.93		23.98	0.000440	2.07	141.30	46.78	0.17
LRSP Channel	1	900	Max WS	10Yr Final	135.41	19.30	23.09		23.13	0.000458	1.83	104.04	41.73	0.17
LRSP Channel	1	600	Max WS	100Yr Final	159.51	19.16	23.83		23.86	0.000267	1.62	143.33	47.02	0.14
LRSP Channel	1	600	Max WS	10Yr Final	109.94	19.16	22.97		22.99	0.000295	1.47	104.87	41.83	0.14
LRSP Channel	1	300	Max WS	100Yr Final	154.72	19.03	23.76		23.79	0.000239	1.55	146.01	47.38	0.13
LRSP Channel	1	300	Max WS	10Yr Final	97.60	19.03	22.90		22.92	0.000218	1.28	107.36	42.20	0.12
LRSP Channel	1	0	Max WS	100Yr Final	151.30	18.89	23.69		23.72	0.000215	1.48	149.44	47.78	0.12
LRSP Channel	1	0	Max WS	10Yr Final	85.01	18.89	22.84		22.86	0.000151	1.08	111.00	42.69	0.10