

BALLONA CREEK GREENWAY PLAN

GREENWAY PLAN

Introduction

The Ballona Wetlands

Mar Vista

Culver City

Mid-City

Implementation

Introduction

The Ballona Creek Greenway Plan describes opportunities to reconnect residents with their creek, create a green corridor of trails and points of access, enhance habitat, mitigate stormwater runoff, redevelop land to improve watershed functions, re-establish riparian areas, and increase the health and sustainability of the region.

The Reach Plans summarize design opportunities in general terms, focusing on trail connections, gathering and entry points, stormwater mitigation, and street design.

Each Reach Plan features at least one site-specific Early Action Plan, reflecting the ideas of stakeholders developed during design charrettes. Following each Early Action Plan is a Vision Plan that integrates a naturalized stream with the surrounding community. These plans can serve as advance planning for the U.S. Army Corps' Lower Ballona Ecosystem Restoration Feasibility Study.

Reach 1: Ballona Wetlands The Coastal Centerpiece

While the Ballona Wetlands are a defining feature of the Los Angeles coast, the interdependent features that comprise the wetlands as a system are disconnected from each other and highly disturbed. Planning for the restoration of this wetland system is a larger effort outside the scope of the Ballona Creek

Greenway Plan. The Plan reflects stakeholder recommendations for access that would complement wetlands restoration.

Reach 2: Mar Vista Reaching Out

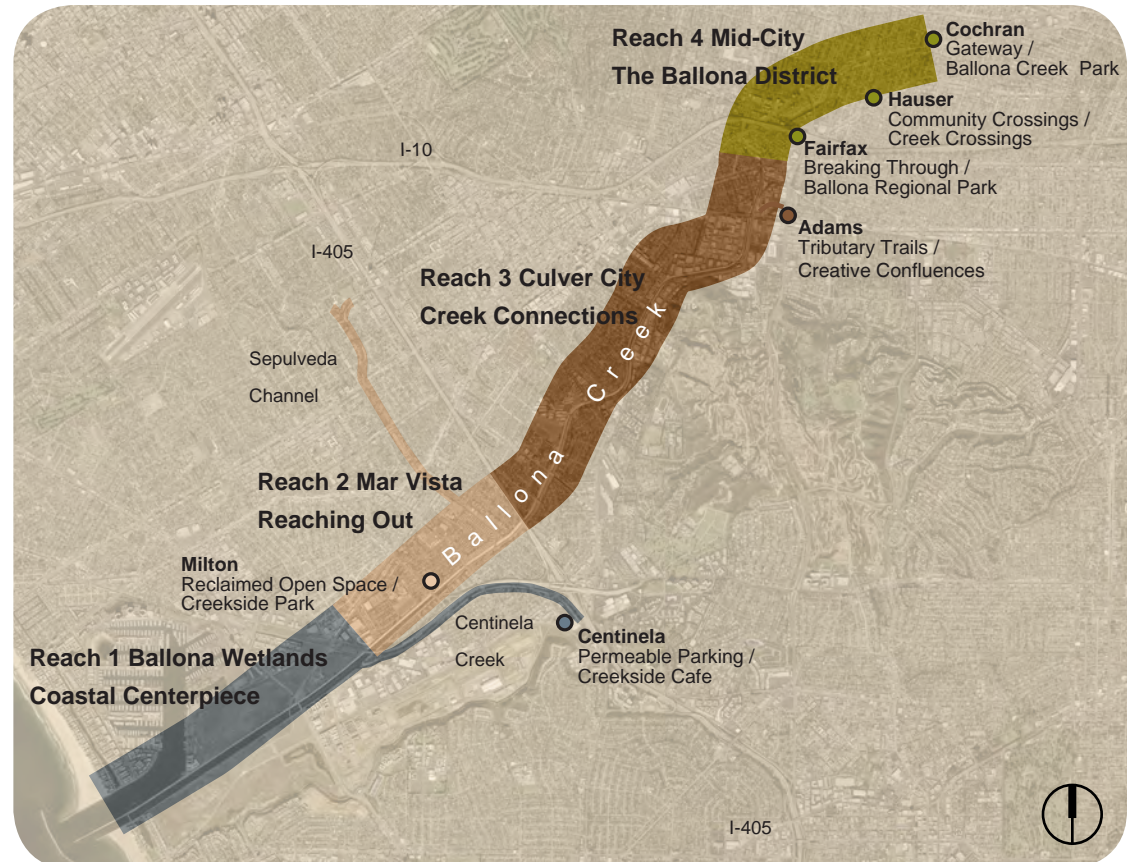
Through Mar Vista, Ballona Creek's presence can be enhanced by continuing the Greenway experience into the neighborhoods bordering the creek. Urban forestry, pedestrian enhancements, and extensions of the Greenway landscape are some of the elements that can reinforce connections.

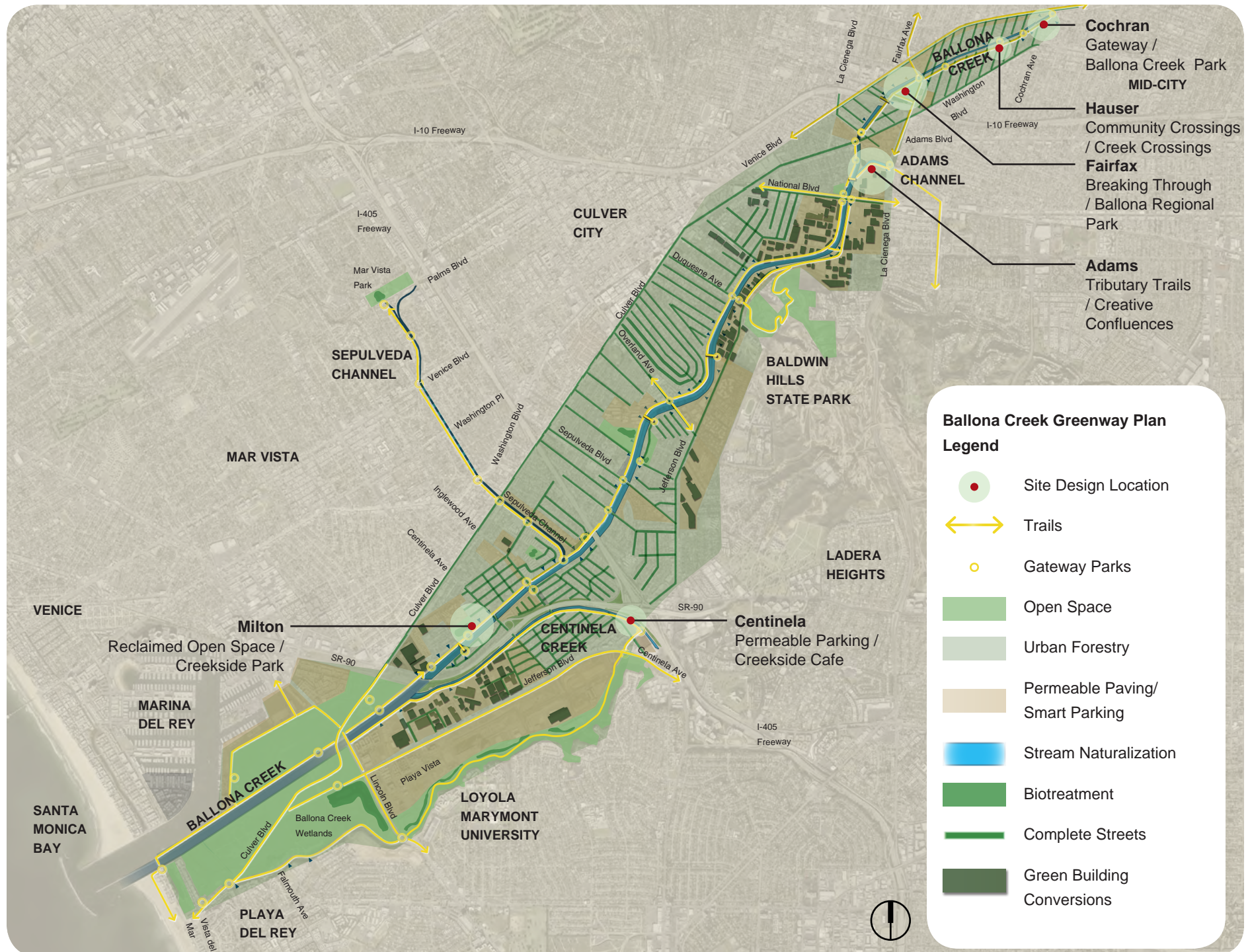
Reach 3: Culver City Creek Connections

Improving connections to local parks integrates Ballona Creek with the Culver City neighborhoods. The Greenway Plan balances access with privacy for residents bordering the creek.

Reach 4: Mid-City The Ballona District

The under-utilized Mid-City reach of Ballona Creek can be redefined by enhancing its creek-side character with distinctive native plants, landscape treatments, and trails that connect and beautify neighboring residential and business districts.





Core Approaches

Pervious Paving

Pervious Paving replaces impervious surfaces throughout a range of land uses to increase stormwater infiltration and reduce flooding.

Biotreatment

Biotreatment relies on the action of soil and plant microorganisms to break down pollutants. Biotreatment works well in bioswales, detention or retention basins, subsurface trenches, and treatment wetlands.

Urban Forestry and Greenway Landscape

Tree canopies reduce the urban heat island effect, increase infiltration of stormwater, beautify communities, and enhance habitat. Native landscaping reduces dependence on irrigation and provides habitat for birds and small animals.

Channel Naturalization

Channel naturalization removes concrete from the channel bottom, accommodating restoration of some stream function. The Lower Ballona Ecosystem Restoration Feasibility Study will explore channel naturalization potential in detail. The

Greenway Plan provides a preliminary hydraulic modeling evaluation of a naturalized channel.

Combined Approaches

Complete Streets

Complete Streets provide multiple benefits for pedestrians, cyclists, automotive traffic, stormwater management and habitat enhancement. Features in a typical Complete Street may include conversion of some parking spaces to traffic-calming “bulb-outs” and/or bioswales or rain gardens; consistent tree canopy; permeable paving in parking zones; and bicycle “sharrows” indicating the appropriate path of travel for bicycles in the traffic lane.

Street Narrowing

Street Narrowing can create space for Complete Streets features or channel greenway improvements. Complete or partial street closures are another tool to improve open space and connections.

Smart Parking

Smart Parking concepts reduce the negative visual and watershed impacts of parking areas by increasing permeability and biotreatment and/or reducing the footprint of parking area square footage.

Green Building Conversions

Existing structures can be retrofitted to capture and use rainwater, increase permeability, and connect to the surrounding landscape. Redevelopment zones can factor these improvements into new construction.

Restoration Planning

Channel Design

Naturalization of Ballona Creek has long been considered an impossibility. Extensive development to the edges of the channel’s right-of-way limits restoration of the historical floodplain. Observations of partially channelized streams and examples of partial naturalization of urban waterways offer clues to returning some stream functions to Ballona Creek.

To maintain existing levels of flood protection while converting from a concrete channel to one with a natural bottom with some riparian/wetland vegetation requires increasing the overall cross-sectional area of the creek and channel. Increasing the cross-section is achieved by widening the channel within the right-of-way, adding low floodwalls, and/or increasing the width of the right-of-way. Another factor that

impacts flooding are constrictions such as bridges. Widening the channel typically requires bridge replacement to eliminate the constriction.

The Los Angeles Regional Curve (2006) developed by Natural Channel Design, Inc. was used for initial channel naturalization planning. The regional curve plots the relationship between watershed size and channel width, depth, and area for waterways at bankfull flows within the same climatic and geographic area as Ballona Creek. The regional curve was used to determine the width of the channel bottom in the development of the Greenway Plan and site designs presented herein.

(Top) Channel naturalization re-establishes riparian habitat while trail and right-of-way landscape provide upland habitat and recreational access.

(Left) A typical Complete or Green Street enhances safe pedestrian and bicycle access through the traffic calming effects of a continuous tree canopy, curb extensions and marked shared lane markings. Curb extensions double as rain gardens for the treatment of stormwater runoff.

(Right) Urban Forestry and native plants improve habitat connectivity for birds while creating pocket parks for residents. Street Narrowing slows traffic, enhancing the pedestrian zone.

The Ballona Creek Greenway Plan uses these common BMPs to achieve water quality, habitat, livability and sustainability goals. They can be combined and applied to specific land uses that affect watershed function.



Hydraulic Modeling

In 2008, initial channel naturalization cross-sections for four reaches were developed using Manning's Equation as a reference for estimating channel capacity. Cross-sections for the upper two miles of the creek (National Boulevard, Culver City to Cochran Avenue, Mid-City), were then developed by Restoration Design Group for flood modeling. This preliminary modeling effort evaluated the existing conditions and a proposed natural bottom channel for three design storm conditions:

1959 As-Built Design Flows: The creek's 1959 As-Built plans indicate the volume of runoff the channel was designed to convey. It is not known if the channel was designed to convey a 100-year storm (a storm with a 1 percent chance of occurring in any year) or 50-year storm (2 percent chance of occurring). It should be noted that upstream of the channel and some areas on tributaries, fall within the 100-year floodplain. FEMA maps indicate that the right-of-way of part of the channel floods during the 100-year storm.

2008 LBERF Flows: The U.S. Army Corps updated the 100-year storm calculations in 2008 as part of the Lower Ballona Ecosystem Restoration Feasibility Study (LBERF). Better data and new methods for calculating runoff may reflect changes from the 1959 As-Built estimates. The 2008 LBERF data reflect the federal government's standard for flood protection.

1968 County Capital Storm: While the Capital Storm for Ballona Watershed is in the process of being updated, the calculations performed in 1968 remain the current standard. These standards were used during planning to evaluate the capacity of both the existing and proposed channel conditions.

Initial findings confirm that designs proposed for the creek from National Boulevard to Cochran Avenue can contain the 1959 As-Built design flows. When evaluating the LBERF 100-year storm, flows overtop the channel in a small area around Burchard Street. Overtopping could be prevented by modifying area flood walls and Burchard Bridge elevations. Containing the 1968 Capital Storm, however, is challenging not only for the naturalization design, but also for the channel in its current condition; in either scenario, additional flood storage is needed. The lower water surface elevations of the Capital Storm in naturalization cross-sections result from replacing existing low clearance bridges with free-spanning bridges.

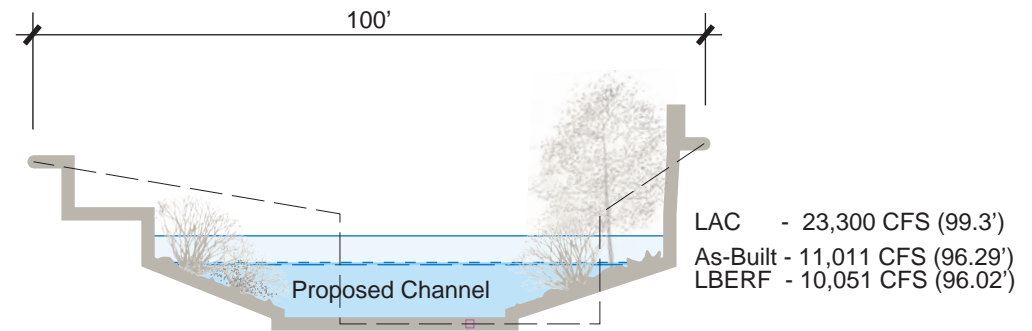
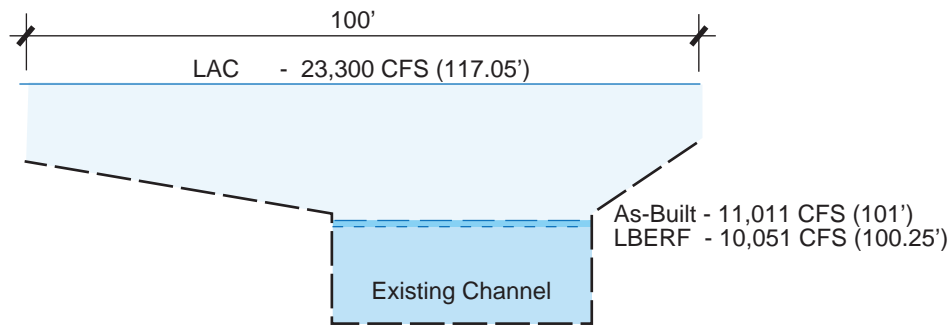
Preliminary modeling focused on extreme flood conditions in order to ascertain the value of more detailed restoration design and planning. Initial results suggest further analysis is warranted. The potential flood protection role of adjacent public land, such as large DWP maintenance yards that could act as flood storage, should be considered in future modeling.

The Vision Plans, which propose naturalized channels for the Mid-City and Culver City reaches (pp.52-53, 58-59, 62-63, and 66-67) incorporate the modeled channel cross-sections into their designs. The Vision Plans for Mar Vista and Ballona Wetlands (pp. 38-39 and 44-45) use the conceptual channel cross-sections estimated with Manning's Equation as the preliminary reference for naturalization.

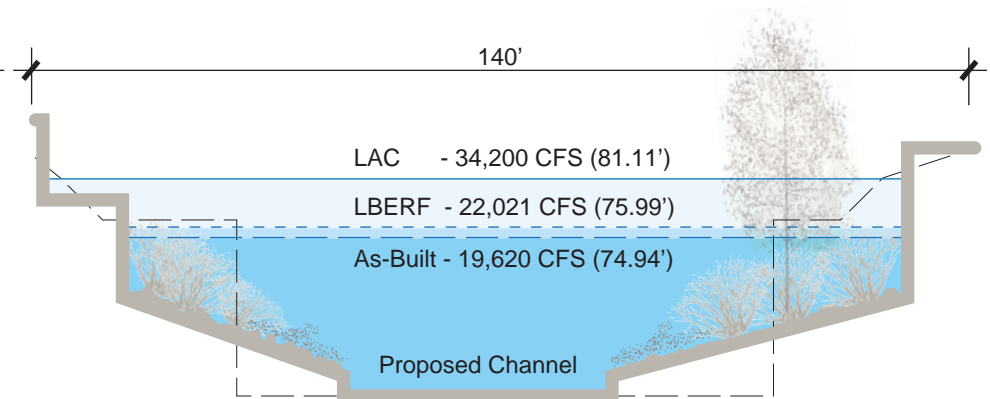
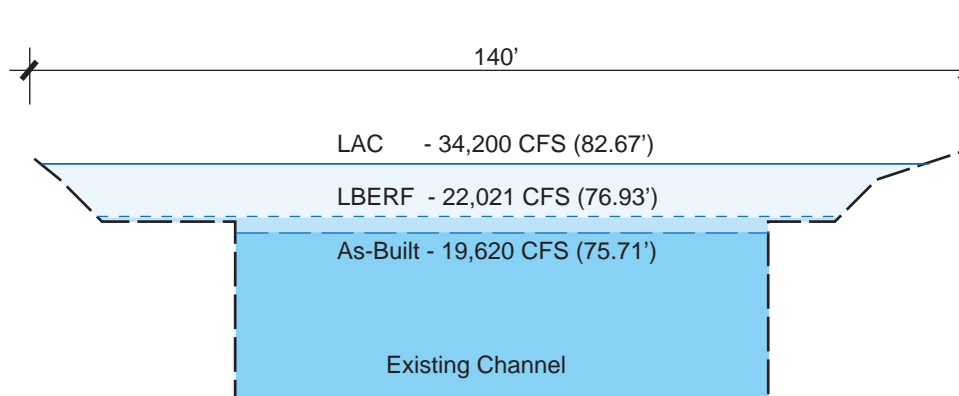
Modeling results are described in detail in the Appendix.



Location of Modeled Reach



Modeled Water Surface Elevations, Existing and Proposed Channels
Station 101+00 near Cochran Ave



Modeled Water Surface Elevations, Existing and Proposed Channels
Station 11+41 near Sentney Ave

Legend

- Existing Channel (no vegetation)
- Proposed Naturalization Channel with vegetation

Modelled Water Surface Elevations for the Following Flows:

- 1959 As-Built Design Storm
- 1968 Capital Storm
- 2008 LBERF Design Storm

Cross Section Comparison: Existing and Proposed Channel Geometries and Water Surface Elevations

Mid-City: The Ballona District

The Ballona Greenway Committee proposes a Ballona District concept in Mid-City. The concept blends past and present cultural and natural influences on the landscape.

The scale and layout of this reach lends itself to beautification as a District, where native landscape signals the creek-side zone. This work can be implemented in concert with redevelopment or neighborhood improvement projects.

The Ballona District's amenities provide a framework for community redevelopment, enhanced outdoor leisure, and connections to the rest of Ballona Creek, Ballona Wetlands, and Santa Monica Bay.

At Fairfax Avenue, the Los Angeles Department of Water and Power (DWP) maintenance yards and substation have stormwater BMPs that increase permeability, capture site runoff, and treat incoming flows. Due to major infrastructure blocking the right-of-way, in the short term, bicycling connections are made via Venice Boulevard. Alternatively,

a bike path in the channel bottom, similar to the path in the bed of the Arroyo Seco, could maintain a path connection. A channel bottom path would lie under water during storm events. Another bikeway connection follows the DWP electrical transmission lines to the Adams Channel and Baldwin Hills.

Neighborhood access to the creek occurs at every street end. Increased entry points encourage greater use; more users create a safer greenway.

Biofiltration projects along the trail direct runoff to vegetated treatment areas. Continuous Deflection System (CDS) units are installed where storm drains connect. Some of the right-of-way is converted for community garden use.

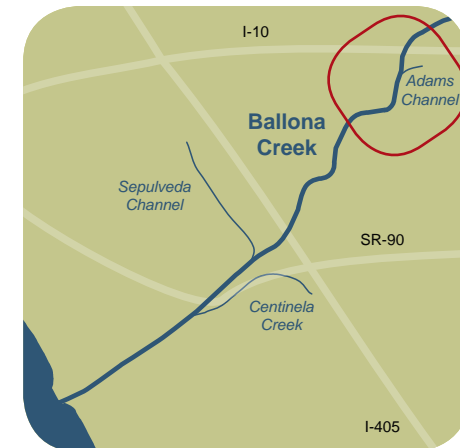
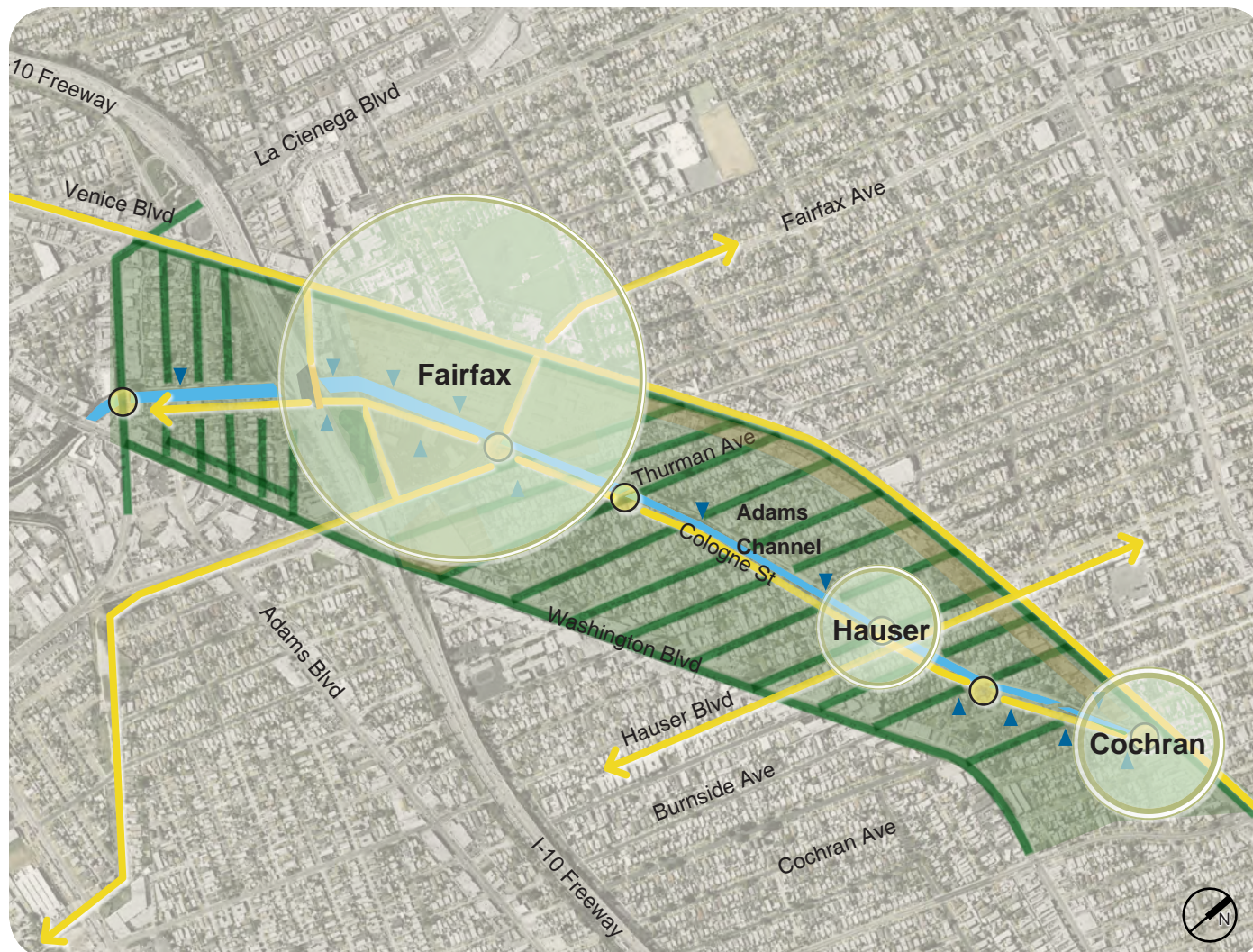
Pedestrian improvements within Complete Streets concepts at Thurman Avenue, Hauser Boulevard, and Burnside Avenue reclaim the streets for people. Through-traffic slows and the creek trail appears better connected.

A gateway park at Cochran Avenue signals the creek's presence. Street

improvements along Venice Boulevard and residential streets abutting the creek incorporate bioswales and urban forestry to capture and infiltrate runoff before entering Ballona Creek.

In the Early Action Plan, Ballona Creek's flows are redirected into the main channel, providing some visual interest and minor improvements in habitat.

Throughout this reach of Ballona, long-term restoration possibilities are promising. Initial flood modeling supports naturalization of the creek and should be explored further. Additionally, relocation of a maintenance yard at Fairfax can free space for Ballona Regional Park, a significant future destination on the Ballona Creek Greenway. Integrated into the park concept are the multiple benefits of watershed management: stream and floodplain restoration, flood storage, active and passive parkland, and water quality treatment.



Reach 4: Mid-City

Legend

Access

- Access Gateway
- Bicycle / Pedestrian Route
- Bicycle / Pedestrian Bridge

Hydrology

- Creek (Existing Channel)
- Naturalized Creek
- Creek - Culverted
- Storm Drain Outfall Entering Creek

Landscape

- Open Space / Park
- Urban Forestry
- Biofiltration
- Pervious Paving
- Green Roof
- Complete Street

Early Action Plan: Fairfax / Breaking Through

Breaking through or increasing permeability is the theme for this intensely paved reach of Ballona Creek. Permeability, however, does not refer to water alone. It includes permeable paving at Los Angeles Department of Water and Power (DWP) Maintenance yards, and the creation of Complete Streets. It also allows cyclists to break through the barrier of the 10 Freeway to the west, to connect Culver City, the Ballona Wetlands, and the Pacific Ocean.

Breaking through these barriers is a significant undertaking. The Greenway Committee considered several options including laying a bike path in the bed of the creek; terracing the right-of-way down and around freeway piers; cantilevering paths over the channel; and suspending short spans of bicycle bridge from the freeway structure. In the short-term, bicyclists will need to ride Fairfax Avenue to Venice Boulevard and connect to the creek via La Cienega Boulevard, or ride Fairfax Avenue to La Cienega Boulevard and the Adams Channel.

With or without this short-term solution, traffic calming and pedestrian improvements on Fairfax Avenue, Venice Boulevard, and La Cienega Boulevard are priorities.

Existing Conditions: Aerial Photograph





Legend

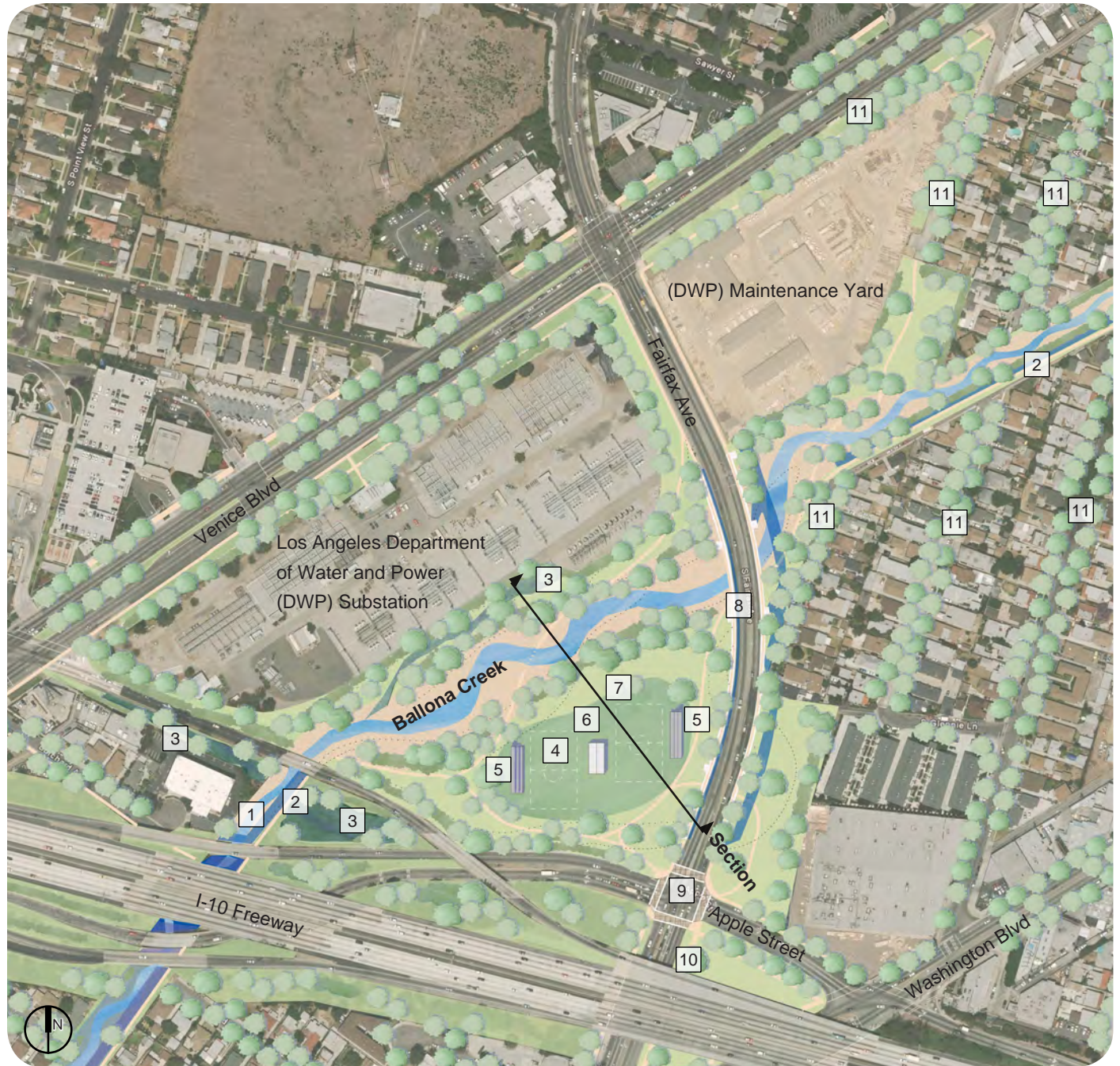
- 1 Ballona Creek Bike Path
- 2 Biotreatment
- 3 Permeable Paving
- 4 Enhanced Crossing
- 5 Complete Street
- 6 Park



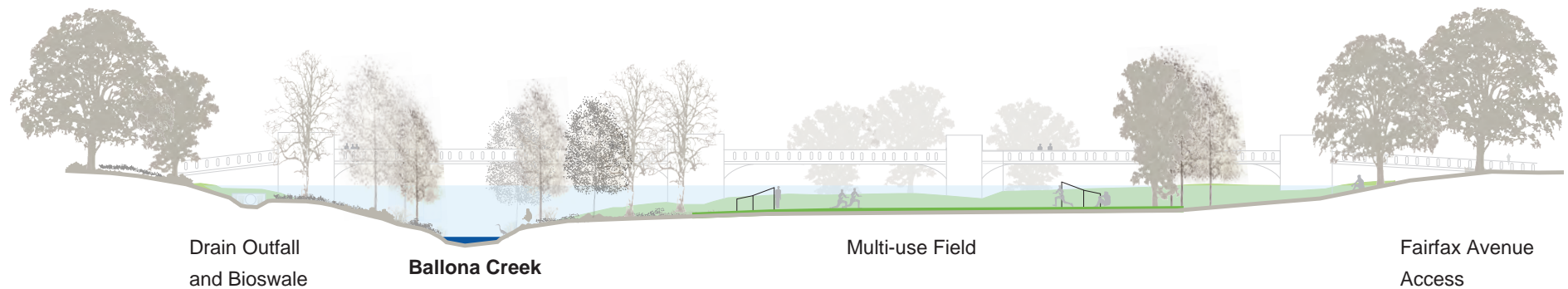


Legend

- 1 Naturalized Ballona Creek
- 2 Ballona Creek Bike Path
- 3 Biotreatment
- 4 Multi-Use Fields
- 5 Seating
- 6 Stage and Storage
- 7 Flood Detention
- 8 Bridge
- 9 Enhanced Crossing
- 10 Trail to Adams Channel and Baldwin Hills
- 11 Complete Street



Vision Plan: Plan View



Vision Plan: Section through Ballona Regional Park

Vision Plan: Fairfax / Ballona Regional Park

This plan relies on visionary political support and cooperation of the City of Los Angeles Department of Water and Power to combine and manage two maintenance yards jointly. This allows for the southern yard to be transformed into the Ballona Regional Park in a restored floodplain. The park stores floodwaters, provides habitat, and allows for recreational activities, music, and theater.

This park is a significant destination for residents in Mid-City and a regional attraction accessible via public transit and bicycling. The park is the terminus of the Baldwin Hills-to-Ballona Creek Trail. The park concept was developed first in the Ballona Creek Watershed Management Plan. It utilizes a DWP transmission

corridor to integrate trails, park elements, and biofiltration technologies.

Ballona Creek's riparian corridor within Ballona Regional Park has room to meander. It would inundate a willow thicket and provide essential habitat.

The park features a building with rest rooms, equipment storage, and a stage. The fields surrounding the building accommodate multiple activities. The site slopes gently up to the street level with terraced amphitheater seating.

Soil is excavated to lower the park and create a basin that can be flooded. This major change in topography requires a new bridge at Fairfax Avenue. Park visitors can cross beneath this bridge

to access adjacent residential streets or cross from the intersection of Fairfax Avenue and Apple Street.

Neighboring streets are improved with Complete Streets approaches and pedestrian enhancements.



Existing Conditions: Aerial Photograph

Early Action Plan: Hauser / Community Crossings

Greenway street crossings break trail continuity and create hazards. The Community Crossings concept strengthens continuity with landscape that slows and alerts traffic to trail users.

The concept can be applied to any trail street crossing. The example presented

was developed for Burnside Avenue, Thurman Avenue, and Hauser Boulevard.

The trail meets the street and the existing cap over the creek is transformed into a small plaza and staging area. Low native shrubs soften the edges of the plaza. Patterned paving and signal-activated,

flashing crossing lights highlight the crosswalk, expanded to the width of the right-of-way.

The Complete Streets concept combines rain gardens and urban forestry at Hauser Boulevard. Class II bike lane striping or Class III “sharrows” markers improve bike safety and biofiltration swales treat

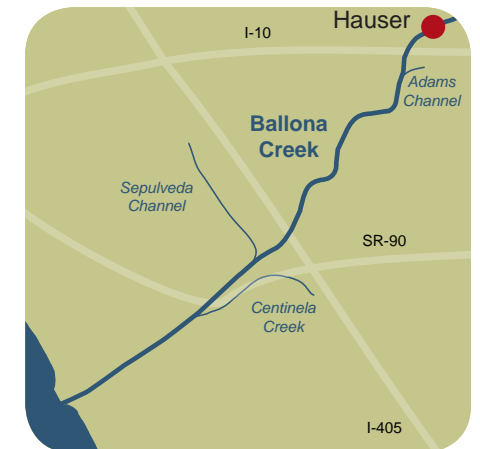


Legend

- 1 Ballona Creek Bike Path
- 2 Native Landscape
- 3 Seating
- 4 Enhanced Crossing
- 5 Bicycle Lanes
- 6 Complete Street

Early Action Plan: Plan View

stormwater. The redesign increases non-motorized connections between Ballona Creek, nearby commercial areas, and the Venice Boulevard Class II bike lane.



Vision Plan: Hauser / Creek Crossings

The Hauser Creek Crossings plan reorients the experience of passers-by, calling attention to Ballona Creek and the natural park environment.

Naturalization of Ballona Creek reintroduces the sights and sounds of singing birds, rustling leaves, and flowing water. The former concrete cap is replaced by a bridge that gently raises travelers over the creek. Guardrails on the bridge replace walls and planters, inviting views of the creek.

This creek restoration concept maintains existing levels of flood protection and meets current standards for a 100-year storm event. Most of the year, trail users will only see a trickle of water.

Native landscape along the creek trail provides upland habitat to complement riparian habitat and reinforces the feeling of an ecological retreat.

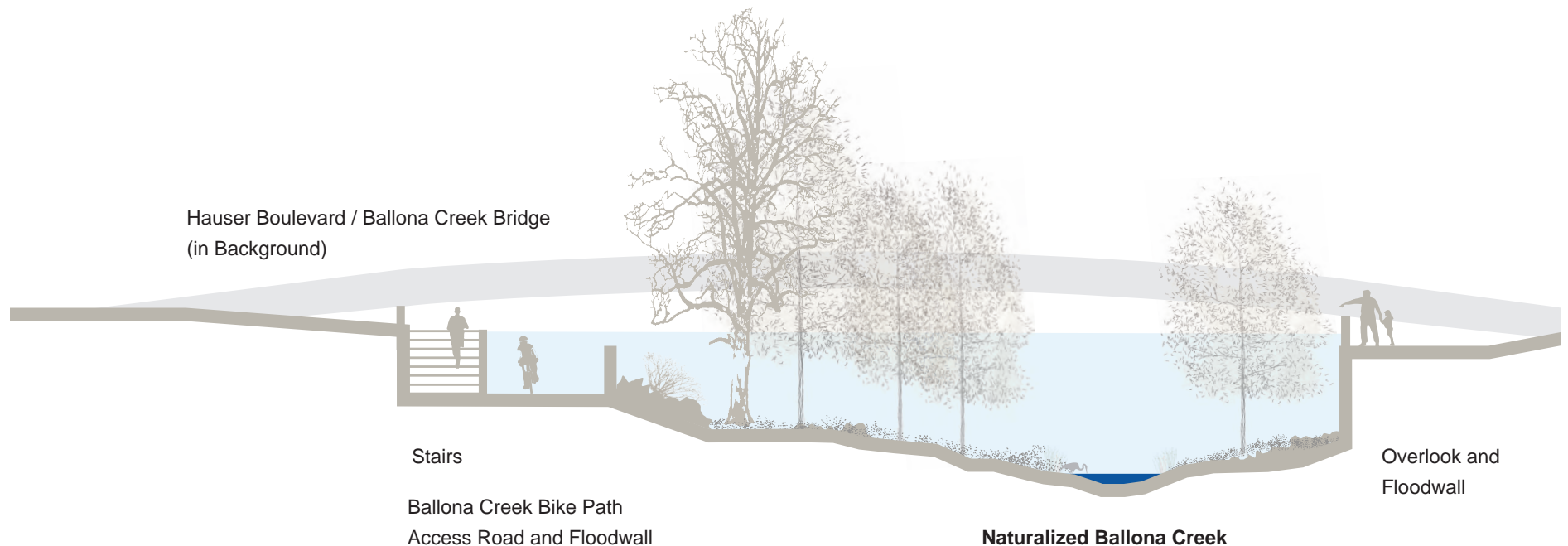
Pedestrian travel is improved with paths from Hauser Boulevard to the bike path

as well as over the new bridge; the Ballona Creek Bike Path passes below.

A Class II bike lane provides a continuous connection to Venice and Washington Boulevards. Hauser Boulevard's wide parking strips are transformed into rain gardens and urban forestry, creating a Complete Streets design.

While the Hauser/Creek Crossings Vision Plan focuses on Hauser Boulevard, its principles can apply

to all street crossings over Ballona Creek. Thurman and Burnside Streets are similar in scale, making them particularly strong candidates for the Hauser approach.





Vision Plan: Plan View

Legend

- 1 Naturalized Ballona Creek
- 2 Ballona Creek Bike Path
- 3 Bridge
- 4 Trail Underpass
- 5 Bicycle Lane
- 6 Native Landscaping
- 7 Complete Street





Existing Conditions: Aerial Photograph

Early Action Plan : Cochran / Gateway

The Ballona Gateway announces Ballona Creek's presence to travelers on Venice Boulevard. Pocket parks on either side of the intersection of Venice Boulevard and Cochran Avenue lead visitors to a daylighted channel. The Gateway Park marks the eastern terminus of the expanded Ballona Creek Bike Path.

With no parkland within a half mile radius of this location, the Gateway Park creates a rare public gathering area for the community. The park's seating encourages visitors to rest in the shade. Groups can meet in the park and prepare for their trail experience.

The Gateway Park pumps water from the channel bottom and runs it through a biofiltration fountain. These flows return to Ballona Creek.

Paving distinguishes the creek-side area and alerts motorists to this pedestrian-friendly zone. Venice Boulevard and all



Early Action Plan: Plan View

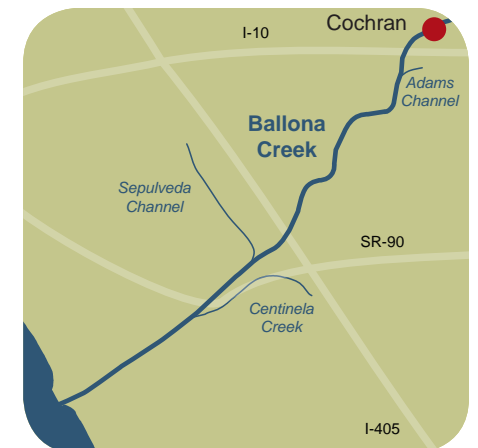
streets that terminate at the creek are outfitted with rain gardens, bioswales, urban forestry and permeable paving.

Native vegetation along the channel is interspersed with community garden plots, encouraging stewardship of the creek.

In Ballona Creek, a low weir over the inlet to the diversion channel keeps low flows in the channel. The sight and sound of moving water increases interest for trail users.

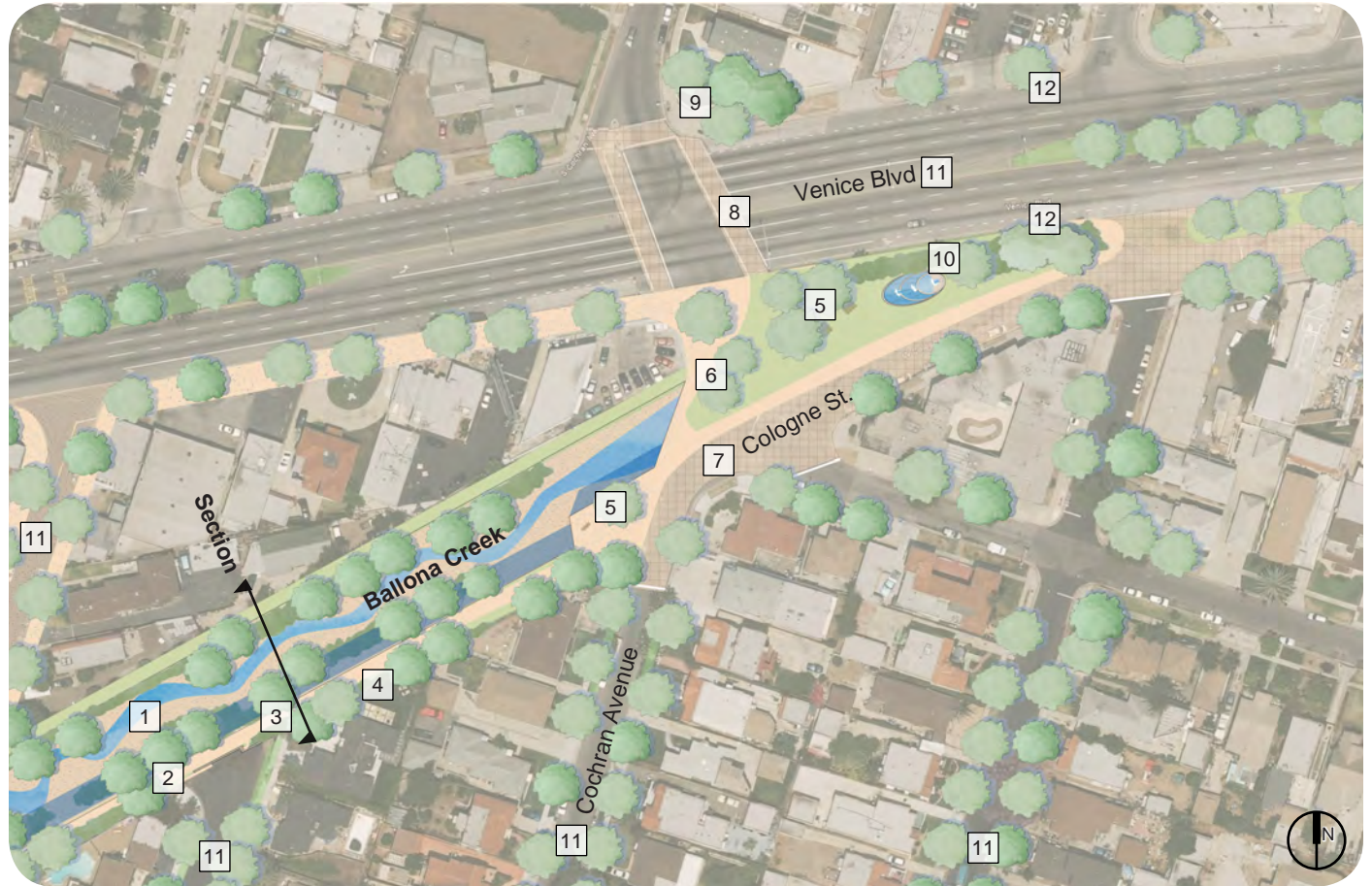
Legend

- 1 Ballona Creek Bike Path
- 2 Native Landscaping
- 3 Seating
- 4 Enhanced Pedestrian Zone
- 5 Enhanced Crossing
- 6 Pocket Park
- 7 Biotreatment Fountain
- 8 Complete Street
- 9 Bicycle Lane

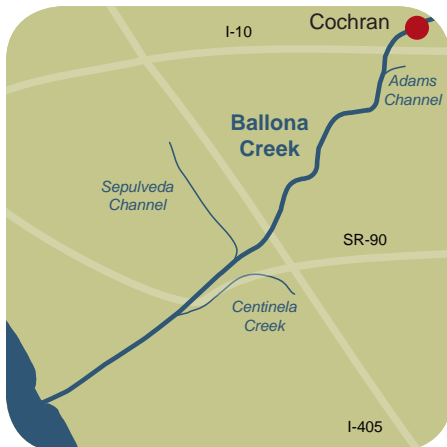


Legend

- 1 Naturalized Ballona Creek
- 2 Ballona Creek Trail
- 3 Stairs
- 4 Native Landscaping
- 5 Seating
- 6 Street Closure
- 7 Enhanced Pedestrian Zone
- 8 Enhanced Crossing
- 9 Pocket Park
- 10 Biotreatment Fountain
- 11 Complete Street
- 12 Bicycle Lane



Vision Plan: Plan View



Vision Plan: Cochran / Ballona Creek Neighborhood Park

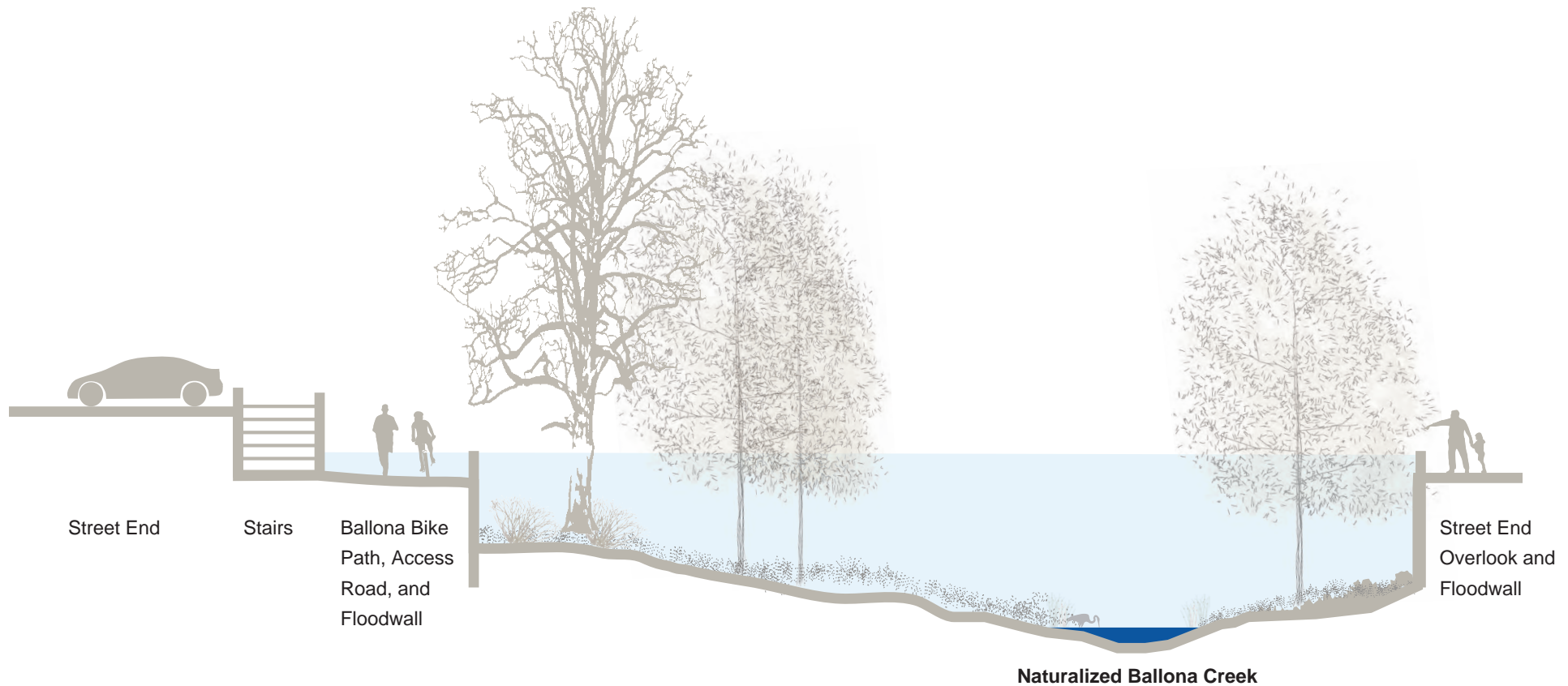
The Ballona Creek Neighborhood Park anchors a naturalized Ballona Creek within the Ballona District.

By closing a small stretch of Cochran Avenue, the park is extended to connect with Ballona Creek. Permeable paving lines the pedestrian area that replaced Cologne Street. Vehicular access between Venice Boulevard and the

residential community is relocated one block east at Cloverdale Street.

The park provides seating and staging areas. Native trees shade benches and picnic tables. Shrubs buffer the park and residences from Venice Boulevard traffic. As in the Early Action Plan, biotreatment of Ballona Creek's low flows is integrated into the park's design.

Ballona Creek transitions from a box culvert to a naturalized channel with floodwalls. Willows and mulefat dominate the creek's floodplain. Sycamore, oak, toyon, native sage, blackberry, and grasses soften the edges of the trail. Preliminary modeling indicates that this natural, widened creek zone can contain the same flows as the current concrete channel.



Vision Plan: Section

The Ballona Creek Bike Path doubles as an access road approximately 13' above the channel bottom. Where street ends meet the channel at a higher elevation, stairs and ramps provide access down to the trail.

Venice Boulevard and smaller, residential streets in this area are retrofitted as Complete Streets. Street-side planted areas capture, treat, and infiltrate

stormwater. Native landscape enhances the urban forest. Streets are striped to ensure that motorists can share the road with bicyclists.

The Park is a keystone of the Ballona District, signalling Ballona Creek's presence, improving the environment and creating better between residential and business areas.