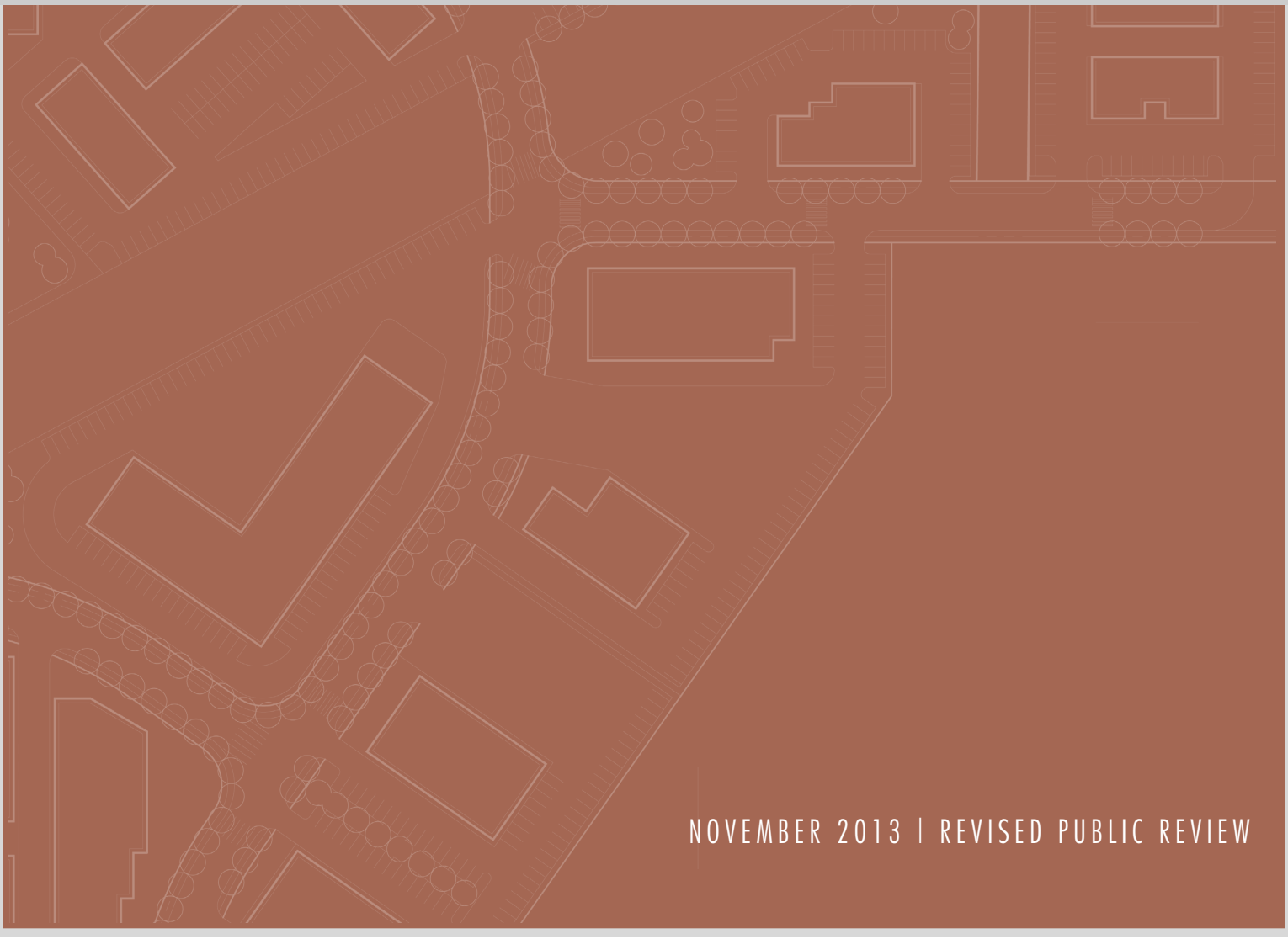
RIVERBANK LOCAL REDEVELOPMENT AUTHORITY

RIVERBANK ARMY AMMUNITION PLANT SPECIFIC PLAN



NOVEMBER 2013 | REVISED PUBLIC REVIEW

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RIVERBANK ARMY AMMUNITION PLANT SPECIFIC PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS

CHAPTER 1:

INTRODUCTION

The Riverbank Army Ammunition Plant (RAAP) has been a primary employment center in Riverbank for more than six decades. From 1952 to 2009, the U.S. Army used the site to manufacture shell casings, mortar grenades and other ammunition components. However, the RAAP was selected for closure as part of the Base Closure and Realignment (BRAC) 2005 round, and the Army decided to move Riverbank's munitions production facilities to Rock Island, Illinois. Because the RAAP provided local residents with relatively high-paying jobs, the RAAP's closure has the potential to create a strong negative impact on the economic well-being of Riverbank. It is for this reason that the City of Riverbank has prioritized the redevelopment of this property for civilian use and envisions this property as a continued economic engine for the City.

To ensure that the RAAP property will continue to thrive under civilian ownership, the Riverbank Local Redevelopment Authority (LRA) has prepared this Specific Plan to develop a clear framework for future development on the site, both in existing industrial areas and currently undeveloped areas. The City also wants to ensure through this Specific Plan process that new development at the site is in keeping with the character of Riverbank and that development occurs in a sustainable manner. Through this process and the development framework of this Specific Plan, it is envisioned that the RAAP will not only return to its previous role as a source of jobs for the city, but that it will become redefined as a green industrial park that can serve as a model for sustainability for the entire region.

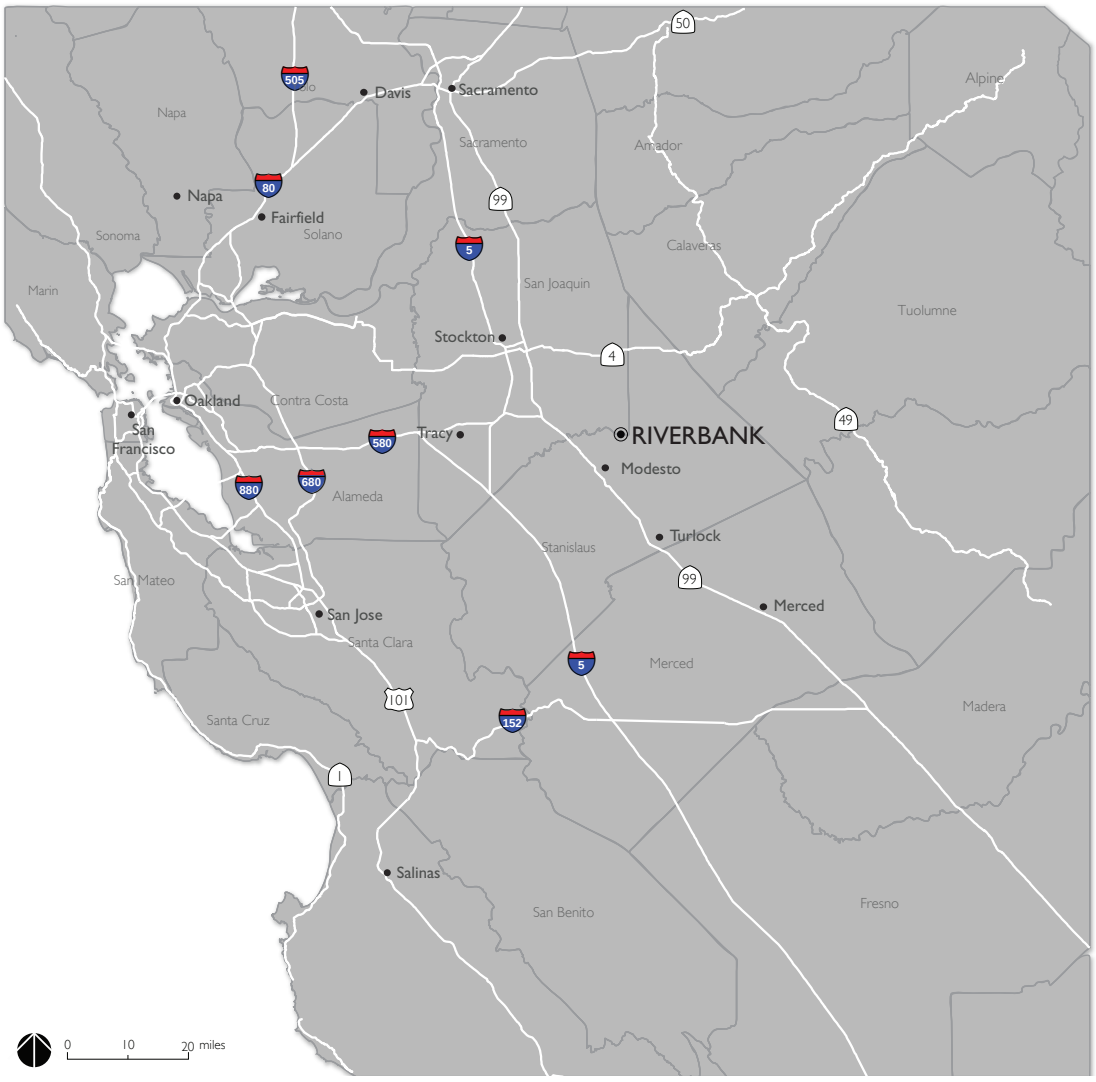

INDUSTRIAL
COMPLEX

A. Regional and Local Setting

The City of Riverbank is located in the heart of California's Central Valley in Stanislaus County. The City is located 5 miles northeast of the City of Modesto, 90 miles east of Oakland and 70 miles southeast of Sacramento. Figure 1-1 shows Riverbank's location within the region.

The RAAP is composed of two non-contiguous sites, as shown in Figure 1-2. The Main Site, and focus of this Specific Plan, is located in the most southeastern portion of Riverbank's city limits. The Evaporation/Percolation Ponds (E/P Ponds) are located just north of the city limits, between State Highway 108 and the Stanislaus River. The E/P Ponds are undeveloped open space used for evaporation and percolation of wastewater from groundwater treatment. These 29 acres will be retained by the Army and are not included in this Specific Plan.

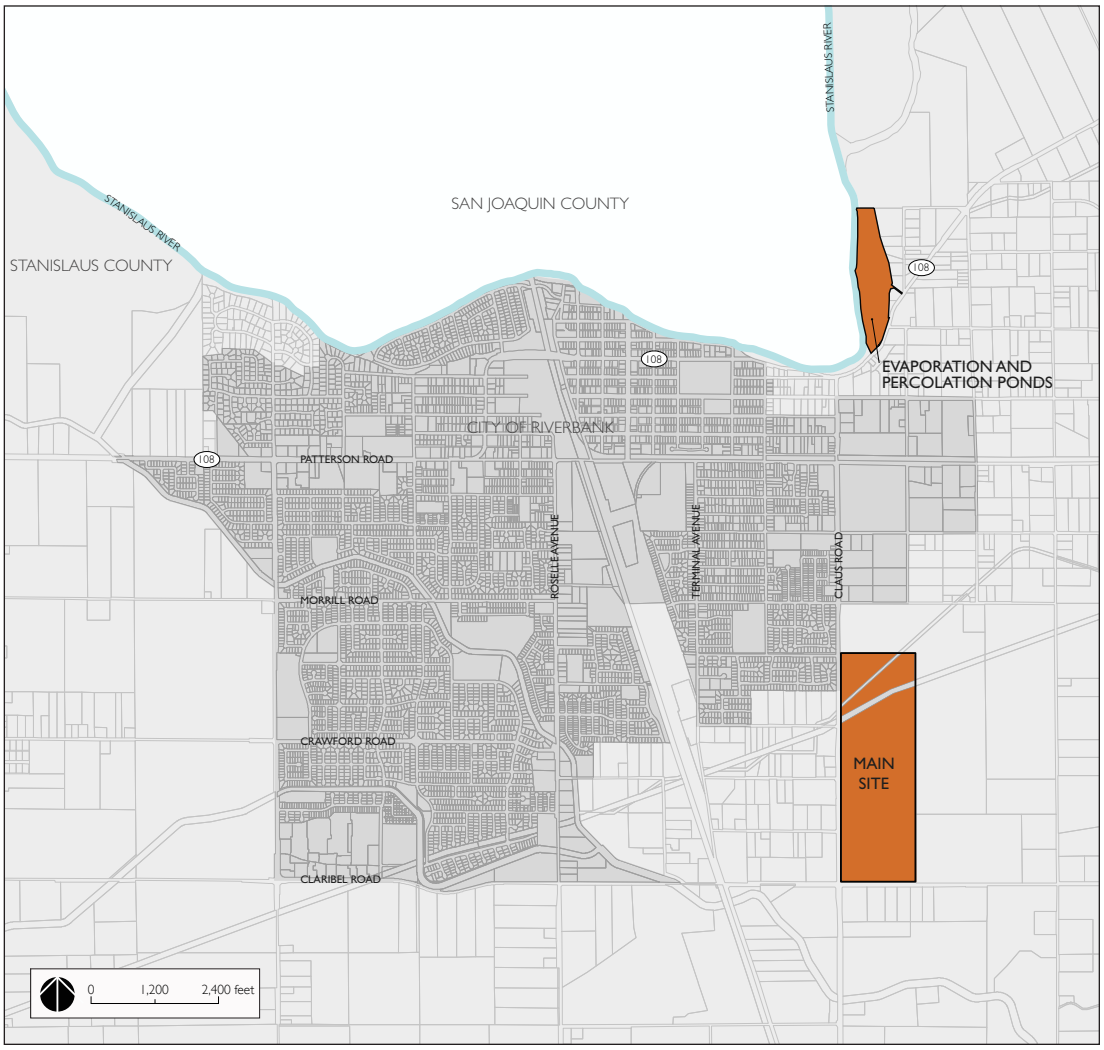
Figure 1-1 Regional Map



B. Specific Plan Area

The Specific Plan Area only applies to the Main Site. The Main Site is located at the corner of Claus Road and Claribel Road, as shown in Figure 1-3, and is approximately 146 acres in area. The RAAP site contains approximately 150 existing structures, most of which were used for ammunition manufacturing; some are now occupied by private tenants. In addition to these areas, there is a significant amount of vacant land at the northern and southern areas of the Main Site, along Claus and Claribel Roads, are also included in the Specific Plan Area.

Figure 1-2 RAAP Subareas



C. Purpose and Intent of Specific Plan

This Specific Plan is intended to serve as the primary document and reference guide for the future development and redevelopment of the RAAP site. This Specific Plan provides the community and decision-makers with clear documentation of the vision for the RAAP. Furthermore, it is intended to provide a clear policy and regulatory framework by which future development projects and public improvements will be reviewed. To augment these provisions of the Plan, guidance on design, potential public investments, and implementation is provided.

D. Planning Process

This section describes the planning process that led to the development of this Specific Plan.

1. BRAC Process

The Base Closure and Realignment (BRAC) Commission, convened by the U.S. Congress in 2005, made recommendations for closing a number of United States military bases, including the RAAP. The BRAC process was created as a mechanism to plan for and ultimately transition the property from federal ownership to ownership by public or private entities.

As part of the base closure process, the City of Riverbank was required to complete a Base Reuse Plan, with a community process to develop a strategy for returning the RAAP to civilian use.

2. Base Reuse Plan Process and Preparation

The LRA prepared a Base Reuse Plan prior to undertaking the process for this Specific Plan. The approved Base Reuse Plan contains a detailed recommendation for conveyance of the RAAP property, as well as a conceptual land use plan for its future use. The Base Reuse Plan established a goal for the types of future businesses desired and a broad plan for undeveloped areas of the site. The Base Reuse Plan served as a starting point for the development of this Specific Plan.

Work on the Base Reuse Plan began in March 2007, with initial kick-off meetings between LRA staff, its consultants, and representatives of the Army. These meetings were followed by tours of the facility and initial planning for community and stakeholder events.

Figure 1-3 Main Site Location

The first stakeholder meeting was held on May 9, 2007. Representatives from each of the then-current RAAP tenant businesses were invited to attend the stakeholder meeting, along with representatives from the Army, the City of Riverbank, and the City's consulting team. The purpose of the first stakeholder meeting was to explain the BRAC process, identify the opportunities and constraints faced at the site, address any tenant concerns, and solicit feedback on tenants' desires for the future of the RAAP site. A second stakeholder meeting was held on July 11, 2007. This meeting focused more on detailed issues such as the groundwater contamination on the site, the timeline for remediation of the site, future land uses, and infrastructure.

A community workshop was held on June 7, 2007, between the first and second stakeholder meetings. The public was asked to provide their vision for the future of the site. The workshop was useful in solidifying the community's vision and generated goals that were appropriate for the site.

On February 25, 2008, an open house was held to review the preliminary alternative plans proposed for the reuse of the RAAP site. The open house was informal and allowed members of the public to view the alternatives and ask questions before the LRA chose a preliminary preferred alternative. Existing business tenants at RAAP were also invited to view and discuss the alternatives. Later that evening, the LRA held a formal public hearing to receive direction from the public on the preliminary preferred alternatives presented and select the community's preference.

The Draft Base Reuse Plan was posted on the City's website on September 15, 2008. A public presentation of the Draft Reuse Plan was held on September 18, 2008, and also included public tours of the installation. The presentation on the Draft Reuse Plan was enthusiastically received by the approximately 100 individuals in attendance. Attendees included residents, LRA officials, Stanislaus County officials, Congressional staff, current business tenants, prospective businesses and employees, real estate officials, and consultants. Subsequent public meetings and hearings provided substantial opportunity to receive feedback regarding the Reuse Plan. Public meetings were held on September 22, 2008, and October 27, 2008, with a final public hearing on October 30, 2008.

3. Specific Plan Process

This Specific Plan was developed based on extensive public input received during the base reuse planning process. Additionally, this Specific Plan reflects input received during public review of previous drafts of the Specific Plan and its associated Environmental Impact Report, as well as from input received during presentations of the Specific Plan at Planning Commission and City Council hearings.

E. Statutory Requirements of the Specific Plan

This section describes the statutory requirements of the Specific Plan.

1. Required Contents

This Specific Plan has been prepared in accordance with the requirements of California Government Code Section 65451. As prescribed by law, the Plan includes text and diagrams that generally describe the following:

- The distribution, location and extent of all land uses, including open space.
- The proposed distribution, location, extent and intensity of major components of public infrastructure, such as transportation and drainage systems.
- The standards and criteria by which development will proceed.
- A program of implementation measures, such as financing measures, policies, regulations and public works projects.
- A statement of the relationship of the Specific Plan to the General Plan.

2. General Plan Consistency and Amendments

a. General Plan Consistency

State Law requires that any Specific Plan, such as the RAAP Specific Plan, must be consistent with the adopted General Plan. Riverbank adopted its General Plan, after a multi-year revision process, in 2009. The General Plan provides guidance for all future development with the City, as well as goals and policies for how the City should expand.

With few exceptions, the proposed Specific Plan is consistent with the Riverbank General Plan. Those exceptions are noted in the next section and a General Plan Amendment is proposed to provide conformity.

The consistency begins with the City's Vision as stated in the General Plan. The General Plan says that it wants to create an environment where "residents live, work and play locally". A "healthy and diversified industrial base served by its railroad" is desired along with "a wide range of employment . . . opportunities". Furthermore, an "appropriate balance between housing, commerce, industry, circulation, and open spaces for agriculture and nature" is desired. The Specific Plan helps to further this vision. The site will provide an excellent location for the growth of industry that can provide jobs for the City's residents. It currently provides a variety of jobs including many manufacturing jobs. Approval of the Specific Plan will encourage even more job growth. The property is served by the railroad

which provides excellent transportation options for its businesses. Locating jobs in the City will also improve air quality and traffic congestion caused by the need for City residents to commute.

In the Land Use Element, one of the main goals is that "Commercial and Industrial Development Contribute to the Health, Welfare, and Vitality of the Community". This project area is one of the City's main industrial areas. The Specific Plan will aid in the development of this site to meet this goal.

In the Community Character Design Element, there is an emphasis on the aesthetics of new development, particularly areas that can be seen from the public right-of-ways. This project helps to promote those desires. For example, this element requires attractive streetscapes and designates both Claus and Claribel Roads as Gateway and Urban Design Streets. The Specific Plan will require attractive streetscaping and commits to meeting any requirements that may be adopted by the City for Gateway streets. Furthermore, this element requires that "when new development, redevelopment . . . of industrial . . . complexes occurs, the City will require aesthetic and landscaping improvements of facades and entry features oriented to the street that will strengthen the identity of Riverbank. The project site has been in federal ownership for more than 60 years and has been developed in a more utilitarian manner than an aesthetically pleasing manner. Nevertheless, it does have some attractive industrial characteristics that will be maintained under this plan and enhanced with additions that will improve the look of the site.

The City's Conservation Element requires that buildings that are not historically significant but that have historical value should be preserved whenever possible. If this is not feasible, then the resource needs to be documented and the information retained. RAAP-2 is the only part of the site with any buildings on it. These are not historically significant but they do have some historical value. Most of the buildings will be retained but there are a couple of large buildings that will need to be demolished. They will be documented and the information retained as noted above. In addition, the most visible of the buildings is made of brick which will be reused on site to provide some retention of the "look" of the building.

The Conservation Element also promotes adaptive reuse of buildings. Although this site is no longer needed as an ammunition plant for the Army, it is in the process of being reused as an industrial park.

The Economic Development Element of the General Plan has several Goals/Policies that apply to this site. The overarching goal of the element is to "[plan] for a community where businesses can thrive and attract wealth, create jobs and income growth for local residents, generate revenue for local government, serve local market needs, and help revitalize older neighborhoods." The policies go on to encourage the exploration of business development opportunities with durable manufacturing industries and to maximize the opportunities using the railroad lines, spurs and shoreline railroads. In the past 3 ½ years, the RAAP-2 site has gone from 3 manufacturers to 9 manufacturers. In addition, the number of jobs provided on site has tripled. This growth is expected to continue and expand under the Specific Plan. With respect to the development of RAAP-1, interest has been shown repeatedly in this land because of the existence of the rail spur that serves the site. At present, the RLRA can only lease this property to others which makes it difficult for developers to get financing to build on the property. Transfer of the property to the RLRA will likely result in some quick land sales to developers for this property and this is largely due to the presence of rail.

b. General Plan and Zoning Amendments

California law requires a Specific Plan to be consistent with a City's General Plan and that findings regarding consistency be included in the Specific Plan itself. Although the following amendments to the City's General Plan and Zoning Ordinance will be necessary to allow its implementation, the recommendations, objectives, development standards and Design Guidelines of the RAAP Specific Plan are consistent with the overarching goals of the Riverbank General Plan and its associated Elements, including the direction given for this industrial area.

The following amendments to the General Plan will be required:

- Revise General Plan Figure LAND.4 on Page LAND-13 to show new designations for the Specific Plan Area.
- Revise General Plan Figure Circulation CIRC-1 on Page CIRC-11 to eliminate the extension of Townsend Avenue beyond Claus Road along the northern property line of the project as an east-west Collector Road. The existing railroad is active which makes the RAAP one of two industrial parks in Stanislaus County with active rail connections. Currently, the General Plan indicates the extension of Townsend Avenue east across Claus Road along the northern property line but there is no plan or desire to deactivate or remove the existing railroad.
- Revise General Plan Figure DESIGN.36 to add the Claus/Claribel intersection as an additional gateway.

The Specific Plan implements the General Plan and contains elements to guide development at the RAAP. The RAAP site is currently zoned Light Industrial. A zoning amendment will be required to ensure that the current uses at the RAAP are conforming. The proposed project includes a zoning district that will be added to the existing Zoning Ordinance. The zoning district boundaries will be consistent with the Specific Plan Area. For those provisions not modified by the Specific Plan, the similar zoning classifications in the City's existing Zoning Ordinance will apply. Should conflicts exist between the Specific Plan and Zoning Ordinance, the provisions in the Specific Plan will apply. Following modification, the RAAP Specific Plan will be consistent with the Zoning Ordinance.

F. Plan Contents

These additional chapters follow this introduction.

Chapter Two: Existing Conditions

» This chapter provides an overview of existing conditions on the RAAP site and its immediate surroundings.

Chapter Three: Vision and Concepts

» This chapter tells the "story" of the Specific Plan by providing a vision statement and documenting the major land use, urban design and other concepts proposed in the Specific Plan.

Chapter Four: Goals and Policies

» This chapter provides clear goals and policy statements for several topic areas.

Chapter Five: Land Use Designations and Development Standards

» This chapter provides the land use framework and designations for the RAAP, including the uses and densities allowed. The chapter also provides land use regulations and development standards for new development at the RAAP.

Chapter Six: Circulation

» This chapter discusses proposed circulation improvements and recommendations for the RAAP site, including potential vehicular, pedestrian, bicycle and parking improvements.

Chapter Seven: Infrastructure

» This chapter describes proposed improvements and extension of infrastructure facilities to meet ongoing and potential increased demand for utility infrastructure, including wastewater, water, stormwater, and dry utilities.

Chapter Eight: Implementation

» This chapter provides a strategy for implementing this Specific Plan, including phasing and financing strategies.

Appendix A: Design Guidelines: Industrial and Research & Development

» This document provides the design standards and guidelines for all new industrial and research & development construction on the former Riverbank Army Ammunition Plant.

Appendix B: Design Guidelines: Retail

» This document provides the design standards and guidelines for all new retail construction on the former Riverbank Army Ammunition Plant.

Appendix C: Model Standards & Specifications for Low Impact Development Practices

» This document provides the City's standards and guidelines for low impact development.

Appendix D: LID Stormwater Management for the Riverbank Army Ammunition Plant

» This document describes low impact development stormwater practices that were developed for the former Riverbank Army Ammunition Plant.

Appendix E: Riverbank Army Ammunition Plant Parking Assessment Memorandum

» This document provides additional detail regarding parking assessment as it pertains to the former Riverbank Army Ammunition Plant.

Appendix F: City of Riverbank Landscape Standards Approved Street Trees

» This document provides the current list of approved street trees used by the City of Riverbank.

Appendix G: Mitigation Measures and Monitoring Program

» This document describes the mitigation measures and monitoring requirements for this Specific Plan as included in the associated Environmental Impact Report.

Appendix H: General Raw & Sprinkler Map

» This document provides additional detail to the existing water circulation system on the former Riverbank Army Ammunition Plant.

Appendix I: General Sanitary Sewer Map

» This document provides additional detail to the existing sanitary sewer system on the former Riverbank Army Ammunition Plant.

CHAPTER 2:

EXISTING CONDITIONS

In the initial stages of the planning process for this Specific Plan, a thorough review of existing conditions on the RAAP site was conducted. The results of that review are summarized in this chapter. The information herein is current as of December 2011, when the Specific Plan was being prepared. It is based on the research and field investigations conducted by the consultant team between May 2010 and April 2011.

A. Land Uses

This section describes the existing uses on the RAAP site, as well as its immediate surroundings.

1. RAAP Uses

The RAAP site contains a variety of uses, ranging from vacant, undeveloped land to intensively developed industrial uses. As shown in Figure 2-1, the site can generally be divided into eight land uses. Land uses vary widely across different portions of the site, since much of the site is currently undeveloped.

» Existing Industrial Area. The developed portion of the RAAP is located in the central area of the site. Buildings in this developed area generally have large setbacks from public rights-of-way. The area's primary entries and parking lots are located adjacent to Claus Road, along the southern half of the site. The existing industrial area contains a wide variety of industrial uses and structures, including large buildings that were used to produce ammunition, storage structures, smaller manufacturing buildings, and outdoor storage. In addition to industrial facilities and storage areas, the existing industrial area contains parking areas, internal roads, limited undeveloped areas, and a former landfill that is now capped.

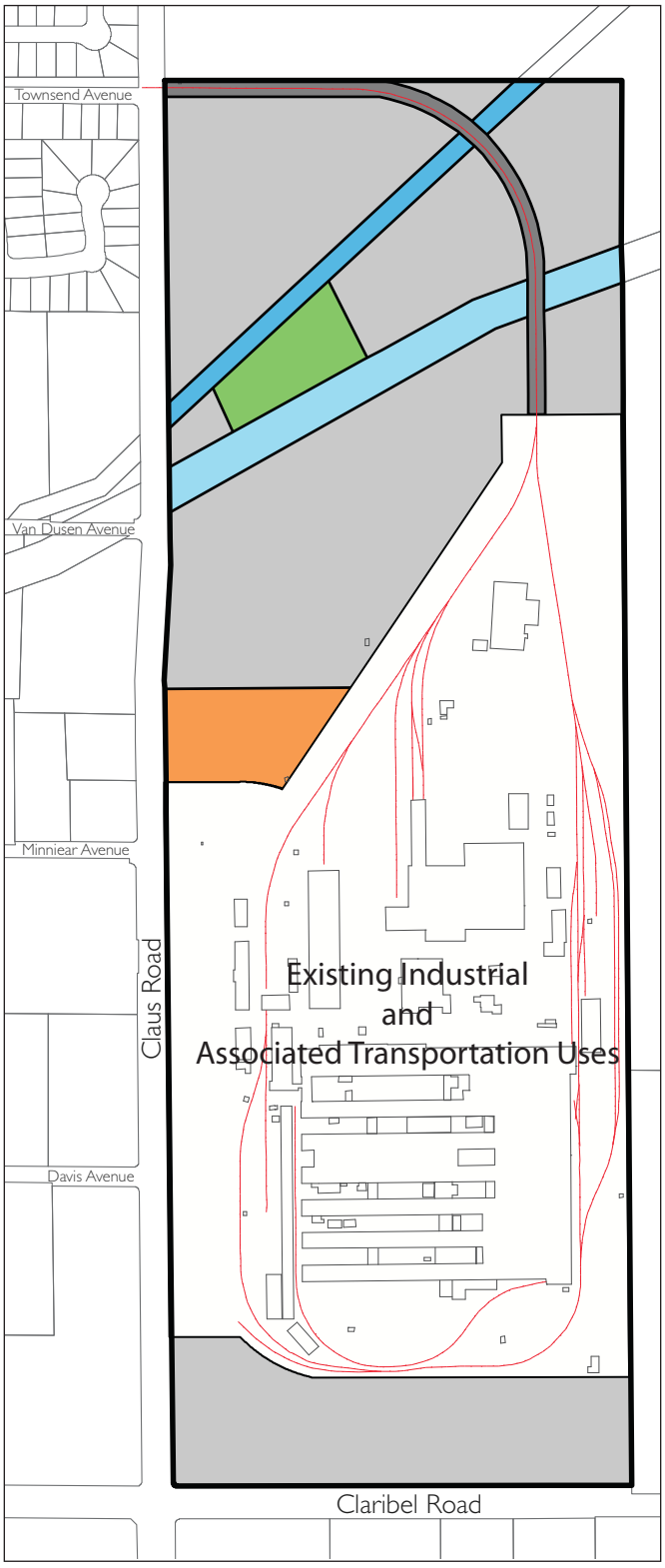
» Vehicle Storage. A small vehicle storage lot is located along Claus Road, between its intersections with Minniear Avenue and Van Dusen Avenue. Spaces in this area are currently being leased for storage of vehicles, primarily recreational vehicles. The lot operates independently of the existing industrial uses and is located outside the fences that contain most of these buildings.

» Undeveloped Land. A large portion of the RAAP site remains undeveloped. Undeveloped areas south of the existing industrial areas, along Claribel Road, are fenced off from the remainder of the RAAP site. The undeveloped areas in the northern portions of the site were historically used as pastures for livestock grazing.

» Stormwater Pond. As indicated in green on Figure 2-1, a stormwater pond is currently located between two easements in the northern portion of the site. This area serves as detention for stormwater runoff from the existing industrial areas.

» Hetch Hetchy Aqueduct. The Hetch Hetchy Aqueduct conveys water underground and also serves as a right-of-way for the conveyance of electricity through large overhead power lines. The Hetch Hetchy Aqueduct right-of-way runs roughly east-west across the site and is approximately 100 feet wide. It is owned by the San Francisco Public Utilities Commission (SFPUC).

Figure 2-1 Existing Land Use



» Oakdale Irrigation District. The Oakdale Irrigation District (OID) canal is located near the northern portion of the site and runs from the northeast to the southwest. The canal's right-of-way easement is approximately 60 feet wide, and the actual infrastructure for the canal is located underground.

» Rail Easement. An active rail line surrounded by a 50-foot easement enters the RAAP site at its northwest corner, near Townsend Avenue. The rail, which connects to the Burlington Northern Sante Fe rail line, runs across the undeveloped areas in the north and crosses both the Hetch Hetchy Aqueduct and the Oakdale Irrigation District canal. Ultimately, the rail enters the existing industrial areas, splits and serves many of the existing buildings.

2. Surrounding Uses

The existing industrial area on the main site is bordered on the north and east by pasture land and rural residential uses, to the south is Claribel Road and additional pasture and rural residences. Low-density residential uses and an RV storage area are located west across Claus Road on the northern half of the site. A trucking facility, with on-site truck storage, is located west across Claus Road at the southern extent of the site, near Davis Avenue.

B. Existing Land Use Policy

This section discusses existing land use policies governing the Specific Plan Area.

1. General Plan Land Use Designations

The Riverbank General Plan is intended to serve as a long-term vision and guide for the future of the city. A critical component of the General Plan is its land use designations, which guide the types of development that should take place on individual parcels and in different areas of the city. The various designations prescribe the general land use types and land use intensity that are desired. As shown in Figure 2-2, the majority of the RAAP site is designated Industrial/Business Park (I/BP). However, additional designations include Medium-Density Residential (MDR) and Buffer/Greenway/Open Space (B/G/OS). The General Plan's description for each designation on the RAAP site is as follows:

» Industrial/Business Park (I/BP). This designation includes manufacturing uses, as well as a mixture of light manufacturing and office spaces. These uses may be located in campus-like settings sometimes referred to as "business parks" or "research parks." This category is meant to accommodate a variety of employment-generating, basic (as opposed to community serving) enterprises. Office parks could accommodate businesses of various types, research and development, logistics services, and other uses. Areas with this designation near existing or future planned residential and other sensitive land uses are subject to performance standards to ensure against noise, traffic, safety, light spillage and glare, and other impacts typically generalized as "compatibility."

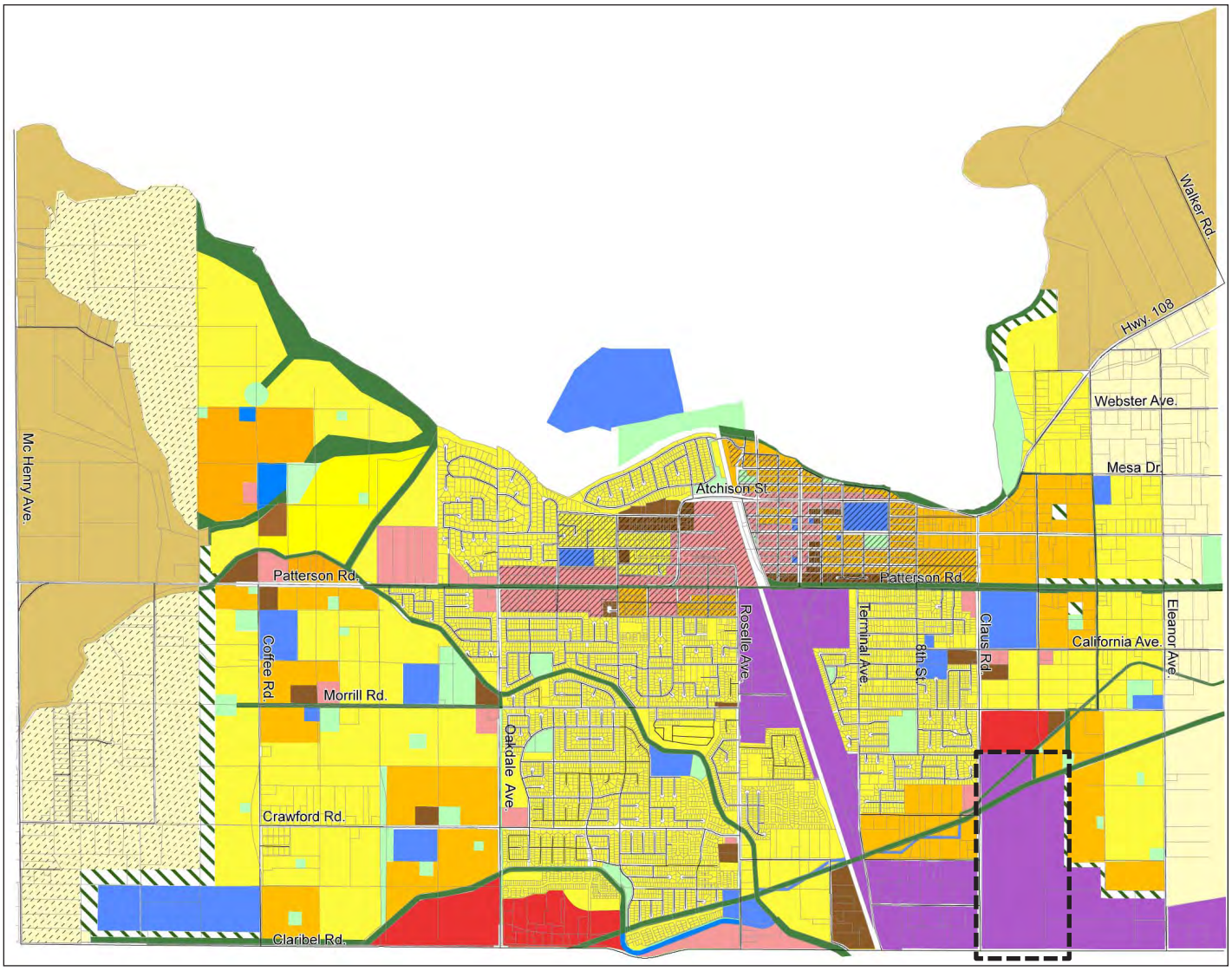
» Medium-Density Residential (MDR). This category includes small-lot, single-family detached homes, attached single-family homes, and other residences developed at a net density of between eight and 16 dwelling units per acre. Lots would be at least 2,500 square feet in size.

» Buffer/Greenway/Open Space (B/G/OS). This designation provides the opportunity to preserve important open spaces containing natural resources, such as sensitive biological habitat. This category also includes areas where buffering is necessary between different land uses. Bicycle and pedestrian pathways are also accommodated by this Land Use Designation.

2. Zoning

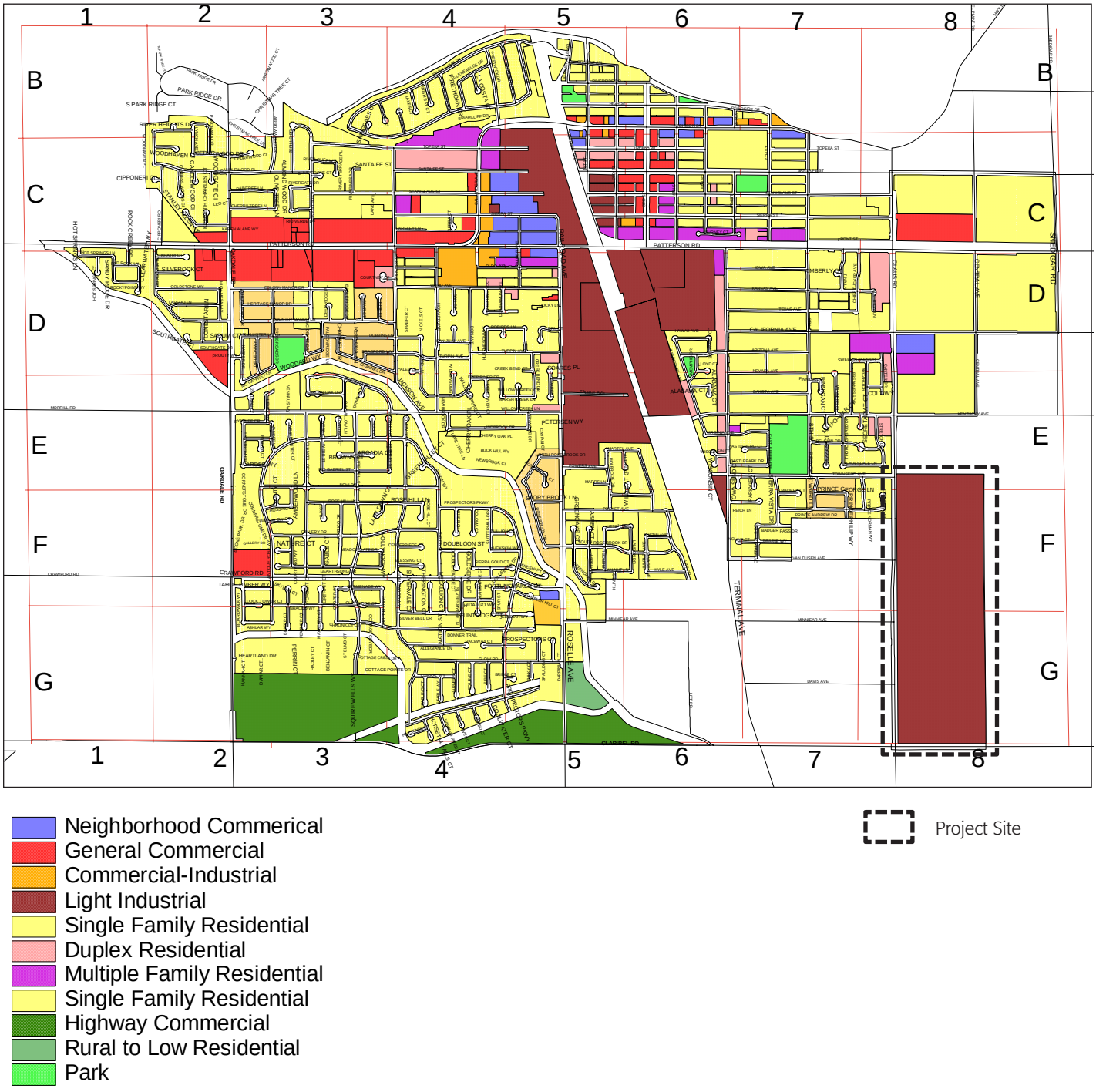
Riverbank's Zoning Ordinance is intended to implement the goals and policies of the General Plan by prescribing more detailed land use regulations and development standards. More specifically, the City's Zoning Ordinance dictates in detail the uses allowed on individual parcels and the building requirements for new development. Chapter 153 of the City's Municipal Code describes the City's zoning districts and each district's associated requirements.

Figure 2-2 Riverbank General Plan Land Use Designations



As shown in Figure 2-3, the RAAP site is zoned Light Industrial (M-1).

Figure 2-3 Riverbank Zoning Ordinance Map



C. RAAP Design Character

This section describes the urban design character of the RAAP sites, focusing mainly on site layout, relationships between buildings on the site, and relationships between the site and surrounding uses.

1. Urban Design Character

The design character of the existing industrial areas of the RAAP site is generally utilitarian. The majority of buildings are concentrated in the southern half of the existing industrial area, with the largest and most intensive uses concentrated around the main production line facility. All but one building on the site is oriented to run in either a north-south or east-west direction. This building orientation creates rectangular-shaped areas between buildings that are used for outdoor storage or to provide space for small sheds and equipment. Other than the main production lines, which are exceptionally tall, most of the buildings are low-rise, single-story structures. Building heights are generally consistent across the site.

The second primary group of buildings is located north of the main production line facility. Existing buildings are set further apart from one another in this area, creating concrete areas between buildings that are used for outdoor storage or to provide space for small sheds and equipment.

The character of the edges of the RAAP property varies but generally creates an open feel due to the lack of buildings near the street edge. The edge adjacent to Claus Road has an open character with large undeveloped lots separating the edges of existing industrial buildings by approximately 600 feet. Similarly, the edge adjacent to Claribel Road is open with buildings along its frontage being set back significantly. Most of the Claribel Road frontage is lined with undeveloped open space, with the exception of frontages adjacent to the existing industrial areas, which are lined with various surface parking areas.

2. Architectural Character

The existing architecture at the RAAP is typical of industrial architecture during World War II in that it emphasizes honest expression of building technologies of that time, as opposed to ornamental forms typical in traditional architecture.

The existing RAAP buildings were designed solely for their function as industrial and manufacturing spaces, with the following key attributes:

- Box-like buildings with flat, sawtooth or monitor roofs
- Steel-frame construction
- Ample fenestration
- Minimal or no exterior ornamentation

The buildings that line the western edge of the existing industrial areas on the RAAP site differ in architectural character from the buildings on the rest of the site. These buildings were designed for administrative purposes and their character is less utilitarian in nature. As such, they incorporate greater architectural detail, with keystoned, splayed lintels at doors and windows, gabled roofs, and regular fenestration in a domestic-institutional pattern.

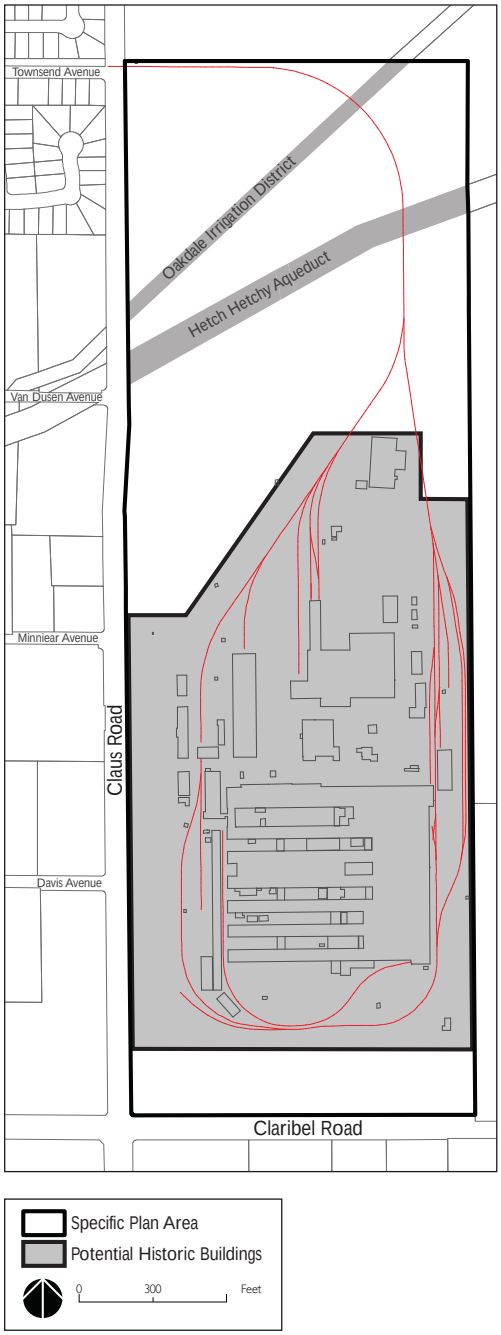
D. Historic Resources

The developed portion at the RAAP appears to be eligible for the California Register of Historic Places as a historic district. Specifically, it is significant under Criterion 3, which states that a historic resource "embodies the distinctive characteristics of a type, period, region or method of construction or represents the work of a master or possesses high artistic values." Specifically, it is significant as a representation of historic design of manufacturing facilities within the context of industrial architecture.

It should be noted that not all buildings and infrastructure on the site would be considered historically significant. The primary period of significance is from the RAAP's inception in 1942 until 1958 and would encompass buildings and other significant site elements, including roads and rail lines. Although the site has changed physically since the period of significance described above, the RAAP still retains historical integrity. Figure 2-4 shows areas with potentially historic buildings at the RAAP.

Table 2.1 lists the buildings and structures that have been recorded and may be eligible for listing in the National Register of Historic Places (NRHP) and a portion of the developed site may be eligible as a historic district under the California Register of Historical Resources (CRHR). However, the City does not intend to pursue nor does this Plan propose such a designation. Many of the buildings have been altered or demolished and those remaining will continue to be modified to accommodate changes in manufacturing and industrial needs as well as address building maintenance and safety concerns. Policies are proposed within this Plan to seek protection of existing historic character and incorporate these architectural elements in new construction. No special permits are necessary for modifications to these potentially historic buildings but prior to demolition of buildings in this list, an Historic American Building Survey/Historic American Engineering Record (HABS/HAER) recordation will need to be conducted for the affected structures. HABS/HAER technical documentation consists of informa-

Figure 2-4
Areas with Historic Buildings



tion recorded in standard formats: measured drawings, photographs from large-format black-and-white negatives and color transparencies, and written histories. Documentation guidelines are currently maintained by the National Park Service and are available through their website: www.cr.nps.gov/hdp/standards/guidelines.htm.

Table 2-1 RAAP Site Properties Potentially Eligible for NRHP Listing

STRUCTURE (Building Number in Parenthesis)	YEAR BUILT
Administration and Gatehouse (16 and 17)	1942
Boiler House (12)	1942
Building 120	1951
Building 120 A	1953
Carbon Rodding Building (7)	1942
Garage (130)	1954
Cafeteria (18)	1942
Machine Shop (9)	1942
Metals Service Building, Press Room (8)	1942
Ore Unloading Building (11)	1948
Paint Spray Building (169)	1978
Plant Cafeteria (21)	1951
Pot Room For Aluminum Production (1 through 5)	1942
Production Line (46)	1952
Rectifier Station, Production Line (13)	1942
Terminal House (110)	1951
Transformer Oil Pump Building (85)	1951
Transformer Service Building (15)	1942
Unloading Shipping Building (10)	1942
Washroom (14)	1942
Water Wells 1 through 5	1942

Source: Knapp Architects, 2009.

E. Economic Setting

This section discusses the economic setting within Riverbank and the region with respect to redevelopment of the RAAP.

1. Market Context

Achievable rent levels for facilities of the type available for redevelopment or reuse at the RAAP are generally low, in the range of $4.25 per square foot per year ($0.35 per month). As a result of the current recession, there is an ample supply of comparable but functionally superior space available in the region. This constitutes a challenge for the RAAP's short-term redevelopment. Similarly, achievable industrial land values are estimated to be in the $50,000 to $60,000 per acre range, with significant competitive land supply currently on the market. As a result, the LRA will need to work aggressively in attracting new tenants to ensure job creation.

2. Potential for Redevelopment

The City of Riverbank is committed to redeveloping the RAAP as an economic engine and job creator for the City. As an initial step, the City has supported planning for reuse by developing this Specific Plan and by supporting existing tenants at the RAAP.

Existing tenants have expressed an interest in leasing additional space at the RAAP. In addition, the LRA has completed extensive infrastructure evaluations as part of the operational planning process, which is being used to inform capital planning.

3. Potential Job Creation

Reuse and redevelopment of the RAAP is expected to yield significant job creation. Overall, the redevelopment project is expected to create between 825 and 1,650 permanent jobs on-site in the next ten to fifteen years, both by attracting tenants to existing buildings and through development of the undeveloped portions of the site. The redevelopment of the RAAP will also provide short-term employment gains from construction activities for new development, infrastructure upgrades, and improvements to existing structures.

F. Transportation and Circulation

1. Current Traffic Conditions and Trends

Claribel Road and Claus Road are two-lane roadways that currently carry an ADT of approximately 8,000 vehicles per day, with large trucks accounting for approximately 10 percent of traffic volumes. The daily Level of Service (LOS) for Claribel Road and Claus Road in the vicinity of the RAAP is LOS B. The signalized Claus Road/Claribel Road intersection operates at LOS C during both the morning and evening peak hours. Both roadways are planned to be four + lane arterials.

2. Access Points to the Site

Claus Road, a two-lane arterial, provides sole vehicular access and serves as the western boundary of the RAAP site. Truck and rail are the primary means of delivery to the site. Vehicular access to the interior of the existing industrial area is through a gate on the western portion of the site, south of the existing RV storage area. Rail enters the site from the northwest corner and then circulates around the perimeter and through the interior.

3. Parking

A parking design assessment was prepared in November 2010. Based on this assessment, peak parking demand rates per employee were developed for the industrial uses as presented in Table 2-2. The rates are similar to those in the City of Riverbank Municipal code, which requires one parking space for each employee on a maximum shift plus three additional spaces for industrial uses. When the number of employees cannot be determined, one space for every 300 square feet of gross floor area is required. City Code parking requirements for each of the uses that could be constructed as part of the RAAP Specific Plan is presented in Table 2-3.

Table 2-2 RAAP Specific Parking Demand Rates Per Employee

CONDITION	REGULAR	VISITOR	ADA ACCESSIBLE	MOTORCYCLE	TOTAL
Average Peak Parking Demand	56	6	2	5	68
Demand Rate per Employee	0.86	0.09	0.03	0.08	1.06
Maximum Peak Parking Demand	60	6	2	7	75
Demand Rate per Employee	0.92	0.09	0.03	0.11	1.15

Source: Fehr & Peers, September 2010.

Table 2-3 Existing City Code Automobile Parking Requirements

LAND USE	PARKING CODE REQUIREMENT
Industrial	1/300 square feet
Research and Development	1/300 square feet
Local Retail	1/300 square feet plus loading

Source: City of Riverbank Parking Code Requirements (153.184).

4. North County Corridor Planning

The North County Corridor (NCC) is a high priority project for Stanislaus County that would improve west-east connectivity and relieve traffic congestion. The Tier 1 project for NCC consists of constructing an expressway between McHenry Avenue east to SR 120; Tier 2 would extend the facility from McHenry to SR 99. This Specific Plan addresses Tier 1 of the North County Corridor project (NCC) which has been funded; funding for full build-out of the corridor has not yet been identified and no alignment has been adopted.

The City of Riverbank has signed a Joint Powers Agreement and, upon alignment adoption and certification of the necessary CEQA analysis, the City will amend the circulation element and reserve right of way for the NCC project. The City's preferred alternative includes the relocation of Claribel Road to the north, ending in a "T" intersection at Claus Road at the main entry to RAAP; Central Avenue is extended midway down the eastern edge of the project turning east and continuing to a new intersection. The NCC would be located where Claribel Road currently exists and the intersection at Claus Road would be realigned and become an undercrossing. This alignment will require a large right-of-way which would essentially eliminate the development of the South End Cap.

This Specific Plan, along with the City's Circulation Element, will need to be amended if an alignment is adopted and CEQA documents are certified.

G. Infrastructure Service

This section discusses existing infrastructure service at the RAAP.

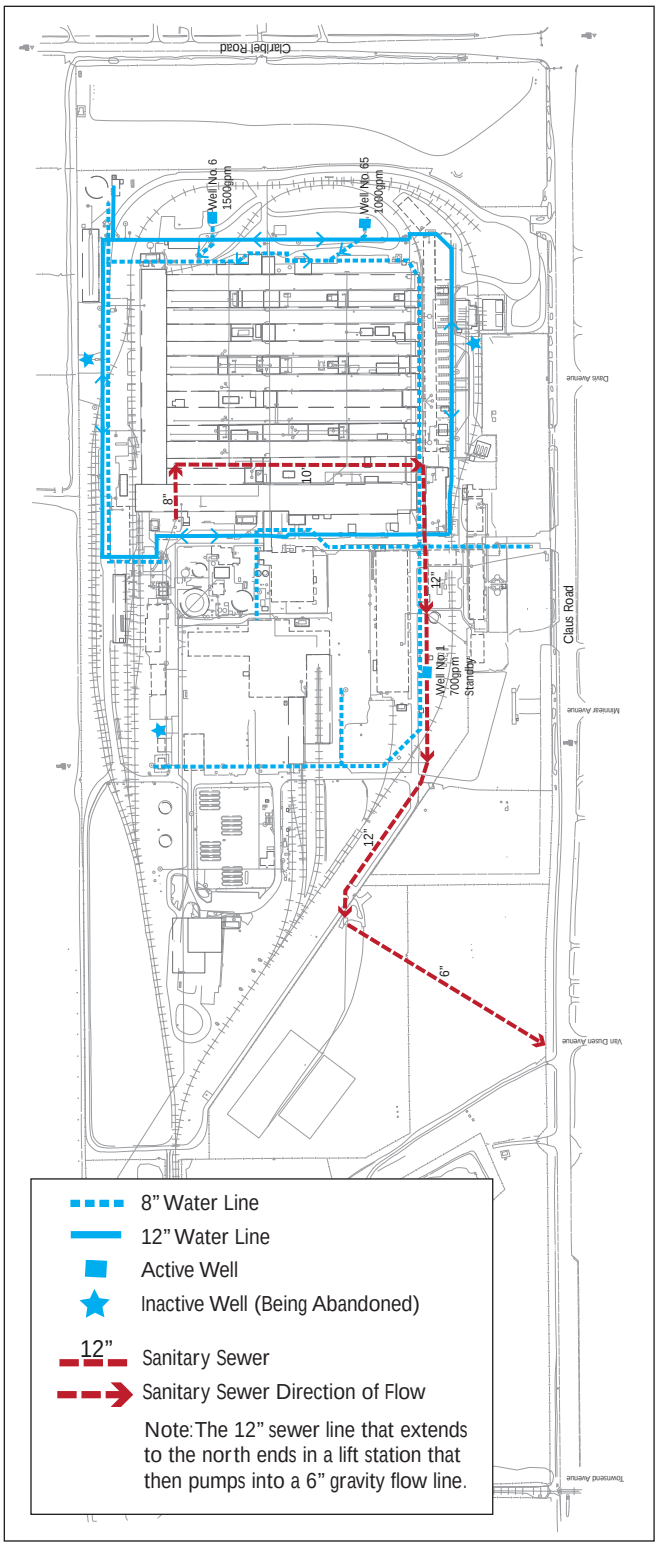
1. Water

This section assumes that water usage at the RAAP is a constant over an 8-hour period with both pumps operated continuously and 40,000 gallons of storage capacity.

A single water system serves the entire developed portion of the facility and obtains its water from three active wells located on the property. There are a total of six wells on the site. Currently, only three wells are operational. Of these three, one is on standby. The three non-operational wells are in the process of being properly abandoned and closed by the Army in consultation with California Department of Public Health. Figure 2-5 shows the existing wells along with raw and sprinkler waterlines larger than 8-inches.

The potable water system has one storage tank, which has a 100,000 gallon capacity. Currently, the storage tank is operated over a range of zero to 40,000 gallons. The capacity is restricted to 40,000 gallons due to seismic constraints. There is also a 1,000,000 gallon water tank that is used to provide adequate fire flow but is not used for potable water.

Figure 2-5
Water and Sanitary Sewer Map



During the 8-hour usage period, the flow to the distribution system is 2,600 gallons per minute (gpm) from the wells and 83 gpm from storage (40,000 gallons/8 hours), so the maximum potential usage of the existing system is 2,683 gpm.

2. Wastewater

The present sanitary sewer system transfers the domestic sanitary sewer waste to the City of Riverbank sanitary sewer system. Figure 2-5 shows sewer mainlines 8-inches and larger in size. Treated groundwater from the groundwater treatment plant is sent to evaporation ponds owned by the Army near the Stanislaus River. It is anticipated that the Army will continue to treat and dispose of the groundwater in this manner for the next 10-20 years or more.

The sanitary sewer collection system begins as a series of 6-inch pipes in the main production line area. These pipes drain to the north by gravity feed and become progressively larger as waste from additional buildings is added. Ultimately, one 12-inch diameter pipe conveys waste to the lift station north of Building 9. From the lift station, waste is transferred by a 4-inch diameter force main before transitioning back to gravity flow and connecting to the City's collection system. There is also an additional lift station near the Industrial Wastewater Treatment Plant (IWTP). The total length of the gravity sanitary sewer system is approximately 6,078 linear feet.

The system is built mostly of reinforced concrete pipe with some small sections of cement asbestos and corrugated metal pipe. There are over 55 manholes and clean-out locations. Due to the age of the concrete pipe, there are many areas with vertical and/or horizontal pipe cracks. Based on a camera assessment conducted in September 2009, the severity of the cracks range from minor superficial cracking to at least one section of collapsed pipe. Additionally, there are pipe segments of both vertical crowns and valleys, meaning the gravity system cannot function properly since material settles in these areas. There are also many instances of cracked or offset joints in the sewer lines.

Pipes range in size from 6- to 12-inches in diameter. As of August 2010 when many of the buildings at the RAAP were vacant, the system operated on an average of 10% of its total capacity. This figure is based on the following assumptions:

» 100 gallons/day per 1,000 square feet of industrial/commercial space
» 200 gallons/day per 1,000 square feet of administrative space

Based on a camera investigation conducted in September 2009, many deficiencies were noted that will require correction. The main issues noted were:

» Cracked or offset joints
» Horizontal or vertical cracking in the concrete pipe
» Low areas in pipes where waste is settling
» One crown in the pipe where the pipe is actually raised

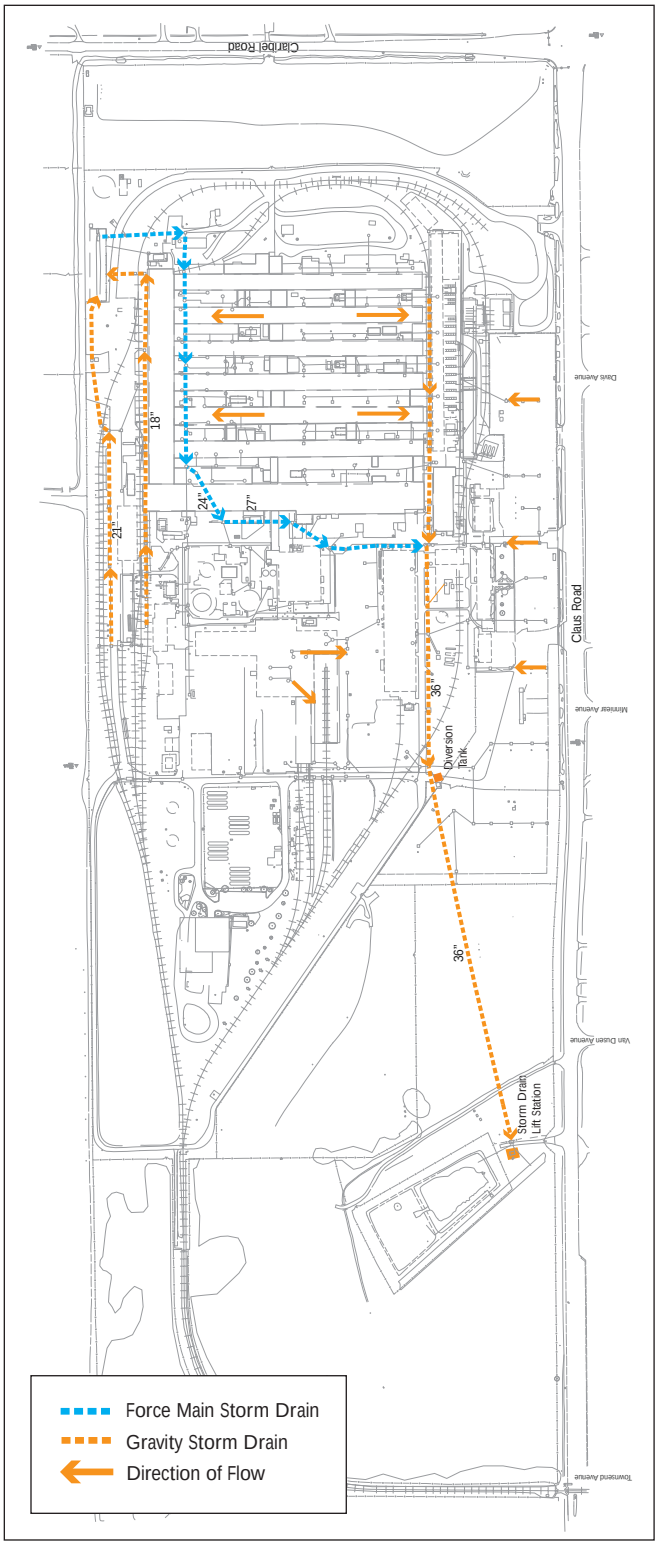
3. Stormwater

The stormwater collection system is shown in Figure 2-6. Primary stormwater collection is made in two phases. Stormwater in the southeast quadrant flows to the large basin near tank 139 in the southeast corner of the site. From this pond, the water is pumped to the main line via 6-inch vitrified clay pipe and connected to a 12-inch reinforced concrete pipe. Through the eastern edge of Existing Industrial Area, the pipe increases in size from 12-inch to 24-inch before turning to the west and then running parallel to Building 7. An additional 12-inch pipe is located between the western edge of the Existing Industrial Area and Building 13. This pipe is reinforced concrete and increases in size to 30-inches in diameter near Building 15. At this point, connection is also made with the area drains on the western edge of the site in the parking lot. Near Building 15, the pipe is 36-inches in diameter and continues to flow by gravity to the area near Gate 10 where a 600 gallon per minute pump is located. The water then flows to an additional storm drain lift station before being stored in the storm drain reservoir. Historically, during periods of excessive rain, any overflow was conveyed to the Oakdale Irrigation District 30-inch diameter line that runs parallel to the reservoir but this connection has been severed. Any excessive rain is now handled on site by backing up into parking lots without flooding buildings.

The storm system transports stormwater runoff from the developed portion of the site to the stormwater ponds on the undeveloped northern portion of the site. The system is operating properly, but with some deficiencies identified during inspection. Portions of the camera assessment were abandoned due to debris in the line. The deficiencies include:

» Cracked or offset joints
» Longitudinal cracking in the concrete pipe
» Low areas in pipes where waste is settling

Figure 2-6
Stormwater Collection



The correction of these items can also be accomplished by re-lining or slip-lining the pipe. The manholes should also be repaired to ensure the lids seal properly to prevent inflow and infiltration of storm water during rain events.

The north reservoir has a design capacity of approximately 3.0 million gallons (MGAL). More specifically, the capacity includes 1.5 MGAL in the west side, which typically has approximately two feet of ponding water, and 1.5 MGAL in the east side, or overflow side, which is typically dry.

A small portion of the site drains to the south stormwater reservoir, located near the southeast corner of the site. This reservoir is referred to in other documents as Area 135. A lift station adjacent to the south stormwater reservoir pumps runoff from the reservoir to the south end, or high side, of the above-mentioned main storm drain.

4. Natural Gas

The main natural gas feed for the RAAP is provided by Pacific Gas and Electric (PG&E). The feed enters the site at the southeast corner of the site and is then carried to a metering and mixing station. Natural gas then is fed to the few buildings and infrastructure that require natural gas on the site. Pipe sizes range from 2-inch to 10-inch in diameter.

Given the size of the existing pipe network and the relatively low demand for natural gas, no immediate upgrade is necessary. Current tenants do not use pieces of equipment that have large natural gas demands.

5. Electrical Utilities

The electrical distribution system equipment for the developed portion of the site, on an average, has been in service for over 50 years, well beyond its expected service life. However, some new substations have been added. The older substation secondary distribution systems are 480 volt ungrounded Delta systems.

The existing main substation with the new 5 mega volt ampere (MVA) transformer on-line has approximately 50 percent spare capacity, beyond the current site demand, for additional loads.

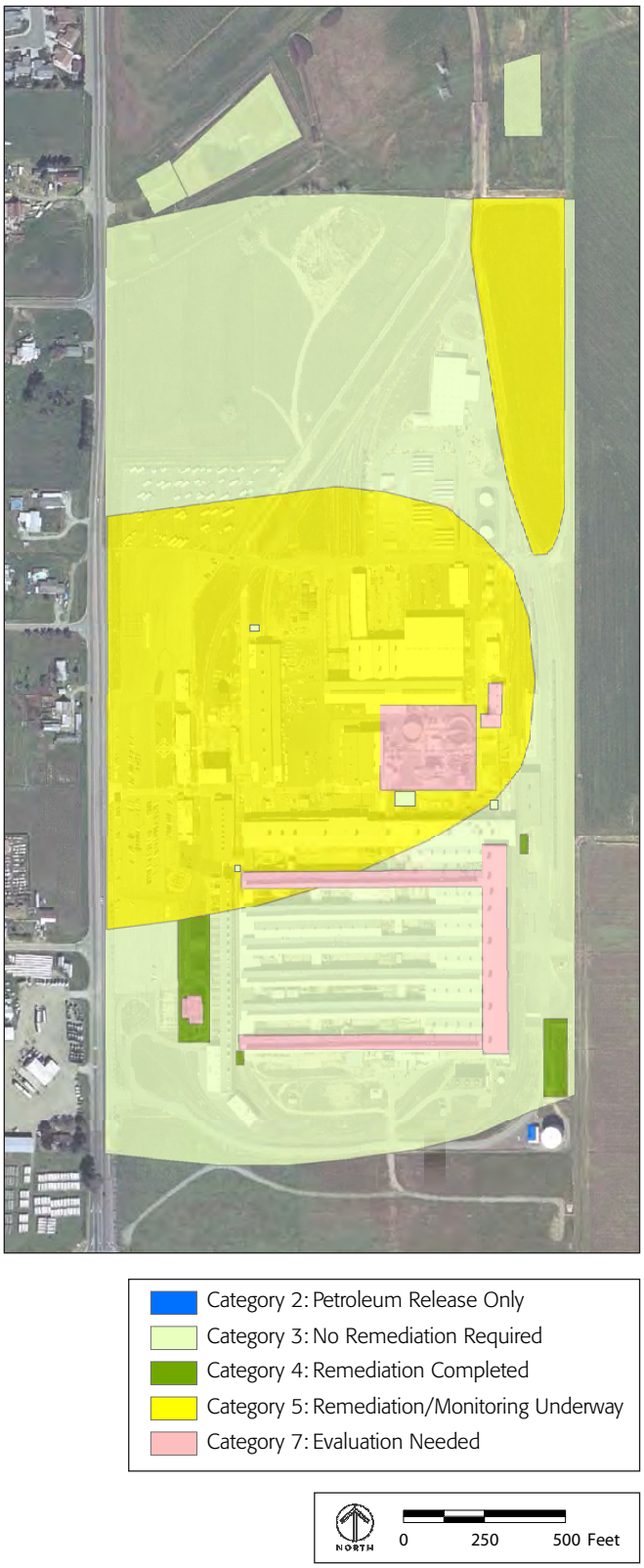
H. Hazardous Materials

The RAAP is currently listed as a federal Superfund site due to groundwater contamination and other pollutants at the site. Some remediation has already occurred and further remediation is planned for the future. Additionally, there are areas and buildings on the RBAAP site that may require investigation and study to determine the extent of contamination. The existing stormwater pond and the developed industrial core area are currently being remediated; until remediation is completed no food preparation or retail sales are allowed in these affected areas.

As shown on Figure 2-7, there are several different levels of contamination on the site. The most significant contamination issue is a plume of subsurface groundwater contamination that contains chromium and cyanide; the plume resulted from past spills at the Industrial Wastewater Treatment Plant (IWTP). While the defects that caused the spills have been corrected, further treatment is required to remediate the contamination to State and federal standards. There are also other areas with less significant contamination issues, some of which limit where future development can occur. Areas within the RAAP site were divided into the following seven categories:

- **Category 1.** No contamination.
- **Category 2.** Areas where only the release of petroleum has occurred.
- **Category 3.** Areas where contamination has occurred at a level that requires no further remediation.
- **Category 4.** Areas where sufficient remediation has already taken place and no further action is necessary.
- **Category 5.** Areas where contamination has occurred and remediation is underway, but further action or ongoing monitoring is required.
- **Category 6.** Areas where contamination has occurred, but for which no remediation effort has been implemented (no Category 6 sites were identified at RAAP).
- **Category 7.** Areas requiring further assessment.

Figure 2-7
Environmental Remediation Requirements



The landfill area has been characterized as being underlain with groundwater contamination that do not require removal or other remedial response. The Existing Industrial Area has been classified as having groundwater contamination; removal or other remedial actions are underway but not all required actions have been taken. The groundwater contamination includes both chromium and cyanide above the Maximum Contamination Level (MCLs). The area of the North End Cap located south of the north reservoir has groundwater contamination but removal or other remedial response is not required due to the low concentration. The South End Cap is located south of the main development, immediately north of Claribel Road. This area is currently undeveloped and no existing contamination issues have been identified.

The *Environmental Condition of Property Phase I Report,* published in November 2006, describes the degree of remediation needed on the site and identifies areas and buildings that require further assessment.[1] Some of these areas and buildings were assessed in 2007, resulting in the publication of a *Site Investigation Report* in March 2008. The document reports the findings of additional assessment and identifies those areas and buildings for which no further assessment is necessary. [2]

A site visit to review visual environmental site conditions occurred in 2009. Not all areas were accessible due to being locked or requiring tenant permission for access. The site walk focused on the Existing Industrial Area including Buildings 1, 2, 5, 6, 7, and 8 of the former production line areas, Building 11 (the former spheroidizing facility), as well as the industrial water treatment facilities, and landfill.

[1] *CH2M HILL, 2006, Environmental Condition of Property Phase I Report, U.S. Army Corps of Engineers, page ES-15.*

[2] *CH2M HILL, 2008, Site Investigation Report, U.S. Army Corps of Engineers, pages 4-1 to 4-8.*

Buildings in the Existing Industrial Area exhibit a range of former and current industrial use. A partial list of observations includes the following:

- visible staining on floors;
- active and stored equipment including hydraulic lifts;
- remnants of wall or pipe insulation, material and equipment storage;
- equipment labeled with non-standard labels as polychlorinated biphenyl (PCB)-tested;
- vinyl tile floors which may have asbestos;
- several potentially asbestos containing transite panels and areas of missing panels;
- potentially asbestos containing fire proofing material on building walls;
- potential PCBs in the hydraulic storage tanks for the lifts; and
- signs of decay of wiring coating (suspect for potential asbestos, lead and PCD content) on electrical feeds run from transformer to exterior of building.

Due to the majority of the buildings being constructed before 1978, it is highly likely that all structures have lead based paint present. [3]

Only one minor area of friable asbestos was noted during the investigation with the remainder being non-friable asbestos. Further investigation is necessary as a complete asbestos survey should be performed on the entire site to identify all areas of concern. [4]

During a field investigation the galbestos siding on several of the buildings were sampled to assess if the material was friable. During additional research into the potential friability issues associated with galbestos, information was obtained that some forms of galbestos are coated with a non-liquid polychlorinated bi-phenols (NL-PCBs). Galbestos, also known as Robertson Protected Metal (RPM), is a special siding panel used in fire-retardant applications. RPM was available in several forms, but generally consisted of corrugated metal with asbestos felt and an outer tar coating on both sides. Twelve of the 21 samples collected from 21 buildings that appeared to contain RPM siding indicated the presence of PCBs. [5]

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[3] *Weston, 2010, Operations and Infrastructure Assessment, City of Riverbank, pages 16 to 17.*

[4] *Ibid.*

[5] *Ibid.*

Visual evidence at the IWTP indicates that one clarifier is out of use and the other has minimal usage; the majority of process tanks appear to be defunct and not maintainedl; chemical placarding did not appear to match actual material being stored; and acids and bases appeared to be stored in the same containment area. A waste bin storage area is present next to the IWTP and several bins were in use. Some staining was observed in the area south of the IWTP.

The landfill area appears to be well maintained; no erosion from the top or sides was evident and no obvious signs of subsidence were apparent. The vegetation appeared consistent across the area and burrowing animal traps were located at regular intervals around the base of the landfill.

CHAPTER 3:

VISION AND CONCEPTS

This chapter presents the vision for the RAAP and presents specific design strategies for the achievement of that vision.

A. RAAP Vision Statement

This Specific Plan envisions that:

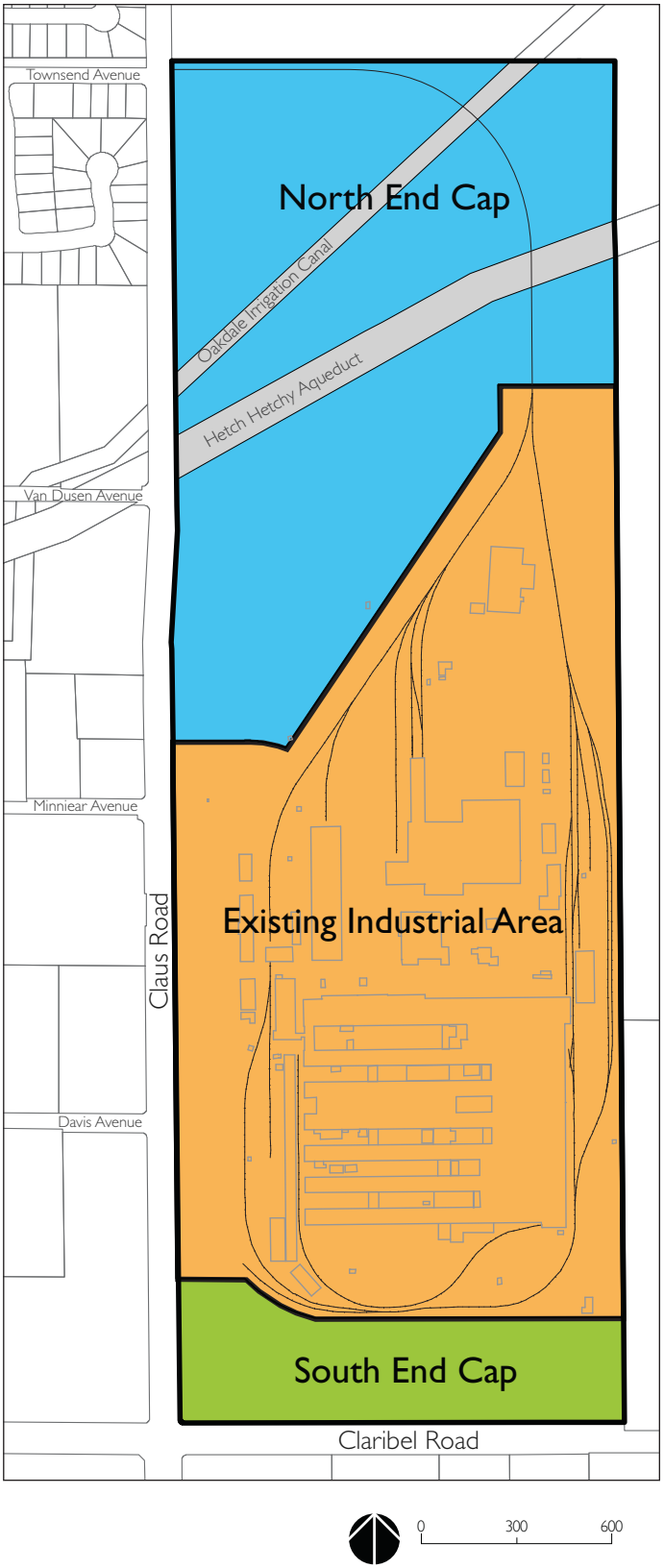
The former Riverbank Army Ammunition Plant will continue its success as a thriving industrial park that is occupied by a variety of manufacturing businesses. This success will strengthen Riverbank's economic well-being by providing jobs that are suitable for local residents. The RAAP will support the retention and expansion of existing businesses, as well as the attraction of new businesses that provide high-quality employment opportunities. A new green business park will attract environmentally sustainable manufacturing businesses, alternative-energy product designers; and research facilities. In addition, limited retail areas will provide for some of the everyday needs of community members and the RAAP's workers. Finally, the former base will provide a location where Riverbank's growing businesses can expand and thrive.

This is consistent with the City of Riverbank's adopted Vision Statement, which envisions that:[1]

Riverbank in 2025 has a small-town character where residents can live, work and play locally. The City has a thriving downtown that offers a variety of retail opportunities and services, and functions as the social and cultural heart of the community. Riverbank has a healthy and diversified industrial base served by its railroad, safe and walkable/bikeable neighborhoods, and a wide range of employment and housing opportunities for its diverse population. Although we welcome automobiles, Riverbank is a place for PEOPLE. Those who choose not to drive can easily and safely walk, bicycle, or use public transit to get to work, school, shopping, or a local park. Riverbankers' strong sense of community identity is reflected in its public gathering places and activities, architectural variety, and the ways in which the City's riverfront location, railroad-oriented history, agricultural heritage, and other unique qualities are celebrated in the built environment. Riverbank in 2025 has succeeded in creating a BALANCE between housing and jobs for its residents, commerce and industries that support the local economy, and the protection of agriculture and natural resources.

[1] *City of Riverbank, 2005, City of Riverbank General Plan: 2005-2025, pages IN-1 and IN-2.*

Figure 3-1 RAAP Subareas



B. Land Use and Circulation Concept

This section describes the land use and circulation concept for the Specific Plan Area. As shown in Figure 3-1, the Specific Plan Area can be divided into the following subareas:

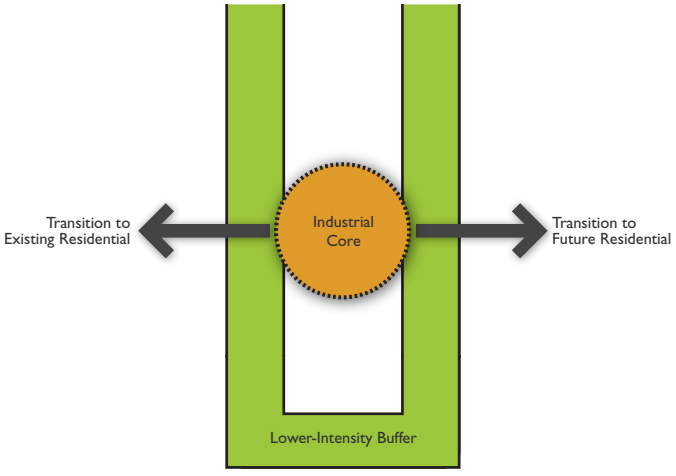
- Existing Industrial Area
- North End Cap
- South End Cap

These subareas are defined based on existing character and future development potential, and these names will be referenced throughout the remainder of this Specific Plan.

1. Land Use Transitions

As shown in Figure 3-2, the Land Use Concept for the RAAP site focuses on concentrating more intensive industrial activities in the Existing Industrial Area, as well as in the interiors of the South End Cap and North End Cap. Following this concept will help ensure that uses in the Specific Plan Area are sensitive to adjacent uses and include effective transitions toward these uses. Specifically, development on the west and east sides of the RAAP site should create a transition toward existing residential areas and future residential areas, respectively.

Figure 3-2 Land Use Transitions



Furthermore, concentrating lower-intensity uses along Claus Road will provide the greatest opportunity to provide aesthetic improvements to this primary corridor as it enters Riverbank since these uses require less outdoor storage and can be enhanced with landscaping to a greater degree.

2. Existing Industrial Area

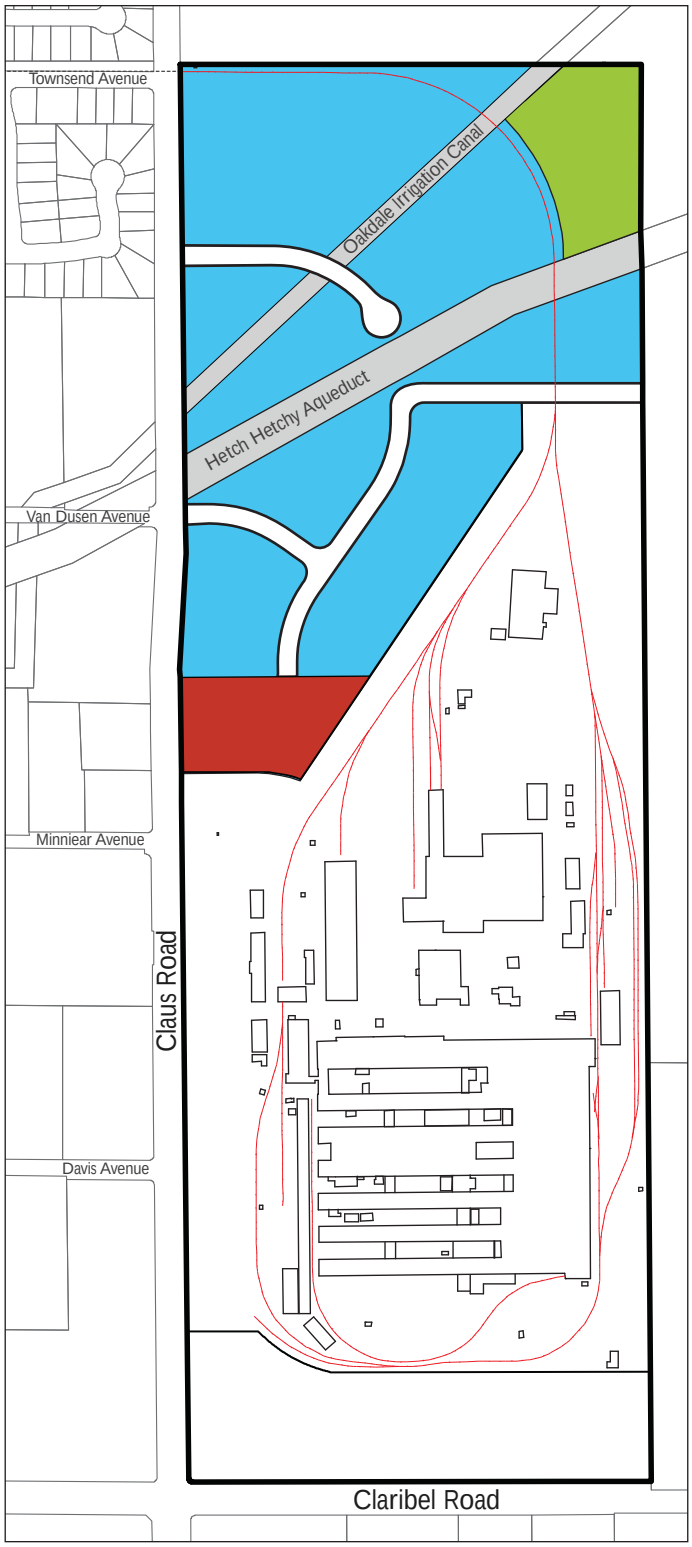
It is recommended that the Existing Industrial Area be retained as it is now. The Specific Plan does allow additional buildings and modifications to existing buildings in this area, with efforts made to maintain the historic character and preserve the viability of this area for future heavy industrial uses. Additional landscaping is also recommended for this area in the Specific Plan, both for improved aesthetics and to implement principles of low-impact development (LID). It is anticipated that new development in this area would be of a similar character to existing development and range from one to two stories.

3. North End Cap

As shown in Figure 3-3, the following uses are proposed for the North End Cap:

» **New Roadway.** A roadway network is recommended in the North End Cap that includes two entrances from Claus Road, one near Van Dusen Avenue and one approximately 800 feet further north. This network is preferred, but the exact location and configuration of future roads in the North End Cap will be determined at a future date as projects are proposed.

Figure 3-3 North End Cap



» **Northern Industrial/R&D.** The Specific Plan recommends a mix of research and development (R&D) and industrial uses in this area, which would be planned for collectively as an R&D/industrial park. Recommended uses range from light industrial uses to higher-end office and R&D uses, such as solar panel design and manufacturing, flexible office space, biotech research facilities, as well as other light manufacturing. The Specific Plan recommends that more intensive industrial uses be located in the interior of the Northern Industrial/R&D and that less intensive office uses be located closer to Claus Road. R&D/Industrial uses will be between one and three stories in this area.

» **Claus Retail.** New retail uses are proposed on the west side of the RAAP site along Claus Road, between the Van Dusen Avenue and Minniear Avenue intersections. Single-story retail with surface parking is envisioned for this area. Uses could include restaurants, dry cleaners, clothing stores, grocers, or other similar uses.

» **Retention Pond.** The current storm drainage pond only serves the developed portion of the site (RAAP-2). In order to provide storm drainage for additional development in this area. This pond could be expanded at its current location or expanded and relocated to a better location. New development will utilize LID principles of storm drainage disposal and provide any needed storage on-site. It is possible that if the pond is relocated, it could be sized to handle the entire Specific Plan area thus freeing up additional developable space; any relocation of the retention pond would be at the developer's discretion and cost. The need to relocate the stormwater pond could be triggered if more impervious surface is added to RAAP-2 and additional storm drainage capacity is required. This relocation would require a minor administrative amendment under the process as described in Chapter 8. While the Specific Plan calls for the LRA to investigate this concept further, it does not commit the City to implementation of this concept.

» **OID Relocation.** The OID canal currently transverses the site and presents challenges for siting new R&D and industrial development in the North End Cap. There is a road easement that goes 60 feet from centerline in favor of Stanislaus County. There are three proposed alternatives for relocating the OID canal which would allow for more feasible development of the North End Cap by creating larger, uninterrupted parcels; these alternatives may or may not be pursued. Option 1 pushes the OID canal into the northern adjacent parcel, running west along the property lines, turning south and running on the east of Claus Road until it crosses Claus Road at its current location. Option 2 has the OID canal routed south to and then southwest parallel to the Hetchy Hetchy Aqueduct. Option 3 has the OID canal reconfigured to run along the northern and western perimeters of the RAAP site.

» The OID Riverbank Drain runs along the eastern and southern edges of the project. There is no recorded easement for the drain on the north side of Claribel Road but OID could claim a prescriptive easement; OID has recorded rights-of-way downstream and upstream of that area OID's standard easement for an open ditch is 60' to the north of Claribel and 40' to the south of Claribel for a pipeline, both being centered on the facility. Regardless of the ownership of the facility (whether County, OID or private), the drain water would need to continue to be conveyed as it historically has through this area. Whether this is accomplished by pipeline, rerouting, etc. is up to the developer of the project impacting the historical operations. Any proposed driveway on Claribel Road east of Claus Road will require an encroachment permit subject to approval of the OID Board of Directors. The underlying fee title holder would need to fill out an application for a structure permit and pay a deposit; the deposit is currently $300 but is subject to change. OID staff would evaluate the application and prepare documents to take to the Board of Directors for approval. Application does not guarantee approval of an Encroachment Permit but as long as plans adhere to District Standards and Specifications and do not interfere with District operations, they would generally be approved; this would include piping the drain. Bioswales are typically not installed as the District removes bioswale plants when cleaning drains. Developers will need to meet with District staff prior to development plan preparation to work out the details that would be acceptable to the District.

» The other potential scenario is to request that the drain no longer be a District facility which must also be approved by the Board of Directors. In that instance, an Encroachment Permit would not be necessary. OID staff is in the process of reviewing District drains and may potentially privatize the drain before development may occur on the project. The Developer will need to coordinate efforts with the OID.

4. South End Cap

As shown in Figure 3-4, the following uses are proposed for the South End Cap:

» **Claus/Claribel Retail.** Retail uses are also proposed at the corner of Claus and Claribel Roads to take advantage of this prominent corner. Single-story retail with surface parking is envisioned for this area (uses similar to those proposed for Claus Retail described above).

» **Southern Industrial/R&D.** The southern undeveloped area on Claribel Road is proposed for R&D/industrial uses. Higher-end R&D and office development is proposed at this location. Proposed uses are similar to those proposed for the Northern Industrial/R&D described above. Development would be between one and three stories in this area.

Figure 3-4a
OID Relocation Option 1

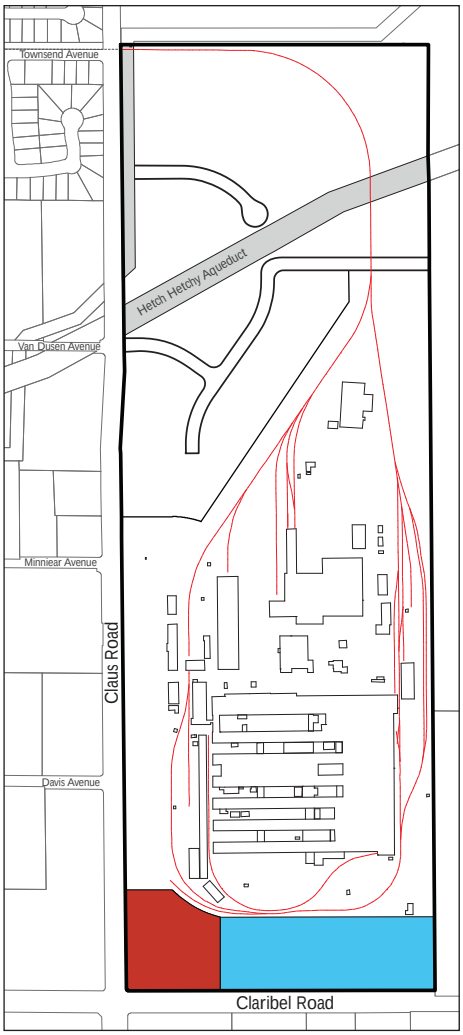


Figure 3-4b
OID Relocation Option 2

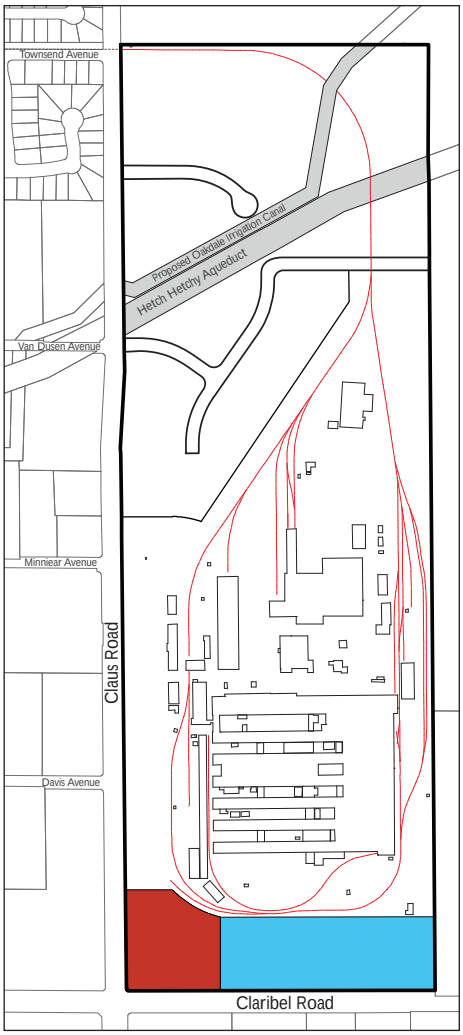
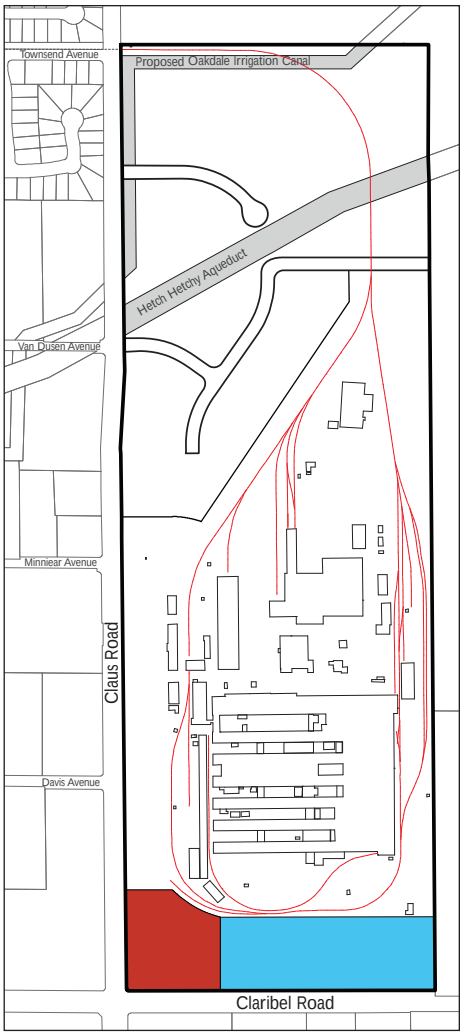


Figure 3-4c
OID Relocation Option 3



Southern Industrial/R&D

Claus/Claribel Retail

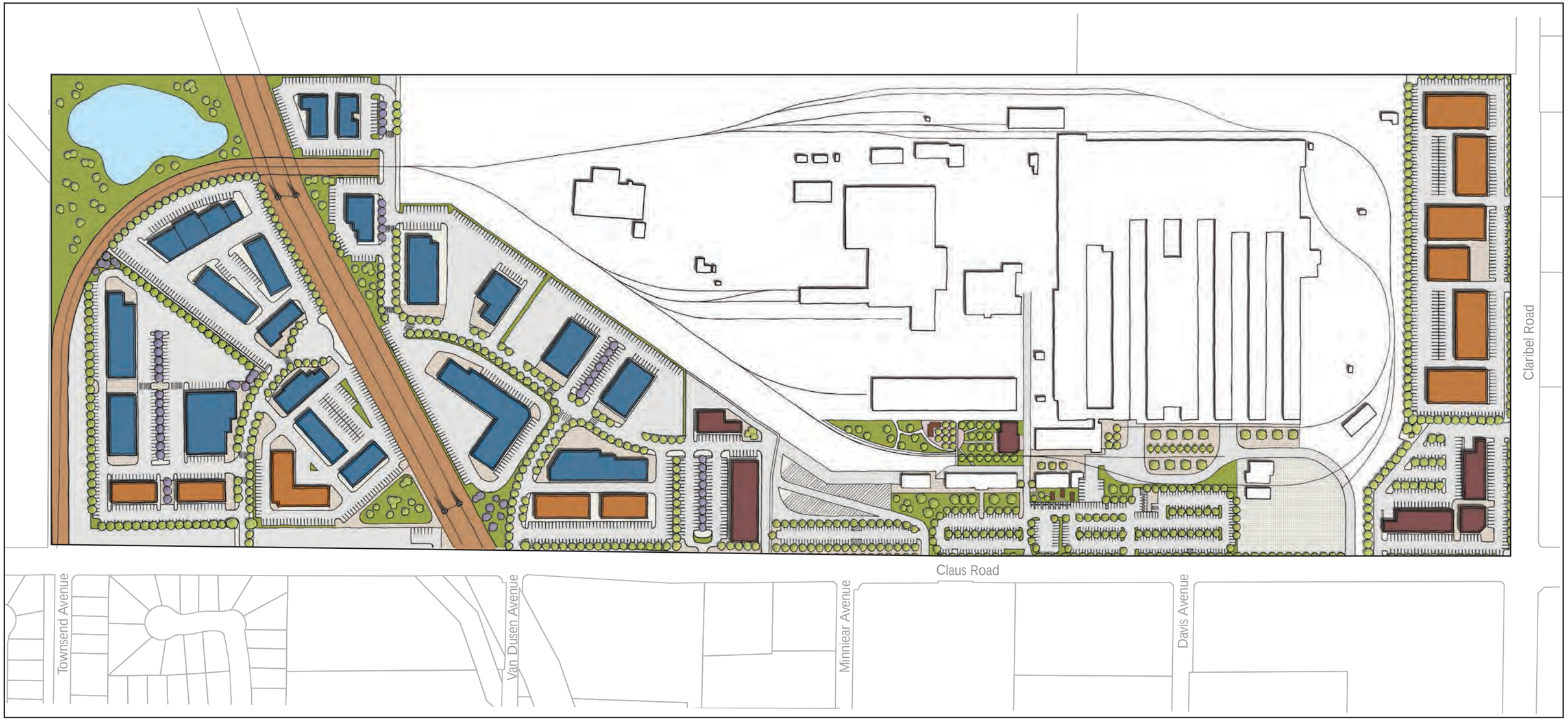
0 300 Feet

C. Development Concepts

This section is intended to illustrate how the North End Cap and South End Cap subareas of the RAAP site might ultimately be developed, based on the design and land use principles in this Specific Plan. Figure 3-5 shows a conceptual illustrative plan that depicts the potential build-out of private development and public improvements recommended by this Specific Plan. The illustrative plan is designed to show feasible site plans for new development, but is strictly conceptual. The exact locations of new development and improvements will be determined during implementation of this Specific Plan, in more detailed design processes and during approval of specific development projects. In this illustrative, burgundy represents retail, orange represents R&D, and blue represents industrial.

This section provides recommendations for the development of the Specific Plan Area for several topics, including building and street layout, circulation, and open space.

Figure 3-5 Conceptual Illustrative Plan



1. Building and Street Layout

The following principles govern the layout of new buildings and streets at the RAAP:

» Relationship of Buildings to Streets. As shown in Figure 3-5, buildings should generally face streets or should be designed so as to respond to the presence of streets. For example, the building in Figure 3-6 is oriented toward the interior street in the North End Cap area. Main entrances and windows, landscaping, plazas, publicly-accessible open spaces, water features, or other elements of a development should be oriented to the street.

» Building Form and Height. Buildings in the Specific Plan Area should be between one and three stories.

» Termination of Axes. Where possible, it is important to provide landscape elements, special building features, or other special elements where streets intersect or terminate. As shown in Figure 3-7, the entry feature, signage and landscaping is located at the terminus of the street.

» Gateway Elements and Entryways. Gateways and entry features are recommended at primary entries to the RAAP site. These features should provide a clear indication of the uses and buildings in the adjacent area, as well as attractive landscape elements that benefit the public realm. Figure 3-8 shows a perspective of a potential newly constructed entry feature at the Existing Industrial Area.

Figure 3-6 Building Facing the Street

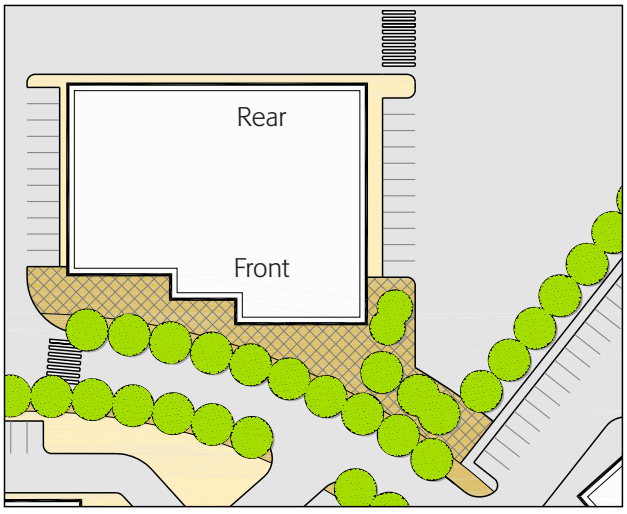


Figure 3-7 Terminated Axis

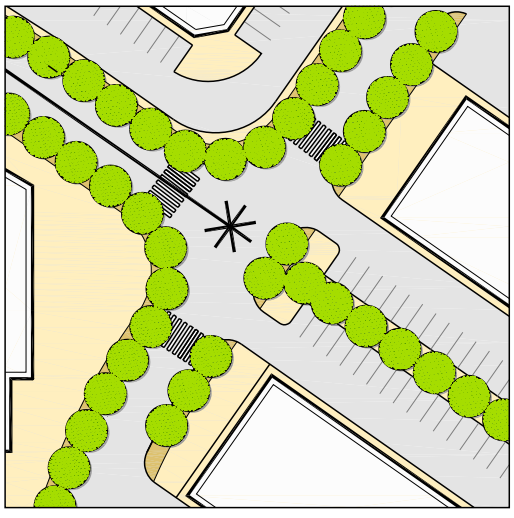


Figure 3-8 Potential Gateway at Entrance

2. Pedestrian Circulation

The following principles govern pedestrian circulation at the RAAP:

» Sidewalks. Sidewalks should be provided along all street frontages, including the interior streets of the RAAP site, as well as Claus and Claribel Roads. It is recommended that sidewalks be at least six feet wide so as to safely accommodate pedestrians and serve as an amenity.

» Pedestrian Crossings. Crossings should be provided at key points to ensure safety for pedestrians traveling within the RAAP. Crossings should also be provided at key entryways to the RAAP site from across Claus Road, particularly at Minniear Avenue and at the Claus Road and Claribel Road intersection.

» Site-specific Pedestrian Circulation. Individual new developments within the RAAP site should be designed to provide for safe pedestrian circulation within the site. For example, sidewalks and crossings through parking lots should be clearly demarcated and connect building entrances, parking areas, and open space areas.

3. Vehicular Circulation

The following principles govern vehicular circulation at the RAAP:

» Safe Circulation for All Drivers. Development should be designed to safely accommodate a variety of vehicular circulation, including employees' vehicles and delivery trucks. Sufficient queueing space should be provided for delivery vehicles where necessary. Additionally, there should be sufficient entrances and exits so that all vehicles can safely enter and exit individual developments.

» Parking Location. The majority of parking should be provided behind buildings to ensure more attractive street frontages. Visitor and employee parking should be separated and clearly indicated.

» Reconfigured Parking at Existing Industrial Area. It is proposed that the current parking lot in the Existing Industrial Area be converted from angled parking to 90 degree parking to better accommodate anticipated parking needs as industrial space in this area is leased and the number of employees increase.

4. Open Space and Landscaping Improvements

The following principles govern the provision of open space at the RAAP:

» Public Open Space. Figure 3-5 shows several potential opportunities to provide common open spaces that could be shared by the various tenants at the RAAP, as well as the general public. These spaces could be programmed in a variety of ways, but passive open spaces within the interior of the RAAP site are recommended. For example, open spaces could be provided at a few central locations accessible to employees and the general public. These could provide places for company events, impromptu lunches, or other gatherings. Figure 3-9 shows an example of how a single development could provide a publicly-accessible open space, as well as a private open space that would be restricted to employees. Development is encouraged to provide public open space to the extent feasible based on sensitivity of business activities and site constraints.

» Private Open Space. Private open space should also be provided where possible within the interior of sites. These spaces can provide opportunities for break areas for employees, as well as water features that assist in stormwater management. Figure 3-10a shows how new private open spaces could be incorporated into the Existing Industrial Area.

» Parking Area Landscaping. Figures 3-10b and 3-10c show a reconfigured parking lot at the Existing Industrial Area. In addition to adding capacity as discussed above, there are opportunities to provide enhanced landscaping and entry features in this location. As shown, the parking lot could be enhanced with a new pocket park near the main RAAP visitor entry point. Additionally, new planted medians can be provided in the parking lot to better demarcate spaces, add to the aesthetic quality of the site by providing opportunities to provide trees, provide shade, and potentially assist in stormwater management.

Figure 3-9 On-Site Open Space

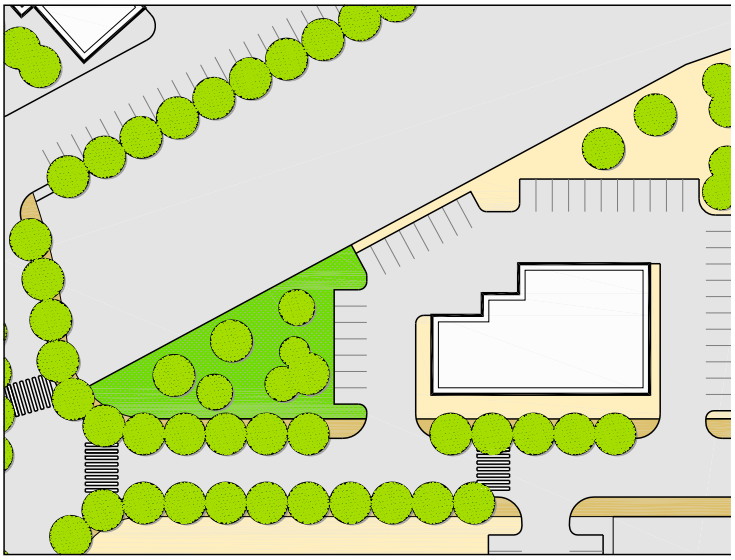


Figure 3-10a Open Space and Landscaping Concepts

Figure 3-10b Open Space and Landscaping Concepts

Figure 3-10c Open Space and Landscaping Concepts

5. Low Impact Development (LID)/Stormwater Management

The following principles govern LID/stormwater management at the RAAP:

» General LID Practices. LID practices are to be incorporated throughout the RAAP and required on new development in both the North and South End Caps to mitigate peak runoff flow rates, conserve and create natural areas, minimize stormwater pollutants of concern, and protect slopes and channels following the City's Model Standards & Specifications for Low Impact Development Practices.

» Site Specific LID Practices. A LID Stormwater Management for the Riverbank Army Ammunition Plant document lays out recommendations for sustainable practices at the RAAP site that support LID, including stormwater improvements as well as other measures, and that can be implemented immediately or phased in over time. Recommendations serve as a beginning point to address site-specific constraints while following the City's Model Standards & Specifications for Low Impact Development Practices.

6. New Construction or Building Modification

The following principles govern new construction and building modification at the RAAP:

» Sustainable Building Practices. The RAAP is envisioned as a green industrial park and new devel-opment is encouraged to incorporate sustainable design practices and pursue LEED, Build It Green, or other acknowledged sustainability certifications.

» LEED-ND for Project. The City is exploring certification of the overall Property under the LEED for Neighborhood Development ("LEED-ND") at the level of "Certified" or greater; there is no guarantee that certification efforts will commence.

» Other LEED certification. The City may seek certification of individual buildings within the Property, including certification of the buildings under the LEED for New Construction ("LEED-NC"), LEED for Core & Shell ("LEED-CS"), LEED for Commercial Interiors ("LEED-CI") and the LEED for Existing Buildings ("LEED-EB") rating systems at the level of "Certified" or greater.

» Other green certification. The City may seek additional sustainable building certifications or in-corporate equivalent or additional sustainability features or strategies into the operation and maintenance of the RAAP and may seek third party certification of same.

» Tenant improvements. Tenants are encouraged to seek LEED certification of the tenant spaces at their sole cost and expense; the City shall reasonably cooperate with the same provided there is no expense to the City. Tenant shall be required to adhere to certain construction and operational practices and procedures that may be necessary in order for the RAAP to comply with the City's LEED objectives. Required practices and procedures shall be set forth in the lease or development agreements.

D. Streetscape Concepts

This section describes the broad streetscape concepts recommended for the Specific Plan Area. Recommendations are provided for interior roads within the North End Cap as well as for Claus and Claribel Road, both of which border the RAAP site.

1. Interior Roads

It is recommended that interior roads in the North End Cap be designed to accommodate vehicle traffic for typical industrial uses as well as for office uses. The lane configuration will need to support heavier trucks as well as smaller trucks and automobiles, such as those driven by employees, as well as a Class III bike route. The streetscape should include a landscaped area at the outside edge of each travel lane that separates vehicular traffic from sidewalks. Trees should be planted within the buffer to provide shade, shield pedestrians from traffic, and enhance the aesthetic character of the RAAP site. All interior street frontages should provide sidewalks to ensure safe pedestrian circulation between buildings as well as for those walking to and from their places of employment. Right-of-way for interior streets will be in accordance with the City's standards and Circulation and Community and Character Design Elements.

2. Perimeter Roads

It is recommended that the western and southern project frontages, along Claribel and Claus Roads, be widened to their ultimate widths and the appropriate turn-pockets, bicycle facilities and pedestrian amenities provided. It is recommended that four 12-foot lanes be provided for primary vehicular circulation with a 2-way turn lane or possible median separating travel directions. This lane configuration will support heavier trucks as well as smaller trucks and automobiles, such as those driven by employees. The streetscape should include a planter strip/swale at the outside edge that provides a landscape buffer and a sidewalk/bike path. Trees should be planted within the buffer to provide shade, shield pedestrians from traffic, and enhance the aesthetic character of the RAAP site. Northbound right-turn lanes into the site from Claus Road should be constructed where heavy truck movements are expected to facilitate their movements into the site. Given the length of the site, over ½ mile, several potential transit stops should be included along the project frontage on both Claus and Claribel Roads. Right-of-way for perimeter roads will be in accordance with the City's standards and Circulation and Community and Character Design Elements.

Figure 3-11 Northwest Park Option

E. Additional North End Cap Concept

Figures 3-11 and 3-12 show an additional concept for development of the North End Cap area. The primary ideas shown in this concept are an alternative configuration of the interior roads within the North End Cap and the potential extension of Central Avenue along the eastern property line of the RAAP, connecting Kentucky Avenue and Claribel Road.

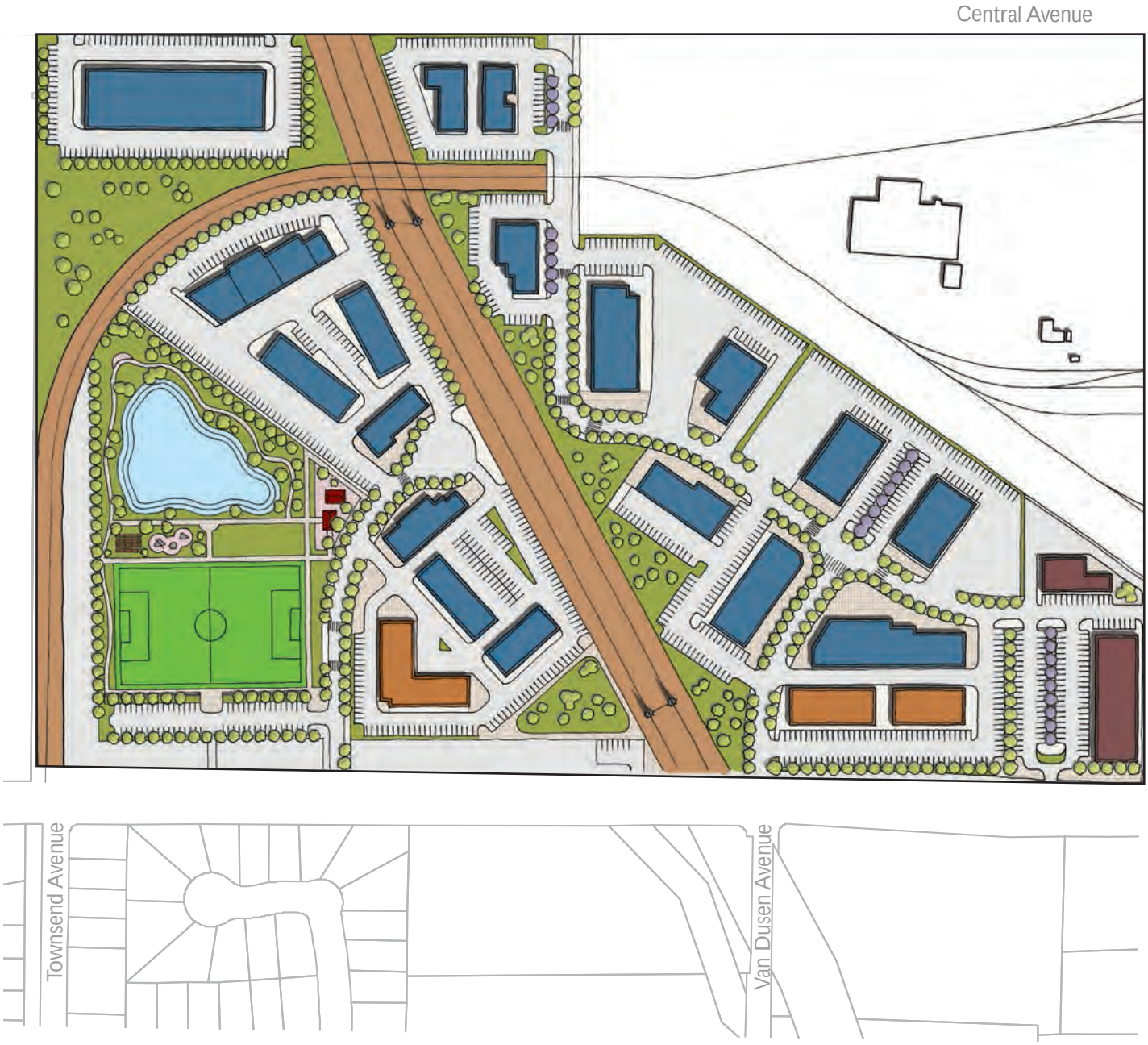
1. Interior Roadway Network

The interior road network in this concept is reconfigured to terminate in a cul-de-sac at the Hetch Hetchy Aqueduct. This would occur on the north and south sides of the easement. This option would be suitable if the San Francisco Public Utilities Commission (SFPUC) will not grant permission for a new road across the Aqueduct. However, it would result in reduced circulation within the North End Cap.

2. Northeast Development

The extension of Central Avenue gives the northeast portion of the RAAP site frontage along a new street section. As discussed as part of the land use concept above, this site is located along an anticipated Central Avenue extension and should therefore be developed with lower intensity uses. Similarly to new development along Claus Road, this would help to transition to existing agricultural uses or future residential uses expected in this area.

Figure 3-12 Additional North End Cap Concept



3. Northwest Community Park and Stormwater Pond

In this alternative, industrial uses are shown in the far northeast corner of the North End Cap and a community park and stormwater pond is shown in the northwest corner. The soccer field shown on the park in Figures 3-11 and 3-12 would function as part of the stormwater management system, carrying water down to the stormwater retention pond to the east. In addition to the soccer field, picnic facilities, lawn areas, horseshoe pits, and a trail around the stormwater pond are all envisioned in this concept. However, it should be noted that these park elements are only conceptual ideas and could be substituted for other features if desired. Figure 3-11 shows a realistic rendering of how the community park and stormwater pond could be designed. Additional information on the storm drainage needs and options are discussed in Chapter 7.

CHAPTER 4:

GOALS AND POLICIES

This chapter outlines goals and policies for the RAAP Specific Plan with respect to land use and community design, transportation and circulation, public facilities and services, cultural resources, and economic development. The goals and policies evolved from the Base Reuse Plan and Specific Plan processes. The policies implement those in the General Plan by providing clear parameters by which City staff and decision-makers can review new projects and significant additions or remodeling within the Specific Plan Area.

Goals and policies are defined as follows:

- **Goal.** A goal is a specific condition or end that represents fulfillment of the vision and concepts outlined in this Specific Plan.

A policy is a specific statement that guides decision-making as the City works to achieve a goal. Policies, once adopted, represent statements of City regulation.

A. Economic Development

Goal ED-1: New jobs at the RAAP for local residents, and especially Riverbank residents.

Policy ED-1: Market the RAAP site to regional developers, particularly those that have successfully completed other industrial/R&D projects.

Policy ED-2: Market to green businesses that need industrial, R&D, or office space.

Policy ED-3: Identify and contact companies throughout the region, State, and nation that may be looking to expand their current operations and may need the type of facilities or land offered at the RAAP.

Policy ED-4: Support existing tenants that wish to expand their current facilities, either in existing buildings or on currently undeveloped areas.

Policy ED-5: Encourage new employment uses that are consistent with the educational attainment and specialized training of Riverbank's working-age population.

Goal ED-2: An emerging industrial park and retail area that is attractive to developers.

Policy ED-6: Continue efforts to "brand" the RAAP and create materials that can be used to market the RAAP to potential developers.

Policy ED-7: Identify incentives that could increase developer interest in the RAAP.

B. Land Use and Community Design

Goal LUD-1: A land use mix that contributes to job creation for Riverbank residents.

Policy LUD-1: Encourage a mix of new employment-intensive development types on undeveloped portions of the RAAP, including traditional industrial uses, R&D space, flex space, office uses, and supporting retail space.

Goal LUD-2: A new industrial park and retail area that contributes positively to the aesthetic character of Riverbank.

Policy LUD-2: Ensure that new development follows the standards and guidelines provided in this Specific Plan.

Policy LUD-3: Ensure that new development respond appropriately to adjacent development, particularly residential neighborhoods through screening, setbacks, and other mechanisms.

Policy LUD-4: Encourage significant climate apropriate landscaping along frontages as part of private development.

Policy LUD-5: Encourage appropriate setbacks, screening, and landscaping along Claus Road, Claribel Road, and the anticipated Central Avenue extension.

Policy LUD-6: Accentuate entries to the North End Cap property and Riverbank Industrial Complex with gateway features, such as special landscaping, building accents, signage, open space, or other design features.

Goal LUD-3: A building design that maintains historic character.

Policy LUD-7: Ensure new buildings in RAAP-2 compliment the historic character of existing buildings in proportions, massing, general architectural elements, and materials insofar as these actions do not limit the functionality of subject buildings and sites.

C. Transportation and Circulation

Goal TRAN-1: A new industrial park and retail area that facilitates the safe circulation of vehicles, bicycles, and pedestrians.

Policy TRAN-1: Provide pedestrian crossings as appropriate to ensure that employees can safely walk between buildings and to areas off-site.

Policy TRAN-2: On new public streets built in the Specific Plan Area, use a landscaped planting strip to buffer sidewalks from roadways.

Policy TRAN-3: Ensure bicycles are accommodated through the provision of on-site bicycle parking.

Policy TRAN-4: Design roadways to accommodate all modes of travel safely.

Policy TRAN-5: Where appropriate, encourage shared access drives between separate developments.

Goal TRAN-2: Retail and industrial uses that provide adequate parking for local residents and visitors.

Policy TRAN-6: Require on-site parking for individual developments.

Policy TRAN-7: Where appropriate, encourage shared parking between developments.

Goal TRAN-3: An industrial park that provides for safe queuing of delivery vehicles.

Policy TRAN-8: Ensure that truck deliveries and movement do not inhibit pedestrian, bicycle, and vehicular circulation.

Policy TRAN-9: Ensure that ample room and circulation is provided in roadway and circulation design so as to maximize accessibility for new tenants.

D. Public Facilities and Services

Goal PUB-1: Adequate facilities that serve the needs of new development.

Policy PUB-1: Invest in new "backbone" infrastructure on the North and South End Cap properties to attract new development at the RAAP.

Policy PUB-2: Ensure that adequate infrastructure is provided as necessary to support new development.

Policy PUB-3: Coordinate with Stanislaus Consolidated Fire Protection District to ensure fair share development fees for future development resulting from implementation of the RAAP Specific Plan to ensure equipment, staffing, and facilities for emergency medical services, urban search and rescue, hazardous materials emergency response, and other relevant needs, as appropriate.

Goal PUB-2: Sustainable infrastructure that exhibits principles of low-impact development (LID).

Policy PUB-4: Require developers to implement "green" infrastructure where practical, such as on-site stormwater management, water reclamation, permeable surfaces, solar and clean energy, and other appropriate technologies.

CHAPTER 5:

LAND USE DESIGNATIONS AND DEVELOPMENT STANDARDS

This chapter provides the land use designations and development standards for the RAAP site. Land use designations support the goals of the General Plan and this Specific Plan by prescribing general uses and building intensities for different areas of the RAAP site. The RAAP has been assigned with land use designations from the existing General Plan, with only certain portions of the site changing designation. Development standards implement the goals of the General Plan and this Specific Plan by providing requirements for the physical form of future development and significant redevelopment.

A. Land Use Designations

The following General Plan land use designations are based on the Base Reuse Concept and will apply within the Specific Plan Area. Figure 5-1 shows the land use designations for the Specific Plan Area.

These Land Use Designations and Development Standards replace existing zoning policies, development standards and design guidelines. These Land Use Designations and Development Standards do not replace or augment current City of Riverbank regulations pertaining to health, safety and welfare issues. All applications for new construction, or substantial modifications to existing development, shall be reviewed for conformance with the policies contained in this Plan's Land Use Designations and Development Standards.

Existing land uses that are not consistent with the regulations associated with these land use designations are permitted to continue as legal nonconforming uses consistent with the limitations of the Riverbank Municipal Code. These limitations include but are not limited to the following:

- » If the nonconforming use ceases for a continuous period of six months it shall be considered abandoned and use of the building or land shall adhere with the current regulations for the RAAP.
- » If the nonconforming use expands in area or the expansion modifies the business to include new uses, the nonconforming status is forfeited.

Figure 5-1 Land Use Designations

» Ordinary maintenance and repairs may be made to any nonconforming building provided no structural alterations are made and providing that such work does not exceed 15% of the appraised value in any one-year period. Other repairs or alterations may be permitted provided that a use permit shall first be secured in each case.
» A nonconforming building damaged or destroyed by fire, explosion, earthquake or other act to an extent of more than 75% of the appraised value thereof, according to either the assessor's records or an appraisal performed by a qualified real estate appraiser may be restored only if made to conform to all the regulations of the district in which it is located, provided that such building may be restored to a floor area not exceeding that of the former building if a use permit first shall be secured.

1. Industrial/Business Park (I/BP).

This designation includes manufacturing uses, as well as a mixture of light manufacturing and office spaces. These uses may be located in campus-like settings sometimes referred to as "business parks" or "research parks," or as more traditional industrial parks. This category is meant to accommodate a variety of employment-generating, basic (as opposed to community serving) enterprises. Office parks could accommodate businesses of various types, research and development, logistics services, and other uses. Areas with this designation near existing or future planned residential and other sensitive land uses are subject to performance standards to ensure against noise, traffic, safety, light spillage and glare, and other impacts typically generalized as "compatibility."

2. Community Commercial (CC)

Areas with this designation are anticipated to be developed for retail, employment, and/or commercial services. These areas are located along major roadways on the periphery of existing and planned neighborhoods. The maximum FAR is 0.3.

3. Buffer/Greenway/Open Space (B/G/OS)

This designation provides the opportunity to preserve important open spaces containing natural resources, such as sensitive biological habitat. This category also includes areas where buffering is necessary between different land uses. Bicycle and pedestrian pathways are also accommodated by this Land Use Designation.

Figure 5-2 RAAP Zoning Areas

B. RAAP Zoning Areas

Figure 5-2 shows the zoning areas that apply to the RAAP. These areas are discussed in more detail in the development standards for each area.

Figure 5-3 Conceptual Parcelization

C. Conceptual Parcelization

Figure 5-3 shows a conceptual plan for parcelization of the North End and South End Cap areas. The parcel configuration shown is strictly conceptual. Actual parcelization will be determined in the future as projects occur within the Specific Plan Area.

D. Permitted Uses

Table 5-1 shows the uses that are permitted in each RAAP area, including those that are subject to a use permit. In the RAAP-OS area, all uses are subject to a use permit, which shall determine the development standards for that use. See H. Definitions later in this chapter for additional information on land use types.

Table 5-1 Allowed Uses in RAAP Areas

Land Use	RAAP Industrial/R&D (RAAP-1)	RAAP General Industrial (RAAP-2)	RAAP Retail (RAAP-R)
Commercial			
Bank, Retail	—	—	P
Business Support Service	UP	—	P
Car Wash	—	—	P**
Equipment Sales and Rental	UP	—	UP
Food and Beverage Sales—10,000 square feet or less	—	UP	P
Food and Beverage Sales—Over 10,000 square feet	—	—	—
Gas and Service Station	—	—	UP
Health/Fitness Facility	—	—	UP
Medical Clinic or Lab	—	P*	—
Office	P	P	—
Outdoor Storage	UP	P*	UP
Personal Services—Low Impact	—	—	P
Personal Services— Moderate Impact	—	—	—
Restaurant or Café—Full Service	—	—	UP
Restaurant or Café—Quick Service	—	P**	P
Retail, General	—	—	P
Secondhand Store	—	—	UP
Shopping Center	—	—	UP
Temporary Use	UP	UP	UP
Trade or Vocational School—Private	P	P	—
Trade or Vocational School—Public	—	P	—
Truck Wash	—	P**	—

* Allowed if screened from view from a public right-of-way.

** Allowed only as an accessory use.

P	permitted
UP	requires use permit
-	not permitted

Table 5-1 Allowed Uses in RAAP Areas (Continued)

Land Use	RAAP Industrial/R&D (RAAP-1)	RAAP General Industrial (RAAP-2)	RAAP Retail (RAAP-R)
Industrial/Research and Development			
Agricultural Support Services	P	—	—
Fertilizer Manufacturing	P	—	—
Food Trucks	P***	P***	—
Food Truck Plaza	—	P***	—
Green Energy Plant	UP	P	—
Maintenance and Repair Service	UP	—	—
Manufacturing and Processing—General	P	P	—
Manufacturing and Processing—Heavy	UP	P	—
Manufacturing and Processing—Light	P	P	UP
Recycling Facility—Large	UP	P	—
Recycling Facility—Small	—	—	P
Research Laboratory	UP	P	—
Reverse Vending Machine—Bulk	—	—	—
Reverse Vending Machine—Small	—	—	P
Vehicle Service and Repair	—	P*	—
Warehousing, Wholesaling, and Distribution	UP	UP	—
Transportation, Communications, and Utilities			
Cell Tower	UP	UP	UP
Freight Terminal	—	UP	—
Natural Gas Fuel Station	P	—	—
Public or Quasi-Public Facility	UP	UP	UP
Public Utilities—Major	—	UP	—
Public Utilities—Minor	P	P	P

* Allowed if screened from view from a public right-of-way.

** Allowed only as an accessory use.

*** Allowed with conditions.

P	permitted
UP	requires use permit
-	not permitted

E. RAAP Light Industrial/R&D (RAAP-1) Development Standards

The following standards shall be applied for all areas zoned RAAP-1, as shown in Figure 5-4.

1. Purpose and Intent

The purpose of this area is to provide for the development of light manufacturing and R&D uses at the RAAP site.

2. Maximum Building Height: 55 feet

3. Maximum Area: Sufficient to provide minimum yard, landscaping, and parking requirements.

4. Minimum Site Dimensions

a. Width (Interior Lot): 55 feet
b. Width (Exterior Lot): 65 feet
c. Depth: 100 feet

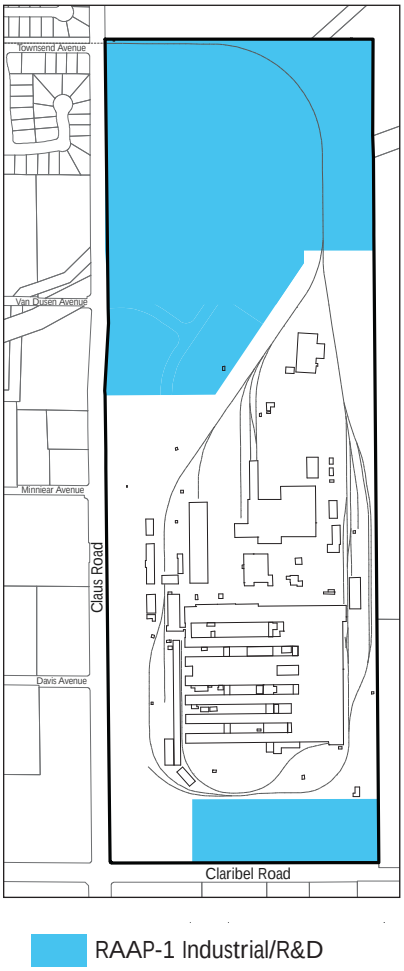
5. Minimum Setbacks

a. Front or side yard of a corner lot: 10 feet
b. Front: 0 feet
c. Side: 0 feet
d. Back: 0 feet

6. Parking Requirements

a. Offices: 1 space per 300 square feet gross floor area
b. Industrial Uses (except those listed below): Per Municipal Code OR conduct a parking study or consult with the Community Development Director to demonstrate reduced needs
c. Warehousing: Per Municipal Code OR conduct a parking study or consult with the Community Development Director to demonstrate reduced needs
d. Transportation, Communication and Utilities: Determined by use permit, or through site plan review if a use permit is not required
e. ADA: 1 space for every 40 total parking spaces; after 600 total parking spaces, provide 1 space for each 200 spaces thereafter; or as required by the California Building Code.
f. Electric Car: 1 space per 100 public parking spaces.

Figure 5-4 RAAP-1



7. Accessory Structures
   a. With the exception of structures manned for security purposes, accessory structures shall not be located in the front setback of new development.
   b. Accessory structures shall be screened from view of public rights-of-way.
   c. Accessory structures shall be located so as not to inhibit or conflict with vehicular circulation within a given development.

8. Landscaping
   a. On sites where soil contamination precludes excavation for planting beds and tree wells, the landscaping requirements of this section may be modified through the site plan review process.
   b. A minimum of 15 percent of each site's area shall be landscaped. In addition, a minimum of five percent of the surface of each parking lot shall be landscaped.
   c. Landscaping will meet Model Water Efficient Landscape Ordinance (WELO) requirements.
   d. For every eight parking stalls, one shade tree shall be provided in the paved area. Shade trees shall be a minimum 24-inch box in size and shall be selected from a City-approved list of canopy tree species.
   e. Parking areas along public rights-of-ways shall including landscape plantings at their edges. Landscaping shall allow views into the site.

9. Signage
   a. Only wall signs and monument signs shall be permitted. Freestanding signs other than monument signs shall not be permitted.
   b. One monument sign shall be permitted for each parcel of the site. Each monument sign shall be limited to 10 feet in height and 85 square feet per sign face. Monument signs shall be set back at least 5 feet from any right-of-way or lot line.
   c. Individual wall signs shall be limited to 85 square feet.
   d. Signs, if lit, shall be externally illuminated.
   e. Tenant identification signs shall be located near entries to the building and shall be in scale with the design of the building and entryway.

10. Bicycle Parking
   a. New development shall provide two bicycle parking spaces, or five percent of the vehicle parking spaces, whichever is greater. Where the application of this standard would result in a fractional number of spaces, the required number of spaces shall be rounded up to the next whole number.
   b. Each bicycle parking space shall provide a securely-anchored, stationary parking device that is adequate to lock and secure a 6-foot-long bicycle.

c. All bicycle parking spaces shall be located within 50 feet of the main entrance to the building they serve. For outdoor parking areas, pedestrian walkways shall be provided between the bicycle parking spaces and the nearest building entrance.

11. Vehicle and Loading Access.
    a. Vehicle openings of buildings shall be set back a minimum of 20 feet from the property line or planned right-of-way line that the opening faces.
    b. Loading docks shall be designed so that all maneuvering, loading, and unloading takes place off-street.

12. Excavation
    a. All excavation will be per Municipal Code.

F. RAAP General Industrial (RAAP-2) Development Standards

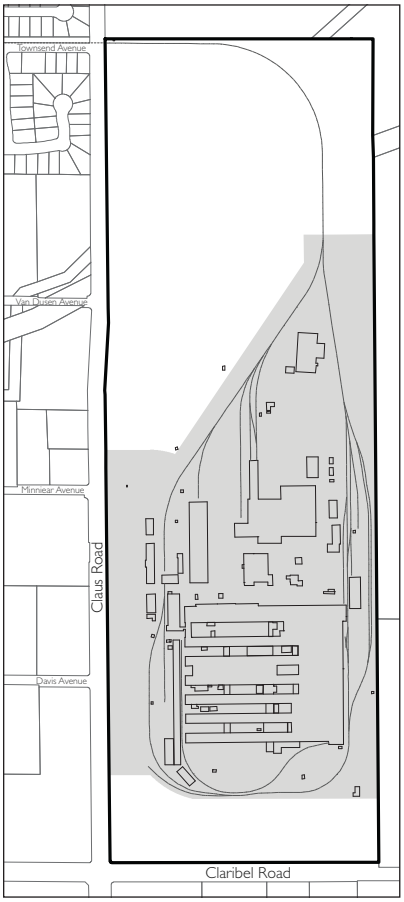
The following standards shall be applied for all areas zoned RAAP-2, as shown in Figure 5-5.

1. Maximum Building Height: 70 feet

2. Minimum Setbacks
    a. Front (Claus Road frontage): 20 feet
    b. Front (Central Avenue Extension frontage): 50 feet
    c. Front, side and back (internal roads): 0 feet

3. Parking Requirements
    a. Offices: 1 space per 300 square feet gross floor area
    b. Industrial Uses (except those listed below): Per Municipal Code OR conduct a parking study or consult with the Community Development Director to demonstrate reduced needs
    c. Warehousing: Per Municipal Code OR conduct a parking study or consult with the Community Development Director to demonstrate reduced needs
    d. Transportation, Communication and Utilities: Determined by use permit, or through site plan review if a use permit is not required
    e. ADA: 1 space for every 40 total parking spaces; after 600 total parking spaces, provide 1 space for each 200 spaces thereafter; or as required by the California Building Code.
    f. Electric Car: Encourage existing tenants to provide electric car hookups and parking within existing parking; expansion of existing parking would require 1 space per 100 public parking spaces.

Figure 5-5 RAAP-2



4. Accessory Structures
   a. With the exception of structures manned for security purposes, accessory structures shall not be located in the front setback of new development.
   b. Accessory structures shall be screened from view of public rights-of-way.
   c. Accessory structures shall be located so as not to inhibit or conflict with vehicular circulation within a given development.

5. Landscaping
   a. On sites where soil contamination precludes excavation for planting beds and tree wells, the landscaping requirements of this section may be modified through the site plan review process.
   b. Landscaping will meet Model Water Efficient Landscape Ordinance (WELO) requirements.

6. Signage
   a. Interior signs not visible from Claus or Claribel Roads are exempt.
   b. Center signs identifying multiple tenants shall be at least 150 feet apart and no more than 50 feet high.
   c. Wall-mounted signs on buildings visible from Claus or Claribel Roads are permitted if using channelized letters in sizes as allowed in the Riverbank Municipal Code.

7. Bicycle Parking
   a. New development shall provide two bicycle parking spaces, or five percent of the vehicle parking spaces, whichever is greater. Where the application of this standard would result in a fractional number of spaces, the required number of spaces shall be rounded up to the next whole number.
   b. Each bicycle parking space shall provide a securely-anchored, stationary parking device that is adequate to lock and secure a 6-foot-long bicycle.
   c. All bicycle parking spaces shall be located within 50 feet of the main entrance to the building they serve. For outdoor parking areas, pedestrian walkways shall be provided between the bicycle parking spaces and the nearest building entrance.

8. Vehicle and Loading Access
   a. Vehicle openings of buildings shall be set back a minimum of 20 feet from the property line or planned right-of-way line that the opening faces.
   b. Loading docks shall be designed so that all maneuvering, loading, and unloading takes place off-street.

9. Excavation
    a. All excavation will be consistent with deed restrictions and otherwise per Municipal Code.

G. RAAP Retail (RAAP-R) Development Standards

The following standards shall be applied for all areas zoned RAAP-R, as shown in Figure 5-6.

1. Maximum Building Height: 30 feet

2. Minimum Site Dimensions
    a. Width (Interior Lot): 55 feet
    b. Width (Exterior Lot): 65 feet
    c. Depth: 100 feet

3. Minimum Setbacks
    a. Front: 10 feet
    b. Side: 10 feet
    c. Back: 10 feet

4. Parking Requirements
    a. Commercial Uses (except those listed below): 1 space per 300 square feet gross floor area
    b. Banks: 1 space per 500 square feet gross floor area
    c. Offices: 1 space per 300 square feet gross floor area
    d. Transportation, Communication and Utilities: Determined by use permit, or through site plan review if a use permit is not required
    e. ADA: 1 space for every 40 total parking spaces; after 600 total parking spaces, provide 1 space for each 200 spaces thereafter; or as required by the California Building Code.

5. Landscaping
    a. On sites where soil contamination precludes excavation for planting beds and tree wells, the landscaping requirements of this section may be modified through the site plan review process.
    b. A minimum of 15 percent of each site's area shall be landscaped. In addition, a minimum of five percent of the surface of each parking lot shall be landscaped.

Figure 5-6 RAAP-R

c. Landscaping will meet Model Water Efficient Landscape Ordinance (WELO) requirements.
d. For every eight parking stalls, one shade tree shall be provided in the paved area. Shade trees shall be a minimum 24-inch box in size and shall be selected from a City-approved list of canopy tree species.
e. Parking areas along public rights-of-ways shall including landscape plantings at their edges. Landscaping shall allow views into the site.

6. Signage

a. Only wall signs and monument signs shall be permitted. Freestanding signs other than monument signs shall not be permitted.
b. One monument sign shall be permitted for each parcel of the site. Each monument sign shall be limited to 10 feet in height and 85 square feet per sign face. Monument signs shall be set back at least 5 feet from any right-of-way or lot line.
c. Wall signs shall be limited to 85 square feet.
d. Individual signs, if lit, shall be externally illuminated.
e. Tenant identification signs shall be located near entries to the building and shall be in scale with the design of the building and entryway.

7. Bicycle Parking

a. New development shall provide two bicycle parking spaces, or five percent of the vehicle parking spaces, whichever is greater. Where the application of this standard would result in a fractional number of spaces, the required number of spaces shall be rounded up to the next whole number.
b. Each bicycle parking space shall provide a securely-anchored, stationary parking device that is adequate to lock and secure a 6-foot-long bicycle.
c. All bicycle parking spaces shall be located within 50 feet of the main entrance to the building they serve. For outdoor parking areas, pedestrian walkways shall be provided between the bicycle parking spaces and the nearest building entrance.

8. Vehicle and Loading Access

a. Vehicle openings of buildings shall be set back a minimum of 20 feet from the property line or planned right-of-way line that the opening faces.
b. Loading docks shall be located where trucks can head in and head out of the loading dock. Loading docks shall be designed so that all maneuvering, loading, and unloading takes place off-street.

9. Excavation

a. All excavation will be per Municipal Code.

H. Definitions

AGRICULTURAL SUPPORT SERVICES. A establishment directly related to agriculture and intended to facilitate the production, marketing and distribution of agricultural products including retail and service establishments. Does not include farm-based business.

BANK, RETAIL. A financial institution such as a bank, credit agency, or lending institution that serves walk-in customers. Does not include check cashing stores, which are considered a "moderate-impact personal service."

BUSINESS SUPPORT SERVICE. An establishment that provides services that are necessary to other businesses, such as blueprinting, computer rental and repair, copying, mailing and mailbox services, messenger services, and temporary employment.

CAR WASH. A permanent, self-service or full-service establishment that provides facilities for washing vehicles with no more than two axles.

CELL TOWER. A wireless transmission and reception facility for a telephone and/or data network. Includes all associated antennas, supporting structures, enclosures or cabinets housing associated equipment, cables, and other accessory development.

EQUIPMENT SALES AND RENTAL. An establishment that sells or rents large construction equipment, such as bulldozers, ditch diggers, tractors, industrial generators, water tankers, or similar items.

FERTILIZER MANUFACTURING. A retail establishment directly related to the manufacture and distribution of fertilizer. Fertilizer product could be plant- or animal-derived agricultural growth-inducing products such as compost teas and guano, or manufactured (synthetic) fertilizers or pesticides (including herbicides, insecticides and fungicides), or other plant growth regulators.

FOOD AND BEVERAGE SALES. A retail establishment in which the majority of the floor area open to the public is occupied by food products or non-alcoholic beverages that are packaged for consumption away from the store. Includes convenience markets that sell a range of merchandise, including household items, newspapers and magazines, incidental to food and beverage sales. Does not include the sale of alcoholic beverages, which is not permitted.

FOOD TRUCK. A retail establishment located in a vehicle that prepares and sells food; also referred to as a mobile kitchen, mobile canteen, or catering truck. The majority of the square footage of vehicle is occupied by food preparation equipment and space to operate equipment, food products or non-alcoholic beverages that are prepared and packaged for consumption away from the vehicle. Does not include the sale of alcoholic beverages, which is not permitted. Trucks are limited to 2-hours on site per day. Vehicle-mounted generators are allowed. The only associated parking is for the food truck vehicle itself which is limited to available on-site parking; no parking is associated with food trucks as customers are intended to be employees within walking distance of the food truck. Trucks will need to have a business license with the City of Riverbank.

FOOD TRUCK PLAZA. An area set aside for multiple food trucks to gather on a temporary basis. Electrical hook-up and seatting may or may not be provided. Plaza use is limited to no more than five food trucks at a time between the hours of 10:00 am to 2:00 p.m. on non-holiday weekdays; food trucks are not allowed during other hours or in higher numbers unless by written permission from the Community Development Director.

FREIGHT TERMINAL. A rail facility used for the loading and unloading of freight from rail cars. A freight terminal may also include a "team track" facility for transferring freight from rail cars to trucks.

GAS AND SERVICE STATIONS. An establishment used primarily for the retail sale and dispensing of motor fuels, lubricants, and motor vehicle accessories, and the rendering of services and minor repairs to vehicles, not including painting, body work or fender work. A gas station may include "food and beverage sales" and a car wash as accessory uses.

GENERAL RETAIL. See "Retail, general."

GREEN ENERGY PLANT. A facility that uses renewable materials to produce electrical power. "Renewable materials" may include waste material, such as manure and grain stubble, from normal agricultural operations. "Renewable materials" shall not include waste material from non-agricultural uses, or any coal or petroleum product.

HEALTH/FITNESS FACILITY. A fitness center, gymnasium, or health and athletic club, which may include any of the following: free weights; a swimming area, sauna, spa or hot tub facilities; indoor tennis, handball, racquetball, and other indoor sport activities. Does not include archery or shooting ranges, which are not permitted.

MAINTENANCE AND REPAIR SERVICE. An establishment that provides off-site maintenance or repair services at a client's premises, including heating, ventilation and air conditioning (HVAC) repair; heavy equipment and appliance repair; janitorial services; pest control; and plumbing. Includes services for both commercial and domestic purposes. These services are considered an accessory use when they are offered as part of a retail establishment that sells the products being maintained or repaired.

MANUFACTURING AND PROCESSING. The conversion of raw materials or assembly of parts into new products that are primarily sold off-site. Also includes storage and distribution of the goods that are manufactured and processed.

MANUFACTURING AND PROCESSING—GENERAL. A facility for manufacturing and processing activities where the scale of operations is greater than "manufacturing and processing—light," but where impacts on surrounding land uses can customarily be mitigated to acceptable levels. Includes clay products manufacturing; metal fabrication and machine welding shops; stone product assembly and fabrication; and wood assembly and woodworking.

MANUFACTURING AND PROCESSING—HEAVY. A facility for manufacturing and processing activities that may need to be significantly isolated from surrounding land uses through setbacks, screening, or other methods in order to avoid unacceptable impacts on its surroundings. Includes heavy machinery manufacturing; large-scale metal coating; large-scale metal pressing and extruding; and other uses that generate significant amounts of air emissions, noise, odors, vibration, or similar impacts.

MANUFACTURING AND PROCESSING—LIGHT. A facility for manufacturing and processing activities that are unlikely to cause impacts on surrounding uses. Includes the following:

1. Artisanal and hand-craft manufacturing. Includes establishments that manufacture artisanal goods or other durable consumer goods by hand or on a small scale, including ceramics and pottery, jewelry, small glass and metal art and craft products, sporting and athletic goods, taxidermy, and toys.

2. Clothing and fabric products. Includes establishments that produce clothing, draperies, textiles, and other products related to the fabrication and assembly of cloth.

3. Electronics and appliance manufacturing. Includes establishments that assemble small-scale electrically powered equipment and fabricate small parts for this equipment, including the assembly of computers, medical devices and small appliances.

4. Food and beverage products. Includes establishments that produce or process foods and beverages for human consumption and primarily for wholesale or distribution purposes, including wholesale bakeries, breweries, butcher shops, candy manufacturing, catering services separate from stores or restaurants, coffee roasting, dairy products manufacturing, frozen food locker rental, and ice production.

5. Photo/film processing lab. Includes establishments that use chemical processes to develop photographic negative film or produce transparencies or prints in large volumes for professional and commercial use. Does not include small-scale processing equipment as an accessory use for a retail business.

6. Printing and publishing. Includes establishments that assemble or produce printed copies by use of letterpress, lithography, screen press, or xerographic copying. Does not include engravers, newspaper presses, offset presses and similar types of presses, which are considered "manufacturing and processing—general." Does not include consumer-oriented copy shops, which are considered "business support services."

MEDICAL CLINIC OR LAB. A facility that provides medical, dental, mental health, surgical and other personal health services for outpatients on a walk-in basis, including urgent care facilities, as well as medical laboratories that perform X-rays and conduct testing of specimens from walk-in patients. Does not include hospitals or other facilities that provide more intensive emergency or inpatient care.

MONUMENT SIGN. A detached sign that is placed on the ground on a foundation or load-bearing surface and is not supported by poles, braces or similar structures.

NATURAL GAS FUEL STATION. An establishment used primarily for the retail sale and dispensing of natural gas. Does not include service station, car wash, convenience markets, painting or other body work, or good and beverage sales.

OFFICE. A place of employment occupied by businesses that provide professional services. Includes accountants, architects, call centers, engineers, graphic designers, insurance agents, lawyers, photographers, and real estate agents. Does not include any facility providing medical care or engaging in the care or sales of animals. Does not include any separately defined use, including "personal services" and "retail banks."

OUTDOOR STORAGE. The keeping of any materials, including parts and finished products, outside of an enclosed building. "Outdoor storage" shall include the storage of company-operated vehicles other than passenger vehicles.

PERSONAL SERVICES. An establishment other than a "professional office" that provides services to individuals as a primary use, and that may sell products related to these services as an accessory use.

PERSONAL SERVICES—LOW IMPACT. A personal services establishment that tends to create minimal adverse impacts for its surroundings, including but not limited to barber shops and beauty salons, clothing rental, dry cleaning services with no on-site dry-cleaning equipment, home electronics repair, laundromats, and massage salons and spas. Does not include adult entertainment businesses, which are not permitted.

PERSONAL SERVICES—MODERATE IMPACT. A personal services establishment that may tend to attract criminal activity or reduce property values when found near similar establishments, and that may need to be dispersed in order to reduce these potential negative impacts. Includes check-cashing stores, hookah bars, pawnshops, psychics, and tattoo or body piercing parlors.

PUBLIC OR QUASI-PUBLIC FACILITY. Any facility owned and operated by the City, county, State or federal government, or by a public agency, regardless of the use. Any use that is listed as an allowed use for a given area may be provided as a public or quasi-public facility, even if the area does not list "public or quasi-public facility" as an allowed use. Additional uses may include stormdrain ponds, open space, public plazas, athletic fields, trails and walking paths, and dog parks; does not include playgrounds and play equipment.

PUBLIC UTILITIES—MAJOR. Any large-scale facility or equipment that is part of a public utility system, including electrical substations and switching stations, natural gas regulating and distribution facilities, public water system wells, and treatment plants.

PUBLIC UTILITIES—MINOR. Any small-scale facility or equipment used for the local distribution of public utilities, including transmission points, junction boxes and vaults, and other small structures.

RECYCLING FACILITY—LARGE. An establishment where bulk quantities of recyclable materials, including metal, paper, plastic, and oil, are collected or processed.

RECYCLING FACILITY—SMALL. A center for the collection of recyclable materials. Does not include storage containers located on the premises of a commercial or manufacturing use and used solely for the recycling of material generated by that business or manufacturer. Does not include "reverse vending machines."

RESEARCH LABORATORY. A facility for scientific research, including pharmaceutical, chemical, and biotechnology research, or the design, development and testing of electrical, electronic, magnetic, optical, computer, or telecommunications components.

RESTAURANT OR CAFÉ—FULL SERVICE. An establishment that prepares and serves food or beverages for immediate consumption, primarily on the premises; where food is prepared after a customer places an order; where table service is provided; and where payment is required after consumption. Does not include "food and beverage sales" establishments that include a restaurant as an accessory use.

RESTAURANT OR CAFÉ—QUICK SERVICE. An establishment that prepares and serves food or beverages for immediate consumption, either on or off the premises; where food may be prepared before a customer places an order; where limited or no table service is provided; and where payment is required prior to consumption. Does not include "food and beverage sales" establishments that include a restaurant or café as an accessory use.

RETAIL, GENERAL. A retail establishment that sells a variety of merchandise and is not otherwise identified in this chapter as a unique retail use, including antique stores, appliance and electronics stores, beauty supply stores, bicycle stores with incidental repair, bookstores, camera shops with incidental developing, drugstores, department stores, dressmaking shops, florists, hardware stores, picture frame shops, retail bakeries, upholstery shops, and any use of like kind or character.

REVERSE VENDING MACHINE. An automatic mechanical device that accepts one or more types of empty beverage containers, including aluminum cans, glass containers, and plastic bottles, and issues a cash refund or a redeemable credit slip with a value not less than the container's redemption value as determined by the State.

REVERSE VENDING MACHINE—BULK. A reverse vending machine that occupies more than 50 square feet, is designed to accept more than one container at a time, and will pay by weight instead of by container.

REVERSE VENDING MACHINE—SMALL. A reverse vending machine that occupies 50 square feet or less, is designed to accept only one container at a time, and will pay only by container

SECONDHAND STORE. A retail store that primarily engages in the buying and selling of used products for general consumer use, including appliances, business equipment, clothing, furniture and household goods, jewelry, motors, musical instruments, tools, or any similar secondhand items. Does not include bookstores or antique stores, which are considered "general retail," or used vehicle sales, which are not permitted.

SHOPPING CENTER. A primarily retail-oriented commercial site with at least three separate retail, sales, service, or restaurant tenants that share common on-site pedestrian and parking facilities.

TEMPORARY USE. A short-term activity that may or may not meet the normal development or use standards of the applicable zoning district, but that occurs for a limited period of time and does not permanently alter the character or physical facilities of a property.

TRADE OR VOCATIONAL SCHOOL—PRIVATE. A private school that primarily provides specialized education or training for a particular profession or trade.

TRADE OR VOCATIONAL SCHOOL—PUBLIC. A school that is operated under the authority of a public school board or district, and that primarily provides specialized education or training for a particular profession or trade.

TRUCK WASH. A permanent, self-service or full-service establishment that provides facilities for washing vehicles with three or more axles.

VEHICLE SERVICE OR REPAIR. An establishment that provides any repair, alteration, servicing, restoration, or finishing of any vehicle as a primary use, including but not limited to body repair, collision repair, muffler and radiator shops, oil change shops, painting, tire and battery sales and installation, and towing.

WAREHOUSING, WHOLESALING, AND DISTRIBUTION. The provision of facilities used primarily for storing, selling, or distributing goods to retailers, contractors, commercial purchasers or other wholesalers, or to the branch or local offices of a company or organization.

CHAPTER 6:

CIRCULATION

This chapter discusses circulation and transportation improvements recommended within the Specific Plan Area for vehicles, pedestrians, bicycles, rail, and transit systems. Parking recommendations are also provided.


RIVERBANK
INDUSTRIAL
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A. Vehicular Roadway and Site Access Improvements

This section discusses recommended roadway improvements for the roads bordering the RAAP site and internal roads in the North End Cap area. This section also discusses driveway improvements that will be required as development occurs.

The North County Corridor Project (SR-99 to SR-120) is a planned east-west road that would improve regional network circulation, relieve existing traffic congestion, reduce traffic delay, and accommodate future traffic. It is anticipated that the facility would be a multi-lane, access-controlled expressway/freeway, with interchanges, at-grade intersections, grade-separated railroad crossings, irrigation district crossings, frontage roads, and local street alignments[1]. Depending on the build-out of the RAAP and the timing and ultimate design of the North County Corridor Project, some of the off-site improvements may no longer be needed. The EIR provides additional information on off-site roadway intersections and level of service issues.

1. Claus Road and Claribel Road

Claus and Claribel Roads are designated in the City of Riverbank General Plan as four + lane arterial roadways. As development occurs on the RAAP site, these roadways will be widened to their ultimate width, and will include sidewalks, transit, and bicycle facilities. Pedestrian amenities will be attractive and distinctive, in keeping with the City's Community and Character Design Element. Specific design of these amenities and the design palette will be developed in collaboration with the developer, LRA, and the City with the widening of Claus and Claribel Roads. Pedestrian environment improvements will strive to strengthen the identity of Riverbank and improve the streetscape's aesthetic. The street cross-section will be based on Table CIRC-2 in the Riverbank General Plan.

2. Internal Roadways

The Project site is divided into three development areas: the North End Cap, the Existing Industrial Area, and the South End Cap. No internal connections are planned between these three areas due to existing uses and security concerns. However, emergency access should be provided between the three portions of the site. A conceptual publicly-accessible roadway system for the North End Cap is shown in Figure 6-1.

3. Driveways and Site Entry

Specific Plan driveways should be designed to accommodate the turning movements of large trucks. Vehicular access points, as shown on Figure 6-2, are proposed to be improved as follows.

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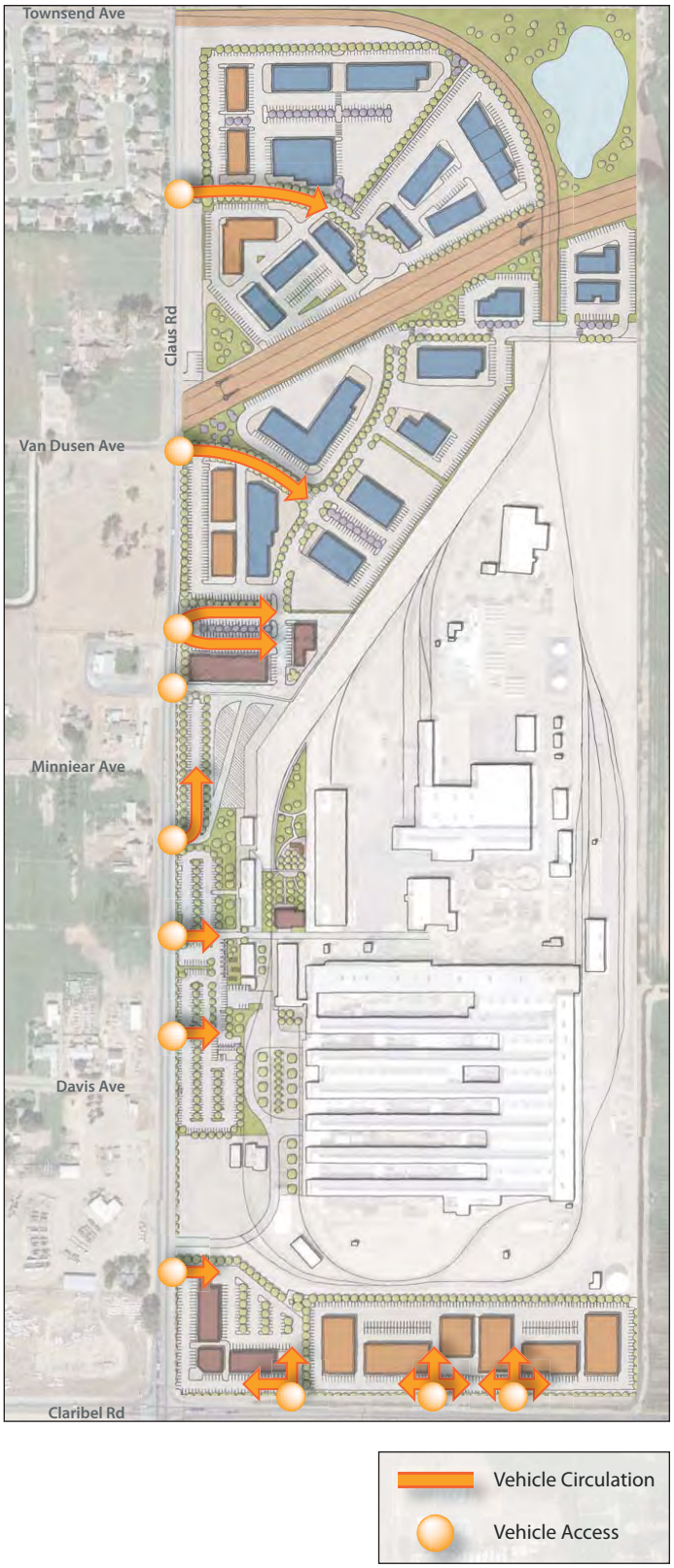
[1] *Description information based on http://www.dot.ca.gov/dist10/environmental/projects/ncc99to120/index.html accessed February 1, 2012.*

Figure 6-1 Vehicle Access and Circulation



a. North End Cap

Up to four new driveways may be constructed on Claus Road to provide access to the North End Cap portion of the site. Since details of future development are unknown at this time, the recommendations below are preliminary. As development projects occur at the RAAP site, more detailed analysis of the development proposals should be conducted to determine the specific sizing and traffic control of driveways serving the site.

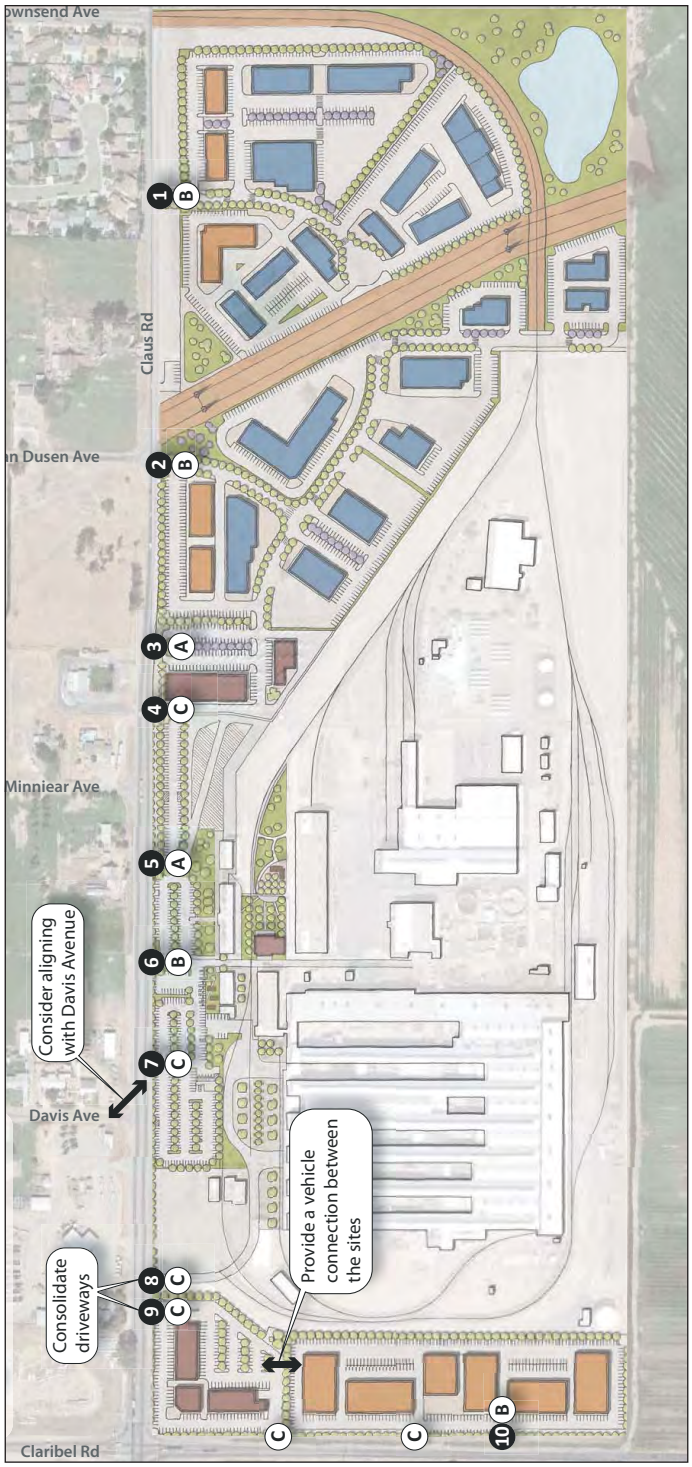
» **Claus Road/Northern Driveway 1.** This is the northernmost site driveway, located approximately 600 feet south of Townsend Avenue and 700 feet north of Van Dusen Avenue. Preliminary analyses indicate that this driveway would operate acceptably as a full-access side-street stop-control intersection. Approximately 100 feet of throat depth should be provided, with separate left- and right-turn lanes for vehicles exiting the site. The curb radii should accommodate the turning movements of large trucks that are expected access the buildings in this area. A southbound left-turn lane on Claus Road into the site should also be constructed.

» **Claus Road/Van Dusen Avenue/ Northern Driveway 2.** This driveway is proposed to align with Van Dusen Avenue to create a four-way intersection, and would primarily serve new industrial and R&D uses. Although a signal is not warranted in the existing condition, this intersection should ultimately be signalized and provide separate left and right-turn lanes for vehicles exiting the site, with appropriate curb radii to accommodate trucks. A southbound left-turn lane on Claus Road into the site should also be constructed.

» **Claus Road/Northern Driveway 3 (Retail Driveway).** This driveway is proposed to serve the northern retail parcel and would be located between the Van Dusen Avenue and Minniear Avenue intersections on Claus Road – approximately 500 feet from each intersection. While this intersection would operate acceptably as an unsignalized full-access intersection in the near-term, providing full access once Claus Road is widened to its ultimate configuration may not be desirable and the intersection may be restricted to right-in/right-out operations.

» **Claus Road/Northern Driveway 4.** A secondary access point approximately 150 feet south of the retail driveway (Driveway 3) is also proposed to serve the loading areas. This driveway should be restricted to right-in/right-out operation when Claus Road is widened to its ultimate width.

Figure 6-2 Site Access Considerations



b. Existing Industrial Area

Four driveway connections currently serve the Existing Industrial Area from Claus Road. No access changes to this area are proposed. Each location is discussed below.

» **Claus Road/Weigh Station Driveway 5.** This driveway is located north of the main entrance. It serves the weigh station and provides truck access to the Existing Industrial Area. Full access should be maintained at this driveway to permit truck access to the weigh station. As it is located between two intersections that would be signalized in the future, it is expected that sufficient gaps in traffic would be provided to allow adequate access.

» **Claus Road/RAAP Main Entrance 6.** This driveway currently serves as the main entrance to the site, and would provide access to a large parking lot for the existing site uses under the RAAP Specific Plan. This intersection should be signalized as part of the project. Modifications to on-site circulation may be necessary to provide adequate vehicle storage at the driveway.

» **Claus Road/Off-Set Davis Avenue Driveway7.** This is an existing driveway to the site located between the Main Entrance and Davis Avenue, which is currently not in use. It is recommended that the ultimate driveway location be aligned with Davis Avenue. The resulting intersection could operate acceptably with side-street stop-controlled full access, but could also be signalized if future needs warrant. If the ultimate driveway is off-set from Davis Avenue, it may need to be restricted to right-in/right-out operation as Claus Road is widened to its ultimate width and traffic increases along the corridor.

» **Claus Road/Southern Existing Driveway 8.** This driveway is currently closed with a barricade to prevent access. However, it is possible that in the future this driveway could be used to access the southern portion of the Existing Industrial Area. Should this driveway be re-opened, it would be located in close proximity to a driveway serving the Southern End Cap (Driveway 9). Given the proximity to the adjacent driveway and the Claus Road/Claribel Road intersection (approximately 400 feet), this driveway should be restricted to right-in/right-out access only and/or consolidated to provide a single access point with Driveway 9. If these driveways are consolidated, measures should be taken to ensure safety and security is prioritized and conflicts are minimized between vehicles accessing the Existing Industrial Area and those accessing the Claus/Claribel retail uses.

c. South End Cap

Access to the South End Cap would be provided from both Claus Road and Claribel Road, as discussed below.

» **Claus Road/Southern Project Driveway 9.** A driveway may be provided on the northern-most portion of the South End Cap, in close proximity to Driveway 8. Given the driveway spacing and proximity to the Claus Road/Claribel Road intersection (approximately 400 feet), these driveways may need to be restricted to right-in/right-out access only, or consolidated to provide a single access point.

» **Claribel Road/Project Driveway(s).** The potential to provide several site access points from Claribel Road is proposed as part of the Specific Plan. It is recommended that the eastern-most driveway on Claribel be designed as a full access driveway with provisions for future signalization. The resulting driveway would be approximately 1/4-mile east of the Claus Road intersection. The remaining driveways should be designed to provide right-in/right-out access to Claribel Road.

4. Traffic Calming Features

The internal roadways and intersections should be designed for slow speeds to enhance the pedestrian environment and promote safety. Potential traffic calming features include:

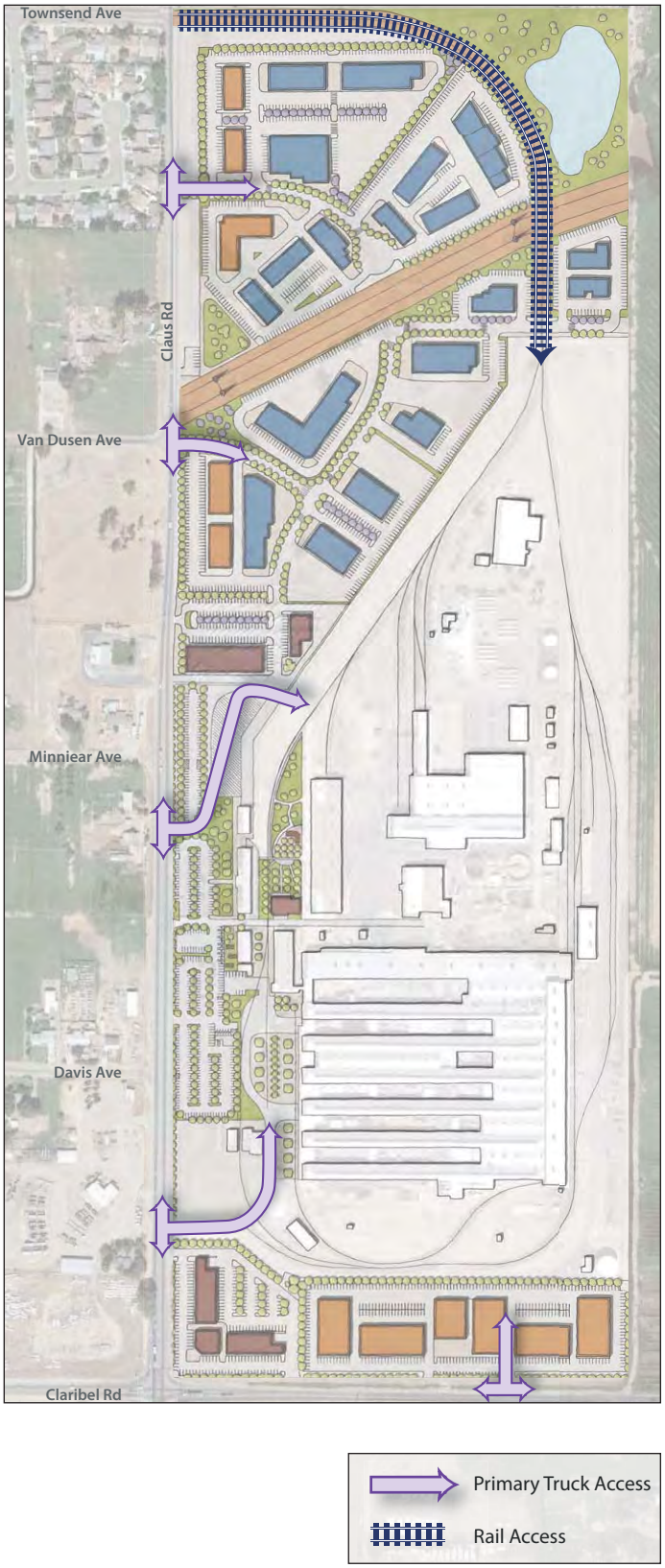
» Curved roadway alignments and short blocks (North End Cap).
» Traffic control at primary internal intersections (all-way stops).
» Curb extensions at intersections.
» High-visibility crosswalks.

Speed humps, while not currently recommended due to the potential for truck traffic through the site, could be considered should speeds through the site become a problem.

5. Emergency Vehicle Access

Numerous driveways serving the various areas of the site would provide emergency vehicle access. Internal emergency vehicle connections will be provided between the three areas of the site.

Figure 6-3 Freight Access



B. Freight Rail and Truck Access

This section describes the rail and truck access proposed for the RAAP site. Figure 6-3 shows recommended rail and truck access routes.

1. Rail Access

A rail line surrounded by a 50-foot easement enters the RAAP site at its northwest corner, near Townsend Avenue. The rail, which connects to the Burlington Northern Sante Fe rail line, runs across the undeveloped areas in the north and crosses both the Hetch Hetchy Aqueduct and the Oakdale Irrigation District canal. Ultimately, the rail enters the existing industrial areas, splits and serves many of the existing buildings. Rail access is not expected to change as part of Specific Plan development.

A new internal east-west roadway is proposed over the existing rail tracks. Although a limited number of trains per day are expected to use this crossing, appropriate safety devices, including pedestrian safety devices, will be installed at the crossing, based on consultation with the Public Utilities Commission (PUC).

2. Truck Access

a. Internal Access

Internal truck routes from the public roadway to loading docks of each industrial building will be developed with the final site plan to ensure adequate circulation to each individual loading dock. Loading docks will also be provided for the retail portions of the project.

As described in Chapter Three, Vision and Concepts, truck access is proposed to be provided on the west side of the RAAP site and could be designed as is detailed in Figure 3-10b and 3-10c.

C. Bicycle Circulation

Providing for bicycle access is a priority for this Specific Plan. Bicycle facilities and amenities should be included along with new development in the Specific Plan Area, and the roads that border the site as described below.

1. Bike Trails and Bicycle Lanes

Planned bicycle circulation within and to the site is depicted on Figure 6-4. Bicycle facilities are proposed on Claus and Claribel Roads. Bicycle routes will also be provided on the site's main internal roadways.

2. Bicycle Parking

Short-term and long-term bicycle parking will be provided within the site to serve employees as well as retail patrons. Public bicycle parking may also be appropriate within the public rights-of-way in the North End Cap, particularly if a park is developed on the site.

3. Bicycle Programs

Additionally, given the size of the site and the potential for complementary uses, a bike sharing program should be investigated to provide circulation between areas.

Figure 6-4 Primary Bicycle Circulation

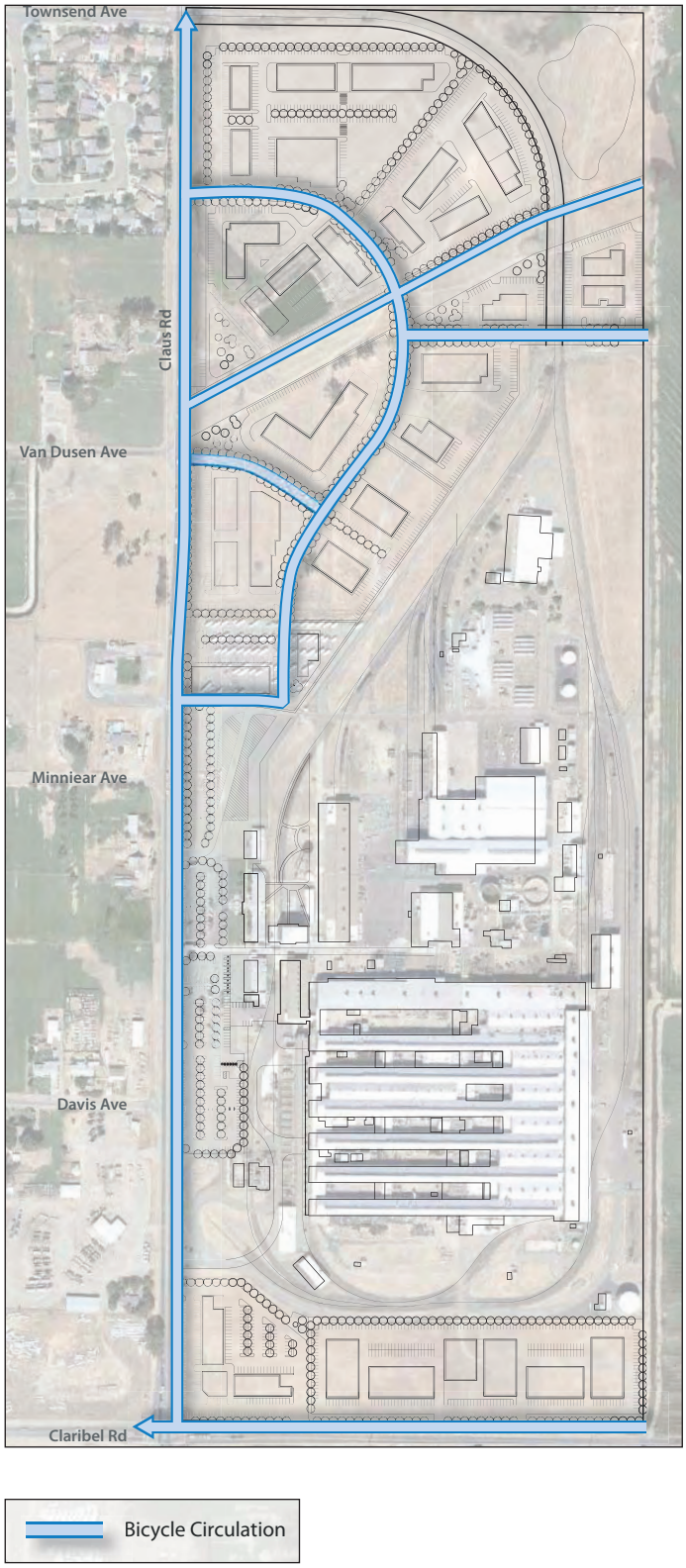
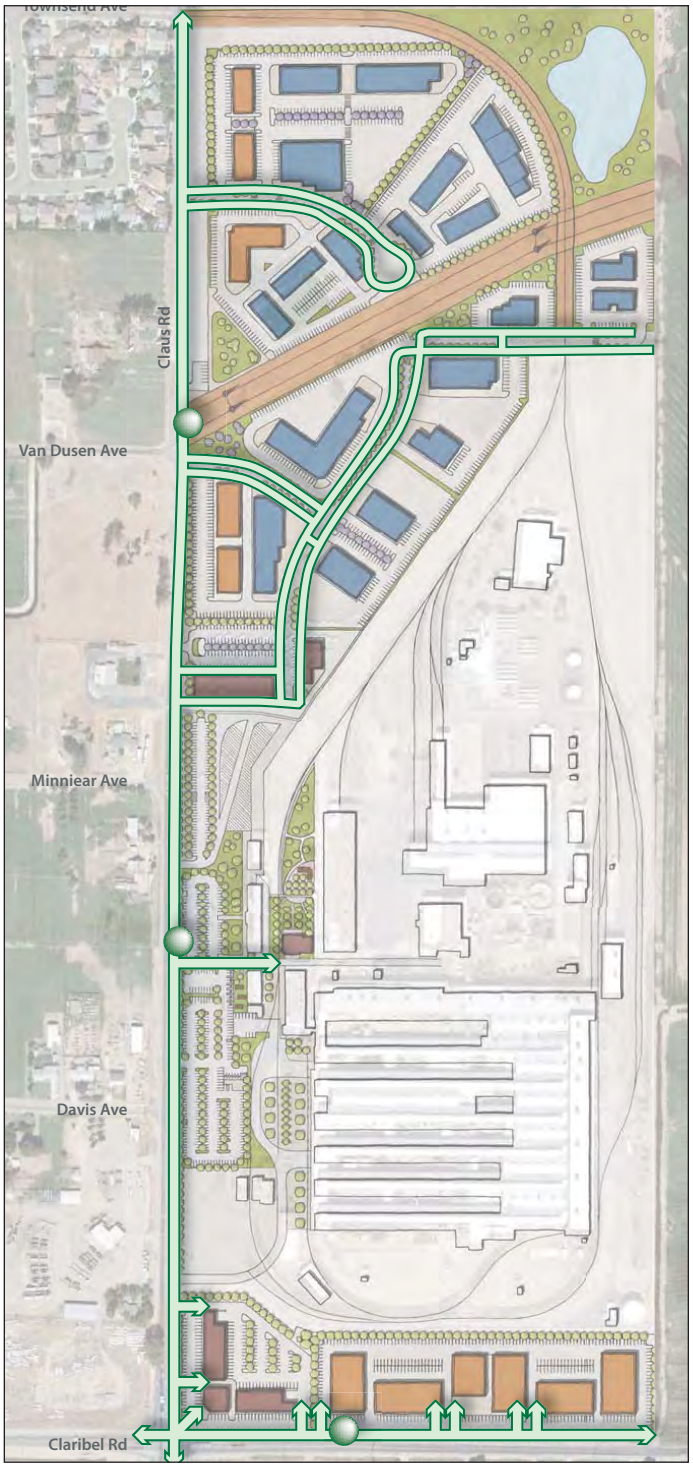


Figure 6-5 Primary Pedestrian Circulation and Potential Transit Stop Locations



D. Pedestrians

Figure 6-5 shows the primary pedestrian circulation system proposed for the site.

1. Sidewalks

Sidewalks will be constructed along the project frontage on Claribel and Claus Roads as these roadways are widened to their ultimate width. It is recommended that sidewalks be provided at a minimum width of 6 feet. Sidewalks should also be provided along all internal roads proposed within the North End Cap area. Sidewalks will encourage employees to walk within the North End Cap to other businesses or to the public amenities anticipated to be provided on the site.

2. Crosswalks

Crosswalks should be provided at all intersections and potentially at mid-block locations crossing the proposed roadways in the North End Cap area. Crosswalks should be clearly marked with striping, and potentially special textured paving. For mid-block crossings, it may be appropriate to include special warning signals for vehicular traffic, such as plastic warning signs with lighting.

3. Bulbouts

As appropriate and with consideration given to the needs of truck traffic, bulbouts and curb extensions are recommended at intersections in the North End Cap area. Bulbouts decrease the crossing distances for pedestrians and also help to slow traffic.

E. Transit

To accommodate transit service to the site, multiple transit stops should be designated along Claribel and Claus Road. The ultimate locations should be based on consultation with ROTA and StaRT. Although regular transit service is not currently provided to the site, it is expected as the City grows and continues to implement the General Plan goals of increasing the availability and use of transit (Goal CIRC-3) in the City of Riverbank, regular transit service would be provided to the site. Potential transit stop locations have been identified on Figure 6-5, which serve the three areas of the site. Pedestrian connections should be provided connecting the transit stop to the main pedestrian pathways and building entrances. Attractive and distinctive transit amenities should be planned for, including shelters, benches, plazas, bicycle parking, and other schedule information in keeping with the City's Community and Character Design Element.

F. Parking

Parking for the site would be provided in individual parking lots adjacent to each building for RAAP-1 and RAAP-R (3?); RAAP-2 will have shared parking. As proposals are developed for each area, a parking assessment should be conducted to ensure that the appropriate amount of parking is provided to accommodate the expected demand. If appropriate, shared parking should be explored between tenants on the RAAP site to decrease the overall number of parking spaces that would need to be provided. With shared parking, multiple tenants or businesses would share a common pool of parking. This is particularly effective when parking for individual businesses is most needed at different time periods during the work day or night.

Industrial uses can vary significantly in the amount of space and number of employees required. Industrial parking ratios should be flexible to respond to these variables in operational requirements.

G. Transportation Demand Management

Transportation Demand Management refers to strategies to reduce single-occupant vehicle use for trips to/from the site, which in turn reduces traffic congestion and parking demand. As the project is developed, a transportation demand management plan should be prepared to maximize commute alternatives for employees of the site, reduce single occupant vehicle trips, and reduce parking demand. Strategies to consider include:

- » Carpool and vanpool incentives, such as preferential parking.
- » Commuter Check benefit, allowing employees to use pre-tax dollars to purchase discounted transit passes (once transit service is provided to the site).
- » Flexible work schedules.
- » Guaranteed Ride Home.
- » Bicycle parking and showers/lockers.

CHAPTER 7:

INFRASTRUCTURE

The chapter outlines the infrastructure requirements necessary to implement the RAAP Specific Plan.

A. Water

The Riverbank Army Ammunition Plant (RAAP) operates a water system that serves the entire facility, inclusive of 26 service connections at points throughout the site, and obtains its water from three active wells located on the property. There are a total of six wells on the site, identified as Wells 1 through 6. Currently, only Wells 1, 5, and 6 are operational with Well 1 being a standby well. The remaining three wells are in the process of being properly abandoned pursuant to regulations of the California Department of Public Health.

Information for the three active wells is shown in Table 7-1 below:

Table 7-1 Potable Water Well Information

SOURCE	CAPACITY	EQUIPMENT	DEPTH	COMMENTS
Well No. 5	1100 gpm	75 hp DWT	600 feet	Propane-powered angle drive backup power
Well No. 6	1500 gpm	125 hp DWT	600 feet	
Well No. 1	765 gpm	50 hp DWT	300 feet	Standby

Notes: gpm = gallons per minute
hp = horsepower
DWT = deep well turbine

Treatment of the water supply is accomplished at the well head by gas chlorination. Given existing and anticipated demands based on current occupancy and facility size, it is expected that the wells have the capacity for at least 20 to 40 years.

The RAAP potable water distribution system is original to the site and therefore varies from 60 to 80 years old. The potable water distribution system has one existing water storage tank and has a 100,000 gallon capacity but is presently operated over a range of 0 to 40,000 gallons; seismic analysis led to the tank being restricted to 40,000 gallons. The low waterline on the tank is 106 feet above grade, resulting in a static pressure of 46 psi at grade. At the maximum water level, the static pressure is 50 psi at grade. The two primary wells are used to supply the potable distribution system via this elevated tank.

For this analysis, it is assumed that water usage at the RAAP is a constant over an 8-hour period with both pumps operated continuously and 40,000 gallons of storage capacity. During the 8-hour usage period, the flow to the distribution system would be 2,600 gpm from the wells and 83 gpm from storage (40,000 gallons/8 hours), so the maximum potential usage of the existing system is 2,683 gpm.

The maximum usage rate could be increased by adding storage capacity, so that the tank or tanks would completely fill in the 16-hour non-use period and then release during the 8-hour usage period. Operating both wells continuously, with 2.5 million gallons of storage capacity, the maximum usage rate would be 7,800 gpm. Operation of the wells, however, would typically be alternating. If each well was operated for 12 hours per day, the resulting average flow rate would be 1,300 gpm. With the required storage capacity of 1.25 million gallons, the maximum usage rate would be 3,900 gpm over the 8-hour period.

The existing water system will be used for RAAP-2, including the 1 million gallon non-potable water tank for fire flow purposes; this tank has a pressure of 120 psi. There are no plans for the current water system for RAAP-2 to be operated by the City's Public Works Division. It will continue to be operated by the LRA staff, consultants, or Master Developer. It is anticipated that this system will operate independent of the City's water system indefinitely.

RAAP-1 and RAAP-R will connect to the City's water system in Claus Road and, when extended, on Claribel Road. Such connection shall be according to the City's Water Master Plan.

B. Sanitary Sewer

The sanitary sewer presently conveys waste to the City of Riverbank. Prior to 1975, sanitary sewer waste was collected and treated on-site. The effluent and sewage beds remain intact, but were closed in 1975 when connection to the City's system was made.

RAAP-2's sanitary sewer system will continue operating as outlined below. The sanitary sewer collection system begins as a series of 6-inch pipes in the Production Area. These pipes drain to the north by gravity feed and become progressively larger as waste from Buildings 9, 10, 13, 16, 17, and the 120 area are added. Ultimately, one 12-inch diameter pipe conveys waste to the lift station north of Building 9 and across the railroad tracks from the propane storage area. From the lift station, waste is transferred by a 4-inch diameter force main before transitioning back to gravity flow and connecting to the City of Riverbank collection system. There is an additional lift station near the Industrial Wastewater Treatment Plant (IWTP). The total length of the gravity sanitary sewer system is approximately 6,078 linear feet.

The system is built mostly of reinforced concrete pipe with some small sections of cement asbestos and corrugated metal pipe. There are over 55 manholes and clean-out locations. Due to the age of the concrete pipe, there are many areas with vertical and/or horizontal pipe cracks. Based on a camera assessment performed during the week of September 20, 2009, many deficiencies were noted that will require correction. The main issues identified were: cracked or offset joints; horizontal or vertical cracking in the concrete pipe (the severity of the cracks range from minor superficial cracking to at least one section of collapsed pipe); low areas in pipes where waste is settling; one crown in the pipe where the pipe is actually raised.

While full-depth removal and replacement is likely not necessary, correction of these items can be accomplished by re-lining or slip-lining the pipe. This is an economical approach to the repair and will extend the life of the existing pipe network. All maintenance of the on-site sanitary sewer system will be handled by LRA staff or consultants and not City crews.

Construction of RAAP-1 and RAAP-R will be responsible for their own individual hook-ups to the City's sanitary sewer system. Extensions of the City's sanitary sewer system will be handled just like any other extension and service in the City. If a new development needs to have a City service extended to serve it, it must pay for such extension. If it is an improvement that is included in any System Development Fee, then a credit or future reimbursement may be available. Any such extensions in the street will be the City's responsibility with respect to maintenance and any lines on private property will be the property owner's responsibility to maintain. Such connection shall be according to the City's Sewer Master Plan.

The 2007 Sewer Collection System Master Plan that Nolte prepared for the City indicates that all wastewater from the General Plan area including new service areas should be designed to convey wastewater to the existing treatment plant. The RAAP site lies in the East Riverbank service area and includes Sewer Sheds 8 and 9. Sewer Shed 8 covers the RAAP site south of the Hetch Hetchy right-of-way and is recommended to flow west to the Crawford Road Pump Station. Sewer Shed 9 is intended to flow by gravity into the respective existing trunk lines; there is an existing 10" sewer trunk line running south along Claus Road, ending at Minniear Avenue.

C. Storm Drainage

Primary storm sewer collection is made in two phases. Storm water in the southeast quadrant flows to the large basin near tank 139 in the southeast corner of the site. From this pond, the water is pumped to the main line via a 6-inch vitrified clay pipe and connected to a 12-inch reinforced concrete pipe. Through the eastern edge of Production Area, the pipe increases in size from 12-inch to 24-inch before turning to the west and then running parallel to Building 7. An additional 12-inch pipe is located between the western edge of the Production Area and Building 13. This pipe is reinforced concrete and increases in size to 30-inches in diameter near Building 15. At this point, connection is also made with the area drains on the western edge of the site in the parking lot. Near Building 15, the pipe is 36-inches in diameter and continues to flow by gravity to the area near Gate 10 where a 600 gpm pump is located. The water then flows to an additional storm drain lift station before being stored in the storm drain reservoir.

Generally speaking, the storm system is operating properly with similar deficiencies to the sanitary sewer system noted during the inspection. The deficiencies include: cracked or offset joints, horizontal or vertical cracking in the concrete pipe, and low areas in pipes where waste is settling. Portions of the camera assessment were abandoned due to debris in the line.

The correction of these items can also be accomplished by re-lining or slip-lining the pipe. The manholes should also be repaired to ensure the lids seal properly to prevent inflow and infiltration of storm water during rain events. Low impact development and sustainable design approaches for storm water management should also be addressed for the site through additional study and design as specific development projects move forward. Appendix D: LID Stormwater Management for the Riverbank Army Ammunition Plant and Appendix E: Riverbank Army Ammunition Plant Parking Assessment Memorandum provide more specific details on and guidance for methods and specifications regarding low impact development stormwater management practices.

It is anticipated that the existing development will continue to provide storm drainage as currently exists. This is maintained by the LRA, not the City Public Works Division, and will continue with that form of maintenance. Should additional impervious surface be added to the RAAP-2 site, additional storm drainage will be the responsibility of the LRA or its successor. One of the options that has been discussed is moving and expanding the current northwest storm drainage pond to the northeast corner of the property. There is enough space there to provide an adequate storm drainage pond to serve both the RAAP-2 site and the RAAP-1 and RAAP-R sites, eventually. If such a move occurs and if the pond is

sized to serve property other than RAAP-2, maintenance responsibilities will have to be determined at that time. It may not be possible to mix the two storm water systems if an agreement between the LRA and the City Public Works Division cannot be worked out.

In the interim, RAAP-1 and RAAP-R will have to provide on-site storm drainage on each individual site. These systems shall be the responsibility of the individual property owners and will be sized as required during the permitting process and be in keeping with the City's Storm Drainage Master Plan.

Drainage along Claus and Claribel Roads will be addressed as part of the anticipated widening of the road; storm drainage for these roads will be handled by a bioswale system which is consistent with the City's LID standards.

D. Natural Gas

The main natural gas feed from Pacific Gas and Electric (PG&E) enters the site in the extreme southeast corner of the site. A 10-inch gas pipe runs along the eastern edge of the property boundary to a metering and mixing station near the northeast corner of Building 7. From this metering station, feeds are made to the Boiler House (Building 12), Propane Area, Building 7, and Building 120. Sizing of the pipes ranges from 2-inch to 10-inch diameter services.

Given the size of the existing pipe network and the relatively low demand for natural gas, no immediate upgrade is necessary. There are no significant pieces of equipment that have large natural gas demands. The primary natural gas demands are from small water heaters to serve restroom facilities and a boiler in Building 3. Since much of the piping is run above ground, upgrades, if necessary can be easily accomplished.

E. Electrical

The incoming power to the developed portion of the site (RAAP-2) is received from Hetch Hetchy at 115 kiloVolts (kV). Redundant service is provided at 115 kV from Line 3 PG&E and Line 8 Modesto Irrigation District (MID). There is a main 20 megavolt-amphere (MVA) substation transformer to step the voltage down to 13.8 kV for in plant distribution. A second main 5 MVA transformer was recently installed and is ready to put on line for stepping down the voltage to 13.8 kV. The new, smaller transformer will become the primary transformer now that electrical demand requirements are lower and the 20 MVA assumes the role of backup. This new smaller transformer was installed because the average site electrical demand has gone down significantly with Norris Industry's (NI) departure. The present average demand is approximately 2.125 MVA.

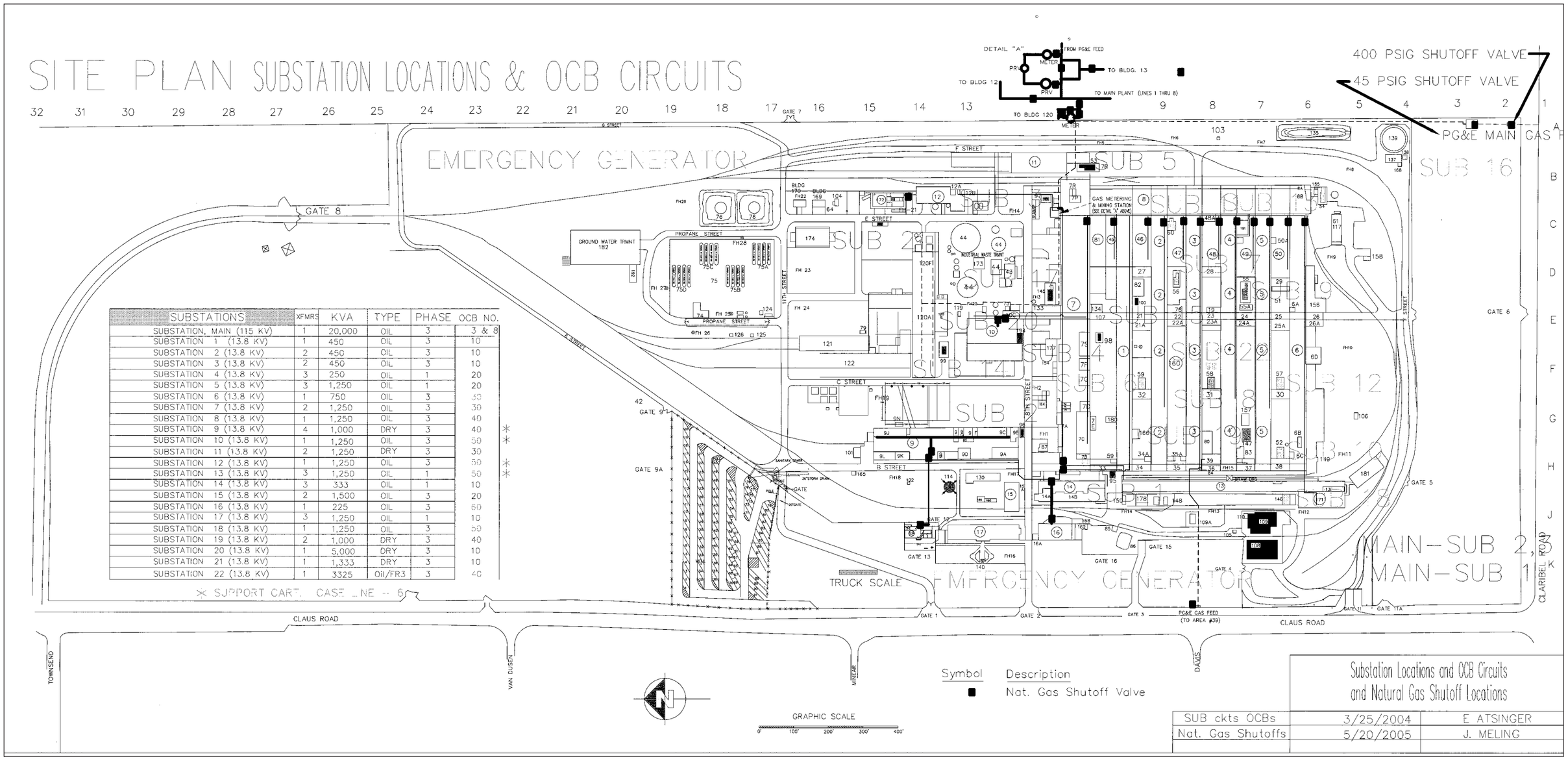
From the main substation, power is distributed around the facility at 13.8 KV via pole lines or cable supported from the buildings by racks anchored to the side of the buildings.

There are 22 substations that convert the voltage to a utilization voltage of 480 volts. The 13.8 kV service connections to most of these substations are accomplished with open lead sheath cables supported on insulators either from pole lines or buildings. The 480 volts service from the substations is mostly overhead and is supported with insulators between the switchgear and the buildings served; a majority of these cables are also lead sheath cables. Several of the new substations are fed at 13.8 kV with insulated high voltage cables in buried conduit. These substation secondary cables are also insulated and in buried conduit. Many of the larger buildings (Building 1 through 8) receive power from more than one substation. Substation locations are shown in Figure 7-1.

In general the electrical switchgear and circuit breakers have been well maintained and refurbished to include electronic trips unit. The substation transformers have been tested and the results indicated the transformers are in good condition. While the electrical equipment has been well maintained, most of the distribution equipment is more than 50 years old, well past its expected useful life. There are exceptions to this such as Substations 20, 21, and 22, which are new. Note that Substation 21 has not been put on-line because of equipment short circuit interrupting rating not being adequate. The older substation secondary distribution systems are 480 volt ungrounded Delta systems. Ungrounded systems were used in the past in industrial facilities with special continuity of production requirements. These facilities typically had well trained in-house operation and electrical maintenance personnel. Ungrounded systems are not recommended for commercial operations or for industrial operations where in-house qualified electricians are not employed. Ungrounded electrical distribution systems present electrical safety hazards not present in grounded systems. Trained electricians can find and correct these problems before someone can be injured.

As a general statement, it would be difficult to segregate the existing buildings electrically for power distribution or metering purposes without major changes to the existing equipment and systems. It is recommended that the electrical distribution systems (substation, feeders, motor control centers, and panelboards) be replaced as tenants are identified. The new systems should be designed to meet the requirements of the tenants and be flexible enough to be able, with only minor changes, to satisfy future tenants. The new system shall provide individual service disconnects and metering facilities. The upgraded electrical systems are required to meet the current National Electrical Code, OSHA, and all applicable local codes.

Figure 7-1 Substation Locations and OCB Circuits and Natural Gas Shutoff Locations



SUBSTATIONS	XFMRS	KVA	TYPE	PHASE	OCB NO.
SUBSTATION, MAIN (115 KV)	1	20,000	OIL	3	3 & 8
SUBSTATION 1 (13.8 KV)	1	450	OIL	3	10
SUBSTATION 2 (13.8 KV)	2	450	OIL	3	10
SUBSTATION 3 (13.8 KV)	2	450	OIL	3	10
SUBSTATION 4 (13.8 KV)	3	250	OIL	1	20
SUBSTATION 5 (13.8 KV)	3	1,250	OIL	1	20
SUBSTATION 6 (13.8 KV)	1	750	OIL	3	30
SUBSTATION 7 (13.8 KV)	2	1,250	OIL	3	30
SUBSTATION 8 (13.8 KV)	1	1,250	OIL	3	40
SUBSTATION 9 (13.8 KV)	4	1,000	DRY	3	40
SUBSTATION 10 (13.8 KV)	1	1,250	OIL	3	50
SUBSTATION 11 (13.8 KV)	2	1,250	DRY	3	30
SUBSTATION 12 (13.8 KV)	1	1,250	OIL	3	50
SUBSTATION 13 (13.8 KV)	3	1,250	OIL	1	50
SUBSTATION 14 (13.8 KV)	3	333	OIL	1	10
SUBSTATION 15 (13.8 KV)	2	1,500	OIL	3	20
SUBSTATION 16 (13.8 KV)	1	225	OIL	3	60
SUBSTATION 17 (13.8 KV)	3	1,250	OIL	1	10
SUBSTATION 18 (13.8 KV)	1	1,250	OIL	3	50
SUBSTATION 19 (13.8 KV)	2	1,000	DRY	3	40
SUBSTATION 20 (13.8 KV)	1	5,000	DRY	3	10
SUBSTATION 21 (13.8 KV)	1	1,333	DRY	3	10
SUBSTATION 22 (13.8 KV)	1	3325	Oil/FR3	3	40

Substation Locations and OCB Circuits and Natural Gas Shutoff Locations		
SUB ckts OCBs	3/25/2004	E ATSINGER
Nat. Gas Shutoffs	5/20/2005	J. MELING

The new substations should be pad mounted with primary and secondary services underground, similar to existing Substations 20 and 22. All existing lead sheath distribution cables installed along the sides of buildings should be removed and replaced with cables in conduit from the new substations. All new distribution systems at 480 volt and below shall be grounded systems. It is difficult to develop a cost for this work because the tenants and their requirements are not known. How the existing buildings will be subdivided is also unknown.

The existing main substation with the new 5 MVA transformer on-line has approximately 50% spare capacity, beyond the current site demand, for additional loads. The adequacy of this transformer must be addressed on a continual basis as new tenant requirements are established. The LRA will maintain the on-site electrical system for RAAP-2 while Hetch Hetchy will maintain their lines.

There is a possibility that the undeveloped properties could be served by Hetch Hetchy but this would require negotiations with Hetch Hetchy and the LRA at the time of the potential service. The difficulty is that the main substation is located on the RAAP-2 site. At present there is no intention for this site to provide electrical service outside the boundaries of RAAP-2.

Developers of the property should assume that they will have to deal with either MID or PG&E, both of which are available. This will be up to the future developers.

F. Communications

The phone and data connectivity network enters the RAAP-2 site near Building 17 and is distributed by both above ground and below ground conduit. The most recent drawing information is dated November 29, 1971. This drawing references 26-gauge wire that is distributed to a variety of terminal blocks through the site. The system is dated, but meets the current demands of the tenants and users due to the limited communication requirements associated with the operations. Fibre optic was installed in 2011. In the future, should a tenant require more extensive computer networks or communication services, upgrades may be required through the local providers.

Phone and data services will have to be provided by developers of RAAP-1 and RAAP-R as any other development within the City.

G. Roads, Grounds and Security

The developed site (RAAP-2) is a mixture of asphalt and concrete pavement and native vegetation. The primary parking area is on the western edge of the site and consists of approximately 180 parking spaces. The cross-section of the pavement section is unknown, but visual inspection of the parking lot confirmed that the asphalt is in fair condition with limited surface cracking that would indicate subgrade failure. Similarly, the paved areas interior to the site are in fair condition with limited restoration necessary. New sections of pavement were identified during the site walk around Building 11.

The general condition of the roads and grounds is fair and with regular maintenance, the present condition of the paved areas can be maintained. If regular maintenance is not accomplished in these areas, significant costs can be expected for full replacement.

Additional components of the site are the security features that present a benefit to the various tenants. The present configuration includes a chain-link fence that surrounds the perimeter, pan-tilt-zoom cameras for video assessment, and two manned entry points. The entry points are controlled by armed guards. With the relocation of the NI operations, the armed guards are no longer necessary. To continue to provide a level of security, it is recommended that the fence remain in place as well as the cameras for video assessment purposes. To augment the security system and control access to the site without providing armed guards, an access control system should be added at a minimum of two gates. Access to the site would therefore be granted by presenting a valid access card at a card reader at either of the entry portals. A system of issuing and controlling the access cards as well as escorting unbadged individuals would need to be established by the City of Riverbank.

There is no intent to expand the perimeter of the secure area to non-developed areas.

H. Rail

A Rail Condition Survey and Team Track Assessment were prepared which found that the tracks on the property require maintenance including the replacement of ties, ballast, and 112-pound rail. Other conclusions included that the diamond crossing should be removed near tracks 9 and 10 and that a team track is feasible, but will require significant investment.

The tracks are currently maintained by the Sierra Northern Railway Company who has a track use agreement with the LRA until March 31, 2015. This agreement may be renewed for up to 5 more years. The railroad tracks will be retained in the ownership of the LRA or its successors and shall consist of an easement at least 60 feet in width. Sierra Railway Company operates short-line rails that connect industrial areas to main rail lines as well as three scenic passenger rail routes (like the Sierra RR Dinner Train and the Skunk Train through the Redwoods. They also have a subdivision of their company that builds and repairs tracks so they are well-capable of meeting their responsibilities.

When new development occurs, developers may want to utilize this rail spur. In order to make that work, additional side spurs will be necessary. It will be the responsibility of the developer to negotiate with the LRA and Sierra Railway (or their successors) and to fund the construction of these side spurs.

CHAPTER 8:

IMPLEMENTATION

This chapter outlines the program by which the RAAP Specific Plan will be implemented. The intent is to ensure that implementation of the Specific Plan occurs in an orderly manner that is responsive to the needs of the City and its Local Redevelopment Authority (LRA).

A. Requirements for Adoption of the Specific Plan

In order for the Specific Plan to be adopted and the Environmental Impact Report certified, the following technical steps must be followed.

1. General Plan Amendments

Adoption of the Specific Plan requires minor amendments to the General Plan's Land Use and Circulation Elements, so that the land use designations and circulation in the General Plan are consistent with the Specific Plan. These amendments will be adopted concurrently with the Specific Plan.

2. Specific Plan Zone

Adoption of the Specific Plan requires an amendment to the City's Zoning Ordinance to apply the Specific Plan District to the RAAP site. In a Specific Plan district, the requirements of the associated Specific Plan take precedence over the Zoning Ordinance's city-wide requirements. This amendment will be adopted concurrently with the Specific Plan.

3. Certification of EIR

The City of Riverbank will certify the EIR for the RAAP Specific Plan at the same meeting as the Specific Plan is adopted but prior to such adoption The City's action to certify the EIR did not represent approval of the Specific Plan. Rather, it indicates that the EIR has been completed in compliance with the California Environmental Quality Act (CEQA) and that the EIR was reviewed by decision-makers and the public prior to approving the Specific Plan.

4. Mitigation Monitoring Program and CEQA Findings

Public Resources Code Section 21081.6 requires that a "reporting or monitoring program be designed to ensure compliance during project implementation." The adopted program applies to changes made to the project, or conditions of project approval, that are designed to mitigate or avoid significant effects on the environment. The monitoring program (MMP) provides a brief summary of the required mitigation for impacts attributable to the project, identifies the party responsible for monitoring the project's compliance with the mitigation measure, and identifies at what point or phase of the project the mitigation measure is to be completed. The City has prepared a mitigation monitoring program in conjunction with the preparation of the EIR for the Specific Plan. The EIR identified several environmental impacts that could be reduced to less than significant through implementation of the mitigation measures.

B. Anticipated Phasing

The Specific Plan Area will have two phases that will run independently of each other as described below. Although these areas may or may not proceed at the same time, they are treated separately in this section due to different types of infrastructure improvements required, and potentially different financing mechanisms to pay for that infrastructure, for each area. More detail about specific infrastructure improvements can be found in Chapter 7 and Section E below.

Existing Industrial: The existing industrial area, also called RAAP-2, has many structures that are occupied and will continue to be occupied. Some existing structures will be renovated or demolished, and new structures may be added. The LRA will continue to manage this area and will seek financing for all necessary improvements. This work can begin immediately or may be delayed for some years, depending on demand. Since all infrastructure currently exists for buildout of this area, there are no infrastructure constraints to fully develop the site.

All Other Property: This includes the North End Cap and the South End Cap. These properties will be sold to be divided into parcels and the parcels developed independently. Primary responsibility for making most of the future improvements will be borne by the property owners. Improvements will be guided by the development standards and guidelines included in this Plan, Riverbank's city-wide development policies and the Municipal Code. These improvements are further described in Section E below.

C. Funding Strategies for RAAP

It is incumbent on the City to pursue an array of funding sources and financing mechanisms to implement some of the larger public improvements included in this Plan. These mechanisms are complex and are tied to many factors outside the control of the City of Riverbank, including market and economic cycles, State and federal funding availability, etc. This precludes the ability to immediately establish a detailed timeline for development and related infrastructure improvements. Therefore, this implementation strategy focuses on identifying the range of potential mechanisms available for delivering the major improvements necessary to realize the core elements of the Plan's vision.

Implementation of the RAAP Specific Plan will need to deliver the infrastructure and other improvements necessary to support the Plan's goals and policies. Consideration will need to be given to the following:

» Some types of improvements will be completed through a single existing mechanism. For example, development standards establish minimum requirements for individual on-site open space, to be provided by each individual development.

» Some improvements may need to be funded by several different mechanisms. For example, while development standards require that developers provide basic infrastructure for new streets, additional enhancements such as public landscaping and street furniture may need to be funded through a community benefits program, an assessment district, the City's capital improvements, system development or impact fees.

» There may be some trade-offs involved in making implementation decisions. For example, some improvements will have the greatest impact if completed in the near term, and therefore take precedence over longer term improvements, which will be implemented as additional resources become available.

Following are possible financing mechanisms utilizing private development for RAAP Specific Plan improvements. The use of these mechanisms would be associated with RAAP-1 and RAAP-R as the mechanisms assume that property has been sold to a master developer or developers.

1. Development Agreements

The City may require a development agreement for any and all development projects proposed under the Specific Plan. The development agreement will stipulate how the proposed project will pay its fair share of the plan-area capital improvements and ensure that the proposed project will be served by adequate public infrastructure and services, among other issues identified in the Municipal Code.

2. Development Impact Fees

Impact fees are levied on new development to mitigate the effects of that development. The City has developed impact fees that mitigate the effects of new development. The City's System Development Fees meet the requirements of AB 1600.

Some public improvements that are called for in the Specific Plan are well suited to the collection of development impact fees. For example, proposed transportation improvements that benefit all residents of the City, not just the RAAP, can readily be financed through impact fees. It is anticipated that, in addition to off-site improvements, the traffic signals needed along Claus Road, as well as the widening of Claus adjacent to RAAP-2 are of City-wide benefit and are proposed for inclusion in the City's System Development Fees.

3. Developer-Funded Improvements

All improvements that are needed in order to serve the developing property will be paid for by the developer of that property. In some cases, the development of one or more parcels in the Specific Plan area may require the construction of offsite infrastructure improvements, the size of which may be larger than what is needed to serve just the proposed development. In such cases, if the City does not have the funds available to pay for the additional infrastructure capacity, the property owner or developer may agree, through a development agreement, to pay for the full cost of the offsite infrastructure improvement and to be repaid as additional development occurs. The development agreement would stipulate the terms of such repayment.

If the cost of infrastructure improvements is to be repaid to a property owner, developer, or other entity that paid the upfront cost, the City may prohibit other development under the Specific Plan until the project applicant has paid the required infrastructure cost repayment fee in accordance with the terms of the development agreement.

4. Assessment Districts

Assessment districts can finance the construction of public improvements on public property, public rights-of-way, and public easements. The public must pay for the portions of the improvements that provide general benefit to the public at large, but real property that receives a special benefit may be assessed for the costs, proportional to the level of benefit received.

Assessment districts are intended to finance construction of physical improvements. They cannot pay for operations and maintenance, or additional services. If additional improvements are desired after an assessment district is established, the entire process is required for those additional improvements.

Assessment districts may be used to finance improvements in one of two general ways. The assessments may repay the City or an initial developer for the upfront costs of infrastructure. The City may also issues bonds pursuant to an assessment district and use the proceeds to fund the infrastructure improvements and use the assessments to repay the bonds.

Generally, assessment districts can be used to finance the following improvements:

- Local streets
- Streetlights
- Parks
- Landscaping
- Sidewalks
- Sanitary sewers
- Water supply and distribution facilities
- Gas and electric power
- Flood control and drainage improvements
- Parking facilities

5. Community Facilities Districts

Community facilities districts (CFDs) can fund the planning, design, purchase, construction, expansion, improvement, or rehabilitation of capital facilities, defined as having a useful life of five or more years. CFDs can also fund the provision of a variety of public services, such as public safety, parks and recreation, landscape maintenance and lighting, flood control, and site remediation.

The Mello-Roos Community Facilities Act of 1982 (Government Code section 53311 et seq.) authorizes the establishment of CFDs. However, these districts are not assessment districts, as discussed in the previous section, and differ in several important ways.

CFDs levy a special tax instead of a special assessment. This tax may be applied to the value of each property, rather than assessed based on the level of special benefit received. However, because it is a special tax, a two-thirds majority vote is required to approve the levy of the special tax. If the district has 12 or more registered voters, the election polls voters, with each having an equal vote. If there are less than 12 registered voters, the election polls property owners, with each vote weighted by acreage owned within the district boundary. Properties within the district need not necessarily be contiguous. Finally, establishing a CFD requires only a general description of the facilities, services, and costs associated with the district, not the detailed engineer's report required for assessment districts.

The properties subject to this Specific Plan will participate in CFDs that include land outside its boundaries provided the CFD benefits the property. An example of this would be the CFD that will be set up for the Bruinville district of the City to fund on-going costs of police protection.

6. Landscaping and Lighting Maintenance Districts

Landscaping and lighting maintenance districts (LLMD) can fund the construction of certain public improvements and the operation and maintenance of public improvements. LLMDs are authorized by the Landscaping and Lighting Act of 1972 (Streets and Highways Code section 22500 et seq.).

An LLMD requires annual assessment process for any assessments other than previously approved assessments to pay previously approved and issued debt. The annual assessment process is similar to that used to establish assessment districts.

The improvements and services provided by LLMDs include:

- Landscaping
- Public lighting, including traffic signals
- Appurtenant facilities, including grading, clearing, removal of debris, the installation or construction of curbs, gutters, walls, sidewalks, or paving, or water, irrigation, drainage, or electrical facilities
- Park or recreational improvements
- Land preparation
- Lights, playground equipment, play courts, and public restrooms
- The maintenance or servicing, or both, of any of the foregoing
- Acquisition of land for park, recreational, or open-space purposes
- Acquisition of existing improvements

LLMDs can be expanded over time, following a process similar to that used to establish the district.

D. Additional Funding Sources

1. Local Share of Sales Tax Receipts

New businesses at the RAAP could generate additional sales and use tax revenues for the City's General Fund, based on the one-percent share received by local governments. These proceeds could help to finance capital improvements and ongoing operating costs at the RAAP. However, given the current economic situation, a local share of sales tax receipts is highly unlikely.

2. Grants and Loans

The Riverbank LRA has succeeded in securing grants and loans from a wide range of funding sources, including Community Development Block Grant (CDBG) funds and a loan from the Stanislaus County Economic Development Bank. Over time, the LRA will continue to pursue additional grant funding for the site, and potentially additional loans if necessary.

E. Infrastructure Improvements

Infrastructure improvements in the RAAP will be handled in two different manners.

First, with respect to the existing developed area (RAAP-2), water and storm drainage are handled as separate systems that do not intersect with the City's water and storm drainage systems. RAAP-2's sewer system is self-contained until it enters the City's sanitary sewer system at a single access point in Claus Road. All on-site roads are private and are maintained by the manager of the RAAP-2 site, whether that is the LRA, a consultant, or a master developer. Hetch Hetchy provides electrical service to the RAAP-2 site and PG&E provides natural gas. These providers will continue to service the site.

Second, with respect to the undeveloped properties, these services will be provided by others. Sewer and water will be provided using the City's normal processes. Lines for these services will have to be extended at the developer's expense and normal City connection fees will be charged. Storm drainage will be provided on each individual site. Natural gas will be provided through PG&E. Electrical services can be provided through either PG&E or the Modesto Irrigation District, both of which provide services in the areas. Any development of the undeveloped properties will need to extend services and make improvements under this Specific Plan.

Rail service is currently provided to the entire site via a spur that runs from the site to the BNSF Mainline. This service is provided by Sierra Northern Railway and is expected to remain available to all users. In order to provide rail access in the undeveloped areas, additional rail spurs may be needed for loading and unloading of goods. The construction of these spurs will be the responsibility of the developer of the property.

F. Overall Implementation/Administration

The strength of a plan lies in its implementation. For the RAAP Plan area, the implementation strategy will occur over time, working to achieve the Plan's goals and objectives. For RAAP-1 and RAAP-R, the vacant parcels will be sold and the property owner will be responsible for their development. Primary responsibility for making most of the future improvements will be borne by the private sector. Guided by the development standards and guidelines included in this Plan, Riverbank's city-wide development policies and Municipal Code, these development projects will each incrementally contribute to establishing a green industrial park that can serve as a model for sustainability for the entire region.

Plan implementation will occur over an extended period of time and will be driven by completion of on-going remediation efforts and various market forces. For RAAP-2, the existing industrial core, once the property transfers from the Army it is anticipated that it will take a minimum of three years to replace the galbestos siding after which additional tenants will be recruited. For RAAP-1 and RAAP-R, the vacant parcels will be sold and the property owner will be responsible for their development. Given that there are no utilities at the South End Cap, it is likely that development will start at the North End Cap and utilities will be extended as needed.

The Specific Plan calls for traffic signals on Claus and Claribel Roads. Amending the City's System Develop Fees may be appropriate for the signals and the frontage improvements along Claus Road adjacent to RAAP-2. For RAAP-1 and RAAP-R, warrants for signalization are dependent on what other development occurs along the corridor when Claus Road is widened to the ultimate cross-section, what actual uses are developed and where within the RAAP, as well as other projects on the west side of Claus Road that may also need to contribute to the signalization. A monitoring program should be established that is tied to the square footage of development, starting subsequent to 250,000 square feet being constructed and occupied, and then at reasonable intervals from there until the project is fully built-out. The intervals should be dependent on the level of trip generation from the first 250,000 square feet, but could likely be at 100,000 to 250,000 square foot intervals or tied separately to development on the North End Cap and South End Cap. Alternatively, they could require a focused transportation study for each project that analyzes site access/circulation issues as the regional issues would have been covered by the EIR.

The City of Riverbank is considering formation of one or more Community Facilities Districts (CFDs) for the purpose of funding on-going operations and public services such as police services. If such a CFD(s) is formed and if property included in this Specific Plan are found to impact such services, then properties in this Specific Plan shall participate in the CFD.

8: IMPLEMENTATION

1. Development Process

Tentative Map: There are two types of tentative maps under State Law. Tentative Subdivision Maps are required for non-industrial uses. A Tentative Parcel Map is required for industrial uses and shall be utilized when dividing the site. A Tentative Parcel Map only requires Planning Commission approval unless appealed to the City Council. All Tentative Maps shall be processed as required in Chapter 152 of the Riverbank Municipal Code.

Site Plan Review: No site plan review will be required for projects in the Specific Plan if the Community Development Director determines that the project is consistent with the Specific Plan. Any such determination may be appealed to the Planning Commission and, if the Planning Commission decision is unacceptable to the appellant, to the City Council.

Conditional Use Permit: Some of the uses shown in Table 5.1 require a Conditional Use Permit. These permits require review by both the Planning Commission and City Council with City Council approval required before any such use may be established. The requirements for a Conditional Use Permit can be found in Section 153.216 of the Riverbank Municipal Code.

Appeals: Appeals are permitted as described in Section 153.218 of the Riverbank Municipal Code.

2. Environmental Review

A program level Environmental Impact Report (EIR) has been prepared for the RAAP. Future proposed projects will tier off of the program level EIR and identify what conforms and is addressed in the EIR and what needs additional analysis. For projects that are not fully consistent with the EIR, only those factors with potential impacts will require additional analysis. Such analysis may be provided using a Mitigated Negative Declaration, Subsequent, or Supplemental EIR consistent with CEQA guidelines.

The Mitigation Monitoring Program provides a summary of required mitigation for impacts attributable to the project, identifies the party responsible for the monitoring of mitigation measures, and identifies the timing when the measure is to be completed. The City has prepared such a program and it will be implemented as required by Law.

3. Recovery of Specific Plan Fees

Under consideration is a reimbursement fee to pay for that portion of the cost of developing the RAAP Specific Plan which was not paid for with grants. This cost is the $300,000 Economic Development Bank Loan that will be repaid in 2014. The City Council will consider a fee to reimburse itself (through the LRA) for this cost, as allowed by California state law. Included in the consideration may be the concept of reducing the fee for those businesses that provide a high number of jobs. Implementation of this fee and policies determining the application of the fee will be considered by the City Council after the adoption of the Specific Plan.

G. Modifications to the Specific Plan

Implementation of the Specific Plan will realistically will occur over time. It is reasonable to expect that development and land uses unanticipated now may be proposed during the life of the Specific Plan.

MAJOR AMENDMENT TO THE SPECIFIC PLAN: Major discretionary amendments to the Specific Plan may include the following: parcelization of RAAP-2, proposal to have the City Public Works Division maintain the water and storm water systems, any change that requires an amendment to the General Plan, and any other change that is determined by the Community Development Director to be major in nature.

MINOR/ADMINISTRATIVE AMENDMENTS TO THE SPECIFIC PLAN: All other modifications (not included in those defined as "Major") to RAAP-1, RAAP-2, RAAP-R, and RAAP-OS, including new land uses, are subject to administrative review based on the goals of the Specific Plan and the requirements of the Municipal Code. Examples of such amendments may include text interpretations, minor deviation of design standards, and new land uses that are consistent with the intent of the Specific Plan and the General Plan Amendment. Any such minor amendments may be appealed to the Planning Commission and, if necessary, to the City Council.

APPENDIX A:

DESIGN GUIDELINES

Industrial and Research & Development

This section provides the design standards and guidelines for all new industrial and research & development (R&D) construction on the former Riverbank Army Ammunition Plant. These standards and guidelines are intended to ensure that new development results in a high-quality, highly desirable business park environment that encourages economic development and investment.

This document includes graphics that illustrate the standards and guidelines. These graphics are not meant to show the only possible design solution for any particular standard or guideline.

The language in this document follows these principles:

» *"Shall"* or *"must"* refers to a mandatory design standard that all projects must follow.

» *"Should," "may,"* or *"encouraged"* refers to a design guideline that the City recommends for all developers. While design guidelines are more flexible than design standards, the City will encourage applicants to follow the guidelines.

A. Site Planning

These standards and guidelines are intended to ensure that new development uses an efficient and functional arrangement of buildings and site components. They are also intended to ensure that projects contribute to a cohesive urban design for the RAAP site as a whole, while still allowing for creative flexibility from project to project.

1. Building Orientation

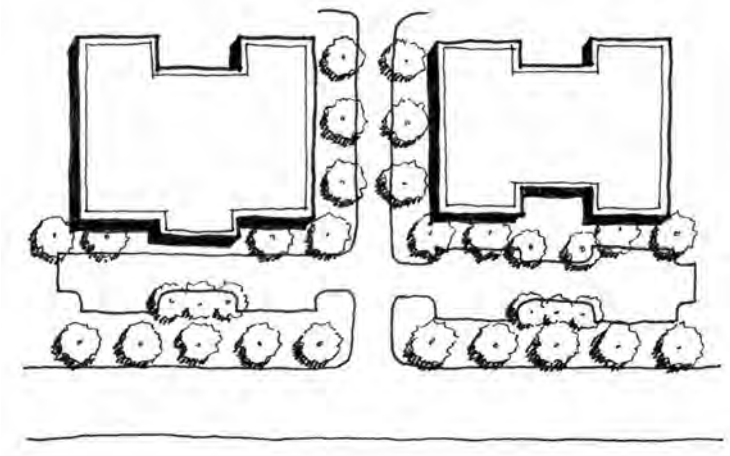
- » Main building faces shall be oriented toward the street.
- » Buildings should be arranged to be as close to public streets as practical. Large front setbacks are discouraged.
- » Visitor entrances to buildings should be clearly visible from a public street.

2. Vehicular Access

- » Access drives shall be limited, to the extent feasible.
- » Common access drives shared by multiple sites are encouraged.

3. Parking Area Design

- » Visitor, short-term, and accessible parking spaces may be provided in between building frontages and streets. However, the majority of employee and service parking should be behind the building.
- » Surface parking should be divided into smaller units to reduce the visual impact of large expanses of pavement and vehicles. This can be accomplished by providing landscaped medians between parking bays and by providing pedestrian paths.
- » The distance from parking spaces to building entries should be minimized.



Two sites sharing a common access drive.

Pedestrian path through parking lot.

4. Pedestrian Access and Amenities

» Clear pedestrian pathways should be provided to connect building entries to public sidewalks.

» Primary routes for pedestrian circulation should provide universal access wherever possible by reducing unnecessary steps and level changes.

» All sites should have safe and convenient pedestrian access to public rights-of-way.

5. Plazas, Green Spaces, and Pedestrian Areas

» Plazas, green spaces, and pedestrian areas and facilities should be incorporated within the site design as a whole. Where possible, they should be visible from public streets to provide visual interest.

» Employees should be provided with break and gathering spaces that are sufficient in size and scale and are located in areas buffered from traffic and vehicle circulation.

6. Internal Circulation

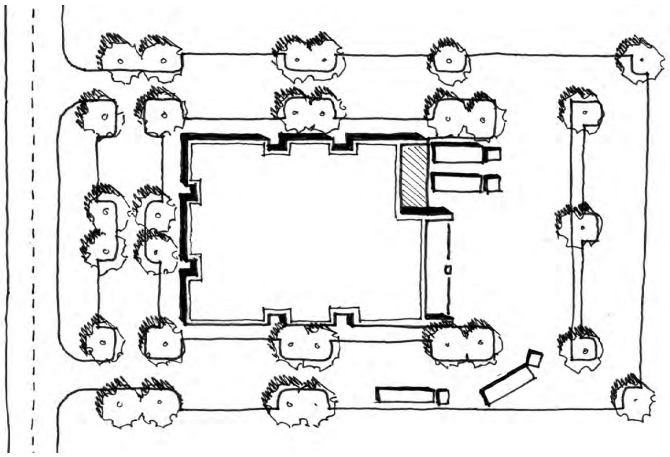
» Internal circulation shall be of sufficient size and have appropriate turning radii to prevent internal routes from requiring movement onto public or semi-private streets.

» Within development parcels, access drives shall be designed to provide sufficient vehicle stacking during peak traffic hours without impacting internal circulation or the adjoining street.

7. Service, Delivery, and Storage Areas

» The impact of service, delivery, and storage areas shall be mitigated by locating these areas on the sides or backs of buildings away from public streets and pedestrian circulation.

» Loading areas shall be located so that trucks being loaded or unloaded do not disrupt circulation within the site.



Loading area located to the rear of a building.

» Street-side loading shall be prohibited unless the loading dock is set back at least 70 feet from the street and is screened with materials that have a similar color, texture, roof style, and architectural detailing to the overall site and building design, and that form an opaque screen up to a height of 8 feet. This requirement shall not apply in RAAP-2 districts.

» On-site queuing space for vehicles waiting to be unloaded shall be provided where necessary.

» Outdoor storage, including company-operated vehicles other than passenger vehicles, shall be screened from public view using any combination of walls, berms, and landscaping.

» Refuse areas shall be designed to fit the number of trash and recycling bins required to accommodate all waste generated by building users.

» Refuse enclosures shall be constructed of durable materials with a similar color, texture, roof style, and architectural detailing to the overall site and building design.

» Refuse areas shall be designed to accommodate truck access.

8. Utilities and Backflow Preventers

» Utility cabinets and meters shall be contained in the building or otherwise fully screened from public view.

» Backflow prevention devices should be fully screened from public view through the use of landscaping, berms, low walls, or other screening techniques.

B. Architectural Design

The standards and guidelines in this section are intended to ensure that the appearance and details of new buildings create an aesthetically pleasing, human-scaled environment. They apply only to façades and portions of façades that are readily visible from a public street.

1. Massing and Façades

- » Buildings shall be designed with the human scale in mind, incorporating overhangs, changes in wall planes and building height, vertical elements, and other architectural features to break up the bulk of a single building and provide visual interest.
- » Façades shall incorporate structural or design elements to break wall expanses into smaller parts. Windows, doors, and other openings shall be designed to help implement this principle.
- » Regardless of construction type, development shall include decorative façade treatments that minimize the sense of a boxy, "tilt-up"-style building.
- » A building's façade should delineate a base, middle, and top of the building.

Changes in massing divide a building into smaller components.

An integrated palette of materials.

Decorative façade treatments add to a building's visual interest.

2. Materials and Detailing

- » At least 75 percent of a building's front façade, and at least 25 percent of all other building façades, shall consist of non-metallic surfaces such as wood, stone, rock, brick, or glass. Side walls that are designed to be expandable shall be exempt from this requirement, provided that these walls are shown on the site plan. This requirement shall not apply in RAAP-2 districts.

» Cornices, parapets, and eaves should be used to denote the top of a building and provide greater visual interest on tall façades.
» Roof cornices, where employed, should incorporate materials, colors, and forms that fit the architectural character of the overall building design.
» Changes in parapet height should relate to changes in the building's massing, rather than creating higher false façades.

3. Windows

» Recessed windows are strongly encouraged. Other means of accenting the windows, such as distinctive color treatments, should also be considered in order to create a sense of depth on the façade.

Recessed windows add depth to a façade.

4. Entries

» Primary building entries should be emphasized by changes in building mass or building height, or by incorporating special architectural features such as overhangs.
» Architectural detailing and materials should be used to distinguish the hierarchy between visitor and employee/service entries.

Changes in massing denote a building entrance.

C. Green Building Components

The standards and guidelines in this section are intended to ensure that new development makes efficient use of resources and adheres to environmentally sensitive development practices.

1. Waste Reduction and Management

» Construction waste should be recycled, salvaged, or reused rather than disposed of in landfills or incinerators. Materials such as excavated soil or concrete should be reused on site where possible.

» Recycling should be encouraged by providing appropriate and convenient recycling facilities, including a recycling collection area that serves the entire building and provides space for the collection and separation of all applicable recyclable materials.

2. Sustainable Materials

» Light-colored concrete or other light-colored materials, which reflect heat rather than absorbing it, shall be used for walkways and plazas.

» Concrete and asphalt wastes produced during construction should be recycled and used as aggregate for walkway and roadway base.

» High volume fly ash concrete should be used wherever possible.

» Materials that incorporate recycled content should be used where possible.

» Materials that are produced within a 500-mile radius of Riverbank should be used where possible.

» Wood products that have been harvested and produced according to Forest Stewardship Council (FSC) requirements should be used where possible.

Recycled materials were used to construct this seating area.

3. Roofs

» Roofing materials should be chosen based upon their durability.
» Cool roofing materials should be used to maximize energy savings. Cool roofing materials have a high reflectivity and emissivity; they reflect the sun's rays from the roof (reflectivity) and limit the amount of heat stored by the roof (emissivity).

4. Energy Use

» Daylighting should be incorporated into new buildings to reduce energy costs and provide natural light.
» Passive solar heating and cooling, using building materials with a high thermal mass, should be used to reduce the need for mechanical heating and cooling.
» High-performance windows should be used to minimize heat loss and gain.
» On-site renewable energy systems should be incorporated into new development where possible. Potential renewable energy sources include solar and wind collection systems.

5. Stormwater Management

» Permeable paving materials should be used for walkways, driveways, and parking lots. These materials include porous concrete, porous asphalt, and open-grid pavers.
» Impervious surfaces should be minimized by clustering development.
» Vegetated areas, such as swales and rain gardens, should be used to slow stormwater runoff and filter its pollutants before it enters storm drains.
» Where possible, stormwater should be collected from rooftops and diverted into storage areas, then used for irrigation. As an alternative to stormwater capture, vegetated roofs, or "green roofs," may be used to absorb stormwater and allow it to evaporate.

Parking lot with permeable asphalt.

D. Landscape Design

The standards and guidelines in this section are intended to ensure that the amount, layout, and materials of landscaped areas contribute to the enjoyment and comfort of a building's users.

1. Function

» Landscaping shall be used to provide an attractive setting for development; soften hard building contours; shade parking areas and other large expanses of pavement; buffer and merge various uses; mitigate building height; and screen unsightly uses.

» Developers are strongly encouraged to provide more landscaping than the minimum standard, particularly in publicly viewed areas, in order to create a more attractive environment for employees and the general public.

» Landscaping should be designed and located to provide stormwater treatment where possible.

» Shade trees should be planted where they can provide shade for pedestrian areas, such as outdoor patios, and improve people's comfort during hot months.

Landscaping provides an attractive edge treatment for this site.

Landscaping accentuates a building entrance.

2. Building Entries

» Where provided at entryways, landscaping shall not block or screen views to the entryway.

» Landscaping should be used to accentuate entryways that face public streets.

3. Adjacent Properties and Streets

» Landscaping elements shall be used to partially screen industrial activity from nearby residential uses and public streets.
» Landscaping along street frontages should provide a unifying character to the street and enhance the appearance of individual developments.

4. Parking Areas

» Surface parking areas facing public streets shall be partially screened by berms or landscaping.
» For security purposes, openings shall be incorporated into landscaping to provide views into the site.
» Parking areas shall incorporate plantings and trees to provide shade and reduce impervious surfaces.

Trees provide shade for parked cars.

5. Plant Selection

» Landscape plants shall be chosen based upon the characteristics of Riverbank's climate to ensure that the plants will thrive with minimal irrigation. California natives and climate-adapted plants are both suitable.
» A variety of plants shall be used to provide a mix of heights, colors, and textures.
» Integrated pest management (IPM) techniques, rather than pesticides, should be utilized to control disease, invasive plants and pests. IPM techniques include planting species that will attract beneficial insects, installing mechanical trapping devices for pests, and using dense ground covers to shade out weeds.
» Lawn and turf areas should be minimized in landscape design, since they require frequent watering and maintenance.

Landscaping with varied colors and features.

6. Irrigation

» Plants shall be grouped within the landscape, or hydrozoned, based upon their different water needs.
» Drip irrigation shall be used rather than overhead irrigation spraying where possible.
» Irrigation controls that regulate the use of irrigation in response to rainfall shall be used.

E. Signage

The standards and guidelines in this section are intended to ensure that signs are designed and constructed to make a positive contribution to the overall character of the development project.

1. Design

» Signs shall be constructed of high quality and durable materials.
» Signs should relate to the materials, colors, and shapes of the architectural elements of the building they serve.
» Where possible, signs should align with major architectural features such as building entrances.
» Signs should be designed to be easily legible. Legibility can be optimized by providing high contrast between the sign content and its background.

Monument sign constructed from high-quality materials.

Wall sign integrated into architectural details.

2. Wall Signs

» Wall signs should fit within a building's architectural details rather than obscuring them.
» Signs are encouraged to be designed as individual letters and icons directly attached to a building façade, rather than as a separate sign with a background and a frame attached to the building.

3. Monument Signs

» Multiple-tenant monument signs should display tenant information proportionately to the size of each tenant.

F. Exterior Lighting

The standards and guidelines in this section are intended to ensure that the design of fixtures and the light provided contributes to the character of development and does not impact adjacent development or the night sky.

Downward-facing light fixture.

1. Lighting Design

- » Exterior lighting shall be designed to provide light only in areas where it is necessary for comfort and safety.
- » The lighting of landscape features, architectural embellishments, or signage shall be kept to a minimum. Where lighting is appropriate, downlighting should be used where possible rather than uplighting.
- » Exterior lighting should be integrated with the architectural and landscape design.

2. Lighting Height

- » Parking lots shall be designed with a greater number of shorter, low wattage, tightly spaced fixtures rather than a lesser number of taller, higher wattage fixtures. Fixtures shall not exceed 18 feet in height.
- » Pedestrian sidewalks and plazas should be illuminated at night, using downward-facing lights where possible.

Downward-facing lights along a pedestrian path.

3. Lighting Levels

- » Lighting levels shall be adequate to provide for safety, but shall be limited to conserve energy and avoid light pollution.
- » Lighting shall employ control features to avoid light being directed offsite.
- » Lighting of outdoor service, loading, or storage areas shall be contained within each area's boundaries and enclosure walls. No light spillover shall occur outside the service area, and light sources shall not be visible from the street or adjacent properties.
- » Curfew controllers should be used to turn off all nonessential lights after a specified evening time.

G. Fences and Walls

The standards and guidelines in this section are intended to ensure that the location and appearance of fences and walls meets functional requirements while contributing positively to the appearance of development.

1. Location

- » Fences and walls shall not be used between buildings and public roadways, except where they are less than 48 inches high or are necessary to screen maintenance, service, or outdoor storage areas.
- » Screening fences and walls may be used as part of the internal site design.

Semi-transparent fence along a site's edge.

2. Design

- » Fences and walls should use similar materials, heights, and construction techniques throughout a development. Design elements of fences and walls should reflect the materials, colors, and design details of nearby buildings.
- » Fences and walls should be semi-transparent. They should be opaque only where they are shielding maintenance, service, or outdoor storage areas.
- » Walls or fences that are over 60 feet in length and visible from a public street should be articulated with a change in appearance. This can be achieved through a change in the material, texture, or wall plane.
- » Service fencing that is not visible from public rights-of-way can be provided as coated chain-link fencing.
- » Fences should return to meet buildings rather than surround them.

APPENDIX B:

DESIGN GUIDELINES

Retail

This section provides the design standards and guidelines for all retail construction on the former Riverbank Army Ammunition Plant. These standards and guidelines are intended to ensure that new retail development results in a high-quality, desirable retail environment that encourages investment and is attractive to customers.

This chapter includes graphics that illustrate the standards and guidelines. These graphics are not meant to show the only possible design solution for any particular standard or guideline.

The language in this chapter follows these principles:

- *"Shall"* or *"must"* refers to a mandatory design standard that all projects must follow.
- *"Should," "may,"* or *"encouraged"* refers to a design guideline that the City recommends for all developers. While design guidelines are more flexible than design standards, the City will encourage applicants to follow the guidelines.


Landon's

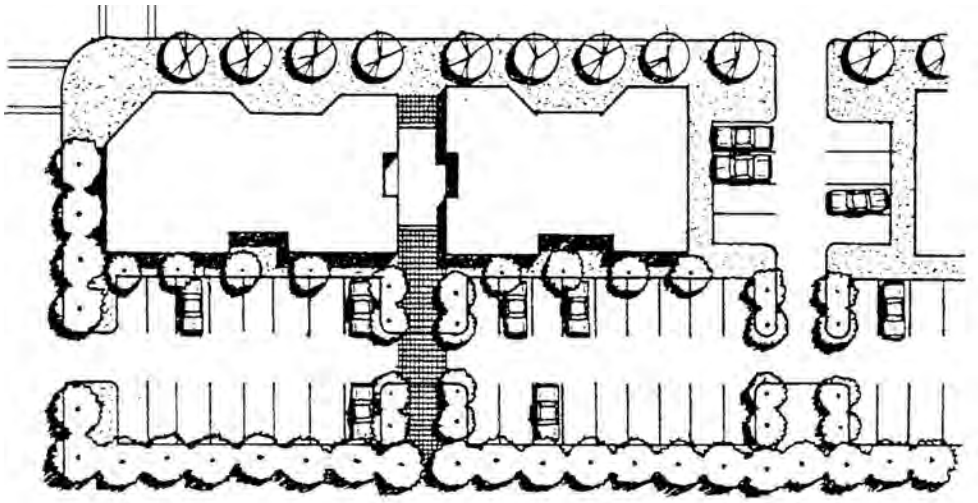
A. Site Planning

These standards and guidelines are intended to ensure that new development uses an efficient and functional arrangement of buildings and site components.

1. Building Orientation

» Building entrances facing the street are strongly encouraged.

» Building orientation should be coordinated with adjoining properties to avoid creating nuisances such as noise, light intrusion, invasion of privacy and traffic, particularly when development is adjacent to sensitive uses such as residential development.



Buildings can front onto the street as well as parking lots.

2. Building Setback

» Buildings should be located as close as possible to the front setback line, while respecting the character of the existing street edge.

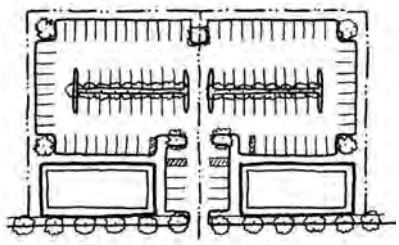
» Portions of a building may be set back from the main façade to create usable outdoor space, such as an outdoor seating area for a restaurant.

A corner tower helps to anchor an intersection.

3. Corner Sites

» Main entrances of corner buildings should be located at the corner, where feasible.

» Buildings located on corners should include special design and architectural features to help anchor intersections.



Adjacent sites share a common access drive.

4. Vehicular Access

» Access drives at corner lots should be limited but sufficient in number to provide safe and efficient movement of traffic to and from a site.

» Access to corner lot driveways should be located as far as possible from the intersection.

» Common access drives shared by multiple sites are encouraged.

5. Parking Area Design

» Parking shall be minimized between buildings and public streets.

» Surface parking shall be divided into smaller units to reduce the visual impact of large expanses of pavement and vehicles. This can be accomplished by providing landscaped medians between parking bays and by providing pedestrian paths.

» Surface parking areas facing a public street shall be buffered by landscaping, with openings in the landscaping to provide visibility and security.

» The distance from parking spaces to building entries should be minimized.

Landscaping buffers the edge of a parking lot and divides the lot into smaller units.

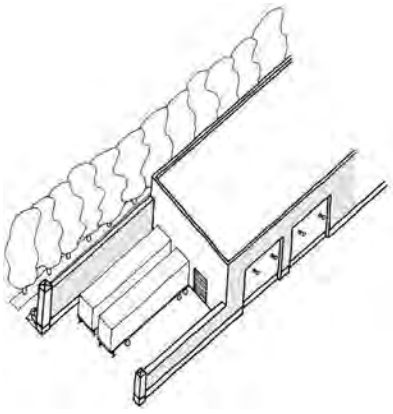
6. Internal Circulation

» Within development parcels, access drives shall be designed to provide sufficient vehicle stacking during peak traffic hours without impacting internal circulation or the adjoining street.

7. Service, Delivery, and Storage Areas

» The impact of service, delivery, and storage areas shall be mitigated by locating these areas on the sides or backs of buildings away from public streets, automobile parking, and pedestrian circulation.

» Loading areas shall be located so that trucks being loaded or unloaded do not disrupt circulation within the site.



Screening for a loading area.

Refuse enclosure made with durable, high-quality materials.

» Street-side loading shall be prohibited unless the loading dock is set back at least 70 feet from the street and is screened with materials that have a similar color, texture, roof style, and architectural detailing to the overall site and building design, and that form an opaque screen up to a height of 8 feet. This requirement shall not apply in RAAP-2 districts.

» On-site queuing space for vehicles waiting to be unloaded shall be provided where necessary.

» Outdoor storage, including company-operated vehicles other than passenger vehicles, shall be screened from public view using any combination of walls, berms, and landscaping.

» Refuse areas shall be designed to fit the number of trash and recycling bins required to accommodate all waste generated by building users.

» Refuse enclosures shall be constructed of durable materials with a similar color, texture, roof style, and architectural detailing to the overall site and building design.

» Refuse areas shall be designed to accommodate truck access.

8. Utilities and Backflow Preventers

» Utility cabinets and meters should be contained in the building or otherwise fully screened from public view.

» Backflow prevention devices should be fully screened from public view through the use of landscaping, berms, low walls, or other screening techniques.

» Developers are strongly encouraged to utilize minimally obtrusive designs for backflow prevention devices. Backflow devices should be located inside the building where possible.

A clearly marked pedestrian path.

9. Pedestrian Access and Amenities

» Clearly marked pedestrian pathways shall be provided to connect building entries to public sidewalks through parking areas.

» Primary routes for pedestrian circulation shall provide universal access wherever possible by reducing unnecessary steps and level changes.

» Special design features should be utilized to increase the safety for pedestrians within parking lots, across driveways, and in other locations where the pedestrian walkway should be defined. Potential design features include textured pavement, decorative paving, striping, or raised "speed table" crossings.

10. Plazas, Green Spaces and Pedestrian Areas

- » Plazas, green spaces, and pedestrian areas should be integrated within the site design as a whole.
- » Seating, including informal seating areas such as low walls and stairs, should be incorporated into plazas, green spaces, and pedestrian areas.
- » Lighting should be incorporated into plazas, green spaces, and pedestrian areas to ensure that they are safe at night.
- » Public plazas should be readily accessible from and connected to parking areas.

A public plaza that is directly accessible from an adjacent parking lot.

B. Architectural Design

The standards and guidelines in this section are intended to ensure that the appearance and details of new buildings create an aesthetically pleasing, human-scaled environment.

Storefront windows facing a street.

1. Massing and Façades

- » Building frontages facing the street shall have transparent windows along a minimum of 40% of their length. Where possible, these windows should look directly into the store. Display windows should be used where windows into the store are not practical.
- » Retail centers shall be designed as a complex of buildings rather than as a single large structure, in order to provide visual interest and a human scale.
- » Façades shall incorporate structural or design elements to break long walls into smaller parts. Windows, doors, and other openings should be designed to help implement this principle.
- » Buildings should be designed with the human scale in mind, incorporating outdoor patios, overhangs, changes in wall planes and building height, vertical elements, and other architectural features to break up the bulk and mass of single buildings and provide visual interest.

Building with details that provide visual interest.

» A building's façade should delineate a base, middle, and top of the building.

» Regardless of construction type, development shall include decorative façade treatments that minimize the sense of a boxy, "tilt-up"-style building.

» Buildings with multiple tenants should be subdivided into separate storefronts through the use of various materials and colors, as well as through massing changes and/or façade articulation.

2. Materials and Detailing

» The use of genuine materials, such as wood trim, is recommended rather than simulated materials, such as foam trim.

» Where one building material is used to simulate another, it should be used in a way that is in keeping with the character and properties of the material being simulated.

» All detailing on the building facades should be integral to the architectural design and not tacked onto the surface.

» Cornices, parapets, and eaves should be used to denote the top of a building and provide greater visual interest on tall façades.

» Roof cornices, where employed, should incorporate materials, colors, and forms that fit the architectural character of the overall building design.

» Changes in parapet height should relate to changes in the building's massing, rather than creating higher false façades.

A cornice denotes the top of a building.

3. Windows

» All retail buildings should position windows for visibility by both pedestrians and motorists at street level.

» On the façade where the primary entry is located, storefront, transom, and display windows, along with doors, should be provided on at least 50% of the length of the façade.

» Windows should be vertically proportioned, with a greater height than width. Appropriate height-width ratios typically range from 1.5:1 to 2:1. Where horizontally proportioned windows are used, they should include muntins that divide them into vertically proportioned segments.

» Recessed windows are strongly encouraged. Other means of accenting the windows, such as distinctive color treatments, should also be considered in order to create a sense of depth on the façade.

Vertically proportional storefront windows.

4. Entries

» The main entrance of a building should be designed so that it is accessible to all people, regardless of their mobility level.

» Buildings with multiple tenants should provide separate entrances to each store.

» Primary building entries should be emphasized by changes in building mass, building height, special façade or window treatments, or a combination thereof.

» The design of building entrances should be integrated with other architectural features of the building.

» Storefront doors should provide views into the interior space of buildings.

5. Awnings, Canopies and Arcades

» The use of awnings, canopies, and arcades is encouraged to provide shade and cover from the elements and to reinforce the pedestrian scale.

» The design and material of awnings, canopies and arcades should be consistent with the design character of the building to which it is attached.

» The height of awnings and canopies should be consistent across a building façade, with a minimum clearance of 8 feet above the sidewalk.

» Arcades should be designed to provide at least 10 feet of clear space between the building façade and the edge of the arcade.

An arcade provides shelter and shade.

C. Green Building Components

The standards and guidelines in this section are intended to ensure that new development makes efficient use of resources and adheres to environmentally sensitive development practices.

1. Waste Reduction and Management

» Construction waste should be recycled, salvaged, or reused rather than disposed of in landfills or incinerators. Materials such as excavated soil or concrete should be reused on site where possible.

» Recycling should be encouraged by providing appropriate and convenient recycling facilities, including a recycling collection area that serves the entire building and provides space for the collection and separation of recyclable materials.

2. Sustainable Materials

» Light-colored concrete or other light-colored materials, which reflect heat rather than absorbing it, shall be used for walkways and plazas.

» Concrete and asphalt wastes produced during construction should be recycled and used as aggregate for walkway and roadway base.

» High volume fly ash concrete should be used wherever possible.

» Materials that incorporate recycled content should be used where possible.

» Materials produced within a 500-mile radius of Riverbank should be used where possible.

» Wood products that have been harvested and produced according to Forest Stewardship Council (FSC) requirements should be used where possible.

Light-colored concrete with an inset decorative feature.

3. Roofs

» Roofing materials should be chosen based upon their durability.

» Cool roofing materials should be used to maximize energy savings. Cool roofing materials have a high reflectivity and emissivity; they reflect the sun's rays from the roof (reflectivity) and limit the amount of heat stored by the roof (emissivity).

4. Energy Use

» Daylighting should be incorporated into new buildings to reduce energy costs and provide natural light.

» Passive solar heating and cooling, using building materials with a high thermal mass, should be used to reduce the need for mechanical heating and cooling.

» High-performance windows should be used to minimize heat loss and gain.

» On-site renewable energy systems should be incorporated into new development where possible. Potential renewable energy sources include solar and wind collection systems.

Swales within a parking lot.

5. Stormwater Management

» Permeable paving materials should be used for walkways, driveways and parking lots. These materials include porous concrete, porous asphalt, and open-grid pavers.

» Impervious surfaces should be minimized by clustering development.

» Vegetated areas, such as swales and rain gardens, should be used to slow stormwater runoff and filter its pollutants before it enters storm drains.

» Where possible, stormwater should be collected from rooftops and diverted into storage areas, then used for irrigation. As an alternative to stormwater capture, vegetated roofs, or "green roofs," may be used to absorb stormwater and allow it to evaporate.

D. Landscape Design

The standards and guidelines in this section are intended to ensure that the amount, layout, and materials of landscaped areas contribute to the enjoyment and comfort of a building's users.

Shade trees adjacent to pedestrian path.

1. Function

» Landscaping shall be used to provide an attractive setting for development; soften hard building contours; shade parking areas and other large expanses of pavement; buffer and connect various uses; mitigate building height; and screen unsightly uses.

» Developers are strongly encouraged to provide more landscaping than the minimum standard, particularly in publicly viewed areas, in order to create a more attractive environment for employees and the general public.

» Landscaping should be designed and located to provide stormwater treatment where possible.

» Shade trees should be planted where they can provide shade for pedestrian areas, such as outdoor patios, and improve people's comfort during hot months.

2. Building Entries

» Where provided at entryways, landscaping shall not block or screen views to the entryway.

» Landscaping should be used to accentuate entryways that face public streets and parking lots.

3. Adjacent Properties and Streets

» Landscaping elements shall be used to partially screen parking and service areas from nearby residential uses and public streets.

» Landscaping along street frontages should provide a unifying character to the street.

4. Parking Areas

» Surface parking areas facing public streets shall be partially screened by landscaping.

» For security purposes, openings shall be incorporated into landscaping to provide views into the site.

» Parking areas shall incorporate plantings and trees to provide shade and reduce impervious surfaces in parking areas.

A clearly marked pedestrian path divides a parking lot into smaller units.

5. Plant Selection

» Landscape plants shall be chosen based upon the characteristics of Riverbank's climate to ensure that the plants will thrive with minimal irrigation. California natives and climate-adapted plants are both suitable.

» A variety of plants shall be used to provide a mix of heights, colors, and textures.

» Integrated pest management (IPM) techniques, rather than pesticides, should be used to control disease, invasive plants and pests. IPM techniques include planting species that will attract beneficial insects, installing mechanical trapping devices for pests, and using dense ground covers to shade out weeds.

» Lawn and turf areas should be minimized in landscape design, since they require frequent watering and maintenance.

6. Irrigation

» Plants shall be grouped within the landscape, or hydrozoned, based upon their different water needs.

» Drip irrigation shall be used rather than overhead irrigation spraying where possible.

» Irrigation controls that regulate the use of irrigation in response to rainfall shall be used.

E. Signage

The standards and guidelines in this section are intended to ensure that signs are designed and constructed to make a positive contribution to the overall character of the development project.

1. Design

» Only monument, wall, window, awning, and canopy signs shall be used.

» Box signs shall not be internally illuminated. A sign composed of individual three-dimensional letters and symbols may be internally illuminated.

» Signs shall be constructed of high quality and durable materials, such as brick, wood or metal.

» Signs should relate to the materials, colors, and shapes of the architectural elements of the building they serve.

» Signs should be designed to be easily legible. Legibility can be optimized by providing high contrast between the sign content and its background.

2. Monument Signs

» One monument sign shall be permitted on each development site.

» Monument signs shall not exceed a maximum height of 4 feet and a maximum width of 10 feet.

» Multiple-tenant buildings should display tenant information proportionately to the size of each tenant.

Monument sign for multiple tenants.

3. Wall Signs

» Wall signs should fit within a building's architectural details rather than obscuring them.

» Signs are encouraged to be designed as individual letters and icons directly attached to a building façade, rather than as a separate sign with a background and a frame attached to the building.

4. Window Signs

» Window signs should not be placed in a manner that obscures primary views into and out from the storefront.

» Painted signs and letters should present a neat and aligned appearance.

Professionally designed window sign.

5. Awning and Canopy Signs

» Any signs on awnings should be directly painted onto the awning materials.

» Where a canopy sign is located above the canopy, the use of individual three-dimensional letters is strongly recommended.

Canopy sign with individual letters.

F. Exterior Lighting

The standards and guidelines in this section are intended to ensure that the design of fixtures and the light provided contributes to the character of development and does not impact adjacent development or the night sky.

Downward-facing decorative light fixture.

1. Lighting Design

- » Decorative lighting fixtures that coordinate with the architectural design of the building are encouraged.
- » Exterior lighting shall be designed to provide light only in areas where it is necessary for comfort and safety.
- » The lighting of landscape features, architectural embellishments, or signage shall be kept to a minimum. Where lighting is appropriate, downlighting should be used where possible rather than uplighting.
- » Exterior lighting should be integrated with the architectural and landscape design of the overall development.

2. Lighting Height

- » Parking lots shall be designed with a greater number of shorter, low wattage, tightly spaced fixtures rather than a lesser number of taller, higher wattage fixtures. Fixtures shall not exceed 18 feet in height.
- » Pedestrian sidewalks and plazas should be illuminated at night, using downward-facing lights where possible. For sidewalks, low lighting fixtures, such as bollards with lights, are encouraged. For plazas, taller light poles are encouraged in combination with low fixtures, as appropriate.

3. Lighting Levels

- » Lighting levels shall be adequate to provide for safety, but shall be limited to conserve energy and avoid light pollution.
- » Lighting shall employ control features to avoid light being directed offsite.
- » Lighting of outdoor service, loading, or storage areas shall be contained within each area's boundaries and enclosure walls. No light spillover shall occur outside the service area, and light sources shall not be visible from the street or adjacent properties.
- » Curfew controllers should be used to turn off all nonessential lights after a specified evening time.

G. Fences and Walls

The standards and guidelines in this section are intended to ensure that the location and appearance of fences and walls meets functional requirements while contributing positively to the appearance of development.

1. Location

» Fences and walls shall not be used between buildings and the public roadways, except where they are necessary to screen maintenance, service, or outdoor storage areas.

» Screening fences and walls may be used as part of the internal site design.

A semi-transparent wall screens a seating area.

2. Design

» Fences and walls should use similar materials, heights, and construction techniques throughout a development. These design elements should reflect the materials, colors, and design details of nearby buildings.

» Fences and walls should generally be semi-transparent. They should be opaque only where they are shielding maintenance, service, or outdoor storage areas.

» Walls or fences that are over 60 feet in length and visible from a public street should be articulated with a change in appearance. This can be achieved through a change in the material, texture, or wall plane.

APPENDIX C:

DESIGN MANUAL

Model Standards & Specifications for Low Impact Development Practices

Model Standards & Specifications for Low Impact Development Practices

The City of Riverbank, California

January 2013

AECOM

City of Riverbank

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Contents

1.0 Introduction

In order to comply with existing and future stormwater discharge regulations, while promoting a resource efficient and sustainable approach to reducing stormwater runoff pollution, the City of Riverbank (City) has recognized the need to develop Low Impact Development (LID) standards and specifications. The City's General Plan provides the overarching policy framework for a more natural approach to drainage. This document provides specific guidance for LID solutions that are customized to the local context.

Land planning and drainage design should be integrated to **emphasize water conservation** and the use of on-site naturalized features to **protect water quality and downstream receiving water bodies**. To achieve this, natural and engineered hydrologic controls can mimic predevelopment hydrologic conditions to **improve water quality**, **reduce flooding,** and **improve overall watershed health**.

LID stormwater treatment standards **appropriate for the local conditions** will be used to **guide new development and redevelopment** projects. This guidance ensures more thoughtful and responsible stormwater management, stormwater pollution prevention, **reduction of community infrastructure costs,** and environmental enhancement in drainage designs.

As Riverbank and other San Joaquin Valley cities have developed, stormwater runoff from impervious hardscape has had a substantial negative impact on the Stanislaus River, the San Joaquin Delta, and regional wildlife. By implementing standards and specifications for municipal LID planning and development, tributaries to the San Joaquin River, including the Stanislaus River, can realize water quality and ecological benefits – both on a watershed and local scale. LID standard practices of intercepting stormwater runoff at or near the source and using natural vegetation to settle and filter stormwater runoff pollutants can have a widespread beneficial impact to the rivers of the Central Valley and the ecological health of the Sacramento-San Joaquin Delta.

In addition to stormwater management and treatment, the implementation of LID practices can augment groundwater recharge, assist in the removal of air pollutants, mitigate urban heat island effect, and sequester carbon. Local communities will also benefit from pleasing landscape aesthetics, natural resource conservation, and habitat creation - all of which can provide stormwater treatment functions.

Although the techniques for LID implementation are well documented in many regions, there are limited LID standards or manuals developed specific to the unique conditions in the San Joaquin Valley. These conditions include seasonal rainfall patterns, arid climate, hardpan soils, high groundwater tables, and native vegetation. This manual provides targeted design guidance for developers, designers and City staff to implement LID solutions at any scale for any land use.

How to Use This Document

The following flow chart summarizes the steps to be taken when implementing LID practices for a project.

Step 1: Site Context — *Section 1*

- Map your site and its preliminary design considerations
- Review local regulatory conditions and applicability to your proposed development
- Understand LID goals, benefits, and challenges

Step 2: Site Assessment — *Section 2*

- Analyze the your site to identify constraints and opportunities
  - Land Use/Existing Infrastructure
  - Hydrology
  - Groundwater
  - Topography
  - Soils and Geology
  - Space Constraints
- Identify appropriate Best Management Practices (BMPs) using BMP Selection Matrix

Step 3: Detailed LID Design — *Section 3*

- Understand site opportunities, goals, and constraints
- Review BMP Fact Sheets
  - Underground Infiltration
  - Bioretention Area
  - Vegetated Swale
  - Filter Strip
  - Detention Pond
  - Constructed Wetland
  - Permeable Pavement
  - Rainwater Harvesting
  - Green Roof
- Implement and design BMPs

Riverbank Context

The City of Riverbank General Plan 2005-2025 identifies 14 different land uses categories, as shown on the following page in Figure 2. LID opportunities and applications will vary across these different land uses. However for the purpose of this manual, land uses have been distilled down into the following three simple categories:

- greenfields;
- redevelopment areas; and
- special conditions

The purpose of developing these categories is to assist in identifying the type of BMPs and understanding the opportunities and constraints associated with each.

Figure 3 shows the historical growth patterns in the City. This map aids in identifying areas that may be more or less likely to experience development or redevelopment over the next 30 years. For example, residential areas built within the past 20 years are considered a stable land use and most of these are unlikely to see major change in the near future. By analyzing the City's growth patterns, in conjunction with other planning data (such as the Downtown Specific Plan), areas have been identified that fit within the categories of greenfield development, redevelopment or special conditions sites. These opportunity sites are shown in Figure 1 below and discussed in more detail on the next pages

The specific LID techniques and design guidance provided in this manual were developed by overlaying these potential development areas with the specific physical (e.g. soil, hardpan) and drainage conditions. The intent is to provide stormwater management techniques that are specific to the expected conditions that designers will encounter when developing in the Riverbank area.

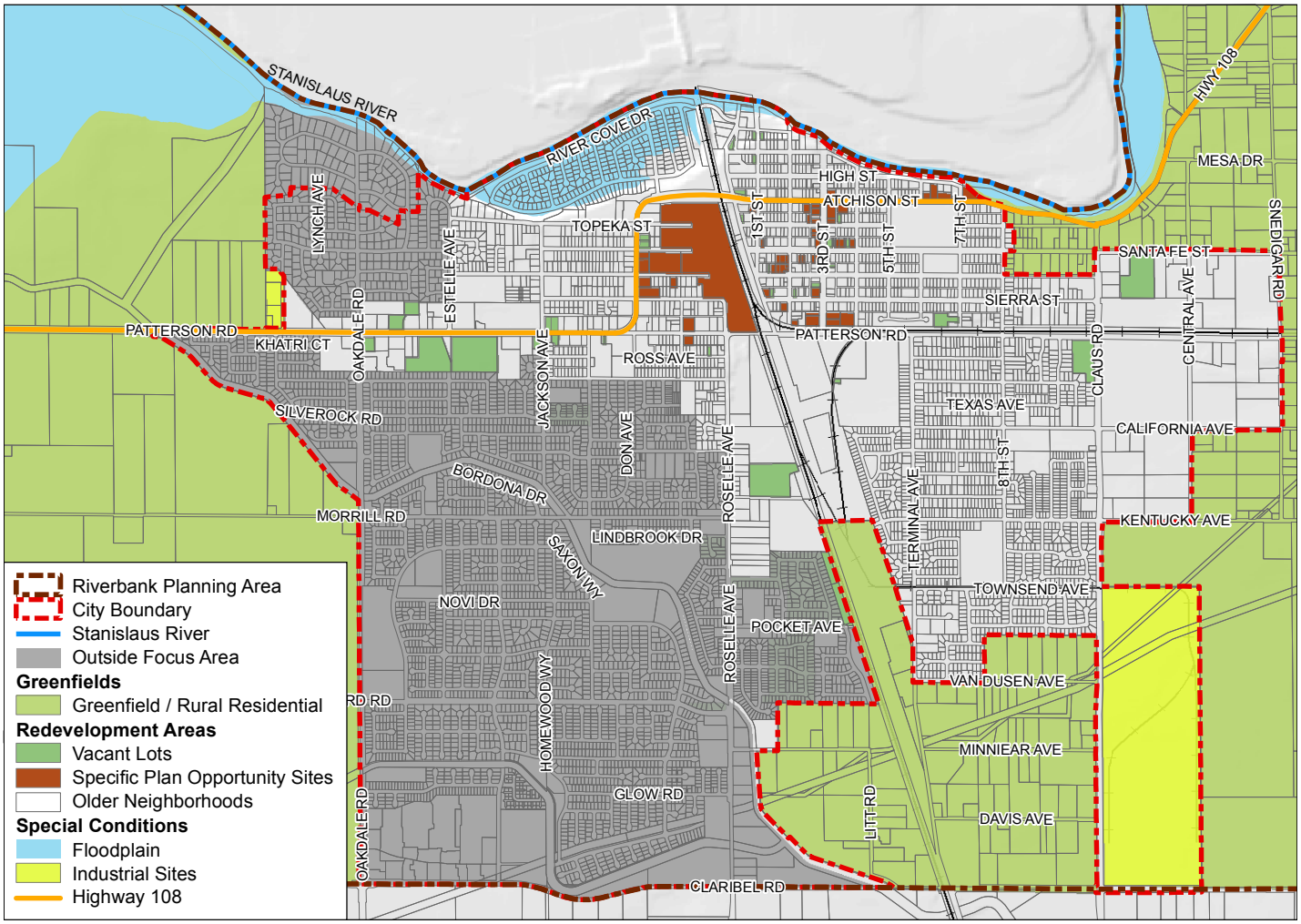


Figure 1: Opportunity Sites Map (Source: General Plan)
Map of entire Riverbank Planning Area located in Appendix C

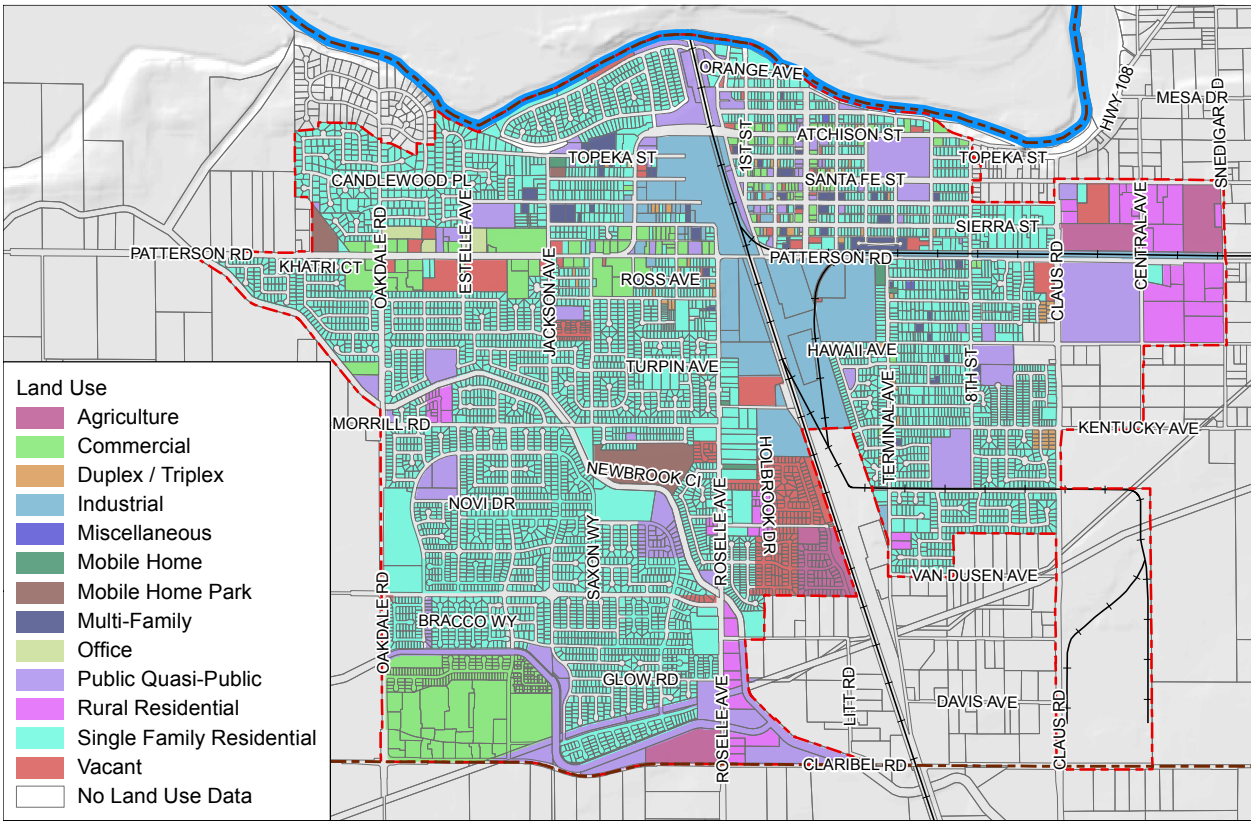


Figure 2: Existing Land Use Map (Source: General Plan)

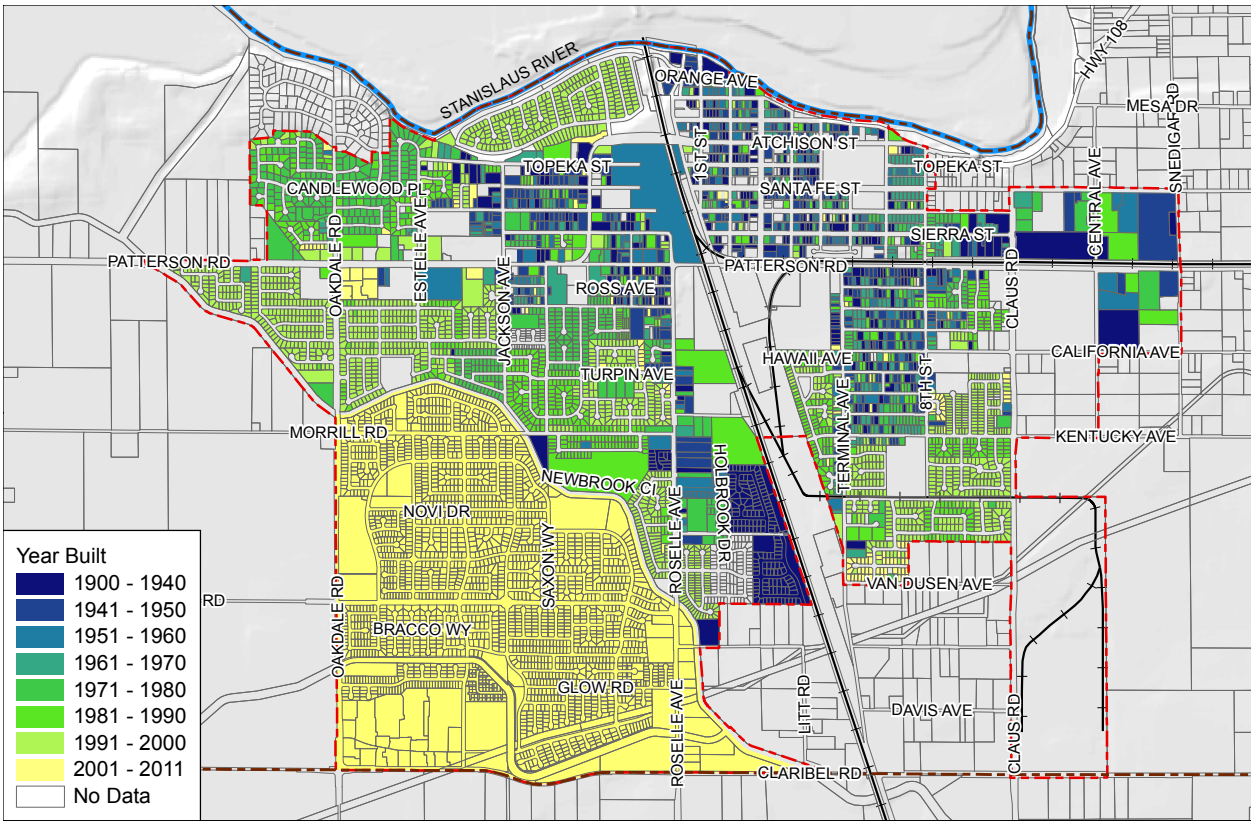


Figure 3: Historic Growth Patterns Map (Source: City of Riverbank)

Greenfields

Greenfield lands are those areas that are undeveloped or are in a substantially natural state. The majority of the land within the Riverbank Planning Area outside of City limits would be classified as greenfield (such as rural residential parcels, agricultural land, and undisturbed natural areas).

When developing within a greenfield area, it is important to maintain existing hydrological conditions by conserving natural areas and existing drainage features, where possible. Impervious hardscape surfaces (conventional roofs and paving) should be minimized and designed to discharge to pervious areas to help filter and infiltrate the stormwater runoff. To further aid infiltration, native soil compaction in landscaped areas should be minimized.

New infrastructure costs related to development can be reduced by incorporating LID techniques. Vegetated swales and permeable pavements can minimize or replace gutters and drain pipes. Retention and infiltration systems can reduce or eliminate the need for connections to storm drain mains. A rainwater harvesting system might avoid the need to upsize or install a new water supply line.

Greenfield areas with no prior development can use a wide array of treatment elements, but care should be taken to preserve the natural character of the site in order to minimize pollutants and changes to drainage patterns.

Redevelopment Areas

Areas that have the most opportunity for redevelopment within the City include vacant lots, Specific Plan Opportunity Sites, and older neighborhoods in need of revitalization or necessary improvements. Though implementation of LID practices can be more challenging in redevelopment areas, they are of crucial importance in these locations. Within these more urbanized areas LID can provide substantial water quality benefits by removing pollutants and sediment currently reaching local streams and rivers.

Site design practices that provide hydrologic benefits and improve groundwater conditions in previously developed areas should be considered. These can include distributed BMPs that slow down or infiltrate water closer to its source, conversion of paved surfaces to permeable surfaces, rainwater harvesting retrofits, and rerouting runoff from impervious surfaces across naturalized and vegetated areas.

There are redevelopment possibilities in the Downtown Specific Plan Area, along Patterson Road and elsewhere in the City. Development in the Specific Plan areas on the edges of the planning area can use a wider array of treatment elements. For instance, the roundabouts that are common throughout the Crossroads area and other more recent development could be replicated in new development areas with stormwater functionality incorporated into the center of the traffic circle.

Sites in the developed areas of the City present important opportunities to reduce the amount of impervious surface and treat runoff before it enters the storm drain system.

Special Conditions

Riverbank has land uses and spaces that may experience development or redevelopment activity that do not fit within the “greenfield” or “redevelopment” categories, as it relates to LID design and stormwater management. These areas include sites that are within the floodplain, large industrial sites, and the State Highway 108 (SR108) corridor.

When constructing in the floodplain and adjacent to riparian areas it is imperative to implement solutions that do not include raised surfaces, berms, or any type of grading than may inhibit the flood flows and change upstream flood levels. These areas in the floodplain often possess a certain amount of ecological value, and it is important to develop solutions that conform to the adjacent habitat and ecological conditions.

Large industrial sites often include expansive impervious surfaces and therefore are important areas to be considered for implementation of LID solutions. However, designers should be cautious of possible contaminated soil conditions and the potential for infiltration-based LID solutions to facilitate the transport of those contaminants into the groundwater basin.

Development within the SR108 corridor must consider the applicability of Caltrans specifications and design guidelines. Given its large area and ample right-of way, this area offers many opportunities for LID to manage and treat stormwater runoff. Consideration should be given to installing stormwater facilities concurrently with the construction of safety and screening facilities.

SR108 has many sections with significant unused right-of-way area ideally suited for LID treatment facilities.

Standing water remains at the vacant tomato cannery multiple days after a rain event, showing the need for stormwater management.

Jacob Meyers Park, located adjacent to the Stanislaus River, has numerous structures and development located within the floodplain.

Regulatory Context

The State Water Resources Control Board (SWRCB) Water Quality Order 2003-0005-DWQ, NPDES General Permit No. CAS000004 (Permit) established the requirements for storm water discharges from small municipal separate storm sewer systems (MS4s). The City of Riverbank participates in this permit along with three other co-permittees (the cities of Ceres, Oakdale, and Patterson) and is designated as an MS4 operator.

Permit requirements include the prohibition of the discharge of any materials other than stormwater, implementation of BMPs to the maximum extent practicable (MEP) to protect water quality, the development and implementation of a Storm Water Management Plan (SWMP), reducing the discharge of pollutants to the MEP, and annually reporting on the progress of SWMP implementation to the Regional Water Quality Control Board (RWQCB).

The Permit also contains supplemental provisions (in "Attachment 4") for participating communities that are designated as fast growing, which the City qualifies for due to recent population growth. They include specific post-construction design standards and BMP implementation procedures. These design standards are summarized on the following page. The BMPs implemented should focus on LID, source control, and treatment control.

Typical Development Process

Confirm Zoning. Areas are zoned to facilitate the development of compatible neighboring land uses. Zoning rules also set building and other standards or determine how much of a certain land use may occur.

Planning Review Process. Most projects are required to go through the Planning Review Process. Applicants have the option of submitting a Preliminary Proposal to the Planning Department for preliminary feedback, and would follow this with a full Planning Application. This application is then reviewed for approval.

Building Plan Review. Additional processes, such as obtaining a building permit, may be required after planning approval and prior to the commencement of construction.

Inspections. The aim of the Building Division is to create partnerships with the development community, business community and citizens to accomplish mutually beneficial goals such as the safe, successful and timely completion of projects.

More information on these processes as well as associated forms, applications, guides, and fee schedules can be found on the City's "Development Center" website:

www.riverbank.org/Depts/DevelopmentServices/pages/Development%20Center.aspx

Relevant Documents

Fact Sheet for State Water Resources Control Board Water Quality Order No. 2003 – 0005 – DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000004

This is the permit which contains the waste discharge requirements for stormwater discharges from MS4s. This is the primary guiding document for stormwater quality regulations in Riverbank and is summarized on this and the following page.

www.swrcb.ca.gov/water_issues/programs/stormwater/docs/final_ms4_permit.pdf

City of Riverbank Storm Drain System Master Plan (June 2008)

This plan serves as a basis for storm drain infrastructure and as an aide to assessing the impact of new and future development. It contains a summary of the existing storm drain system and recommended improvements.

City of Riverbank Public Works Department

Storm Water Management Program for the Cities of Ceres, Oakdale, Patterson, Riverbank, Report of Waste Discharge (March 10, 2003)

This document establishes the four cities as co-permittees to the small MS4 Permit, characterizes the conditions of recieving streams, and describes proposed stormwater quality management activities and objectives.

www.waterboards.ca.gov/water_issues/programs/stormwater/swmp/ceres_swmp.pdf

City of Riverbank Standard Specifications, Section 7 - Storm Drains (2007)

This document section contains the required City standard design parameters, specifications, and details for storm drain infrastructure built within the public right-of-way within the City.

City of Riverbank Public Works Department

Stanislaus County Standards and Specifications, Chapter 4 - Storm Drainage (2007)

This document chapter contains the required County standard design parameters, specifications, and details for storm drain infrastructure built within, or to be maintained by, the County. Though not directly applicable to development in the City, this is useful for background and reference.

www.stancounty.com/publicworks/pdf/2007_Imp_stand.pdf

Design Standards

The Permit's "Attachment 4" design standards apply to projects that fall into one of the following categories[1]:

Applicable Development Categories
Commercial or Industrial Developments (of 100,000 square feet or more)
Automotive Repair Shops
Retail Gasoline Outlets
Restaurants
Home Subdivisions (with 10 housing units or more)
Parking Lots (5,000 sf or more; or 25 or more parking spaces and potentially exposed to stormwater runoff)

The following must be implemented for all categories:

- **Mitigate peak runoff flow rate.** Post-development peak stormwater discharge rates shall be equal or less than the peak pre-development rates for developments where the increased runoff rate will result in increased potential for downstream erosion.
- **Conserve and create natural areas.** Developments shall incorporate and implement the following items:
  - concentrate development and minimize disturbance of remaining areas;
  - minimize the clearing of native vegetation;
  - maximize trees and vegetation, cluster tree areas, and promote native and/or drought tolerant plants in landscaped areas and parking lot islands; and
  - preserve any riparian areas and wetlands.
- **Minimize stormwater pollutants of concern.** Development must be designed to minimize the discharge of pollutants of concern (POC) to the MEP. The BMPs used must be chosen for the optimal removal of the POC. POC are pollutants that exhibit one or more of the following characteristics:
  - current loadings or historic deposits of the pollutant are impacting the beneficial uses of a receiving water;
  - elevated levels of the pollutant are found in sediments of a receiving water and/or have the potential to bioaccumulate in organisms; or
  - the detectable inputs of the pollutant are at concentrations or loads considered potentially toxic to humans and/or flora and fauna.
- **Protect slopes and channels.** Development must be designed to minimize erosion by:
  - conveying runoff safely from slope tops;
  - stabilizing disturbed slopes;
  - utilizing natural drainages to the MEP;
  - stabilizing permanent channel crossings;
  - vegetating slopes with native or drought tolerant vegetation, as appropriate; and
  - installing energy dissipaters at storm drain outlets.
- **Provide storm drain stenciling and signage.** All inlets and catch basins within a project area should be labeled with standard warnings.
- **Properly design outdoor material and trash storage areas.** Trash and materials stored outdoors that have the potential to contaminate stormwater must be placed in a covered and enclosed structure that averts drainage from surrounding areas and prevents runoff and spillage from leaving.
- **Provide proof of ongoing BMP maintenance.** Permanent BMPs must have a system in place for maintenance, with an inspection at least annually.
- **Incorporate treatment control BMPs for water quality.**[2] Pollutant levels in site stormwater runoff must be mitigated through the use of permanent post-construction treatment control BMPs designed to either a volumetric or flow-based standard. The LID techniques and stormwater BMP design standards contained in this manual are intended address this water quality requirement.

There are additional design provisions, intended to futher reduce the potential for pollutant discharge, that apply to specific development categories. These are outlined in the table below and explained in greater detail in Attachment 4 of the Permit.

Development Category	Additional Design Provisions
Commercial/Industrial	Loading Dock Areas, Repair/Maintenance Bays, Vehicle/Equipment Wash Areas
Auto Repair Shops	Loading Dock Areas, Repair/Maintenance Bays, Vehicle/Equipment Wash Areas, Fueling Areas
Retail Gasoline Outlets	Fueling Areas
Restaurants	Equipment/Accessory Wash Areas
Home Subdivisions	none
Parking Lots	Reduce Impervious Area, Infiltrate Runoff, Limit Oil Contamination

This regulatory basis requiring the implementation of various site design techniques, to which LID is especially well suited, is a foundation for this manual.

1 Multi-family developments are assumed to be captured in the Home Subdivision category and/or the Parking Lots category.

2 Restaurants and retail gasoline outlets that are smaller than 5,000 square feet are excluded from this water quality requirement.

Overview of Low Impact Development (LID)

LID is an approach toward development that seeks to mimic the natural processes occuring on a site while addressing the small, frequent storms which combined produce the majority of a site's runoff.

LID practices can greatly improve stormwater quality by encouraging processes (such as sedimentation, filtration, or evapotranspiration) which reduce the pollutants present in urban and suburban runoff.

Another primary purpose of LID is to preserve a site's pre-development hydrologic pattern by minimizing impervious surfaces, capturing the low-intensity events that contribute to erosion, and providing a measure of control over the larger events, which can cause both erosion and flooding.

LID stormwater managment facilties, referred to as Best Managment Practices (BMPs), are most effective when dispersed throughout a site to address runoff at its source. Draining sidewalks to vegetated filter strips, constructing parking lots with permeable pavement, and outletting roof leaders to the surface of a bioretention area can all provide treatment and attenuation of stormwater flows.

Though there are numerous reasons to implement LID on a site, there are also a variety of constraints that will limit certain practices and inform an ideal design. The site constraints summarized below are discussed in more detail in Section 2, with explanation of how each constraint will influence LID design.

Goals and Benefits

- **Improve water quality.** A primary goal is the protection of downstream receiving water bodies from increased pollutant loads. All BMPs have potential to provide treatment. However, site constraints can hamper this (underground infiltration and permeable pavement, for example, must be able to infiltrate in order to provide acceptable pollutant removal).
- **Attenuate flows.** LID can be very effective at mitigating flooding and erosion issues. The volume of stormwater can be reduced by capturing runoff in retention systems (which drain by infiltration or reuse) and the flowrate and velocity of runoff can be lowered, to varying degrees, by all BMPs.
- **Recharge groundwater.** By increasing pervious area and managing the runoff from impervious area, LID is able to help restore water to the aquifer through infiltration.
- **Reduce potable water consumption.** A central component of LID is an emphasis on water conservation, primarily through the harvesting of rainwater. Utilizing captured water allows a site to address stormwater challenges while also lowering municipal water use.
- **Habitat restoration.** In addition to their hydrological goals, with proper design many BMPs are able to serve as desireable habitat.
- **Improve aesthetics.** Landscape-based stormwater management facilities and preservation of natural areas offer development sites unique opportunities to create an appealing character.
- **Reduction of community infrastructure costs.** Widespread use of LID can serve a community by helping to reduce costs, such as storm drain upsizing, erosion maintenance, and street repairs.

Potential Constraints

- **Impermeable soils.** Sites with high clay content in the native soils typically have low infiltration rates, limiting the use of infiltration practices.
- **Shallow hardpan.** Many areas in Riverbank have a hardpan condition, which is a very dense layer of soil near the surface that is largely impermeable. This will influence the ability to provide infiltration.
- **Shallow groundwater.** Certain areas, especially closer to the river, have a shallow groundwater table which precludes the use of infiltration.
- **Tributary area.** BMPs differ in the amount of drainage needed to function properly. Some are only effective with smaller catchments, while others can handle, or even require, larger upstream areas.
- **Available space.** In areas with existing development, especially dense commercial areas, it can be difficult to fit BMPs into locations receiving drainage.
- **Retrofit capability.** It is often preferred to reuse a site's existing infrastructure, which may affect BMP siting or design. Infiltration practices must have a setback from building foundations and wells.
- **Steep slopes.** Steep terrain can constrain designs due to lack of flat space, issues with infiltration, and the need to keep flows relatively slow and shallow.

Regulatory Considerations

- Facilities should achieve the water quality standard targeting pollutants, especially pollutants of concern.
- Design facilities and lay out sites to promote and conserve natural and vegetated areas.
- Help mitigate potential runoff rate increases and erosive flows through dispersed retention, infiltration, and energy dissipation.

The deployment of BMPs on a site can take many forms, which allows the facilities to integrate with landscaping while still providing optimal stormwater functionality. These examples show bioretention areas within an outdoor courtyard (above left), a vegetated swale and filter strip serving as a buffer for homes (above right), and a rocky swale area meant to be appealing while dry but able to handle infrequent large flows.

2.0
Site Assessment

This section provides a framework for selecting appropriate LID BMPs. Proper site planning and BMP selection involves a comprehensive assessment to evaluate existing conditions, such as hydrology, land use, runoff water quality, topography, and soils.

This site assessment will help to identify and understand constraints that exist at the site that will influence the performance and applicability of different BMP options. The maps and selection matrix included in this section can be used to quickly identify which BMPs are most appropriate for a site. This initial assessment should always be followed up and validated by a detailed site investigation.

Floodplain

Areas within the floodplain (see Figure 4) have a high groundwater table and an increased likelihood for erosion. It is essential that development in this area does not change the ground elevation in a manner that might result in an increased water surface elevation during a flood event.

Development should limit grading and the creation of surface features (such as berms or unreinforced channels) that could be washed-out or substantially eroded in a flood. Surface discharge from BMP facilities should be in the form of dispersed sheet-flow, with point discharges minimized or eliminated.

Groundwater

Groundwater plays a significant role in the hydrologic process, and it is important to promote groundwater recharge, especially in areas with limited rainfall. LID features can facilitate groundwater recharge by promoting rainwater infiltration. Groundwater recharge maintains local water tables, provides base flow to streams and rivers during dry periods, and maintains the integrity of riparian habitats.

It is important to determine the depth to the groundwater table's surface (see Figure 5), as a high groundwater table that is close the surface must be protected from contamination. Infiltration into the subgrade soil of a BMP is not allowed if there is less than 10 feet of separation between the bottom of the BMP and the top of the seasonally high groundwater table. BMPs constructed in areas of high groundwater tables should be installed with an impermeable liner (such as a waterproof membrane or compacted native clay) if their design would promote infiltration.

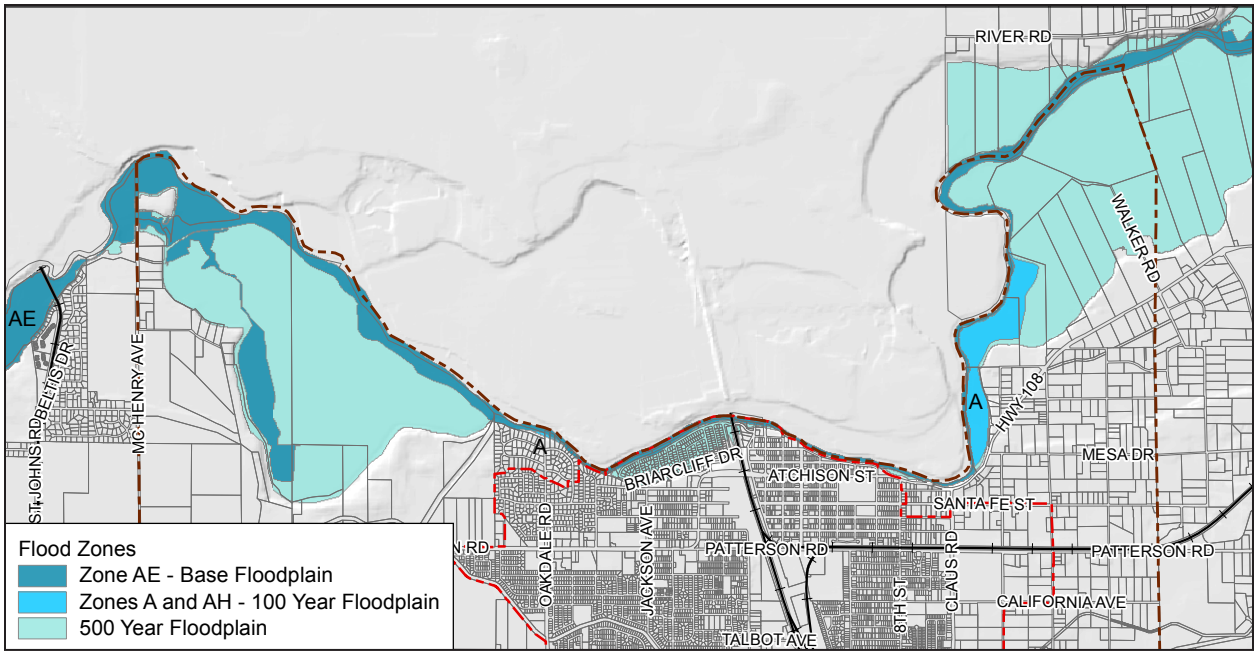


Figure 4: Flood Zones Map (Source: FEMA 2011)

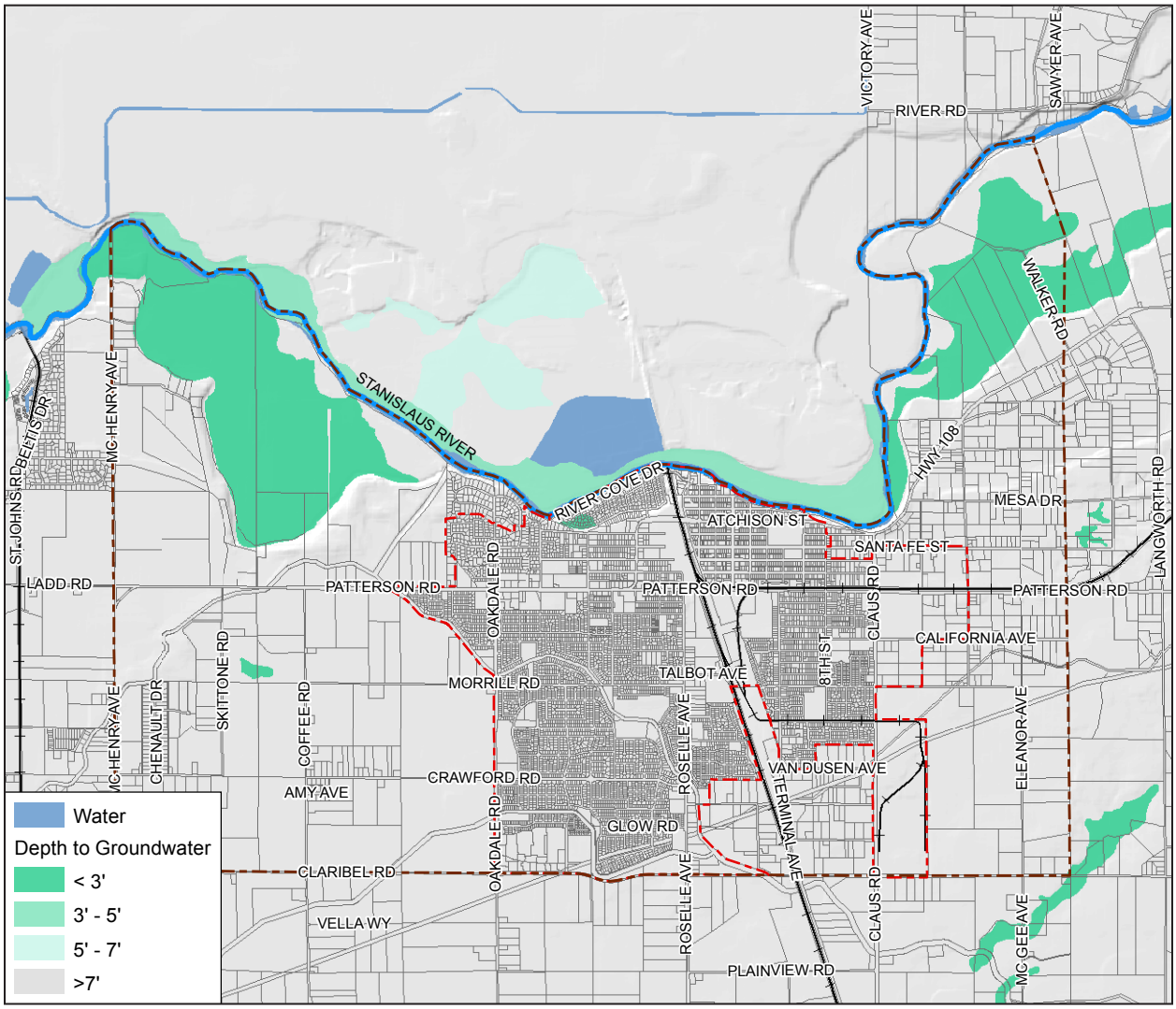


Figure 5: Expected Depth to Groundwater Map (Source: NRCS 2011)

Pollutants of Concern

Urban runoff can transport pollutants, including sediment, oils, metals, fertilizers, pesticides, bacteria, and trash into local surface water bodies, causing impairments.[1] In the region, the Stanislaus River and downstream waters have been impacted by the application of pesticides and fertilizer as well as commercial extraction of natural resources. Specific pollutants of concern include: diazinon, Group A pesticides, and mercury. Urban runoff pollutants are becoming more of a concern as well. These include: organics, organophosphate, nitrogen, selenium, pyrethroids, pathogens, fecal coliform, and PCBs (industrial runoff). General guidance on the effectiveness of BMPs to remove common urban pollutants is included in Appendix B.

Topography

The topography of the site, including site slopes and locations of existing drainages, can impact the effectiveness of BMPs and must be considered. Steeper slopes (from 5%-15%) increase flow velocity (which may cause scour and reduced treatment effectiveness in both receiving or conveying stormwater) and make construction of larger volume facilities more difficult.

Infiltration practices are not recommended adjacent to or within very steep slopes, as water put into the ground could cause slope stability issues. There are very few extremely steep slopes in the Planning Area, mostly adjacent to the river floodplain. Areas at the top of these slopes can be found in the North Residential Area and the Downtown Residential Area.

Soils and Geology

One of the most important components of selecting appropriate LID features is the evaluation of existing soils and geologic conditions to determine soil group, texture, and permeability. Many LID strategies, especially retention BMPs, function optimally when they are able to infiltrate runoff. A minimum infiltration rate of 0.5 in/hr is typically required for infiltration facilities.

As a preliminary assessment, the Hydrologic Soil Group designation assigned by the National Resources Conservation Services (NRCS) to the site soils can be examined (see Figure 7). This rating describes the physical properties of each soil type.[2] Soils of Type A or B are typically better suited for infiltration practices (assuming all other site conditions are met). Soils of Type C or D have low permeability and are more susceptible to clogging and will, therefore, limit the applicability of infiltration. LID projects in areas with these soils should focus on conveyance, detention, and filtration practices and must be designed to drain without relying on infiltration. All potential project locations should have a geotechnical report that yields permeability information for at least 10 feet below the bottom of the proposed improvements.

Hardpan Condition

Infiltration strategies will also be affected by the hardpan condition found throughout much of the Riverbank area (see Figure 8). The hardpan, a thick layer of dense soil found beneath the topsoil layer, is most likely very impervious and will require special design considerations. In locations of hardpan, there exists the possibility to break up the hardpan and install rock wells or other methods to convey treated stormwater below the hardpan layer. The general strategy for considering infiltration within a hardpan area is as follows:

- If the depth to hardpan, as measured from the bottom of the BMP, is greater than 10 feet, infiltration is acceptable.
- If the depth to hardpan is less than 10 feet and the hardpan thickness is 4 feet or less, infiltration is acceptable if soils below the hardpan are well draining and rock well is installed through hardpan.
- If the depth to hardpan is less than 10 feet and the hardpan thickness is greater than 4 feet, infiltration is not acceptable.
- Separation of 10 feet between the bottom of the infiltration BMP or rock well and the groundwater surface elevation is also necessary.

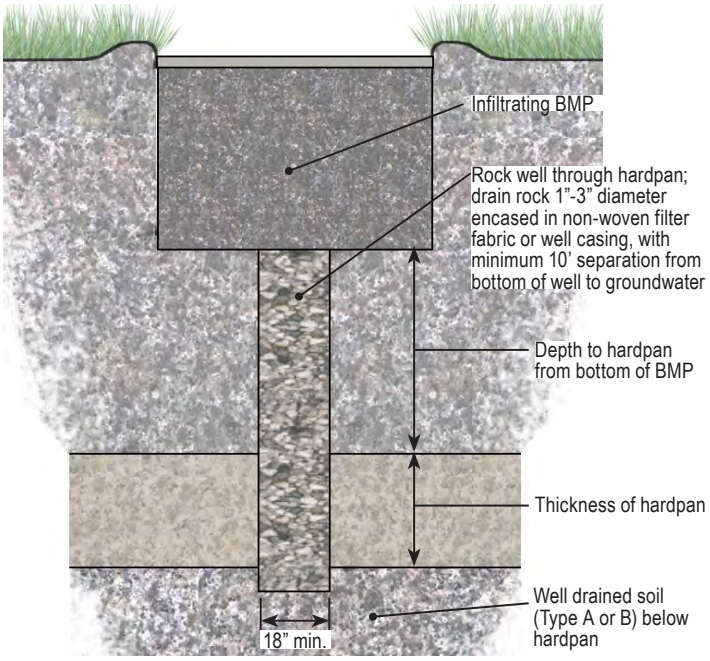


Figure 6: Typical rock well installed beneath an infiltrating BMP in an area with a hardpan layer close to the surface that is less than 4 feet thick.

1 Section 303(d) of the CWA requires that regulatory agencies determine the amount of specific pollutants that can be assimilated by water bodies which do not meet water quality standards. Pollutants must be accounted for from point sources, nonpoint sources, and natural background sources.

2 Soils classified as Group A (gravel, sand, sandy loam) are highly permeable and produce the least surface runoff; Group B soils (silt loam, loam) have good permeability; Group C soils (sandy clay loam) offer fair to poor drainage characteristics; and Group D soils (clay loam, sandy clay, silty clay, clay) have very little infiltration potential and produce the greatest surface runoff.

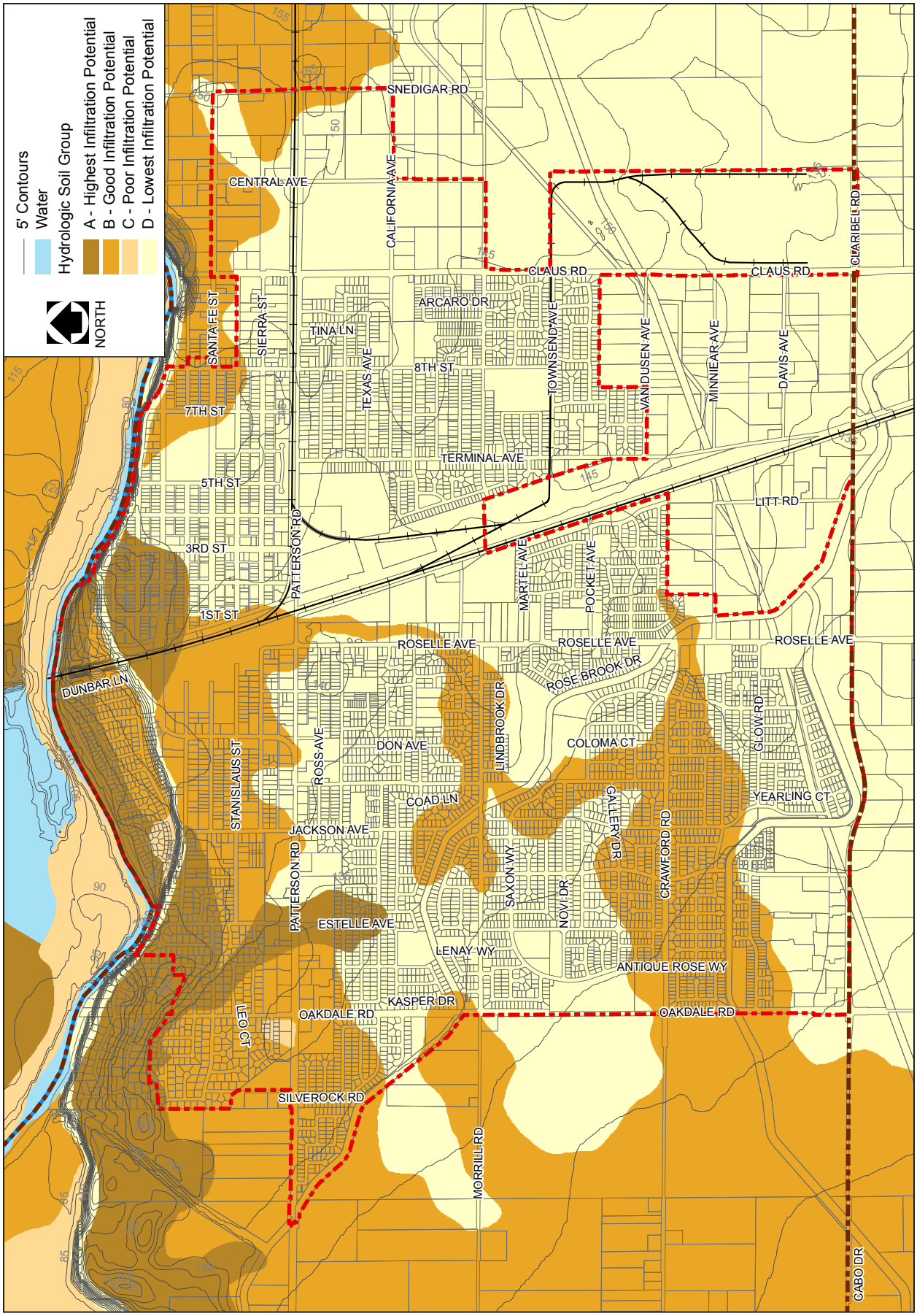


Figure 7: Soils Map (Source: NRCS 2011)
Map of entire Riverbank Planning Area located in Appendix C

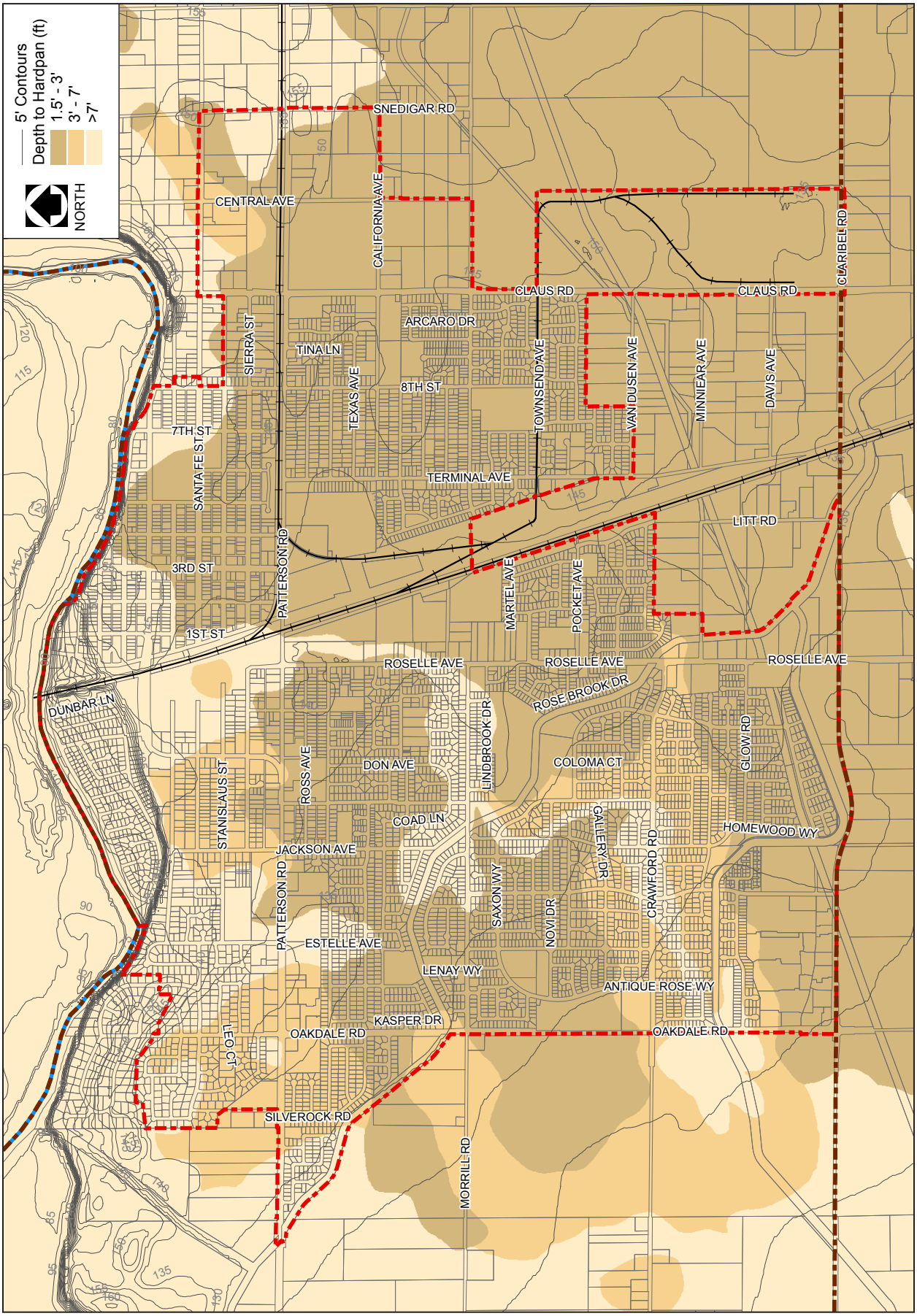


Figure 8: Depth to Hardpan Layer Map (Source: NRCS 2011)
Map of entire Riverbank Planning Area located in Appendix C

Space Limitations

Another factor to consider when selecting BMP features is site configuration and available space. Some BMPs require more surface area than others. Therefore, it is important to evaluate the amount of space available and the best way to balance development goals and stormwater requirements.

If the characteristics of the site allow infiltration, consider piping runoff to underground infiltration systems, which can be located beneath many different surface types, or converting hardscape areas to permeable pavement. These systems can result in very little need to modify the layout or programming of a site, while still providing water management benefits. Similarly, a thin infiltration trench that is long and deep can provide the same function as a detention basin or wetland, only in a much smaller footprint.

Another strategy is to integrate numerous dispersed bioretention area cells into small open spaces on the site and strips of landscaping in the street. By locating many small areas throughout a project, runoff is captured and treated almost immediatly. This allows the runoff to then be routed to existing infrastructure and eliminates the need for a larger facility to handle collected flows.

BMP Selection Matrix

The table below is intended to provide a quick and convenient method of identifying which BMPs are most appropriate for use on a given site. The left-hand column contains a list of questions that identify a possible site constraint. For any question answered “yes” the project should consider the BMPs marked with a green box, with any additional requirements for using a BMP listed within the green box.

For example, consider a site with a high groundwater table (less than 10’ to the bottom of BMPs), steep slopes of around 6%, and Type C soils (but not located in a floodplain, having no hardpan layer, and with adequate space). The BMPs which are appropriate for this location are bioretention areas (if terraced and installed with a liner and underdrain), rainwater harvesting, and green roofs.

Constraint	Underground Infiltration	Bioretention Area	Vegetated Swale	Filter Strip	Vegetated Basin	Constructed Wetland	Permeable Pavement	Rainwater Harvesting	Green Roof
Located in floodplain?									
Less than 10-foot separation to groundwater table?		With liner and underdrain	With liner		With liner		With liner & underdrain (provides no treatment)		
Sited on steep slope (5-15%)?		If terraced	If installed along contour						
Sited on very steep slope (>15%)?									
Soil type C or D?		With underdrain					With underdrain (provides no treatment)		
Less than 10-foot separation to thin (<4') hardpan layer?	With rock well	With underdrain or rock well					With underdrain or rock well		
Less than 10-foot separation to thick (>4') hardpan layer?		With underdrain					With underdrain (provides no treatment)		
Limited space for BMP facilities?			With adequate length						

Figure 9: BMP Selection Matrix

3.0

Stormwater BMP Design

The use of LID techniques can aid in addressing the water quality and hydrologic issues that are typically exacerbated by development. When planning and designing new development and redevelopment the goals of LID and requirements of the MS4 Permit should be incorporated and promoted. These site design goals include:

- conserve natural areas and drainages;
- minimize impervious surfaces, drain to pervious area;
- minimize soil compaction;
- mitigate peak runoff and associated erosion; and
- treat runoff in stormwater BMPs.

There are a number of BMPs recommended for use in the City and surrounding areas. These facilities, along with sizing criteria and design recommendations, are detailed in this section.

BMP Sizing Criteria

Treatment control BMPs, which provide post-construction water quality benefits, are most efficient and economical when they target the frequent, small storm events that produce the majority of annual rainfall. Larger, more intense storms are the basis of design for conveyance and flood control facilities, but there are only marginal improvements to runoff water quality when BMPs are designed to this standard.

The NPDES permit specifies that BMPs for treatment of stormwater pollutants should be sized to either a flow-based or volume-based standard, or both. The permit lists three methods for volume-based sizing and two methods for flow-based sizing, summarized below.

Volume-based BMPs must be sized for:

- The volume of annual runoff based on unit basin storage water quality volume, to achieve 80% or more volume treatment by the method recommended in California Stormwater BMP Handbook (2003); or
- The 85th percentile 24-hour runoff event, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ ASCE Manual of Practice No. 87, (1998); or
- The runoff volume produced from a historical-record based reference 24-hour rainfall criterion for “treatment” that achieves similar pollutant reduction to the 85th percentile 24-hour runoff event.

Flow-based BMPs must be sized for:

- The flow produced from a rain event equal to at least twice the 85th percentile hourly rainfall intensity; or
- The flow that will result in treatment of the same portion of runoff as treated using volume-sizing.

Methods for sizing flow and volume-based BMPs are explained on the following page.

Larger or more complicated projects may benefit from the use of continuous simulation modelling in lieu of these simplified methods; there are numerous software package available which provide this functionality.

Flow-Based Sizing

Flow-based BMPs must be designed to carry or process the runoff resulting from the targeted water quality rainfall under flow conditions that promote treatment (specific to each BMP, but generally low velocity and minimal flow depth). The water quality flow (WQF) is the flow of runoff produced by a rain event equal to twice the 85th percentile hourly rainfall intensity, based on local rainfall data. For the Riverbank area, the 85th percentile hourly rainfall intensity is approximately 0.10 inches per hour[1], resulting in a design rainfall intensity of **0.20 in/hr**.

To calculate the required treatment flow, first determine the size of the drainage area contributing runoff to the BMP and the composite stormwater runoff coefficient[2] for that drainage area. The rational method can then be used to calculate the flow rate:

WQF = C x i x A = 0.20 x C x A

Where:

- WQF = water quality flow (cfs)
- C = composite runoff coefficient for drainage area (unitless)
- i = design rainfall intensity (0.20 in/hr)
- A = drainage area (acres)

1 Based on California State University, Sacramento Office of Water Programs' Basin Sizer, Version 1.45 (2007).

2 Standard runoff coefficients for different land use types can be found in Section 4.3 of the City of Riverbank Storm Drain System Master Plan (2008).

Volume-Based Sizing

Volume-based BMPs must be designed to capture and treat 80 percent or more of the annual runoff volume, determined using the methodology recommended in the CASQA California Stormwater BMP Handbook. The water quality volume (WQV) to which a BMP must be sized is based on the drainage area's unit basin storage volume, determined from local rainfall data and site characteristics. A volume-based BMP must also be designed to release this volume (typically through an orifice or via infiltration) within an acceptable drawdown time (generally 24-48 hours).

To calculate the required treatment capture volume, first determine the size of the drainage area contributing runoff to the BMP and the composite stormwater runoff coefficient for that drainage area. The Unit Basin Storage Volume (UBS) for the drainage area is determined from the sizing curve for 80% capture; find the composite runoff coefficient of the drainage area on the x-axis, follow it up until it intersects the line representing the desired drawdown time, and read the corresponding UBS value from the y-axis. Calculate the treatment volume by multiplying the UBS by the drainage area (convert to more convenient units, such as cubic feet or gallons, for use during design):

WQV = UBS x A

Where:

- WQV = water quality volume
- UBS = Unit Basin Storage Volume (inches)
- A = drainage area (acres)

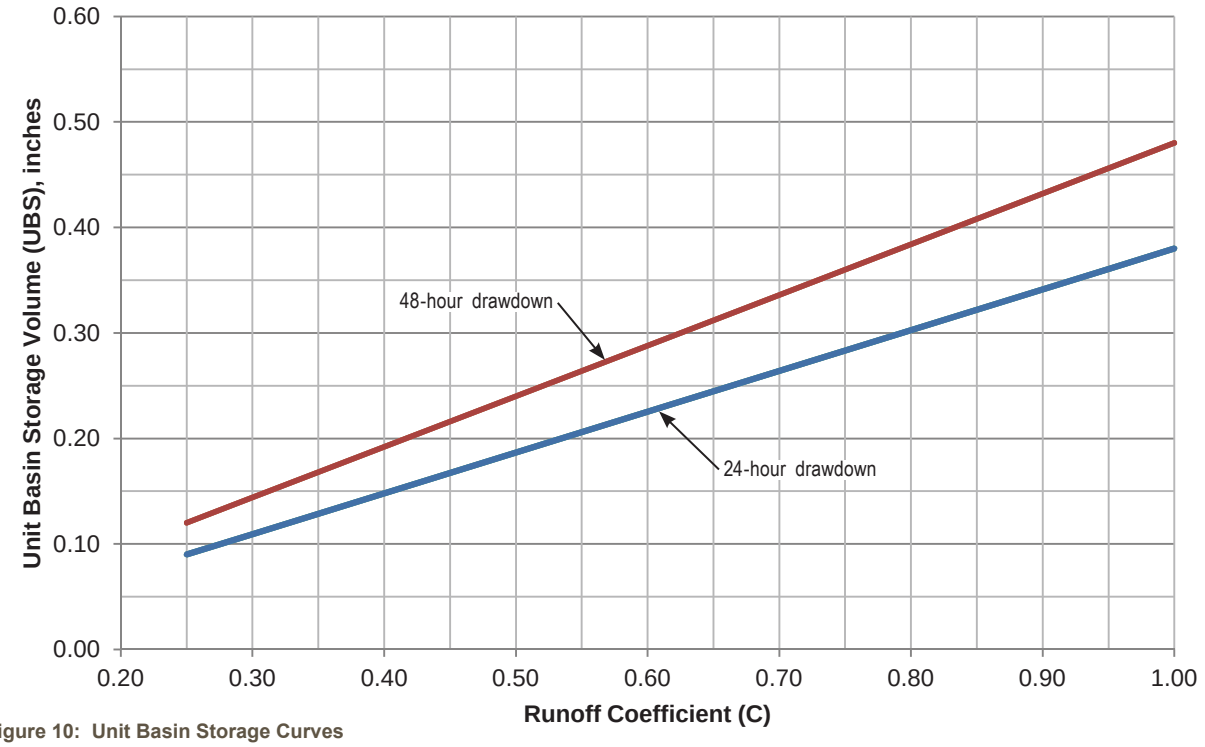


Figure 10: Unit Basin Storage Curves

BMP Fact Sheets

Detailed information on the stormwater facilities recommended for LID design in the Riverbank area are included in the BMP fact sheets which follow. Each fact sheet contains a description of the BMP, a retrofit opportunity example, technical design criteria, plant selection recommendations, and a list of benefits, constraints, and siting applications. This information is intended to aid in selecting, placing, and designing the various BMPs. Some of the BMPs (in particular constructed wetlands, rainwater harvesting systems, and green roofs) will likely require prior experience or more detailed guidance to develop a design appropriate for construction.

BMP	Sizing Method	Other Sizing Criteria
Underground Infiltration	WQV	Drawdown time
Bioretention Area	WQV or WQF	Drawdown time
Vegetated Swale	WQF	Residence time, flow speed, flow depth
Filter Strip	WQF	Flow speed, flow depth, tributary width
Vegetated Basin	WQV	Drawdown time
Constructed Wetland	WQV	Drawdown time
Permeable Pavement	WQV	Drawdown time
Rainwater Harvesting	WQV	Drawdown time
Green Roof	WQF	Roof-based system

Sediment Forebay

Stormwater treatment facilities, especially those designed to treat catchment areas that are larger or have higher anticipated pollutant loads, benefit from pretreatment. One simple and effective pretreatment component is a sediment forebay, which helps prevent clogging of BMPs, eases maintenance requirements (such as easier cleanup of collected trash and debris), and can also be used to provide peak flow storage. A sediment forebay is a small basin located at the incoming discharge point or just upstream of a BMP. The forebay allows sediment to settle out and trash/debris to collect prior to runoff reaching the primary treatment area.

Tree-well Filter

Tree-well filters are systems which utilize one or more precast concrete chambers filled with engineered bioretention media. Stormwater is directed into the chambers and receives treatment as it flows through the filter media and then is collected and released by a perforated pipe. Proprietary systems are available which are designed for efficient pollutant removal at high flow rates and thus have a relatively small footprint compared to other LID facilities. Their unique attributes make tree-well filters suitable to almost any site, however, City approval must be obtained in order to utilize these devices.

Note: Image courtesy of Filterra Bioretention Systems. Proprietary systems are included for representative purposes only and are not an endorsement of any specific product.

BMP Selection Guide

There are three major goals to managing stormwater on-site: (1) to *improve the quality* through treatment; (2) to *reduce the quantity* through retention (permanently stays on-site); and (3) to *reduce the peak flow* through retention or detention (temporarily stays on-site).

An ideal site design would utilize BMPs that provide all three. The BMPs would not only improve the quality of the storm water through treatment, but also reduce the quantity and peak flow by permanently retaining the storm water on-site through infiltration or reuse. Due to site constraints, this is not always feasible. See the BMP Selection Matrix and Infiltration Feasibility section for more details. The most constrained sites will only improve the quality and reduce the peak flow through treatment and detention. The table below is provided as a guide to determine what mechanisms each BMP provides.

Treatment + Retention	Treatment + Detention	Treatment [3]
• Bioretention w/o underdrains [1]	• Bioretention w/ underdrains	• Vegetated Swale
• Permeable Pavement w/o underdrains [1]	• Permeable Pavement w/ underdrains	• Filter Strip
• Vegetated Basin [1]	• Vegetated Basin w/ liner	
• Underground Infiltration [1]	• Green Roof [2]	
• Constructed Wetlands [1, 2]		
• Rainwater Harvesting [2]		

1 These BMPs require infiltration, see section on Infiltration Feasibility.

2 Careful consideration should be given to the higher design, implementation, and maintenance costs of these BMPs.

3 Though some infiltration may occur within these flow-based systems, they do not significantly reduce the total volume. However, they are good options for reducing the peak velocity of stormwater.

Infiltration Feasibility

Typically, the preferred method of draining any stormwater BMP is through infiltration to the underlying subgrade soils. This allows for maximum treatment ability, groundwater recharge, and reductions in stormwater volume. Infiltration is not always possible though, as there are a variety of site constraints that can impede or prohibit the implementation of this function.

The table below summarizes the general parameters a site must meet in order for infiltration to be used and/or relied upon as a treatment or discharge method. More explanation of these contraints can be found in Section 2, and information on design considerations can be found in the BMP Fact Sheets which follow.

Site Constraint	Acceptable Condition
Hydrologic Soil Group	Type A or B
Soil infiltration rate	0.5 in/hr minimun
Slope	Less than 5% [2]
Separation from hardpan layer [1]	10-foot minimum (no minimum for thin hardpan with rock well installed through to underlying soils)
Separation from groundwater table [1, 2]	10-foot minimum
Setback from buildings foundations [2]	10-foot minimum
Setback from drinking water wells [2]	100-foot minimum
Soil or groundwater contamination [2]	Not allowed

1 The acceptable 10' separation is based on a statewide standard and is a conservative criteria to minimize risk. Available information from NRCS does not provide any resolution of hardpan and groundwater data for depths greater than about seven feet, therefore geotechnical investigation will be necessary to determine actual depth.

2 BMPs with less than the minimum separation to groundwater, setback to foundations and wells, or in contaminated soils must be lined with an impermeable liner to protect those elements. Other constraints generally require the installation of an underdrain or orifice for primary drawdown of captured stormwater.

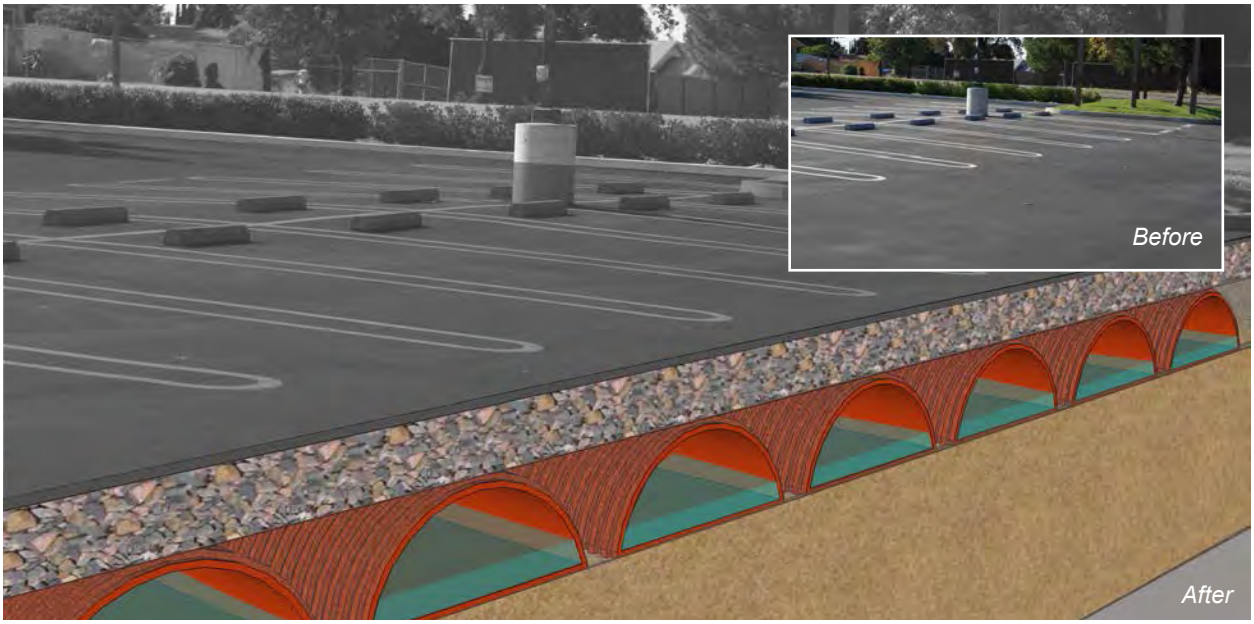
3 Specific site conditions or well developed designs will present exceptions to this. For example, terraced bioretention designs can accomodate slopes up to 15%.

UNDERGROUND INFILTRATION

These systems can take different forms but provide identical function: controlled discharge of stormwater through infiltration. The primary pollutant removal mechanism of this practice is filtering through the native soil. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff from upstream areas. A dry well is a small rock-filled pit that usually receives runoff from rooftops or other impervious areas with low sediment loading. Water is stored in the void space between the stones and percolates through the underlying soil matrix. If high sediment loads are expected, pretreatment is desirable to reduce the maintenance burden.

Underground infiltration systems can be integrated into a site to enhance and diversify the landscaping, in addition to providing stormwater improvements.

Retrofit Opportunities



Benefits

- Reduces runoff volume and attenuates peak flows
- Improves water quality - good for removing fine sediment and adsorbed pollutants
- Enhances groundwater recharge and contributes to stream base flow
- Minimal surface space requirements; located underground and thus visually unobtrusive
- Low construction and maintenance costs

Potential Constraints

- Requires permeable subgrade soils, not recommended for impermeable soil Types C or D
- Requires groundwater separation
- Contributing area should generally be less than 5 acres
- Not suitable on fill sites, steep slopes, contaminated soils, industrial sites, or sites where spills are likely to occur
- May encounter siting challenges in urban retrofit areas due to foundation setback and poor soil conditions

Siting Applications

- Mixed-use and commercial
- Roads and parking lots
- Parks and open spaces
- Single and multi-family residential

Technical Information

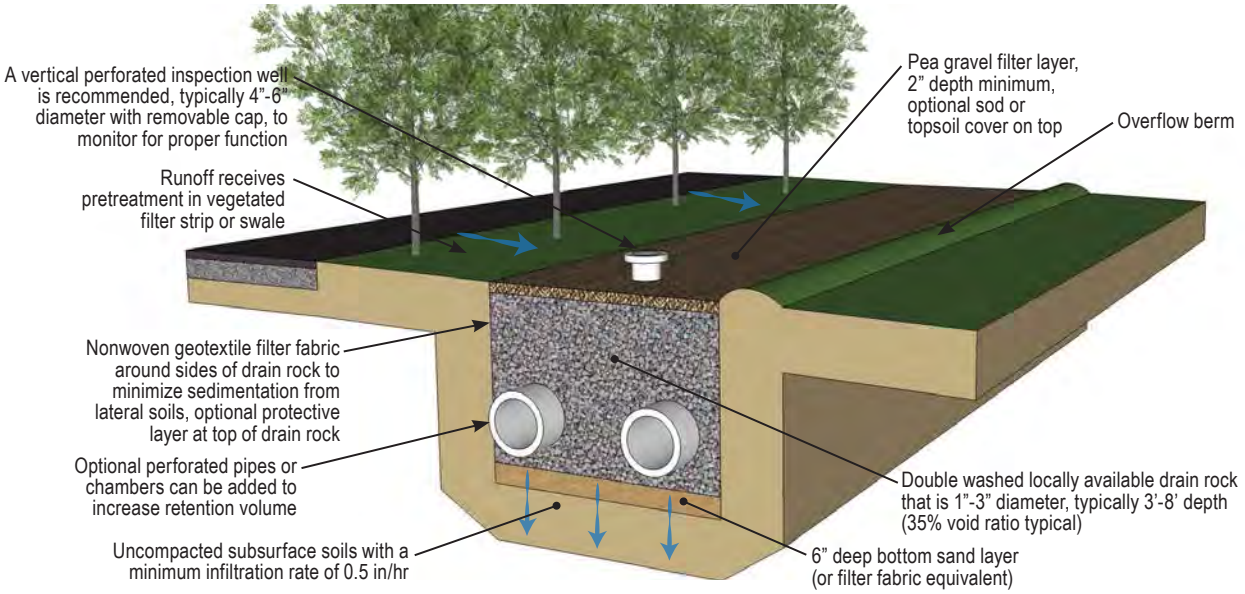


Figure: Infiltration trench typical detail

Design & Sizing Criteria

- Infiltration facilities are volume-based systems sized to capture the WQV within the void space of the storage layer and should infiltrate all stored runoff into the subsoils within a maximum 72 hour drawdown time.
- Requires a minimum subgrade soil infiltration rate of 0.5 in/hr minimum. If soil infiltration rates exceed 2.5 in/hr, runoff should be fully treated (with one or more upstream BMPs) prior to infiltration to protect groundwater quality.
- Requires a 10 foot minimum separation from the bottom of the facility to the seasonally high groundwater elevation.
- Should be placed a minimum of 10 feet from building foundations and 100 feet from drinking water wells.
- Should be installed with a flat bottom to promote uniform infiltration.
- To help prevent clogging and ease maintenance, it is important to provide upstream pretreatment (using filter strips, swales, forebays, or manhole sumps) to remove coarse sediment, particles, and oils.
- If possible, system should be designed to avoid classification as a Class V injection well, which requires submission of an inventory form to the EPA. A Class V injection well is deeper than it is wide.
- If infiltration is not possible, can be installed with an orifice to provide flow and volume control functions without any water quality treatment.

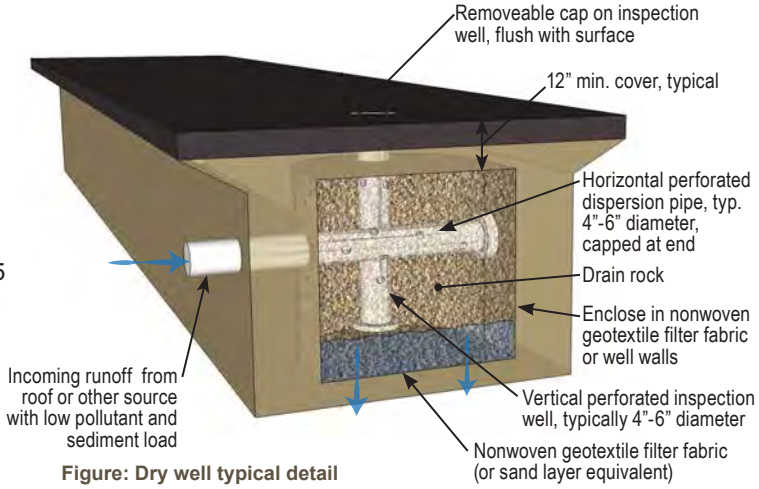


Figure: Dry well typical detail

Proprietary Systems

There are many retention systems designed to maximize subsurface capture volume and that include components for pretreatment and flow control.

Cudo Cubes are an example of a typical modular block system.

Triton stormwater chambers are a typical semi-circular linked chamber system.

Note: Proprietary systems are included for representative purposes only and are not an endorsement of any specific product.

BIORETENTION AREA

Bioretention areas are shallow, landscaped areas that receive and treat stormwater. Runoff is allowed to pond on the surface of the bioretention area, typically less than a foot deep, where it can then filter through a vegetative layer and engineered soil media to remove sediment and pollutants. In locations of well drained subsoils, the water may then infiltrate into the subgrade. At sites or locations that will not allow for infiltration, flow-through systems are required; underdrains are installed beneath the planting soil to drain the facility and release the treated water to a conveyance feature or storm drain system. Bioretention areas are very versatile facilities that can fit a wide range of settings.

Bioretention areas are among the most common LID techniques implemented, often in highly visible locations, and can be a valuable educational opportunity especially if signage is installed illustrating function, intent, or native plants.

Retrofit Opportunities

Benefits

- Applicable to a wide range of sites and layout, easily integrated into urban retrofit projects
- Provides reliable water quality function and facilitates evapotranspiration
- Attenuates peak flows; reduces runoff volume and recharges groundwater when infiltration possible
- Provides greening and reduces heat island effect in urban areas
- Provides aesthetic amenity and creates habitat

Potential Constraints

- Infiltration design requires sufficiently permeable soils, depth to groundwater/hardpan; underdrain system increases cost and infrastructure
- Vegetation requires maintenance
- Maintaining desired aesthetics may require dry season irrigation
- Should not receive more than about 1 acre of runoff; divide larger watersheds among dispersed cells

Siting Applications

- Residential yards
- Office and commercial storefronts
- Roadway medians, bulb-outs, and traffic circles
- Parking lot islands, cul-de-sacs
- Parks and other landscaped areas

Other Names: Raingarden, Bioretention Cell, Bioretention Swale, Dry Swale, Flow-Through Planter

Technical Information

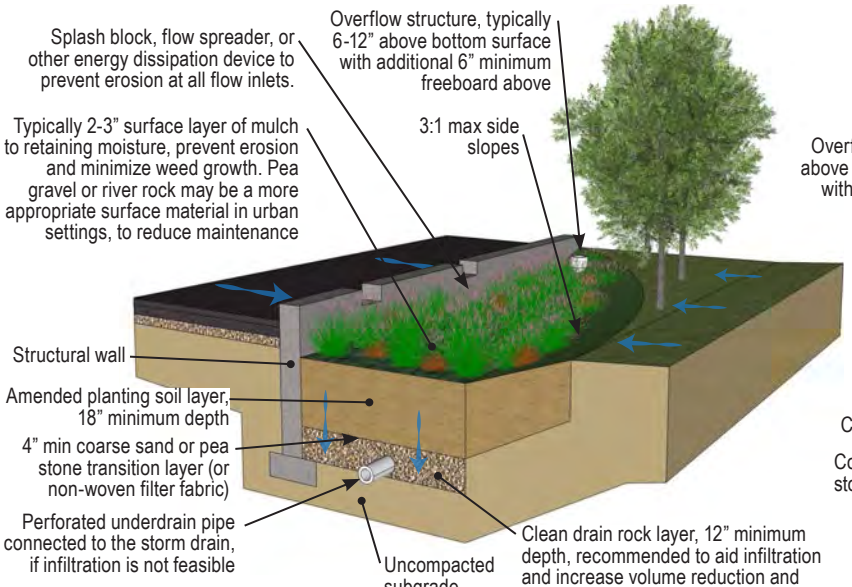


Figure: Bioretention area detail, showing hard edge and soft edge

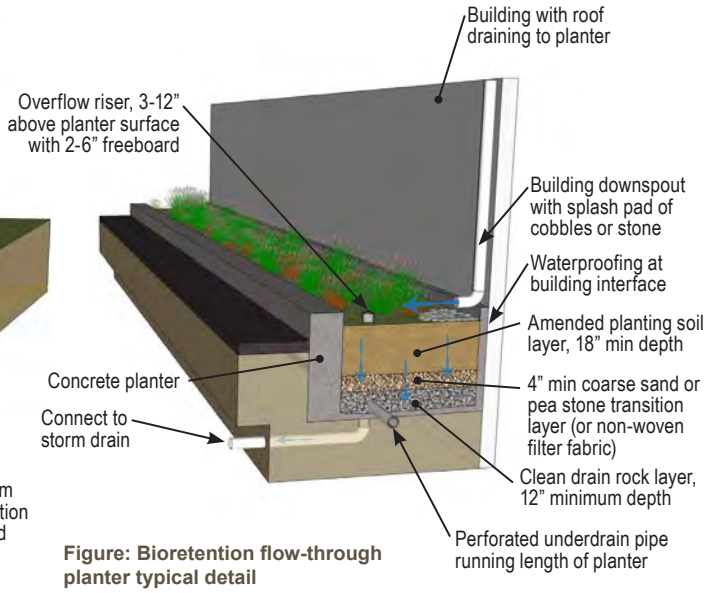


Figure: Bioretention flow-through planter typical detail

Design & Sizing Criteria

- Bioretention areas can be sized as either volume-based or flow-based systems (or a combination).
- Volume-based systems are sized to capture the WQV within the surface ponding area and void space of the drain rock storage layer and should release all captured runoff within a maximum 48 hour drawdown time (either by subgrade infiltration or through an underdrain).
- Flow-based systems are sized to percolate the WQF through the bottom of the facility. The surface area of the system multiplied by the infiltration rate of the planting media (which should be considered as 5 in/hr for design) must equal or exceed the WQF. The subgrade infiltration rate must be high enough to process this flow as well, or an underdrain is necessary.
- Reliance on subgrade infiltration requires a minimum soil infiltration rate of 0.5 in/hr, in addition to the above requirements. Within impermeable soils (Type C and D), an underdrain should be installed.
- If the separation from the bottom of the facility to the seasonally high groundwater elevation is less than 10 feet then an underdrain should be installed, with an impermeable liner placed beneath all system media.
- Infiltrating bioretention systems should be placed a minimum of 10 feet from building foundations and 100 feet from drinking water wells.
- Pretreatment (vegetated buffer strip, swale, sediment forebay) can improve function and ease maintenance.
- Runoff from storms larger than the water quality event are ideally diverted to the storm drain system.

Plant Selection *(See Appendix A)*

Plants should be suitable for periods of inundation during the rainy season. Vegetation should be drought-tolerant, especially at the edges, but may require irrigation during initial establishment or dry periods. Trees require more intensive maintenance, and may show limited growth.


Blue eyed grass


Desert baccharis


California rose


San Diego sedge

VEGETATED SWALE

Vegetated swales are shallow stormwater conveyance channels with vegetation covering the side slopes and bottom. Treatment occurs as runoff flows through the vegetation and infiltrates into the soil matrix. Swales can be designed as part of the stormwater conveyance system and can eliminate the need for some curbs, gutters and storm drains. They are also well suited to treat runoff from roads and highways because of their linear nature. The treatment effectiveness is correlated to the residence time of the runoff in the swale, and therefore, flow-based swales tend to be considerably longer than other types of treatment BMPs.

Vegetated swales, such as this installed in a parking lot, can both treat and convey runoff, eliminating the need for some catch basins and pipes.

Retrofit Opportunities

Benefits

- Can convey stormwater, including within street right-of-way
- Low installation and maintenances costs
- Reduces peak flows and velocity compared to concrete or piped conveyance
- Improves water quality, depending on site constraints, by removing sediment, suspended solids, and trace metals
- Vegetation provides aesthetic benefit and reduces the heat island effect in urban areas

Potential Constraints

- Larger space requirements than traditional conveyance methods
- Requires regular vegetative maintenance and trash removal
- Can be difficult to locate in retrofit applications
- Not suitable for areas with steep slopes or highly erodible soils
- Limited to relatively small drainage areas, generally less than 5 acres
- Limited volume reduction and peak flow attenuation, unless designed with check dams

Siting Applications

- Road shoulders and medians
- Parking lot islands
- Commercial, industrial, and residential developments
- Open space and parks

Other Names: Treatment Swale, Grassy Swale, Rock-lined Swale, Bioswale

Technical Information

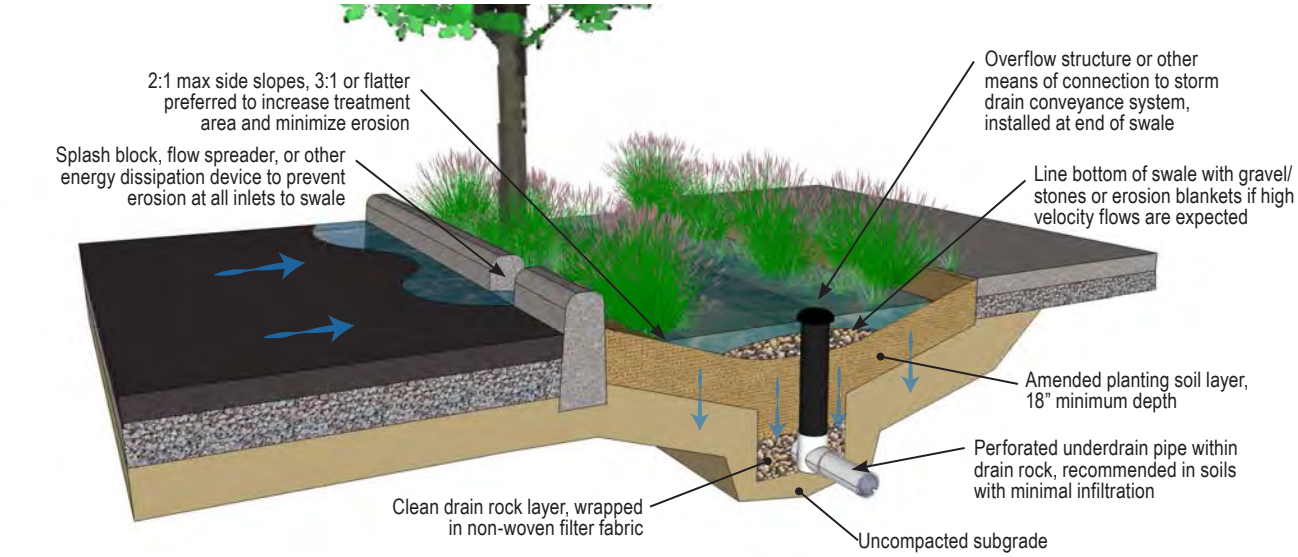


Figure: Vegetated swale typical detail

Design & Sizing Criteria

- Swales are flow-based systems sized to convey the WQF at a flow velocity not exceeding 1 foot per second and maximum water depth not exceeding the lesser of 6 inches or 2/3 of the vegetation height.
- Swales must provide a minimum of 10 minutes of stormwater residence time for pollutant removal, with a minimum length of 100 feet.
- The preferred longitudinal slope is 1-2% to limit flow velocity. Check dams placed across the flow path can promote additional infiltration and flow reduction, and should be used for longitudinal slopes exceeding 5%.
- Swales should generally have a trapezoidal or parabolic shape to promote even flow across the whole width of the swale. The bottom width should be between 2 and 10 feet.
- A dense and well maintained vegetative cover on the swale bottom and side slopes filters pollutants out of runoff and helps reduce flow velocities and protect the swale from erosion. Stones or gravel may also be used on the bottom to protect against erosion.
- Vegetated swales that are primarily designed to detain runoff (behind check dams or due to layout) should be considered bioretention facilities and designed accordingly.
- Most effective on soils that allow infiltration. In impermeable soils, installing well-drained planting media with an underdrain beneath is recommended.

Plant Selection *(See Appendix A)*

Riverbank receives little precipitation and has a long dry period in the summer, so flow will be irregular and plants must be chosen accordingly. Periodically the swale will experience high flows and plants should be chosen with well established roots to protect against erosion, and the ability to withstand inundation.


Purple needle grass


Hummingbird trumpet


Bush monkey flower


Western meadow sedge

FILTER STRIP

Filter strips are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces. Filter strips function by slowing runoff velocities and allowing sediment and other pollutants to settle and by providing some infiltration into underlying soils. Filter strips are most effective when runoff passes over the filter surface as shallow, uniform sheet flow. They can suffer erosion and lack of treatment if exposed to concentrated flows. They are well suited to treat runoff from adjacent roads or small parking areas and are good for use as vegetated buffers between developed areas and natural drainages.

Filter strips can be as simple as a gentle slope covered in grass that receives runoff from an adjacent strip of parking stalls.

Retrofit Opportunities

Benefits

- Low construction cost and minimal maintenance requirements (generally just erosion prevention and mowing)
- Can provide reliable water quality benefits if properly designed, vegetated, and maintained
- Good for roadside shoulders and landscape buffers when slope and length criteria are met
- Simple, aesthetically pleasing landscape feature
- Easy to customize to varying site conditions

Potential Constraints

- Not appropriate for industrial sites or locations where spills may occur
- Limited ability to treat large drainage areas
- Water quality benefits severely limited without adequate filter length and flow characteristics
- Does not provide significant stormwater volume reduction
- Only minor reduction in flow rate, especially during larger storms
- May require dry season irrigation

Siting Applications

- Roads and highway shoulders
- Small parking lots
- Residential, commercial, or institutional landscaping
- Pretreatment component for subsequent BMP

Technical Information

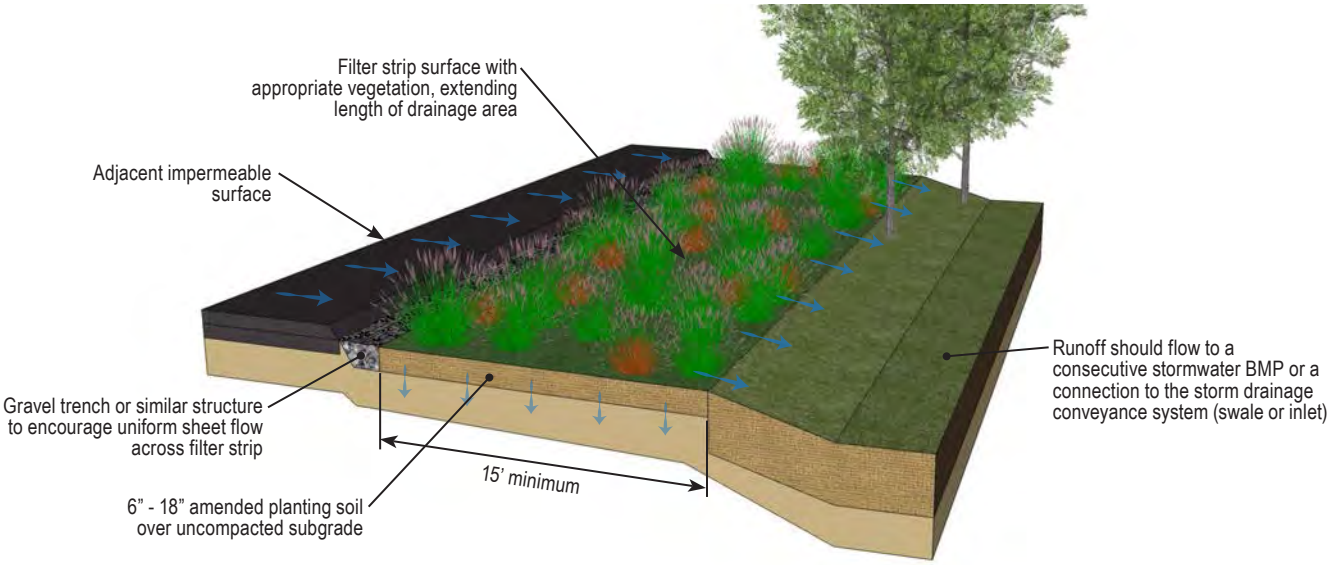


Figure: Filter strip typical detail

Design & Sizing Criteria

- Filter strips are flow-based systems designed to convey the WQF across the vegetated surface at a flow velocity not exceeding 1 foot per second and maximum water depth not exceeding 1 inch.
- Should be at least 15 feet wide and preferably 25 feet wide (in the direction of flow) to provide adequate water quality treatment.
- Filter strips are considered effective at treating contributing impervious surface widths up to twice the width of the vegetated strip. The maximum length (in the direction of flow towards the filter strip) of the contributing tributary area should be 60 feet.
- Should be immediately adjacent to, and extend the full length of, the contributing drainage area.
- Ideal cross-slope is between 2% and 6% to avoid ponding (at low slopes) and concentrated flows (at high slopes). Slopes up to 15% may be acceptable with proper design and careful maintenance, but are generally not recommended.
- If the cross-slope is less than 0.50%, or if the underlying soil infiltration rate is less than 0.5 in/hr, consider an underdrain system to facilitate drainage.
- Requires shallow, evenly-distributed sheet flow across the entire width of the strip. Level slopes perpendicular to the direction of flow are required to achieve sheet flow.
- A level spreading feature such as a gravel trench may help promote sheet flow, however if used it must be carefully maintained.

Plant Selection *(See Appendix A)*

The filter area should be densely vegetated with native grasses, shrubs, and trees that effectively bind the soil. The thicker and more uniform the plant cover, the greater the stormwater management benefits.


California encelia


Wild rye


California sagebrush


San Diego sedge

VEGETATED BASIN

Vegetated basins are temporary holding areas for stormwater that capture and detain flows from a water quality design storm for some minimum time (e.g. 48 hours) to allow particles and associated pollutants to settle. They are typically designed with an outlet structure that slowly releases the water requiring treatment via a small orifice and allows controlled routing of larger events. Water quality drawdown can be achieved through infiltration, if site conditions will allow. Stormwater collected in vegetated basins can be re-used for landscape irrigation, and basins can also be used to provide flood control by including additional flood detention storage.

Basins that are thoughtfully designed and planted can manage stormwater from a larger area, while still offering aesthetic appeal.

Retrofit Opportunities

Benefits

- Relatively low construction and maintenance costs
- Highly effective at attenuating peak flows, can reduce runoff volumes with infiltration or reuse
- Improves water quality by removing particulate matter, sediment, trash, and debris
- Suitable for sites where infiltration is poor or not an option
- Suitable for large drainage areas
- Multi-purpose detention ponds can provide open space, habitat, and aesthetic amenity

Potential Constraints

- Limitations of the release orifice may not allow use of detention in watersheds of less than 5 acres (would require an orifice with a diameter of less than 0.5 inches that would be prone to clogging)
- Only moderate pollutant removal, compared to some other BMPs and ineffective at removing soluble pollutants
- May exhibit undesireable aesthetics due to dry, bare areas and inlet and outlet structures
- Site must have no risk of land slippage if soils are saturated

Siting Applications

- Parks, open spaces, and golf courses
- Commercial, industrial, or residential developments
- Regional detention & treatment

Design Variation

A basin designed with a permanent pool is commonly referred to as a wet pond; additional treatment and amenity benefits can be realized by the body of water, along with maintenance and the need for base flow or supplemental water.

Other Names: Detention Basin, Extended Detention Basin, Detention Pond, Dry Pond, Wet Pond

Technical Information

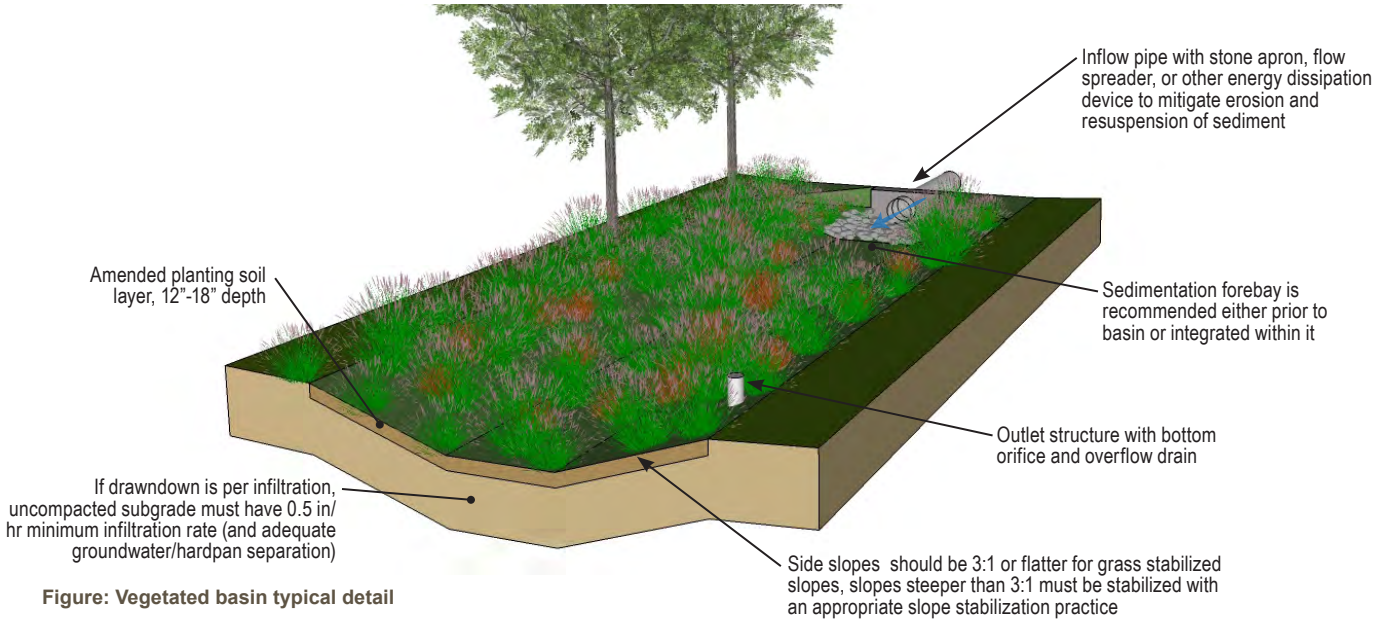


Figure: Vegetated basin typical detail

Design & Sizing Criteria

- Vegetated basins are volume-based systems sized to capture the WQV and discharge it within a typical 48 hour drawdown time, with no more than 50% of the total volume draining in the first 16 hours.
- Longer drawdown times may result in vector breeding, and should be used only after coordination with local vector control authorities. Shorter times should be limited to BMP drainage areas with coarse soils that readily settle or where infiltration is responsible for the majority of drawdown.
- A length to width ratio of at least 1.5:1 (and ideally 3:1) is recommended for greatest treatment capability (due to a longer flow path).
- A reinforced channel from inlet to outlet can be included to convey low flows through the basin.
- Maintenance can be reduced if runoff passes through upstream filtration BMPs or a sedimentation forebay prior to entering the basin.
- Outlet structure(s) include an orifice (and/or infiltration) for drawdown, an overflow drain for storms greater than the design storm, and an emergency spillway/drain for large flood events.
- If the separation from the bottom of the facility to the seasonally high groundwater elevation is less than 10 feet the facility should be lined with impermeable liner (compacted native clay or geomembrane).
- If sufficient space is available, a vegetated buffer around the pond can be used to slow overland runoff entering via the side slopes, help prevent access to the pond if desired, and provide an aesthetic and habitat amenity.

Plant Selection *(See Appendix A)*

Vegetation within the detention zone (up to the elevation of the design storm) increases pollutant removal and decrease resuspension of accumulated sediment. Vegetated detention basins have greater pollutant removal than concrete basins.


Sweet bay


Four wing saltbush


Chuparosa


Blue grama

CONSTRUCTED WETLAND

Constructed wetlands are man-made systems that typically have multiple shallow permanent pools of water at varying depths, incorporating both emergent wetland plants and open water areas. Though possessing less biodiversity than natural wetlands, they still offer significant habitat enhancement and aesthetic value while being optimized for stormwater treatment. These facilities are among the most effective at removing pollutants from stormwater. Constructed wetlands provide water quality benefits through settling, microbial transformation, and plant uptake. Treatment primarily occurs in the root zone and soil media, where nutrients and dissolved pollutants are removed.

Though more technically complex, constructed wetlands have the potential to provide the most water quality improvements of any naturalized system.

Retrofit Opportunities

Benefits

- Effective at removing a broad spectrum of stormwater pollutants
- Reduces stormwater peak flows
- Provides substantial habitat
- Attractive landscape feature, well suited as an open-space amenity
- Good in areas unsuitable for infiltration or with high groundwater table
- Easily customizable to various sizes and dimensions, based on site, budget, and design intent

Potential Constraints

- Occupies relatively large area
- Standing water may represent safety concern
- Mosquito breeding is likely to occur, requiring vector control
- Cannot be placed on steep or unstable slopes
- Base flow or supplemental water source needed in dry season if water level is to be maintained
- Possible aesthetic concerns related to vegetation appearing dead or unkempt in winter and summer

Siting Applications

- Parks, open spaces, and golf courses
- Commercial, industrial, or residential developments
- Regional detention & treatment

Design Variation

A subsurface flow wetland has no open water and runoff is directed beneath the surface through a planted substrate. They generally require less surface area and have fewer vector issues, but may be more expensive to construct and maintain.

Technical Information

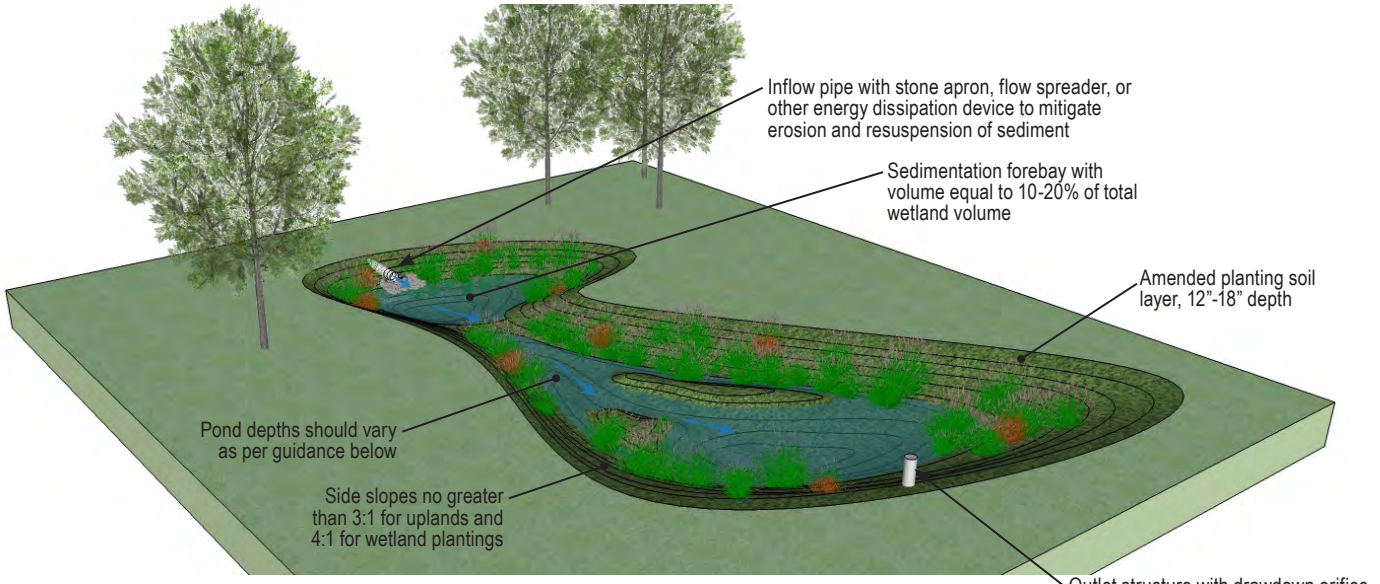
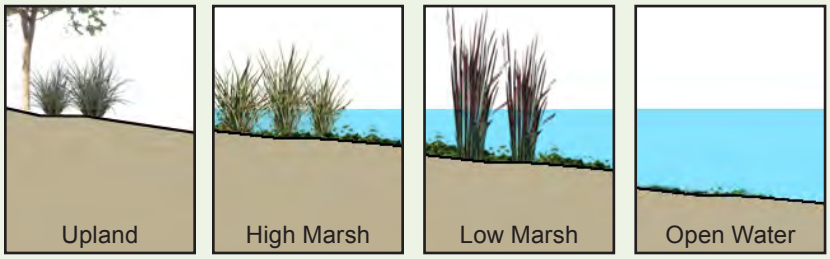


Figure: Constructed wetland typical detail

Design & Sizing Criteria

- Constructed wetlands are volume-based systems sized to capture the WQV and discharge it from the outlet within 24 hours.
- The health of wetland vegetation is integral to the ability of stormwater wetlands to improve water quality. Wetlands should have zones of both very shallow (less than 6 inches) and moderately shallow (6 to 18 inches) standing water to maintain both vegetated and open water areas, with maximum depths of about 5 feet.
- To enhance pollutant removal, wetlands should feature “complex microtopography” in which the underwater surface varies in elevation to increase the length of flow paths for runoff.
- The minimum length to width ratio should be 2:1 though 4:1 is preferred.
- Open water should be occupy 25-50% of the surface.
- Pretreatment, which occurs via settling in a forebay, will greatly aid the function of constructed wetlands. Additional upstream BMPs may also be used to enhance treatment effectiveness.
- Stormwater wetlands require sufficient drainage to maintain a permanent pool, typically at least 5 acres.
- In areas with well draining soils (Type A or B) an impermeable liner may be necessary to maintain standing water.
- Wetlands may intersect the groundwater table, which will help maintain the permanent pool. This should be avoided in areas where stormwater or the groundwater may be contaminated. In these areas, an impermeable liner should be utilized.

Constructed Wetland Zones



Upland	High Marsh	Low Marsh	Open Water
• Edge & small islands	*• Water depth ≤6”*	*• Water depth 6”-18”*	*• Water depth ≤5’*
• 3:1 max side slope	*• 4:1 max side slope*	*• 5:1 max side slope*	*• 25-50% of total area*
• Inundated by runoff	*• May dry in summer*	*• Emergent plants*	

Plant Selection

Wetlands, with their variety of water depths and topography, will require a more diverse and extensive plant palette than other BMPs. Most locations will require plants suitable for prolonged standing water and, due to the permament pool, it is also acceptable to use plants with higher irrigation demand.

PERMEABLE PAVEMENT

Permeable pavement refers to any porous, load-bearing surface that allows runoff to pass through the surface layer and be temporarily stored in a drain rock layer. Ideally, site conditions will allow the subsurface storage layer to drain by infiltration into the subsoils. The permeable pavement system itself will provide some water quality benefits by filtering sediments and some other pollutants, but primarily will reduce peak flows due to detention in the rock layer. Infiltration functions as the primary mechanism for water treatment and volume reduction. Systems which use underdrains will not provide these benefits. When properly constructed, pervious pavements are durable, low maintenance, and have a low life-cycle cost.

Since they replace traditional hard surfaces, permeable pavement is easily integrated into developed areas. The wide variety of surface types provide diverse options for either matching or enhancing the character of an existing site.

Retrofit Opportunities

Benefits

- Assists in attenuating peak flows
- Reduces runoff volume and facilitates groundwater recharge (infiltration-based systems only)
- Easily integrated into existing infrastructure and retrofits
- Reduces the heat island effect
- Can be used as a design element to provide aesthetic benefits
- Construction costs can be equivalent to conventional paving
- Can reduce the need for curbing and storm sewers

Potential Constraints

- Not recommended for roads with high-speed traffic or frequent turning
- Maintenance costs are greater than for conventional paving
- Will require additional maintenance when exposed to regular high-volume traffic
- Storage and infiltration are only effective on relatively flat sites with slopes less than 5%, as level subgrade must be achieved
- Likely not effective as a treatment method if infiltration to the subgrade is not an option

Siting Applications

- Parking lots or parallel parking strips
- Driveways and low traffic roads
- Sidewalks and pathways
- Golf cart paths
- Park hardscape
- Plazas, patios, or terraces

Technical Information

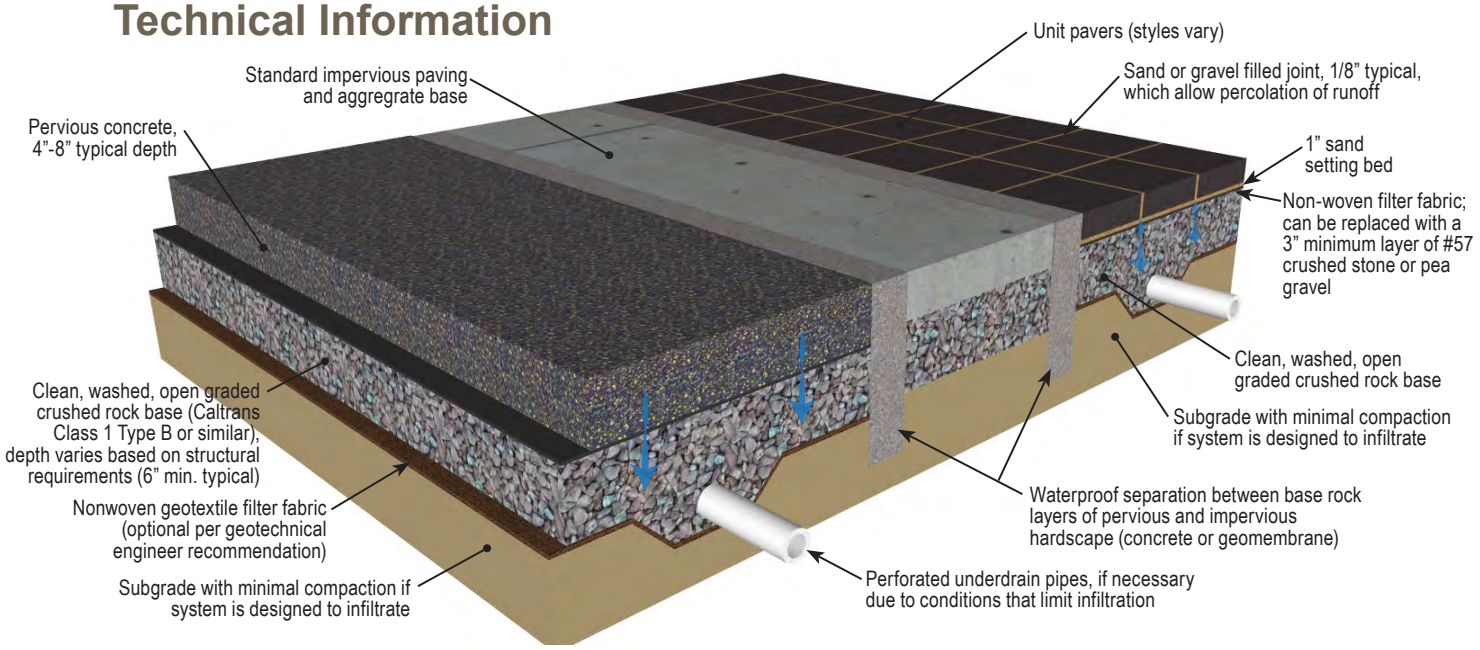


Figure: Pervious concrete and permeable pavers typical details

Design & Sizing Criteria

- Permeable pavements are volume-based systems sized to capture the WQV within the void space of the subsurface storage layer and should fully drain all stored runoff within a maximum 72 hour drawdown time.
- Infiltration-based systems (which provide treatment and volume reduction) must have a minimum subgrade soil infiltration rate of 0.5 in/hr; underdrains should be used in impermeable soils (Types C and D) that do not meet this standard. If infiltration exceeds 2.5 in/hr, runoff should be fully treated with upstream BMPs to protect groundwater quality.
- Infiltration requires a minimum 10-foot separation between the bottom of the drain rock layer and the seasonally high groundwater elevation. For areas with inadequate separation or where the groundwater is contaminated, an underdrain should be used with an impermeable liner placed beneath the rock.
- Infiltration-based systems should be placed a minimum of 10 feet from building foundations and a minimum of 100 feet from drinking water wells.
- Tributary areas should contribute runoff with low levels of sediment to avoid clogging the surface layer. If drainage will come from pervious or un-stabilized areas, appropriate pretreatment measures should be implemented to filter the runoff before reaching the permeable pavement.
- To ensure proper system function, it is essential that permeable pavements (especially poured in place systems) are installed properly by a contractor with prior experience and certification.

Pavement Types

There are several styles of permeable pavement available, including those that are poured in place (such as pervious concrete and porous asphalt) and modular paving systems (such as interlocking concrete pavers, unit stone or brick pavers, or reinforced turf type systems).

Pervious Concrete

Porous Asphalt

Permeable Pavers

Reinforced Turf

RAINWATER HARVESTING

Rainwater harvesting involves capturing stormwater runoff and then using the stored water for a non-potable application, typically landscape irrigation. Captured runoff can be stored in anything from small rain barrels to large underground cisterns or retention ponds. A distribution system (a pump and/or valves) draws stored water and delivers it to the intended use, routing it through an appropriate treatment system, if necessary. With the right conditions, rainwater harvesting is a very effective stormwater control mechanism, as it provides substantial treatment and volume reduction while also satisfying a portion of the site's water demand.

Harvesting systems can incorporate sculptural or artistic rainwater conveyance components, which serve as aesthetic amenities in addition to making the practice more visible.

Retrofit Opportunities

Benefits

- Pollutant removal rates are nearly 100% for reused water
- Offsets a portion of the potable water required by a site
- Reduces the volume and peak flows of stormwater runoff
- Good for sites where infiltration is not an option
- Easy to apply to rooftop collection; both new buildings and retrofits on existing roofs
- Scalable to large drainage areas, provided demand is adequate

Potential Constraints

- Requires reliable reuse demand high enough to ensure availability of treatment volume in storage
- Lack of summer rainfall coincides with larger irrigation demands
- Often requires infrastructure (pumps or valves) to use stored water, increasing complexity
- Relatively frequent inspection and maintenance is necessary to ensure reliable system function
- Regulatory obstacles may limit reuse opportunities beyond irrigation

Siting Applications

- Collect rooftop runoff
- Golf courses and parks
- Any type of land use, provided adequate end use of water

Technical Information

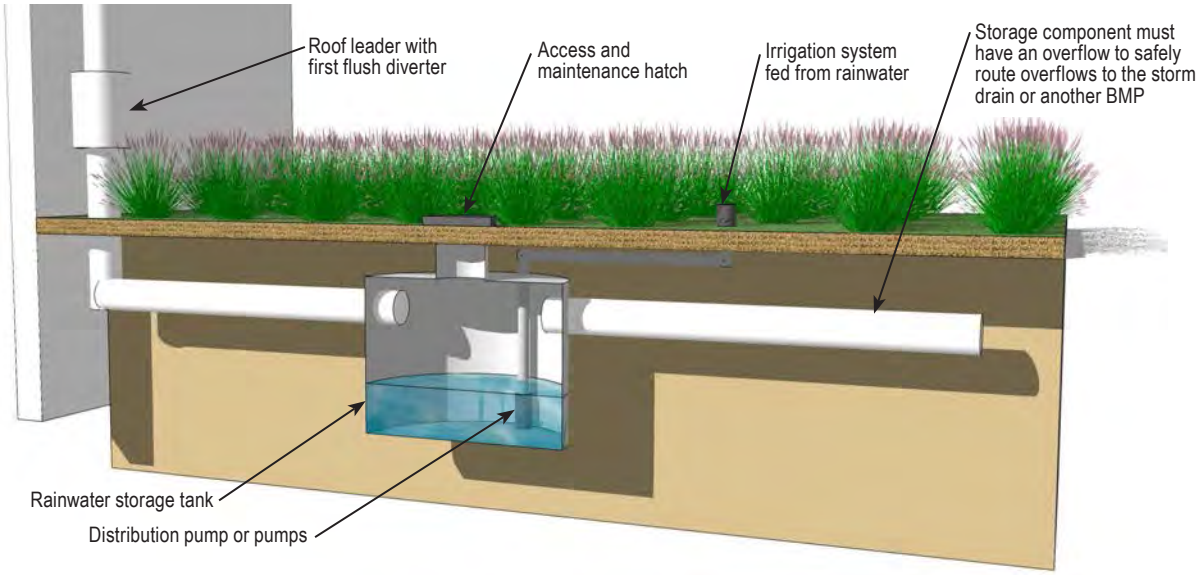


Figure: Rainwater harvesting system typical detail

Design & Sizing Criteria

- Rainwater harvesting systems are volume-based systems with adequate capacity available in the storage component to capture the WQV. In order to be used as a water quality treatment device, the operational demand on the system (water use) must be sufficient to free up storage space equal to the WQV within 72 hours of any rain event.
- The seasonal rainfall patterns in Riverbank present difficult circumstances for designing rainwater harvesting systems. Riverbank receives approximately 13 inches of rain annually, with an average of less than an inch falling each month from April through October. This lack of rainfall coincides with the higher irrigation demand of the warmer summer months. It is this mismatch of supply and demand that will inhibit successful implementation of rainwater harvesting for many sites. To provide a noticeable offset to potable water demand will likely require enough storage to capture runoff from a large upstream watershed.
- Components of all rainwater harvesting systems include conveyance (to collect water), storage (to hold water), and distribution (to use water).
- In a typical pumped system, stormwater from a building's roof is conveyed through rainwater leaders into a storage tank. The storage tank is connected to a wet well or suction pump, which is linked to the irrigation system. When the pump receives a signal to deliver water, it will begin operation. When the pump receives a signal to stop (either because irrigation is complete or from a level sensor in the tank indicating that it is nearly empty), it will end operation.
- A supplemental method of supplying water is typically necessary, generally through a valved connection to the traditional water system to either refill the tank or supply irrigation water directly.
- All rainwater harvesting system pipes and fixtures should be labeled "NON-POTABLE WATER, DO NOT DRINK."
- Design of the stormwater storage component is flexible as long as the water quality volume and an appropriate distribution system can be accommodated.
- Enclosed tanks should have a hatch or manhole opening for maintenance access. Above-ground tanks should be sited in a stable area (ideally in a cool, shaded location to avoid algal growth) and may require seismic stabilization if greater than 5000 gallons.
- Any pumps and treatment components should be accessible for maintenance.

A pretreatment component is necessary to remove trash and sediment prior to storage to avoid clogging the distribution pump and to reduce maintenance. Pretreatment components may be:

- first flush diverter
- in-line filter
- upstream BMP

GREEN ROOF

A green roof is a vegetated systems covering a building's roof that detains and filters incident rainfall. Stormwater is captured in the soil media and storage layers of the system, reducing peak storm flows and promoting evapotranspiration. A primary water quality benefit of green roofs is that they avoid the common pollutants associated with conventional roof runoff, instead releasing only rainwater that has been further filtered. Green roofs can be designed with minimal thickness to allow retrofit installation on existing buildings or with a mix of shrubs, trees, pathways, and benches to be a valuable amenity for building tenants and the public.

Green roofs are unique stormwater features which also provide a variety of diverse benefits to building systems as well as inhabitants and users.

Application Examples

Extensive green roof

Intensive green roof

Benefits

- Reduces the peak discharge rate by slowing down roof runoff
- Enhances site aesthetics and can provide a useable amenity or public space
- Creates habitat and increases vegetation, even in densely developed areas
- Can extend the life of the roof, compared to a conventional roof
- Reduces heat island effect and improves air quality
- Provides insulation, which reduces building energy use

Potential Constraints

- Not ideal for steep roofs (>20 degrees)
- Only manages rooftop runoff
- Greater roof weight may increase dead and live loads and increase structural support requirements
- Existing buildings may not be able to support increased load
- Will likely require irrigation during establishment (typically first 2 years) and dry seasons
- Requires increased maintenance compared to a conventional roof
- Higher cost than other BMPs

Siting Applications

- Commercial, industrial, and large residential buildings
- Urban areas with limited space and/or minimal vegetation

Technical Information

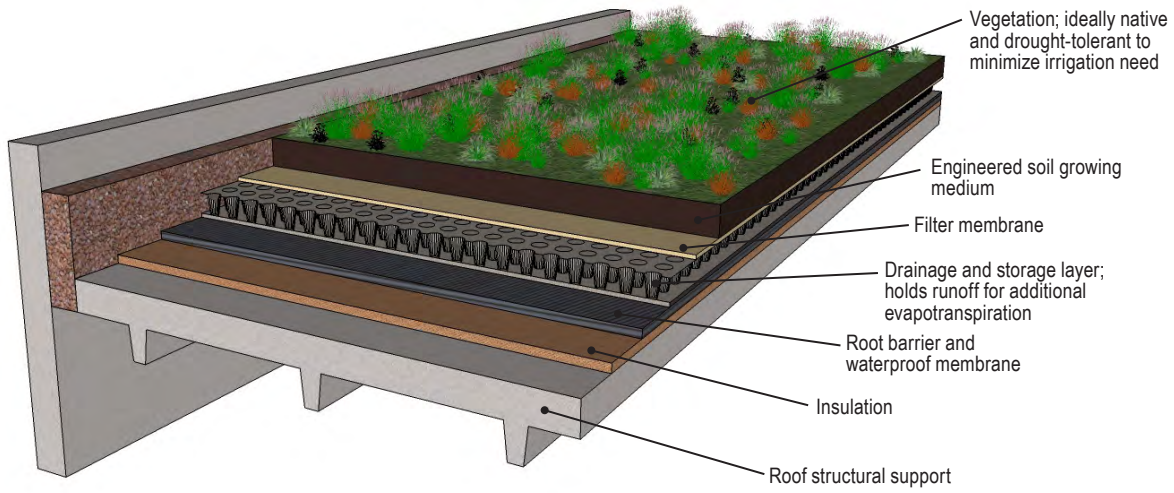


Figure: Green roof typical detail

Design & Sizing Criteria

- Green roofs are flow-based systems designed to treat the rainfall that falls directly onto the vegetated area.
- Runoff from rooftop areas that are not part of the vegetated system (such as spaces for mechanical or ventilation equipment) will likely need to be routed to treatment areas on the ground.
- Green roofs are generally classified as either extensive or intensive. Extensive green roofs generally have six inches or less of soil media, use smaller plants, are a lower maintenance option, and are typically not intended to be accessible. Intensive green roofs have greater than six inches of soil, larger plants, greater structural and maintenance requirements, and are often designed as rooftop gardens or park-like settings for use by people.
- They are most suitable for flat roofs or those with slopes less than 20 degrees. Extensive green roofs can be constructed on slopes up to 40 degrees with specialized designs.
- A new or retrofit building must be designed to support the weight of the green roof when all layers and vegetation are fully saturated. This wet weight can be up to 6 or 7 pounds per square foot per inch of soil depth.
- A waterproof membrane is needed to protect the roof structure and a root barrier can be installed to protect the membrane. Insulation, if included, can be installed either above or below the waterproof membrane.

Plant Selection *(See Appendix A)*

Vegetated roofs should feature drought tolerant plants that are well adapted to the local climate. Vegetation that is fire resistant is important considering the setting. Low maintenance plants that will create a healthy and appealing aesthetic are ideal candidates for vegetated roofs. Long lived and perennial plants are favorable.


Coreopsis


Beard tongue


Lyme grass


Foothill penstemon

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Mosquito Abatement

Local District

East Side Mosquito Abatement District

http://www.eastsidemosquito.com/

This district is a member of:

Mosquito & Vector Control Association of California (MVCAC)

www.mvcac.org/

American Mosquito Control Association (AMCA)

http://www.mosquito.org/

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Start at the Source: Design Guidance Manual for Stormwater Quality Protection. Bay Area Stormwater Management Agencies Association (BASMAA), 1999.

Stormwater C.3 Guidebook: Stormwater Quality Requirements for Development Applications, 6th Edition. Contra Costa Clean Water Program, February 2012.

Stormwater Quality Design Manual for the Sacramento and South Placer Regions, First Edition. May 2007.

Storm Water Quality Handbooks: Project Planning and Design Guide. State of California Department of Transportation, July 2010.

Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). Orange County Watersheds, May 2011.

Other Design References

A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California. University of California Cooperative Extension California Department of Water Resources, August 2000.

Appendix A - Plant List

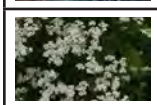
The species listed below are intended to serve as a general guide for identifying plants likely to be suitable for use in LID within Central California climate zones. This list has been compiled of largely California native species and augmented with California friendly species to promote species diversity while avoiding monoculture. The list has been organized to group species likely to be compatible with the hydrozones found in the LID solutions in this manual and includes information for determining estimated water budgets. A qualified professional in LID site design should be consulted before construction and implementation.

Photo	Common Name	Latin Name	Form	Light Level	Irrigation Need	Height/ Spread
Suitable for long periods of inundation or permanent shallow water						
	Beaked Spikerush	*Eleocharis rostellata*	Grass	Sunny	High	3’-4’ / 3’-4’
	Cardinal Flower	*Lobelia cardinalis*	Perennial	Sunny	Medium	1’-6’ / 1’-3’
	Common Spikerush	*Eleocharis palustris*	Grass	Sunny	High	6”-18” / 6”-18”
	Gooding’s Willow	*Salix gooddingii*	Tree	Sunny	High	10’-40’
	Long Leaf Rush	*Juncus macrophylla*	Grass	Sunny	High	2’-3’ / 2’-3’
	Narrowleaf Willow	*Salix exigua*	Tree	Sunny	High	8’-16’ / 8’-16’
	Needle Spikerush	*Eleocharis acicularis*	Grass	Sunny	High	6 ”/ 6”
	Pacific Reed Grass	*Calamagrostis nutkaensis*	Grass	Sunny	Low	2’ / 2’-3’
	Scarlet Monkey Flower	*Mimulus cardinalis*	Perennial	Sunny	Medium	3’ / 2’
	Silvery Sedge	*Carex canescens*	Grass	Sunny	High	1’-2’ / 1’-2’
	Soft Rush	*Juncus effuses*	Grass	Sunny	Medium	2’-3’ / 2’-3’

Notes: Certain plants which prefer very wet environments will generally be suitable for use in locations which experience only short periods of inundation. Of the plants listed above, this would include Cardinal Flower, Pacific Reed Grass, and Scarlet Monkey Flower.

Photo	Common Name	Latin Name	Form	Light Level	Irrigation Need	Height/ Spread
Suitable for short periods of inundation (24-48 hours)						
	Blue eyed grass	*Sisyrichium bellum*	Grass	Sunny	Very Low	6”-18”
	Blue Oat Grass	*Helicotrichon sempervirens*	Grass	Sunny	Medium	24”-30” / 24”-30”
	California rose	*Rosa californica*	Shrub	Sunny	Low	3’-5’ / 8’-10’
	California wax myrtle	*Myrica californica*	Shrub	Sunny	Low	15’-20’ / 15’-20’
	Common Rush	*Juncus patens*	Grass	Sunny	Medium	18”-24” / 18”-24”
	Cottonwood	*Populus fremontii*	Tree	Sunny	Medium	40’-60’ / 25’
	Deer grass	*Muhlenbergia rigens*	Grass	Sunny	Low	2’-3’ / 2’-3’
	Desert Baccharis	*Baccharis sergiloides*	Shrub	Sunny	Low	4’-6’ / 4’-6’
	Desert willow	*Chilopsis linearis*	Tree / shrub	Sunny	Very Low	15’-20' / 15’-20’
	Fourwing saltbush	*Atriplex canescens*	Shrub	Sunny	Very Low	4’-5’
	Narrow leaf milkweed	*Asclepias fascicularis*	Shrub/ gound-cover	Sunny	Low	2’-3’ / 3’-4’
	San Diego sedge	*Carex spissa*	Grass	Sunny	Medium	3’-5’ / 4’-5’
	Sweet bay	*Laurus nobilis*	Tree / shrub	Sunny/ Partial Shade	Low	15’-20' / 15’-20’
	Western meadow sedge	*Carex praegracilis*	Grass	Sunny	Medium	12”-15”
	Western sycamore	*Platanus racemosa*	Tree	Sunny	Medium	40’-80’ / 30’-50’

Photo	Common Name	Latin Name	Form	Light Level	Irrigation Need	Height/ Spread
Prefer upland / suitable for slope stability						
	Beard tongue	*Penstemon spectabilis*	Shrub / perennial	Sunny	Low	3’-5’
	Blue grama	*Bouteloua gracilis*	Grass	Sunny	Low	15”-24” / 12”
	Broom Baccharis	*Baccharis sarothroides*	Shrub	Sunny	Low	8’-10’ / 8’-10’
	Bush anemone	*Carpenteria californica*	Shrub	Partial Shade	Low	6’ / 6’
	Bush monkey flower	*Mimulus aurantiacus*	Shrub	Sunny	Low	2’-3’ / 2’-3’
	California encelia	*Encelia californica*	Shrub	Sunny	Very Low	3’-5’ / 3’-5’
	California Meadow Sedge	*Carex Pansa*	Grass	Sunny	Medium	12” / 18”
	California sagebrush	*Artemisia californica*	Shrub	Sunny	Low	3’-5’ / 5’-7’
	Canyon live oak	*Quercus chrysolepis*	Tree	Sunny/ Partial Shade	Low	60’ / 40’
	Chaparral honeysuckle	*Lonicera subspicata*	Shrub / vine	Partial Shade	Medium	3’-4’ / 8’-10’
	Chuparosa	*Justicia californica*	Shrub	Sunny	Low	4’-6’ / 6’-8’
	Coast live oak	*Quercus agrifolia*	Tree	Sunny	Very Low	30’-60’ / 40’-70’
	Common buckwheat	*Eriogonum fasciculatum*	Shrub	Sunny	Low	2’-3’ / 2’-3'
	Coreopsis	*Coreopsis grandiflora*	Shrub / perennial	Sunny	Low	1’-2’ / 2’-3 ‘
	Coreopsis - large	*Coreopsis gigantea*	Shrub / perennial	Sunny	Low	3’-5’ / 3’-4’
	Desert mallow	*Sphaeralcea ambigua*	Shrub	Sunny	Low	2’-3’ / 2’-3’
	English lavender	*Lavandula angustifolia*	Shrub	Sunny	Low	2’-3’ / 2’-3’
	Ericameria	*Ericameria laricifolia*	Shrub	Sunny	Low	2’-4’ / 2’-4’

Photo	Common Name	Latin Name	Form	Light Level	Irrigation Need	Height/ Spread
	Foothill needle grass	*Nassella lepida*	Grass	Sunny	Low	1'-2' / 1'-2'
	Foothill penstemon	*Penstemon heterophyllus*	Shrub / perennial	Sunny	Low	1'-2'/ spreading
	Grape soda lupine	*Lupinus excubitus*	Shrub	Sunny	Very Low	3' / 4'
	Honey mesquite	*Prosopis glandulosa*	Tree	Sunny	Low	25'-30' / 25'-30'
	Hummingbird trumpet	*Epilobium canum*	Shrub	Sunny/ Partial Shade	Low	varies
	Lyme grass	*Leymus arenarius*	Grass	Sunny	Very low	4'-5' / clumping
	Nodding needle grass	*Nassella cernua*	Grass	Sunny	Low	3' / 3'
	Parry's penstemon	*Penstemon palmeri*	Shrub / perennial	Sunny	Low	4'-6'
	Pink muhly grass	*Muhlenbergia capillaris*	Grass	Sunny	Low	2' / 2'-3'
	Purple needle grass	*Nassella pulchra*	Grass	Sunny	Low	18"-24" / 18"-24"
	Rosemary	*Rosmarinus officinalis*	Shrub	Sunny	Low	4'-6' / 6'-10'
	Saffron buckwheat	*Eriogonum crocatum*	Shrub	Sunny	Low	1'-2' / 2'-3'
	Scarlet bugler	*Penstemon centranthifolius*	Shrub / perennial	Sunny	Low	2'-3' / 2'-3'
	Sulfur buckwheat	*Eriogonum unbellatum*	Shrub / ground-cover	Sunny	Low	6"-18" / 1'-3'
	Western redbud	*Cercis occidentalis*	Tree	Sunny/ Partial Shade	Very Low	15'-20' / 15'-20'
	Western serviceberry	*Amelanchier alnifolia*	Shrub / Tree	Sunny/ Partial Shade	Low	3'-15' / 6'
	Wild rye	*Leymus condensatus*	Grass	Sunny	Very Low	2'-3' / 2'-3'
	Yarrow	*Achillea millefolium*	Ground-cover	Sunny	Low	18"-30" / clumping

Appendix B - BMP Pollutant Removal Efficiency

Different pollutants tend to be present in runoff depending on the land use. The table below provides general guidance as to which pollutants may be expected in higher concentrations, as well as the typical ability for different BMPs to remove the pollutants.

		Target Pollutant				
		Sediment	Nutrients	Metals	Bacteria	Oil & Grease
Land Use	Agriculture	✖	✖		✖	
	Commercial	✖		✖		✖
	Residential	✖				
	Industrial	✖		✖		✖
	Parks	✖				
	Vacant/Barren Areas	✖	✖			
	Roads & Parking Lots	✖		✖		✖

		Pollutant Removal Efficiency				
		Sediment	Nutrients	Metals	Bacteria	Oil & Grease
Best Management Practice	Underground Infiltration[1]	⭘	●	●	●	●
	Bioretention Area[2]	●	⭘	⭘	●	●
	Vegetated Swale	⭘	○	⭘	○	⭘
	Filter Strip	●	○	●	○	⭘
	Vegetated Basin	⭘	○	⭘	⭘	⭘
	Constructed Wetland	●	⭘	●	●	●
	Permeable Pavement [1]	●	●	⭘	⭘	⭘
	Rainwater Harvesting [3]	●	●	●	●	●
	Green Roof [4]	●	●	●	●	●

Key to Symbols: ● High ⭘ Medium ○ Low

1 If underground infiltration and permeable pavement are unable to drain by infiltration, removal efficiency for all constituents is low.

2 Assumes that bioretention area is drained by underdrains. If able to discharge via infiltration, efficiency will be increased.

3 Rainwater harvesting effectively removes all pollutants from runoff since the water quality volume is never released downstream.

4 Green roofs receive runoff which has not yet encountered pollutants, and eliminate the addition of pollutants typically found on roofs.

Appendix C - Planning Area Maps

Additional maps, showing the entire Riverbank Planning Area, are included for reference on the following pages.

- Opportunity Sites Map
- Soils Map
- Depth to Hardpan Layer Map

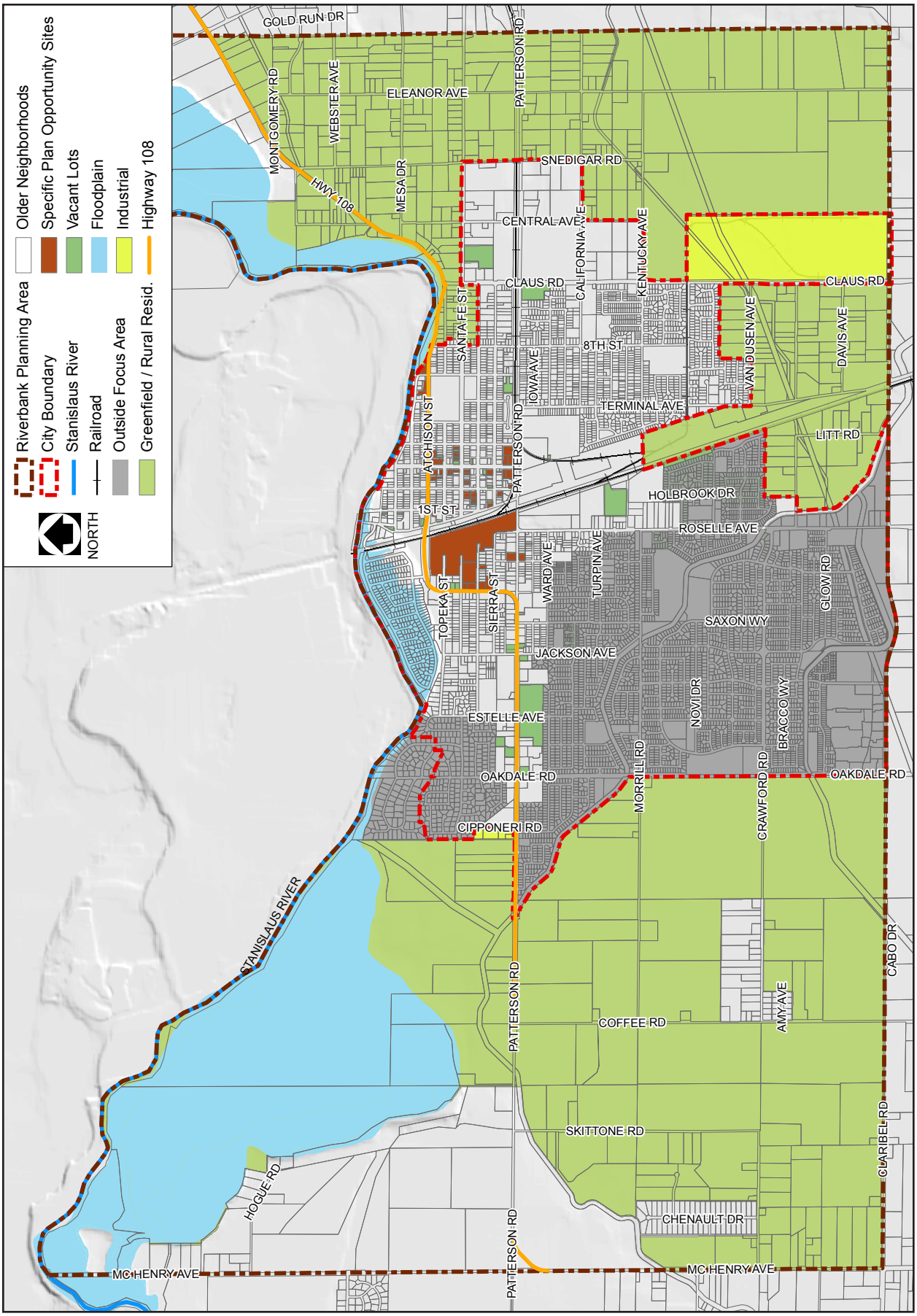


Figure C1: Opportunity Sites Map (Source: General Plan)

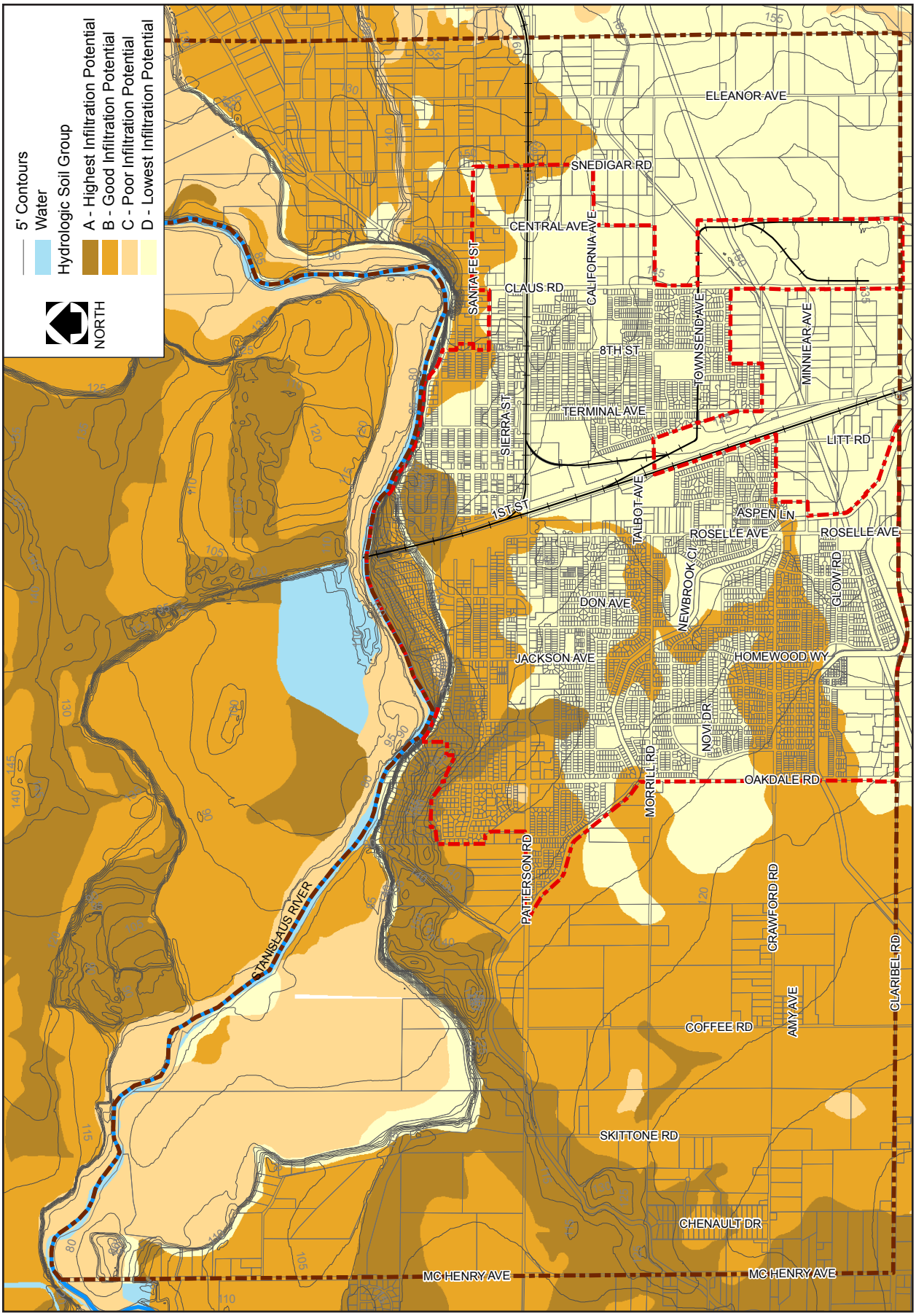


Figure C2: Soils Map (Source: NRCS 2011)

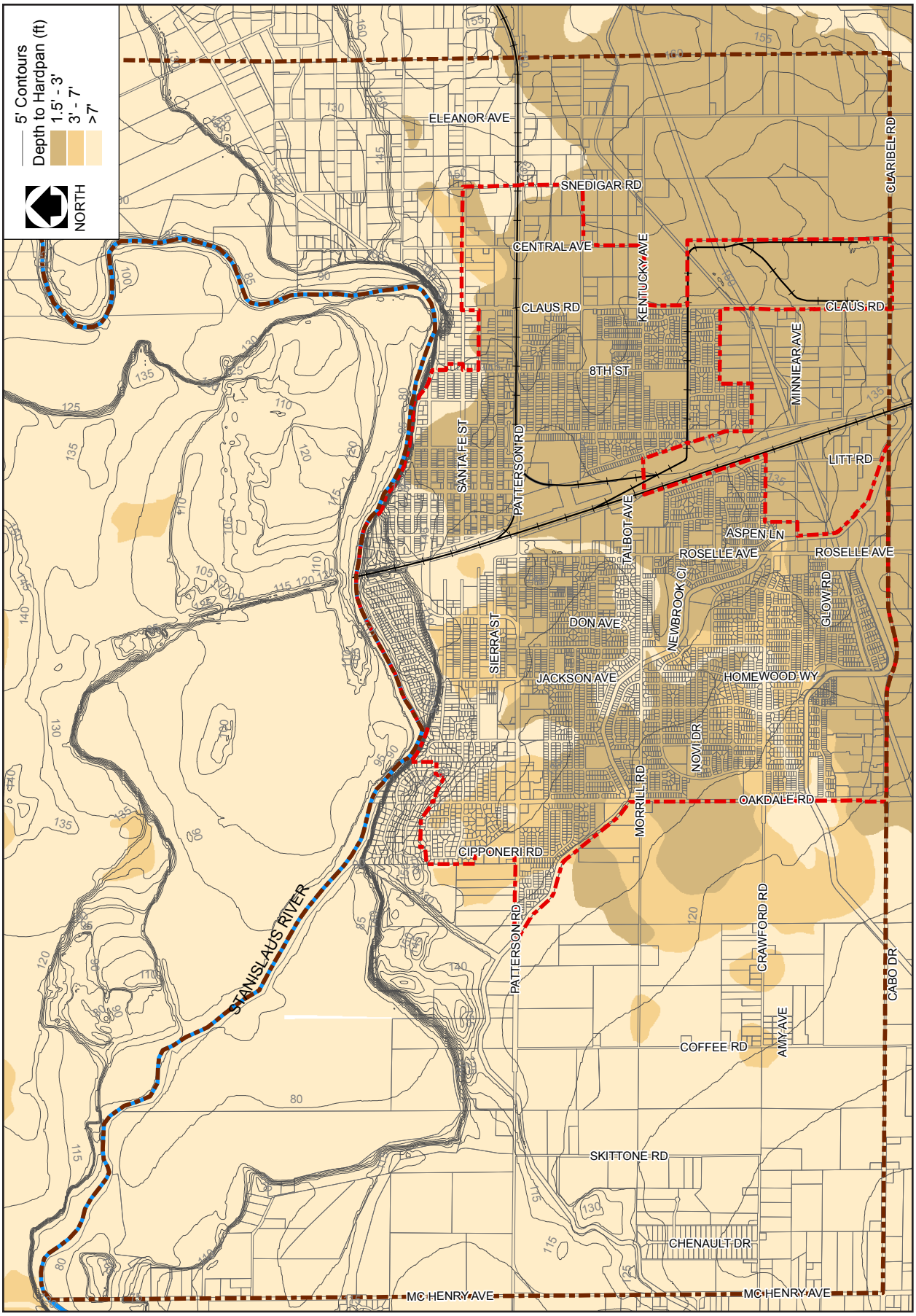
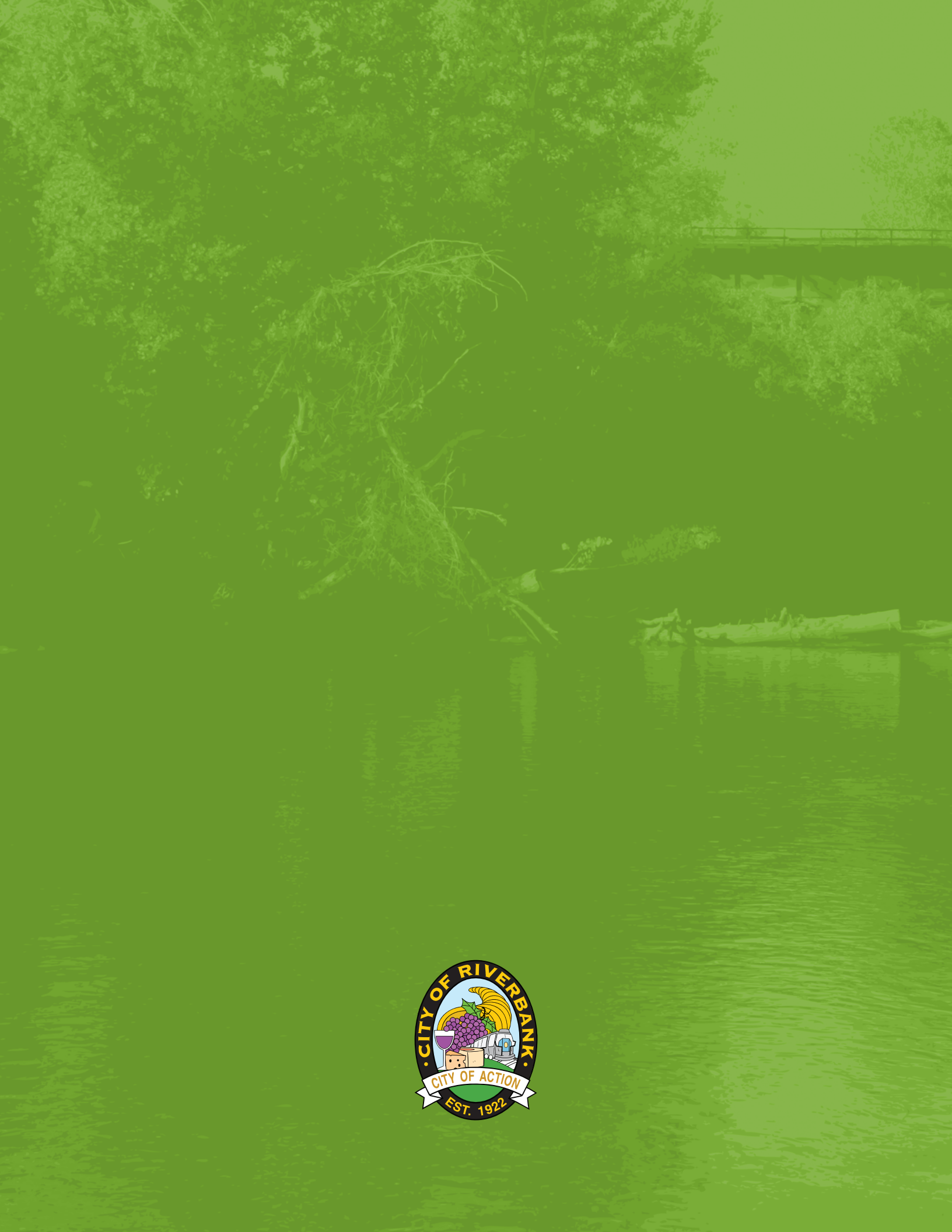


Figure C3: Depth to Hardpan Layer Map (Source: NRCS 2011)


CITY OF RIVERBANK
CITY OF ACTION
EST. 1922

APPENDIX D:

STORMWATER MANAGEMENT

LID Stormwater Management for the Riverbank Army Ammunition Plant

LID STORMWATER MANAGEMENT FOR THE RIVERBANK ARMY AMMUNITION PLANT

FOR THE RIVERBANK LOCAL REDEVELOPMENT AUTHORITY

DESIGN, COMMUNITY & ENVIRONMENT

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In Association with

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AUGUST 2010

LID STORMWATER MANAGEMENT

The Riverbank Local Redevelopment Authority (LRA) is pursuing redevelopment of the Riverbank Army Ammunitions Plant (RAAP) to attract employers and employees to Riverbank, see Figures 1 and 2. RAAP is a 173-acre site that was originally constructed during World War II as an aluminum smelting plant. It was subsequently converted for manufacturing mortar shells and other armaments.

As part of this effort, the LRA is seeking development of a "green" corporate park that incorporates as many sustainable practices as are feasible to retain current tenants and attract new development on the property.

New development at RAAP will further the City's sustainability goals by incorporating sustainable design principles that minimize energy consumption, conserve water, and use recycled or sustainable building materials. In addition, landscape and streetscape design will incorporate sustainability principles.

This document focuses on potential low impact development (LID) strategies to address stormwater management for the site. It provides approaches to minimizing impacts to the existing infrastructure while looking at other methods for distribution, collection, and potential reuse of stormwater in consideration of the site's opportunities and constraints. In addition, this document identifies which strategies are appropriate for portions of the site that have already been developed, as well as undeveloped parts of the site. An end goal of these sustainable design approaches is to draw "green" employers to the area.

A. LID Components

The LRA is particularly interested in incorporating LID practices to address stormwater management on-site. LID addresses stormwater management by reintroducing systems that are modeled on natural processes. These systems include infiltration, filtering, storing, evaporation, bioretention, and deten-

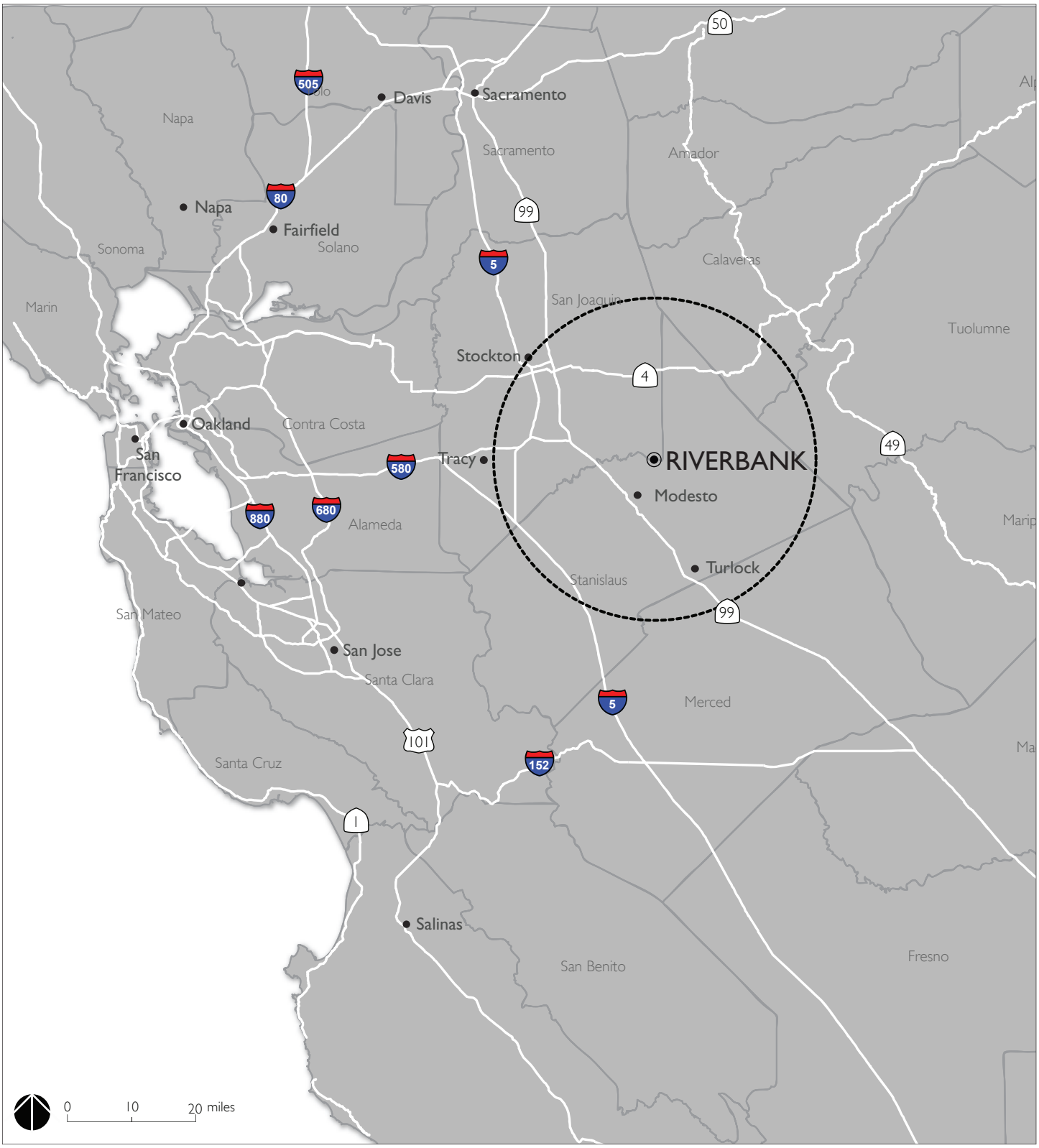

FIGURE 1

REGIONAL LOCATION

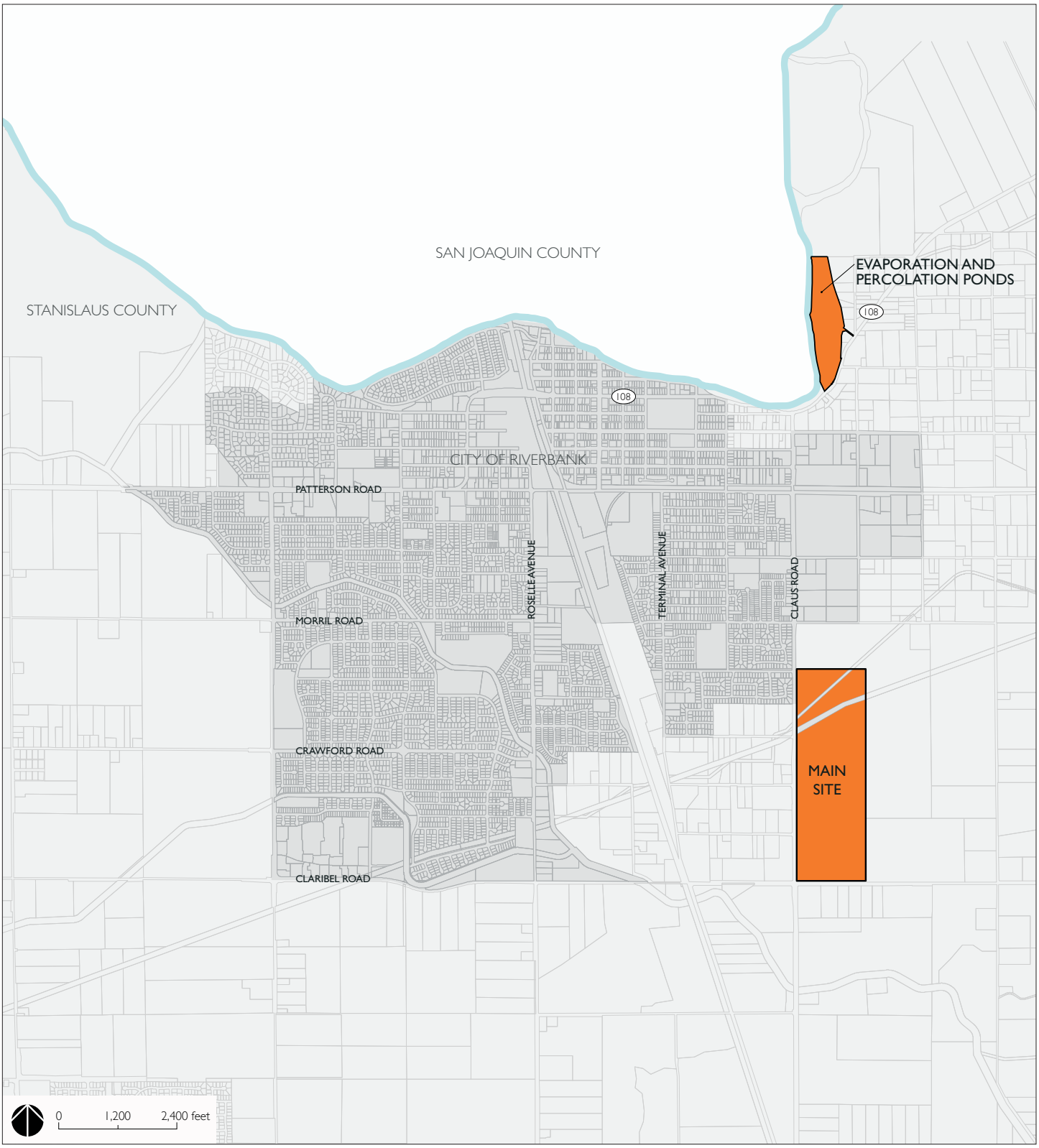

FIGURE 2

PROJECT SITE

tion of runoff in a decentralized fashion. LID minimizes or eliminates the need for a more traditional system based on capturing and conveying/disposing stormwater into a centralized facility. A LID approach encourages conservation measures to slow the flow and reduce the amount of stormwater runoff; minimizes development impacts; and uses a variety of integrated best management practices (BMPs) to reduce and clean runoff.

Vegetated swale

Mulch from recycled wood waste

Rain Barrel

There are many strategies that can be used to incorporate LID into stormwater management, including:

- **Amended Soil**: soil enriched with sand and organic materials to increase the soil's capacity to infiltrate water.
- **Cistern**: large containers that collect rainwater, typically from rooftops. Rain barrels are similar but store a smaller amount of water.
- **First Flush Filtering**: filtering process that removes contaminants, waterborne heavy metals and chemical residues before runoff reaches a water storage system.
- **Grassy or Vegetated Swale**: planted channels that slow stormwater runoff and encourage infiltration, entrapment of sediment, and treatment of pollutants.
- **Green Roofs**: planted roofs that provide insulation, slow stormwater runoff, improve air quality, and increase evapotranspiration.
- **Infiltration Basins**: shallow depressions designed to infiltrate stormwater into the soil and help recharge groundwater.
- **Mulch**: Organic matter used as a weed suppressant and to retain water for use by plants.
- **Natural Drainage**: grading that works with natural topography and/or preserves natural patterns of stormwater drainage, reducing the need for constructed drainage systems.
- **Rain Barrels**: small containers that collect rainwater, typically from rooftops.

- **Rain Garden**: depressions or low areas designed with soil amendments to promote infiltration of stormwater.
- **Planting**: organic material that, by increasing the size of planting areas and designing to accommodate seasonal inundation, can provide additional absorption of water.
- **Porous Pavement**: pavement systems that allow stormwater to infiltrate the ground.
- **Preserved Native Vegetation**: naturally occurring vegetation on-site that is protected and/or enhanced, providing connection to the existing natural plant community, as well as improved evaporation-transpiration.
- **Redirection of Rooftop Runoff**: disconnecting downspouts and directing rooftop runoff into storage or vegetated swales, planters, or other landscape areas that encourage infiltration.
- **Reduced Hardscape**: reduction of impervious surfaces, including street narrowing, to increase pervious surfaces and open areas.

Porous pavement

Redirection of Rooftop Runoff

B. Goals

The LRA has established three key sustainability principles as guides for development on site:

- New development should minimize energy consumption, conserve water use, and use recycled or sustainable building materials.
- Landscaping should be appropriate to the local climate and provide stormwater collection and retention.
- Existing buildings should be retrofitted to allow rainwater capture and reuse on-site including for irrigation and detention/retention.

For RAAP's stormwater infrastructure, these principles can be implemented through a combination of incorporating LID components into existing and

future development and directing the remaining stormwater runoff into stormwater reservoirs.

C. Stormwater Regulations

Development at RAAP will need to comply with national, State, and local stormwater regulations.

All construction activities that disturb more than one acre or are part of a larger development disturbing more than one acre may be subject to the National Pollutant Discharge Elimination System (NPDES) Construction Activities Storm Water General Permit. These activities must submit a Storm Water Pollution Prevention Plan (SWPPP) as outlined in the Stanislaus County Storm Water Management and Discharge Control Ordinance.[1]

To regulate post-construction stormwater discharge, Stanislaus County is currently developing a Manual of Storm Water Quality Control Standards to comply with the national requirements of Attachment 4 of the NPDES General Permit. This manual will be available in September 2010. The NPDES General Permit was put in place by an amendment to the Clean Water Act to reduce the amount of point source pollutants. While the County is still developing its guidelines, post-construction stormwater management in new development or redevelopment must, at a minimum, comply with the State NPDES requirements.[2] A few of these general requirements are outlined below:

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[1] Specific requirements of a SWPPP are not discussed in this document. More information can be found in the Stanislaus County Storm Water Management and Discharge Control Ordinance. http://www.stancounty.com/publicworks/storm/pdf/storm-water-mgmt-discharge-control-ordinance.pdf.

[2] The State Water Resources Control Board Fact sheet for the NPDES General Permit is available at http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/final_ms4_permit.pdf.

- Stormwater runoff may not exceed predevelopment rates.
- Conserve natural areas when possible, cluster development, limit grading, protect wetlands, and maximize vegetation.
- Capture pollutants of concern such as gasoline, pesticide, and pathogens in BMPs on site.
- Protect slopes from runoff using appropriate native vegetation and energy dissipaters.
- Incorporate volumetric or flow based treatment BMPs to mitigate stormwater runoff based on the design storm event for the site.
- Reduce parking lot areas and capture stormwater runoff in landscape BMPs.

Until Stanislaus County completes its manual, it is recommended that site development at RAAP comply with section C.3 of the NPDES Permit developed for the San Francisco Bay Region for new and redevelopment projects.[3] These regulations require that projects that create or replace 10,000 square feet or more of impervious surface must treat 100 percent of the amount of runoff with LID treatment measures on-site or at joint treatment facilities. If a project replaces more than 50 percent of the impervious surface, all the stormwater runoff from the site, for the design storm event, must be treated. If a project replaces less than 50 percent of impervious surface, only the new surface must be treated. Preferred LID measures are discussed in Section E of this document and include rainwater harvesting and reuse, rainwater infiltration into on-site soil, and reducing impervious areas.4

[3] The October 14, 2009 San Francisco Bay Region NPDES Permit is available at www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/mrp.shtml.

[4] Another good resource is Contra Costa Clean Water Program Stormwater C.3 Guidebook September 10, 2008 which is a standard urban stormwater management plan with stormwater management techniques, combining traditional and LID approaches, http://www.cccleanwater.org/Publications/Guidebook/Stormwater_C3_Guidebook_4th_Edition_9-10-08.pdf.

D. Existing Conditions

The RAAP site can be divided into five different areas, each with separate requirements and opportunities for inclusion of LID approaches to storm-water management. The five areas are shown in Figure 3 and include Production Sites 1 through 3, the North End Cap, and the South End Cap. The three Production Sites include the areas around buildings formerly associated with the production of ammunitions; they are differentiated based on geography and the presence of groundwater contamination. The North End Cap is the land north of the Production Sites and is transected by the Hetch Hetchy Aquaduct and Oakdale Irrigation Canal. The North End Cap is undeveloped with the exception of the northwest stormwater reservoir and stormwater lift station. The South End Cap is the undeveloped portion of the site located south of the Production Sites.[5]

Figure 4 shows a diagram of the storm sewer collection system. Addition information on the existing storm drain network for each area is provided in Section E of this document.

[5] The existing topography on-site slopes gently towards the south. Stormwater runoff, in general, is collected in numerous inlets located around the RAAP site that connect to a main storm drain line. The main storm drain line carries flows towards the north, which is opposite the surface grades, to a lift station located near Gate 10. The lift station pumps flows into a gravity line where it flows towards the north to another lift station located adjacent to the northwest stormwater reservoir which conveys flow into the northwest stormwater reservoir. The northwest reservoir provides temporary storage of the stormwater runoff prior to being infiltrated into the underlying soil strata or evaporating into the atmosphere. During periods of excessive rain, any overflow from the northwest stormwater reservoir and lift station is conveyed to the Oakdale Irrigation District's 30-inch diameter line, which runs parallel to the north side of the northwest stormwater reservoir. A small portion of the RAAP site drains to the southeast stormwater reservoir, located near the southeast corner of the RAAP site. A lift station adjacent to the southeast stormwater reservoir pumps runoff into the gravity main storm drain line that carries flows towards the north as discussed above.

NORTH
1"=280'

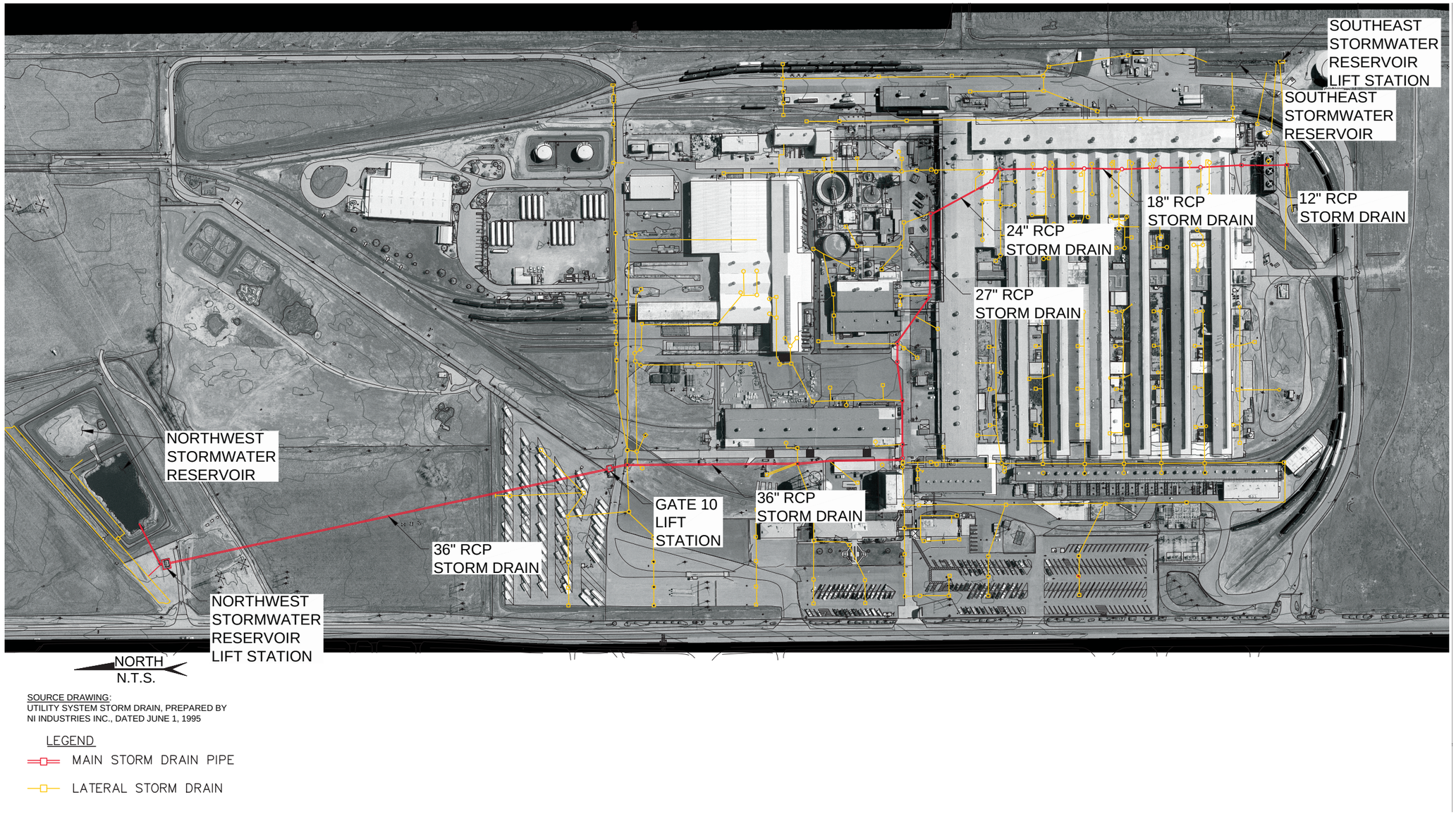
LEGEND

- *CATEGORY 5 GW CONTAMINATION
- PRODUCTION AREA (IN GENERAL, EXISTING STRUCTURES TO REMAIN)
- DESIGNATION AREA BOUNDARY
- *APPROXIMATE LOCATION AS SHOWN ON FIGURE ES-1, PROPERTY CATEGORIZATION MAP BY CH2MHILL

Source: Weston Solutions

FIGURE 3

LID APPROACH BY AREA



Source: Weston Solutions

FIGURE 4

STORM SEWER COLLECTION SYSTEM

E. LID Approaches by Area

LID approaches for each area at the RAAP site are outlined below.

1. Production Site 1

Production Site 1, as shown in Figure 5, comprises an elongated section in the middle of the overall site that coincides with groundwater contamination. The area is generally bounded by the railroad tracks to the east, the site boundary to west, Building 74 to the north, and Building Group 1 to the south. The total area of Production Site 1 is approximately 34 acres. Approximately 95 percent or more of this area is covered by impervious surfaces. Buildings occupy roughly 6.8 acres, or 20 percent, of the surface area. In a separate report, CH2M Hill identified Production Site 1 as an "area in which release, disposal, or migration of hazardous substances has occurred, and removal or other remedial actions are under way, but all required actions have not yet been taken."[6] Groundwater contamination is shown in Figure 6; the groundwater contamination includes both chromium and cyanide above the Maximum Contamination Level (MCLs).

Stormwater runoff is collected by numerous inlet structures, which connect to the main storm drain line. The main storm drain enters Production Site 1 as a 24-inch corrugated metal pipe (CMP) under the east side of Building 7. The pipe increases in size to 27 inches and proceeds west along Building 7. West of Building 9 the main storm drain line turns north, increases in size to 36 inches, and proceeds to a 600 gallons per minute (gpm) lift station located near Gate 10. Prior to reaching the 600 gpm pump station, the main line is joined by numerous laterals of varying size that collect stormwater runoff from inlets around the site. The lift station discharges to a 36-inch pipeline and continues north to the location of the northwest stormwater reservoir, where an additional storm drain lift station conveys the runoff into the northwest stormwater reservoir for storage and subsequent infiltration and evaporation.

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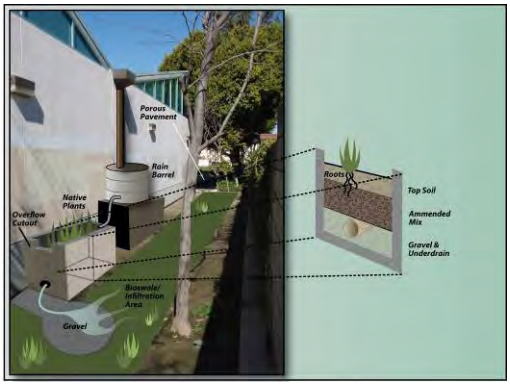
[6] CH2M Hill, 2006, *Environmental Condition of Property Phase 1 Report, Riverbank Army Ammunition Plant*, Figure ES-1: Property Categorization Map.

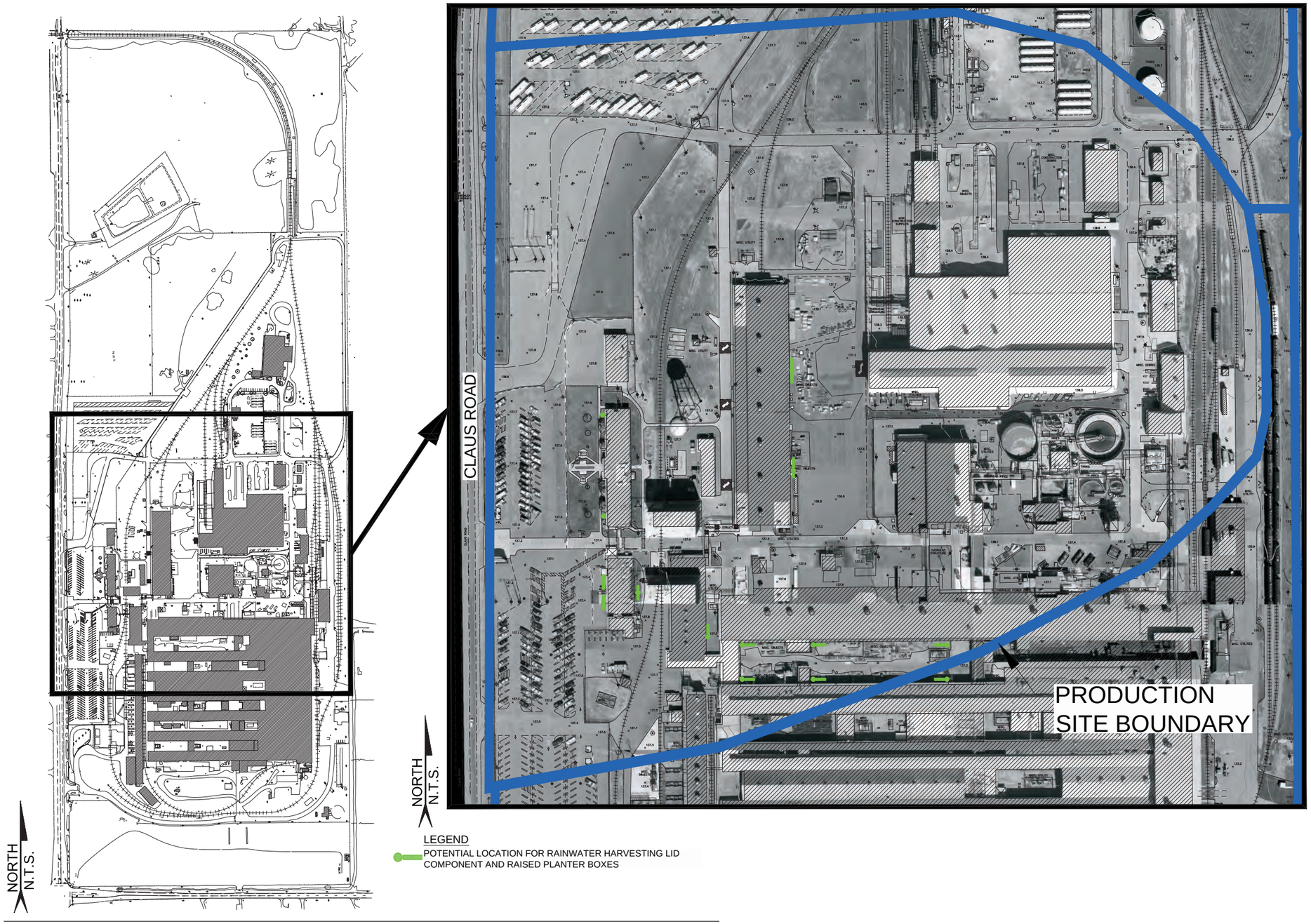
In Production Site 1, groundwater contamination issues limit the ability to increase permeability in this area to allow stormwater infiltration. Therefore, existing impervious surfaces should remain in place. In the future, if it is determined that remediation efforts are successful and the infiltration of surface runoff is deemed acceptable, LID components such as permeable hard surfaces, bioretention/infiltration basins, dry wells, and landscaped beds should be utilized in the area.



Rain catchment

A variety of rain catchment methods can be used in Production Site 1 to store stormwater runoff for irrigation and/or infiltration in other areas of the RAAP site. Redirection of rooftop runoff, including providing gutters to channel stormwater into cisterns and/or rain barrels, can be used successfully in this area with minimal cost. Based on the amount of roof area, harvesting water would moderately reduce the amount of runoff generated by this area. The harvested water would need to be utilized on-site shortly after collection or be treated for longer-term storage. Typically, harvested water is used with automated drip-type irrigation systems. To utilize the harvested water, landscaped areas such as raised planters or trees in planter boxes, could be added. These additions would provide greenery into this heavily developed core creating an amenity for employees and potentially helping to slow the rate of stormwater runoff by trapping water in foliage. Based on the limited amount of space for the addition of landscaped areas and use of harvested water, it is estimated that aggressively incorporating rain harvesting in Production Site 1 may reduce runoff leaving this area by three to ten percent. This estimated reduction in stormwater runoff may not be considered significant in the overall stormwater management; however, rainwater harvesting, properly designed with first-flush diverters, can provide for treatment, by filtration, of relatively high concentrations of pollutants in rooftop runoff (see Figure 7 for an example of a basic rainwater harvesting system).

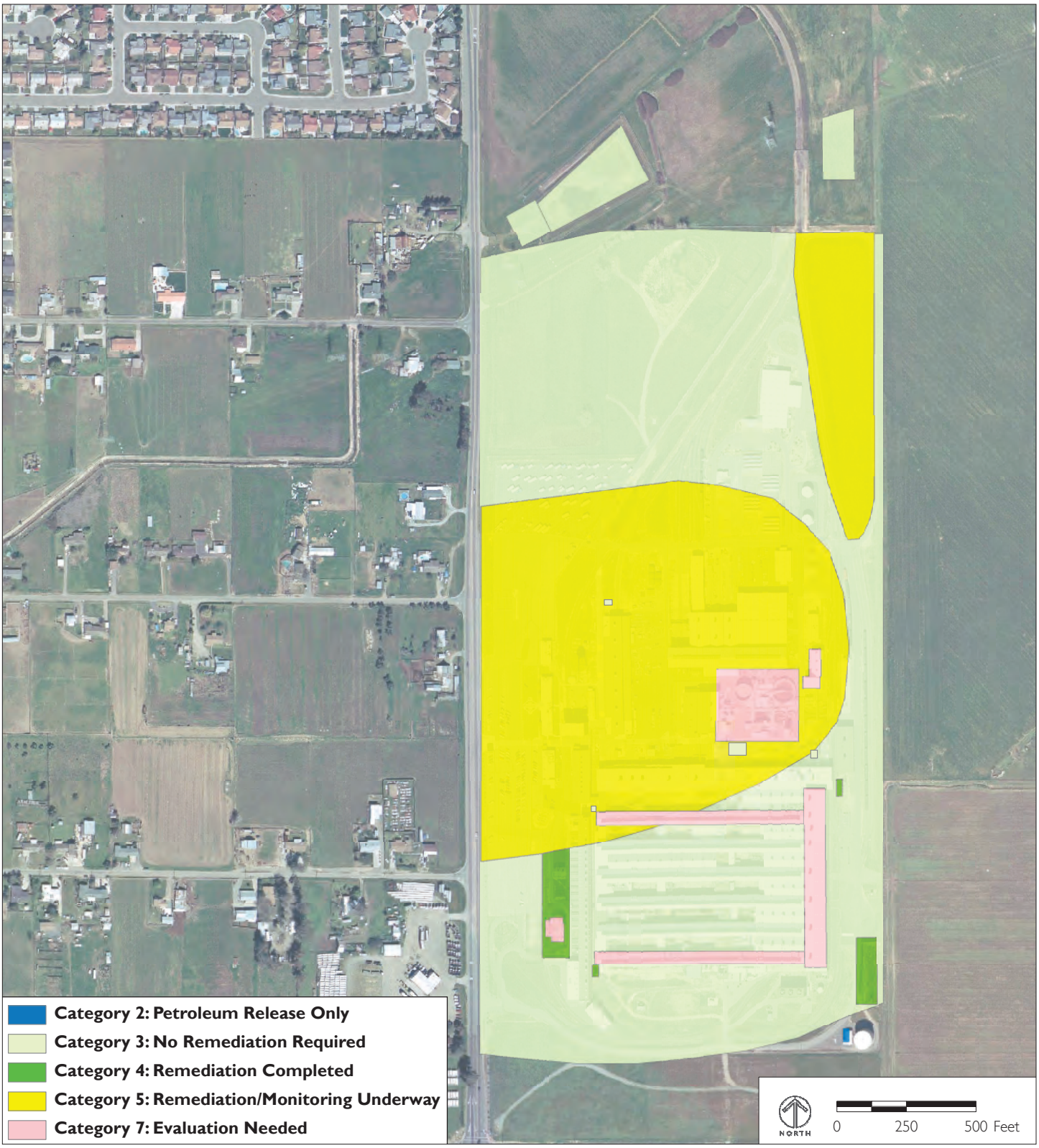
With elaborate harvesting systems that comply with applicable State, county and local plumbing codes, harvested water may be used as flushing water for toilets and industrial non-potable water uses. However, this would require



Source: Weston Solutions

FIGURE 5

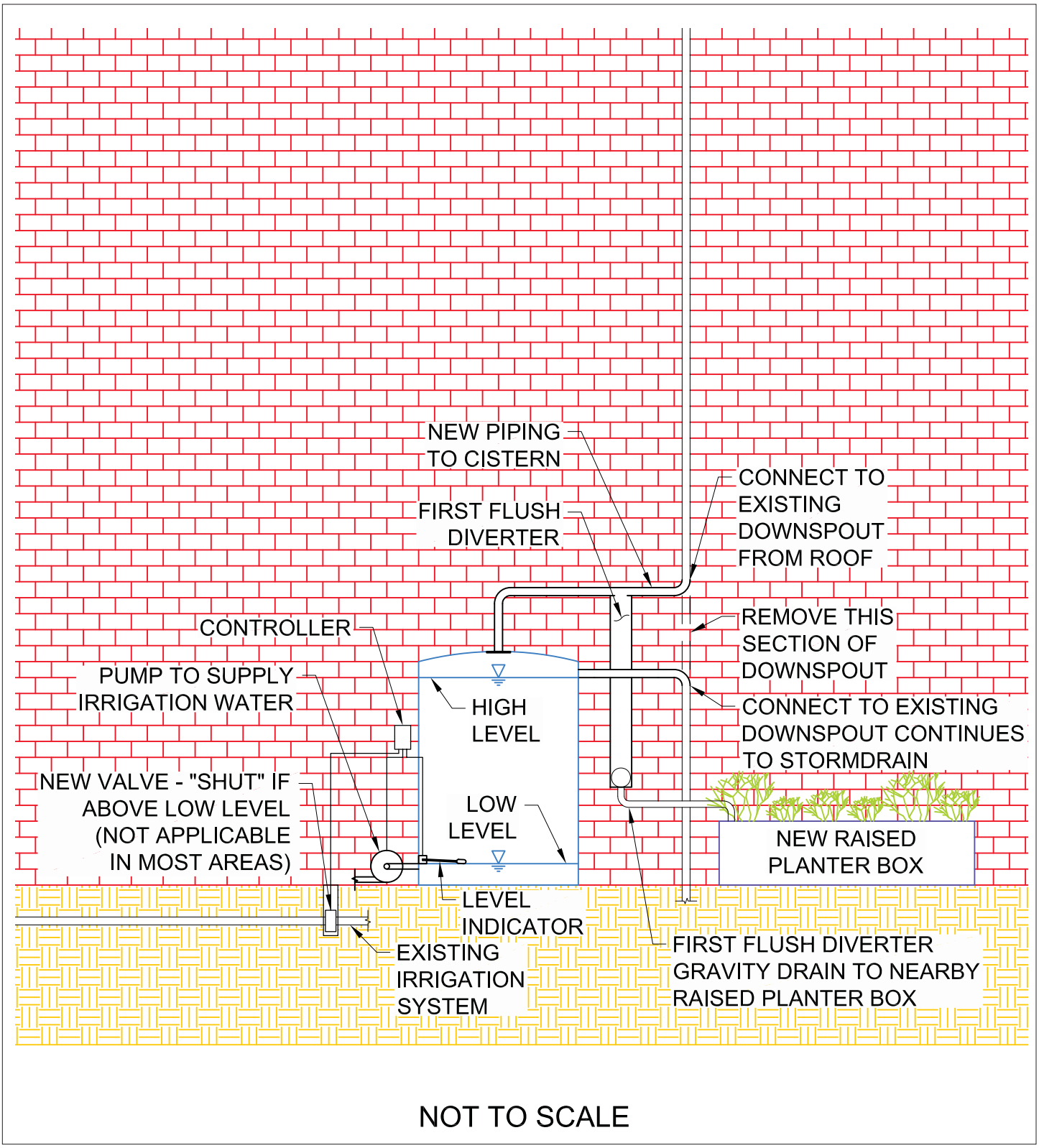
POTENTIAL LID COMPONENTS: PRODUCTION SITE I



Map highlights the status of contamination assessments within RBAAP's boundaries.
Souce: CH2M Hill, 2006; CH2M Hill, 2008

FIGURE 6

ENVIRONMENTAL REMEDIATION REQUIREMENTS



Source: Weston Solutions

FIGURE 7

RAINWATER HARVESTING SYSTEM

additional permitting and upgrades to the current infrastructure, which would most likely be cost prohibitive. An additional study focused on the beneficial uses of non-potable uses, existing water supply infrastructure, and permitting requirements should be conducted in the future if this type of re-use is strongly desired.

Structural analysis has indicated that few, if any, of the existing buildings could support solar panels or green roofs. The existing condition of the buildings on-site exclude them from being retrofitted with either of these options.

Rainwater cistern

2. Production Site 2

Production Site 2 is a continuation of the former ammunition plant on Production Site 1, located between Production Site 1 and the North End Cap as shown in Figure 8. The east portion of Production Site 2 is occupied by a landfill that has been covered with a clay cap. This area is baited with poison to preclude ground burrowing by rodents and other animals. Similar to the entirety of Production Site 1, the landfill covers an area with groundwater contamination. West of the landfill area are a few scattered buildings, above-ground propane storage tanks, railroad tracks, and parking lots. This area is characterized as having groundwater contamination "in which release, disposal, or migration of hazardous substances has occurred, but in concentrations that do not require a removal or other remedial response."[7] The area of the landfill is approximately 4.3 acres. The west portion of Production Area 2 is approximately 12 acres in size with roughly 60 percent impervious coverage.[8]

[7] CH2M Hill, 2006, *Environmental Condition of Property Phase 1 Report, Riverbank Army Ammunition Plant*, Figure ES-1: Property Categorization Map.

[8] The presence of Polychlorinated Biphenols (PCB) contamination was identified in portions of this area. Remediation action is expected in the future to mitigate the PCB contamination. Once mitigation is complete, and subject to regulatory approval, the level of contamination is expected to be reduced to very low levels and should not affect the design and implementation of future LID features

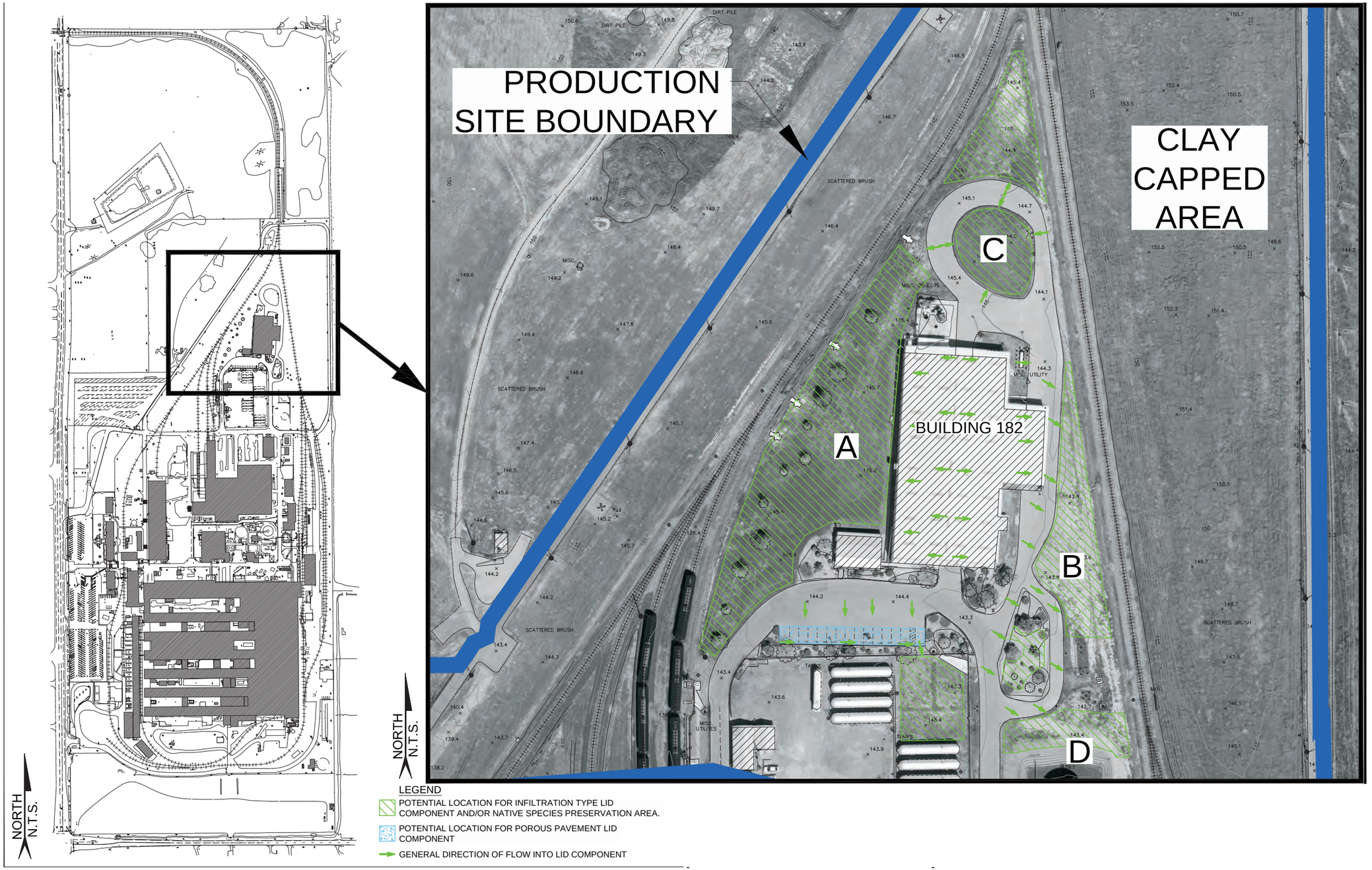
Underground infiltration tanks.
http://www.treepeople.org/open-charter-school

Bioretention basin

Stormwater runoff on the clay capped landfill is directed into ditches located on the east and west sides of the landfill area. Flows in the ditches travel to the south end of the landfill area and are conveyed into an underground 16-inch storm drain pipe that carries the flow to the west, into the main storm drain line and lift station located near Gate 10. Stormwater from the lift station flows north to another lift station and into the northwest stormwater reservoir. Stormwater in the west portion of Production Area 2 is collected in numerous inlets and pipe networks and flows to the above-mentioned lift station located near Gate 10, eventually reaching the northwest stormwater reservoir.

The clay cap covering the landfill area will remain intact in the future. Therefore, very limited options are available to reduce the amount of stormwater runoff leaving this area. Landscaping with amended soils to absorb the rainfall could be constructed above the landfill on top of the clay cap. This type of landscaping system would require a root barrier to protect the clay cap. However, this type of landscaping would most likely be cost prohibitive.

Stormwater runoff from the landfill area could be directed to an underground infiltration LID feature located on an adjacent part of the RAAP site. The existing storm drain system conveys stormwater runoff from the landfill area at a low elevation. Thus, if adequate separation from the water table can be maintained, underground storage/infiltration chambers may be constructed in the available property located west of the landfill (e.g. the unused parking lot or property that is vacated in the future, and thus, slated for redevelopment). This type of improvement could potentially be incorporated into conditions of approval for the redevelopment of the aboveground tank property. The cost of constructing the underground infiltrations tanks could be offset by reduction in the initial property cost (i.e. fair market price minus cost of underground infiltration tanks). Maintenance of said system would most likely be the responsibility of the City and require an agreement between the future property owner and the City.



Source: Weston Solutions

FIGURE 8

POTENTIAL LID COMPONENTS: PRODUCTION SITE 2

A second option for treating the stormwater runoff from the landfill area is to adjust the grading above the landfill to direct flows into an aboveground LID feature, such as an infiltration basin or bioretention basin. The grading above the landfill would include placing fill on top of the landfill, which would keep the clay cap intact. The new additional LID feature could be in an area currently occupied by landscaping on an adjacent property to the west of the landfill, see Letter D in Figure 8. This would require directing stormwater runoff under the railroad track located along the west side of the landfill and may require a structurally enhanced, reinforced concrete box culvert.


Permeable concrete parking lot stalls

The area west of the landfill appears to have ample space to incorporate LID features. Directly west of Building 182 is a large landscaped area, see Letter A in Figure 8, where infiltration basins and/or rain gardens could be constructed to collect and treat stormwater runoff from the roof, roadway, parking lot, and other impervious areas. The parking stalls in the parking lot located south of Building 182 could be replaced with a porous pavement section over existing soils.

There are opportunities for LID features along the existing access roads, see Letter B on Figure 8, to collect and infiltrate stormwater runoff. This may include converting existing landscape areas into infiltration basins, infiltration trenches, and/or rain gardens. The area encircled by the access road, see Letter C on Figure 8, north of Building 182, is one example of an area that could be converted into a large infiltration basin. If improvements to the existing roadways are completed as part of the site redevelopment, the improvements could incorporate LID features such as infiltration basins.

3. Production Site 3

Production Site 3 is an area formerly associated with the production of ammunition, located south of Production Site 1 and north of the South End Cap area (see Figure 9). Many of the buildings in this area are uniquely oriented toward custom manufacturing processes. While Production Site 3 suffers

from groundwater contamination, it is "in concentrations that do not require a removal or other remedial response."[9]

Stormwater runoff along the east boundary and southeast area of Production Site 3 drains into the southeast stormwater reservoir. A lift station pumps the runoff from the basin into the underground storm drain main piping. Stormwater runoff from the other areas of Production Site 3 is collected in a series of inlets and pipes connected to the main storm drain piping. In the main storm drain piping, the flows travel north, through Production Sites 1 and 2, reaching the 600 gpm lift station located near Gate 10. Stormwater from the lift station flows north to another lift station and into the northwest stormwater reservoir.

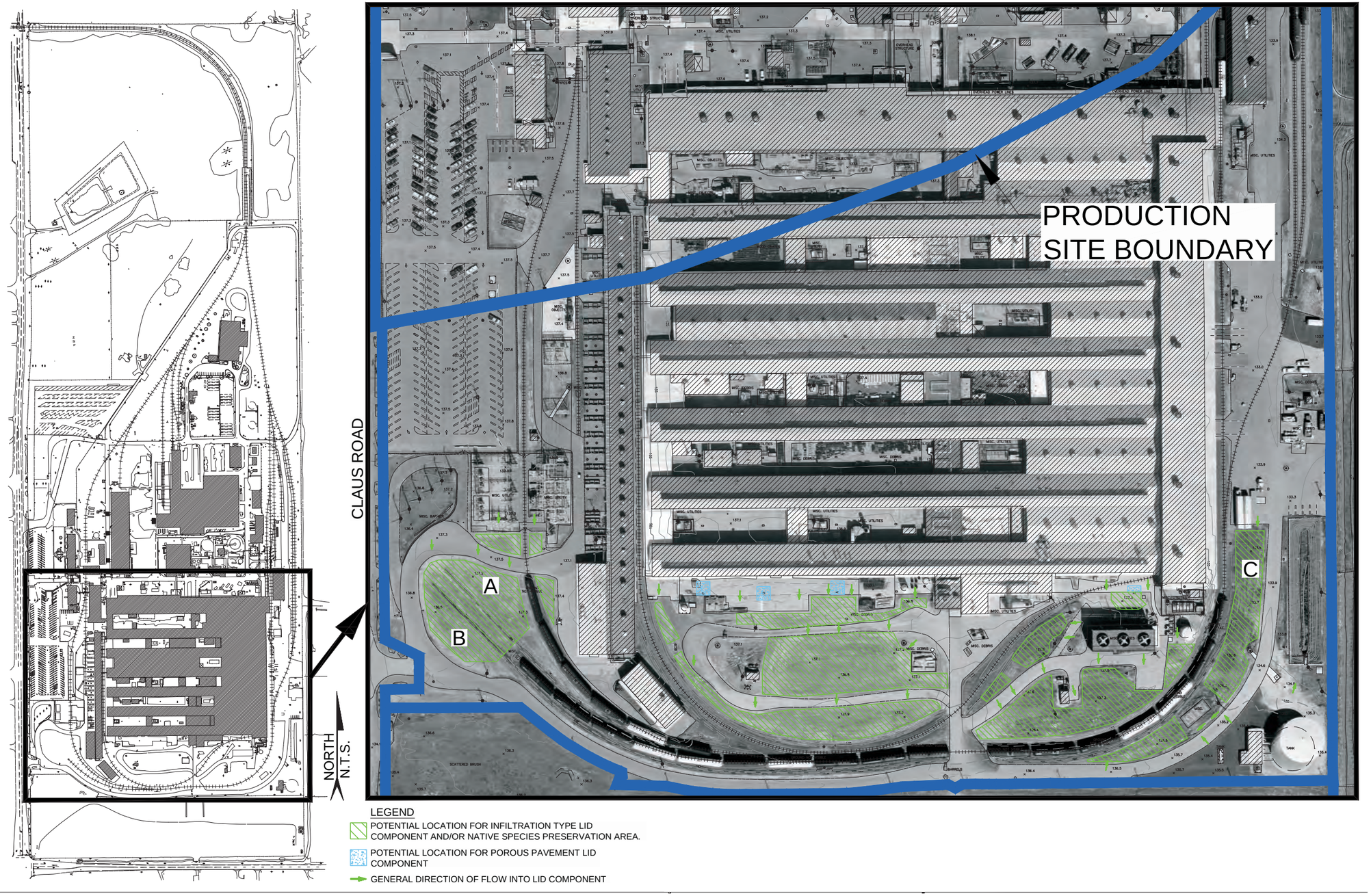
Vegetated swale catching parking lot runoff

Stormwater planting

The northern portion of Production Site 3 is occupied primarily by buildings, access roads and parking lots. There may be opportunities to selectively remove hardscape and increase permeability around the buildings. Due to the significant amount of truck and trailer traffic, removal of hardscape will need to be limited to areas not associated with driveways and access roads. Impervious surfaces could be removed along walkways and replaced with a combination of landscaping and porous pavement. Areas within parking lots, such as parking stalls where existing inlets are located, could also be replaced with a porous material. Additionally, parking lots could be reconfigured to include infiltration basins and rain gardens.

A variety of rain catchment methods could be used to store stormwater runoff for irrigation and/or infiltration in Production Site 3. Redirection of rooftop runoff, including providing gutters to channel stormwater into cisterns and/or rain barrels, can be used successfully in this area with minimal cost. The harvested water could be used to provide irrigation to added landscape areas (see Figure 7 for an example of a rainwater harvesting system).

[9] CH2M Hill, 2006, *Environmental Condition of Property Phase 1 Report, Riverbank Army Ammunition Plant*, Figure ES-1: Property Categorization Map.



Source: Weston Solutions)

FIGURE 9

POTENTIAL LID COMPONENTS: PRODUCTION SITE 3

The southern area of Production Site 3 is generally unoccupied by buildings and has greater opportunities to incorporate LID features. Directly south of Building Group 6 are open space areas where infiltration basins and/or rain gardens could be constructed to collect and treat stormwater runoff from the roof, roadway, parking lot, and other impervious areas. Portions of this undeveloped land could be planted with native vegetation, in conjunction with removal of exotic invasives.

There are opportunities for LID features along the existing access roads to collect and infiltrate stormwater runoff, see Letters A through C on Figure 9. This could include creating several small infiltration basins adjacent to each side of the roadways. Larger basins could be constructed in the areas west and south of Building 108. If improvements to the existing roadways are completed as part of the site redevelopment, the improvements could incorporate LID features such as parkway infiltration basins.


Vegetated swale collecting roadway runoff

If the area around the southeast stormwater reservoir is redeveloped, the reservoir should be enlarged to provide additional volume for temporary storage and surface area for infiltration.


Rain garden along a roadway with sidewalk separation

4. South End Cap

The South End Cap is located south of Production Site 1 and immediately north of Claribel Road as shown in Figure 10. This area is currently undeveloped and could offer convenient access from Claribel Road. A wide range of LID approaches can be used in this are, as there are no existing contamination issues identified that preclude maintaining a high degree of site permeability. Proposed buildings can incorporate green roofs, gutter systems that connect to a variety of rainwater catchment systems, or with disconnected downspouts dispersing into infiltration basins and / or rain gardens. Planter boxes, raised planters, native vegetation, reduced hardscape, pervious pavement parking stalls and walkways, and natural drainage are other examples of typical LID features that could be incorporated into site plans. Proposed roadways for this area could also incorporate LID features such as parkway landscaped infiltration basins, infiltration trenches, and/or rain gardens.

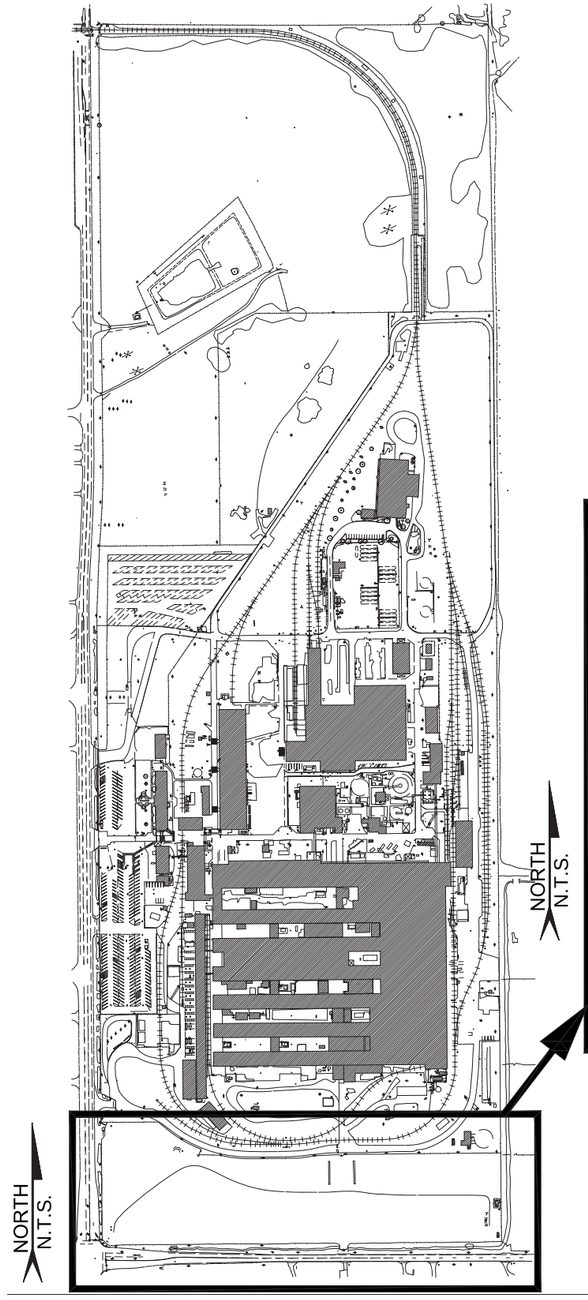
Permeable concrete parking lot

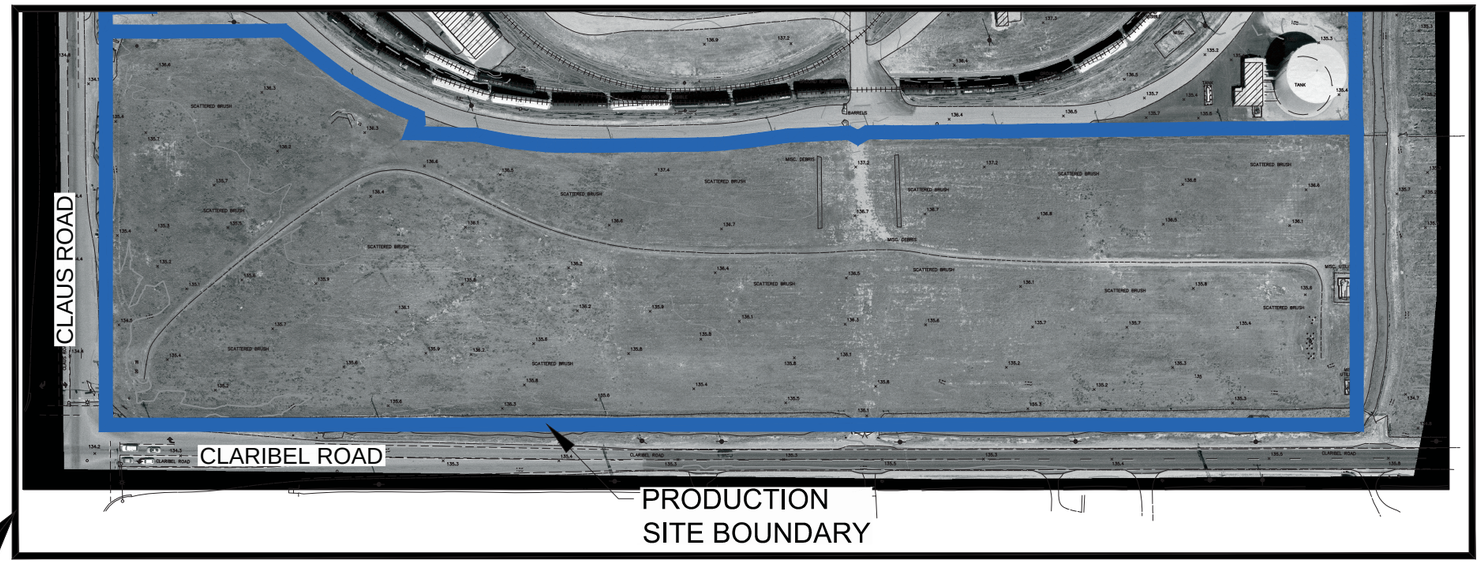
Based on the location of this area and the existing topography, which slopes slightly towards the south, conveying stormwater runoff from this area to the northwest stormwater reservoir presents several challenges. These include the energy that would be required to pump excess stormwater runoff and the difficulty of constructing new storm drain piping through existing improvements. Therefore, site plans should provide for the collection, storage and infiltration on-site of the stormwater runoff for the flood control design storm by using underground infiltration chambers and/or aboveground infiltration basins. These storm drainage storage facilities should be designed in accordance with the Stanislaus County Department of Public Works Standards and Specifications, 2007 Edition or as updated, to hold runoff resulting from the 50-year or greater storm events. To reduce the amount of runoff, and thus the size and costs of constructing and maintaining infiltration systems, site plans should maximize the amount of pervious surface and, where possible, create separation between impervious surfaces to allow for infiltration.

5. North End Cap

The North End Cap is the most northern part of the site, bound on the north by railroad lines and split into thirds by the Oakdale Irrigation Canal and the Hetch Hetchy Aqueduct, as shown in Figures 2 and 11. The Canal and the Aqueduct are closed systems located underground. The Oakdale Irrigation Canal and Hetch Hetchy Aqueduct are on their own parcels which include buffers. Positive drainage away from these existing utilities and easements will need to be maintained. Therefore grading plans should incorporate the established elevations over and adjacent to the utilities, and in general, follow the existing topography of the site. The area of the North End Cap located south of the northwest reservoir has groundwater contamination "in concentrations that do not require a removal or other remedial response."[10]

[10] CH2M Hill, 2006, *Environmental Condition of Property Phase 1 Report, Riverbank Army Ammunition Plant*, Figure ES-1: Property Categorization Map.

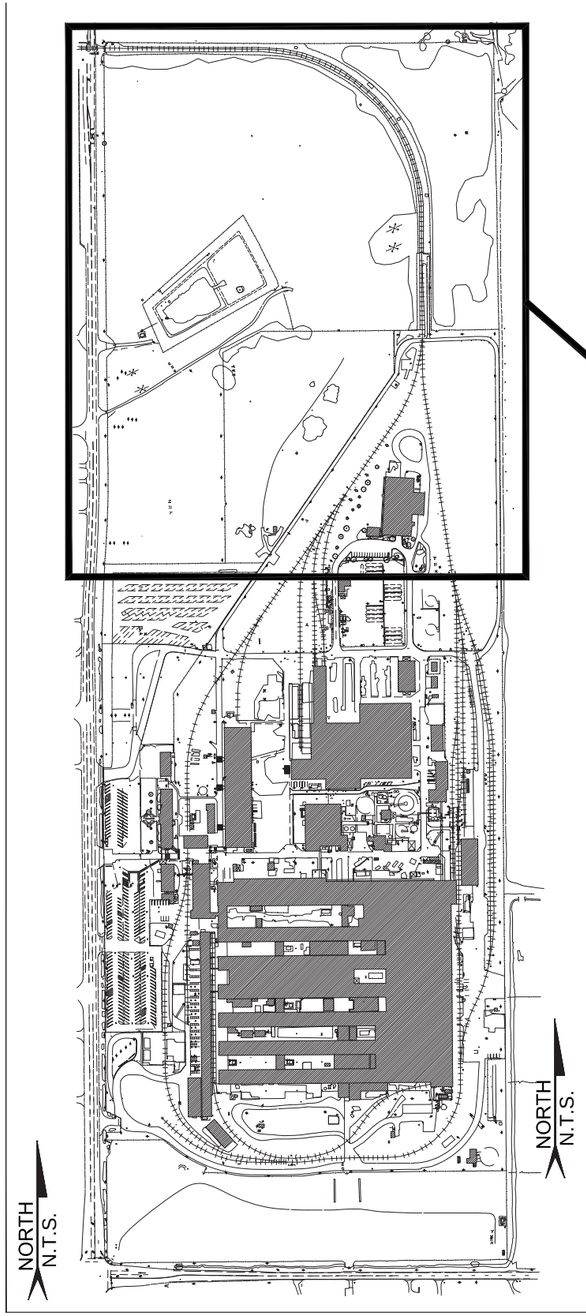


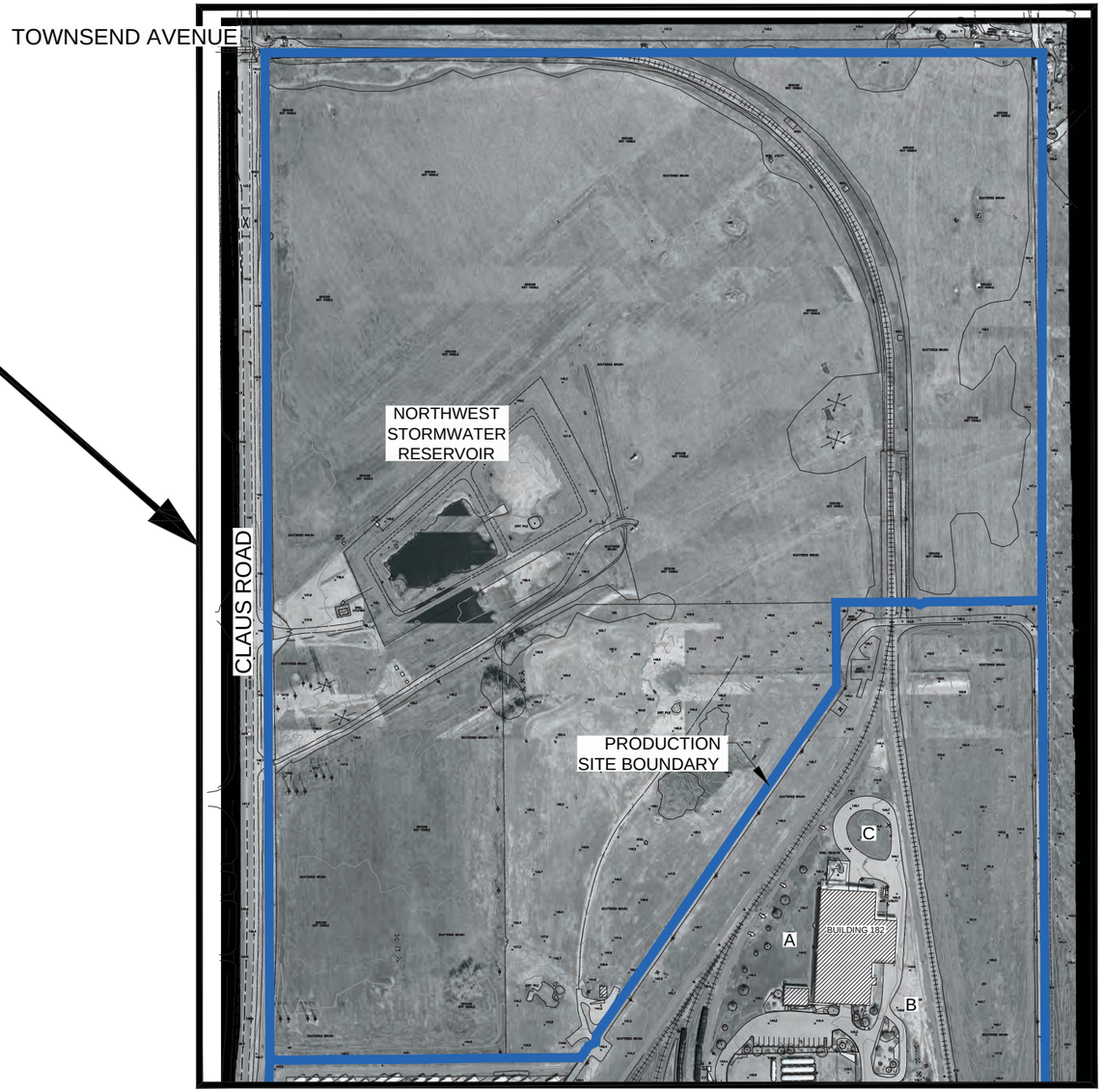


Source: Weston Solutions

FIGURE 10

POTENTIAL LID COMPONENTS: SOUTH END CAP





Source: Weston Solutions

FIGURE 11

POTENTIAL LID COMPONENTS: NORTH END CAP

Stormwater runoff on the North End Cap areas flows towards the southwest. The parking lot current occupied by Leisure RV Storage is slightly elevated and runoff ponds in the adjacent vacant area prior to infiltration and evaporation. The northwest stormwater reservoir, the associated lift station, and the 36-inch conveyance storm drain pipe are located within the North End Cap. The northwest stormwater reservoir will continue to operate until LID and stormwater infrastructure improvements within the Production Sites eliminate its need. Extensive redevelopment of the Production Sites, which is not anticipated in the foreseeable future, would be required to address stormwater infrastructure improvements sufficient for the removal of the northwest stormwater reservoir. Access easements for the pipeline associated with the reservoir could be granted to the party responsible for maintaining the on-site storm drain system when the property is sold in the future.

Permeable pavers a type of porous pavement

A variety of LID approaches can be incorporated into the future development of the North End Cap area. Buildings can incorporate green roofs, gutter systems connecting to a variety of rainwater catchment systems or with disconnected downspouts dispersing into infiltration basins and/or rain gardens. Planter boxes, raised planters, preserved native vegetation, reduced hardscape, pervious pavement parking stalls and walkways, and natural drainage are other examples of typical LID features that should be incorporated into site plans. Another important and often overlooked LID feature associated with new development is site layout to minimize the amount of connected impervious surfaces. By reducing the connected impervious surfaces, the amount of stormwater runoff generated on-site is reduced and the time of concentration is increased, which in turn reduces the overall peak storm event flow and the amount of temporary storage volume required to collect runoff. The time of concentration is the time for water to travel from the most hydraulically distant point and is dependent on length, slope and ground cover. Proposed roadways for this area could also incorporate LID features such as parkway landscaped infiltration basins, infiltration trenches, and/or rain gardens. Proposed sidewalks should be separated from the roadway curb and drain towards the parkway. Landscaped infiltration basins or rain gardens can be constructed within the roadway adjacent to road side parking stalls. Addi-

Underground infiltration chambers
http://www.treepeople.org/open-charter-school

tionally, if bike lanes are part of proposed roadways, they could be constructed with a porous pavement section over native soils.

Ideally, site development on the North End Cap should include LID features designed to capture, temporarily store, and infiltrate on-site the stormwater runoff for the design flood control storm event. This can be achieved using a combination of LID features throughout the site and by having features where storm drain pipes daylight such as underground infiltration chambers and/or aboveground infiltration basins. Underground infiltration chambers can be constructed beneath parking lots or landscaped areas. These devices have a high initial cost and require maintenance on a regular basis. The initial costs of infiltration basins are less than underground devices. Additionally, basins, if designed properly, can be incorporated into and maintained as part of the site landscaping. However, infiltration basins require adequate space to store and infiltrate stormwater runoff in a manner that does not create vector control issues. Vector control is the control of an organism, usually an insect, which carries and transmits disease-causing organisms such as the mosquito and the West Nile Virus.

The North End Cap properties may be less attractive to potential developers if capture and infiltration of flood control volumes is required. A second option for management of stormwater runoff from the North End Cap is to construct a second lift station, or increase the capacity of the existing lift station adjacent to the northwest stormwater reservoir, so that stormwater can be directed to an expanded northwest reservoir. However, this would result in less developable land around the reservoir and prevent its future removal.

F. Summary of Recommendations

The following sustainable practices should be implemented as part of new development or improvements to the RAAP site. These recommendations include a variety of practices that support LID, including stormwater improvements as well as other measures. These practices can be implemented

immediately or can be phased in over time. It is anticipated that a Stormwater Master Plan will be developed for RAAP that further refines and implements these recommendations.

Production Site 1

- Construct precast planter boxes to provide landscaped areas where possible. Impervious surfaces should remain in place throughout Production Site 1.
- Redirect rooftop runoff into cisterns and/or rain barrels. This may require the construction of new gutters.

Production Site 2

- Convert portions of the landscaped area located west of Building 182 into landscaped infiltration basins and/or rain gardens.
- Redirect rooftop runoff into infiltration basins, rain gardens, cisterns and/or rain barrels. This may require the construction of new gutters.
- Replace impervious pavement within parking stalls of the parking lot located south of Building 182 with pervious pavement.
- Construct landscaped infiltration basins, infiltration trenches, and/or rain gardens along existing roadways.
- Include LID features in future roadway improvements.
- Incorporate infiltration basins or underground infiltration chambers to capture stormwater runoff from the capped landfill area. This may require remedial grading above the capped landfill.

Production Site 3

- Convert portions of the undeveloped area located south of Building 6 into landscaped infiltration basins and/or rain gardens. Portions of this undeveloped land could be planted with native vegetation in conjunction with the removal of exotic invasives.

- Redirect rooftop runoff into infiltration basins, rain gardens, cisterns and/or rain barrels. This may require the construction of new gutters.
- Remove hardscape selectively and increase permeability around buildings. Impervious surfaces may be removed along walkways and replaced with a combination of landscaping and porous pavement.
- Construct landscaped infiltration basins, infiltration trenches, and or rain gardens along existing roadways. Construct landscape infiltration basins in the area south of Building 108.
- Increase capacity of the southeast stormwater reservoir if possible.
- Include LID features in future roadway improvements.

South End Cap

- Incorporate green roofs into new buildings.
- Connect gutter systems to a variety of rainwater catchment systems, or have disconnected downspouts dispersing into infiltration basins and/or rain gardens.
- Incorporate LID features into site plans, including planter boxes, raised planters, native vegetation, reduced hardscape, pervious pavement parking stalls and walkways, and natural drainage.
- Minimize the number of connected impervious surfaces.
- Include LID features into roadway improvements.
- Collect, temporarily store, and infiltrate stormwater runoff from the flood control design storm on site.

North End Cap

- Incorporate green roofs into new buildings.
- Connect gutter systems to a variety of rainwater catchment systems, or have disconnected downspouts dispersing into infiltration basins and/or rain gardens.

- Incorporate LID features into site plans, including planter boxes, raised planters, native vegetation, reduced hardscape, pervious pavement parking stalls and walkways, and natural drainage.
- Minimize the number of connected impervious surfaces.
- Include LID features into roadway improvements.
- Collect, temporarily store, and infiltrate stormwater runoff from the flood control design storm on-site. Alternatively, expand the northwest stormwater reservoir to provide capacity for stormwater runoff from new development in the North End Cap area.

Existing Infrastructure Verification

- Verify the capacities of the lift station. Perform detailed hydrology analysis to identify existing infrastructure shortfalls, and provide recommendations for upgrades, where applicable.
- Conduct percolation testing around the site to support the design and implementation of infiltration basins.
- Evaluate existing railroads to determine existing and future potential uses, and implement a plan to remove tracks with no current or future uses.

G. Additional Resources

The following references provide a variety of specific information that may be helpful in future development of LID strategies.

- **Environmental Protection Agency Links**
  - EPA: Low Impact Development (LID) and Other Green Design Strategies
    http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=124
  - Low Impact Development links can be found at www.epa.gov/nps/lid/

- EPA Stormwater Technology Fact Sheet Porous Pavement www.epa.gov/npdes/pubs/porouspa.pdf
- More information about the National Pollutant Discharge Elimination System (NPDES) is available at http://cfpub.epa.gov/npdes/index.cfm

♦ **California State Water Resources Control Board Links**

- Best Management Practices (BMP) Database www.waterboards.ca.gov/water_issues/programs/stormwater/bmp_database.shtml
- Fact sheet for the NPDES General Permit is available at www.swrcb.ca.gov/water_issues/programs/stormwater/docs/final_ms4_permit.pdf

♦ **Stanislaus County Links**

- The Stanislaus County Stormwater Pollution & prevention Program home page can be found at www.stancounty.com/publicworks/storm/index.shtm
- Specific requirements of a SWPPP are not discussed in this document. More information can be found in the Stanislaus County Storm Water Management and Discharge Control Ordinance. www.stancounty.com/publicworks/storm/pdf/storm-water-mgmt-discharge-control-ordinance.pdf

♦ **C.3 Links**

- Until Stanislaus County completes its manual, it is recommended that site development at RAAP comply with section C.3 of the NPDES Permit developed for the San Francisco Bay region available at www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/mrp.shtml
- Several Bay Area Counties have developed guidebooks and tools outlining LID stormwater techniques to help projects comply with San Francisco Bay Region C.3 requirements.
  - Contra Costa Clean Water Program Stormwater C.3 Guidebook September 10, 2008 www.cccleanwater.org/Publications/Guidebook/Stormwater_C3_Guidebook_4th_Edition_9-10-08.pdf

  - Alameda Countywide Clean Water Program c.3 Stormwater Technical Guidance www.cleanwaterprogram.org/uploads/ACCWP_C3_Technical_Guidance_090506-300dpi.pdf
  - City of Emeryville Stormwater Sizing Worksheet www.ci.emeryville.ca.us/planning/sizing_worksheet_v8.xls

♦ **Other LID Links**

- Low Impact Development Center www.lowimpactdevelopment.org
- Stormwater Manager's Resource Center www.stormwatercenter.net
- LID Urban Design Tools, www.lid-stormwater.net
- California Stormwater Quality Association, www.cabmphandbooks.com
- Low Impact Development Technical Guidance Manual for Puget Sound January 2005 www.psp.wa.gov/downloads/LID/LID_manual2005.pdf
- Guidelines for the Standard Urban Storm Water Mitigation Plan Storm Water Best Management Practices for New Development and Redevelopment For the Santa Rosa Area and Unincorporated Areas around Petaluma and Sonoma, June 3, 2005 www.sonoma-county.org/prmd/sw/pdf/susmp.pdf
- Santa Clara Valley Urban Runoff Pollution Prevention Program www.scvurppp-w2k.com/default.htm

APPENDIX E:

FINAL PARKING ANALYSIS

FEHR & PEERS
TRANSPORTATION CONSULTANTS

MEMORANDUM

Date: November 16, 2010

To: Jeff Williams, Design, Community & Environment

From: Kathrin Tellez

Subject: ***Riverbank Army Ammunition Plant Parking Assessment***

WC09-2656

This memorandum presents the findings of a parking study conducted for the Riverbank Army Ammunition Plant (RAAP) in Riverbank, California. Parking demand for the existing tenants was documented at varying times of day/week to assess existing parking demand characteristics. The results were used to estimate the parking supply needed for proposed tenants of the vacant portion of the site. Approximately 215,000 square feet of the existing 673,625 square feet of building area is currently occupied with industrial uses, with approximately 90 employees over two shifts. With occupation of the vacant portion of the site, the total employment is expected to increase to 550 employees over two shifts.

Based on this assessment, additional parking supplies would be needed to meet peak parking demand. Reconfiguring the existing parking lots and adding additional parking in currently unused areas of the site would increase the on-site parking supply from approximately 260 spaces to approximately 500 spaces. The resulting parking supply would be generally sufficient to accommodate projected peak parking demands; however, parking shortages may be experienced during shift change times. Strategies to alleviate parking shortages include staggering shifts, restricting parking in one area to second shift employees only during certain times of day, and promoting ridesharing and alternative modes of travel.

The following presents our Project Understanding, Existing Parking Conditions, Future Parking Conditions, and Recommendations.

PROJECT UNDERSTANDING

The developed portion of the RAAP is located on a 146-acre site in the northeast quadrant of the Claus Road/Claribel Road intersection in the City of Riverbank, as shown on **Figure 1**. (An undeveloped 23-acre portion of the RAAP located on the Stanislaus River was not included in this analysis.) The existing RAAP currently contains approximately 673,625 square feet of industrial building area, of which approximately 215,000 square feet is occupied. The current tenant operates two shifts with 60 to 65 employees in the first shift and 25 employees in the second shift. Of the employees in the first shift, approximately 45 are in manufacturing, while the remaining employees are office workers, security, facility maintenance (provided by EMCOR Group, Inc.) and dispatch (for Storer Transit Systems).

Occupation of the vacant square footage is proposed by an industrial user that would contain manufacturing/production uses as well as security, office and maintenance uses. At full occupancy, it is expected that 400 total employees would be at the RAAP during the day, with an additional 150 employees on a second shift, for a total employment of 550. Of the employees on the day shift, approximately 80 percent would be in production/manufacturing, and the remaining 20 percent would be security, office and maintenance employees. For the second shift, it is expected that 98 percent of employees would be in production/manufacturing and the remaining would be maintenance.

EXISTING CONDITIONS

This section discusses the existing parking conditions, including the supply and demand characteristics.

Parking Supply

There are currently three parking areas at the RAAP, totaling approximately 260 marked spaces, as shown on **Figure 2.** Table 1 presents the number of spaces by type (regular, visitor, ADA accessible, and motorcycle/other) and the total number of spaces for each area. Access to the parking areas is provided by one driveway off Claus Road, located approximately 500 feet south of Minnear Avenue and 500 feet north of Davis Avenue. A second driveway, which provides access to the truck scales and the internal roadway network, is located north of the main driveway. A third driveway is located on Claus Road, south of the main driveway – this driveway is currently closed.

TABLE 1
EXISTING PARKING SUPPLY SUMMARY (BY TYPE OF SPACE)

Parking Area	Regular	Visitor	ADA[1] Accessible	Motorcycle/ Other[2]	Total
Area 1	42	6	0	19	67
Area 2	69	0	6	1	76
Area 3	117	0	0	0	117
Total	228	6	6	20	260

Notes:
1. Americans with Disability Act (ADA) accessible stalls.
2. Unmarked or motorcycle parking.

Source: Fehr & Peers, 2010.

Use of the parking area is constrained by the placement of power poles and utility boxes within the main parking field. Some of the obstacles are barricaded, while others are in the middle of drive aisles. The location of these obstacles is noted on Figure 2.

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Data Collection

A parking occupancy survey was conducted to determine the parking demand at various times of the day/week to document the peak parking demand of the existing tenants. Fehr & Peers staff recorded the number of parked vehicles at the RAAP at 9:30 AM, 11:30 AM, 1:30 PM, and 3:30 PM on Wednesday, September 8th and Thursday, September 9th as summarized in Table 2. Parking demand for distinct user groups was documented, including vehicles parked in marked visitor and Americans with Disability Act (ADA) accessible stalls, as well as motorcycle parking. Parking demand was also separated by lot, which indicates Parking Area 3 is not highly used, and the parking demand fairly evenly split between Parking Areas 1 and 2. Parking data by lot is attached.

TABLE 2
PARKING SURVEY SUMMARY

Date	Time	Regular	Visitor	ADA[1] Accessible	Motorcycle/ Other	Total
Wednesday, September 8th	9:30 AM	53	5	1	4	63
	11:30 AM	50	5	1	5	61
	1:30 PM	50	5	2	7	64
	3:30 PM	51	5	2	5	63
Thursday, September 9th	9:30 AM	51	5	1	4	61
	11:30 AM	53	6	1	3	63
	1:30 PM	59	6	1	3	69
	3:30 PM	60	5	1	2	68

Notes:
1. Americans with Disability Act (ADA) accessible stalls.

Source: Fehr & Peers, 2010.

Peak general parking demand was observed on Thursday afternoon at 3:30 PM, with a demand of 60 regular or unrestricted parking spaces. Peak visitor parking demand was six vehicles, with average visitor parking demand of five vehicles. Americans with Disability Act (ADA) accessible stall demand ranged between one and two vehicles. Motorcycle parking demand ranged between two and seven vehicles. The overall peak parking demand of 69 occupied stalls was observed at 1:30 PM.

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Parking Demand Rates

Parking demand rates expressed as parking spaces per employee were calculated based on the number of employees in the first shift and the average peak demand (by space type), over the two days of data collection, as presented in Table 3. The number of employees, instead of the square footage of occupied building area, was selected as the variable to base parking calculations, as the number of employees that could occupy a set square footage could vary significantly and the number of employees is typically a better predictor of parking demand when that data is available.

Additionally, data presented in the Institute of Transportation Engineers publication *Parking Generation,* 4th Edition was reviewed for uses similar to the existing RAAP tenants, including manufacturing, office (which includes research and development), and warehousing. Data contained in *Parking Generation* is based on multiple surveys conducted at numerous locations across the United States.

TABLE 3
RAAP SPECIFIC
PARKING DEMAND RATES PER EMPLOYEE

Condition	Regular	Visitor	ADA Accessible	Motorcycle	Total
Average Peak Parking Demand	56	6	2	5	68
Demand Rate per Employee	0.86	0.09	0.03	0.08	1.06
Maximum Peak Parking Demand	60	6	2	7	75
Demand Rate per Employee	0.92	0.09	0.03	0.11	1.15

Source: Fehr & Peers, September 2010.

As shown in Table 3, the average RAAP parking demand rate is 1.06 spaces per employee. This accounts for employee parking demand, as well as demand from visitors and others on the site. The maximum observed parking demand rate was 1.15 spaces per employee. The calculated average and maximum rates consider the average and peak occupancy of the distinct parking user groups, as the parking for one group, such as ADA accessible parking, cannot be used to serve the parking demands of another group.

Parking demand rates per employee from the RAAP surveys and from *Parking Generation* are presented in Table 4 for comparison purposes. This comparison shows that the average peak observed rate for RAAP is higher than for other similar uses. The maximum observed RAAP rate is slightly lower than the maximum documented rate for other similar uses.

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TABLE 4
PARKING DEMAND PER EMPLOYEE
RATE COMPARISON

Source/Land Use Type	Average	Max
RAAP Specific	1.06	1.15
ITE Manufacturing	0.97	1.22
ITE Office	0.83	1.35
ITE Warehousing	0.78	1.16

Source: *Parking Generation,* 4th Edition, Institute of Transportation Engineers, Fehr & Peers, September 2010.

Since the collected data is representative of the site, its location, and the proposed uses, as well as the mode choices of the local labor pool, the RAAP specific rates were selected to estimate parking demand with the planned employment increases.

FUTURE PARKING DEMAND ASSESSMENT

The average and maximum observed parking demand rates by user group were applied to the proposed number of employees with full occupancy of the site. The resulting parking demands are presented in Table 5.

TABLE 5
FUTURE PARKING DEMAND ESTIMATES[1]

Number of Employees	Regular	Visitor	ADA Accessible	Motorcycle	Total
Average	345	37	12	31	425
Maximum	369	37	12	43	462

Notes:
1. Based on 400 employees in the first shift.

Source: Fehr & Peers, 2010.

With the employment increases to 400 on the first shift, the peak parking demand is expected to be 425 spaces and could be as high as 462 spaces. Based on the data from other similar uses, it is likely that the average parking demand per employee could decrease as the site achieves more operational efficiencies with a larger employee pool, including increased opportunities for carpooling. Also, there is likely to be fewer visitors per employee, a consolidation of deliveries, and alternative work schedules for office employees that could reduce the number of people on site at any given time. Therefore, it is expected that typical peak parking demand would be closer to 425 spaces than 462 spaces.

As the RAAP is an employment center, a circulation efficiency factor of approximately 5 to 10 percent is recommended. Circulation efficiency allows drivers to enter a parking lot and find an available parking space without re-circulating through the parking aisles in search of a limited

number of available spaces. This also provides a parking supply buffer for periodic increases in parking demand.

Based on the expected parking demand and the provision of a circulation efficiency factor, it is recommended that between 468 and 500 parking spaces be provided with first shift employment levels of 400. To accommodate this level of parking supply, modifications to the existing parking scheme are recommended.

RECOMMENDATIONS

Based on the projected level of parking demand with the expected level of employment increases, a conceptual parking layout of the existing parking areas was prepared, as shown in **Figure 3**. Restriping of the existing three parking fields is recommended in addition to providing a fourth parking area in the northern portion of the site. This parking scheme considers the location of utilities within the existing parking field to minimize their effect on vehicle circulation.

The conceptual plan provides approximately 504 parking stalls, including 464 standard stalls, 10 ADA accessible stalls, 6 compact stalls, 20 motorcycle stalls, and 4 semi-truck stalls. The Americans with Disability Act requires that for parking lots with 500 or more parking spaces, 2 percent of the parking supply be ADA accessible, or 10 spaces for the potential level of parking supply that could be accommodated at the RAAP. Additional ADA parking could be provided if conditions warrant.

Modifying the northern portion of the site adjacent to the truck scale area to provide additional parking supplies is also recommended. Approximately 74 parking spaces could be provided in the area west of the truck scale – minimizing conflicts between parked vehicles and large trucks. Additional lighting may need to be added in this area and a pedestrian path should be designated between the parking area and main building entrance.

The parking supply in the southern portion of the site was designed to allow the southern driveway to be re-opened, if necessary. Should this driveway not be re-opened, additional parking spaces could be added in this area.

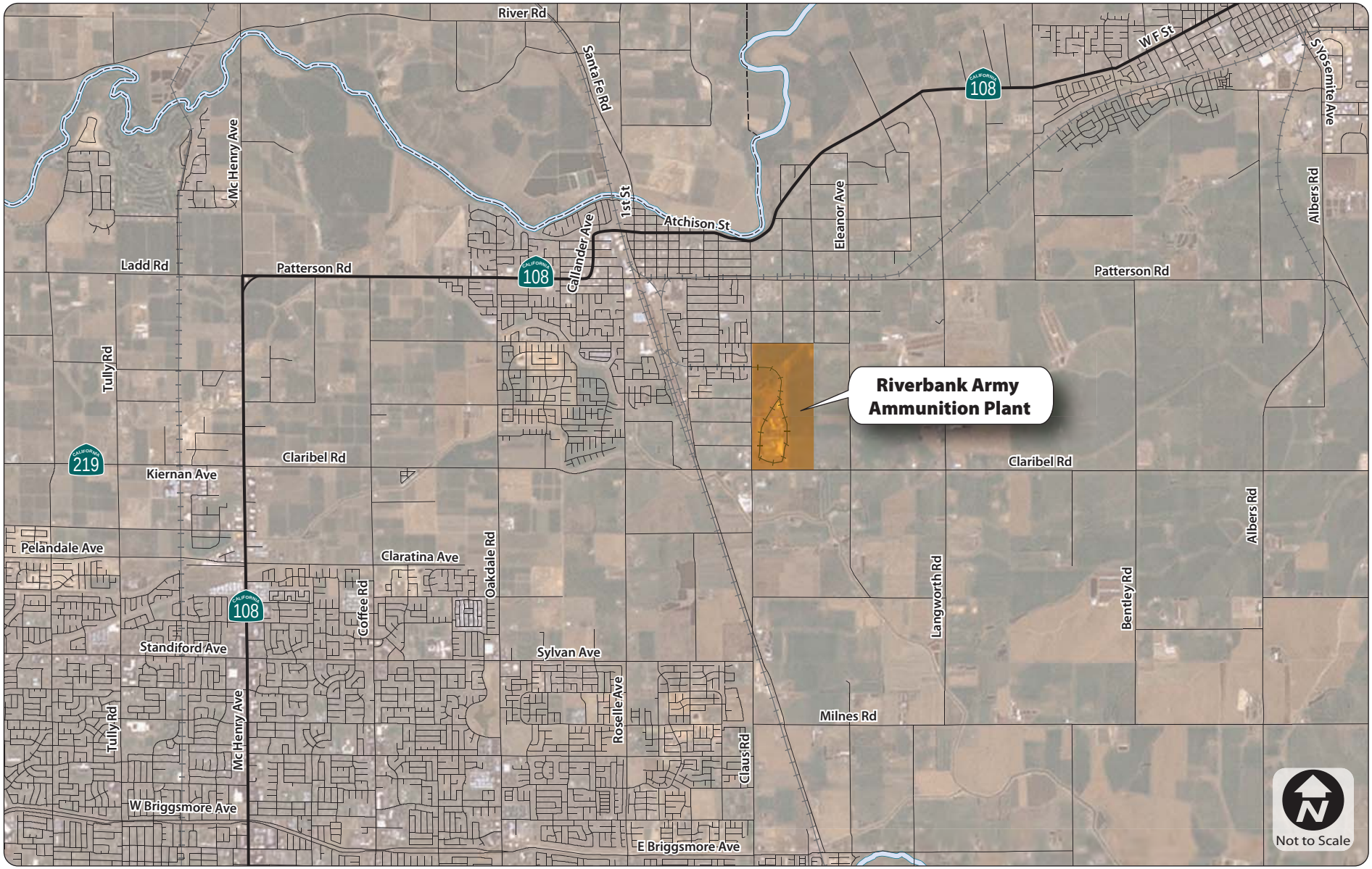
The recommended parking supply of 500 spaces is expected to accommodate the peak parking demand on a typical day with 400 employees. However, parking shortages could occur during shift change times if 150 second shift employees arrive while first shift employees are still present. To minimize the potential impact during shift change, the following strategies are recommended:

- Designate preferential parking spaces (those located closest to the building entrance) for carpools to encourage ridesharing, thereby reducing parking demand

- Implement rolling shift changes, such as two day shifts with staggered start times and end times such that at least 150 day shift employees have left the site by the time the second shift arrives

- Designate one parking area for second shift employees parking for a period of time until the remaining lots are cleared of first shift employees
- Encourage use of alternative modes to access the site, such as bicycling.

As additional development is planned on the RAAP, additional parking supplies would need to be provided. This concludes our parking demand study. Please call Kathrin if you have any questions.



Riverbank Army Ammunition Plant

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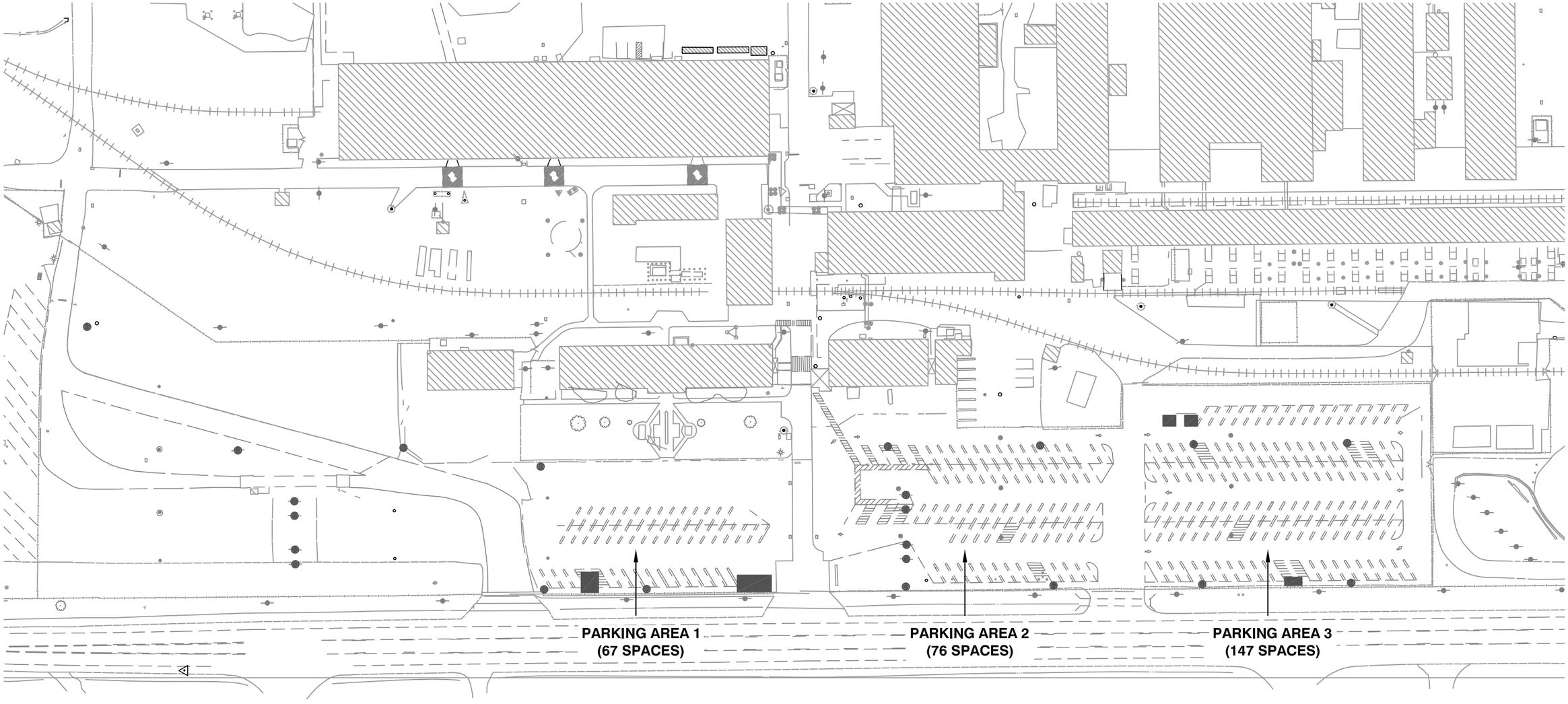
November 2010
TruckScaleMemo\WC09-2656_1_ProjSiteVic

PROJECT SITE VICINITY MAP

FIGURE 1



Riverbank Army Ammunition Plant

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Oct 22, 2010 FPA
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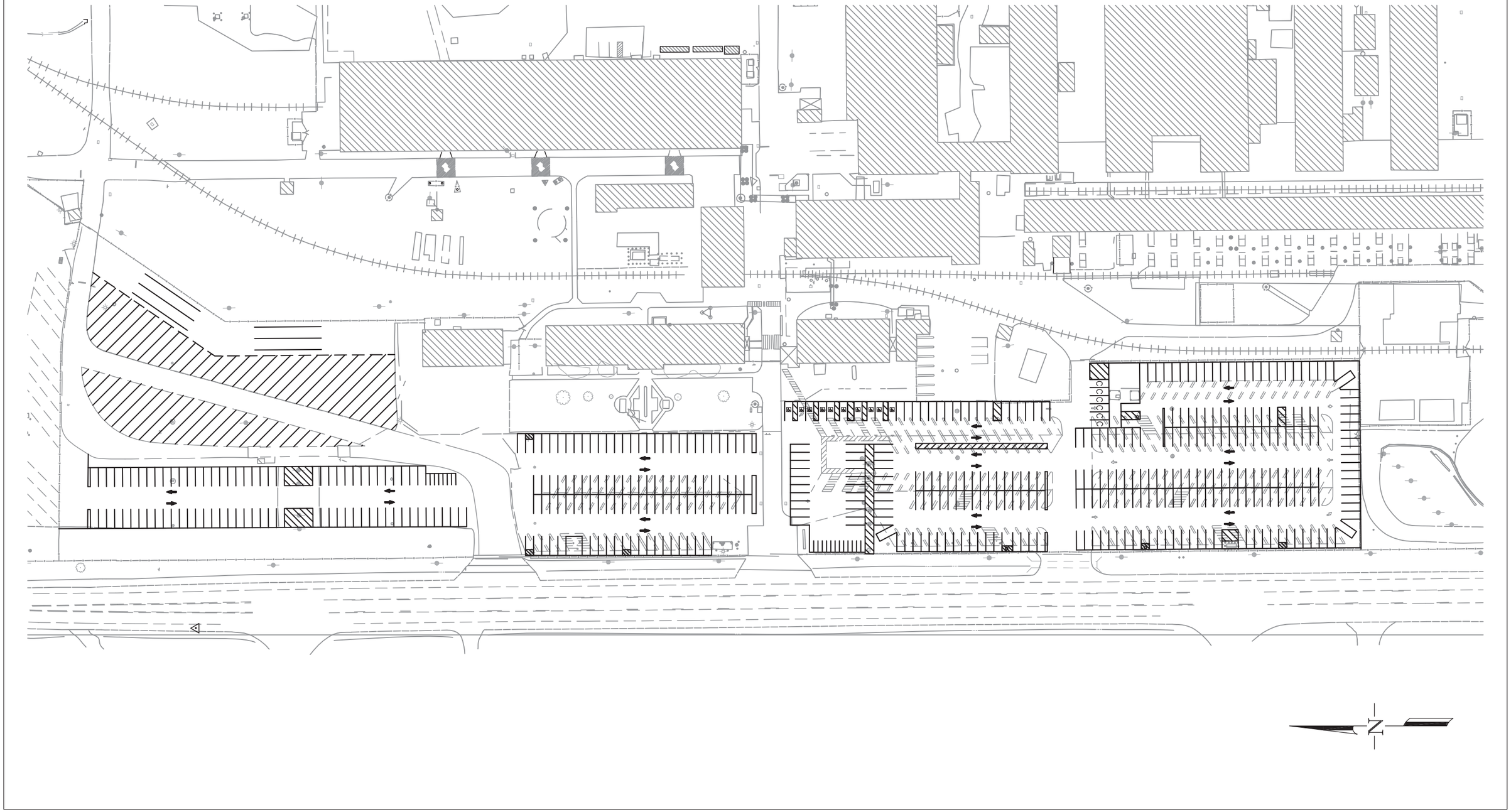
EXISTING PARKING AREAS

FIGURE 2



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CONCEPTUAL PARKING LOT RECONFIGURATION

FIGURE 3

APPENDIX F:

CITY APPROVED STREET TREES

CITY OF RIVERBANK LANDSCAPE STANDARDS

Approved Street Trees

TREE	LATIN	TYPE
Flowering Plum	*Prunus Blireana* *Prunus Atropurpuce* *Prunus Cistene*	Deciduous
Hawthorn	*Crataegus Lavellei* *Crataegus Phaenopyrum* *Crataegus Oxyacantha Paulii*	Deciduous
Sawleaf Zelkova	*Zelkova Serrata*	Deciduous
Red Horse Chestnut	*Aesculus Camea*	Deciduous
Holly Oak/Other Oaks	*Quercus Ilex*	Evergreen or Deciduous
Maidenhair	*Ginkgo Biloba*	Deciduous
Chinese Pistachio	*Pistacia Chinensis*	Deciduous
Goldenrain Tree	*Koelreuteria Paniculata*	Deciduous
Ash varieties (except Modesto)	*Fraxinus*	Deciduous
Fruitless Pear	*Pyrus Calleryana*	Deciduous

- At planting, minimum tree size shall be 15-gallon containers; minimum tree height shall be 7’0” from top of container to top of tree; caliper of tree shall be no smaller than ¾”.
- Each interior lot will require one (1) tree; corner lots will require at least one (1) tree per street frontage (minimum of two trees total).
- The developer or contractor shall water trees at the time of planting and shall be responsible for the care of the trees until the house is occupied.

APPENDIX G:

MITIGATION MONITORING AND REPORTING PROGRAM

MITIGATION MONITORING AND REPORTING PROGRAM

This Mitigation Monitoring and Reporting Program (MMRP) for the RAAP Specific Plan reflects the analysis of impacts and mitigation measures included in the Environmental Impact Report.

The purpose of the MMRP is to ensure the implementation of mitigation measures identified as part of the environmental review for the Project. The MMRP includes the following information:

- A list of mitigation measures.
- The party responsible for implementing the mitigation measures.
- The implementation trigger or timing.
- The agency responsible for monitoring the implementation
- The procedure for implementation of the mitigation measure.
- The timing or frequency of monitoring activities.
- A record of compliance.

Public Resources Code sec. 21081.6(a) requires an agency to adopt a program for reporting or monitoring mitigation measures that were adopted or made conditions of Project approval. The City of Riverbank would adopt this MMRP, or an equally effective program, if it approves the proposed Project with the mitigation measures included in the Environmental Impact Report.

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SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
Air Quality						
AQ-1a: Each individual project component of the Specific Plan, including those projects allowed by right, shall be analyzed for significant construction period air quality impacts. For each project-level analysis, a construction emissions estimate will be made by SJVAPCD using the latest SJVAPCD accepted methodology and will be compared to accepted thresholds of significance. Means of mitigating construction period impacts to a less-than-significant level include, but are not limited to, Mitigation Measures AQ-1a through AQ-1d. Since approval of the RAAP Specific Plan may constitute the final discretionary approval by the City of Riverbank, each individual project component, including those projects allowed by right, shall be required to demonstrate to the SJVAPCD compliance with construction period requirements of Rule 9510 prior to issuance of the first building and/or grading permits as a condition of project approval. The applicant shall document, to the City's reasonable satisfaction, its compliance with this mitigation measure.	Project Applicant	Prior to issuance of building permit	City of Riverbank Development Services Department	SJVAPCD to review construction specifications materials and provide compliance verification to City to retain for administrative record	Once	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
AQ-1b: SJVAPCD Regulation VIII Control Measures. Prior to initiation of construction activities, the applicant for an individual, site-specific development under the RAAP Specific Plan shall be required to implement the following controls: ♦ All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover; ♦ All on-site unpaved roads and off-site unpaved ac-	Construction Contractors	During construction	City of Riverbank Development Services Department	Review construction specifications materials and retain for administrative record/ Conduct site inspections	During regularly scheduled inspections	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
cess roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant; ♦ All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by pre-soaking; ♦ With the demolition of buildings up to six stories in height, all exterior surfaces of the building shall be wetted during demolition; ♦ When materials are transported off-site, all material shall be covered, or effectively wetted to limit visible dust emissions, and at least six inched of freeboard space from the top of the container shall be maintained; ♦ All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. *(The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden)*; ♦ Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant; ♦ Within urban areas, trackout shall be immediately removed when it extends 50 or more feet from the site and at the end of each workday; and ♦ Any site with 150 or more vehicle trips per day shall prevent carryout and trackout.						

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
AQ-1c: Enhanced Control Measures. Prior to initiation of construction activities, the applicant for an individual, site-specific development under the Specific Plan, the following measures shall be implemented at construction sites when required to mitigate significant PM_{10} impacts (note, these measures are to be implemented in addition to Regulation VIII requirements): ♦ Limit traffic speeds on unpaved roads to 15 mph; and ♦ Install sandbags or other erosion control measures to prevent silt runoff to public roadways from sites with a slope greater than one percent.	Construction Contractors	During Construction	City of Riverbank Development Services Department	Review construction specifications materials and retain for administrative record/ Conduct site inspections	During regularly scheduled inspections	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
AQ-1d: Additional Control Measures. The following control measures are strongly encouraged by the SJVAPCD at construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions: ♦ Install wheel washers for all exiting trucks, or wash off all trucks and equipment leaving the site; ♦ Install wind breaks at windward side(s) of construction areas; ♦ Suspend excavation and grading activity when wind exceeds 20 mph *(Regardless of wind speed, and owner/operator must comply with Regulation VIII's 20 percent opacity limitation.)*; and ♦ Limit area subject to excavation, grading, and other construction activity at any one time.	Construction Contractors	During construction	City of Riverbank Development Services Department	Review construction specifications materials and retain for administrative record/ Conduct site inspections	During regularly scheduled inspections	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
AQ-1e: The following measures may be implemented to mitigate emissions from construction equipment exhaust: ♦ Use of alternative-fueled or catalyst-equipped diesel construction equipment;	Construction Contractors	During construction	City of Riverbank Development Services Department	Review construction specifications materials and retain for	During regularly scheduled inspections	Initials:_____ Date:_____ Initials:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
♦ Minimize idling time (e.g. 5-minute maximum); ♦ Limit the hours of operation of heavy duty equipment and/or the amount of equipment in use; ♦ Replace fossil-fueled equipment with electrically-driven equivalents (provided they are not run via a portable generator set); ♦ Curtail construction during periods of high ambient pollutant concentrations; this may include ceasing of construction activity during the peak-hour of vehicular traffic on adjacent roadways; and ♦ Implement activity management (e.g. rescheduling activities to reduce short-term impacts).				administrative record/ Conduct site inspections		Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
AQ-2: Each individual project component of the Specific Plan, including those projects allowed by right, shall be analyzed for significant construction period air quality impacts. For each project-level analysis, an operational emissions estimate will be made by SJVAPCD using the latest SJVAPCD accepted methodology and will be compared to accepted thresholds of significance. Means of mitigating operational period impacts to a less-than-significant level include, but are not limited to, improving transportation and transit design (e.g., improved bikeways, transit infrastructure, and pedestrian enhancements); contributing a project's fair share to the Air Quality Mitigation Fee Fund; and contributing a project's fair share towards Transportation Control Measures implementation programs. For each individual project, the applicant shall document, to the City's reasonable satisfaction, its compliance with this mitigation measure. Since approval of the RAAP Specific Plan may constitute the final discretionary approval by the City of	Project Applicant	Prior to issuance of building permit	City of Riverbank Development Services Department	SJVAPCD to review construction specifications materials and provide compliance verification to City retain for administrative record	Once	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
Riverbank, each individual project component, including those projects allowed by right, shall be required to demonstrate to the SJVAPCD compliance with operational period requirements of Rule 9510 prior to issuance of the first building and/or grading permits as a condition of project approval. For each individual project, the applicant shall document, to the City's reasonable satisfaction, its compliance with this mitigation measure. Each individual project, including those projects allowed by right, that introduce significant sources of air pollutant emissions or stationary sources of TACs shall complete separate ambient air quality analysis and health risks assessments to ensure that violations of ambient air quality standards do not occur, including an analysis of cumulative emissions from the RAAP Specific Plan. For each individual project, the applicant shall document, to the City's reasonable satisfaction, its compliance with this mitigation measure.						
Biological Resources						
BIO-1: Implementation of the Plan shall avoid disturbance to the maternity roosts of special-status bats during the breeding season in accordance with the following procedures for Pre-Construction Special-Status Bat Surveys and Subsequent Actions. No more than two weeks in advance of any demolition or construction activity involving concrete breaking or similarly noisy or intrusive activities, that would commence during the pup-rearing season (April 15 through August 31), or winter hibernacula season (October 15 through March 1, depending on weather conditions) a qualified bat biologist, acceptable to the CDFG, shall conduct pre-demolition surveys of all potential special-status bat breeding habitat in the vicinity of the planned activity. Depending on the	Construction Contractor	Prior to issuance of grading and construction permits	City of Riverbank Development Services Department	Site inspection	Once per individual development project	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
survey findings, the following actions shall be taken to avoid potential adverse effects on breeding special-status bats: 1. If active roosts are identified during pre-construction surveys, a no disturbance buffer will be created by the qualified bat biologist, in consultation with the CDFG, around active roosts during the breeding season. The size of the buffer will take into account factors such as the following: ♦ Noise and human disturbance levels at the project site and the roost site at the time of the survey and the noise and disturbance expected during the construction activity; ♦ Distance and amount of vegetation or other screening between the project site and the roost; and ♦ Sensitivity of individual nesting species and the behaviors of the bats. 2. If pre-construction surveys indicate that no roosts of special-status bats are present, or that roosts are inactive or potential habitat is unoccupied, no further mitigation is required. 3. Pre-construction surveys are not required for demolition or construction activities scheduled to occur during the non-breeding and winter hibernacula season (September 1 through October 15, and March 1 through April 15). 4. Noisy demolition or construction activities as described above (or activities producing similar substantial increases in noise and activity levels in the vicinity) commencing during the non-breeding season and continuing into the breeding season do not require surveys (as it is assumed that any bats taking						

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
up roosts would be acclimated to project-related activities already under way). However, if trees are to be removed during the breeding season, the trees would be surveyed for roosts prior to their removal, according to the survey and protective action guidelines 1a through 1c, above. 5. Bat roosts initiated during demolition or construction activities are presumed to be unaffected by the activity, and a buffer is not necessary. 6. Destruction of roosts of special-status bats and overt interference with roosting activities of special-status bats shall be prohibited. 7. The noise control procedures for maximum noise, equipment, and operations identified in Chapter 4.12, Noise, of this EIR shall be implemented. Implementation of the above mitigation measure would reduce potential impacts to the maximum extent practicable.						
Cultural Resources						
CUL-1: Prior to the demolition of buildings and structures comprising the eligible district, an Historic American Building Survey/Historic American Engineering Record (HABS/HAER) recordation shall be conducted for the affected structures. HABS/HAER recordation could include archiving of original plans, undertaking archival research for preparation of a report, making measured drawings, and completing a photographic study of the structures.	Project Applicant	Prior to demolition of buildings and structures comprising the eligible district	City of Riverbank Development Services Department	Review HABS/HAER recordation	Once	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
Greenhouse Gas Emissions						
GHG-1: Each individual project component of the Specific Plan shall be analyzed for significant GHG impacts. For each project-level analysis, appropriate BPS will be implemented or a 29 percent GHG emission reduction compared to BAU will be demonstrated. Means of mitigating GHG impacts to a less-than-significant level include, but are not limited to, technological controls for stationary sources (such as for boilers, generators, and process heaters) and the GHG emission reduction measures (such as energy efficiency, transportation, and site design measures) for development projects listed in the SJVAPCD CCAP. For each individual project, the applicant shall document, to the City's reasonable satisfaction, its compliance with this mitigation measure.	Project Applicant	Prior to issuance of building permits	City of Riverbank Development Services Department	SJVAPCD to review project-level analyses and provide compliance verification to City to retain for administrative record	Once	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
Noise						
NOISE-1: In order to reduce noise generated by activities occurring within the RAAP site, the following mitigation measures shall be implemented: ♦ Project level acoustical analyses shall be constructed for noise-generating land uses proposed as part of the Specific Plan. Exterior noise levels at residential land uses interfacing active parks, commercial land uses, or industrial land uses shall be maintained in accordance with the standards presented in the General Plan and Municipal Code. ♦ Parking lot cleaning activities in commercial and industrial areas shall be limited to daytime and evening hours (7 a.m. to 10 p.m.). ♦ Trash compactors in commercial and industrial areas shall be located away from adjacent residential receivers or shielded with noise barriers.	Developers and Construction Contractors	Prior to construction and site plan approval	City of Riverbank Development Services Department	Review project level acoustic analyses and retain for administrative record/ Site inspection	Review analyses once per individual development project/ Conduct site inspection at least once at beginning of operation	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
♦ Loading dock hours of operation shall be limited to daytime and evening hours (7 a.m. to 10 p.m.).						
NOISE-2: Noise reduction methods shall be implemented to reduce generated by activities resulting from the Specific Plan. These measures shall include, but are not limited to the following: ♦ Paving streets with "quieter" pavement types such as Open-Grade Rubberized Asphaltic Concrete would reduce noise levels by 2 to 3 dBA depending on the existing pavement type, traffic speed, traffic volumes, and other factors. ♦ New or larger noise barriers could reduce noise levels by 5 dBA Ldn. Final design of such barriers, including an assessment of their feasibility and reasonableness, should be completed during project level review. ♦ Sound insulation treatments to affected buildings, such as sound rated windows and doors, could reduce noise levels in interior spaces. ♦ Installing traffic calming measures to slow traffic along Claus Road could provide qualitative improvement by smoothing out the rise and fall in noise levels caused by speeding vehicles.	Project Applicant	Prior to construction and site plan approval	City of Riverbank Development Services Department	Consider measures to include in construction and site plans	Once	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
NOISE-3: To reduce noise levels generated by construction, the following standard construction noise control measures shall be included in all construction projects within the plan area: ♦ Limit construction to the hours of 7:00 a.m. to 6:30 p.m. on weekdays, and 9:00 a.m. to 5:00 p.m. on Saturdays, with no noise-generating construction on Sundays or holidays. ♦ Equip all internal combustion engine-driven	Construction Contractors	Prior to construction	City of Riverbank Development Services Department	Review construction plans and retain for administrative record	Once per individual development project	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
equipment with mufflers which are in good condition and appropriate for the equipment. ♦ Unnecessary idling of internal combustion engines should be strictly prohibited. ♦ Locate stationary noise generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA. ♦ Utilize "quiet" air compressors and other stationary noise sources where technology exists. ♦ Route all construction traffic to and from the project site via designated truck routes where possible. Prohibit construction related heavy truck traffic in residential areas where feasible. ♦ Control noise from construction workers' radios to a point that they are not audible at existing residences bordering the project site. ♦ The contractor shall prepare and submit to the City for approval a detailed construction plan identifying the schedule for major noise-generating construction activities. ♦ Designate a "disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g. starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem be implemented. Conspicuously post a telephone number for the disturbance						Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule.						
NOISE-4: Implement Mitigation Measure NOISE-2.	Project Applicant	Prior to construction and site plan approval	City of Riverbank Development Services Department	Consider measures to include in construction and site plans	Once	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
Public Services						
PUB-1: The City shall coordinate with Stanislaus Consolidated Fire Protection District to ensure fair share development fees for future development resulting from the implementation of the RAAP Specific Plan to ensure equipment, staffing, and facilities for emergency medical services, urban search and rescue, hazardous materials emergency response, and other relevant needs, as appropriate.	City of Riverbank	Prior to issuance of building permits	City of Riverbank Development Services Department and Stanislaus Consolidated Fire Protection District	Review the RAAP Specific Plan	Once	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
Transportation and Traffic						
TRANS-1: Future developers within the RAAP area shall contribute their fair share, through the payment of	Project Applicant	Prior to issuance of building	City of Riverbank Development	Obtain proof of payment	Once per individual	Initials:_____ Date:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
local and regional fees, towards the construction of left-turn pockets on all approaches to the Claribel Road/Coffee Road intersection with appropriate storage and deceleration length, and signalization of the intersection. This improvement would improve the service at the Claribel Road/Coffee Road intersection level to LOS C or better (the level of service standard for this intersection) in both peak hours, as shown on Table 4.16-9. Stanislaus County plans to signalize this intersection as part of the Claribel Road widening project. Funding for signalization is provided from Congestion Mitigation and Air Quality (CMAQ) Federal funding. Construction is scheduled to begin in 2013.		permits	Services Department	and retain for administrative record	development project	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
TRANS-2: Future developers within the RAAP area shall contribute their fair share, through the payment of local and regional fees, towards the construction of left-turn pockets on all approaches to the Claribel Road/Roselle Avenue intersection with appropriate storage and deceleration length, and signalization of the intersection. This improvement would improve the service level at the Claribel Road/Roselle Avenue intersection to LOS D or better (the level of service standard for this intersection) in both peak hours, as shown on Table 4.16-9. Signalization of this intersection is programmed in the Stanislaus County 2011-2012 budget using CMAQ funding and is scheduled for construction in 2015/2016.	Project Applicant	Prior to issuance of building permits	City of Riverbank Development Services Department	Obtain proof of payment and retain for administrative record	Once per individual development project	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
TRANS-3: Future developers within the RAAP area shall contribute their fair share towards improvements to provide adequate turning radii in conformance with STAA requirements at intersections on State Route 108, specifically at the intersections of Atchison Street (State Route 108)/1st Street, State Route 108/Claus Road and State Route 108/Patterson Road, though the payment of local and regional traffic fees. No other improvements	Project Applicant	Prior to issuance of building permits	City of Riverbank Development Services Department	Obtain proof of payment and retain for administrative record	Once per individual development project	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____

SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

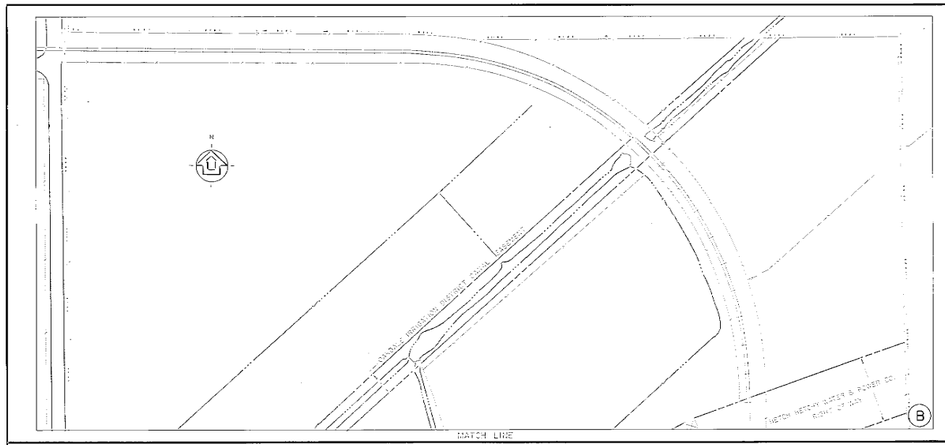
Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
are needed to mitigate project impacts at these intersections.						Date:_____ Initials:_____ Date:_____
TRANS-4: Although construction impacts are expected to be temporary and less-than-significant, for all future development in the plan area, the following is recommended to minimize the effects of construction related activity: ♦ Prepare a construction management plan, including: • Project staging plan to maximize on-site storage of materials and equipment. • A set of comprehensive traffic control measures, including scheduling of major truck trips and deliveries to avoid peak hours; lane closure proceedings; signs, cones, and other warning devices for drivers; and designation of construction access routes. • Permitted construction hours. • Location of construction staging. • Provision of on-site parking for all construction employees, site visitors, and inspectors. • Provisions for street sweeping to remove construction related debris on public streets.	Project Applicant	Prior to construction	City of Riverbank Development Services Department	Review construction management plan and retain for administrative record	Once per individual development project	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____ Date:_____
TRANS-5: Construction of Phase 2 of the North County Corridor Project, which would connect the Phase 1 project, which is planned to terminate at McHenry Avenue, to State Route 99, is expected to shift sufficient traffic from this intersection that LOS C would be achieved. Alternatively, intersection improvements beyond the cross-section identified in the General Plan could be provided to improve peak hour operations,	County of Stanislaus	Implementation of North County Corridor Project	City of Riverbank	Continue monitoring of conditions following completion of North County Corridor Project	Following completion of North County Corridor Project	Initials:_____ Date:_____ Initials:_____ Date:_____ Initials:_____

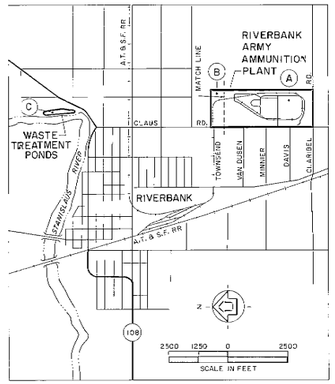
SUMMARY OF MITIGATION MEASURES AND MONITORING PROGRAM FOR THE RIVERBANK SPECIFIC PLAN EIR

Mitigation Measures	Party Responsible for Implementation	Implementation Trigger/Timing	Agency Responsible for Monitoring	Monitoring/ Reporting Action	Monitoring Frequency	Monitoring Compliance Record (Name/Date)
such as dual left-turn lanes and right-turn only lanes on all approaches. This improvement would improve the service level to LOS E during the AM peak hour and LOS D during the PM peak hour, as shown on Table 4.16-10. These service levels are considered deficient for this intersection. Given the uncertainly of constructing parallel capacity or the feasibility of additional improvements beyond the planned General Plan cross section, this impact is expected to remain significant and unavoidable.						Date: Initials: Date:
TRANS-6: Construction of Phase 2 of the North County Corridor Project, which would connect the Phase 1 project, which is planned to terminate at McHenry Avenue, to State Route 99, is expected to shift sufficient traffic from this intersection that LOS D would be achieved. Alternatively, construction of additional improvements at this intersection that would result in acceptable service levels, including dual left-turn pockets on the northbound, westbound, and eastbound approaches could be constructed. This improvement would improve the service level to LOS D or better (the level of service standard for this intersection) in both peak hours, as shown in Table 10 of the TIA, reducing this impact to a less-than-significant level. However, given the uncertainly of constructing parallel capacity or the feasibility of additional improvements beyond the planned General Plan cross section, this impact is expected to remain significant and unavoidable.	County of Stanislaus	Implementation of North County Corridor Project	City of Riverbank	Continue monitoring of conditions following completion of North County Corridor Project	Following completion of North County Corridor Project	Initials: Date: Initials: Date: Initials: Date: Initials: Date:

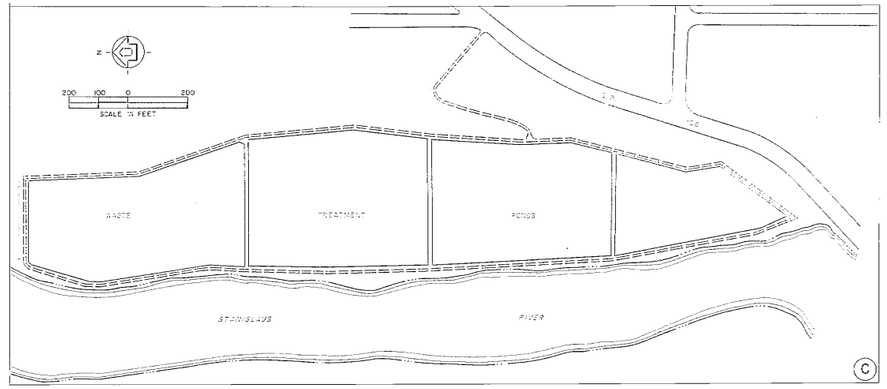
APPENDIX H:

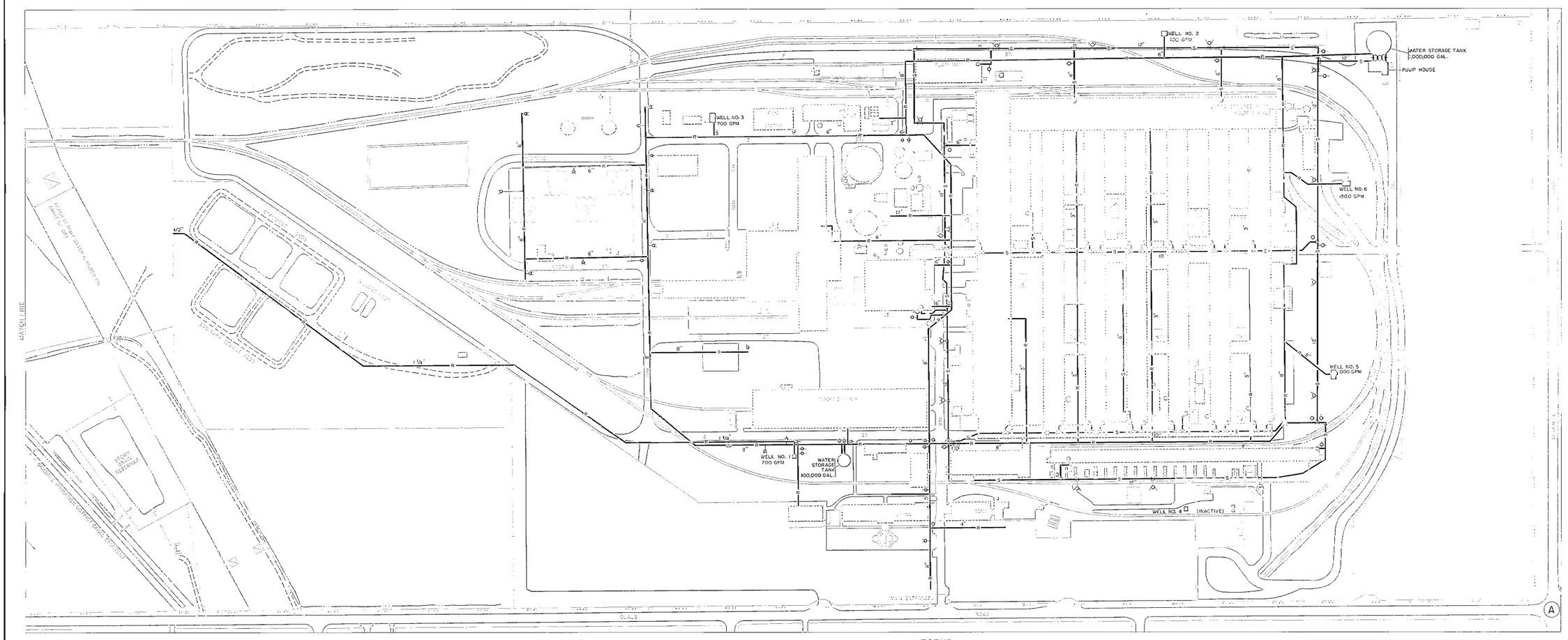
GENERAL RAW & SPRINKLER WATER MAP





LOCATION MAP





EXISTING / SIZE

- 8" R — RAW WATER
- 12" S — SPRINKLER WATER
- VALVE
- POST INDICATOR VALVE
- FIRE HYDRANT
- RISERS

ALL LINES ARE STEEL UNLESS OTHERWISE SHOWN

LEGEND

EXISTING / NEW

- BUILDING, PERMANENT
- BUILDING, SEMIPERMANENT
- BUILDING, TEMPORARY
- ROADS AND PARKING
- TRAIL OR EARTH ROAD
- RAILROAD
- FENCE
- RESERVATION BOUNDARY
- DRAINAGE DITCH

PREVAILING WIND

N

100 0 100 200 300
SCALE IN FEET

RIVERBANK ARMY AMMUNITION PLANT

RIVERBANK, CALIFORNIA

RMS CORPORATION
PLANNING & CARTOGRAPHY
HILLIARD, OHIO

SACRAMENTO DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

MASTER PLAN

BASIC INFORMATION MAPS

GENERAL RAW & SPRINKLER WATER MAP

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL

DATE:

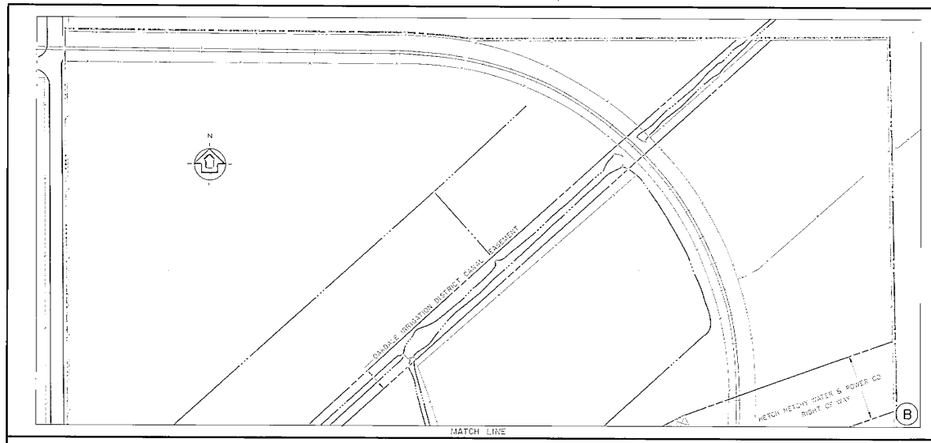
REVIEWED & COMMENTED ON BY MAJOR COMMANDER & FORWARDED TO THE CHIEF OF ENGINEERS

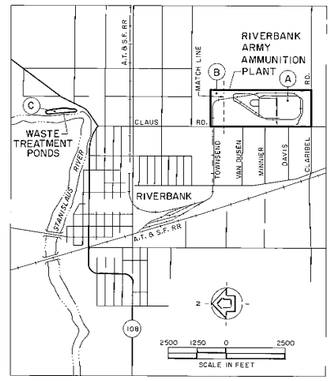
DATE:

DATE	DRAWING NO.
OCT. 1984	18-02-09
SHEET NO.	FILE NO.
3 OF 12	238-14-320

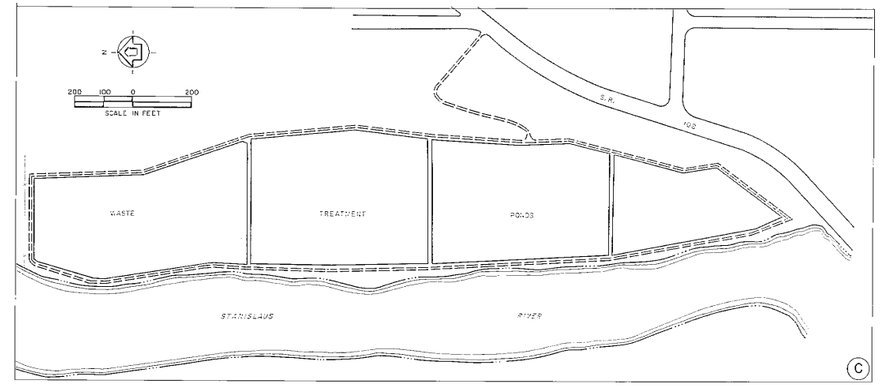
APPENDIX I:

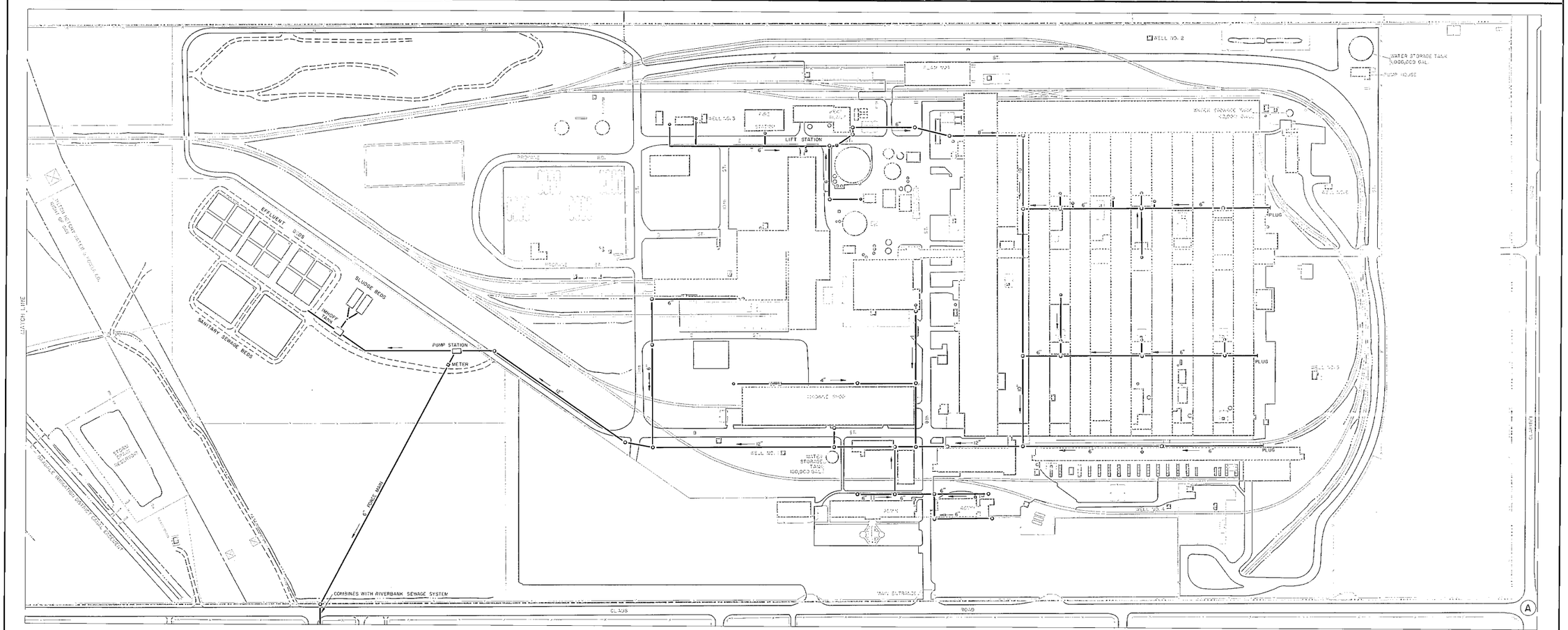
GENERAL SANITARY SEWER MAP





LOCATION MAP





EXISTING

SIZE
MATERIAL
12" SANITARY SEWER MAIN

MANHOLE

CLEANOUT

DIRECTION OF FLOW

MATERIALS OF CONSTRUCTION

T = TRANSITE

ALL LINES ARE VC UNLESS OTHERWISE NOTED

LEGEND

EXISTING

- BUILDING, PERMANENT
- BUILDING, SEMIPERMANENT
- BUILDING, TEMPORARY
- ROADS AND PARKING
- TRAIL OR EARTH ROAD
- RAILROAD
- FENCE
- RESERVATION BOUNDARY
- DRAINAGE DITCH

PREVAILING WIND

N

100 0 100 200 300

SCALE IN FEET

RIVERBANK ARMY AMMUNITION PLANT

RIVERBANK, CALIFORNIA

AMS CORPORATION PLANNING & CARTOGRAPHY HILLIARD, OHIO	SACRAMENTO DISTRICT CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA

MASTER PLAN

BASIC INFORMATION MAPS

GENERAL SANITARY SEWER MAP

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL

DATE:

REVIEWED & COMMENTED ON BY MAJOR COMMANDER & FORWARDED TO THE CHIEF OF ENGINEERS

DATE:

DATE	DRAWING NO.
OCT. 1984	18-02-10
SHEET NO. 6 OF 12	FILE NO. 238-14-320

FILE No E-873.3 SHT 3