Soldotna Downtown Riverfront Redevelopment Plan Appendices

APPENDIX A: PROJECT INITIATION

A.1 Environmental Review

A.2 Market Analysis

A.3 Transportation Conditions Assessment

A.4 Parks and Trails Considerations

APPENDIX B: BUILD THE VISION

B.1 Preliminary Development Concepts

B.2 Utilities Impacts Analysis

B.3 Traffic and Safety Impacts Analysis

B.4 Market Hall Case Studies

B.5 Market Hall Assessment

B.6 Development Feasibility Analysis

APPENDIX C: MASTER PLAN

C.1 Development Summary

C.2 Business Case- 20-Year Build-out

C.3 Development Strategy

C.4 Streets, Sterling Trail and Utilities Cost Estimate

C.5 Plazas and Parks Cost Estimate

APPENDIX D: COMMUNITY ENGAGEMENT

D.1 Community Engagement Plan

D.2 Project Advisory Committee Plan

D.3 Engagement Milestone #1 Objectives and Vision

D.4 Engagement Milestone #2 Preliminary Concepts

D.5 City Council Work Sessions

APPENDIX E: DRAFT MIXED USE ZONING

E.1 Draft Downtown Riverfront Mixed-Use District

APPENDIX B: BUILD THE VISION

B.1 Preliminary Development Concepts

Document: Preliminary Development Concepts, FIRST FORTY FEET

Description: Summary of the project objectives, vision, and guiding principles that informed a set of "big ideas" for future development within the project area. Concepts include mobility, land uses, development scenarios and the supporting riverfront public use areas amenities that are essential to attract investment and establish downtown as a one-of-a-kind destination.

B.2 Utilities Impacts Analysis

Document: Utilities Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the current utilities (water, sewer, storm, gas, electric and communications) serving the Project area, identifies utilities in need of upgrade, and new utilities to support planned future development.

B.3 Traffic and Safety Impacts Analysis

Document: Traffic and Safety Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the preliminary development concepts for land uses and mobility improvements to determine potential impacts to traffic operations, Sterling Highway access and pedestrian and bicycle circulation. Provides a summary of the main benefits or impacts.

B.4 Market Hall Case Studies

Document: Market Hall Case Studies; ECONorthwest, Economics and Research Consultant
Description: Memo showcasing three case studies that have varying governance and operations structures, varying public investment, and different missions. These case studies demonstrate a range of what the City might want to consider and can help the City identify which elements they like from each.

B.5 Market Hall Assessment

Document: Market Hall Assessment Presentation; ECONorthwest, Economics and Research Consultant
Description: Slideshow presentation showcasing three case studies, their takeaways and considerations for Soldotna. Provides results of stakeholder interviews and recommendations for the Market Hall's potential offerings, critical elements, potential tenant mix, partners and programming for the City to consider.

B.6 Development Feasibility

Document: Soldotna Riverfront Redevelopment, Feasibility Analysis Results; ECONorthwest, Economics and Research Consultant

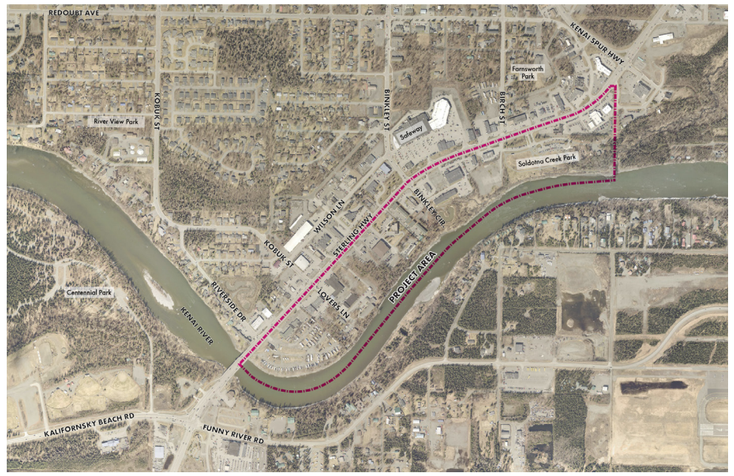
Description: Feasibility study on four development types based on the preliminary development concepts and discussions with the City. These development types include mixed-use, multifamily, townhomes, and hotel. The study provides insights into the feasible scale and types of development for the initial "catalytic" phase, which is intended to kick-start future development.

CONCEPTUAL PLANNING I OBJECTIVES, VISION & GUIDING PRINCIPLES

IDENTITY

The Riverfront Redevelopment Plan is intended to be transformative and a strategy to guide the redevelopment of an 85-acre portion of downtown— currently a mix of auto-oriented businesses along the busy Sterling Highway along with underutilized and undeveloped properties located between the Sterling Hwy and the world-renowned Kenai River. The plan will direct the Downtown's long-term economic development goals based on a set of **project objectives.** Through an engagement process with the City staff, Council and Mayor, Project Advisory Committee and the community, **a vision and guiding principles** for the project were identified.

Project Area

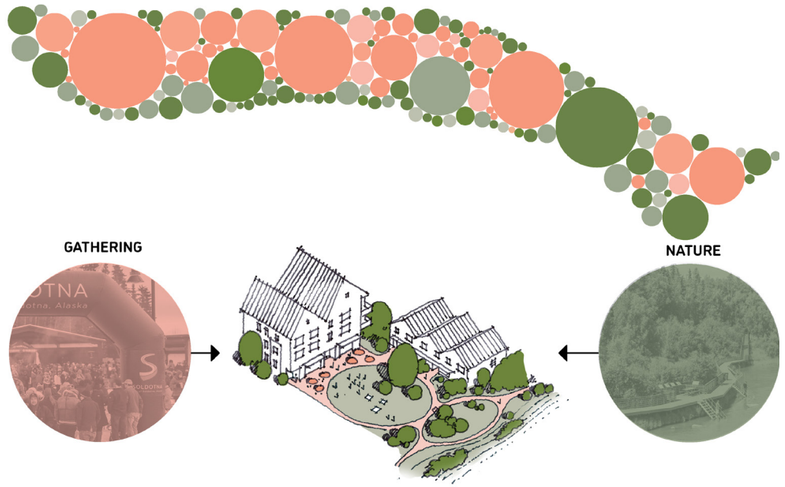


Project Objectives

- Create a **one-of-a-kind riverfront experience** with shopping, dining, entertainment, and lodging in a walkable destination
- Support **local businesses, expansion and attract** new entrepreneurs
- **Highlight** the Kenai River **and incorporate** the natural landscape into the Downtown
- Identify opportunities for **public and private partnerships**
- **Identify critical infrastructure** to support redevelopment
- Explore **options and strategies** for funding and implementation
- Provide housing options to meet local needs

Vision:

Downtown Soldotna is a place where **nature** and community **gathering** spaces coexist, expanding and enhancing one another.



Guiding Principles:

The Kenai River corridor is a **woven blend** of nature, wildlife, recreation, and gathering

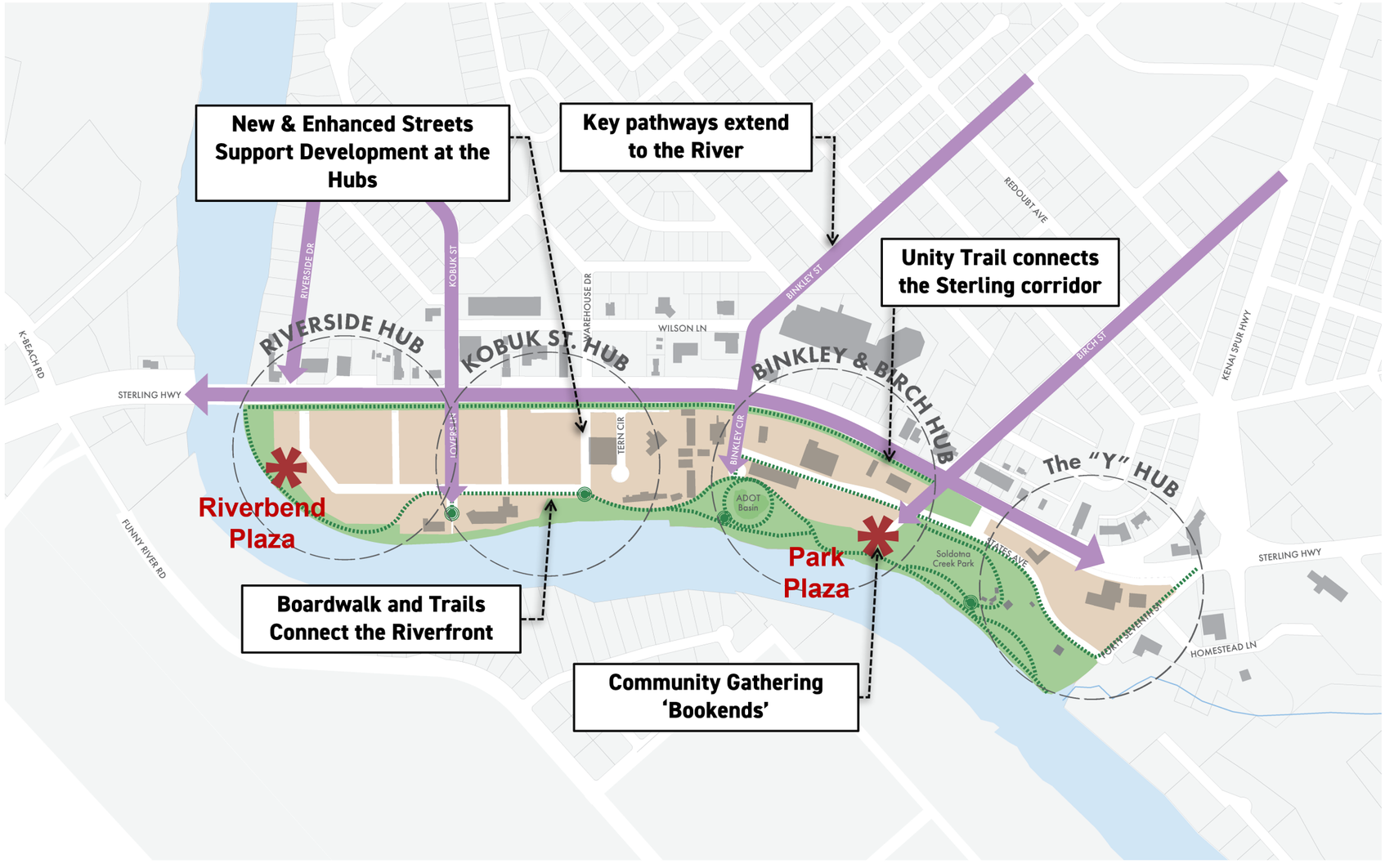
New and enhanced **streets support Downtown Hubs** as places to live, work, and play

Key **pathways connect** neighborhoods to the river and destinations along Sterling Highway

CONCEPTUAL PLANNING I THE BIG IDEAS

The big ideas represent strategies that will bring the vision to life: a place where nature and community gathering spaces can coexist--expanding and enhancing one another. The Big Ideas were translated into alternative development scenarios with supporting land use and mobility frameworks.

The Big Ideas



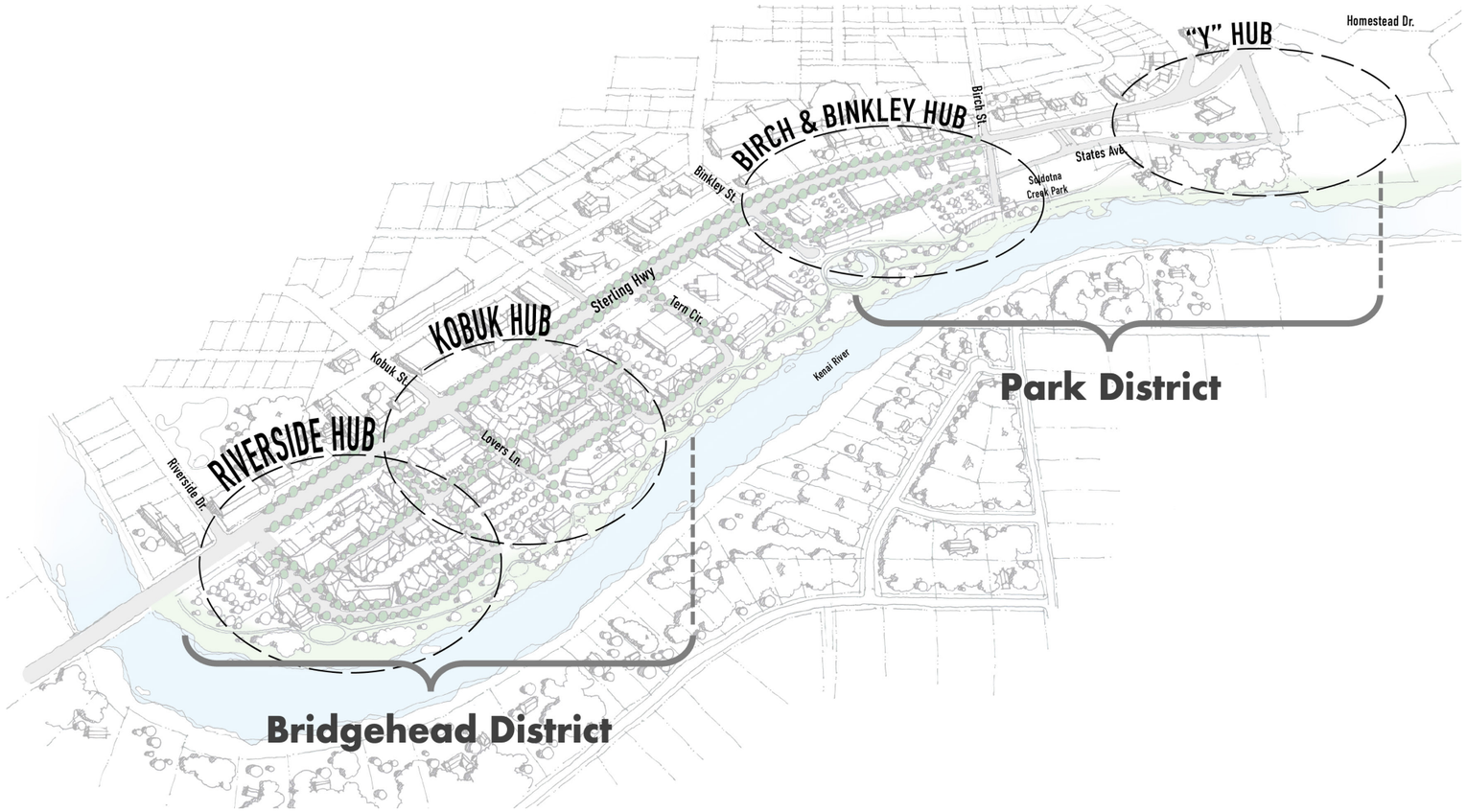
CONCEPTUAL PLANNING | PRELIMINARY REDEVELOPMENT CONCEPTS FOR BUILDING THE DISTRICTS

PLACE

Downtown Districts

The project area consists of two distinct areas that include the Park District, centered around Soldotna Creek Park, and the supporting commercial uses within Hubs located at the Binkley and Birch Streets and the "Y" intersections; and the Bridgehead District oriented to the Kenai River and the supporting commercial uses at the intersections of Riverside Drive and Kobuk Street.

Two Bridgehead District scenarios depict how future development might be organized. The Main Street scenario is built around retail storefronts extending across a few blocks along a new street between the highway and the river. The River Street scenario orients retail storefronts to the Kenai River and along a new street supporting housing and businesses with river views. The Park District scenarios provide opportunities for improved park access, parking, and an active riverfront gathering space.



CONCEPTUAL PLANNING | PRELIMINARY REDEVELOPMENT CONCEPTS FOR BUILDING THE DISTRICTS

PLACE

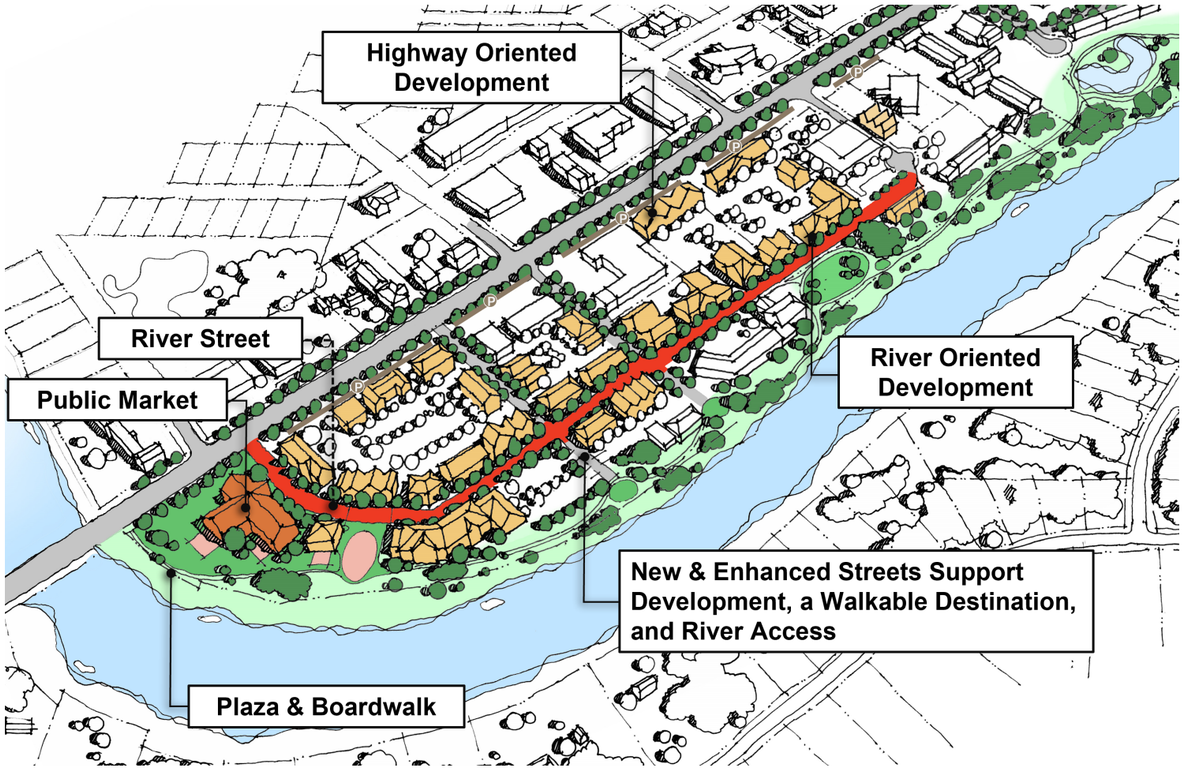
Bridgehead District Scenarios

Main Street + Bridgehead Plaza

Main Street Concept—Three blocks of storefronts span edge-to-edge, offering retail, dining, entertainment and housing and anchored by Bridgehead Plaza, a riverfront park, and the existing Blazy Mall. The riverfront includes public gathering spaces, trails, a boardwalk, and a hotel with a restaurant and bar. River-oriented storefronts and housing will grace the new River Street, while commercial uses align with Sterling Highway. Both Main Street and River Street feature wide sidewalks, street trees, lighting, and a shared roadway for bicycles and vehicles.

A continuous trail network would extend along the riverfront and the Sterling Highway connecting the "bookend" public plazas at Soldotna Creek Park and the bridgehead.

River Street + Public Market and Bridghead Plaza



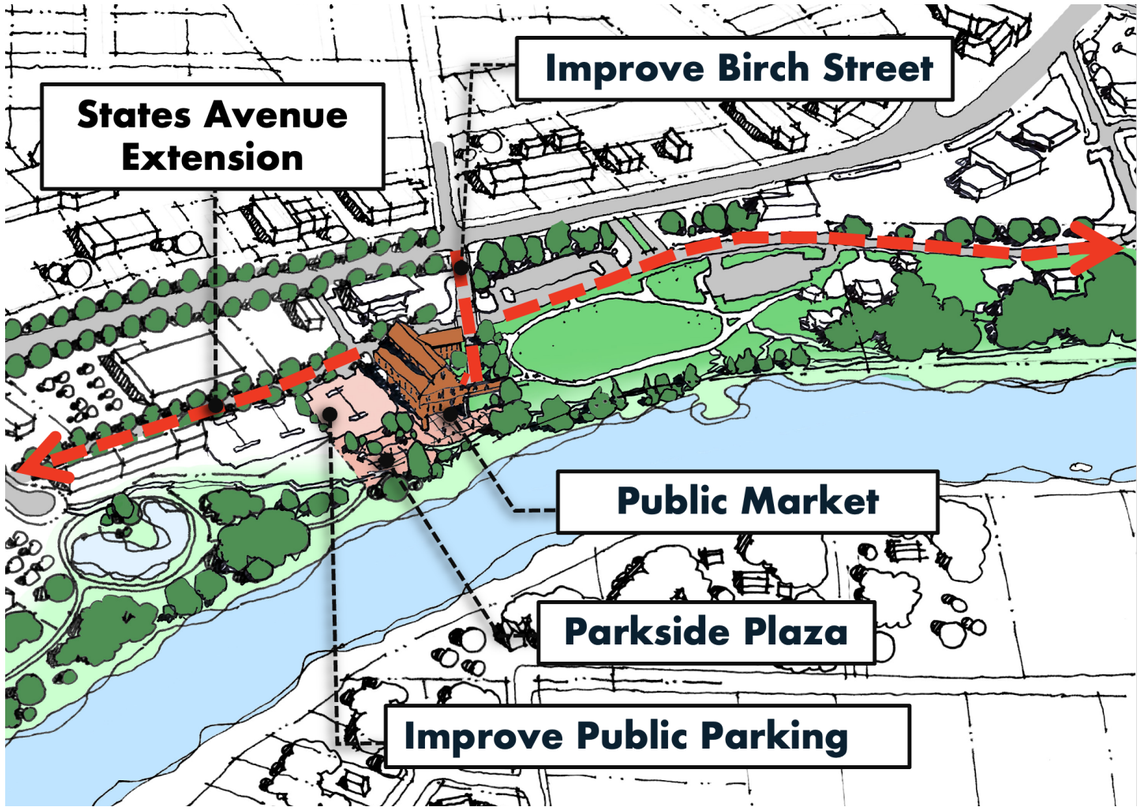
River Street Concpet—This concept would "cluster" edge-to-edge storefronts with retail, dining, and entertainment uses along a new River Street. Anchored by Bridgehead Plaza, and a riverfront park, the riverfront area features public gathering, trails, a boardwalk, and a public market building. River oriented storefronts and housing would line the new River Street, while new commercial uses would be oriented along Sterling Highway. River Street will have wide sidewalks, street trees, lighting, and a shared roadway for bicycles and vehicles.

A continuous trail network would extend along the riverfront and the Sterling Highway connecting the "bookend" public plazas at Soldotna Creek Park and the bridgehead.

PLACE

Park District Scenarios

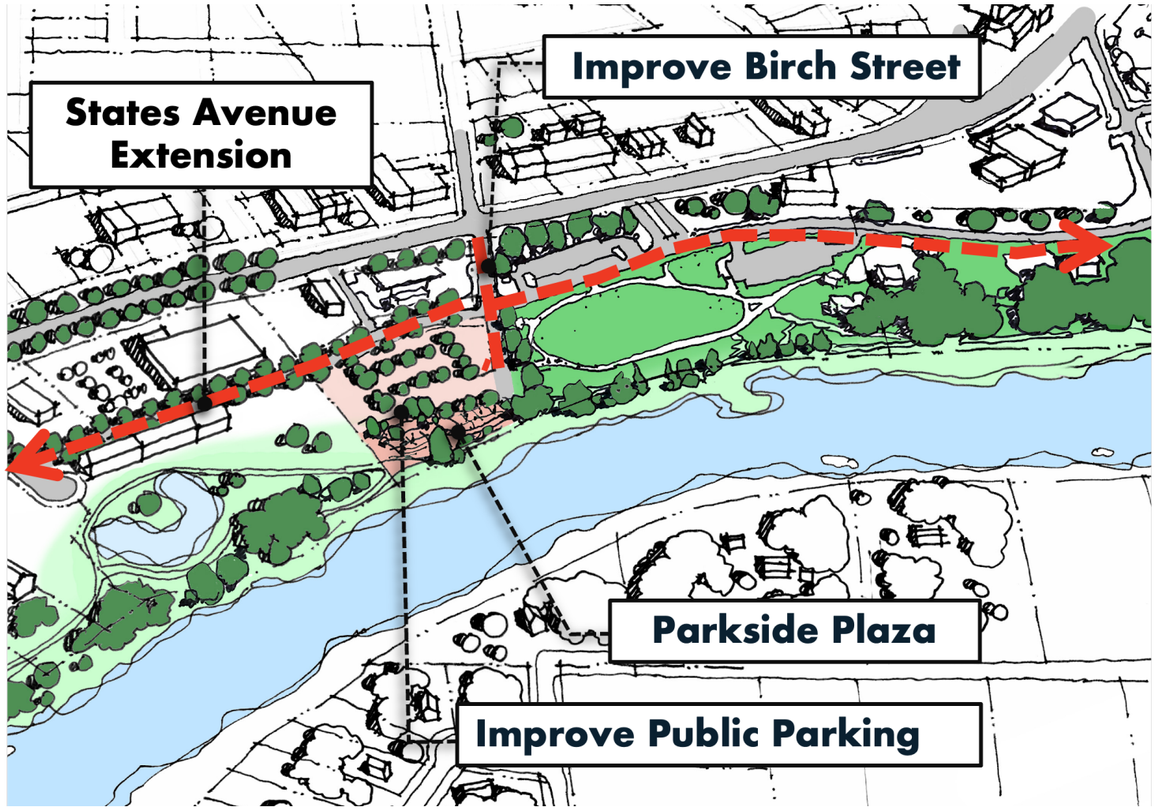
States Avenue Extension + Public Market and Parkside Plaza



States Avenue Extension + Public Market and Parkside Plaza- Soldotna Creek Park will host a public market and plaza at Birch Street, activating the park's edge. States Avenue is extended and enhanced between Binkley Circle and 47th Street, improving local access between existing businesses and the park, to create a more connected downtown.

A continuous trail network would extend along the riverfront and the Sterling Highway connecting the "bookend" public plazas at Soldotna Creek Park and the bridgehead.

States Avenue Extension + Parkside Plaza



States Avenue Extension + Parkside Plaza- Soldotna Creek Park hosts a public plaza at Birch Street, activating the park's edge. States Avenue extends between Binkley Circle and 47th Street, enhancing local access, creating a connected downtown.

A continuous trail network would extend along the riverfront and the Sterling Highway connecting the "bookend" public plazas at Soldotna Creek Park and the bridgehead.

BRIDGEHEAD & PARK DISTRICT SCENARIOS | MAIN STREET CONCEPT

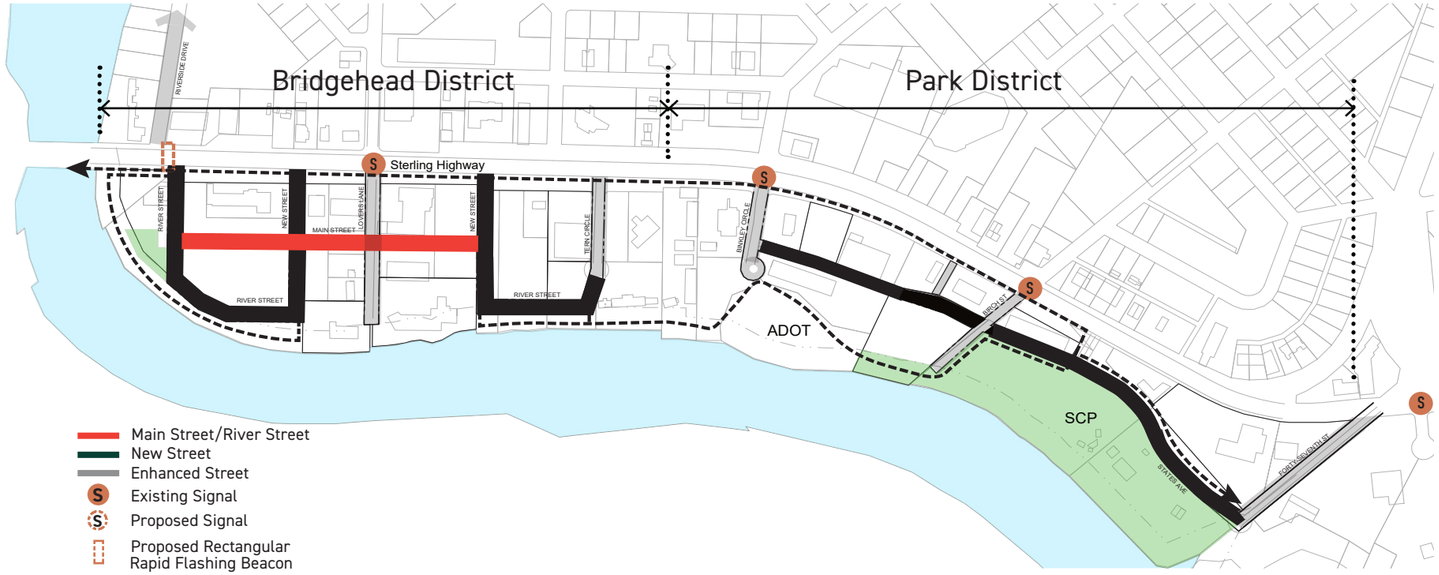
Main Street Development Framework

Within the Bridgehead District, **the Main Street Concept provides for a retail and shopping destination with storefronts and housing oriented along a three block Main Street.** A hotel, public plaza and riverfront open space anchor the Main Street with infill development of commercial uses oriented to Sterling Highway. New and enhanced streets extend access improvements between the highway and the riverfront and establish a pattern of "blocks" to support existing and future development within a walkable street environment. A new States Avenue connection, public parking, plaza and Public Market anchor Soldotna Creek Park within the Park District.

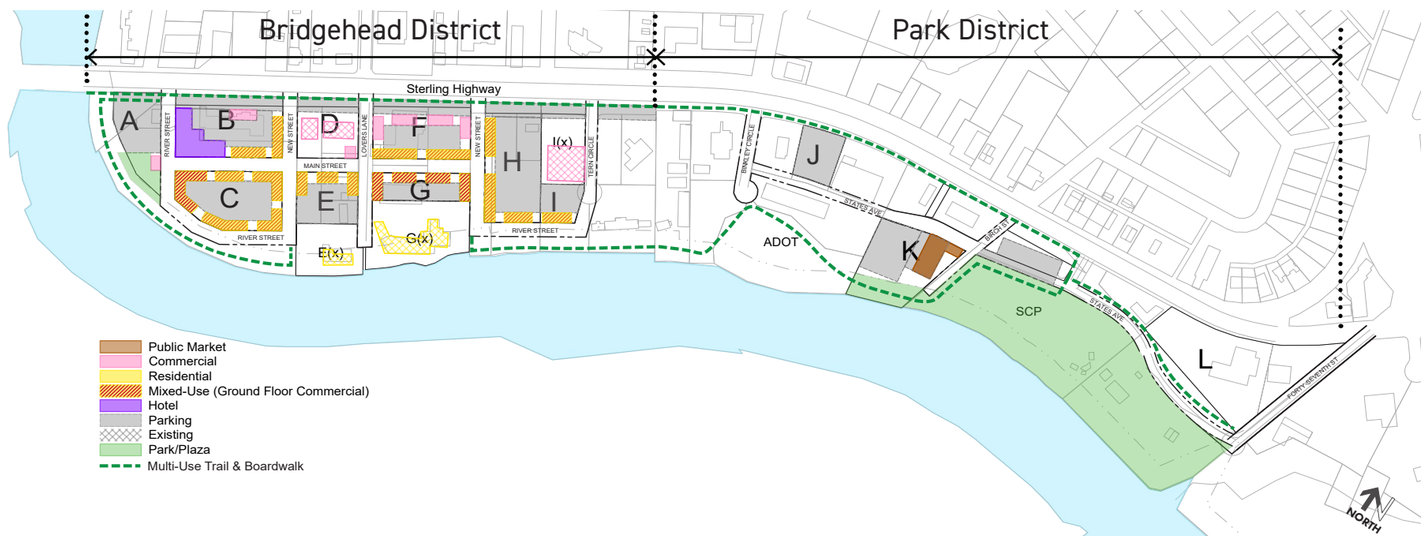
Development Potential:

Highway Commercial:	43,500 square feet
Main Street Retail:	130, 875 square feet
Hotel:	50-75 Rooms w/ Restaurant-Bar
Residential:	294 units
Plaza and Open Space:	6.5 acres
Public Market:	30,000 square feet

Main Street Mobility Framework



Main Street Land Use Framework



BRIDGEHEAD & PARK DISTRICT SCENARIOS | MAIN STREET CONCEPT

Main Street Development Framework

Development Potential:

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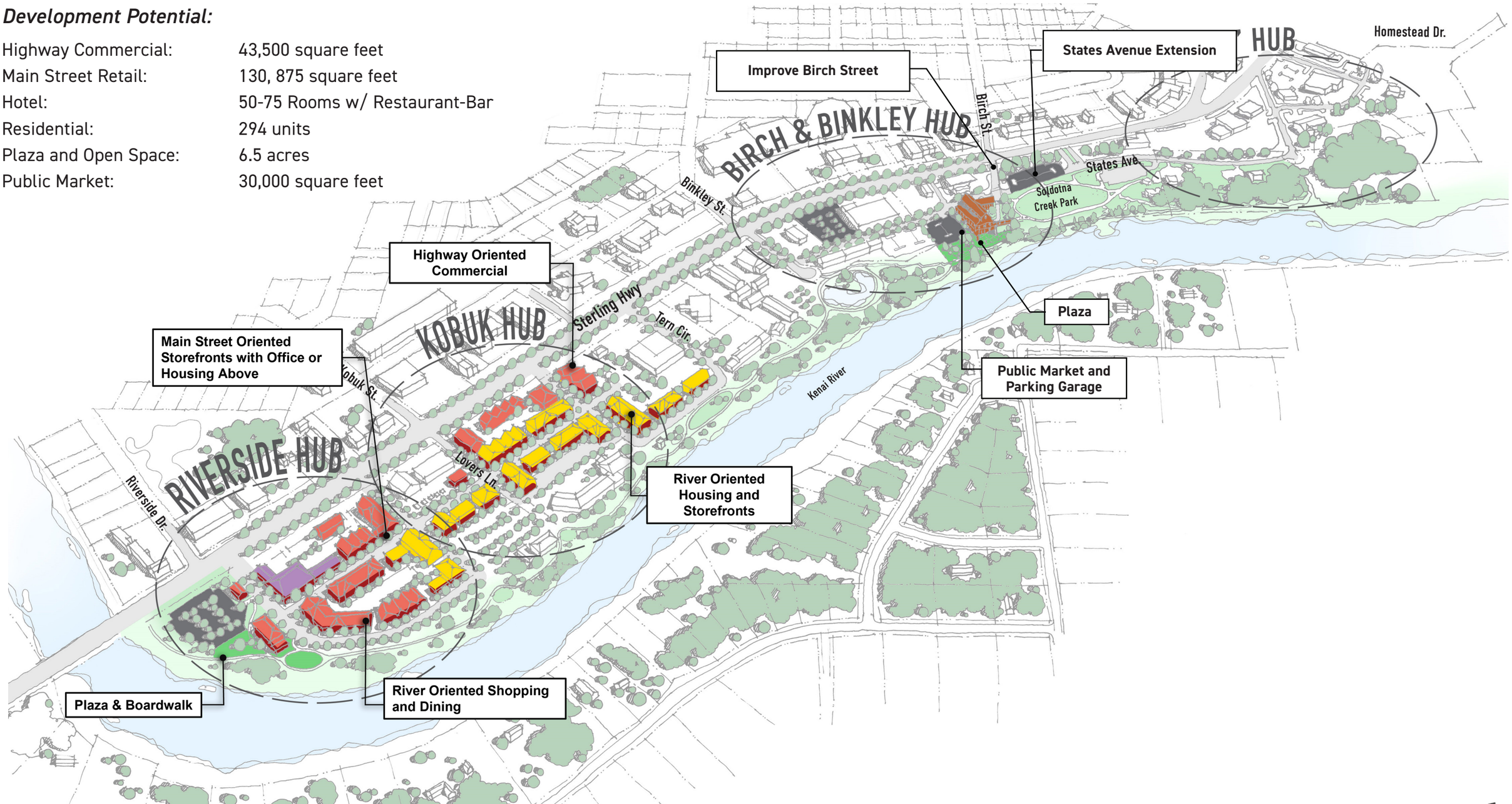
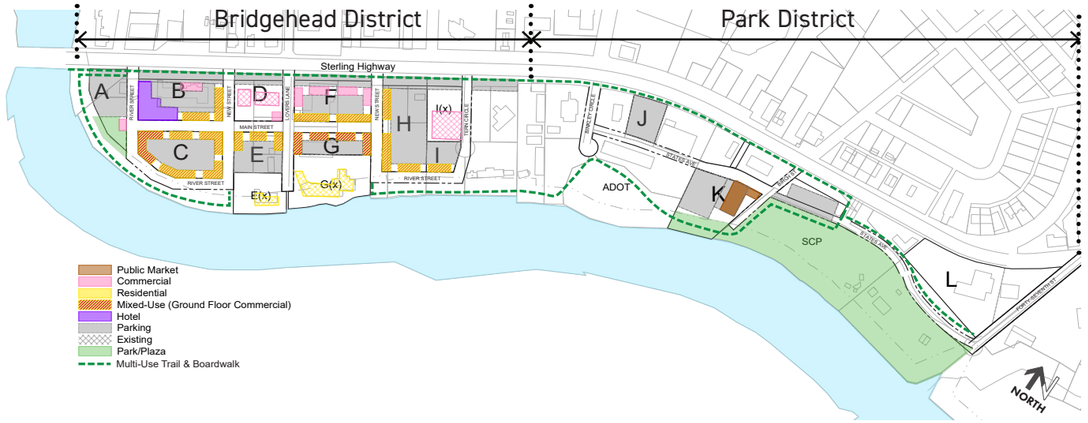


BRIDGEHEAD & PARK DISTRICT SCENARIOS | MAIN STREET CONCEPT

Main Street Development Framework



NEW DEVELOPMENT

Option: Main Street

Block	Type	Total Area	Height (stories)	Res Units	Non Res SF*	New Surface Parking*	*Calc - Required parking*
A	Redevelop	62,000	1	—	2500	108	6
B	Redevelop	96,500	3.5	27	66500	96	207
C	Redevelop	99,500	3.5	78	39200	122	216
D	Existing	54,500	—	—	2100	—	5
--	—	—	—	—	—	—	—
E	Redevelop	55,000	3.5	24	12000	91	66
E(x)	Existing Riverquest	58,000	—	—	—	—	—
F	Redevelop	88,500	3.5	29	31300	75	122
G	Redevelop	47,000	3.5	36	17900	56	98
G(x)	Existing Asst Living	106,500	—	—	—	—	—
H	Redevelop	106,500	3.5	41	20400	178	112
I	Redevelop	27,000	3.5	10	5000	48	28
I(x)	Existing Blazy Mall	53,500	—	—	—	—	—
Subtotal: Bridgehead District				***245***	***196900***	***775***	*860*
J	Redevelop	37,000	—	—	—	87	0
K	Redevelop (Market)	104,500	3.0	—	32000	233	80
L	Redevelop	180,000	—	—	—	—	0
Soldotna Creek Park	Existing	343,000	—	—	—	30	0
Subtotal: Park District				—	***32000***	***350***	*80*
TOTAL				**245**	**228,900**	**1,125**	940

*Does not include existing

*Does not include Sterling Frontage road parking or on-

NEW & ENHANCED STREETS

	Linear Feet	Parking Stalls
Bridgehead District Streets	5,100	392
Park District Streets	3,720	286
TOTAL ON-STREET PARKING		**678**
TOTAL ROW	**8820**	
TOTAL NEW STREETS	5590	
TOTAL ENHANCED STREETS	2270	
Sterling Highway Frontage Road	1,970	246

NEW OPEN SPACE

	Square Feet
TOTAL OPEN SPACE	**285,500**

ASSUMPTIONS	
Comm. Parking Ratio	0.0025
Res. Parking Ratio	1.50
Res. Unit (average)	1,250
Parking Stall Area	425

BRIDGEHEAD & PARK DISTRICT SCENARIOS | RIVER STREET CONCEPT

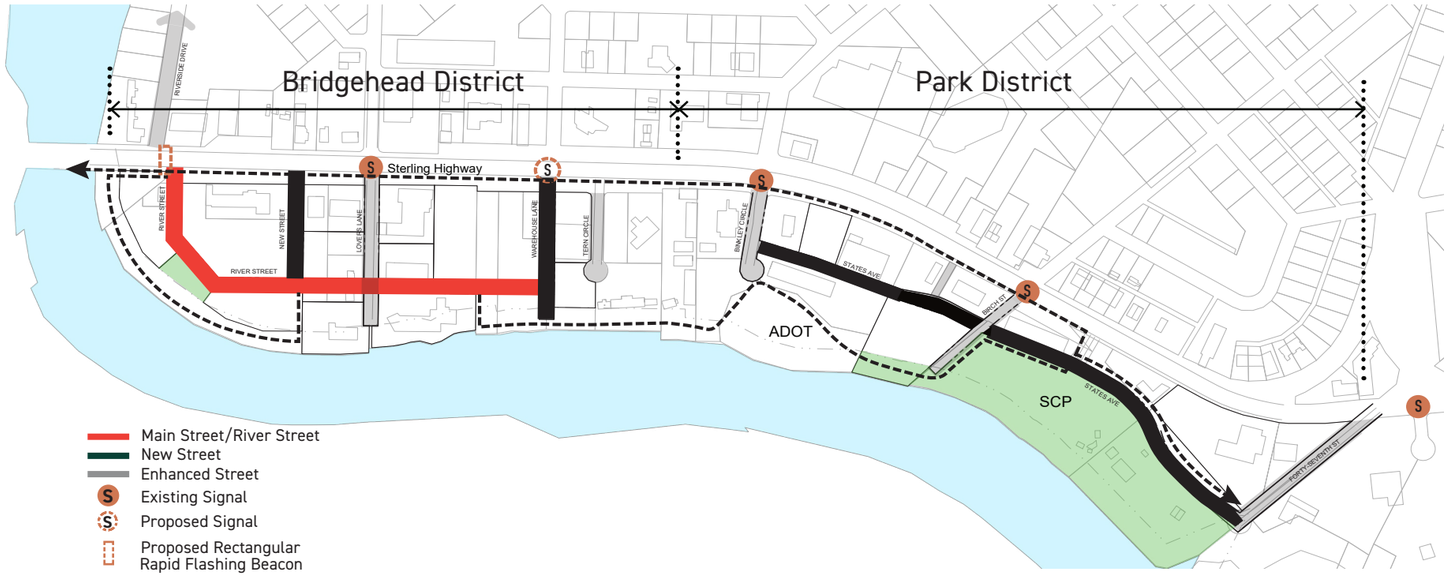
River Street Development Framework

Within the Bridgehead District, the **River Street Concept provides for a retail and shopping destination with storefronts and housing oriented along a four-block River Street.** The River Street development is anchored by a public market, public plaza and riverfront open space with infill development of commercial uses oriented to Sterling Highway. A new States Avenue connection, parking, and plaza anchor the Park District.

Development Potential:

Highway Commercial:	29,825 square feet
River Street Retail:	89,475 square feet
Hotel:	TBD
Residential:	225 units
Plaza and Open Space:	7.3 acres
Public Market:	15,000 square feet

River Street Mobility Framework



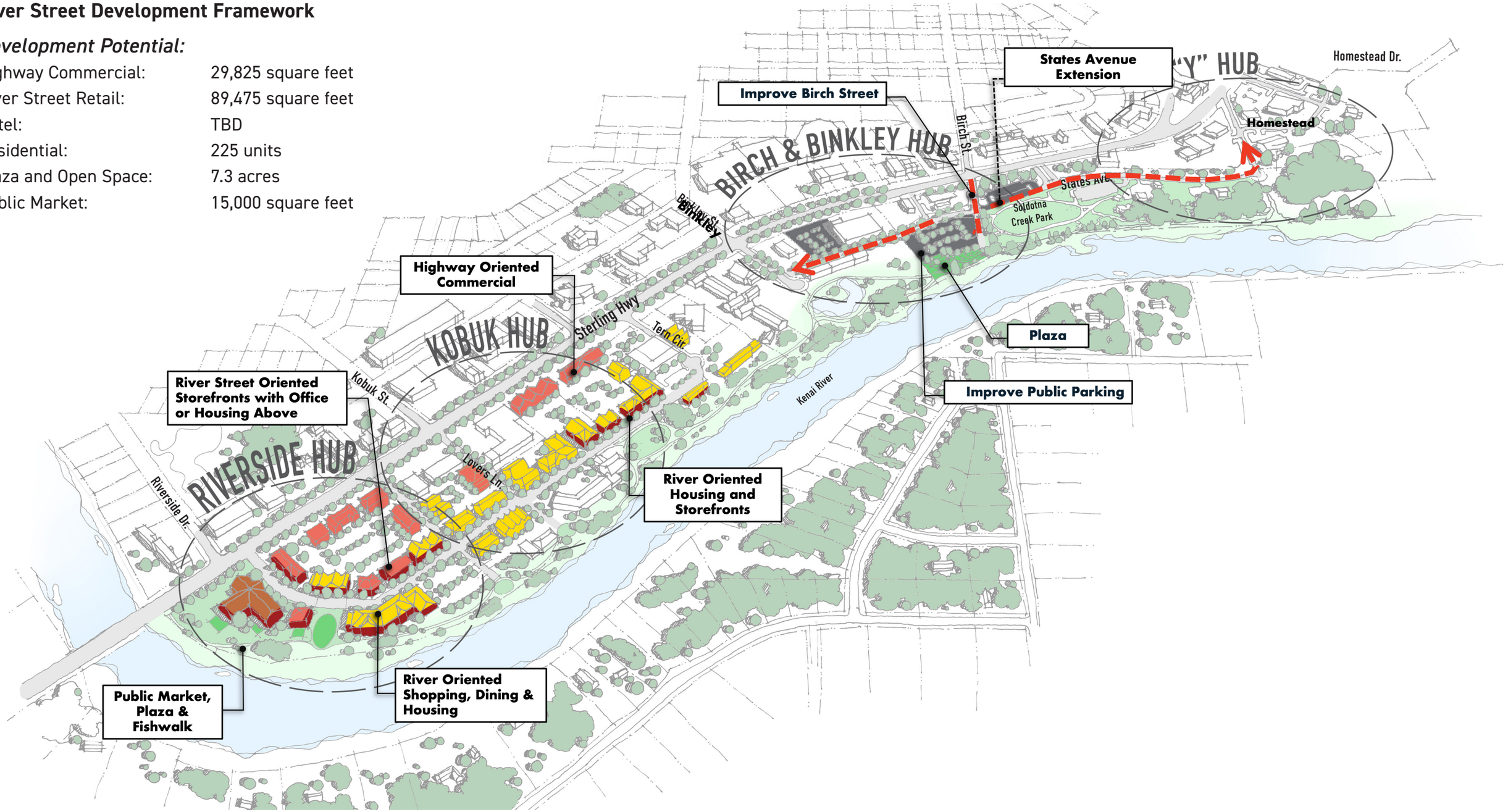
River Street Land Use Framework

BRIDGEHEAD & PARK DISTRICT SCENARIOS | RIVER STREET CONCEPT

River Street Development Framework

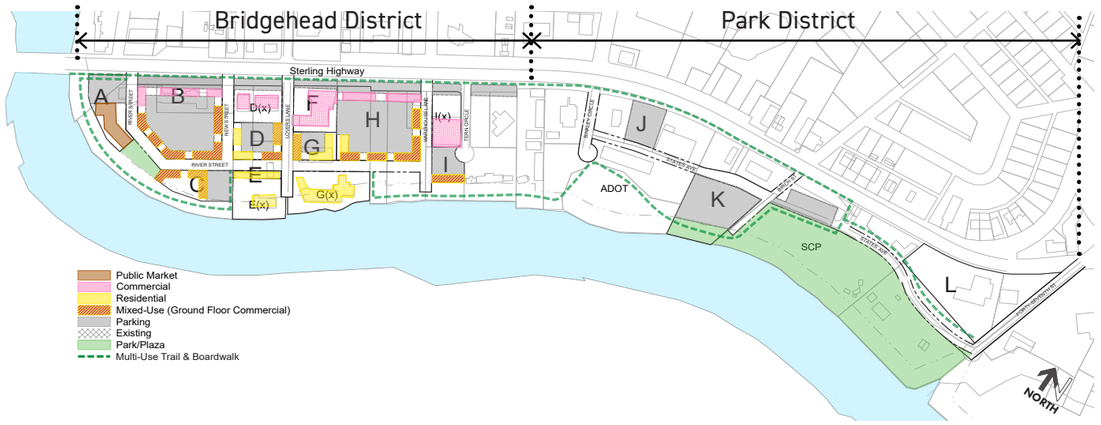
Development Potential:

Highway Commercial:	29,825 square feet
River Street Retail:	89,475 square feet
Hotel:	TBD
Residential:	225 units
Plaza and Open Space:	7.3 acres
Public Market:	15,000 square feet



BRIDGEHEAD & PARK DISTRICT SCENARIOS | RIVER STREET CONCEPT

River Street Development Framework



NEW DEVELOPMENT

Option: River Street

Block	Type	Total Area	Height (stories)	Res Units	Non Res SF*	New Surface Parking*	*Calc - Required parking*
A	Redevelop (market)	63,500	2	—	19000	69	48
B	Redevelop	162,000	3.5	55	41600	226	186
C	Redevelop	64,500	3.5	29	14300	53	79
D	Redevelop	50,000	3.5	34	9100	61	73
D(x)	Existing DQ/Commercial	50,000	—	—	—	—	—
E	New (TH/potential swap)	10,000	2	10	—	—	15
E(x)	Existing Riverquest	58,000	—	—	—	—	—
F	Existing Sal's Commercial	56,000	—	—	—	—	—
G	Redevelop	34,000	2.5	30	5800	31	60
G(x)	Existing Asst Living	82,000	—	—	—	—	—
H	Redevelop	168,000	3.5	53	22200	244	135
I	Redevelop	29,000	3.5	15	7300	52	40
I(x)	Existing Blazy Mall	44,500	—	—	—	—	—
Subtotal: Bridgehead District				***225***	***119300***	***735***	*635*
J	Redevelop	37,000	—	—	—	87	—
K	Redevelop	104,500	—	—	—	186	—
L	Redevelop Kendall's	180,000	—	—	—	—	—
Soldotna Creek Park	Existing	343,000	—	—	—	30	—
Subtotal: Park District				—	—	***303***	—
TOTAL				**225**	**119,300**	**1,038**	635

*Does not include existing

*Does not include Sterling Frontage road parking or on-street

NEW & ENHANCED STREETS

	Linear Feet	Parking Stalls
Bridgehead District Streets	3670	282
Park District Streets	3720	286
TOTAL ON-STREET PARKING		**568**
TOTAL ROW	**7390**	
TOTAL NEW STREETS	5120	
TOTAL ENHANCED STREETS	2270	
Sterling Highway Frontage Road	1,970	235

NEW OPEN SPACE

	Square Feet
TOTAL OPEN SPACE	**321,000**

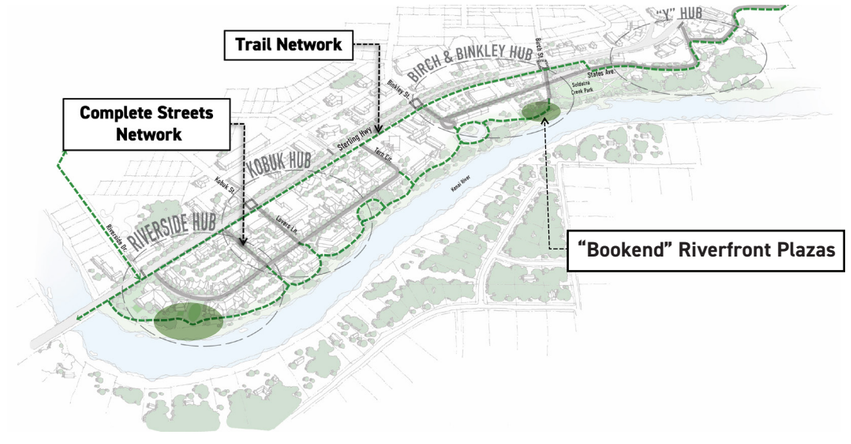
ASSUMPTIONS

Comm. Parking Ratio	0.0025
Res. Parking Ratio	1.50
Res. Unit (average)	1,250
Parking Stall Area	425

COMPLETE STREETS AND TRAILS | SAFE AND DIRECT ACCESS FOR ALL AGES AND ABILITIES

CONNECTED

Complete Streets + Trails Framework



Complete streets and trails provide safe, direct, and continuous access to destinations for all ages, abilities and users, whether you walk, bike, roll, or drive.

New and enhanced streets provide direct and convenient local access between the Sterling Highway and the Kenai River and an interconnected street grid supports existing and future development within Hubs along the corridor.

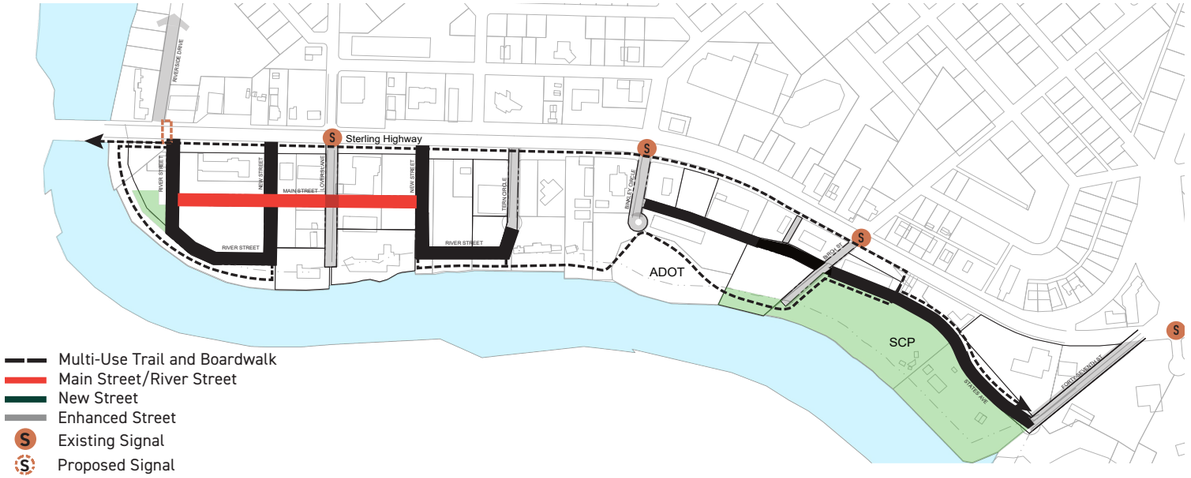
A Main Street or River Street serves as a destination for retail, dining and housing within an emphasis on slower vehicle speeds and encouraging walking and biking.

Trails along Sterling Highway and the Kenai Riverfront support **a continuous multi-use trail connection** to promote walking and biking and access management measures to support highway operations.

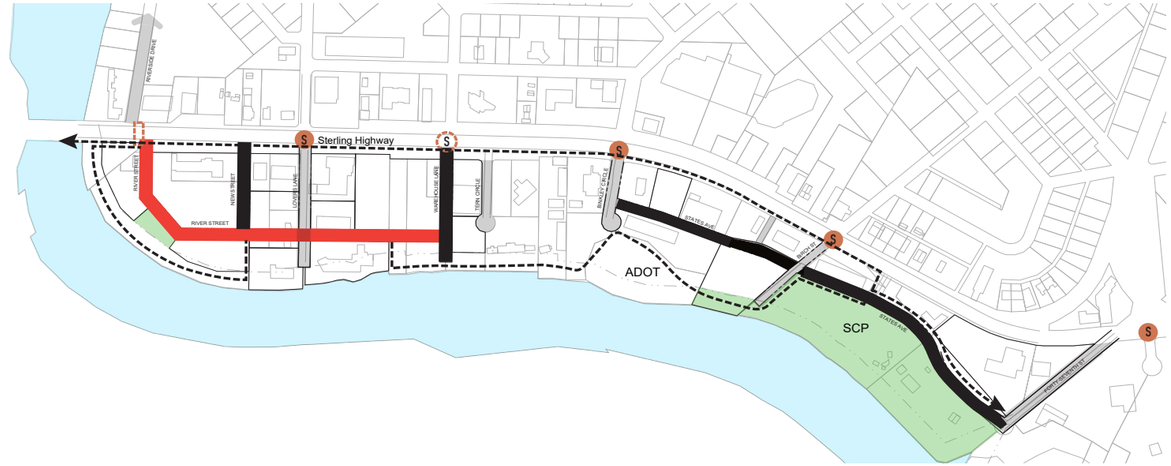
COMPLETE STREETS AND TRAILS | SAFE AND DIRECT ACCESS FOR ALL AGES AND ABILITIES

CONNECTED

Main Street Mobility Framework



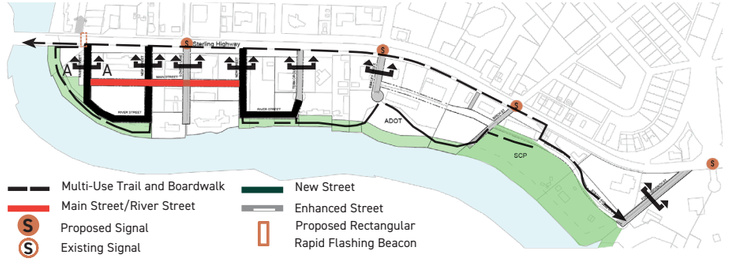
River Street Mobility Framework



The Mobility Framework diagram illustrates a network of streets designed to support redevelopment and encourage the use of streets for more than just vehicular movement, transforming them into vibrant spaces for people. Detailed cross-sections and sidewalk elements promoting a walkable downtown and accessible riverfront are further elaborated on the following pages.

NEW AND ENHANCED STREETS | MAIN STREET

New Streets & Enhanced Streets Framework



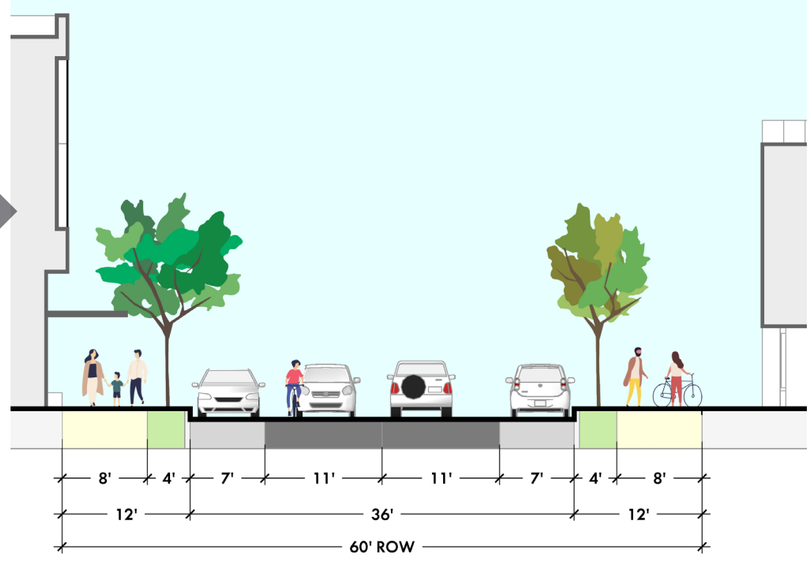
A **new Main Street**, located between the Sterling Highway and the Kenai River, **provides local traffic access, convenient on-street parking to support businesses and residents and an enhanced pedestrian environment** with wide sidewalks, street trees and lighting.

Enhanced streets consist of improvements to Lover's Lane, Birch Street, Binkley Street, and Tern Circle.

All new and enhanced street improvements would be supported within a typical 60-feet right-of-way or modified where conditions require adjustments.

Main Street Precedent

New, Enhanced, & Main Street Section- (Typical 60' Right-of-way)



Ex. Lover's Lane (60' ROW)

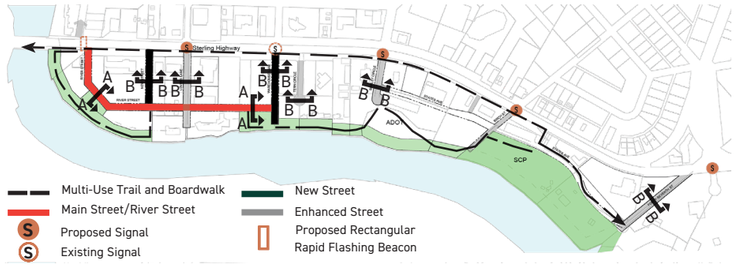
Ex. Tern Circle (60' ROW)

Ex. Binkley Street (60' ROW)

Ex. Birch Street (60' ROW)

NEW AND ENHANCED STREETS | RIVER STREET

New Streets and Enhanced Streets Framework

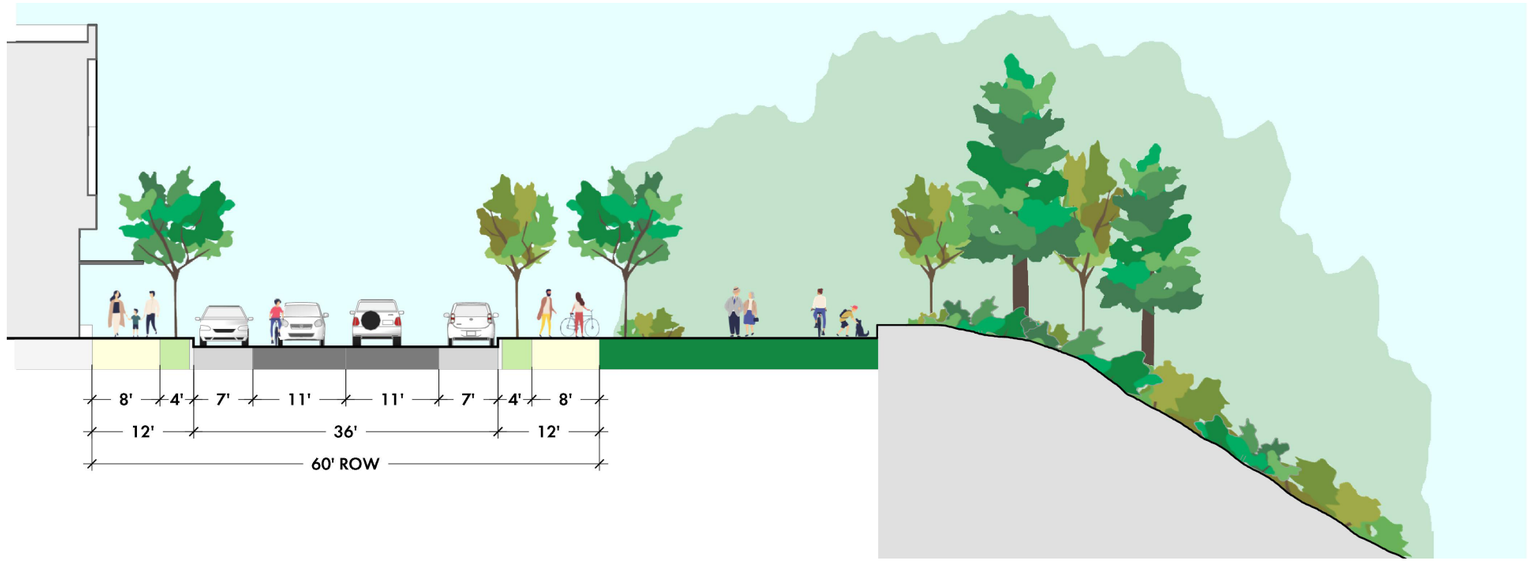


A **new River Street,** oriented to the Kenai River, **provides local traffic access, convenient on-street parking to support businesses and residents and an enhanced pedestrian environment** with wide sidewalks, street trees and lighting.

Enhanced streets consist of improvements to Lover's Lane, Birch Street, Binkley Street, and Tern Circle.

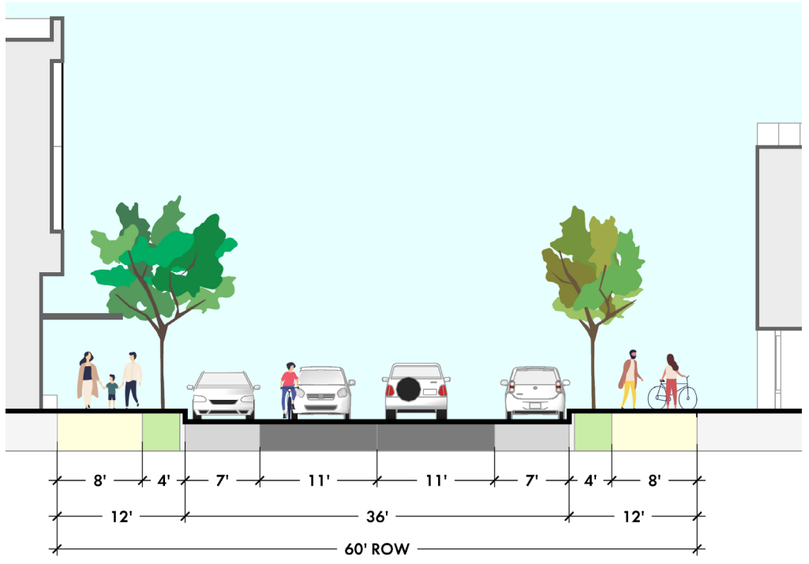
All new and enhanced street improvements would be supported within a typical 60-feet right-of-way or modified where conditions require adjustments.

River Street Section AA- (Typical 60' Right-of-way)



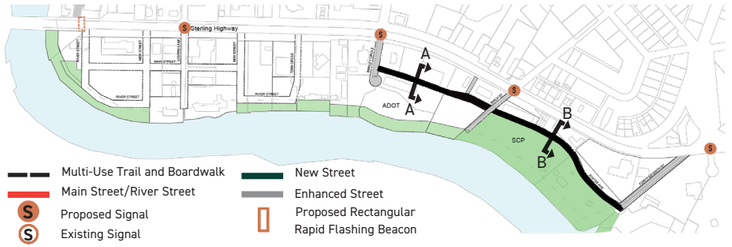
River Street Precedent

New, Enhanced, & River Street Section BB - (Typical 60' Right-of-way)



NEW AND ENHANCED STREETS | STATES AVENUE

New States Avenue + Enhanced Streets Framework

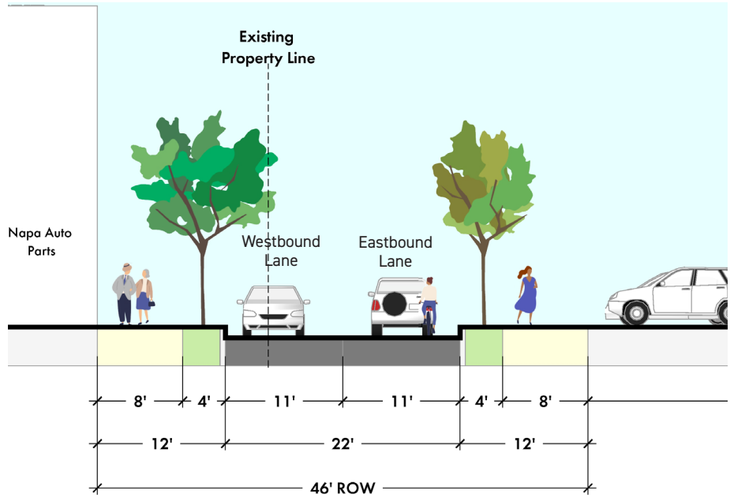


States Avenue replaces the Soldotna Creek Park Driveway and the Aspen Hotel driveway with a new street connection between Binkley Street, Birch Street, and 47th Street. The States Avenue connection combined with the City's planned future improvements to Homestead Drive (between 47th Street and Redoubt Street) will provide a parallel route to Sterling Highway and improved access to businesses between the Binkley Street, Birch Street and the "Y" Intersection Hubs and Soldotna Creek Park.

States Avenue improvements will support convenient local vehicular access, on-street parking and wide sidewalks with street trees and lighting. West of Birch Street a multi-use trail will be located along the north side of the street and is an extension of the proposed Sterling Highway trail.

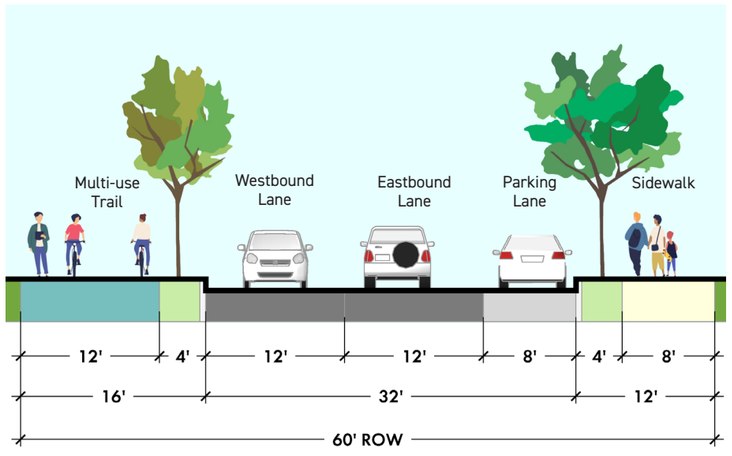
Existing Aspen Hotel Driveway

Proposed States Avenue- Section AA



Existing Soldotna Creek Park Driveway

Proposed States Avenue- Section BB



STERLING HIGHWAY | HIGHWAY ACCESS MANAGEMENT

The Sterling Highway **provides drive-by traffic and visibility that is essential to support businesses** within the project area. Traffic signals at Kobuk Street/Lover's Lane, Binkley Street/Binkley Circle and Birch Street manage traffic flow and access to the local street network. Today, **walk and bike use of the corridor is limited due to a lack of bicycle facilities, existing sidewalks located directly next to busy travel lanes** and crossings limited to only signalized intersections.

Traffic **safety and operations are impacted by the multiple driveways accessing the highway** which contributes to traffic collisions. Some portions of the DOT right-of-way are wider and include a landscape setback and/or parking lanes used by adjacent businesses.

Preliminary concepts for mobility management are intended to address these conditions and provide for:

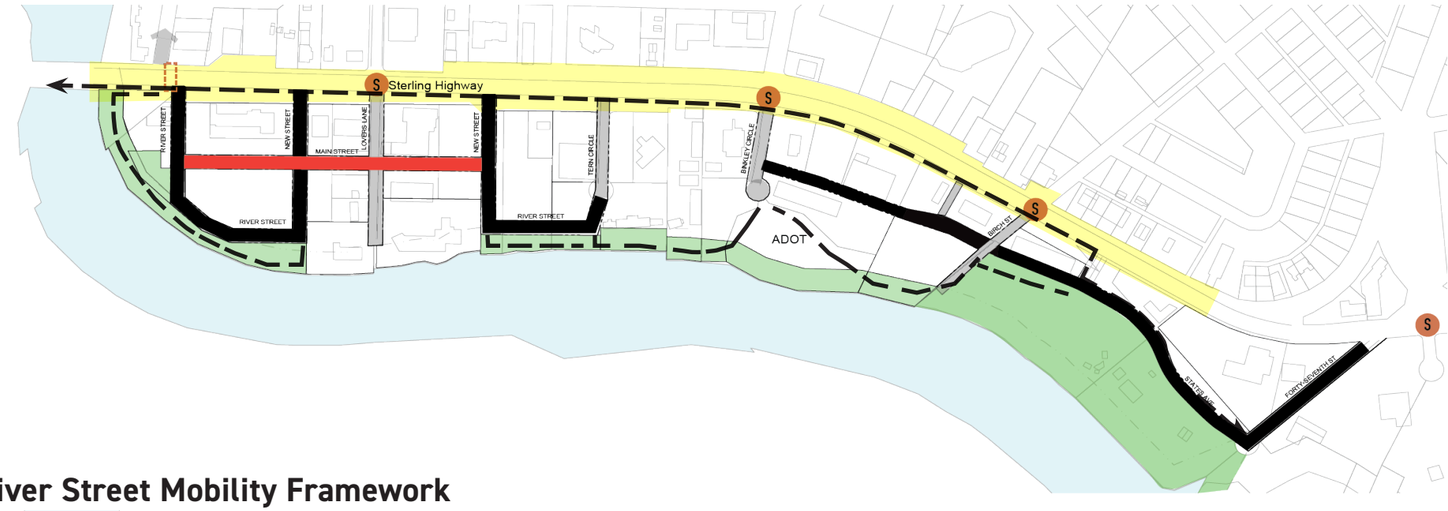
1. A multi-use trail and landscape buffer along the south side of the roadway to promote safe walking and biking

2. Consideration of additional crossings and or enhancements to existing crossings to promote walk and bike access

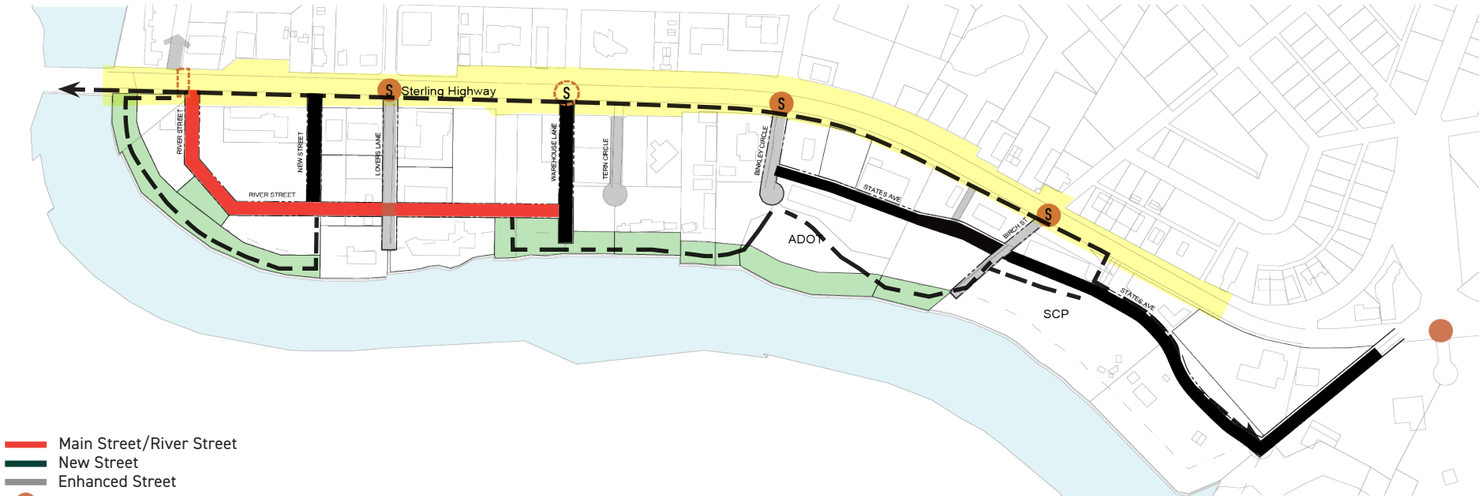
3. Consolidation of some driveways to support traffic operations and safety

4. A standardized parking lane and driveways between business to support business access

Main Street Mobility Framework



River Street Mobility Framework



STERLING HIGHWAY | HIGHWAY ACCESS MANAGEMENT

Sterling Highway Trail +Parking Access Lane Framework

Driveway Consolidation Summary

Location	Existing Driveways	Proposed Driveways
Bridge to Kobuk St/ Lover's Ln.	4	2
Kobuk St/Lover's Ln. to Tern Circle	4	1
Tern Circle to Binkley Circle	2	1
Binkley Circle to Birch Place	5	3
Total:	15	7

Excess Alaska DOT right-of-way, between the Kenai River Bridge and Birch Street **provides an opportunity to improve walk and bicycle access, address driveway impacts on highway operations and safety and improve vehicular access between businesses.**

Exhibit 1 illustrates the general location of the DOT right-of-way along a portion of Sterling Highway in proximity of the Kobuk Street and Lover's Lane intersection and areas where potential improvements may occur.

Exhibit 2 illustrates a conceptual design that incorporates elements that include a multi-use trail and landscape buffers, an improved parking access lane and driveway consolidations (See summary above and specific driveway consolidations on the following page).

The design concept would be implemented between the existing curbline and the edge of the existing right-of-way. No changes to the existing curb-to-curb (5-lane roadway) are suggested.

Exhibit 1- Existing Corridor and Improvement Areas

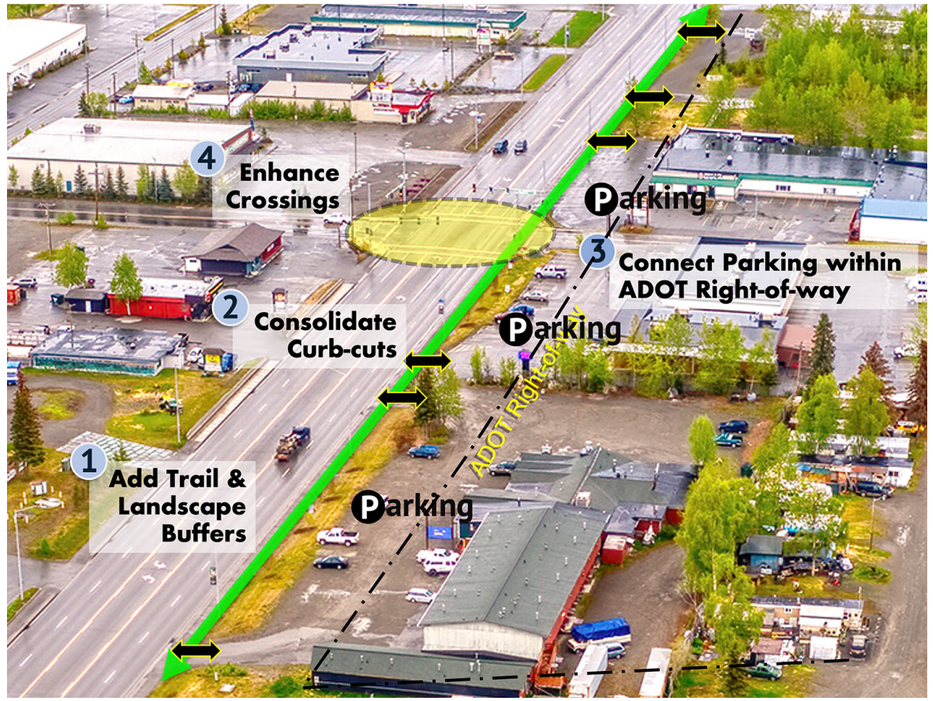


Exhibit 2- Conceptual Improvements

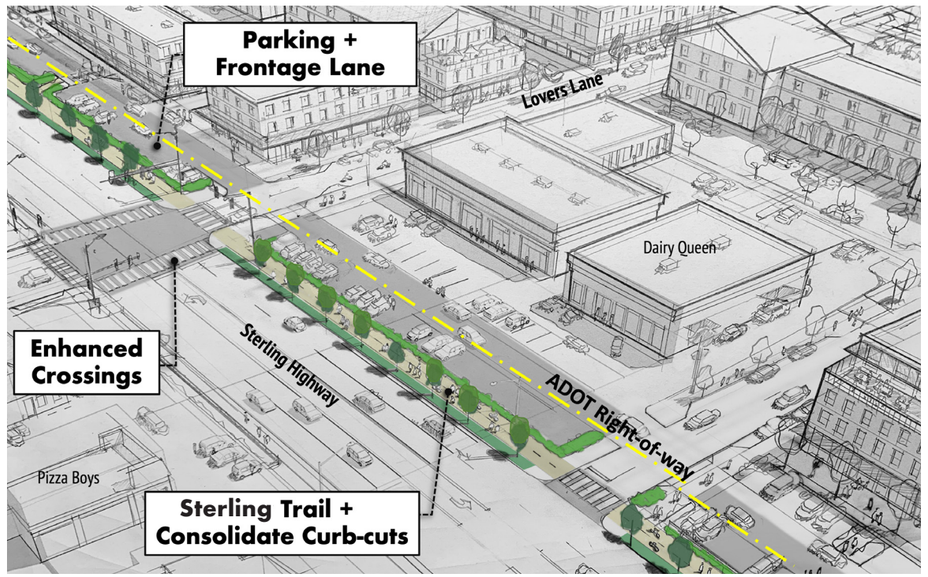
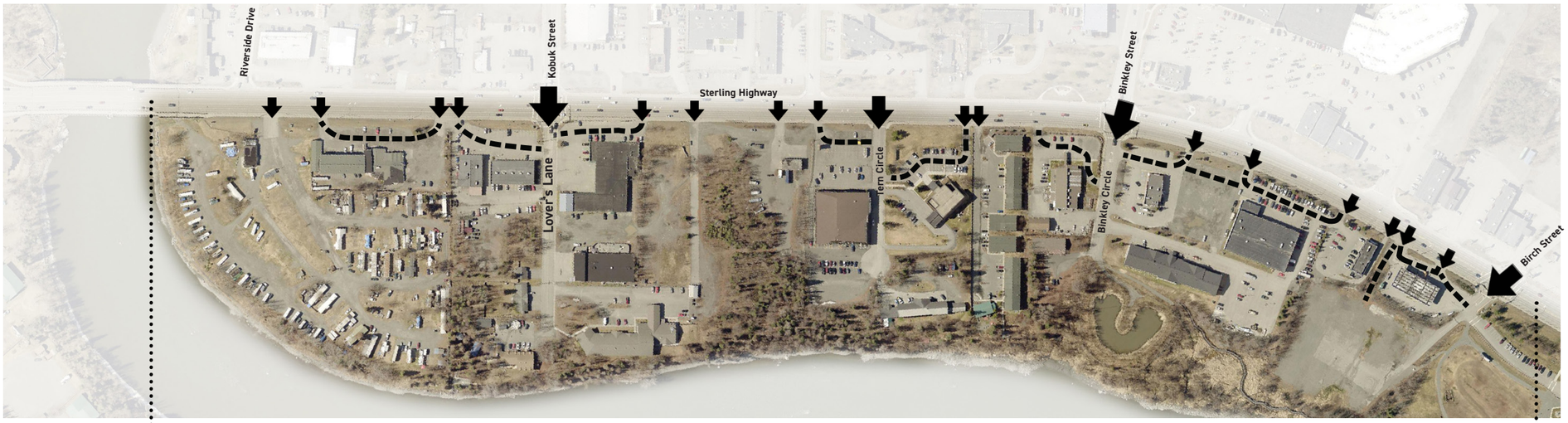


Exhibit 3- Existing Driveways



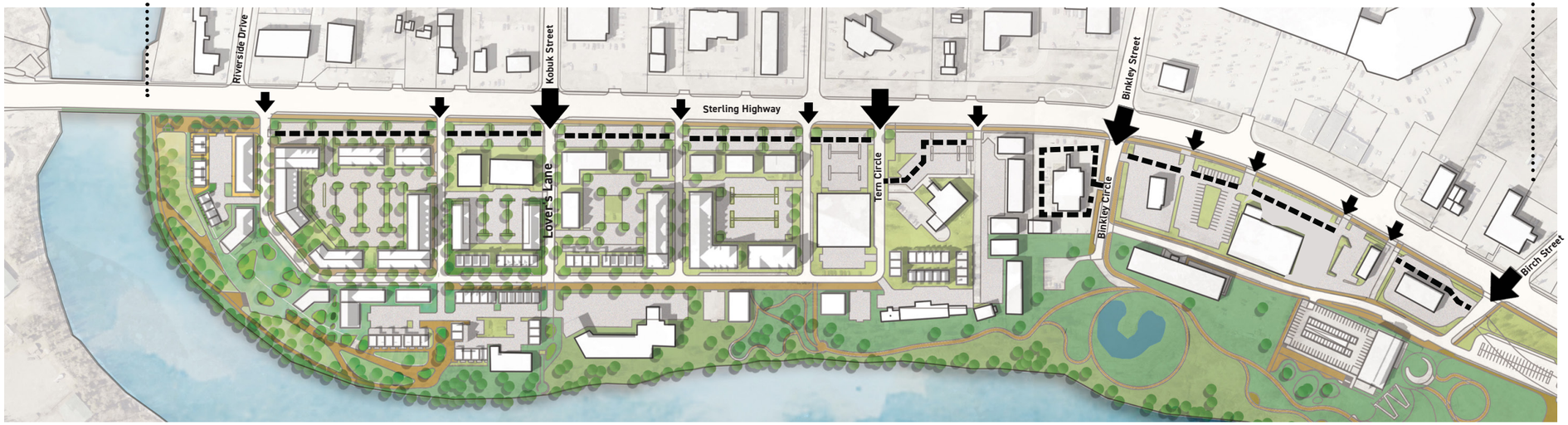
Driveway Consolidation Summary

Location	Existing Driveways	Proposed Driveways
Bridge to Kobuk St/ Lover's Ln.	4	2
Kobuk St/Lover's Ln. to Tern Circle	4	2
Tern Circle to Binkley Circle	2	1
Binkley Circle to Birch Place	6	4
Total:	16	9

Legend

- Intersection
- Curb-cut
- Parking Access Lane

Exhibit 4- Consolidated Driveways



STERLING HIGHWAY | STERLING TRAIL AND PARKING ACCESS LANE

Sterling Highway Trail + Parking Acess Lane Framework

The existing and proposed Sterling Highway street sections provide an indication of how the multi-use trail and parking frontage improvements could fit within the existing DOT right-of-way.

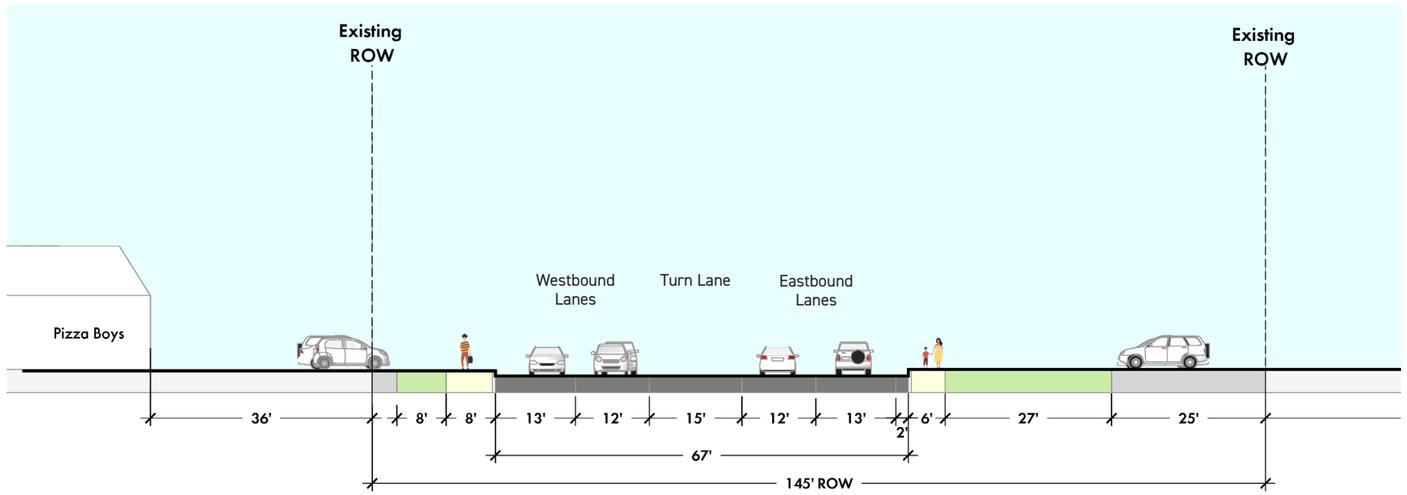
The conceptual design would:

1. Incorporate the existing face of curb and replace the existing sidewalk with a 5.5-feet tree-lined buffer

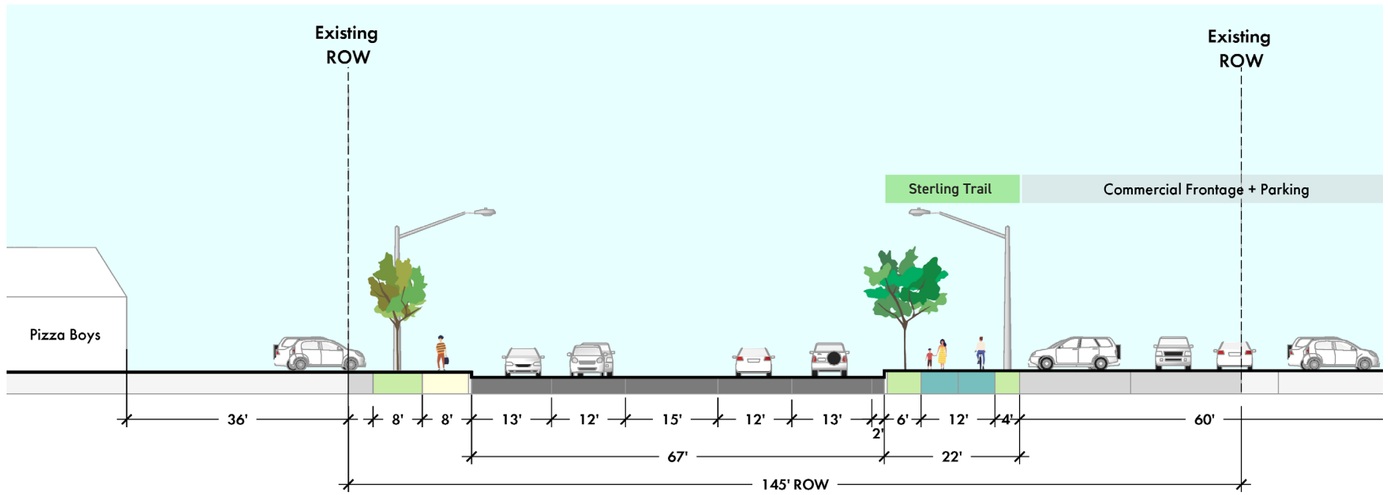
2. Replace the existing landscape buffer with a 12-feet multi-use trail, a 4-feet landscaped buffer

3. Upgrade with new pavement and striping the existing parking and frontage lane and provide driveway access between businesses.

Existing Sterling Highway – Section AA

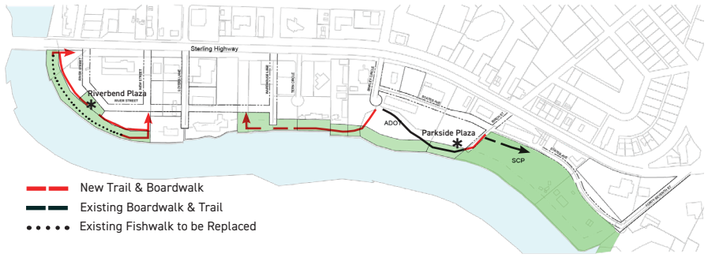


Proposed Sterling Highway – Section AA



RIVERFRONT BOARDWALK AND TRAIL | UPLAND TRAIL

Riverfront Boardwalk and Trail Framework



The Kenai River and riparian corridor is envisioned to be an **interconnected network of trails and boardwalks that connect the "bookends" public plazas.** Today, portions of the corridor include trail, and boardwalks between Soldotna Creek Park, the ADOT detention pond and Binkley Circle.

The conceptual design would:

1. Replace the existing fishwalk with a new light penetrating platform compliant with Kenai River Overlay District requirements.

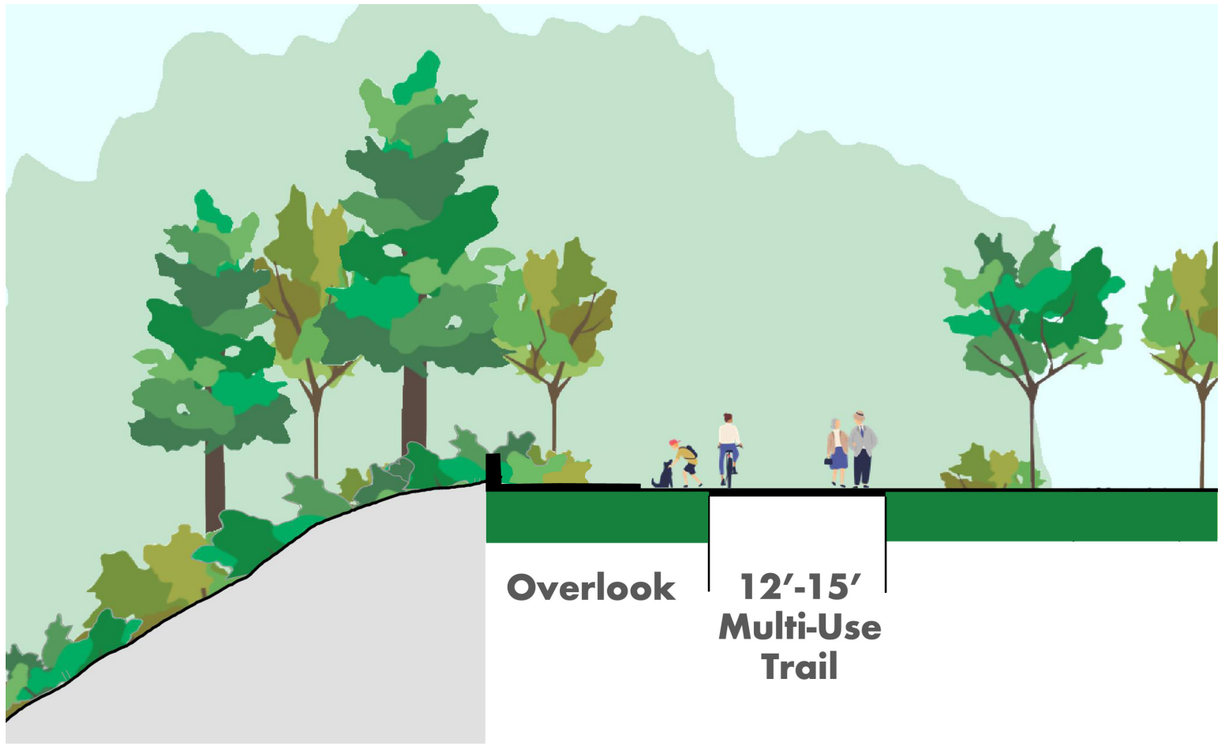
2. Add new trail alignments along the Parkside Plaza frontage and between the Parkside Plaza and existing trail in Soldotna Creek Park.

3. Add new upland trail alignments and boardwalks between the ADOT detention pond and Tern Circle. (see Typical Upland Trail section at right).

Boardwalk

Trail

Typical Upland Trail Section



NEW AND ENHANCED STREETS | RIVERSIDE DRIVE MULTI-USE TRAIL

Enhanced Street (Riverside Drive) Framework

The City of Soldotna and the City of Kenai manage the Unity Trail, an intercity paved and separated trail connection. A portion of the trail is built and resides along Kalifornsky Beach Road with connections to the Tsalteshi and Centennial Trails west of the downtown project area. **The City of Soldotna identifies Riverside Drive, and Kobuk Street as part of the Unity Trail route** between the downtown and built portions of the trail along the Kenai Spur, north of Knight Drive.

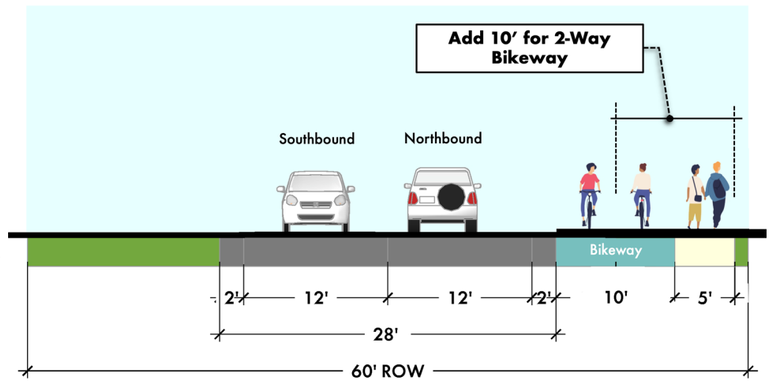
Today, Kobuk Street is improved with bike lanes and sidewalks that supports this route as an extension of the Unity Trail. Riverside Drive is partially improved with a narrow sidewalk on one side of the street.

The conceptual design would:

1. Add a 10-foot wide trail to the sidewalk along the west side of the street intersection at Kobuk Street.
2. Replace rolled curb with a stand-up curb.

Existing Riverside Drive

Proposed Riverside Drive- Section AA



APPENDIX B: BUILD THE VISION

B.1 Preliminary Development Concepts

Document: Preliminary Development Concepts, FIRST FORTY FEET

Description: Summary of the project objectives, vision, and guiding principles that informed a set of "big ideas" for future development within the project area. Concepts include mobility, land uses, development scenarios and the supporting riverfront public use areas amenities that are essential to attract investment and establish downtown as a one-of-a-kind destination.

B.2 Utilities Impacts Analysis

Document: Utilities Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the current utilities (water, sewer, storm, gas, electric and communications) serving the Project area, identifies utilities in need of upgrade, and new utilities to support planned future development.

B.3 Traffic and Safety Impacts Analysis

Document: Traffic and Safety Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the preliminary development concepts for land uses and mobility improvements to determine potential impacts to traffic operations, Sterling Highway access and pedestrian and bicycle circulation. Provides a summary of the main benefits or impacts.

B.4 Market Hall Case Studies

Document: Market Hall Case Studies; ECONorthwest, Economics and Research Consultant
Description: Memo showcasing three case studies that have varying governance and operations structures, varying public investment, and different missions. These case studies demonstrate a range of what the City might want to consider and can help the City identify which elements they like from each.

B.5 Market Hall Assessment

Document: Market Hall Assessment Presentation; ECONorthwest, Economics and Research Consultant
Description: Slideshow presentation showcasing three case studies, their takeaways and considerations for Soldotna. Provides results of stakeholder interviews and recommendations for the Market Hall's potential offerings, critical elements, potential tenant mix, partners and programming for the City to consider.

B.6 Development Feasibility

Document: Soldotna Riverfront Redevelopment, Feasibility Analysis Results; ECONorthwest, Economics and Research Consultant

Description: Feasibility study on four development types based on the preliminary development concepts and discussions with the City. These development types include mixed-use, multifamily, townhomes, and hotel. The study provides insights into the feasible scale and types of development for the initial "catalytic" phase, which is intended to kick-start future development.

KINNEY ENGINEERING, LLC

MEMORANDUM

DATE: June 28, 2023

SUBJECT: City of Soldotna Riverfront Plan: Utilities Impact Analysis

Introduction

Figure 1 shows the Utilities Impact Analysis study area for the Soldotna Downtown Riverfront Redevelopment Plan.In the study area, there are a number of existing utilities that would be impacted by the proposed development alternatives. The City provides and maintains the water and sanitary sewer infrastructure, as well as limited storm drain maintenance in the study area. Electricity is provided by the regional utility company Homer Electric Association (HEA). Natural Gas is provided by the regional utility ENSTAR Natural Gas Company. Communications are provided by both General Communications Inc. (GCI) and Alaska Communications Systems (ACS). The following analysis examines the need for relocating, extending, or constructing new utilities to support the specific proposed roadway development concepts.

Figure 1: Study Area Overview for City of Soldotna Riverfront Plan

The study area is adequately covered by existing **water distribution mains and well-spaced fire hydrants.** New development would likely require a connection to the city water facilities. Water mains and service pipes contain shut off valves at the angle fittings and are typically buried at a depth of 10 feet for frost protection.

Most of the study area is covered by **existing sewer collection mains and sewer services**. There exists a network of 8-inch diameter sewer main pipes, most of which were installed in the 1970s, 1980s and 1990s. New development would likely require a connection to the sewer facilities. They are commonly spaced 10 feet horizontally from water main pipes and run through manholes at about 300 foot spacing. They are typically buried at a depth of 8 feet minimum for frost protection.

The bulk of the **storm drain systems** within the study area are focused along the Sterling Highway and are owned and maintained by ADOT This includes a large sedimentation basin storm water outfall adjacent to the Aspen Hotel on Binkley Circle. A rain garden has also been constructed within Soldotna Creek Park. Any new development or roadway would be required to consider and facilitate drainage. Storm drain inlets are commonly placed in curb lines and run through manholes at about 300 foot spacing. The storm drain pipes are typically buried at a depth of 2 to 5 feet. Exact information on main pipe sizing and depth was not available for this analysis and reflect assumptions based on ADOT standards.

The study area is mostly covered by a mix of **existing overhead and underground electric primary service** conductors. Secondary service conductors branch off to all existing buildings in the riverfront study area. Most streets have pole mounted street lighting in place. The overhead electrical service is supported on wood utility poles spaced as necessary. Secondary service conductors then run overhead to a shorter service drop (transformer) pole near the building or underground through a surface pad mounted electric box (transformer) or pedestal near the building. Electrical conductors are typically buried within rigid metal or plastic conduit with a grounding wire, at a depth of 36 inches.

The entire study area is well covered by **existing coated steel and plastic pipe natural gas distribution mains**. Small diameter service lines branch off the gas mains to all existing buildings in the riverfront study area. ENSTAR provides a metered connection on the building exterior. Any new development would likely require a connection to ENSTAR gas pipelines. They are typically buried at a depth of 36 inches with warning tape and flexible delineator markers along the pipe line route.

Where overhead electrical service conductors are supported on wood utility poles, **communications cables** also use the same poles for transmission and then run down the poles to pedestals near the building or underground through a surface junction box near the building for distribution. Communications cables are typically buried within rigid metal or plastic conduit at a depth of 30 inches.

Soldotna Municipal Code requires all new utilities to be installed underground unless an exception is granted.

Main Street Alternative

The **Main Street Alternative** would have the greatest potential impact on utilities as it would create short new street segments along routes not currently developed or supported by utility mains. While it may be possible to construct new roadways over the top of existing utilities, it is unlikely that would be practiced, due to the age and proximity to excavations of the utilities. It is assumed the existing utility materials would mostly be removed and disposed of as necessary and new utilities and utility extensions would be constructed through future projects. See Figure 2.

Figure 2: Main Street Alternative

Water

A properly sized water main pipe should be constructed/extended along the new River Street 1, River Street 2, New Street, and Main Street. This pipe would form several loops for redundancy, which is desirable for flexibility in the city water system. The existing Lovers Lane and Sterling Highway water main pipes would be connected into these new main extensions. Water is currently supplied to the area between Lovers Lane and Binkley Circle. A new main extension should be looped around Access Lane and River Street 3 to connect to the existing water pipe near Tern Circle.

Fire hydrants should be designed and constructed on every block or spaced approximately 300'. Water service stubs should be constructed to the ROW for future development and tie in by the property owners.

Sewer

A properly sized sewer main pipe should be constructed/extended along the new River Street 1, River Street 2, New Street, and Main Street. The existing Lovers Lane sewer main pipe could be connected into these new main extensions. Sewer service is currently supplied to the area between Lovers Lane and Binkley Circle. A new main extension should be looped around Access Lane and River Street 3 to connect to the existing sewer pipe near Tern Circle.

Sanitary sewer manholes should be designed and constructed, spaced approximately 300'. Sewer service stubs should be constructed to the ROW for future development and tie in by the property owners.

Storm Drain

A properly sized storm drain pipe should be constructed/extended along the new River Street 1, River Street 2, New Street, and Main Street's full length. If concurrent reconstruction allows for it, Lovers Lane should have a storm drain pipe extended its full length along with curb inlets installed. A new storm drain pipe extension should be looped around Access Lane, River Street 3, and Tern Circle, and connect to existing storm drain main piping along the Sterling Highway.

Storm drain manholes and curb line inlet catch basins should be designed and constructed, spaced approximately 300'.

Electric

The local electric utility typically reviews new roadway work and designs relocations or extensions of their electrical service facilities in house. Street lighting and/or pedestrian scale lighting should be considered and designed along all proposed redevelopment routes. Lighting should be constructed along the new River Street 1, River Street 2, New Street, and Main Street's full length. If concurrent reconstruction allows for it, Lovers Lane could have a new modern lighting system extended its full length. New lighting should be looped around Access Lane, River Street 3, and Tern Circle, and connect to existing electrical systems along the Sterling Highway.

Street lighting poles and junction boxes should be designed and constructed and are commonly spaced approximately 150' along local roadways. Several new lighting load center meter panels are assumed to be needed to support the new lighting systems.

Natural Gas

The local gas utility typically reviews new roadway work and designs relocations or extensions of their natural gas service facilities in house. Gas piping may be constructed along the New Street, and Main Street to the northeast. New gas piping could be looped around Access Lane, River Street 3, and Tern Circle, and connect to existing gas systems along the Sterling Highway.

Communications

The local communications utility typically reviews new roadway work and designs relocations or extensions of their facilities in house. Communication facilities may be constructed along the new River Street 1, River Street 2, New Street, and most of Main Street's full length. New communication lines should be looped around Access Lane, River Street 3, and Tern Circle, and connect to existing systems along the Sterling Highway.

Total Construction Cost

The above utility infrastructure improvements may be designed and constructed in phases or as part of street-by-street redevelopment plan under this alternative. See attachments for a more detailed breakdown of estimated construction costs. The total estimated construction cost is $7,400,000.00.

River Street Alternative

The **River Street Alternative** would also have significant impact on utilities as it would create new street segments along routes not currently developed or supported by utility mains. While it may be possible to construct new roadways over the top of existing utilities, it is unlikely that would be practiced, due to the age and proximity to excavations of the utilities. It is assumed the existing utility materials would mostly be removed and disposed of as necessary and new utilities and utility extensions would be constructed through future projects. See Figure 3.

Figure 3: River Street Alternative

Water

A properly sized water main pipe should be constructed/extended along the new River Street 1, River Street 2, and New Street. This pipe would form a loop for redundancy, which is desirable for flexibility in the city water system. The existing Lovers Lane and Sterling Highway water main pipes would be connected into these new main extensions. Water is currently supplied to the area between Lovers Lane and Binkley Circle. A new main extension should be constructed on Warehouse Lane.

Fire hydrants should be designed and constructed on every block or spaced approximately 300'. Water service stubs should be constructed to the ROW for future development and tie in by the property owners.

Sewer

A properly sized sewer main pipe should be constructed/extended along the new River Street 1, River Street 2, and New Street. The existing Lovers Lane sewer main pipe could be connected into these new main extensions. Sewer service is currently supplied to the area between Lovers Lane and Binkley Circle. A new main extension should be constructed on Warehouse Lane.

Sanitary sewer manholes should be designed and constructed, spaced approximately 300'. Sewer service stubs should be constructed to the ROW for future development and tie in by the property owners.

Storm Drain

A properly sized storm drain pipe should be constructed/extended along the new River Street 1, River Street 2, and New Street's full length. If concurrent reconstruction allows for it, Lovers Lane should have a storm drain pipe extended its full length along with curb inlets installed. A new storm drain pipe extension should be constructed on Warehouse Lane and Tern Circle and connect to existing storm drain main piping along the Sterling Highway.

Storm drain manholes and curb line inlet catch basins should be designed and constructed, spaced approximately 300'.

Electric

The local electric utility typically reviews new roadway work and designs relocations or extensions of their electrical service facilities in house. Street lighting and/or pedestrian scale lighting should be considered and designed along all proposed redevelopment routes. Lighting should be constructed along the new River Street 1, River Street 2, and New Street's full length. If concurrent reconstruction allows for it, Lovers Lane could have a new modern lighting system extended its full length. New lighting should be extended on Warehouse Lane and Tern Circle and connect to existing electrical systems along the Sterling Highway.

Street lighting poles and junction boxes should be designed and constructed and are commonly spaced approximately 150' along local roadways. Several new lighting load center meter panels are assumed to be needed to support the new lighting systems.

Natural Gas

The local gas utility typically reviews new roadway work and designs relocations or extensions of their natural gas service facilities in house. Gas piping may be constructed along River Street 2, New Street and Warehouse Lane. New gas piping could be extended along Tern Circle and connect to existing gas systems along the Sterling Highway.

Communications

The local communications utility typically reviews new roadway work and designs relocations or extensions of their facilities in house. Communication facilities may be constructed along the east end of River Street 2 and along New Street. New communication lines should connect to existing systems.

Total Construction Cost

The above utility infrastructure improvements may be designed and constructed in phases or as part of street-by-street redevelopment plan under this alternative. See attachments for a more detailed breakdown of estimated construction costs. The total estimated construction cost is $4,450,000.00.

States Avenue Alternative

The **States Avenue Alternative** would have a potential impact on utilities in the Soldotna Park area. While it may be possible to construct improvements over the top of existing utilities, it is unlikely that would be practiced, due to the age and proximity to excavations of the utilities. It is assumed the existing utility materials would mostly be removed and disposed of as necessary and new utilities and utility extensions would be constructed through future projects. See Figure 4.

Figure 4: States Avenue Alternative

Water

A properly sized water main pipe should be constructed/extended along Birch Street,There are water and sewer mains within Forty-Seventh Street.

Fire hydrants should be designed and constructed on every block or spaced approximately 300'. Water service stubs should be constructed for future development and tie in by the property owners.

Sewer

A properly sized sewer main pipe should be constructed/extended along Birch Street and Forty-Seventh Street.

Sanitary sewer manholes should be designed and constructed, spaced approximately 300'. Sewer service stubs should be constructed for future development and tie in by the property owners.

Storm Drain

A properly sized storm drain pipe should be constructed/extended along Binkley Circle, and part of States Avenue/Forty-Seventh Street.

Storm drain manholes and curb line inlet catch basins should be designed and constructed, spaced approximately 300'.

Electric

The local electric utility typically reviews new roadway work and designs relocations or extensions of their electrical service facilities in house. Street lighting and/or pedestrian scale lighting should be considered and

designed along all proposed redevelopment routes. Lighting should be constructed along Binkley Circle, Birch Street, States Avenue and Forty-Seventh Street.

Street lighting poles and junction boxes should be designed and constructed and are commonly spaced approximately 150' along local roadways. A new lighting load center meter panel is assumed to be needed to support the new lighting systems.

Natural Gas

The local gas utility typically reviews new roadway work and designs relocations or extensions of their natural gas service facilities in house. Gas piping may be constructed along Binkley Circle, Birch Street, and part of States Avenue/Forty-Seventh Street.

Communications

The local communications utility typically reviews new roadway work and designs relocations or extensions of their facilities in house. Communication facilities may be constructed along States Avenue, Birch Street, and part of Forty-Seventh Street. New communication lines should connect to existing systems.

Total Construction Cost

The above utility infrastructure improvements may be designed and constructed in phases or as part of street-by-street redevelopment plan under this alternative. See attachments for a more detailed breakdown of estimated construction costs. The total estimated construction cost is $2,900,000.00.

Sterling Highway Frontage Lane Alternative

The **Sterling Highway Frontage Lane Alternative** would have limited impact on utilities. See Figure 5.

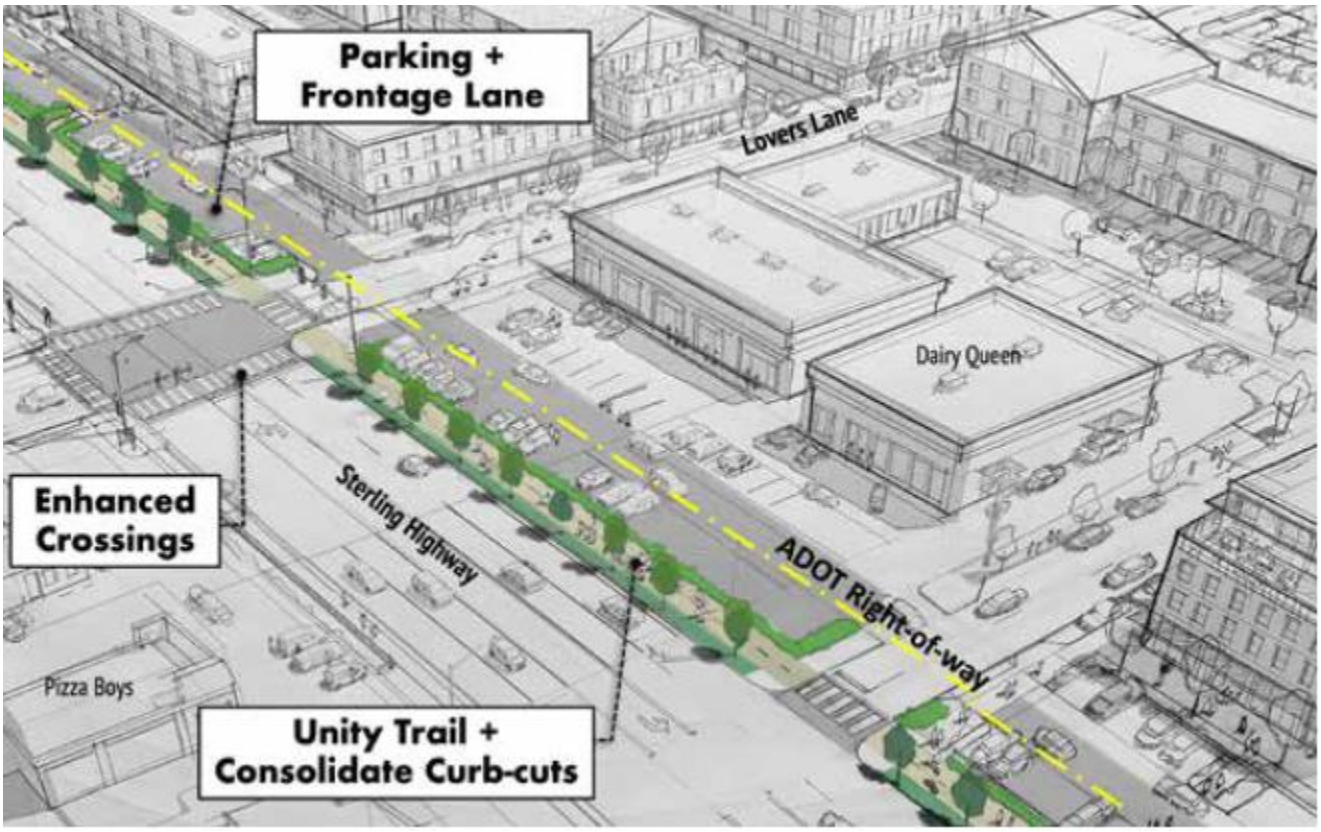


Figure 5: Sterling Hwy Frontage Lane

Water
Several fire hydrants may be relocated.

Sewer
A properly sized sewer main pipe could be constructed along the new frontage lane.

Sanitary sewer manholes should be designed and constructed, spaced approximately 300'. Sewer service stubs should be constructed for future development and tie in by the property owners.

Storm Drain
No impacts. Frontage lane drainage could be handled by existing storm drain systems along the Sterling Highway and/or the proposed storm drain improvements described under the other design alternatives.

Electric
The local electric utility typically reviews new roadway work and designs relocations or extensions of their electrical service facilities in house. There is potentially one power pole and one transformer box that may be relocated.

Natural Gas
The local gas utility typically reviews new roadway work and designs relocations or extensions of their natural gas service facilities in house. No impacts to natural gas facilities are expected.

Communications
The local communications utility typically reviews new roadway work and designs relocations or extensions of their facilities in house. Communication facilities could be constructed along the new frontage lane.

Total Construction Cost
The above utility infrastructure improvements may be designed and constructed in phases or as part of street-by-street redevelopment plan under this alternative. See attachments for a more detailed breakdown of estimated construction costs. The total estimated construction cost is $1,200,000.00.

Additional Utility Improvement Considerations

Utility Permitting & Requirements
The City provides online forms for coordination of most work that could have an effect on the water, sewer, or storm drain systems. A general "Utility Construction Project Permit" is required before a contractor undertakes digging in the area of or work directly on the city utilities. A ROW permit is also required of contractors doing work to ensure bonding and insurance city code requirements are met.

The City's Utility Department regulates connections to water, sewer and storm drain infrastructure. The Building and Plumbing codes along with the Soldotna Municipal Code do not allow certain illegal connections such as utilities serving several properties off of the same service, utilities served by passing under other structures, improper materials, or improper burial depth. Some utilities require the acquisition of easements prior to their construction. The use of public utilities requires properties within 300' of existing mains to connect. Not all areas within the City limits of Soldotna are served with public utilities. Some properties require onsite water wells and onsite waste water disposal systems (septic tanks and leach fields). The ADEC regulates the construction of onsite water wells and waste water disposal systems.

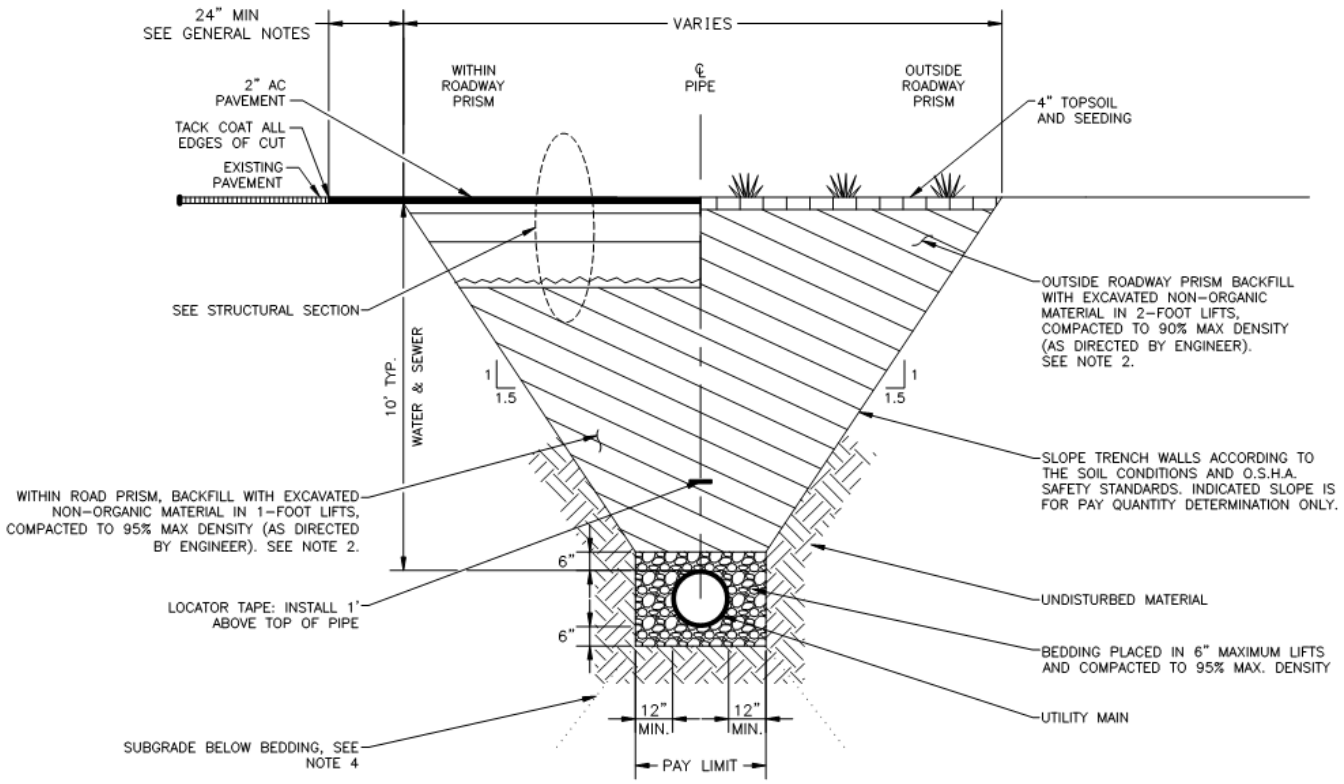
Each individual property is required to have a separate service and developers of property can apply to extend main line utilities to their property. Special assessment districts (SAD) are a way to finance the construction of public capital improvements which primarily benefit property owners in a limited geographical area. This distinguishes them from improvements which benefit the entire community and are generally paid for with City funds or grants. A special assessment district can be initiated either by the City Council, or by application of a sponsor who collects the requisite number of property owner signatures on a petition.

Soldotna Standard Construction Specifications
The city provides design guidance and requirements for work on the water, sewer, and storm drain utility systems through their 1986 construction specifications and details. Design for new roads and utility projects must follow these criteria or provide alternate provisions and details if using a unique or more modern design. These 1986 city specifications and details contain divisions for water, sewer, and storm drain.

Appendix

1. Typical Utility Trench Section
2. Main Street Concept Utilities Map
3. River Street, States Avenue & Sterling Hwy Frontage Lane Concept Utilities Map
4. Concept Utility Improvements Cost Estimates

Utility Trench Detail

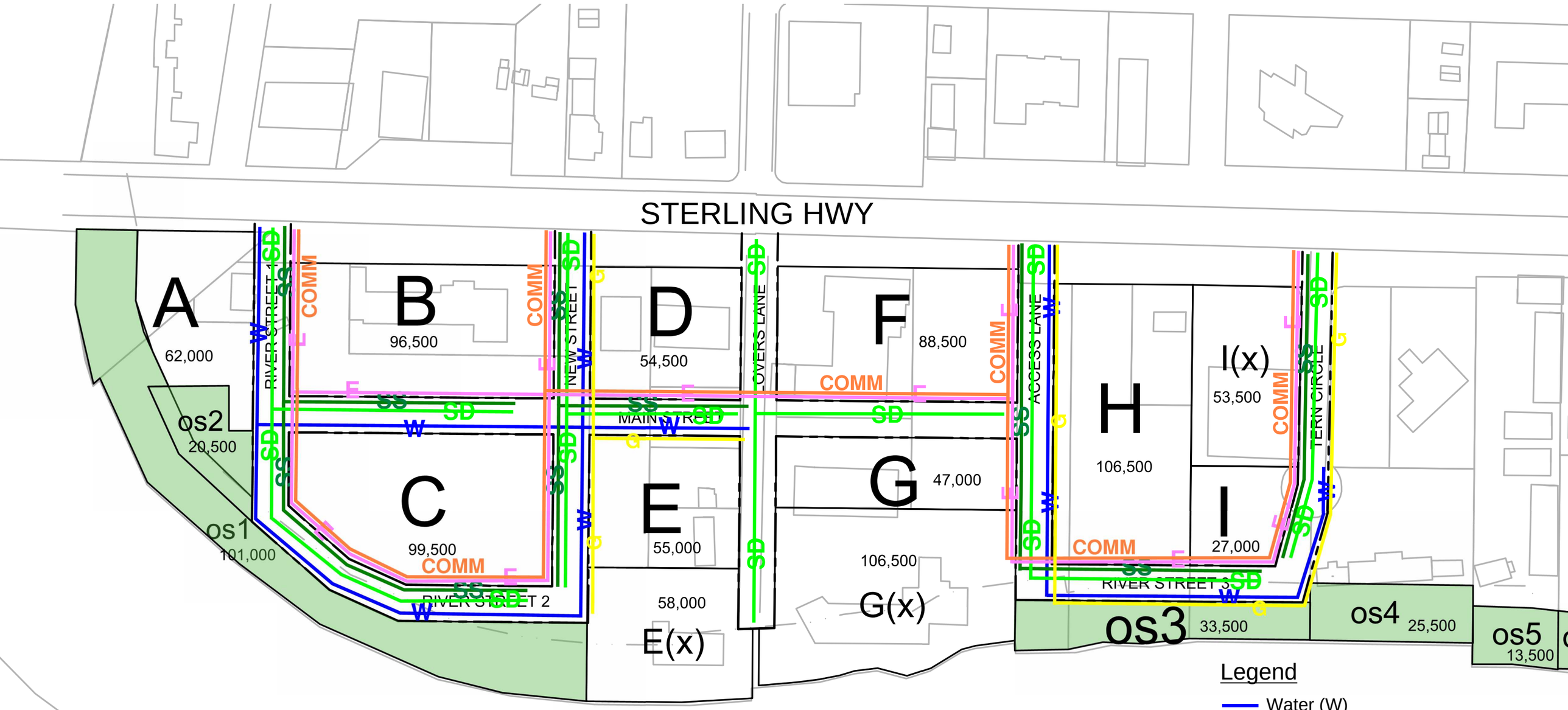


TRENCH SECTION NOTES

1. TRENCH EXCAVATION AND SHORING SHALL COMPLY WITH ALL LOCAL, STATE AND OSHA REGULATIONS AND REQUIREMENTS. PROVIDE PORTABLE STEEL TRENCH SHIELD AS REQUIRED.
2. FOUNDATION MATERIAL FOR TRENCH BACKFILL SHALL BE NATIVE MATERIAL, MEETING TYPE II CLASSIFICATION (MINIMUM) AS APPROVED BY THE ENGINEER. NATIVE MATERIAL NOT MEETING TYPE II CLASSIFICATION SHALL BE REMOVED AND REPLACED WITH TYPE II FILL AND BACKFILL. BACKFILL MATERIAL WITHIN ROADWAY PRISM SHALL HAVE 8" MAXIMUM ROCK SIZE.
3. REMOVE AND PROPERLY DISPOSE OF ALL ORGANIC MATERIALS.
4. SUBGRADE BELOW BEDDING PRISM SHALL BE CLEARED OF ALL DEBRIS AND ORGANIC MATERIAL. BACKFILL AND COMPACT EXCAVATED SUBGRADE.
5. TYPICAL DEPTH OF BURY IS 10 FEET. FURNISH AND INSTALL 4" THICK INSULATION WHERE DEPTH OF BURY IS LESS THAN 10 FEET OR AS NOTED ON THE PLANS. INSULATION SHALL BE 4 FEET WIDE PLACED 1-FOOT ABOVE PIPE. INSULATION SHALL BE R-20 FOR A 4-INCH THICKNESS.

TYPICAL TRENCH SECTION – UTILITY MAIN

APPENDIX 2: MAIN STREET CONCEPT UTILITIES MAP



APPENDIX 3: RIVER STREET, STATES AVENUE & STERLING HWY FRONTAGE LANE CONCEPT UTILITIES MAP

Legend

- Water (W)
- Sewer (SS)
- Storm Drain (SD)
- Electric (E)
- Natural Gas (G)
- Communications (COMM)

Date Modified: June 28, 2023

Main Street Alternative

Date Printed: June 28, 2023

		WORK DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
SEWER		FURNISH AND INSTALL DIP, 12"	LF	4,000	$ 260.00	$ 1,040,000.00
		SANITARY SEWER MANHOLES	EA	15	$ 15,000.00	$ 225,000.00
		SANITARY SEWER SERVICE CONNECTIONS	EA	20	$ 6,000.00	$ 120,000.00
STORM		FURNISH AND INSTALL CPEP, 24"	LF	5,400	$ 210.00	$ 1,134,000.00
		MANHOLES AND CATCH BASIN MANHOLES	EA	18	$ 12,000.00	$ 216,000.00
		CONSTRUCT CATCH BASIN	EA	36	$ 6,000.00	$ 216,000.00
WATER		FURNISH AND INSTALL 12" HDPE SDR 9 WATER MAIN	LF	4,100	$ 260.00	$ 1,066,000.00
		FURNISH AND INSTALL 12" GATE VALVE	EA	16	$ 5,000.00	$ 80,000.00
		FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY (SINGLE PUMPER)	EA	14	$ 18,000.00	$ 252,000.00
		CONNECT WATER SERVICES	EA	20	$ 6,500.00	$ 130,000.00
ELECTRIC		CONDUIT/WIRE	LF	4,600	$ 50.00	$ 230,000.00
		JUNCTION BOX	EA	40	$ 2,500.00	$ 100,000.00
		LIGHT POLE	EA	30	$ 20,000.00	$ 600,000.00
GAS		NATURAL GAS MAIN PIPE	LF	2500	$ 300.00	$ 750,000.00
COMM		COMMUNICATIONS CONDUIT/FIBER	LF	4100	$ 300.00	$ 1,230,000.00

Total Cost	$ 7,389,000.00

Date Modified: June 28, 2023

River Street Alternative

Date Printed: June 28, 2023

		WORK DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
SEWER		FURNISH AND INSTALL DIP, 12"	LF	2,000	$ 260.00	$ 520,000.00
		SANITARY SEWER MANHOLES	EA	7	$ 15,000.00	$ 105,000.00
		SANITARY SEWER SERVICE CONNECTIONS	EA	10	$ 6,000.00	$ 60,000.00
STORM		FURNISH AND INSTALL CPEP, 24"	LF	4,100	$ 210.00	$ 861,000.00
		MANHOLES AND CATCH BASIN MANHOLES	EA	14	$ 12,000.00	$ 168,000.00
		CONSTRUCT CATCH BASIN	EA	28	$ 6,000.00	$ 168,000.00
WATER		FURNISH AND INSTALL 12" HDPE SDR 9 WATER MAIN	LF	2,000	$ 260.00	$ 520,000.00
		FURNISH AND INSTALL 12" GATE VALVE	EA	8	$ 5,000.00	$ 40,000.00
		FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY (SINGLE PUMPER)	EA	7	$ 18,000.00	$ 126,000.00
		CONNECT WATER SERVICES	EA	10	$ 6,500.00	$ 65,000.00
ELECTRIC		CONDUIT/WIRE	LF	3,200	$ 50.00	$ 160,000.00
		JUNCTION BOX	EA	28	$ 2,500.00	$ 70,000.00
		LIGHT POLE	EA	21	$ 20,000.00	$ 420,000.00
GAS		NATURAL GAS MAIN PIPE	LF	2600	$ 300.00	$ 780,000.00
COMM		COMMUNICATIONS CONDUIT/FIBER	LF	1200	$ 300.00	$ 360,000.00

Total Cost	$	4,423,000.00

Date Modified: June 28, 2023

States Avenue Alternative

Date Printed: June 28, 2023

		WORK DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
SEWER		FURNISH AND INSTALL DIP, 12"	LF	800	$ 260.00	$ 208,000.00
		SANITARY SEWER MANHOLES	EA	3	$ 15,000.00	$ 45,000.00
		SANITARY SEWER SERVICE CONNECTIONS	EA	5	$ 6,000.00	$ 30,000.00
STORM		FURNISH AND INSTALL CPEP, 24"	LF	1,200	$ 210.00	$ 252,000.00
		MANHOLES AND CATCH BASIN MANHOLES	EA	4	$ 12,000.00	$ 48,000.00
		CONSTRUCT CATCH BASIN	EA	8	$ 6,000.00	$ 48,000.00
WATER		FURNISH AND INSTALL 12" HDPE SDR 9 WATER MAIN	LF	700	$ 260.00	$ 182,000.00
		FURNISH AND INSTALL 12" GATE VALVE	EA	4	$ 5,000.00	$ 20,000.00
		FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY (SINGLE PUMPER)	EA	2	$ 18,000.00	$ 36,000.00
		CONNECT WATER SERVICES	EA	5	$ 6,500.00	$ 32,500.00
ELECTRIC		CONDUIT/WIRE	LF	4,000	$ 50.00	$ 200,000.00
		JUNCTION BOX	EA	32	$ 2,500.00	$ 80,000.00
		LIGHT POLE	EA	27	$ 20,000.00	$ 540,000.00
GAS		NATURAL GAS MAIN PIPE	LF	1600	$ 300.00	$ 480,000.00
COMM		COMMUNICATIONS CONDUIT/FIBER	LF	2300	$ 300.00	$ 690,000.00

Total Cost	$	2,891,500.00

Date Modified: June 27, 2023

Frontage Lane Alternative

Date Printed: June 27, 2023

		WORK DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
SEWER		FURNISH AND INSTALL DIP, 12"	LF	1,800	$ 260.00	$ 468,000.00
		SANITARY SEWER MANHOLES	EA	6	$ 15,000.00	$ 90,000.00
		SANITARY SEWER SERVICE CONNECTIONS	EA	10	$ 6,000.00	$ 60,000.00
WATER		FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY (SINGLE PUMPER)	EA	3	$ 18,000.00	$ 54,000.00
ELECTRIC		CONDUIT/WIRE	LF	300	$ 50.00	$ 15,000.00
		POWER POLE RELOCATION	EA	1	$ 15,000.00	$ 15,000.00
		TRANSFORMER RELOCATION	EA	1	$ 10,000.00	$ 10,000.00
COMM		COMMUNICATIONS CONDUIT/FIBER	LF	1600	$ 300.00	$ 480,000.00

Total Cost	$	1,192,000.00

APPENDIX B: BUILD THE VISION

B.1 Preliminary Development Concepts

Document: Preliminary Development Concepts, FIRST FORTY FEET

Description: Summary of the project objectives, vision, and guiding principles that informed a set of "big ideas" for future development within the project area. Concepts include mobility, land uses, development scenarios and the supporting riverfront public use areas amenities that are essential to attract investment and establish downtown as a one-of-a-kind destination.

B.2 Utilities Impacts Analysis

Document: Utilities Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the current utilities (water, sewer, storm, gas, electric and communications) serving the Project area, identifies utilities in need of upgrade, and new utilities to support planned future development.

B.3 Traffic and Safety Impacts Analysis

Document: Traffic and Safety Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the preliminary development concepts for land uses and mobility improvements to determine potential impacts to traffic operations, Sterling Highway access and pedestrian and bicycle circulation. Provides a summary of the main benefits or impacts.

B.4 Market Hall Case Studies

Document: Market Hall Case Studies; ECONorthwest, Economics and Research Consultant

Description: Memo showcasing three case studies that have varying governance and operations structures, varying public investment, and different missions. These case studies demonstrate a range of what the City might want to consider and can help the City identify which elements they like from each.

B.5 Market Hall Assessment

Document: Market Hall Assessment Presentation; ECONorthwest, Economics and Research Consultant

Description: Slideshow presentation showcasing three case studies, their takeaways and considerations for Soldotna. Provides results of stakeholder interviews and recommendations for the Market Hall's potential offerings, critical elements, potential tenant mix, partners and programming for the City to consider.

B.6 Development Feasibility

Document: Soldotna Riverfront Redevelopment, Feasibility Analysis Results; ECONorthwest, Economics and Research Consultant

Description: Feasibility study on four development types based on the preliminary development concepts and discussions with the City. These development types include mixed-use, multifamily, townhomes, and hotel. The study provides insights into the feasible scale and types of development for the initial "catalytic" phase, which is intended to kick-start future development.

KINNEY ENGINEERING, LLC

MEMORANDUM

DATE: June 28, 2023

SUBJECT: City of Soldotna Riverfront Redevelopment Plan: Traffic & Safety Impact Analysis

Introduction

Figure 1 shows the traffic and safety impact analysis study area for this Soldotna Riverfront Redevelopment Plan which includes the Sterling Highway from approximately the Kenai Spur Highway intersection to the Kalifornsky Beach Road intersection, all within the City of Soldotna (COS).

Figure 1: Study Area Overview for City of Soldotna Riverfront Redevelopment Plan

Two main concepts have been developed for the redevelopment plan, each of which involves building a local street between the Sterling Highway and the Soldotna River. Both concepts include States Avenue – a route that runs parallel to the Sterling Highway between Binkley Circle and Forty Seventh Street (the recently built connection near the Kenai Spur Highway).

Under the Main Street concept shown in Figure 2, a new route (Main Street) bisects the existing parcels between the Sterling Highway and the river and three new roads (River Street, New Street 1, and New Street 2) are built perpendicular to the Sterling Highway. River Street turns and runs along the river, parallel to the river and the highway. Main Street and, or River Street connect River Street, New Street 1, Lovers Lane, New Street 2, and Tern Circle.

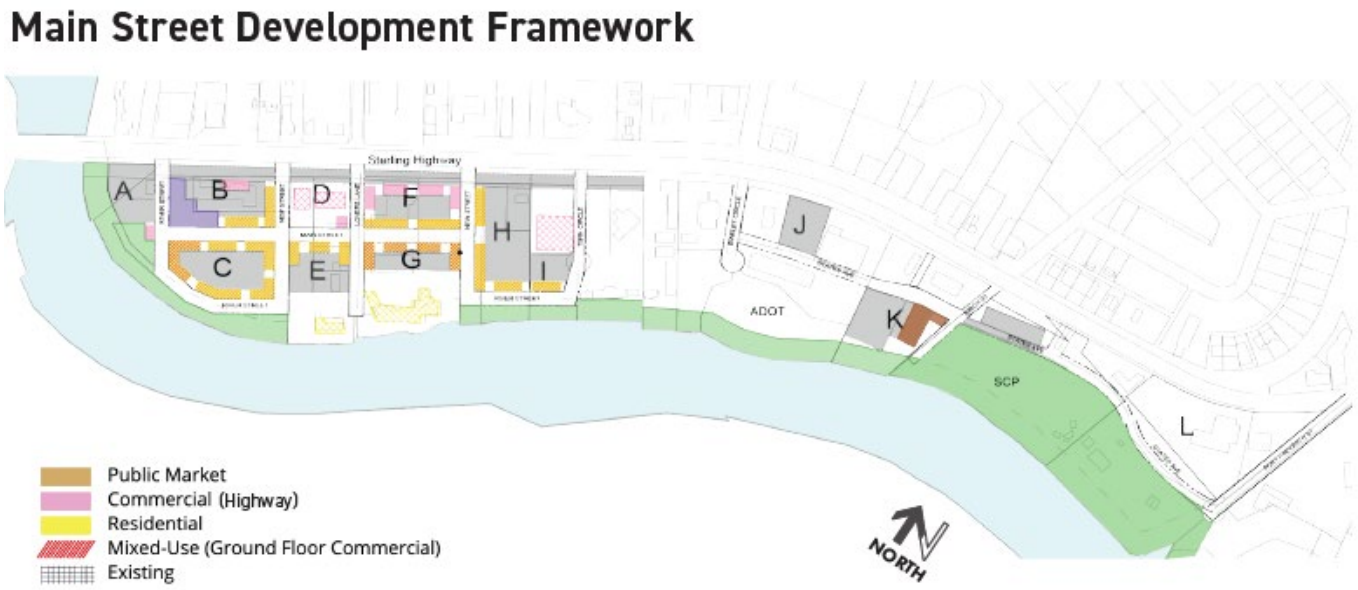


Figure 2: Main Street Concept

Under the River Street concept shown in Figure 3, a new route (River Street) runs parallel to the river with views of the river and connecting to the Sterling Highway. Two new roads (New Street 1 and Warehouse Lane) are built perpendicular to the Sterling Highway, with Warehouse Lane lining up with Warehouse Drive across the Sterling Highway. River Street connects New Street, Lovers Lane, and Warehouse Lane. Tern Circle connects only to the Sterling Highway.

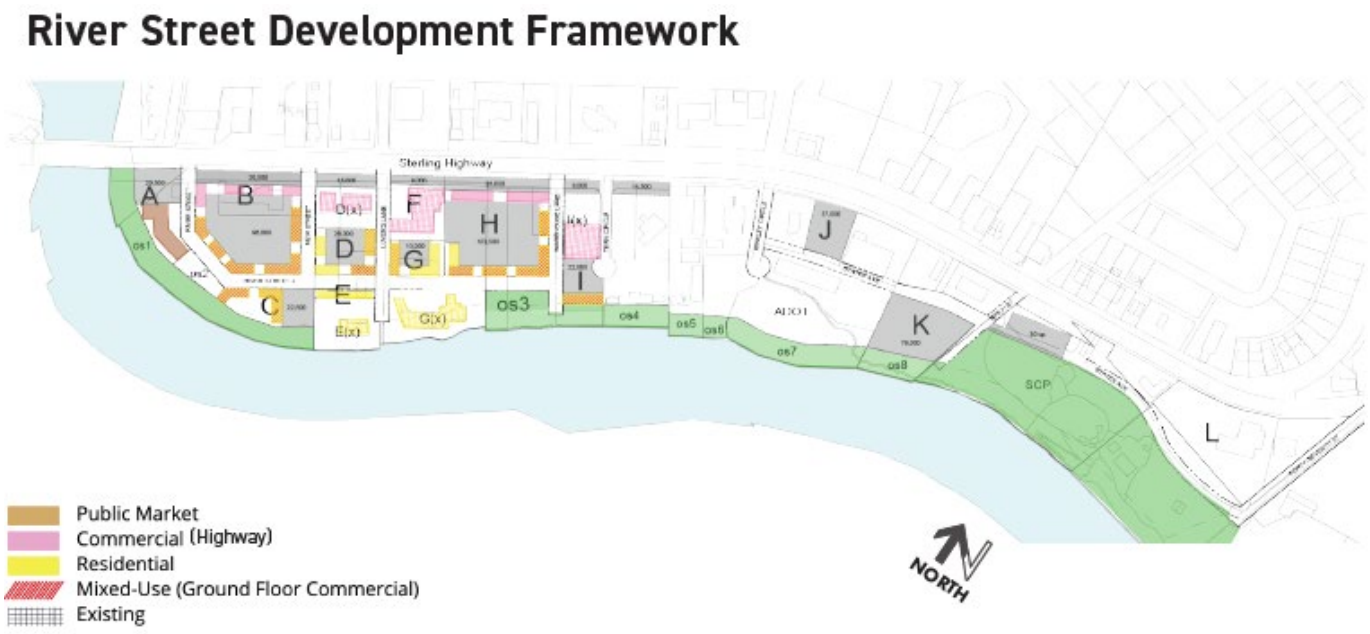


Figure 3: River Street Concept

Trip Generation

As shown in Figure 2 and Figure 3, four general land use types are anticipated to be constructed in the project area. The number of trips that would be associated with each of these types was estimated using a range of specific land

uses in the ITE Trip Generation Manual that fit these generic land use types or using trip generation data that Kinney Engineering collected for the Matanuska-Susitna Borough (MSB), which is expected to better represent Soldotna trip behavior. For existing land uses, trips were estimated using the specific land use in the trip generation manual. Table 1 shows the land uses and trip estimates used.

Table 1: Values used for Trip Generation

Soldotna Riverfront Land Use Type	Trip Generation Example Uses (ITE or MSB)	Weekday PM Peak Hour Average Rate	Unit
Commercial	822 Strip Retail Plaza (<40k) (ITE) 930 Fast Casual Dining (ITE) 931 Fine Dining Restaurant (ITE) 932 High-Turnover (Sit-Down) Restaurant (ITE)	9	1,000 sf
Residential	Multi-Family Housing (MSB)	0.71	units
Hotel	310 Hotel 320 Motel	0.6	Rooms
Public Market	858 Farmers Market	179.4	acre
Assisted Living	254 Assisted Living (ITE)	0.48	1,000 sf
Office Building	710 General Office Building (ITE)	1.44	1,000 sf
Fast-Food Restaurant with Drive-Through	934 Fast-Food Restaurant with Drive-Through (ITE)	33.03	1,000 sf
Public Park	858 Farmers Market	179.4	acre

Using these values and the distributions of land uses shown in Figure 2 and Figure 3, the peak hour trips for each road connection to the Sterling Highway was estimated as shown in Table 2. Note that these values represent person trips for each use. They do not necessarily represent individual vehicle trips since some folks are expected to arrive by walking or biking and some of the trips will be internal (a person will come to the area for multiple purposes).

Table 2: Estimated Total Trips by Most Convenient Route

Main Street Concept		River Street Concept	
Road Name	**Trips during Peak Hour**	**Road Name**	**Trips during Peak Hour**
River Street	430	River Street	360
New Street 1	975	New Street	565
Lovers Lane	445	Lovers Lane	430
New Street 2	445	Warehouse Lane	325
Tern Circle	80	Tern Circle	30
Binkley Circle	225	Binkley Circle	210
Birch Street	1100	Birch Street	990
Forty-Seventh Street	220	Forty-Seventh Street	210

Traffic Signals

There are three existing signals on Sterling Highway at intersections in the corridor: Lovers Lane (Kobuk Street), Binkley Circle (Binkley Street), and Birch Street. The River Street Concept proposes a signal at the proposed Warehouse Lane (Warehouse Drive) intersection.

The CalTrans method is used to evaluate the likelihood that a signal may be warranted in the future using future Annual Average Daily Traffic (AADT) estimates. This method is based on the *Manual on Uniform Traffic Control* Warrant 1, which looks at thresholds for of volumes on the major and minor road separately. The AADTs for the Sterling Highway are above the major road thresholds. As such, the analysis considered whether the AADTs for the side streets fall above the minor road thresholds. If the signals met the warrant, then additional consideration was given as to the appropriateness of a signal at that intersection, such as the spacing of signalized intersections and whether it would be necessary to meet vehicle demand. Table 3 shows the results of this analysis. (Note that Forty-Seventh Street was not considered, as it is outside the project area and falls too close to the Kenai Spur Highway intersection.)

Table 3: Suitability of Signalization at Side Streets

Main Street Concept			River Street Concept		
Road Name	**Above Minor Road Threshold?**	**Suitable for Signal?**	**Road Name**	**AADT above Minor Road Threshold?**	**Suitable for Signal?**
River Street	Yes	Potential	River Street	Yes	Potential
New Street 1	Yes	No – poor network spacing	New Street	Yes	No – poor network spacing
Lovers Lane	Yes	Existing	Lovers Lane	Yes	Existing
New Street 2	Yes	No – poor network spacing	Warehouse Lane	Yes	Potential
Tern Circle	No	No	Tern Circle	No	No
Binkley Circle	Yes	Existing	Binkley Circle	Yes	Existing
Birch Street	Yes	Existing	Birch Street	Yes	Existing

If new signals are not built, it will be difficult for drivers to turn left from the stop-controlled side streets onto the Sterling Highway during peak traffic periods. However, if left-turning drivers travel to the existing signals, those signals are expected to be able to accommodate that traffic at an acceptable level of service.

Pedestrian Signal at River Street

Riverside Drive (the existing extension of River Street) is just over an eighth mile away from the existing signal at Kobuk Street/Lovers Lane. Under both concepts, the Kobuk/Lovers Lane intersection can handle all of the traffic that would desire to turn left from the River Street intersection. As such, a full signal may not be desirable. However, an electric regulatory device such as a pedestrian hybrid beacon to accommodate a pedestrian crossing would be appropriate here:

- Pedestrian demand would likely be above 20 people per hour. This location would be used by people traveling between the Riverfront Boardwalk and the Centennial trail system. It would also be used by people who live along Riverside Drive and Kobuk Street who bike or walk to the riverfront area, as Soldotna residents have identified Riverside Drive as a preferred route for bicycling.
- Speed limit is 35 miles per hour.
- AADT is above 15,000 vehicles per day on Sterling Highway.

Consideration could also be given to placing a median refuge and using rectangular rapid flashing beacons (RRFBs). If this option were constructed, consideration should be given to only allowing right turns onto and off of Riverside Drive and River Street.

Signal at Warehouse Lane (River Street Concept)

Warehouse Drive (the existing extension of River Street) lies just over an eighth mile away from the existing signals at both Lovers Lane (Kobuk Street) and Binkley Street (Binkley Circle). Given the 35 mph speed limit, eighth mile spacing may be acceptable and could potentially help to keep traffic on Sterling Highway platooned as it travels through Soldotna. That being said, the analysis indicates that the Lovers Lane (Kobuk Street) signal could likely handle all of the traffic desiring to turn left from the riverfront area at an acceptable level of service under existing Sterling Highway traffic volumes. Thus, a signal may not be needed at Warehouse Lane within the 20-year time frame but may be desirable in the future.

Traffic Operations

While the proposed redevelopment will increase the number of people traveling to the area, the analysis shows that the existing signals can handle the increased traffic at an acceptable level of service (LOS D or better). Moreover, it is likely that a significant amount of the increased traffic to the redevelopment area would be nonmotorized traffic.

- The development would be built with sidewalks and paths that would allow people to park once and then comfortably walk throughout the improved area.
- There are many neighborhoods in Soldotna within walking and bike riding distance from this area, and with existing infrastructure to promote nonmotorized trips.

The following subsections discuss the operational benefits or impacts of additional concepts.

Frontage Lane for Sterling Highway

One proposed improvement is to build a frontage lane and multi-use trail along the Sterling Highway, largely within the DOT&PF right-of-way. A frontage lane built on the river side of Sterling Highway would improve access control, eliminating driveways that intersect directly with the highway. Instead, drivers would use the frontage lane to access the Sterling Highway from one of the proposed side streets. A frontage lane from the bridge to Birch Place would reduce the number of driveways or side streets accessing the highway from 15 to 7. This would decrease conflict points along the highway, improving safety and decreasing delay. The proposed multi-use trail would also benefit from access control, as bike riders would interact with vehicles only at the side streets. Figure 4 shows what this concept might look like.

Figure 4: Parking Access Lane with Multi-Use Trail Concept

One concern with this concept is that vehicles traveling from the frontage lane to the Sterling Highway would likely be blocked by vehicles queued along the side streets to turn onto the Sterling Highway. In general, driveways on the side streets should be located at least 120 feet from the intersection, and behind the expected queuing distance. (See *NCHRP 659 Guide for the Geometric Design of Driveways*). This guideline may make a true frontage lane impractical; however, it will likely still be possible to build the multi-use trail and consolidate the curb cuts. The new Main Street or River Street will act as backage routes, allowing drivers to access businesses from the side streets.

Reduction in Short Distance Vehicle Trips on Sterling Highway

Whether or not the frontage lane is possible, the new Main Street or River Street concepts provide local roads parallel to the Sterling Highway that are likely to reduce vehicle trips on the Sterling Highway. For example, a driver traveling between the Dairy Queen and the Blazy Mall must use the Sterling Highway under the existing conditions but will be able to avoid the Sterling Highway under the proposed configuration. Similarly, a driver traveling along Kobuk Street to the Blazy Mall currently must use the Sterling Highway but would be able to cross the Sterling Highway and travel on Main or River Street under the proposed configuration.

Summary

Table 4 summarizes the main benefits or impacts of these options.

Table 4: Summary of Main Benefits or Impacts

	Main Street Concept	**River Street Concept**	**States Avenue Concept**	**Frontage Lane and Trail Concept**
Improved nonmotorized crossings of Sterling Highway	Yes, at signalized intersections and at new crossing at Riverside Drive	Yes, at signalized intersections and at new crossing at Riverside Drive		N/A
Improved nonmotorized travel parallel to Sterling Highway	Yes, new river walk and amenities along new roadways	Yes, new river walk and amenities along new roadways	Yes, new river walk and amenities along new roadways	Yes, wide trial instead of narrow sidewalk, plus fewer driveways to cross
Reduction of vehicle traffic on Sterling Highway	Yes, switch to nonmotorized mode plus parallel local streets	Yes, switch to nonmotorized mode plus parallel local streets	Yes, switch to nonmotorized mode plus parallel local streets	Yes, switch to nonmotorized mode
Additional traffic signal needed on Sterling Highway	Consider signalized pedestrian crossing at Riverside Drive	Consider signalized pedestrian crossing at Riverside Drive Consider new signal at Warehouse Drive	No	No
Safety improvements	Yes; decreased demand for local trips on Sterling Highway and decreased conflicts with Sterling Highway; improved pedestrian crossings	Yes; decreased demand for local trips on Sterling Highway and decreased conflicts with Sterling Highway; improved pedestrian crossings	Yes; decreased demand for local trips on Sterling Highway and decreased conflicts with Sterling Highway; improved pedestrian crossings	Yes, decreased conflicts with Sterling Highway Care should be taken that driveways on side streets meet corner clearance

Appendices

- App A: Level of Service and Queuing Results for Alternatives (Synchro Software Reports)

HCM 6th TWSC
1: River Street/Riverside Drive & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	70	870	20	190	1135	40	0	0	130	0	0	240
Future Vol, veh/h	70	870	20	190	1135	40	0	0	130	0	0	240
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	916	21	200	1195	42	0	0	137	0	0	253

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1237	0	0	937	0	0	2073	2712	469	2222	2701	619
Stage 1	-	-	-	-	-	-	1075	1075	-	1616	1616	-
Stage 2	-	-	-	-	-	-	998	1637	-	606	1085	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	559	-	-	727	-	-	31	21	541	24	21	432
Stage 1	-	-	-	-	-	-	234	294	-	108	161	-
Stage 2	-	-	-	-	-	-	261	157	-	451	291	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	559	-	-	727	-	-	9	13	541	13	13	432
Mov Cap-2 Maneuver	-	-	-	-	-	-	9	13	-	13	13	-
Stage 1	-	-	-	-	-	-	203	255	-	94	117	-
Stage 2	-	-	-	-	-	-	79	114	-	292	253	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	1.6	13.9	24.4
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	541	559	-	-	727	-	-	432
HCM Lane V/C Ratio	0.253	0.132	-	-	0.275	-	-	0.585
HCM Control Delay (s)	13.9	12.4	-	-	11.8	-	-	24.4
HCM Lane LOS	B	B	-	-	B	-	-	C
HCM 95th %tile Q(veh)	1	0.5	-	-	1.1	-	-	3.6

HCM 6th TWSC
2: New Street & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	3.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	855	145	300	1350	15	200
Future Vol, veh/h	855	145	300	1350	15	200
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	900	153	316	1421	16	211

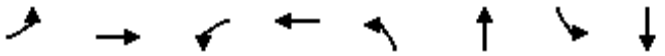
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1053	0	2320	527
Stage 1	-	-	-	-	977	-
Stage 2	-	-	-	-	1343	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	657	-	32	496
Stage 1	-	-	-	-	325	-
Stage 2	-	-	-	-	208	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	657	-	17	496
Mov Cap-2 Maneuver	-	-	-	-	80	-
Stage 1	-	-	-	-	325	-
Stage 2	-	-	-	-	108	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	29.8
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	364	-	-	657	-
HCM Lane V/C Ratio	0.622	-	-	0.481	-
HCM Control Delay (s)	29.8	-	-	15.4	-
HCM Lane LOS	D	-	-	C	-
HCM 95th %tile Q(veh)	4	-	-	2.6	-

Queues
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	58	1053	200	1074	489	258	63	237
v/c Ratio	0.32	1.01	0.85	0.84	1.08	0.32	0.15	0.30
Control Delay	17.1	60.5	47.0	28.1	91.4	6.6	14.6	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	60.5	47.0	28.1	91.4	6.6	14.6	5.6
Queue Length 50th (ft)	16	~281	63	237	~278	26	18	18
Queue Length 95th (ft)	36	#420	#155	#392	#458	71	42	60
Internal Link Dist (ft)		216		343		420		423
Turn Bay Length (ft)	100		100		20		30	
Base Capacity (vph)	184	1040	236	1282	452	807	433	778
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	1.01	0.85	0.84	1.08	0.32	0.15	0.30

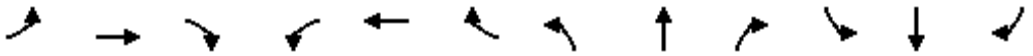
Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	990	10	190	965	55	465	70	175	60	5	220
Future Volume (veh/h)	55	990	10	190	965	55	465	70	175	60	5	220
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	58	1042	11	200	1016	58	489	74	184	63	5	232
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	181	1061	11	235	1156	66	479	204	508	466	14	669
Arrive On Green	0.04	0.30	0.30	0.05	0.23	0.23	0.44	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	1734	3508	37	1734	3327	190	1143	463	1151	1121	33	1516
Grp Volume(v), veh/h	58	514	539	200	528	546	489	0	258	63	0	237
Grp Sat Flow(s),veh/h/ln	1734	1730	1814	1734	1730	1787	1143	0	1614	1121	0	1548
Q Serve(g_s), s	1.7	23.6	23.6	6.3	23.6	23.6	27.2	0.0	8.5	3.2	0.0	8.1
Cycle Q Clear(g_c), s	1.7	23.6	23.6	6.3	23.6	23.6	35.3	0.0	8.5	11.7	0.0	8.1
Prop In Lane	1.00		0.02	1.00		0.11	1.00		0.71	1.00		0.98
Lane Grp Cap(c), veh/h	181	523	549	235	601	621	479	0	712	466	0	683
V/C Ratio(X)	0.32	0.98	0.98	0.85	0.88	0.88	1.02	0.00	0.36	0.14	0.00	0.35
Avail Cap(c_a), veh/h	207	523	549	235	601	621	479	0	712	466	0	683
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.6	27.7	27.7	21.4	29.1	29.1	28.9	0.0	14.9	18.7	0.0	14.7
Incr Delay (d2), s/veh	1.0	35.2	34.3	24.5	16.6	16.2	46.5	0.0	0.3	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	14.2	14.7	4.1	12.7	13.1	15.4	0.0	3.0	0.8	0.0	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	62.8	61.9	45.9	45.7	45.3	75.5	0.0	15.2	18.9	0.0	15.0
LnGrp LOS	C	E	E	D	D	D	F	A	B	B	A	B
Approach Vol, veh/h		1111			1274			747			300	
Approach Delay, s/veh		60.2			45.5			54.6			15.9	
Approach LOS		E			D			D			B	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		39.4	10.6	30.0		39.4	7.0	33.6				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 35	* 6.5	* 24		* 35	* 4.1	* 27				
Max Q Clear Time (g_c+I1), s		37.3	8.3	25.6		13.7	3.7	25.6				
Green Ext Time (p_c), s		0.0	0.0	0.0		1.7	0.0	0.7				

Intersection Summary	
HCM 6th Ctrl Delay	49.7
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
4: New Street & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1175	50	135	1165	45	120
Future Vol, veh/h	1175	50	135	1165	45	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1237	53	142	1226	47	126

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1290	0	2161	645
Stage 1	-	-	-	-	1264	-
Stage 2	-	-	-	-	897	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	533	-	~ 40	415
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	533	-	~ 29	415
Mov Cap-2 Maneuver	-	-	-	-	125	-
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	263	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	45.1
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	254	-	-	533	-
HCM Lane V/C Ratio	0.684	-	-	0.267	-
HCM Control Delay (s)	45.1	-	-	14.2	-
HCM Lane LOS	E	-	-	B	-
HCM 95th %tile Q(veh)	4.5	-	-	1.1	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 6th TWSC
5: Tern Circle & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1290	5	30	1255	45	30
Future Vol, veh/h	1290	5	30	1255	45	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1358	5	32	1321	47	32

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1363	0	2086	682
Stage 1	-	-	-	-	1361	-
Stage 2	-	-	-	-	725	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	500	-	~ 46	392
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	440	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	500	-	~ 43	392
Mov Cap-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	412	-

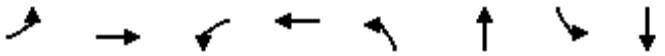
Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	36.8
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	190	-	-	500	-
HCM Lane V/C Ratio	0.416	-	-	0.063	-
HCM Control Delay (s)	36.8	-	-	12.7	-
HCM Lane LOS	E	-	-	B	-
HCM 95th %tile Q(veh)	1.9	-	-	0.2	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Queues
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	5	1384	168	1153	5	132	174	300
v/c Ratio	0.02	0.76	0.68	0.52	0.05	0.31	0.72	0.65
Control Delay	1.8	8.4	23.7	10.4	22.8	8.8	44.8	18.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.8	8.4	23.7	10.4	22.8	8.8	44.8	18.2
Queue Length 50th (ft)	0	48	25	108	2	8	80	54
Queue Length 95th (ft)	m1	m383	m29	m171	10	47	136	123
Internal Link Dist (ft)		598		1107		320		616
Turn Bay Length (ft)	200		350		70		100	
Base Capacity (vph)	327	1814	252	2198	149	536	333	569
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.76	0.67	0.52	0.03	0.25	0.52	0.53

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1250	65	160	1000	95	5	20	105	165	5	280
Future Volume (veh/h)	5	1250	65	160	1000	95	5	20	105	165	5	280
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	5	1316	68	168	1053	100	5	21	111	174	5	295
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	381	1434	74	351	1847	175	154	61	321	307	6	367
Arrive On Green	0.01	0.57	0.57	0.27	1.00	1.00	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	1734	3347	173	1734	3194	303	1079	252	1330	1258	26	1521
Grp Volume(v), veh/h	5	679	705	168	570	583	5	0	132	174	0	300
Grp Sat Flow(s),veh/h/ln	1734	1730	1790	1734	1730	1767	1079	0	1582	1258	0	1547
Q Serve(g_s), s	0.1	28.3	28.4	0.3	0.0	0.0	0.4	0.0	5.5	10.6	0.0	14.6
Cycle Q Clear(g_c), s	0.1	28.3	28.4	0.3	0.0	0.0	14.9	0.0	5.5	16.2	0.0	14.6
Prop In Lane	1.00		0.10	1.00		0.17	1.00		0.84	1.00		0.98
Lane Grp Cap(c), veh/h	381	741	767	351	1001	1022	154	0	382	307	0	374
V/C Ratio(X)	0.01	0.92	0.92	0.48	0.57	0.57	0.03	0.00	0.35	0.57	0.00	0.80
Avail Cap(c_a), veh/h	461	779	806	351	1001	1022	205	0	457	366	0	447
HCM Platoon Ratio	1.33	1.33	1.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.30	0.30	0.30	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.9	15.9	16.0	24.9	0.0	0.0	35.6	0.0	25.1	31.8	0.0	28.6
Incr Delay (d2), s/veh	0.0	18.0	17.9	0.3	0.7	0.7	0.1	0.0	0.5	1.6	0.0	8.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	11.4	11.8	2.3	0.2	0.2	0.1	0.0	2.1	3.3	0.0	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.0	33.9	33.8	25.2	0.7	0.7	35.7	0.0	25.6	33.4	0.0	37.2
LnGrp LOS	A	C	C	C	A	A	D	A	C	C	A	D
Approach Vol, veh/h		1389			1321			137			474	
Approach Delay, s/veh		33.8			3.8			26.0			35.8	
Approach LOS		C			A			C			D	

Timer - Assigned Phs	2	3	4	6	7	8
Phs Duration (G+Y+Rc), s	23.4	16.5	40.1	23.4	4.5	52.1
Change Period (Y+Rc), s	* 4.1	* 5.8	* 5.8	* 4.1	* 4.1	* 5.8
Max Green Setting (Gmax), s	* 23	* 6.9	* 36	* 23	* 4.1	* 39
Max Q Clear Time (g_c+I1), s	16.9	2.3	30.4	18.2	2.1	2.0
Green Ext Time (p_c), s	0.3	0.2	3.8	1.2	0.0	9.4

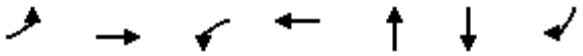
Intersection Summary	
HCM 6th Ctrl Delay	21.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
7: Birch Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	168	1432	5	1273	616	10	100
v/c Ratio	0.74	0.85	0.03	0.97	1.08	0.02	0.15
Control Delay	29.8	15.3	9.2	41.9	85.7	16.5	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.8	15.3	9.2	41.9	85.7	16.5	0.9
Queue Length 50th (ft)	14	95	1	303	~327	3	0
Queue Length 95th (ft)	m#51	#518	6	#455	#527	13	5
Internal Link Dist (ft)		1107		775	289	236	
Turn Bay Length (ft)	175		100				
Base Capacity (vph)	226	1677	172	1318	571	573	646
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.85	0.03	0.97	1.08	0.02	0.15

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
7: Birch Street & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	1330	30	5	880	330	280	25	280	5	5	95
Future Volume (veh/h)	160	1330	30	5	880	330	280	25	280	5	5	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1850	1807	1850	1850	1807	1850	1850	1850	1850	1850	1850	1807
Adj Flow Rate, veh/h	168	1400	32	5	926	347	295	26	295	5	5	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	3	0	0	3	0	0	0	0	0	0	3
Cap, veh/h	258	1697	39	278	942	351	315	22	249	271	250	557
Arrive On Green	0.19	0.99	0.99	0.01	0.38	0.38	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1762	3431	78	1762	2447	912	684	60	684	561	688	1531
Grp Volume(v), veh/h	168	700	732	5	648	625	616	0	0	10	0	100
Grp Sat Flow(s),veh/h/ln	1762	1716	1793	1762	1716	1643	1427	0	0	1249	0	1531
Q Serve(g_s), s	2.4	1.9	1.9	0.1	29.8	30.2	28.8	0.0	0.0	0.0	0.0	3.6
Cycle Q Clear(g_c), s	2.4	1.9	1.9	0.1	29.8	30.2	29.1	0.0	0.0	0.3	0.0	3.6
Prop In Lane	1.00		0.04	1.00		0.55	0.48		0.48	0.50		1.00
Lane Grp Cap(c), veh/h	258	849	887	278	661	632	586	0	0	522	0	557
V/C Ratio(X)	0.65	0.82	0.83	0.02	0.98	0.99	1.05	0.00	0.00	0.02	0.00	0.18
Avail Cap(c_a), veh/h	258	849	887	356	661	632	586	0	0	522	0	557
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.57	0.57	0.57	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.8	0.2	0.2	10.1	24.3	24.4	27.2	0.0	0.0	16.3	0.0	17.3
Incr Delay (d2), s/veh	3.3	5.3	5.2	0.0	30.5	33.1	51.5	0.0	0.0	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	1.4	1.4	0.0	16.6	16.5	19.8	0.0	0.0	0.1	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.1	5.6	5.4	10.1	54.8	57.6	78.7	0.0	0.0	16.3	0.0	17.5
LnGrp LOS	C	A	A	B	D	E	F	A	A	B	A	B
Approach Vol, veh/h		1600			1278			616			110	
Approach Delay, s/veh		8.4			56.0			78.7			17.4	
Approach LOS		A			E			E			B	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		33.2	4.5	45.4		33.2	13.3	36.6				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 5.8	* 5.8				
Max Green Setting (Gmax), s		* 29	* 4	* 33		* 29	* 6.1	* 31				
Max Q Clear Time (g_c+I1), s		31.1	2.1	3.9		5.6	4.4	32.2				
Green Ext Time (p_c), s		0.0	0.0	12.1		0.3	0.1	0.0				

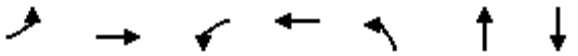
Intersection Summary	
HCM 6th Ctrl Delay	37.5
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
14: Devin Drive & Sterling Highway

06/28/2023



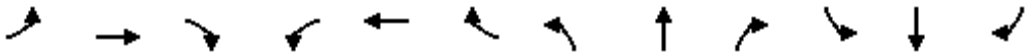
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	4	981	17	525	302	38	23
v/c Ratio	0.01	0.81	0.07	0.45	0.51	0.05	0.03
Control Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Length 50th (ft)	1	125	3	68	68	1	3
Queue Length 95th (ft)	5	#274	13	130	166	17	17
Internal Link Dist (ft)		909		895		264	217
Turn Bay Length (ft)							
Base Capacity (vph)	358	1246	233	1217	593	713	746
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.79	0.07	0.43	0.51	0.05	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
14: Devin Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Future Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	4	636	345	17	524	1	302	5	33	7	12	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	694	376	167	1190	2	689	84	557	240	388	116
Arrive On Green	0.00	0.32	0.32	0.02	0.34	0.34	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1734	2165	1175	1734	3543	7	1397	207	1368	402	951	285
Grp Volume(v), veh/h	4	508	473	17	256	269	302	0	38	23	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1610	1734	1730	1820	1397	0	1575	1637	0	0
Q Serve(g_s), s	0.1	17.5	17.5	0.4	7.1	7.1	9.5	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	17.5	17.5	0.4	7.1	7.1	10.0	0.0	0.9	0.5	0.0	0.0
Prop In Lane	1.00		0.73	1.00		0.00	1.00		0.87	0.30		0.17
Lane Grp Cap(c), veh/h	317	554	516	167	581	611	689	0	642	743	0	0
V/C Ratio(X)	0.01	0.92	0.92	0.10	0.44	0.44	0.44	0.00	0.06	0.03	0.00	0.00
Avail Cap(c_a), veh/h	422	560	521	250	581	611	689	0	642	743	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.4	20.2	20.2	16.3	16.0	16.0	13.8	0.0	11.1	11.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	19.9	21.0	0.3	0.5	0.5	2.0	0.0	0.2	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.4	8.9	0.2	2.6	2.8	2.7	0.0	0.3	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	40.2	41.2	16.5	16.5	16.5	15.8	0.0	11.3	11.1	0.0	0.0
LnGrp LOS	B	D	D	B	B	B	B	A	B	B	A	A
Approach Vol, veh/h		985			542			340			23	
Approach Delay, s/veh		40.6			16.5			15.3			11.1	
Approach LOS		D			B			B			B	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		30.4	5.6	25.8		30.4	4.7	26.8				
Change Period (Y+Rc), s		* 5.2	* 4.6	6.0		* 5.2	* 4.4	6.0				
Max Green Setting (Gmax), s		* 25	* 4	20.0		* 25	* 4	20.2				
Max Q Clear Time (g_c+I1), s		12.0	2.4	19.5		2.5	2.1	9.1				
Green Ext Time (p_c), s		0.8	0.0	0.3		0.0	0.0	2.4				

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
1: River Street/Riverside Drive & Sterling Highway

06/28/2023

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	74	937	200	974	442	279
v/c Ratio	0.37	0.85	0.77	0.74	0.97	0.38
Control Delay	16.6	34.5	33.8	16.9	60.0	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.6	34.5	33.8	16.9	60.0	6.7
Queue Length 50th (ft)	19	227	28	103	198	24
Queue Length 95th (ft)	41	#332	m#128	m202	#394	74
Internal Link Dist (ft)		804		476	311	453
Turn Bay Length (ft)	300		300			
Base Capacity (vph)	201	1101	261	1308	455	743
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.85	0.77	0.74	0.97	0.38

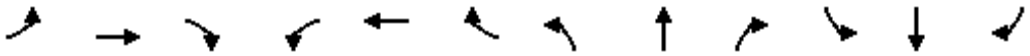
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
1: River Street/Riverside Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	870	20	190	885	40	255	35	130	20	5	240
Future Volume (veh/h)	70	870	20	190	885	40	255	35	130	20	5	240
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	74	916	21	200	932	42	268	37	137	21	5	253
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	249	1106	25	261	1256	57	361	45	150	73	37	606
Arrive On Green	0.04	0.32	0.32	0.10	0.50	0.50	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1734	3458	79	1734	3372	152	701	109	364	60	91	1472
Grp Volume(v), veh/h	74	458	479	200	478	496	442	0	0	279	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1807	1734	1730	1794	1174	0	0	1624	0	0
Q Serve(g_s), s	2.1	19.6	19.6	2.5	17.6	17.6	18.7	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.1	19.6	19.6	2.5	17.6	17.6	29.0	0.0	0.0	10.2	0.0	0.0
Prop In Lane	1.00		0.04	1.00		0.08	0.61		0.31	0.08		0.91
Lane Grp Cap(c), veh/h	249	554	578	261	644	668	555	0	0	716	0	0
V/C Ratio(X)	0.30	0.83	0.83	0.77	0.74	0.74	0.80	0.00	0.00	0.39	0.00	0.00
Avail Cap(c_a), veh/h	271	554	578	297	644	668	555	0	0	716	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.6	25.2	25.2	33.1	17.1	17.1	23.2	0.0	0.0	16.9	0.0	0.0
Incr Delay (d2), s/veh	0.7	13.3	12.8	10.1	7.5	7.3	11.3	0.0	0.0	1.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	9.5	9.9	4.2	6.7	6.9	9.1	0.0	0.0	3.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	38.5	38.0	43.3	24.7	24.4	34.5	0.0	0.0	18.5	0.0	0.0
LnGrp LOS	B	D	D	D	C	C	C	A	A	B	A	A
Approach Vol, veh/h		1011			1174			442			279	
Approach Delay, s/veh		36.7			27.7			34.5			18.5	
Approach LOS		D			C			C			B	

Timer - Assigned Phs	2	3	4	6	7	8
Phs Duration (G+Y+Rc), s	37.0	11.6	31.4	37.0	7.4	35.6
Change Period (Y+Rc), s	* 4.1	* 5.8	* 5.8	* 4.1	* 4.1	* 5.8
Max Green Setting (Gmax), s	* 33	* 7.5	* 26	* 33	* 4.3	* 29
Max Q Clear Time (g_c+I1), s	31.0	4.5	21.6	12.2	4.1	19.6
Green Ext Time (p_c), s	0.6	0.2	2.1	1.8	0.0	4.0

Intersection Summary	
HCM 6th Ctrl Delay	31.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
2: New Street & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	4.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	875	145	300	1095	20	200
Future Vol, veh/h	875	145	300	1095	20	200
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	921	153	316	1153	21	211

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1074	0	2207	537
Stage 1	-	-	-	-	998	-
Stage 2	-	-	-	-	1209	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	645	-	38	488
Stage 1	-	-	-	-	317	-
Stage 2	-	-	-	-	245	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	645	-	~ 19	488
Mov Cap-2 Maneuver	-	-	-	-	89	-
Stage 1	-	-	-	-	317	-
Stage 2	-	-	-	-	125	-

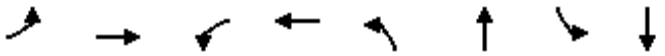
Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	33.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	347	-	-	645	-
HCM Lane V/C Ratio	0.667	-	-	0.49	-
HCM Control Delay (s)	33.9	-	-	15.8	-
HCM Lane LOS	D	-	-	C	-
HCM 95th %tile Q(veh)	4.6	-	-	2.7	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Queues
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	58	1074	200	1042	253	221	42	237
v/c Ratio	0.20	0.75	0.68	0.60	0.92	0.36	0.15	0.42
Control Delay	3.9	9.7	23.6	13.9	65.5	6.8	20.3	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.9	9.7	23.6	13.9	65.5	6.8	20.3	12.1
Queue Length 50th (ft)	4	72	61	257	115	12	14	38
Queue Length 95th (ft)	m5	m91	#119	148	#246	59	38	95
Internal Link Dist (ft)		216		343		420		423
Turn Bay Length (ft)	100		100		20		30	
Base Capacity (vph)	283	1428	304	1753	305	655	320	605
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.75	0.66	0.59	0.83	0.34	0.13	0.39

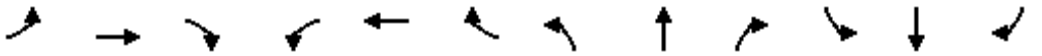
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	1010	10	190	935	55	240	35	175	40	5	220
Future Volume (veh/h)	55	1010	10	190	935	55	240	35	175	40	5	220
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	58	1063	11	200	984	58	253	37	184	42	5	232
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	371	1386	14	322	1113	66	337	89	443	355	11	510
Arrive On Green	0.13	0.40	0.40	0.19	0.67	0.67	0.34	0.34	0.34	0.34	0.34	0.34
Sat Flow, veh/h	1734	3508	36	1734	3320	196	1143	265	1319	1160	33	1516
Grp Volume(v), veh/h	58	524	550	200	513	529	253	0	221	42	0	237
Grp Sat Flow(s),veh/h/ln	1734	1730	1815	1734	1730	1786	1143	0	1584	1160	0	1548
Q Serve(g_s), s	0.0	21.0	21.0	5.5	19.2	19.2	17.3	0.0	8.6	2.3	0.0	9.6
Cycle Q Clear(g_c), s	0.0	21.0	21.0	5.5	19.2	19.2	26.9	0.0	8.6	10.9	0.0	9.6
Prop In Lane	1.00		0.02	1.00		0.11	1.00		0.83	1.00		0.98
Lane Grp Cap(c), veh/h	371	684	717	322	580	598	337	0	533	355	0	521
V/C Ratio(X)	0.16	0.77	0.77	0.62	0.88	0.88	0.75	0.00	0.41	0.12	0.00	0.46
Avail Cap(c_a), veh/h	371	684	717	352	757	781	337	0	533	355	0	521
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.7	21.0	21.0	14.4	11.9	11.9	31.5	0.0	20.5	24.7	0.0	20.8
Incr Delay (d2), s/veh	0.2	8.0	7.7	2.9	17.7	17.3	9.0	0.0	0.5	0.1	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	9.3	9.7	1.9	6.3	6.5	5.6	0.0	3.1	0.6	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	29.0	28.7	17.3	29.6	29.2	40.6	0.0	21.0	24.8	0.0	21.4
LnGrp LOS	C	C	C	B	C	C	D	A	C	C	A	C
Approach Vol, veh/h		1132			1242			474			279	
Approach Delay, s/veh		28.8			27.5			31.4			21.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		31.0	11.6	37.4		31.0	16.4	32.6				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 5.8	* 5.8				
Max Green Setting (Gmax), s		* 27	* 8.9	* 30		* 27	* 4.1	* 35				
Max Q Clear Time (g_c+I1), s		28.9	7.5	23.0		12.9	2.0	21.2				
Green Ext Time (p_c), s		0.0	0.1	3.7		1.4	0.0	5.6				

Intersection Summary	
HCM 6th Ctrl Delay	28.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
4: New Street & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1175	50	135	1150	30	120
Future Vol, veh/h	1175	50	135	1150	30	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1237	53	142	1211	32	126

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1290	0	2154	645
Stage 1	-	-	-	-	1264	-
Stage 2	-	-	-	-	890	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	533	-	41	415
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	361	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	533	-	~ 30	415
Mov Cap-2 Maneuver	-	-	-	-	126	-
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	265	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	32.5
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	284	-	-	533	-
HCM Lane V/C Ratio	0.556	-	-	0.267	-
HCM Control Delay (s)	32.5	-	-	14.2	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	3.1	-	-	1.1	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 6th TWSC
5: Tern Circle & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1290	5	30	1255	30	30
Future Vol, veh/h	1290	5	30	1255	30	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1358	5	32	1321	32	32

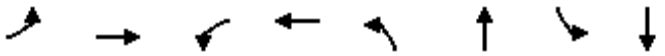
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1363	0	2086	682
Stage 1	-	-	-	-	1361	-
Stage 2	-	-	-	-	725	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	500	-	46	392
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	440	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	500	-	43	392
Mov Cap-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	412	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	29.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	207	-	-	500	-
HCM Lane V/C Ratio	0.305	-	-	0.063	-
HCM Control Delay (s)	29.9	-	-	12.7	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	1.2	-	-	0.2	-

Queues
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	5	1384	168	1153	5	132	174	300
v/c Ratio	0.02	0.78	0.63	0.52	0.05	0.31	0.72	0.66
Control Delay	1.8	11.4	13.8	8.8	22.8	8.8	44.8	19.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.8	11.4	13.8	8.8	22.8	8.8	44.8	19.3
Queue Length 50th (ft)	0	47	21	177	2	8	80	58
Queue Length 95th (ft)	m0	#470	m35	m275	10	47	136	127
Internal Link Dist (ft)		598		1107		320		616
Turn Bay Length (ft)	200		350		70		100	
Base Capacity (vph)	327	1766	267	2198	149	536	333	563
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.78	0.63	0.52	0.03	0.25	0.52	0.53

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1250	65	160	1000	95	5	20	105	165	5	280
Future Volume (veh/h)	5	1250	65	160	1000	95	5	20	105	165	5	280
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	5	1316	68	168	1053	100	5	21	111	174	5	295
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	235	1727	89	308	1847	175	154	61	321	307	6	367
Arrive On Green	0.01	0.69	0.69	0.02	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	1734	3347	173	1734	3194	303	1079	252	1330	1258	26	1521
Grp Volume(v), veh/h	5	679	705	168	570	583	5	0	132	174	0	300
Grp Sat Flow(s),veh/h/ln	1734	1730	1790	1734	1730	1767	1079	0	1582	1258	0	1547
Q Serve(g_s), s	0.1	20.6	20.8	3.5	23.9	24.0	0.4	0.0	5.5	10.6	0.0	14.6
Cycle Q Clear(g_c), s	0.1	20.6	20.8	3.5	23.9	24.0	14.9	0.0	5.5	16.2	0.0	14.6
Prop In Lane	1.00		0.10	1.00		0.17	1.00		0.84	1.00		0.98
Lane Grp Cap(c), veh/h	235	892	923	308	1001	1022	154	0	382	307	0	374
V/C Ratio(X)	0.02	0.76	0.76	0.55	0.57	0.57	0.03	0.00	0.35	0.57	0.00	0.80
Avail Cap(c_a), veh/h	315	892	923	340	1001	1022	205	0	457	366	0	447
HCM Platoon Ratio	1.33	1.33	1.33	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.30	0.30	0.30	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.6	9.3	9.3	13.2	23.3	23.3	35.6	0.0	25.1	31.8	0.0	28.6
Incr Delay (d2), s/veh	0.0	6.1	6.0	0.5	0.7	0.7	0.1	0.0	0.5	1.6	0.0	8.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.0	6.2	1.2	11.1	11.3	0.1	0.0	2.1	3.3	0.0	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.6	15.4	15.3	13.6	24.0	24.0	35.7	0.0	25.6	33.4	0.0	37.2
LnGrp LOS	B	B	B	B	C	C	D	A	C	C	A	D
Approach Vol, veh/h		1389			1321			137			474	
Approach Delay, s/veh		15.3			22.7			26.0			35.8	
Approach LOS		B			C			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		23.4	9.5	47.1		23.4	4.5	52.1				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 23	* 6.9	* 36		* 23	* 4.1	* 39				
Max Q Clear Time (g_c+I1), s		16.9	5.5	22.8		18.2	2.1	26.0				
Green Ext Time (p_c), s		0.3	0.1	7.5		1.2	0.0	6.0				

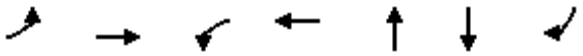
Intersection Summary	
HCM 6th Ctrl Delay	21.6
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
7: Birch Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	168	1432	5	1273	616	10	100
v/c Ratio	0.78	0.85	0.03	0.97	1.08	0.02	0.17
Control Delay	41.8	14.1	9.2	41.9	85.7	16.5	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.8	14.1	9.2	41.9	85.7	16.5	4.7
Queue Length 50th (ft)	33	62	1	303	~327	3	0
Queue Length 95th (ft)	m#78	#518	6	#455	#527	13	30
Internal Link Dist (ft)		1107		775	289	236	
Turn Bay Length (ft)	175		100				
Base Capacity (vph)	216	1677	172	1318	571	573	600
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.85	0.03	0.97	1.08	0.02	0.17

Intersection Summary

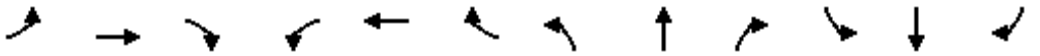
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
7: Birch Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	1330	30	5	880	330	280	25	280	5	5	95
Future Volume (veh/h)	160	1330	30	5	880	330	280	25	280	5	5	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1850	1807	1850	1850	1807	1850	1850	1850	1850	1850	1850	1807
Adj Flow Rate, veh/h	168	1400	32	5	926	347	295	26	295	5	5	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	3	0	0	3	0	0	0	0	0	0	3
Cap, veh/h	227	1564	36	130	942	351	315	22	249	271	250	557
Arrive On Green	0.08	0.46	0.46	0.01	0.39	0.39	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1762	3431	78	1762	2447	912	684	60	684	561	688	1531
Grp Volume(v), veh/h	168	700	732	5	648	625	616	0	0	10	0	100
Grp Sat Flow(s),veh/h/ln	1762	1716	1793	1762	1716	1643	1427	0	0	1249	0	1531
Q Serve(g_s), s	4.5	30.0	30.0	0.1	29.8	30.2	28.8	0.0	0.0	0.0	0.0	3.6
Cycle Q Clear(g_c), s	4.5	30.0	30.0	0.1	29.8	30.2	29.1	0.0	0.0	0.3	0.0	3.6
Prop In Lane	1.00		0.04	1.00		0.55	0.48		0.48	0.50		1.00
Lane Grp Cap(c), veh/h	227	783	817	130	661	632	586	0	0	522	0	557
V/C Ratio(X)	0.74	0.89	0.90	0.04	0.98	0.99	1.05	0.00	0.00	0.02	0.00	0.18
Avail Cap(c_a), veh/h	227	783	817	209	661	632	586	0	0	522	0	557
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.54	0.54	0.54	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.8	20.0	20.0	17.4	24.3	24.4	27.2	0.0	0.0	16.3	0.0	17.3
Incr Delay (d2), s/veh	6.7	8.8	8.6	0.1	30.5	33.1	51.5	0.0	0.0	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	12.6	13.1	0.0	16.6	16.5	19.8	0.0	0.0	0.1	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.5	28.8	28.6	17.5	54.8	57.6	78.7	0.0	0.0	16.3	0.0	17.5
LnGrp LOS	C	C	C	B	D	E	F	A	A	B	A	B
Approach Vol, veh/h		1600			1278			616			110	
Approach Delay, s/veh		28.4			56.0			78.7			17.4	
Approach LOS		C			E			E			B	

Timer - Assigned Phs	2	3	4	6	7	8
Phs Duration (G+Y+Rc), s	33.2	4.5	42.3	33.2	10.2	36.6
Change Period (Y+Rc), s	* 4.1	* 4.1	* 5.8	* 4.1	* 4.1	* 5.8
Max Green Setting (Gmax), s	* 29	* 4	* 33	* 29	* 6.1	* 31
Max Q Clear Time (g_c+I1), s	31.1	2.1	32.0	5.6	6.5	32.2
Green Ext Time (p_c), s	0.0	0.0	0.7	0.3	0.0	0.0

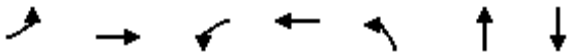
Intersection Summary	
HCM 6th Ctrl Delay	46.5
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
14: Devin Drive & Sterling Highway

06/28/2023



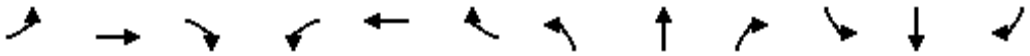
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	4	981	17	525	302	38	23
v/c Ratio	0.01	0.81	0.07	0.45	0.51	0.05	0.03
Control Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Length 50th (ft)	1	125	3	68	68	1	3
Queue Length 95th (ft)	5	#274	13	130	166	17	17
Internal Link Dist (ft)		909		895		264	217
Turn Bay Length (ft)							
Base Capacity (vph)	358	1246	233	1217	593	713	746
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.79	0.07	0.43	0.51	0.05	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
14: Devin Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Future Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	4	636	345	17	524	1	302	5	33	7	12	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	694	376	167	1190	2	689	84	557	240	388	116
Arrive On Green	0.00	0.32	0.32	0.02	0.34	0.34	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1734	2165	1175	1734	3543	7	1397	207	1368	402	951	285
Grp Volume(v), veh/h	4	508	473	17	256	269	302	0	38	23	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1610	1734	1730	1820	1397	0	1575	1637	0	0
Q Serve(g_s), s	0.1	17.5	17.5	0.4	7.1	7.1	9.5	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	17.5	17.5	0.4	7.1	7.1	10.0	0.0	0.9	0.5	0.0	0.0
Prop In Lane	1.00		0.73	1.00		0.00	1.00		0.87	0.30		0.17
Lane Grp Cap(c), veh/h	317	554	516	167	581	611	689	0	642	743	0	0
V/C Ratio(X)	0.01	0.92	0.92	0.10	0.44	0.44	0.44	0.00	0.06	0.03	0.00	0.00
Avail Cap(c_a), veh/h	422	560	521	250	581	611	689	0	642	743	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.4	20.2	20.2	16.3	16.0	16.0	13.8	0.0	11.1	11.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	19.9	21.0	0.3	0.5	0.5	2.0	0.0	0.2	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.4	8.9	0.2	2.6	2.8	2.7	0.0	0.3	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	40.2	41.2	16.5	16.5	16.5	15.8	0.0	11.3	11.1	0.0	0.0
LnGrp LOS	B	D	D	B	B	B	B	A	B	B	A	A
Approach Vol, veh/h		985			542			340			23	
Approach Delay, s/veh		40.6			16.5			15.3			11.1	
Approach LOS		D			B			B			B	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		30.4	5.6	25.8		30.4	4.7	26.8				
Change Period (Y+Rc), s		* 5.2	* 4.6	6.0		* 5.2	* 4.4	6.0				
Max Green Setting (Gmax), s		* 25	* 4	20.0		* 25	* 4	20.2				
Max Q Clear Time (g_c+I1), s		12.0	2.4	19.5		2.5	2.1	9.1				
Green Ext Time (p_c), s		0.8	0.0	0.3		0.0	0.0	2.4				

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
1: Riverside Drive & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	65	885	15	160	1130	45	2	1	115	1	1	240
Future Vol, veh/h	65	885	15	160	1130	45	2	1	115	1	1	240
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	68	932	16	168	1189	47	2	1	121	1	1	253

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1236	0	0	948	0	0	2007	2648	474	2152	2633	618
Stage 1	-	-	-	-	-	-	1076	1076	-	1549	1549	-
Stage 2	-	-	-	-	-	-	931	1572	-	603	1084	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	559	-	-	720	-	-	35	23	537	27	23	432
Stage 1	-	-	-	-	-	-	234	294	-	119	174	-
Stage 2	-	-	-	-	-	-	287	169	-	453	291	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	559	-	-	720	-	-	10	15	537	15	15	432
Mov Cap-2 Maneuver	-	-	-	-	-	-	10	15	-	15	15	-
Stage 1	-	-	-	-	-	-	205	258	-	104	133	-
Stage 2	-	-	-	-	-	-	91	130	-	307	255	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	1.4	33.9	38.2
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	245	559	-	-	720	-	-	351
HCM Lane V/C Ratio	0.507	0.122	-	-	0.234	-	-	0.726
HCM Control Delay (s)	33.9	12.3	-	-	11.5	-	-	38.2
HCM Lane LOS	D	B	-	-	B	-	-	E
HCM 95th %tile Q(veh)	2.6	0.4	-	-	0.9	-	-	5.5

HCM 6th TWSC
2: New Street & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	925	75	180	1295	40	125
Future Vol, veh/h	925	75	180	1295	40	125
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	974	79	189	1363	42	132

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1053	0	2074	527
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	1060	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	657	-	46	496
Stage 1	-	-	-	-	311	-
Stage 2	-	-	-	-	294	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	657	-	~ 33	496
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	311	-
Stage 2	-	-	-	-	209	-

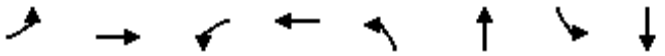
Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	33.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	292	-	-	657	-
HCM Lane V/C Ratio	0.595	-	-	0.288	-
HCM Control Delay (s)	33.9	-	-	12.7	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	3.6	-	-	1.2	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Queues
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	53	1053	195	1153	226	242	74	237
v/c Ratio	0.20	0.68	0.59	0.62	0.93	0.42	0.31	0.43
Control Delay	9.9	23.9	16.6	17.5	72.8	10.0	27.2	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.9	23.9	16.6	17.5	72.8	10.0	27.2	11.5
Queue Length 50th (ft)	12	258	47	236	119	29	32	35
Queue Length 95th (ft)	28	353	79	422	#240	85	67	92
Internal Link Dist (ft)		216		658		420		423
Turn Bay Length (ft)	100		100		20		30	
Base Capacity (vph)	261	1548	354	1870	286	649	281	616
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.68	0.55	0.62	0.79	0.37	0.26	0.38

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	990	10	185	1040	55	215	60	170	70	5	220
Future Volume (veh/h)	50	990	10	185	1040	55	215	60	170	70	5	220
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	53	1042	11	195	1095	58	226	63	179	74	5	232
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	220	1502	16	326	1603	85	322	139	395	323	11	504
Arrive On Green	0.03	0.43	0.43	0.03	0.16	0.16	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1734	3508	37	1734	3342	177	1143	418	1189	1138	33	1516
Grp Volume(v), veh/h	53	514	539	195	567	586	226	0	242	74	0	237
Grp Sat Flow(s),veh/h/ln	1734	1730	1814	1734	1730	1789	1143	0	1607	1138	0	1548
Q Serve(g_s), s	1.4	21.8	21.8	5.4	27.8	27.8	17.5	0.0	10.7	4.9	0.0	10.9
Cycle Q Clear(g_c), s	1.4	21.8	21.8	5.4	27.8	27.8	28.3	0.0	10.7	15.6	0.0	10.9
Prop In Lane	1.00		0.02	1.00		0.10	1.00		0.74	1.00		0.98
Lane Grp Cap(c), veh/h	220	741	777	326	830	858	322	0	534	323	0	514
V/C Ratio(X)	0.24	0.69	0.69	0.60	0.68	0.68	0.70	0.00	0.45	0.23	0.00	0.46
Avail Cap(c_a), veh/h	246	741	777	398	830	858	322	0	534	323	0	514
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.86	0.86	0.86	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.9	20.9	20.9	17.3	31.4	31.4	34.9	0.0	23.6	29.7	0.0	23.7
Incr Delay (d2), s/veh	0.6	5.3	5.1	1.5	3.9	3.8	6.7	0.0	0.6	0.4	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	9.3	9.7	2.3	13.6	14.1	5.3	0.0	4.0	1.4	0.0	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.4	26.2	26.0	18.8	35.3	35.2	41.6	0.0	24.2	30.1	0.0	24.3
LnGrp LOS	B	C	C	B	D	D	D	A	C	C	A	C
Approach Vol, veh/h		1106			1348			468			311	
Approach Delay, s/veh		25.7			32.9			32.6			25.7	
Approach LOS		C			C			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		34.0	11.7	44.3		34.0	7.0	49.0				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 30	* 11	* 35		* 30	* 4.3	* 42				
Max Q Clear Time (g_c+I1), s		30.3	7.4	23.8		17.6	3.4	29.8				
Green Ext Time (p_c), s		0.0	0.2	4.9		1.4	0.0	5.8				

Intersection Summary	
HCM 6th Ctrl Delay	29.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
4: Warehouse Drive & Sterling Highway

06/28/2023

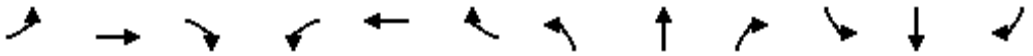
Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	26	1268	116	1205	195	84
v/c Ratio	0.07	0.58	0.35	0.50	0.73	0.29
Control Delay	2.1	6.3	6.6	5.8	36.4	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.1	6.3	6.6	5.8	36.4	12.0
Queue Length 50th (ft)	1	22	17	115	63	5
Queue Length 95th (ft)	m6	425	m12	111	124	41
Internal Link Dist (ft)		658		119	352	525
Turn Bay Length (ft)	300		300			
Base Capacity (vph)	352	2201	361	2407	418	461
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.58	0.32	0.50	0.47	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
4: Warehouse Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	1180	25	110	1140	5	70	5	110	5	5	70
Future Volume (veh/h)	25	1180	25	110	1140	5	70	5	110	5	5	70
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	26	1242	26	116	1200	5	74	5	116	5	5	74
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	428	1455	30	563	2373	10	131	19	139	48	24	214
Arrive On Green	0.02	0.42	0.42	0.51	1.00	1.00	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1734	3466	73	1734	3534	15	500	124	917	35	156	1411
Grp Volume(v), veh/h	26	620	648	116	587	618	195	0	0	84	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1808	1734	1730	1818	1541	0	0	1602	0	0
Q Serve(g_s), s	0.4	29.2	29.2	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.4	29.2	29.2	0.0	0.0	0.0	10.9	0.0	0.0	4.3	0.0	0.0
Prop In Lane	1.00		0.04	1.00		0.01	0.38		0.59	0.06		0.88
Lane Grp Cap(c), veh/h	428	726	759	563	1162	1221	289	0	0	285	0	0
V/C Ratio(X)	0.06	0.85	0.85	0.21	0.51	0.51	0.68	0.00	0.00	0.29	0.00	0.00
Avail Cap(c_a), veh/h	471	842	880	563	1162	1221	445	0	0	450	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.71	0.71	0.71	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	4.3	23.6	23.6	15.0	0.0	0.0	36.8	0.0	0.0	34.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	9.0	8.7	0.2	1.6	1.5	2.7	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	12.8	13.4	1.2	0.5	0.5	4.3	0.0	0.0	1.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	4.4	32.6	32.3	15.1	1.6	1.5	39.6	0.0	0.0	34.8	0.0	0.0
LnGrp LOS	A	C	C	B	A	A	D	A	A	C	A	A
Approach Vol, veh/h		1294			1321			195			84	
Approach Delay, s/veh		31.9			2.7			39.6			34.8	
Approach LOS		C			A			D			C	

Timer - Assigned Phs	2	3	4	6	7	8
Phs Duration (G+Y+Rc), s	17.7	28.7	43.6	17.7	6.0	66.2
Change Period (Y+Rc), s	* 4.1	* 5.8	* 5.8	* 4.1	* 4.1	* 5.8
Max Green Setting (Gmax), s	* 23	* 8.9	* 44	* 23	* 4.1	* 49
Max Q Clear Time (g_c+I1), s	12.9	2.0	31.2	6.3	2.4	2.0
Green Ext Time (p_c), s	0.8	0.1	6.6	0.3	0.0	10.3

Intersection Summary	
HCM 6th Ctrl Delay	19.2
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
5: Tern Circle & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1290	5	10	1250	5	10
Future Vol, veh/h	1290	5	10	1250	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1358	5	11	1316	5	11

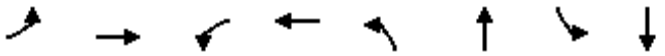
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1363	0	2041	682
Stage 1	-	-	-	-	1361	-
Stage 2	-	-	-	-	680	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	500	-	49	392
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	465	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	500	-	48	392
Mov Cap-2 Maneuver	-	-	-	-	146	-
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	455	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	20.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	251	-	-	500	-
HCM Lane V/C Ratio	0.063	-	-	0.021	-
HCM Control Delay (s)	20.3	-	-	12.4	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Queues
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023



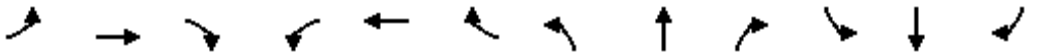
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	68	1300	95	1211	5	116	174	289
v/c Ratio	0.22	0.63	0.34	0.60	0.05	0.30	0.75	0.62
Control Delay	2.2	4.8	8.3	5.7	27.4	9.8	52.9	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.2	4.8	8.3	5.7	27.4	9.8	52.9	16.2
Queue Length 50th (ft)	2	59	1	47	2	7	94	43
Queue Length 95th (ft)	m3	104	m16	m108	11	47	154	114
Internal Link Dist (ft)		598		1107		320		616
Turn Bay Length (ft)	200		350		70		100	
Base Capacity (vph)	319	2061	306	2017	126	489	309	554
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.63	0.31	0.60	0.04	0.24	0.56	0.52

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	1230	5	90	985	165	5	15	95	165	5	270
Future Volume (veh/h)	65	1230	5	90	985	165	5	15	95	165	5	270
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	68	1295	5	95	1037	174	5	16	100	174	5	284
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	537	1483	6	468	1139	191	133	49	308	291	6	345
Arrive On Green	0.31	0.56	0.56	0.40	0.77	0.77	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1734	3535	14	1734	2965	497	1090	217	1359	1276	27	1521
Grp Volume(v), veh/h	68	634	666	95	604	607	5	0	116	174	0	289
Grp Sat Flow(s),veh/h/ln	1734	1730	1819	1734	1730	1732	1090	0	1577	1276	0	1547
Q Serve(g_s), s	0.0	28.4	28.4	0.0	24.2	24.4	0.4	0.0	5.5	11.9	0.0	16.0
Cycle Q Clear(g_c), s	0.0	28.4	28.4	0.0	24.2	24.4	16.4	0.0	5.5	17.4	0.0	16.0
Prop In Lane	1.00		0.01	1.00		0.29	1.00		0.86	1.00		0.98
Lane Grp Cap(c), veh/h	537	726	763	468	664	665	133	0	357	291	0	351
V/C Ratio(X)	0.13	0.87	0.87	0.20	0.91	0.91	0.04	0.00	0.32	0.60	0.00	0.82
Avail Cap(c_a), veh/h	537	861	905	468	882	883	173	0	415	338	0	407
HCM Platoon Ratio	1.33	1.33	1.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.83	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.9	17.8	17.8	19.6	9.2	9.3	40.9	0.0	29.1	36.3	0.0	33.1
Incr Delay (d2), s/veh	0.1	13.7	13.2	0.2	16.2	16.5	0.1	0.0	0.5	2.2	0.0	11.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	11.3	11.8	1.2	6.2	6.3	0.1	0.0	2.1	3.8	0.0	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	31.5	31.0	19.8	25.4	25.8	41.0	0.0	29.6	38.5	0.0	44.5
LnGrp LOS	C	C	C	B	C	C	D	A	C	D	A	D
Approach Vol, veh/h		1368			1306			121			463	
Approach Delay, s/veh		30.7			25.2			30.0			42.3	
Approach LOS		C			C			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		24.5	21.9	43.6		24.5	25.1	40.4				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 24	* 7.5	* 45		* 24	* 6.4	* 46				
Max Q Clear Time (g_c+I1), s		18.4	2.0	30.4		19.4	2.0	26.4				
Green Ext Time (p_c), s		0.2	0.1	7.4		1.0	0.0	8.1				

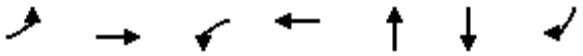
Intersection Summary	
HCM 6th Ctrl Delay	30.1
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
7: Birch Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	53	1516	316	952	547	10	100
v/c Ratio	0.16	1.05	1.14	0.57	1.15	0.02	0.18
Control Delay	11.5	59.2	120.7	19.5	119.6	22.5	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.5	59.2	120.7	19.5	119.6	22.5	1.9
Queue Length 50th (ft)	4	~476	~162	241	~348	4	0
Queue Length 95th (ft)	m28	#618	#327	267	#548	16	12
Internal Link Dist (ft)		1107		775	289	236	
Turn Bay Length (ft)	175		100				
Base Capacity (vph)	341	1440	278	1829	474	487	549
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	1.05	1.14	0.52	1.15	0.02	0.18

Intersection Summary

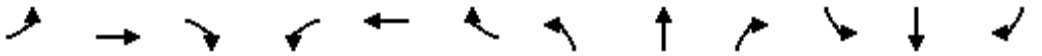
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
7: Birch Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	1310	130	300	900	5	245	20	255	5	5	95
Future Volume (veh/h)	50	1310	130	300	900	5	245	20	255	5	5	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1850	1807	1850	1850	1807	1850	1850	1850	1850	1850	1850	1807
Adj Flow Rate, veh/h	53	1379	137	316	947	5	258	21	268	5	5	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	3	0	0	3	0	0	0	0	0	0	3
Cap, veh/h	470	1339	132	293	1176	6	260	16	208	225	207	458
Arrive On Green	0.25	0.56	0.56	0.12	0.34	0.34	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1762	3155	312	1762	3501	18	671	55	698	553	691	1531
Grp Volume(v), veh/h	53	747	769	316	464	488	547	0	0	10	0	100
Grp Sat Flow(s),veh/h/ln	1762	1716	1751	1762	1716	1803	1424	0	0	1244	0	1531
Q Serve(g_s), s	0.0	38.2	38.2	10.9	22.2	22.2	26.6	0.0	0.0	0.0	0.0	4.4
Cycle Q Clear(g_c), s	0.0	38.2	38.2	10.9	22.2	22.2	26.9	0.0	0.0	0.3	0.0	4.4
Prop In Lane	1.00		0.18	1.00		0.01	0.47		0.49	0.50		1.00
Lane Grp Cap(c), veh/h	470	729	743	293	576	606	484	0	0	432	0	458
V/C Ratio(X)	0.11	1.03	1.04	1.08	0.81	0.81	1.13	0.00	0.00	0.02	0.00	0.22
Avail Cap(c_a), veh/h	470	729	743	293	858	902	484	0	0	432	0	458
HCM Platoon Ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.72	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.4	19.6	19.6	26.9	27.2	27.2	33.3	0.0	0.0	22.2	0.0	23.7
Incr Delay (d2), s/veh	0.1	34.9	37.5	74.6	11.4	10.9	81.4	0.0	0.0	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	18.3	19.2	9.0	10.4	10.9	21.8	0.0	0.0	0.2	0.0	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.5	54.5	57.1	101.5	38.7	38.2	114.7	0.0	0.0	22.3	0.0	23.9
LnGrp LOS	C	F	F	F	D	D	F	A	A	C	A	C
Approach Vol, veh/h		1569			1268			547			110	
Approach Delay, s/veh		54.7			54.1			114.7			23.8	
Approach LOS		D			D			F			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		31.0	15.0	44.0		31.0	23.0	36.0				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 5.8	* 5.8				
Max Green Setting (Gmax), s		* 27	* 11	* 38		* 27	* 4.1	* 45				
Max Q Clear Time (g_c+I1), s		28.9	12.9	40.2		6.4	2.0	24.2				
Green Ext Time (p_c), s		0.0	0.0	0.0		0.3	0.0	6.1				

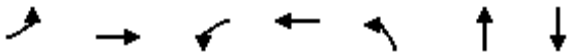
Intersection Summary	
HCM 6th Ctrl Delay	62.9
HCM 6th LOS	E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
14: Devin Drive & Sterling Highway

06/28/2023



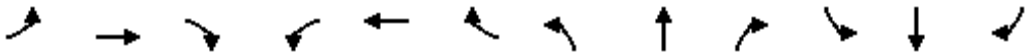
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	4	981	17	525	302	38	23
v/c Ratio	0.01	0.81	0.07	0.45	0.51	0.05	0.03
Control Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Length 50th (ft)	1	125	3	68	68	1	3
Queue Length 95th (ft)	5	#274	13	130	166	17	17
Internal Link Dist (ft)		909		895		264	217
Turn Bay Length (ft)							
Base Capacity (vph)	358	1246	233	1217	593	713	746
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.79	0.07	0.43	0.51	0.05	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
14: Devin Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Future Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	4	636	345	17	524	1	302	5	33	7	12	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	694	376	167	1190	2	689	84	557	240	388	116
Arrive On Green	0.00	0.32	0.32	0.02	0.34	0.34	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1734	2165	1175	1734	3543	7	1397	207	1368	402	951	285
Grp Volume(v), veh/h	4	508	473	17	256	269	302	0	38	23	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1610	1734	1730	1820	1397	0	1575	1637	0	0
Q Serve(g_s), s	0.1	17.5	17.5	0.4	7.1	7.1	9.5	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	17.5	17.5	0.4	7.1	7.1	10.0	0.0	0.9	0.5	0.0	0.0
Prop In Lane	1.00		0.73	1.00		0.00	1.00		0.87	0.30		0.17
Lane Grp Cap(c), veh/h	317	554	516	167	581	611	689	0	642	743	0	0
V/C Ratio(X)	0.01	0.92	0.92	0.10	0.44	0.44	0.44	0.00	0.06	0.03	0.00	0.00
Avail Cap(c_a), veh/h	422	560	521	250	581	611	689	0	642	743	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.4	20.2	20.2	16.3	16.0	16.0	13.8	0.0	11.1	11.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	19.9	21.0	0.3	0.5	0.5	2.0	0.0	0.2	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.4	8.9	0.2	2.6	2.8	2.7	0.0	0.3	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	40.2	41.2	16.5	16.5	16.5	15.8	0.0	11.3	11.1	0.0	0.0
LnGrp LOS	B	D	D	B	B	B	B	A	B	B	A	A
Approach Vol, veh/h		985			542			340			23	
Approach Delay, s/veh		40.6			16.5			15.3			11.1	
Approach LOS		D			B			B			B	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		30.4	5.6	25.8		30.4	4.7	26.8				
Change Period (Y+Rc), s		* 5.2	* 4.6	6.0		* 5.2	* 4.4	6.0				
Max Green Setting (Gmax), s		* 25	* 4	20.0		* 25	* 4	20.2				
Max Q Clear Time (g_c+I1), s		12.0	2.4	19.5		2.5	2.1	9.1				
Green Ext Time (p_c), s		0.8	0.0	0.3		0.0	0.0	2.4				

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
1: Riverside Drive & Sterling Highway

06/28/2023

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	68	948	168	1115	274	284
v/c Ratio	0.23	0.57	0.45	0.60	1.00	0.54
Control Delay	9.6	20.2	13.5	12.0	80.4	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	20.2	13.5	12.0	80.4	14.1
Queue Length 50th (ft)	13	201	12	79	130	49
Queue Length 95th (ft)	35	310	m66	255	#251	111
Internal Link Dist (ft)		804		476	311	453
Turn Bay Length (ft)	300		300			
Base Capacity (vph)	293	1662	406	1851	351	639
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.57	0.41	0.60	0.78	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
1: Riverside Drive & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	885	15	160	1015	45	115	30	115	25	5	240
Future Volume (veh/h)	65	885	15	160	1015	45	115	30	115	25	5	240
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	68	932	16	168	1068	47	121	32	121	26	5	253
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	419	1104	19	546	1841	81	177	55	137	66	24	378
Arrive On Green	0.04	0.32	0.32	0.49	1.00	1.00	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1734	3481	60	1734	3376	149	453	208	522	85	91	1439
Grp Volume(v), veh/h	68	463	485	168	547	568	274	0	0	284	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1810	1734	1730	1794	1183	0	0	1615	0	0
Q Serve(g_s), s	1.5	22.5	22.5	0.0	0.0	0.0	6.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.5	22.5	22.5	0.0	0.0	0.0	20.5	0.0	0.0	14.3	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.08	0.44		0.44	0.09		0.89
Lane Grp Cap(c), veh/h	419	549	574	546	944	979	368	0	0	468	0	0
V/C Ratio(X)	0.16	0.84	0.84	0.31	0.58	0.58	0.74	0.00	0.00	0.61	0.00	0.00
Avail Cap(c_a), veh/h	450	657	688	546	944	979	477	0	0	590	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.2	28.6	28.6	16.5	0.0	0.0	32.1	0.0	0.0	29.8	0.0	0.0
Incr Delay (d2), s/veh	0.2	14.7	14.1	0.3	2.6	2.5	4.5	0.0	0.0	1.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	11.1	11.5	1.8	0.7	0.7	6.1	0.0	0.0	5.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.4	43.3	42.8	16.9	2.6	2.5	36.7	0.0	0.0	31.1	0.0	0.0
LnGrp LOS	A	D	D	B	A	A	D	A	A	C	A	A
Approach Vol, veh/h		1016			1283			274			284	
Approach Delay, s/veh		40.7			4.4			36.7			31.1	
Approach LOS		D			A			D			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		27.7	27.9	34.4		27.7	7.4	54.9				
Change Period (Y+Rc), s		* 4.1	* 5.8	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 31	* 11	* 34		* 31	* 4.9	* 40				
Max Q Clear Time (g_c+I1), s		22.5	2.0	24.5		16.3	3.5	2.0				
Green Ext Time (p_c), s		1.1	0.3	4.1		1.6	0.0	8.9				

Intersection Summary	
HCM 6th Ctrl Delay	23.1
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
2: New Street & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	950	75	180	1180	40	125
Future Vol, veh/h	950	75	180	1180	40	125
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1000	79	189	1242	42	132

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1079	0	2039	540
Stage 1	-	-	-	-	1040	-
Stage 2	-	-	-	-	999	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	642	-	49	486
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	317	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	642	-	~ 35	486
Mov Cap-2 Maneuver	-	-	-	-	133	-
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	224	-

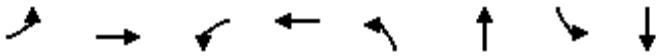
Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	33.1
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	296	-	-	642	-
HCM Lane V/C Ratio	0.587	-	-	0.295	-
HCM Control Delay (s)	33.1	-	-	12.9	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	3.5	-	-	1.2	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Queues
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	53	1079	195	1153	105	211	47	237
v/c Ratio	0.15	0.58	0.49	0.53	0.93	0.49	0.35	0.54
Control Delay	2.8	5.0	14.2	3.4	102.8	10.9	37.1	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.8	5.0	14.2	3.4	102.8	10.9	37.1	12.3
Queue Length 50th (ft)	3	57	29	51	59	15	24	22
Queue Length 95th (ft)	m7	77	94	43	#128	68	52	79
Internal Link Dist (ft)		216		658		420		423
Turn Bay Length (ft)	100		100		20		30	
Base Capacity (vph)	351	1870	457	2157	167	553	197	553
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.58	0.43	0.53	0.63	0.38	0.24	0.43

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	1015	10	185	1040	55	100	30	170	45	5	220
Future Volume (veh/h)	50	1015	10	185	1040	55	100	30	170	45	5	220
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	53	1068	11	195	1095	58	105	32	179	47	5	232
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	530	1258	13	529	1221	65	212	60	336	238	8	380
Arrive On Green	0.23	0.36	0.36	0.47	0.73	0.73	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1734	3509	36	1734	3342	177	1143	240	1340	1171	33	1516
Grp Volume(v), veh/h	53	527	552	195	567	586	105	0	211	47	0	237
Grp Sat Flow(s),veh/h/ln	1734	1730	1815	1734	1730	1789	1143	0	1580	1171	0	1548
Q Serve(g_s), s	0.0	25.3	25.3	0.0	23.0	23.1	8.1	0.0	10.4	3.3	0.0	12.2
Cycle Q Clear(g_c), s	0.0	25.3	25.3	0.0	23.0	23.1	20.2	0.0	10.4	13.7	0.0	12.2
Prop In Lane	1.00		0.02	1.00		0.10	1.00		0.85	1.00		0.98
Lane Grp Cap(c), veh/h	530	620	651	529	632	654	212	0	396	238	0	388
V/C Ratio(X)	0.10	0.85	0.85	0.37	0.90	0.90	0.50	0.00	0.53	0.20	0.00	0.61
Avail Cap(c_a), veh/h	530	732	768	529	888	918	230	0	421	257	0	413
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.85	0.85	0.85	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.1	26.6	26.6	17.5	10.8	10.8	38.8	0.0	29.2	35.1	0.0	29.8
Incr Delay (d2), s/veh	0.1	13.6	13.0	0.4	15.7	15.3	1.8	0.0	1.1	0.4	0.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	12.1	12.6	2.2	6.3	6.5	2.3	0.0	4.0	0.9	0.0	4.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.2	40.2	39.6	17.9	26.5	26.1	40.6	0.0	30.3	35.5	0.0	32.2
LnGrp LOS	C	D	D	B	C	C	D	A	C	D	A	C
Approach Vol, veh/h		1132			1348			316			284	
Approach Delay, s/veh		39.1			25.1			33.7			32.8	
Approach LOS		D			C			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		26.6	25.3	38.1		26.6	24.7	38.7				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 24	* 14	* 38		* 24	* 5.8	* 46				
Max Q Clear Time (g_c+I1), s		22.2	2.0	27.3		15.7	2.0	25.1				
Green Ext Time (p_c), s		0.3	0.4	5.0		1.0	0.0	7.8				

Intersection Summary	
HCM 6th Ctrl Delay	31.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
4: Warehouse Drive & Sterling Highway

06/28/2023

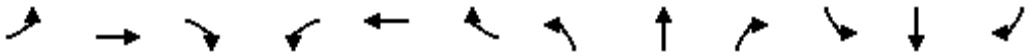
Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	26	1268	116	1205	195	84
v/c Ratio	0.07	0.58	0.34	0.51	0.73	0.29
Control Delay	1.5	3.9	8.6	10.9	36.4	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.5	3.9	8.6	10.9	36.4	12.0
Queue Length 50th (ft)	1	58	13	105	63	5
Queue Length 95th (ft)	m1	77	m67	408	124	41
Internal Link Dist (ft)		658		119	352	525
Turn Bay Length (ft)	300		300			
Base Capacity (vph)	358	2190	365	2384	418	461
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.58	0.32	0.51	0.47	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
4: Warehouse Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	1180	25	110	1140	5	70	5	110	5	5	70
Future Volume (veh/h)	25	1180	25	110	1140	5	70	5	110	5	5	70
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	26	1242	26	116	1200	5	74	5	116	5	5	74
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	547	2254	47	438	1529	6	131	19	139	48	24	214
Arrive On Green	0.48	1.00	1.00	0.01	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1734	3466	73	1734	3534	15	500	124	917	35	156	1411
Grp Volume(v), veh/h	26	620	648	116	587	618	195	0	0	84	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1808	1734	1730	1818	1541	0	0	1602	0	0
Q Serve(g_s), s	0.0	0.0	0.0	1.9	29.5	29.5	6.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	1.9	29.5	29.5	10.9	0.0	0.0	4.3	0.0	0.0
Prop In Lane	1.00		0.04	1.00		0.01	0.38		0.59	0.06		0.88
Lane Grp Cap(c), veh/h	547	1125	1176	438	748	787	289	0	0	285	0	0
V/C Ratio(X)	0.05	0.55	0.55	0.26	0.78	0.79	0.68	0.00	0.00	0.29	0.00	0.00
Avail Cap(c_a), veh/h	547	1125	1176	536	934	982	445	0	0	450	0	0
HCM Platoon Ratio	2.00	2.00	2.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.80	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.6	0.0	0.0	4.7	34.5	34.5	36.8	0.0	0.0	34.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.6	1.5	0.3	8.1	7.7	2.7	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.5	0.5	0.6	15.2	15.9	4.3	0.0	0.0	1.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	1.6	1.5	5.0	42.6	42.3	39.6	0.0	0.0	34.8	0.0	0.0
LnGrp LOS	B	A	A	A	D	D	D	A	A	C	A	A
Approach Vol, veh/h		1294			1321			195			84	
Approach Delay, s/veh		1.8			39.2			39.6			34.8	
Approach LOS		A			D			D			C	

Timer - Assigned Phs	2	3	4	6	7	8
Phs Duration (G+Y+Rc), s	17.7	7.9	64.3	17.7	27.5	44.7
Change Period (Y+Rc), s	* 4.1	* 4.1	* 5.8	* 4.1	* 5.8	* 5.8
Max Green Setting (Gmax), s	* 23	* 8.9	* 44	* 23	* 4.1	* 49
Max Q Clear Time (g_c+I1), s	12.9	3.9	2.0	6.3	2.0	31.5
Green Ext Time (p_c), s	0.8	0.1	11.1	0.3	0.0	7.4

Intersection Summary	
HCM 6th Ctrl Delay	22.3
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
5: Tern Circle & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1290	5	10	1250	5	10
Future Vol, veh/h	1290	5	10	1250	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1358	5	11	1316	5	11

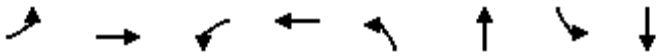
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1363	0	2041	682
Stage 1	-	-	-	-	1361	-
Stage 2	-	-	-	-	680	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	500	-	49	392
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	465	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	500	-	48	392
Mov Cap-2 Maneuver	-	-	-	-	146	-
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	455	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	20.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	251	-	-	500	-
HCM Lane V/C Ratio	0.063	-	-	0.021	-
HCM Control Delay (s)	20.3	-	-	12.4	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Queues
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023



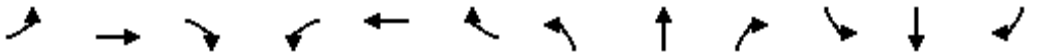
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	68	1300	95	1211	5	116	174	289
v/c Ratio	0.22	0.63	0.34	0.60	0.05	0.30	0.75	0.61
Control Delay	3.0	5.4	7.0	6.7	27.4	9.8	52.9	14.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	5.4	7.0	6.7	27.4	9.8	52.9	14.6
Queue Length 50th (ft)	5	92	6	49	2	7	94	37
Queue Length 95th (ft)	m2	47	m11	m112	11	47	154	106
Internal Link Dist (ft)		598		1107		320		616
Turn Bay Length (ft)	200		350		70		100	
Base Capacity (vph)	310	2061	303	2026	126	489	309	564
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.63	0.31	0.60	0.04	0.24	0.56	0.51

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	1230	5	90	985	165	5	15	95	165	5	270
Future Volume (veh/h)	65	1230	5	90	985	165	5	15	95	165	5	270
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	68	1295	5	95	1037	174	5	16	100	174	5	284
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	411	1547	6	400	1724	289	133	49	308	291	6	345
Arrive On Green	0.02	0.29	0.29	0.32	1.00	1.00	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1734	3535	14	1734	2965	497	1090	217	1359	1276	27	1521
Grp Volume(v), veh/h	68	634	666	95	604	607	5	0	116	174	0	289
Grp Sat Flow(s),veh/h/ln	1734	1730	1819	1734	1730	1732	1090	0	1577	1276	0	1547
Q Serve(g_s), s	1.4	30.9	30.9	0.0	0.0	0.0	0.4	0.0	5.5	11.9	0.0	16.0
Cycle Q Clear(g_c), s	1.4	30.9	30.9	0.0	0.0	0.0	16.4	0.0	5.5	17.4	0.0	16.0
Prop In Lane	1.00		0.01	1.00		0.29	1.00		0.86	1.00		0.98
Lane Grp Cap(c), veh/h	411	757	796	400	1006	1007	133	0	357	291	0	351
V/C Ratio(X)	0.17	0.84	0.84	0.24	0.60	0.60	0.04	0.00	0.32	0.60	0.00	0.82
Avail Cap(c_a), veh/h	472	861	905	400	1006	1007	173	0	415	338	0	407
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.83	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.9	28.8	28.8	23.8	0.0	0.0	40.9	0.0	29.1	36.3	0.0	33.1
Incr Delay (d2), s/veh	0.2	10.7	10.2	0.3	2.2	2.2	0.1	0.0	0.5	2.2	0.0	11.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	15.3	16.0	1.4	0.6	0.6	0.1	0.0	2.1	3.8	0.0	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.1	39.4	39.0	24.0	2.2	2.2	41.0	0.0	29.6	38.5	0.0	44.5
LnGrp LOS	A	D	D	C	A	A	D	A	C	D	A	D
Approach Vol, veh/h		1368			1306			121			463	
Approach Delay, s/veh		37.6			3.8			30.0			42.3	
Approach LOS		D			A			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		24.5	20.3	45.2		24.5	7.4	58.1				
Change Period (Y+Rc), s		* 4.1	* 5.8	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 24	* 7.5	* 45		* 24	* 6.4	* 46				
Max Q Clear Time (g_c+I1), s		18.4	2.0	32.9		19.4	3.4	2.0				
Green Ext Time (p_c), s		0.2	0.1	6.5		1.0	0.0	10.6				

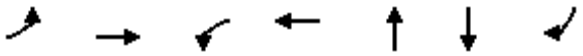
Intersection Summary												
HCM 6th Ctrl Delay			24.4									
HCM 6th LOS			C									

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
7: Birch Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	53	1516	316	952	547	10	100
v/c Ratio	0.16	1.05	1.14	0.57	1.15	0.02	0.18
Control Delay	5.2	57.5	120.7	19.5	119.6	22.5	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.2	57.5	120.7	19.5	119.6	22.5	1.9
Queue Length 50th (ft)	4	~506	~162	241	~348	4	0
Queue Length 95th (ft)	m11	#616	#327	267	#548	16	12
Internal Link Dist (ft)		1107		775	289	236	
Turn Bay Length (ft)	175		100				
Base Capacity (vph)	341	1440	278	1829	474	487	549
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	1.05	1.14	0.52	1.15	0.02	0.18

Intersection Summary

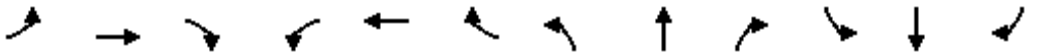
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
7: Birch Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	1310	130	300	900	5	245	20	255	5	5	95
Future Volume (veh/h)	50	1310	130	300	900	5	245	20	255	5	5	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1850	1807	1850	1850	1807	1850	1850	1850	1850	1850	1850	1807
Adj Flow Rate, veh/h	53	1379	137	316	947	5	258	21	268	5	5	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	3	0	0	3	0	0	0	0	0	0	3
Cap, veh/h	470	1339	132	293	1176	6	260	16	208	225	207	458
Arrive On Green	0.38	0.85	0.85	0.12	0.34	0.34	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1762	3155	312	1762	3501	18	671	55	698	553	691	1531
Grp Volume(v), veh/h	53	747	769	316	464	488	547	0	0	10	0	100
Grp Sat Flow(s),veh/h/ln	1762	1716	1751	1762	1716	1803	1424	0	0	1244	0	1531
Q Serve(g_s), s	0.0	38.2	38.2	10.9	22.2	22.2	26.6	0.0	0.0	0.0	0.0	4.4
Cycle Q Clear(g_c), s	0.0	38.2	38.2	10.9	22.2	22.2	26.9	0.0	0.0	0.3	0.0	4.4
Prop In Lane	1.00		0.18	1.00		0.01	0.47		0.49	0.50		1.00
Lane Grp Cap(c), veh/h	470	729	743	293	576	606	484	0	0	432	0	458
V/C Ratio(X)	0.11	1.03	1.04	1.08	0.81	0.81	1.13	0.00	0.00	0.02	0.00	0.22
Avail Cap(c_a), veh/h	470	729	743	293	858	902	484	0	0	432	0	458
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.72	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.1	6.8	6.8	26.9	27.2	27.2	33.3	0.0	0.0	22.2	0.0	23.7
Incr Delay (d2), s/veh	0.1	34.9	37.5	74.6	11.4	10.9	81.4	0.0	0.0	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	9.5	10.2	9.0	10.4	10.9	21.8	0.0	0.0	0.2	0.0	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.2	41.7	44.3	101.5	38.7	38.2	114.7	0.0	0.0	22.3	0.0	23.9
LnGrp LOS	B	F	F	F	D	D	F	A	A	C	A	C
Approach Vol, veh/h		1569			1268			547			110	
Approach Delay, s/veh		42.2			54.1			114.7			23.8	
Approach LOS		D			D			F			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		31.0	15.0	44.0		31.0	23.0	36.0				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 5.8	* 5.8				
Max Green Setting (Gmax), s		* 27	* 11	* 38		* 27	* 4.1	* 45				
Max Q Clear Time (g_c+I1), s		28.9	12.9	40.2		6.4	2.0	24.2				
Green Ext Time (p_c), s		0.0	0.0	0.0		0.3	0.0	6.1				

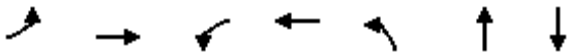
Intersection Summary	
HCM 6th Ctrl Delay	57.3
HCM 6th LOS	E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
14: Devin Drive & Sterling Highway

06/28/2023



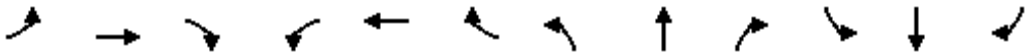
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	4	981	17	525	302	38	23
v/c Ratio	0.01	0.81	0.07	0.45	0.51	0.05	0.03
Control Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Length 50th (ft)	1	125	3	68	68	1	3
Queue Length 95th (ft)	5	#274	13	130	166	17	17
Internal Link Dist (ft)		909		895		264	217
Turn Bay Length (ft)							
Base Capacity (vph)	358	1246	233	1217	593	713	746
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.79	0.07	0.43	0.51	0.05	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
14: Devin Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Future Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	4	636	345	17	524	1	302	5	33	7	12	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	694	376	167	1190	2	689	84	557	240	388	116
Arrive On Green	0.00	0.32	0.32	0.02	0.34	0.34	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1734	2165	1175	1734	3543	7	1397	207	1368	402	951	285
Grp Volume(v), veh/h	4	508	473	17	256	269	302	0	38	23	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1610	1734	1730	1820	1397	0	1575	1637	0	0
Q Serve(g_s), s	0.1	17.5	17.5	0.4	7.1	7.1	9.5	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	17.5	17.5	0.4	7.1	7.1	10.0	0.0	0.9	0.5	0.0	0.0
Prop In Lane	1.00		0.73	1.00		0.00	1.00		0.87	0.30		0.17
Lane Grp Cap(c), veh/h	317	554	516	167	581	611	689	0	642	743	0	0
V/C Ratio(X)	0.01	0.92	0.92	0.10	0.44	0.44	0.44	0.00	0.06	0.03	0.00	0.00
Avail Cap(c_a), veh/h	422	560	521	250	581	611	689	0	642	743	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.4	20.2	20.2	16.3	16.0	16.0	13.8	0.0	11.1	11.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	19.9	21.0	0.3	0.5	0.5	2.0	0.0	0.2	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.4	8.9	0.2	2.6	2.8	2.7	0.0	0.3	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	40.2	41.2	16.5	16.5	16.5	15.8	0.0	11.3	11.1	0.0	0.0
LnGrp LOS	B	D	D	B	B	B	B	A	B	B	A	A
Approach Vol, veh/h		985			542			340			23	
Approach Delay, s/veh		40.6			16.5			15.3			11.1	
Approach LOS		D			B			B			B	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		30.4	5.6	25.8		30.4	4.7	26.8				
Change Period (Y+Rc), s		* 5.2	* 4.6	6.0		* 5.2	* 4.4	6.0				
Max Green Setting (Gmax), s		* 25	* 4	20.0		* 25	* 4	20.2				
Max Q Clear Time (g_c+I1), s		12.0	2.4	19.5		2.5	2.1	9.1				
Green Ext Time (p_c), s		0.8	0.0	0.3		0.0	0.0	2.4				

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
1: Riverside Drive & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	65	885	15	160	1130	45	2	1	115	1	1	240
Future Vol, veh/h	65	885	15	160	1130	45	2	1	115	1	1	240
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	68	932	16	168	1189	47	2	1	121	1	1	253

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1236	0	0	948	0	0	2007	2648	474	2152	2633	618
Stage 1	-	-	-	-	-	-	1076	1076	-	1549	1549	-
Stage 2	-	-	-	-	-	-	931	1572	-	603	1084	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	559	-	-	720	-	-	35	23	537	27	23	432
Stage 1	-	-	-	-	-	-	234	294	-	119	174	-
Stage 2	-	-	-	-	-	-	287	169	-	453	291	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	559	-	-	720	-	-	10	15	537	15	15	432
Mov Cap-2 Maneuver	-	-	-	-	-	-	10	15	-	15	15	-
Stage 1	-	-	-	-	-	-	205	258	-	104	133	-
Stage 2	-	-	-	-	-	-	91	130	-	307	255	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	1.4	33.9	38.2
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	245	559	-	-	720	-	-	351
HCM Lane V/C Ratio	0.507	0.122	-	-	0.234	-	-	0.726
HCM Control Delay (s)	33.9	12.3	-	-	11.5	-	-	38.2
HCM Lane LOS	D	B	-	-	B	-	-	E
HCM 95th %tile Q(veh)	2.6	0.4	-	-	0.9	-	-	5.5

HCM 6th TWSC
2: New Street & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	925	75	180	1295	40	125
Future Vol, veh/h	925	75	180	1295	40	125
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	974	79	189	1363	42	132

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1053	0	2074	527
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	1060	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	657	-	46	496
Stage 1	-	-	-	-	311	-
Stage 2	-	-	-	-	294	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	657	-	~ 33	496
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	311	-
Stage 2	-	-	-	-	209	-

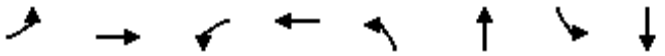
Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	33.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	292	-	-	657	-
HCM Lane V/C Ratio	0.595	-	-	0.288	-
HCM Control Delay (s)	33.9	-	-	12.7	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	3.6	-	-	1.2	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Queues
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	53	1053	195	1079	300	247	74	237
v/c Ratio	0.22	0.79	0.72	0.66	0.94	0.38	0.24	0.37
Control Delay	11.3	28.0	34.9	11.2	64.6	9.3	20.4	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	28.0	34.9	11.2	64.6	9.3	20.4	8.0
Queue Length 50th (ft)	12	248	37	127	138	31	25	23
Queue Length 95th (ft)	28	#336	m#139	173	#286	83	57	72
Internal Link Dist (ft)		216		658		420		423
Turn Bay Length (ft)	100		100		20		30	
Base Capacity (vph)	238	1329	273	1635	342	682	333	666
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.79	0.71	0.66	0.88	0.36	0.22	0.36

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
3: Lovers Lane/Kobuk Street & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	990	10	185	970	55	285	65	170	70	5	220
Future Volume (veh/h)	50	990	10	185	970	55	285	65	170	70	5	220
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	53	1042	11	195	1021	58	300	68	179	74	5	232
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	231	1306	14	306	1428	81	371	160	422	368	12	548
Arrive On Green	0.03	0.37	0.37	0.06	0.29	0.29	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1734	3508	37	1734	3328	189	1143	444	1167	1133	33	1516
Grp Volume(v), veh/h	53	514	539	195	531	548	300	0	247	74	0	237
Grp Sat Flow(s),veh/h/ln	1734	1730	1814	1734	1730	1787	1143	0	1611	1133	0	1548
Q Serve(g_s), s	1.4	21.2	21.2	5.4	22.0	22.0	19.7	0.0	9.3	4.2	0.0	9.2
Cycle Q Clear(g_c), s	1.4	21.2	21.2	5.4	22.0	22.0	28.9	0.0	9.3	13.5	0.0	9.2
Prop In Lane	1.00		0.02	1.00		0.11	1.00		0.72	1.00		0.98
Lane Grp Cap(c), veh/h	231	644	675	306	742	767	371	0	582	368	0	559
V/C Ratio(X)	0.23	0.80	0.80	0.64	0.71	0.71	0.81	0.00	0.42	0.20	0.00	0.42
Avail Cap(c_a), veh/h	259	644	675	319	742	767	371	0	582	368	0	559
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.2	22.4	22.4	17.8	24.1	24.1	30.8	0.0	19.3	24.4	0.0	19.3
Incr Delay (d2), s/veh	0.5	10.0	9.5	4.0	5.8	5.6	12.5	0.0	0.5	0.3	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	9.7	10.1	2.3	10.4	10.7	6.9	0.0	3.4	1.1	0.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.7	32.4	32.0	21.8	29.9	29.7	43.3	0.0	19.8	24.6	0.0	19.8
LnGrp LOS	B	C	C	C	C	C	D	A	B	C	A	B
Approach Vol, veh/h		1106			1274			547			311	
Approach Delay, s/veh		31.4			28.6			32.7			20.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		33.0	11.4	35.6		33.0	6.9	40.1				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 29	* 7.9	* 29		* 29	* 4.1	* 33				
Max Q Clear Time (g_c+I1), s		30.9	7.4	23.2		15.5	3.4	24.0				
Green Ext Time (p_c), s		0.0	0.0	3.2		1.5	0.0	4.4				

Intersection Summary	
HCM 6th Ctrl Delay	29.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
4: Warehouse Drive & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	1185	25	110	1140	5	2	1	110	2	1	70
Future Vol, veh/h	25	1185	25	110	1140	5	2	1	110	2	1	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	1247	26	116	1200	5	2	1	116	2	1	74

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1205	0	0	1273	0	0	2145	2749	637	2111	2760	603
Stage 1	-	-	-	-	-	-	1312	1312	-	1435	1435	-
Stage 2	-	-	-	-	-	-	833	1437	-	676	1325	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	575	-	-	541	-	-	27	20	420	29	19	442
Stage 1	-	-	-	-	-	-	167	227	-	140	197	-
Stage 2	-	-	-	-	-	-	329	197	-	409	223	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	575	-	-	541	-	-	17	15	420	16	14	442
Mov Cap-2 Maneuver	-	-	-	-	-	-	17	15	-	16	14	-
Stage 1	-	-	-	-	-	-	159	217	-	134	155	-
Stage 2	-	-	-	-	-	-	214	155	-	281	213	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.2	31.2	32.5
HCM LOS			D	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	253	575	-	-	541	-	-	206
HCM Lane V/C Ratio	0.47	0.046	-	-	0.214	-	-	0.373
HCM Control Delay (s)	31.2	11.6	-	-	13.5	-	-	32.5
HCM Lane LOS	D	B	-	-	B	-	-	D
HCM 95th %tile Q(veh)	2.3	0.1	-	-	0.8	-	-	1.6

HCM 6th TWSC
5: Tern Circle & Sterling Highway

06/28/2023

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1290	5	10	1250	5	10
Future Vol, veh/h	1290	5	10	1250	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1358	5	11	1316	5	11

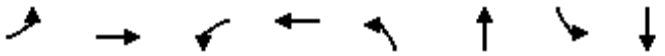
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1363	0	2041	682
Stage 1	-	-	-	-	1361	-
Stage 2	-	-	-	-	680	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	500	-	49	392
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	465	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	500	-	48	392
Mov Cap-2 Maneuver	-	-	-	-	146	-
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	455	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	20.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	251	-	-	500	-
HCM Lane V/C Ratio	0.063	-	-	0.021	-
HCM Control Delay (s)	20.3	-	-	12.4	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Queues
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	68	1300	95	1211	5	116	174	289
v/c Ratio	0.23	0.66	0.36	0.63	0.04	0.29	0.69	0.61
Control Delay	4.1	6.8	7.9	7.2	22.8	8.7	42.9	14.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.1	6.8	7.9	7.2	22.8	8.7	42.9	14.9
Queue Length 50th (ft)	2	58	4	51	2	6	81	40
Queue Length 95th (ft)	m4	370	m12	m116	10	42	133	103
Internal Link Dist (ft)		598		1107		320		616
Turn Bay Length (ft)	200		350		70		100	
Base Capacity (vph)	296	1978	264	1924	159	531	354	588
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.66	0.36	0.63	0.03	0.22	0.49	0.49

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
6: Binkley Circle/Binkley Street & Sterling Highway

06/28/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	1230	5	90	985	165	5	15	95	165	5	270
Future Volume (veh/h)	65	1230	5	90	985	165	5	15	95	165	5	270
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	68	1295	5	95	1037	174	5	16	100	174	5	284
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	333	1399	5	441	1641	275	152	51	316	309	6	354
Arrive On Green	0.08	0.79	0.79	0.23	0.74	0.74	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1734	3535	14	1734	2965	497	1090	217	1359	1276	27	1521
Grp Volume(v), veh/h	68	634	666	95	604	607	5	0	116	174	0	289
Grp Sat Flow(s),veh/h/ln	1734	1730	1819	1734	1730	1732	1090	0	1577	1276	0	1547
Q Serve(g_s), s	1.3	22.8	22.9	0.0	13.8	13.9	0.3	0.0	4.9	10.5	0.0	14.1
Cycle Q Clear(g_c), s	1.3	22.8	22.9	0.0	13.8	13.9	14.4	0.0	4.9	15.3	0.0	14.1
Prop In Lane	1.00		0.01	1.00		0.29	1.00		0.86	1.00		0.98
Lane Grp Cap(c), veh/h	333	685	720	441	957	958	152	0	367	309	0	360
V/C Ratio(X)	0.20	0.93	0.93	0.22	0.63	0.63	0.03	0.00	0.32	0.56	0.00	0.80
Avail Cap(c_a), veh/h	372	813	855	441	957	958	215	0	459	384	0	451
HCM Platoon Ratio	2.00	2.00	2.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.83	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.0	7.4	7.4	23.1	6.5	6.5	35.8	0.0	25.4	31.8	0.0	29.0
Incr Delay (d2), s/veh	0.3	20.3	19.6	0.2	2.6	2.6	0.1	0.0	0.5	1.6	0.0	8.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	6.4	6.6	1.4	3.8	3.8	0.1	0.0	1.8	3.3	0.0	5.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.3	27.8	27.0	23.3	9.2	9.2	35.9	0.0	25.9	33.4	0.0	37.1
LnGrp LOS	A	C	C	C	A	A	D	A	C	C	A	D
Approach Vol, veh/h		1368			1306			121			463	
Approach Delay, s/veh		26.4			10.2			26.3			35.7	
Approach LOS		C			B			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		22.7	19.8	37.5		22.7	7.2	50.1				
Change Period (Y+Rc), s		* 4.1	* 5.8	* 5.8		* 4.1	* 4.1	* 5.8				
Max Green Setting (Gmax), s		* 23	* 5.1	* 38		* 23	* 4.9	* 38				
Max Q Clear Time (g_c+I1), s		16.4	2.0	24.9		17.3	3.3	15.9				
Green Ext Time (p_c), s		0.3	0.1	6.8		1.3	0.0	8.6				

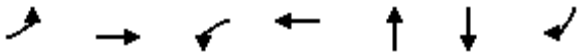
Intersection Summary												
HCM 6th Ctrl Delay			21.2									
HCM 6th LOS			C									

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
7: Birch Street & Sterling Highway

06/28/2023



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	53	1516	316	952	547	10	100
v/c Ratio	0.16	1.08	1.16	0.58	1.14	0.02	0.18
Control Delay	7.8	62.2	127.6	17.6	112.7	20.1	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	62.2	127.6	17.6	112.7	20.1	1.2
Queue Length 50th (ft)	3	~427	~141	210	~302	4	0
Queue Length 95th (ft)	m16	#564	#298	237	#495	15	6
Internal Link Dist (ft)		1107		775	289	236	
Turn Bay Length (ft)	175		100				
Base Capacity (vph)	324	1409	272	1760	479	488	562
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	1.08	1.16	0.54	1.14	0.02	0.18

Intersection Summary

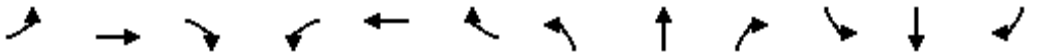
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
7: Birch Street & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	1310	130	300	900	5	245	20	255	5	5	95
Future Volume (veh/h)	50	1310	130	300	900	5	245	20	255	5	5	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1850	1807	1850	1850	1807	1850	1850	1850	1850	1850	1850	1807
Adj Flow Rate, veh/h	53	1379	137	316	947	5	258	21	268	5	5	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	3	0	0	3	0	0	0	0	0	0	3
Cap, veh/h	439	1309	129	286	1186	6	267	16	208	232	211	457
Arrive On Green	0.22	0.55	0.55	0.11	0.34	0.34	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1762	3155	312	1762	3501	18	671	55	698	551	706	1531
Grp Volume(v), veh/h	53	747	769	316	464	488	547	0	0	10	0	100
Grp Sat Flow(s),veh/h/ln	1762	1716	1751	1762	1716	1803	1424	0	0	1257	0	1531
Q Serve(g_s), s	0.0	33.2	33.2	8.9	19.6	19.6	23.6	0.0	0.0	0.0	0.0	3.9
Cycle Q Clear(g_c), s	0.0	33.2	33.2	8.9	19.6	19.6	23.9	0.0	0.0	0.3	0.0	3.9
Prop In Lane	1.00		0.18	1.00		0.01	0.47		0.49	0.50		1.00
Lane Grp Cap(c), veh/h	439	712	726	286	581	611	492	0	0	443	0	457
V/C Ratio(X)	0.12	1.05	1.06	1.10	0.80	0.80	1.11	0.00	0.00	0.02	0.00	0.22
Avail Cap(c_a), veh/h	439	712	726	286	815	857	492	0	0	443	0	457
HCM Platoon Ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.70	0.70	0.70	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.3	17.9	17.9	22.2	24.0	24.0	29.8	0.0	0.0	19.8	0.0	21.0
Incr Delay (d2), s/veh	0.1	41.8	44.9	84.3	10.9	10.5	75.2	0.0	0.0	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	17.5	18.5	9.2	9.1	9.5	19.9	0.0	0.0	0.1	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.4	59.7	62.8	106.5	34.9	34.4	105.0	0.0	0.0	19.8	0.0	21.3
LnGrp LOS	C	F	F	F	C	C	F	A	A	B	A	C
Approach Vol, veh/h		1569			1268			547			110	
Approach Delay, s/veh		60.0			52.6			105.0			21.1	
Approach LOS		E			D			F			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		28.0	13.0	39.0		28.0	19.1	32.9				
Change Period (Y+Rc), s		* 4.1	* 4.1	* 5.8		* 4.1	* 5.8	* 5.8				
Max Green Setting (Gmax), s		* 24	* 8.9	* 33		* 24	* 4.1	* 38				
Max Q Clear Time (g_c+I1), s		25.9	10.9	35.2		5.9	2.0	21.6				
Green Ext Time (p_c), s		0.0	0.0	0.0		0.3	0.0	5.5				

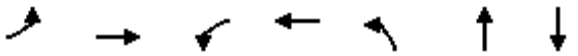
Intersection Summary												
HCM 6th Ctrl Delay			63.1									
HCM 6th LOS			E									

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Queues
14: Devin Drive & Sterling Highway

06/28/2023



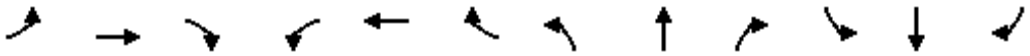
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	4	981	17	525	302	38	23
v/c Ratio	0.01	0.81	0.07	0.45	0.51	0.05	0.03
Control Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	22.1	11.1	16.8	16.4	5.5	9.7
Queue Length 50th (ft)	1	125	3	68	68	1	3
Queue Length 95th (ft)	5	#274	13	130	166	17	17
Internal Link Dist (ft)		909		895		264	217
Turn Bay Length (ft)							
Base Capacity (vph)	358	1246	233	1217	593	713	746
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.79	0.07	0.43	0.51	0.05	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
14: Devin Drive & Sterling Highway

06/28/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Future Volume (veh/h)	4	585	317	16	482	1	278	5	30	6	11	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	4	636	345	17	524	1	302	5	33	7	12	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	694	376	167	1190	2	689	84	557	240	388	116
Arrive On Green	0.00	0.32	0.32	0.02	0.34	0.34	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1734	2165	1175	1734	3543	7	1397	207	1368	402	951	285
Grp Volume(v), veh/h	4	508	473	17	256	269	302	0	38	23	0	0
Grp Sat Flow(s),veh/h/ln	1734	1730	1610	1734	1730	1820	1397	0	1575	1637	0	0
Q Serve(g_s), s	0.1	17.5	17.5	0.4	7.1	7.1	9.5	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	17.5	17.5	0.4	7.1	7.1	10.0	0.0	0.9	0.5	0.0	0.0
Prop In Lane	1.00		0.73	1.00		0.00	1.00		0.87	0.30		0.17
Lane Grp Cap(c), veh/h	317	554	516	167	581	611	689	0	642	743	0	0
V/C Ratio(X)	0.01	0.92	0.92	0.10	0.44	0.44	0.44	0.00	0.06	0.03	0.00	0.00
Avail Cap(c_a), veh/h	422	560	521	250	581	611	689	0	642	743	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.4	20.2	20.2	16.3	16.0	16.0	13.8	0.0	11.1	11.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	19.9	21.0	0.3	0.5	0.5	2.0	0.0	0.2	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.4	8.9	0.2	2.6	2.8	2.7	0.0	0.3	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	40.2	41.2	16.5	16.5	16.5	15.8	0.0	11.3	11.1	0.0	0.0
LnGrp LOS	B	D	D	B	B	B	B	A	B	B	A	A
Approach Vol, veh/h		985			542			340			23	
Approach Delay, s/veh		40.6			16.5			15.3			11.1	
Approach LOS		D			B			B			B	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		30.4	5.6	25.8		30.4	4.7	26.8				
Change Period (Y+Rc), s		* 5.2	* 4.6	6.0		* 5.2	* 4.4	6.0				
Max Green Setting (Gmax), s		* 25	* 4	20.0		* 25	* 4	20.2				
Max Q Clear Time (g_c+I1), s		12.0	2.4	19.5		2.5	2.1	9.1				
Green Ext Time (p_c), s		0.8	0.0	0.3		0.0	0.0	2.4				

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

APPENDIX B: BUILD THE VISION

B.1 Preliminary Development Concepts

Document: Preliminary Development Concepts, FIRST FORTY FEET

Description: Summary of the project objectives, vision, and guiding principles that informed a set of "big ideas" for future development within the project area. Concepts include mobility, land uses, development scenarios and the supporting riverfront public use areas amenities that are essential to attract investment and establish downtown as a one-of-a-kind destination.

B.2 Utilities Impacts Analysis

Document: Utilities Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the current utilities (water, sewer, storm, gas, electric and communications) serving the Project area, identifies utilities in need of upgrade, and new utilities to support planned future development.

B.3 Traffic and Safety Impacts Analysis

Document: Traffic and Safety Impacts Analysis Memo; Kinney Engineering

Description: Assessment of the preliminary development concepts for land uses and mobility improvements to determine potential impacts to traffic operations, Sterling Highway access and pedestrian and bicycle circulation. Provides a summary of the main benefits or impacts.

B.4 Market Hall Case Studies

Document: Market Hall Case Studies; ECONorthwest, Economics and Research Consultant
Description: Memo showcasing three case studies that have varying governance and operations structures, varying public investment, and different missions. These case studies demonstrate a range of what the City might want to consider and can help the City identify which elements they like from each.

B.5 Market Hall Assessment

Document: Market Hall Assessment Presentation; ECONorthwest, Economics and Research Consultant
Description: Slideshow presentation showcasing three case studies, their takeaways and considerations for Soldotna. Provides results of stakeholder interviews and recommendations for the Market Hall's potential offerings, critical elements, potential tenant mix, partners and programming for the City to consider.

B.6 Development Feasibility

Document: Soldotna Riverfront Redevelopment, Feasibility Analysis Results; ECONorthwest, Economics and Research Consultant

Description: Feasibility study on four development types based on the preliminary development concepts and discussions with the City. These development types include mixed-use, multifamily, townhomes, and hotel. The study provides insights into the feasible scale and types of development for the initial "catalytic" phase, which is intended to kick-start future development.

ECONorthwest
ECONOMICS · FINANCE · PLANNING

DATE: August 3, 2023
TO: City of Soldotna
FROM: Nicole Underwood and Cadence Petros, ECONorthwest
SUBJECT: Soldotna Riverfront Redevelopment - Public Market Case Studies

The City of Soldotna is interested in redeveloping an 85-acre portion of its downtown into a mixed-use, walkable waterfront that draws locals and visitors. One concept the City is interested in exploring is a public market that can serve as a catalyst for redevelopment of the area. The City expressed interest in having some control over the direction of the market hall but is open to both private and nonprofit operation of the space. The City also indicated that with the right design and model City Council could be supportive of the project but there will be scrutiny of ongoing public investment.

This memo showcases three case studies that have varying governance and operations structures, varying public investment, and different missions. These case studies demonstrate a range of what the City might want to consider and can help the City identify which elements they like from each.

Who we spoke with

The Grove Market Hall
Caroline Baggott
Development Manager at Project^

Pybus Public Market
Travis Hornby
General Manager

Kodiak Marketplace
Greg Zadina
Project Manager

The Grove Market Hall – Bend, Oregon

Overview

The Grove Market Hall is a privately owned and operated food hall that is the centerpiece for a development that included office space and luxury condos in Bend, Oregon. It is community-focused bringing together local smaller vendors and aims to provide a great experience for locals and visitors alike. The market hall features two large anchor tenants – a seafood store/cafe and a cocktail tenant from Bend Brewing. The governance structure is fully private, with no public partnerships involved in the project.

Description

The Market Hall which opened in 2020 is in the wealthier Northwest Crossing community of Bend and consists of approximately 14,000 square feet tenanted by nine locally owned restaurants, bars and coffee shops. Two larger anchor spaces at each end of the market hall house a seafood store/cafe and a well-known local brewing company (Bend Brewing). The Market Hall was part of the first phase of a larger mixed-use development that includes private executive offices. The developer is working on Phase 2 of the buildout of this project with includes a 32-unit luxury condo building.

The Grove is a collaboration between real estate developer Project^, Portland-based architecture firm Hacker, SunWest Builders, and West Bend Property Company (master developer of Northwest Crossing neighborhood).

Mission

"Savor and sip the best that Bend has to offer. With nine restaurants serving everything from coffee and pastries to fresh seafood, ice cream, and Italian food, Market Hall is a place to gather, refuel, and come together as a community."

"All you need under one iconic roofline."

Governance Structure

The Grove Market Hall operates under a private governance structure, with ownership and decision-making vested in the private development company. West Bend Property Company owns the development. Project^ is responsible for the overall management and operation of the market hall, including tenant selection, working with on-site property management, and ongoing maintenance.

Funding

The Grove Market Hall's development was privately funded, with no involvement support from public entities. Ongoing operations is supported through rent from tenants who pay the high end of market rate.

City/Public Entity's Role in Startup and Ongoing Operations

As a totally private development, the city or public entity does not have a direct role in the startup or ongoing operations of The Grove Market Hall.

Tenanting

The tenanting process prioritized tenants with operational experience, particularly those who were looking to expand to second locations or upgrade from food carts. This strategy aimed to mitigate the challenges faced by tenants without prior restaurant experience. The development company had specific vendors in mind for anchors and enlisted the help of a broker to advertise the remaining available spaces.

What is Going Well

The focus on smaller, local vendors and the community-oriented approach has resonated well with customers. The outdoor space, featuring fire pits, tables, chairs, and umbrellas, has been highly valued and allows for events such as musician performances and art shows, particularly in the nicer months. Bend Brewing, one of the anchor tenants, has proven adept leveraging and marketing these events. This provides a good example for other tenants to follow.

Lessons Learned

- Operations and managing multiple small tenants have been challenging. It is advisable to bring in property management early in the tenanting process to assist with tenant placement and overall operations. Property managers with prior experience in managing market halls can help ensure smooth execution.
- Offering warm shell spaces instead of cold shell spaces can attract smaller local vendors who may find it challenging to afford improvements to their spaces.
- Consideration should be given to the layout and design to ensure a balance between front-of-house and back-of-house space for each tenant.
- Consider location and security measures to maintain a family-friendly environment.
- Mechanical design should account for individual air systems to maintain comfort while ensuring kitchen hoods and cooling systems work efficiently.
- Waste management should be strategically located to avoid inconveniencing tenants and customers.
- Adequate parking, both for employees and customers, is essential to address the challenge posed by limited parking availability in the area.

Conclusion

The Grove Market Hall has successfully created a vibrant community-focused marketplace that has become a popular destination in Bend, Oregon. By offering diverse services, engaging anchor tenants, and utilizing outdoor spaces for events, the market hall has created a unique

experience for visitors. However, the challenges faced in operations and tenanting highlight the importance of proactive management, tenant selection, and considering specific space needs.

Key Takeaways for Soldotna

Smaller scale public market with a focus on local vendors and community gathering space

Privately developed and operated market hall commanding premium market rents

Part of a larger development which includes office and condos

Seasoned, local vendors need less business supports

Strong anchor tenants serve not only as a draw for the market but also an example to other vendors on how to leverage and market events

The market hall hosts events leveraging an outdoor space during nicer weather

Design matters – consider ratio of FOH to BOH space, parking, and how both employees and customers navigate the space

**Real estate developer, Project^, willing to discuss technical/ consulting assistance if needed*

Pybus Public Market– Wenatchee, Washington

Overview

Pybus Public Market is a public-private partnership that transformed an unused steel warehouse in Wenatchee, Washington, into a vibrant public market. The Port of Chelan County acquired the property in 2010 and later worked with private investors Mike and JoAnn Walker and the City of Wenatchee to convert the 28,000-square-foot structure into a public market. Total constructions costs for the project are estimated at $10 million. Currently, the city owns the land and ground leases it to the Pybus Market Charitable Foundation which owns the buildings. The governance structure includes a 20-person board that oversees the operations of the market and charitable foundation

Description

Pybus Public Market, opened in 2013, is a former steel warehouse located on the Columbia River waterfront in Wenatchee. It is 28,000 square feet and houses over 20 restaurants, shops, and specialty stores. Adjacent to the market, the Wenatchee Farmers Market hosts up to 35 vendors selling locally grown fruits and vegetables from May to October. The market is conveniently situated near the Apple Capital Recreation Loop Trail and is just two blocks away from historic downtown Wenatchee. Additional features of Pybus Public Market include an eight-foot bronze statue of E.T. Pybus, a commercial food demonstration kitchen, outdoor patio seating, picnic benches, bike rentals, and a converted flatbed railroad car used as a stage for performers. The foundation that operates the market also owns an event center that is available for public rentals at market rates. The public market includes covered, outdoor dining space.

Mission

Charitable Foundation
"Enhance the quality of life in the greater Wenatchee valley, now and for generations to come."

Public Market
"Pybus Public Market is a destination where people gather to experience quality food, goods, and services from local businesses. We offer a platform for farmers, artisans, and nonprofit organization. We honor history, promote growth, and provide an outlet for community arts, education and charities."

Governance Structure

The Pybus Market Charitable Foundation was founded in 2012 by Mike and JoAnn Walker to establish a public market for the greater community benefit. The Foundation's strategy is to leverage the power, popularity and physical infrastructure of Pybus Public Market to create and maintain charitable activities at the Market benefiting a broad cross-section of the community. By intention, the Foundation engages in a broad set of charitable activities at Pybus Market, rather than a narrow set. Pybus Public Market, a 501(c)5 and Pybus Foundation, a 501(c)3 are governed by a single 20-person Board of Directors.

Funding

The Port of Chelan County acquired the property in 2010 and collaborated with private investors and the City of Wenatchee to convert the 28,000-square-foot structure into a public market. The market construction cost $10 million, funded through private investment and the State of Washington's "local revitalization financing" (LRF) program[1], which directs new sales tax dollars to the City-designated area along the Wenatchee waterfront. In 2017, the City purchased the land from the Port for $2 million using LRF funds and leases it back to the Pybus Market Charitable Foundation, which retains ownership of the buildings.

Ongoing operations of the public market are sustained through the rent paid by tenants, pop-ups, and events. The market is on the verge of breaking even financially as original leases (which were very low) expire and new leases are set closer to (or slightly below) market rate. The market is fully leased. The foundation also owns the event center and offers it for public rental at market rates. Additionally, the Charitable Foundation conducts fundraising efforts to cover operational deficits and to support expansion efforts.

City/Public Entity's Role in Startup and Ongoing Operations

Pybus Public Market has a land lease from the City of Wenatchee. The city supports the market through occasional funding for specific projects, similar to its support for other local associations. However, there is no annual contribution from the city. The partnership between the city and the market aims to enhance the vibrancy of the downtown area and promote economic development.

Tenanting

Pybus Public Market follows a committee-based approach to tenanting, with the leasing and development committee comprising three-quarters of the board members. The committee focuses on finding the right mix of tenants, ensuring a balance between different types of businesses. Most leases are five years or longer, with some tenants having leases exceeding 10 years. The market provides support to fledgling entrepreneurs through pop-up artisan spaces, where artisans rent small spaces and pay a percentage of their sales. For permanent tenants, the market offers two basic leases – flat fixed rate per square foot or percentage of sales (for restaurants) that have built in increases on an annual basis.

Pybus Market supports local tenants by offering loans for tenant improvements and/or reduction of leases when appropriate. The nonprofit does not offer specific business supports but given the nature of some of their tenants (local, small, new), they do provide guidance on what is needed to move into the market and explain the process for a business plan.

[1] The Local Revitalization Financing (LRF) Program was created by Second Substitute Senate Bill 5045 (2SSB 5045), passed by the WA State Legislature in 2009. The LRF program authorizes cities and counties to create "revitalization areas" and allows certain increases in local sales and use tax revenues and local property tax revenues generated from within the revitalization area, additional funds from other local public sources, and a state contribution to be used for payment of bonds issued for financing local public improvements within the revitalization area.

Successes and Lessons Learned

- The market's focus on local businesses has created a sense of community and loyalty. It has become a vibrant gathering place, hosting events and supporting local nonprofits.
- The market's partnership with the broader community has been instrumental in its success. There must be a strong vision shared by the broader community.
- Pybus Public Market and trail redevelopment served as a catalyst to activate the downtown. The alignment of the Market's opening with the development of recreational trails boosted visitation and community appeal.
- All vendors are expected to follow the same schedule (based on their business type), ensuring consistent business hours and a better experience for customers.
- It is important to manage advertising and partnerships to protect the organization's reputation (e.g., the foundation is not affiliated with…)
- Be intentional about pop-up placement to minimize disruption to other businesses
- Standardizing shelving, increasing storage space, and providing three-phase power to every unit have also been identified as crucial considerations for future development

Conclusion

The success of Pybus Public Market is due to support from the broader community. The marketplace has contributed to the revitalization of the downtown area and has become a vibrant space that operates seven days a week, attracting visitors and fostering community engagement. The alignment of the marketplace's opening with the development of recreational trails boosted visitation and community appeal.

Key Takeaways for Soldotna

Medium sized public market with 20 local businesses; hosts the farmer's market

Public/private partnership for market construction; Nonprofit was established to operate the market with oversight from a 20-person board

Community vision and buy in essential for long-term success

Operated through rents, events, and fundraising; Market is close to breaking even operationally as original leases (which were very low) expire and new leases are set at higher market rate.

All businesses are open seven days

Alignment of public market's opening with the development of recreation trails boosted visitation and served as a catalyst to activate the downtown

Committee-based approach to tenanting; Leases can be flat fixed rate per square foot or percentage of sales and can be customized based on business needs

Businesses stay long term once admitted to the market; no time limitations

Kodiak Marketplace

Overview

Kodiak Marketplace is owned by KANA (a regional travel consortium and 501(c)(3) organization representing ten tribes) and aims to expand local economic development opportunities as well as address space and programmatic needs affecting KANA's community services and primary healthcare programs. The marketplace will feature mixed-use small business and retail space on the ground floor, while the second floor will house meeting space, workforce development offices, and economic development services. The marketplace is envisioned as a way to revitalize the downtown area of Kodiak.

Description

The Kodiak Marketplace is a 63,000 square foot building with 11 small business and retail spaces on the ground floor and meeting space, workforce development services, and economic development services on the second floor. It will support food security activities, offer community gathering rooms, conference spaces, training rooms with a commercial kitchen, and executive meeting space with a harbor view. Most of the space is dedicated to business storefronts and meeting areas, including a large open floor plan for microenterprise markets, tradeshows, workshops, and workforce development opportunities. The marketplace will also provide childcare services during events and serve as a seismic shelter. The anticipated opening is on July 31st, 2023, subject to construction timelines.

About KANA and their mission

KANA provides integrated wellness services to the entire Kodiak Island community with focus on our Alaska Native Beneficiaries. Their mission is to *"Elevate the Quality of Life of the People We Serve."*

The Public Market will advance the economic development and workforce development aspects of their mission, knowing that the health of individuals is impacted by the economic health of the entire community.

Governance Structure

KANA, a regional travel consortium representing ten tribes and 501(c)(3) organizations, owns the market and will oversee operations. The management of the retail spaces is contracted out to a real estate firm, with KANA overseeing business services and event space management.

Funding

KANA funded the construction of the marketplace with some support from foundations. The marketplace had no financial support from the City or Borough.

The first three years of operations is expected to have a large operating deficit as KANA implements a gradual rent increase structure that will bring tenants to $3 per square foot over the next three to five years. This is higher than the current downtown rent ($1 to $1.25 per square foot) but lower than what is needed for the project to be financially self-sufficient ($5+

per square foot). Additional revenue opportunities for the marketplace include leasing storage space and administrative space. KANA expects to subsidize the marketplace long-term using funding from its other business revenue streams while aiming to minimize the subsidy over time.

City/Public Entity's Role in Startup and Ongoing Operations

The City and Borough did not provide financial support or incentives for the project. The project faced some challenges with the City since the city has not experienced development of this scale before. However, the economic development agency plans to initiate a storefront revitalization program to build off the marketplace momentum/

Tenanting

Despite higher rents, the marketplace has successfully secured nine tenants. Tenant businesses are mostly local to Kodiak with a mix of business relocations, expansions, and first-time brick and mortar. Recruiting tenants involved direct communication with potential tenants and assisting them in developing business plans to accommodate the higher rents. KANA emphasized the advantages of a new building with higher rents, highlighting how it avoids the challenges faced by older buildings with lower rents and deferred maintenance. Leases were tailored to meet the specific needs of tenants, including gradual rent increases over time. KANA has also provided tenant-ready spaces with essential amenities and negotiated commercial kitchen arrangements and use of event space with the tenants.

Successes and Lessons Learned

- Don't underestimate the importance of an effective public marketing campaign and community engagement. The project initially faced some negative feedback from the community, but a public marketing campaign and social media efforts helped build momentum and address concerns.
- Dedicated parking is not available at the marketplace, which was a community concern. However, emphasizing the availability of parking in the downtown area and promoting the idea of walking short distances to reach destinations can help alleviate the concern
- Managing expectations is crucial. People were disappointed that the marketplace lacked activities for the youth, but this is not part of KANA's mission.
- Tailoring leases to individual tenants and providing business planning assistance were important strategies to ensure tenant success.
- Make sure to conduct market research for size of space needed by tenants. Many tenants needed smaller spaces (between 1,000 and 1,500 square feet).
- Consider business liability insurance requirements for small vendors. Tanana Valley Farmer's market has a good example of how they are structuring vendor agreements to meet liability insurance needs.
- Pop-up events are expected to be crucial for marketing and attracting visitors to the market.

Conclusion

First-time store front business and microenterprise entrepreneurs will have access to high quality leasing space as well as small business development support all in the same building. The project is an investment in the Kodiak community and will benefit Kodiak and outlying village communities, operating as a workforce and economic development hub to improve the viability of existing economies.

Key Takeaways for Soldotna

11 retail spaces co-located with business support services

Nonprofit owned, operated, and funded; no funding support from the City or Borough

The public market will be community benefit, economic driver, and way to revitalize the downtown

Ongoing subsidy from KANA's other business revenue streams with less deficit in year five operation as rents gradually increase

Getting higher rents ($3/sf) required direct outreach to tenants and helping them with business planning

Public marketing campaign, public engagement, and managing expectations were crucial to the development of the marketplace

APPENDIX B: BUILD THE VISION

B.1 Preliminary Development Concepts

Document: Preliminary Development Concepts, FIRST FORTY FEET

Description: Summary of the project objectives, vision, and guiding principles that informed a set of "big ideas" for future development within the project area. Concepts include mobility, land uses, development scenarios and the supporting riverfront public use areas amenities that are essential to attract investment and establish downtown as a one-of-a-kind destination.

B.2 Utilities Impacts Analysis

Document: Utilities Impacts Analysis Memo; Kinney Engineering

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B.4 Market Hall Case Studies

Document: Market Hall Case Studies; ECONorthwest, Economics and Research Consultant
Description: Memo showcasing three case studies that have varying governance and operations structures, varying public investment, and different missions. These case studies demonstrate a range of what the City might want to consider and can help the City identify which elements they like from each.

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B.6 Development Feasibility

Document: Soldotna Riverfront Redevelopment, Feasibility Analysis Results; ECONorthwest, Economics and Research Consultant

Description: Feasibility study on four development types based on the preliminary development concepts and discussions with the City. These development types include mixed-use, multifamily, townhomes, and hotel. The study provides insights into the feasible scale and types of development for the initial "catalytic" phase, which is intended to kick-start future development.

Soldotna Riverfront Redevelopment: Market Hall Options and Considerations

ECONorthwest

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Purpose

Begin to explore a market hall concept in Soldotna

- What can be learned from case studies and applied to Soldotna?
- Are key stakeholders interested in participating in a market hall?

”Love the idea! Public markets are fun and a great draw for locals and tourists. Lived in Washington and loved Pybus Market.”

The Grove Market Hall – credit: Hacker Architects

Case Study 1: The Grove Market Hall

ECONorthwest

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The Grove Market Hall – Bend, Oregon

Description:

- Opened in 2020
- 14,000 SF
- 9 local restaurants
- 2 well-known anchors
- Events and community gathering space
- Centerpiece for a development

Credit: Hacker Architects

Mission

"All you need under one iconic roofline."

"Savor and sip the best that Bend has to offer…Market Hall is a place to gather, refuel, and come together as a community."

The Grove Market Hall

Governance:

- Private developer - no public support

Funding:

- Privately funded construction
- Operations supported through high-end market rate rents

Credit: Hacker Architects

Grove Takeaways and Considerations for Soldotna

- Smaller scale
- Focus on local and community gathering space
- Outdoor expansion element
- Privately developed and operated; premium market rents
- Focus on seasoned retailers meant the need for fewer business supports
- Strong anchor tenants very important
- Events to boost visitation
- Design matters

Case Study 2: Pybus Public Market

ECONorthwest

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Pybus Public Market – Wenatchee, Washington

Description:

- Opened in 2013
- 28,000 SF
- 20 restaurants and shops
- Hosts Farmers Market May to Oct
- Commercial kitchen
- Adjacent event center
- Located on the Columbia River waterfront, adjacent to recreation trail

Credit: ECONorthwest

Pybus Public Market

Governance:

- Nonprofit established to operate
- Public land ownership

Funding:

- **Construction:** Public land, funding through LRF district, private investors
- **Operations:** Rent, events, fundraising
- City occasionally provides project-specific funds but not an annual contribution

Credit: https://pybuspublicmarket.org/

Pybus Public Market is on the verge of breaking even as original leases expire and new leases are set to market rate

Pybus Takeaways and Considerations for Soldotna

- Mid-sized; hosts Farmer's Market
- PPP developed, nonprofit operated
- Operated through rents, events, & fundraising
  - Rents have increased over time decreasing the operating deficit
- All businesses on same schedule
- No time limit for businesses in market
- Community vision and buy in essential for long-term success
- Market and trail dev aligned boosting visitation and activating downtown

"There have been lean times. Relied on the generosity of others who believed in the vision."

- General Manager

Credit: KANA and Vision Architecture

Case Study 3: Kodiak Marketplace

ECONorthwest

ECONOMICS • FINANCE • PLANNING

Kodiak Marketplace – Kodiak, Alaska

Description:

- Opening soon
- 63,000 SF
- 1/3 of space will be rented to businesses
- 11 storefronts on ground floor
- Commercial kitchen, meeting space, offices for workforce and economic development services
- Seismic shelter

Credit: KANA and Vision Architecture

Kodiak Marketplace

Governance:

- Nonprofit owned and operated; private property management

Funding:

- **Construction:** Funded by KANA; no City or Borough money
- **Operations:** Funded by rental income and KANA's other revenue streams
  - Rents $3/sf over 3 to 5 years

About KANA and their mission

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The Public Market will advance the economic development and workforce development aspects of their mission, knowing that the health of individuals is impacted by the economic health of the entire community.

Kodiak Takeaways and Considerations for Soldotna

- 11 retail spaces co-located with business supports
- Nonprofit owned, operated, funded
- Ongoing subsidy from KANA
  - Deficit decreases with gradual rent increases
- Community benefit, economic driver, revitalize downtown
- Direct outreach and business plan support essential for getting higher rents
- Crucial to have public engagement and manage expectations

"Had to go in person to businesses and help them to do business planning that would allow them to pay higher prices"

-Project Manager

A market hall in Soldotna: stakeholder feedback

Who we talked with and what they said

Community Stakeholders

- Megan Weston, business owner
- Cliff Cochran, SBDC Director
- Melodie Allan, business owner
- Kaitlin Vadla, Planning Commission and nonprofit director
- Annette Villa, operator/manager of the Wednesday Market

"I'm excited about a market hall here. We have a great small business culture but it's hard to compete against national chains."

"I'm passionate about supporting small business. They're the backbone of our town."

"I love the idea of a public market!"

"This will be genuinely the best thing for the community"

Envisioning a Soldotna market hall: what it should deliver

- Vibrant community hub: retail, food, entertainment
- Celebrate Soldotna and the Kenai River
- Gathering place for residents and tourists
- Appeal to all ages
- Operate year-round with events and activities
- Affordable for businesses and customers
- Support the business ecosystem

"Would be nice to integrate with the river and riverwalk and have views of the river and fishing."

"Vendor and food is not enough - need music and something the old and young want to be at."

"It would be the worst to be so expensive and only seasonally used."

Potential offerings in a market hall

- Mix of local restaurants, retail, and services
- Community gathering spaces and meeting rooms
- Event space
- Multi-use space that shifts with need
- Shared office space for retail tenants
- Commissary kitchen (could be utilized by market tenants but not located in the market)
- Community seating and dining
- Service provider or government office space (could be an anchor)
- Indoor playground (movable, visible from all angles)

Critical elements of a market hall

Affordable restaurant and retail space for local businesses

Multi-use space that shifts with need

Anchor tenant

Active programming: events, management, etc.

Potential tenant mix

Mix of Local Retail / Restaurants / Services

Examples	
Anchor	**Other**
▪ Local Grocery w/Alaskan goods ▪ Deli ▪ Brewery ▪ Distillery ▪ Restaurant open majority of the day	▪ Flower Shop ▪ Fish Market ▪ Ice Cream or Gelato ▪ Beverage ▪ Restaurants ▪ Take Home Dinners ▪ Food Truck Hookup ▪ Jewelry / Clothing ▪ Tour Guides

Interviewees who expressed interest in tenancy:

- Megan Weston: Felicity Loft Tea Company
- Melodie Allen: Bakery
- Annette Villa – Anchor tenant

Potential partners

Operator

If a paid position…

- Megan Weston
- Melodie Allen
- Annette Villa

"Need to find someone with a passion for this and sees the vision."

Supporters

- Kenai Economic Development District (KPED)
  - Business support; consider as potential tenant
- Cook Inlet Keeper
  - Currently operates incubator space with a DEC approved kitchen
  - Kaitlin could support through grant writing
- SBDC
  - Connecting to tenants
- City of Soldotna

21

Potential programming components

Event programming is essential to draw both residents and visitors

Programming

- Educational activities (esp. for children in winter)
- Musicians (busking/paid)
- Pop-ups
- Theme Days (e.g., children's day where they sell their work)
- Cooking Competitions (if there is a commissary kitchen)
- Art Shows
- Concerts
- Comedy Shows
- Community Forums

"Events are essential…vendors and food are not enough…"

Specific ways to support small businesses

In Market Hall

- Ensure affordable rent
  - Graduated rent or percentage rent
  - First month free
- Adequate storage within spaces
- Active, supportive management

In City

- Pair facade improvement program with tenant improvement, and/or equipment grants in commercial areas
- Ensure adequate access to a commissary kitchen
- Coordinate suite of business support services

Key considerations and takeaways

- Significant community expertise and capacity to operate/tenant space if paid positions and affordable rent
- Partnerships will be essential to success: public, private, nonprofit effort
- Public market may become more self-sustaining over time
- Need a consistent champion
- Community could be part of making the space
- Design matters (movable equipment, reclaimed materials, etc.)
- Marketing is critical
- Can serve as a catalyst for redevelopment and downtown activation

Pros and cons of a market hall in Soldotna

PROS

- Wealth of talent and potential tenants
- Provides needed retail that may not be otherwise feasible
- Could serve as redevelopment catalyst
- Supports small businesses and builds capacity for additional retail tenancy over time

CONS

- Extensive time and effort
- Potential risk of failure
- Reduces capacity to pursue other city priorities for investment

Moving Forward:

- Assess City appetite for concept
- Conduct feasibility study
- Seek seed grant funding

Implementation plan can provide additional steps if the city wants to pursue the market hall concept

Source: City of Soldotna Facebook Page

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Los Angeles

Portland

Seattle

Boise

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DATE: October 17, 2023
TO: John Czarnezki, City of Soldotna
CC: Jason Graf, First Forty Feet
FROM: Nicole Underwood, Michelle Anderson, Bob Whelan, and Cadence Petros, ECONorthwest
SUBJECT: Soldotna Riverfront Redevelopment, Feasibility Analysis Results - FINAL

The City of Soldotna aims to transform an 85-acre downtown area into a vibrant mixed-use, waterfront, appealing to both locals and visitors. To achieve this vision, the City has partnered with a team of consultants led by First Forty Feet to create a Master Plan, which will guide future development. While the initial market analysis identified demand for various amenities including retail, restaurants, lodging, and housing, it is essential to note that this analysis did not assess the financial feasibility of constructing buildings to accommodate these uses.

Why is development feasibility and pro forma analysis important?

Development can be costly and risky. Getting funding to construct new development requires lenders and investors to be reasonably confident they will earn enough financial return to justify the risks.

Economic or market feasibility is generally assessed by comparing the expected revenues (home sales, net income from rents, room rates) against the costs of development. If a development is not feasible, it will not be built. While some of the factors that determine market feasibility are outside a jurisdiction's direct control (e.g., labor and materials costs, interest rates, market rents), local jurisdictions can provide incentives (such as tax exemptions, land donations); or adjust building, utility, and zoning fees, zoning, programs, and other regulations that can have a substantial impact on whether development could be feasible or not.

It is important to understand that the presence of demand for these amenities, as identified in the market analysis, does not necessarily translate to people being able or willing to pay the necessary amounts to build and support new development. Even if there is a demand for a particular amenity, it may not materialize if businesses cannot afford the rent needed to support the costs of a newly developed space.

The Master Plan provides a long-term vision for the waterfront redevelopment project. ECONorthwest, a sub-contractor working with First Forty Feet, has been tasked with exploring catalytic opportunities in the near term. During this process, several crucial questions need answering, including: What scale of development is currently feasible in the project area, and what level of City support will be required to facilitate development that is not-quite financially viable without City participation?

To address this, ECONorthwest conducted a high-level feasibility study on four development types based on the Master Plan and discussions with the City. These development types include mixed-use, multifamily, townhomes, and hotel. The purpose of this study is to provide insights into the feasible scale and types of development for the initial "catalytic" phase, which is intended to kickstart future development of the desired scale. It is important to note that the findings from this study do not preclude the possibility of future phases of development achieving the scale that may be currently infeasible. On the contrary, the catalytic phase is intended to stimulate future development at the desired scale.

Methods and Data

Although we conducted a quantitative feasibility analysis, observations of new construction for these uses are limited in Soldotna and on the Kenai Peninsula as a whole. Limited observations mean less data to inform a quantitative analysis. We therefore relied equally on a qualitative analysis (e.g., interviews with stakeholders) to inform our recommendations.

Given the limited local observations that align with the scale of development outlined in our Master Plan, we needed to expand our review scope to identify comparable benchmarks (rents and sales prices) for new residential and mixed-use developments to include the broader Kenai Peninsula area and Anchorage. This broader perspective is a common practice when a city seeks to develop projects for which there are limited local examples. For the hotel sector, our data encompasses the entire Peninsula, reflecting the fact that tourists generally explore the entire Peninsula during their visits, making the specific location of their stay less critical. Therefore, Soldotna's competitive positioning within the Peninsula as a whole becomes a key consideration.

It is also important to highlight that some of our assumptions are based on industry standards. We derived operating costs for hotels from Anchorage due to data availability, while construction costs are based on national averages with an Alaska-specific multiplier to account for the unique building conditions in the state. Additionally, industry standards were applied to factors such as fees and operating costs, adjusted to align with the Alaskan context. For more detailed information on data and methods please refer to Appendix A.

Recommendations and Findings

Achieving a balance between fostering new development that yields higher rents and ensuring affordability and accessibility for existing residents is paramount. The success of this project hinges on its ability to benefit current Soldotna residents as well as new residents and tourists. Key findings are included below.

- Mixed use and multifamily are *currently* not feasible.
- Townhomes are more feasible, especially with lower cost land.
- A hotel could be feasible but would need enhancements such as riverfront views, a restaurant/bar in the hotel, or broader riverfront redevelopment that enhances the attractiveness of the area.
- City participation and phasing will be necessary to stimulate desired development and ensure affordability and accessibility for Soldotna residents.

Proposed phasing that balances attracting private market investments and preserving affordability for residents is included in the Conclusion and Next Steps. Additional details on implementation will be included in the Master Plan, the next phase of this project.

Residential and Mixed-Use Feasibility Analysis

ECONorthwest completed a financial analysis for residential and mixed-use development that models a developer's decision-making process and cash flow equation for multiple prototypical developments, or *prototypes*. We created a pro forma model to test the financial feasibility to understand how the City could incentivize housing production. We drew our initial market and construction cost insights from sources such as Costar, Redfin, and Craftsman, and then vetted those assumptions with local developers and brokers. Ultimately, this type of assessment will help the City understand the likelihood of developers producing residential and mixed-use development under different scenarios.

Market Analysis

The market analysis showed demand for retail and restaurant space as well as housing for both ownership and rental. However, it raised questions of whether current market rents in Soldotna could sustain new development. Stakeholder interviews echoed this concern, highlighting worries about paying higher rents for commercial space and rental housing. The market analysis also highlighted that the project area lacks entertainment, services, and retail options which could make it more challenging to attract mixed-use and higher end development.

What types of development did we analyze?

To begin, ECONorthwest modeled three prototypes: townhomes, multifamily apartments, and mixed-use apartments (with ground-floor retail), as shown in Exhibit 1. We based the prototypes loosely off various, recent developments on the Kenai Peninsula and in Anchorage. Some recent development that informed these prototypes are shown in Exhibit 2. Though the scale of development ranges substantially in these areas, we triangulated an approximate prototype development that might be possible in Soldotna and could deliver on City goals.

Exhibit 1. Development Prototypes Evaluated

Source: ECONorthwest

#	Type	Description	Tenure
1	Townhomes	2-story with garage	Ownership
2	Multifamily Apartments	3-story with surface parking	Rental
3	Mixed-Use Apartments	3-story with surface parking and retail	Rental

Exhibit 2. Comparable Developments

Source: Redfin, Loopnet, Costar, Apartments.com

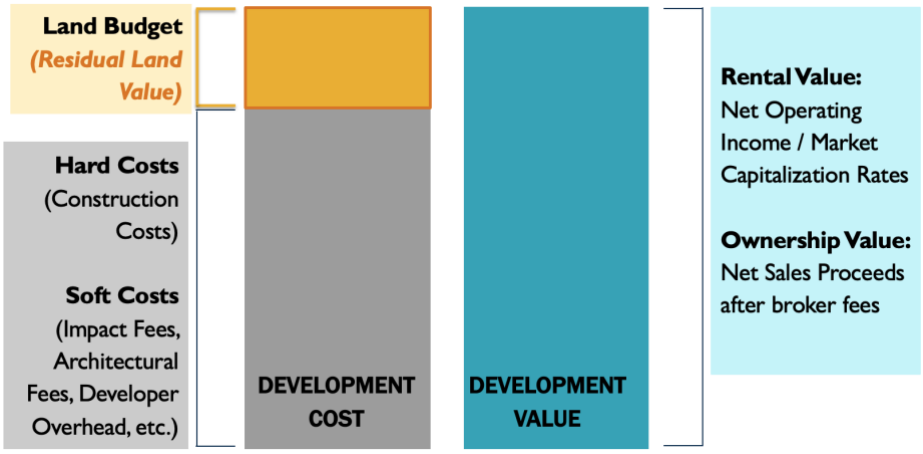
Townhomes	Multifamily	Mixed-Use
		
Anchorage	Seward	Anchorage

Financial Analysis

How do we measure development feasibility for residential and mixed-use?

To model development feasibility, we employed a pro forma model and used a residual land value (RLV) metric, which measures the land budget a developer would be left with after accounting for potential development costs and revenues.

Exhibit 3: Example of Feasible Development using Residual Land Value (RLV) Model
Source: ECONorthwest.



If the RLV is equal to or above land prices in the potential development area, the development is considered feasible at market rate. If the RLV is zero dollars, the development could be feasible if the land were donated for free. However, if the RLV is less than zero, the development is likely infeasible unless a developer receives additional subsidies or incentives, including free land. Please note that results from this method describe a general analysis of prototypes and does not consider the many potential unique conditions that could be factors in development feasibility (e.g., increased predevelopment costs, low land basis from longtime land ownership). For these reasons, residual land value analyses should be thought of as a strong indicator of the relative likelihood of development, rather than an absolute measure of return to the investor or developer.

Baseline Pro forma

In our feasibility analysis, we used key financial data like rent, operating costs, and development expenses for each prototype. To evaluate rental prototypes, we determined the leasable square footage, calculated revenue, deducted vacancy and operating costs (such as taxes, insurance, maintenance, management, select utilities) and arrived at the annual net operating income (NOI). For the ownership prototype, we calculated gross sales price and subtracted commissions.

We calculated development costs by applying the cost per square foot values to different product types (e.g., residential, retail) and adding parking costs. We then summed those values to a total hard cost and calculated the soft cost, contingency, and developer fees to arrive at the total development cost.

To evaluate rental prototypes, we used a debt service coverage ratio (DSCR) to arrive at the supportable land budget (residual land value). DSCR, a financial indicator frequently used by lenders, gauges available cash flow for loan payments and potential profit. This ratio, expressed as net income (after vacancy and operating expenses like property taxes) relative to debt payment, ensures a revenue buffer to minimize the risk of default and foreclosure (i.e., 1.25 DSCR).

For the ownership prototype, we determined the land budget by subtracting total development costs from gross sales less commission and a spread on cost to account for profit. Both rental and ownership prototypes were subjected to a calculation dividing the total land budget by site square footage, arriving at a residual land value per square foot. See Exhibit 4 for detailed assumptions.

Exhibit 4. Assumptions for Development Prototypes Evaluated
Source: ECONorthwest based on market research

Assumption	Townhomes	Multifamily Apartments	Mixed-Use Apartments
Total units	4	60	65
Lot size	10,000 sf	65,000 sf	65,000 sf
Retail area	N/A	N/A	5,000 sf
Unit mix	100% 3-bedroom	20% studio, 45% 1-bedroom, 35% 2-bedroom	20% studio, 45% 1-bedroom, 35% 2-bedroom
Average unit size	1,750 sf	690 sf	690 sf
Average market rent per month*	N/A	$1,200 ($1.75 per sf)	$1,250 ($1.80 per sf)
Average sales price*	$615,000 ($350 per sf)	N/A	N/A
Vacancy expense	N/A	10%	10%
Operating expenses per unit	N/A	$2,400	$3,300
Construction cost per square foot	$190	$250	$250
Total construction cost	$1,650,000	$16,480,000	$19,550,000
Debt service coverage ratio	N/A	1.25	1.25
Spread on cost	10%	N/A	N/A
Residual land value	$95,000	($2,150,000)	($2,640,000)
Residual land value per square foot	$9	($33)	($41)

*This assumption is inclusive of modest market escalation during construction

Understanding the price of land in Soldotna

Predicting a price that a landowner would sell property for development is an imperfect science – each landowner has reasons to sell or hold their land. Some property owners are willing to develop their land without selling. For the purposes of this analysis, we assumed the value of the property (i.e., the price of the land at which an owner would be willing to sell) could be observed through assessed values according to the Kenai Peninsula Borough 2023 assessor data (accessed via the KPB GeoHub). Therefore, this memo compares the feasibility of housing development to current average assessed values, which may present more favorable feasibility results depending on market dynamics.

We identified vacant and improved land in Soldotna according to use type in the assessor data. Most of the parcels are considered improved – approximately 72% of Soldotna is improved. In these cases, redevelopment will not only need to generate enough revenue to cover the costs to build and provide a return to financial partners, but it will also need to generate more revenue than an existing use. The price for improved land is substantially higher than vacant land – improved land averaged approximately $17 per square foot of land and vacant land averages approximately $3 per square foot of land. These values are based on Soldotna properties.

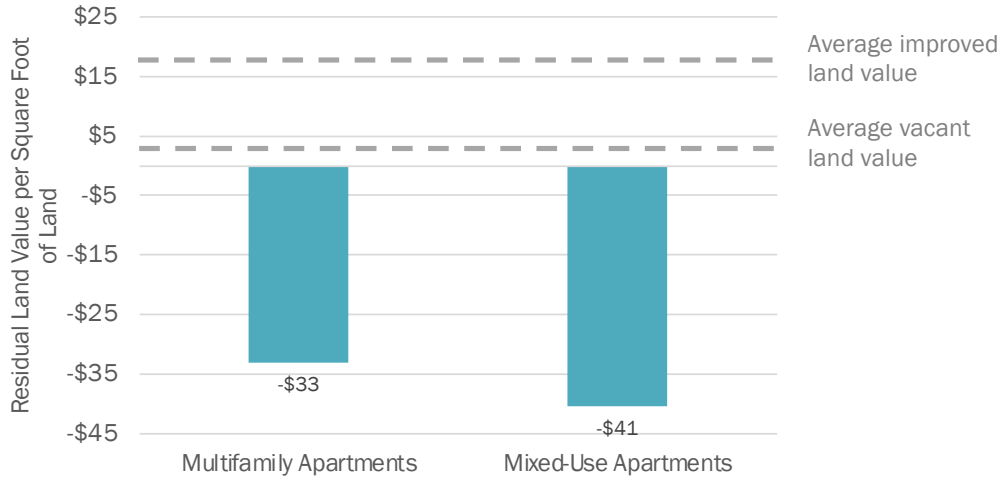
In the riverfront redevelopment area specifically, there is a mix of vacant and improved land. We therefore compare the feasibility results to the average value of vacant land (on the low end) and improved land (on the high end). On column charts showing feasibility results, two dashed lines are shown to represent this range of average land value (per square foot of land). These dashed lines can be viewed as a hurdle for development to exceed – the financial feasibility (the residual land value) must be at least somewhere between these lines, if not above the average improved land line.

Findings and Considerations

Current rents do not support mixed-use or multifamily development.

Average observed rents on the Kenai Peninsula, and even as far as Anchorage, are less than $2 per square foot for recent construction. Most of the observed comparable developments are achieving rents closer to $1.50 per square foot. Assuming rents in this range, multifamily and mixed-use developments are not financially feasible as shown in Exhibit 5. When RLV is negative, which is the case here, a developer would need the land for free and a subsidy to justify development.

Exhibit 5. Multifamily and Mixed-Use Apartment Results
Source: ECONorthwest



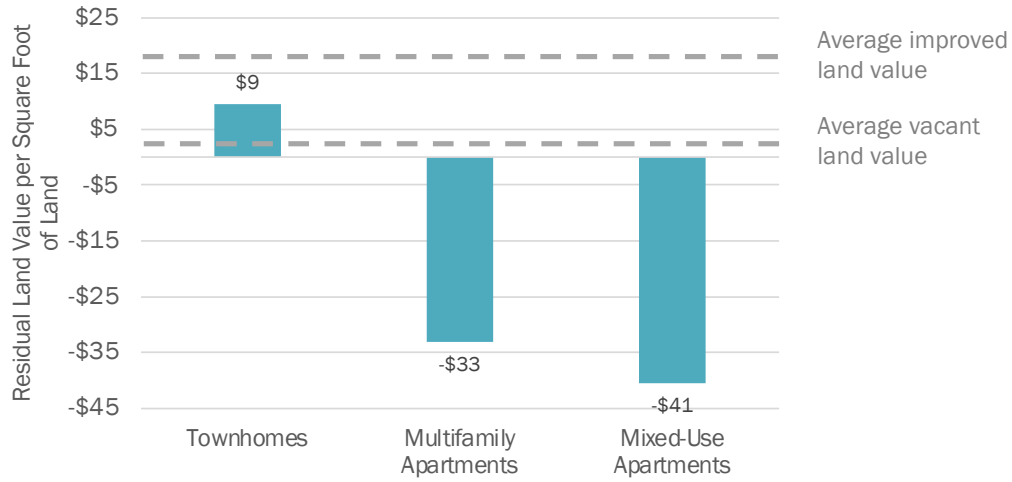
Based on our sensitivity analysis, rents would likely need to increase substantially, to at least $2.30 per square foot, for mixed-use or multifamily development to be financially feasible.

Townhomes are more feasible, especially with lower cost land.

Relative to the apartment prototypes, townhomes are substantially more feasible. Average observed sales prices for new construction townhomes are around $250 to $325 per square foot in Soldotna, Kenai, and Anchorage. Townhomes in Homer are selling for even higher, with a couple currently listed around $1 million per unit.

Assuming the average comparable sales price, this prototype achieves a positive residual land value of approximately $9 per square foot of land meaning that townhomes likely do not need an additional subsidy if land is available at this price. The City could offer land at this price to help catalyze new housing development.

Exhibit 6. Comparison of Townhome Results to other Prototypes
Source: ECONorthwest



There are ways to make development more feasible.

- **The City could offer land for free, as part of a development agreement, to attract residential developers.** Multifamily / mixed-use development is far from feasible, but free land will help if conditions change or if paired with other incentives. Donated land can be catalytic for townhome development. Subsidizing cost of land signals to development partners the City is invested in stimulating development.
- **Advertise fast-track permit review time for development proposals in this area.** Faster permit review can reduce costs and risk and increase feasibility.

Soldotna Hotel Feasibility Analysis

ECONorthwest completed a financial analysis for a hotel development in Soldotna. We modeled the baseline cash flows for a new hotel from construction through its first 15 years of operations. It is a baseline because we modelled a basic hotel. We made assumptions using limited data on the market and construction costs. Also, we did not include potential enhancements that may improve future cash flows.

The result of our analysis is a baseline financial forecast or pro forma. Investors often use pro formas to decide whether to build a new hotel. It also helps us understand the prospects for a new hotel in the redevelopment area.

Feeding into the pro forma is an analysis of the local hotel market. For this, we used historical market data for the Kenai Peninsula. The data originate from Costar. They, through their subsidiary, STR Global, obtain operating data from hotels.

Market Analysis

The data show that the hotel market in the Kenai Peninsula rebounded strongly after the COVID-19 pandemic. Both room rates and occupancy rates rose. However, recent uptrends are not predictive of higher future rates. Markets are dynamic. Higher room rates bring in higher profits. The industry responds by building more rooms. This causes occupancy rates (number of room nights sold as a percentage of room nights available) to decline. Competition compels hoteliers to offer lower rooms rates to attract more guests. The average daily room rate (ADR) in the market drifts lower. ADR is the average room rate charged before taxes and amenities. This process takes time. While ADRs change daily, it can take years to build a new hotel so that supply adjusts. That timing difference is why the hotel business is cyclical. Currently, in the Kenai Peninsula, we are amid an upcycle.

While trends are not predictive, an analysis of historical hotel data can be. We use that data to find the level at which the long-run supply and demand for hotel rooms are in balance. It is called the natural occupancy rate. Natural occupancy rates vary by market based on factors like climate and visitor mix. When doing a forecast looking out many years, it is prudent to assume the market will trend towards the natural occupancy rate.

In the market analysis, ECONorthwest estimated the historical ADRs and occupancy rates of local hotels. ECONorthwest's analysis shows the Kenai Peninsula market has an annual average natural occupancy rate of 66.2 percent at a real ADR of $169.40.[1] At those rates, there is no undue upward or downward pressure on room rates (excluding effects of inflation). Currently, according to Costar, the market is running at 68.6 percent occupancy and an ADR of $180.[2] It is higher because the market in in the middle of an upcycle. Conditions favor the addition of some more hotel rooms.

Based on this analysis, we estimate the market can absorb 62 more hotel rooms and remain suitably profitable. The addition would bring the long-term supply and demand of the market in balance.[3] Therefore, we built a pro forma for a 62-room hotel in Soldotna.

Financial Analysis

How do we measure development feasibility for hotels?

To gauge the feasibility of hotel development, we use the internal rate of return (IRR). An IRR is the compound annual rate of return an investor should expect to make on the hotel project over many years. If the calculated IRR meets or exceeds the required rate of return, the development is deemed feasible; otherwise, additional financial support may be needed. This IRR-based analysis provides an understanding of potential returns and overall project viability.

The required rate of return is influenced by factors like investment risk, market conditions, and investor expectations. It reflects the minimum acceptable return for the project and typically considers aspects such as cost of capital, anticipated inflation, and risk level in comparison to alternative investments.

Why use IRR instead of Residual Land Value (RLV) for hotels?

A cash flow model that solves for an IRR is a more robust analysis of feasibility than RLV, but it requires additional assumptions. Unlike residential and mixed-use development, hotels have a longer stabilization period to achieve their desired occupancy rate. Hotels also have more complex operating costs with more variables. A cash flow model that results in an IRR allows us to better approximate these conditions.

A pro forma that solves for an RLV is often a first step in gauging initial feasibility for development like residential and mixed use. Based on initial findings a developer may then pursue the more robust IRR analysis later.

[1] $169 is expressed in January 2023 dollars. ADRs of past months were adjusted for inflation in the analysis.

[2] We caution that too few hotels participated in Costar's survey to provide us with statistically significant results However, while the Costar survey data had limitations in terms of statistical significance, conversations with city staff and relevant stakeholders, along with data from sources like Placer.ai, confirmed a growing trend in tourism and increased hotel occupancy and room rates.

[3] This is based on market data through January 2023. However, the 35-year demand growth rate was 1.7 percent. Therefore, each year the market would need an additional 26 hotel rooms to remain in balance. That assumes demand grows at the historical rate. In addition, old hotel rooms may be removed in the market because of closures or conversions. These too would need to be replaced.

Developing a brand-new hotel is risky. Investors face challenges related to construction, uncertain timing, cost overruns, and the complexities of starting, staffing, and making a new hotel profitable. For these ventures, an appropriate IRR is around 14% (currently) although some hoteliers may be satisfied with less. A quick rule of thumb for estimating good returns is to double the mortgage rate.

Calculating IRR

The IRR is the value that makes the sum of the future cash flows, when adjusted for time and interest rates, equal to the initial investment. This is essentially finding the interest rate that makes the project's cash inflows and outflows balance out.

Since this formula involves solving for an unknown rate (IRR), it's often more convenient to use financial calculators, software, or spreadsheet functions to calculate IRR rather than solving it manually.

Baseline Pro forma

Our financial analysis starts with an estimate of the cost to open. These costs are based on constructing an upper midscale to upscale hotel with 62 rooms. This is based on construction data for Alaska and information from comparable hotel developments nationally. It is important to note that there is great variability in opening costs. Local conditions, the style of the hotel, the availability of construction supplies and labor, and shipping costs all affect costs. Our estimate serves as a starting point. Ultimately, the cost may be substantially different than shown below in Exhibit 7.

Exhibit 7. Cost to Open the Soldotna Hotel

ECONorthwest analysis utilizing HVS Hotel Cost Estimating Guide (2021)

Component		Cost
Land	$	1,496,082
Building site & improvements	$	12,452,397
OSE (Operating supplies and equipment)	$	2,102,604
FFE (Furniture, fixtures & equipment)	$	1,763,126
Preopening & working capital	$	549,320
Developer fees	$	519,310
Cost to open	**$**	**18,882,839**

We forecast the cash flow for the hypothetical hotel using industry average operating costs for hotels in Alaska. The data for this came from STR Global. The number of participants captured in the STR data were sufficient to assure a statistically significant result. The participants were branded hotels in the mid to upscale categories. A branded hotel is one that operates under a major flag, such as Marriott. In exchange for branding, the hotel operator pays management and franchise fees. They receive marketing support, access to hotel loyalty programs, training, and other forms of support in exchange.

The pro forma covers the construction period (2025) and 15 years of operations (2026 – 2040). The first eight years of operations are shown in Exhibit 8. Note that the forecast include inflation. ECONorthwest projects inflation of 4.2 percent in 2025 with it gradually falling to 3.4 percent per year in later years. Room sales at new hotels typically take 36 months to stabilize; starting off slow and gradually building. The pro forma assumes the Soldotna hotel is branded and reaches a stabilized occupancy rate of 66.2 percent in the third year. We assume a room rate of $169.40 in 2023 dollars, which is adjusted for inflation in the pro forma. The ramp up explains why the expected cash flow or "earnings before interest, taxes, depreciation, and amortization" (EBITDA) rises quickly between 2026 and 2028, but after the third year merely rises with inflation.

Exhibit 8. Operating Cash Flow Projection, 2026-2033

ECONorthwest analysis utilizing STR and Costar data

	2026	2027	2028	2029	2030	2031	2032	2033
Revenue:								
Room sales	$ 2,237,064	$ 2,741,761	$ 3,120,302	$ 3,216,053	$ 3,323,790	$ 3,435,137	$ 3,559,926	$ 3,669,147
Hotel F&B	$ 136,580	$ 167,394	$ 190,505	$ 196,351	$ 202,929	$ 209,727	$ 217,346	$ 224,014
Other operating departments	$ 39,604	$ 48,539	$ 55,241	$ 56,936	$ 58,843	$ 60,815	$ 63,024	$ 64,957
Misc. income	$ 10,850	$ 13,298	$ 15,134	$ 15,599	$ 16,121	$ 16,662	$ 17,267	$ 17,797
Total Revenue	$ 2,424,098	$ 2,970,992	$ 3,381,182	$ 3,484,939	$ 3,601,683	$ 3,722,341	$ 3,857,563	$ 3,975,915
Operating Costs:								
Departmental	$ 569,697	$ 698,224	$ 794,624	$ 819,009	$ 846,445	$ 874,801	$ 906,580	$ 934,395
Undistributed	$ 1,100,777	$ 1,138,431	$ 1,176,823	$ 1,216,253	$ 1,256,998	$ 1,299,107	$ 1,342,627	$ 1,387,605
Total operating expenses	$ 1,670,474	$ 1,836,655	$ 1,971,447	$ 2,035,262	$ 2,103,443	$ 2,173,908	$ 2,249,207	$ 2,322,000
Fixed Charges:								
Management fees	$ 80,022	$ 98,076	$ 111,617	$ 115,042	$ 118,896	$ 122,879	$ 127,343	$ 131,250
Fixed charges	$ 134,387	$ 138,984	$ 143,671	$ 148,485	$ 153,459	$ 158,600	$ 163,913	$ 169,404
Total operating expenses	$ 214,409	$ 237,060	$ 255,288	$ 263,527	$ 272,355	$ 281,479	$ 291,256	$ 300,654
EBITDA	**$ 539,215**	**$ 897,277**	**$ 1,154,447**	**$ 1,186,150**	**$ 1,225,885**	**$ 1,266,954**	**$ 1,317,100**	**$ 1,353,261**

Using the costs to open (Exhibit 7) and the operating cash flow model in Exhibit 8 (extended out to 2040) and a terminal value discount rate of 7 percent, we calculated the that the IRR is 7.3 percent.[4,5] We consider this a baseline pro forma. With enhancements and changes in assumptions, higher rates of return are potentially achievable.

Findings and Considerations

While a new hotel would be positive cash flow positive, a low rate of return may deter developers.

We conclude from our market and financial research that a new hotel in Soldotna would be cash flow positive once operating. However, development costs are high, and the IRR is 7.3 percent as a result. This return is lower than would be considered ideal (14%).

[4] The terminal value assumes the hotel will continue operating past the 15th year. This approach acknowledges that many assets have enduring worth beyond the immediate timeframe under consideration. The terminal value, therefore, captures the long-term perspective by estimating the potential future earnings or resale value of the investment.

[5] The seven percent discount rate is based on the "investment rate" which is the average long-term rate of return on a mix of corporate and noncorporate assets. This is generally considered a leading discount rate for conducting cost-benefit analysis.

Enhancements that may boost the IRR

While the IRR is lower than one would hope, it is based on conservative assumptions. Further, there are possibilities that could work in Soldotna's favor such as:

- Our analysis does not include cash flows from a bar and restaurant. These may be substantial. Notable is that Alaskan liquor control rules would afford the hotel market power. That is economic-speak for an ability to operate with few competitors and thereby earn higher profit margins.
- Room demand is highly seasonal. A way to improve the profitability of a hotel in such a market is to design it in a way that allows you to close off a section of the building during the off-season and thereby save money on utilities and housekeeping.
- Ascertaining the actual cost of developing the hotel is critical. Modest reductions in the development costs would improve the IRR. We suggest reaching out to firms that have built comparable properties and are very familiar with the site in Soldotna for their estimates.
- We included management fees in our cash flow on the assumption that this would be a branded hotel. Under those circumstances the developer may have support including ready-to-use architectural plans, staff training, branded supplies, marketing support, software, and systems. These accelerate ramp-up and typically result in higher occupancy and room rates compared to unbranded competitors. The market on the peninsula is currently dominated by unbranded properties. The ADRs and occupancy rates forecast for Soldotna are based largely on those unbranded properties.
- We also need to emphasize that the broader development of the waterfront will enhance the attractiveness of Soldotna as a tourist destination. If successful, the hotel will likely enjoy higher occupancy and room rates than forecast here. If the hotel had riverfront views, it could also charge more. Premium rates would directly flow to the bottom line.

  For example, raising the ADR from $169 to $199 (2023 dollars) and the occupancy rate by another 2 percent, all possible with a more attractive than average property, the IRR would rise to 12%. Add a bar and restaurant for another $125,000 in EBITDA and the project would nearly double the IRR forecast in the baseline pro forma.

Conclusion and Next Steps

Undoubtedly, realizing the City's envisioned development scale in the redevelopment area presents substantial challenges. Currently, mixed-use and multifamily developments are not financially viable. Among residential options, townhomes are the most feasible, contingent on favorable land costs. A borderline feasible option is a hotel, particularly if the riverfront offers amenities that appeal to upscale hotels. This situation presents a dilemma. To stimulate desired development in the near term, it is likely the City will need to facilitate redevelopment through participating in public private partnerships (e.g., market hall, subsidized land costs for private development, etc.), constructing infrastructure improvements (e.g., streets and sidewalks, trails, and open space), and carefully considering the timing of both public and private investment.

Despite these challenges the City has options that it could pursue to bring its vision to life for the project area. We recommend a phased development approach as follows:

Phase 1:

- **Establish a market hall.** The City could focus on developing a market hall which would support the community's desire for affordable retail/restaurant space for local businesses that the private market cannot support in the near term. This strategic move could lay the groundwork for future private development phases by building and supporting a pipeline of retail businesses to tenant new development and creating a "place" that can serve as a focal point of activity to stimulate additional development in later phases.
- **Encourage townhome development.** Townhomes are the most feasible residential type, offering a promising means to reinvigorate the area through private investment.
- **Partner to develop affordable multifamily housing.** Private three-story multifamily development is unlikely in the current market. The City could instead pursue an affordable multifamily development, which does not rely on market debt and equity like market rate apartment developments. This approach could help the City begin achieving the Master Plan's desired density in the near term rather than waiting for later phases assuming market conditions will change. It will also provide needed affordable housing for residents.
- **Improve trails, streets, and public space.** Trail, street, and public space enhancements will serve as foundational elements for subsequent stages of development by creating developable parcels near public amenities.

Phase 2:

- **Introduce a hotel.** As area improvements take shape, a hotel becomes a logical progression. These enhancements assure upscale hotel developers that the necessary amenities for long-term success are in place.
- **Adaptive reuse.** Consider ways to enhance buildings that already exist. It is likely that larger scale development may not be feasible right away. Adaptive reuse could be one way to continue the momentum of redevelopment in a more cost-effective way.

Phase 3:

- **Three-story mixed-use development.** Initial investments are designed to enhance future phases by enabling developers to command higher rents, potentially making future stages more feasible. Balancing affordability with redevelopment remains a crucial consideration.

ECONorthwest will provide additional details on implementation as a part of the final Master Plan. This approach and phasing could shift after additional discussion with the City.

Appendix A. Assumptions

ECONorthwest completed a financial analysis for residential and mixed-use development that models a developer's decision-making process and cash flow equation for multiple prototypical developments, or *prototypes*. We created a pro forma model to test the financial feasibility to understand how the City could incentivize housing production. We drew our initial market and construction cost insights from sources such as Costar, Redfin, and Craftsman, and then vetted those assumptions with local developers and brokers. Ultimately, this type of assessment will help the City understand the likelihood of developers producing residential and mixed-use development under different scenarios.

The table below show the details of the pro forma model.

Exhibit 9. All Pro Forma Assumptions

Source: ECONorthwest, CoStar, Redfin, Craftsman, Stakeholder Interviews

Assumption	Townhomes	Multifamily Apartments	Mixed-Use Apartments
Building program			
Total units	4	60	65
Lot size	10,000 sf	65,000 sf	65,000 sf
Retail area	N/A	N/A	5,000 sf
Unit mix	100% 3-bedroom	20% studio, 45% 1-bedroom, 35% 2-bedroom	20% studio, 45% 1-bedroom, 35% 2-bedroom
Average unit size	1,750 sf	690 sf	690 sf
Revenue / Operating Assumptions			
Average market rent per month*	N/A	$1,200 ($1.75 per sf)	$1,250 ($1.80 per sf)
Average sales price*	$615,000 ($350 per sf)	N/A	N/A
Vacancy expense	N/A	10%	10%
Operating expenses per unit	N/A	$2,400	$3,300
Retail rent per sf	N/A	N/A	$18 per year / $1.50 per month
Development Costs			
Construction cost per sf	$190	$250	$250
Parking garage cost per stall	$25,000	N/A	N/A
Surface parking cost per stall	N/A	$7,000	$7,000
Total hard cost	$1,140,000	$12,580,000	$14,920,000
Other development costs	Soft costs: 20%; Contingency: 4%; Developer fee: 5%		
Total development cost	$1,650,000	$16,480,000	$19,550,000
Return Assumptions and Results			
Debt service coverage ratio	N/A	1.25	1.25
Spread on cost	10%	N/A	N/A
Residual land value	$95,000	($2,150,000)	($2,640,000)
Residual land value per sf	$9	($33)	($41)

* This assumption is inclusive of modest market escalation during construction

Appendix B. Hotel Assumptions

ECONorthwest completed a financial analysis for a hotel development in Soldotna. We modeled the baseline cash flows for a new hotel from construction through its first 15 years of operations. This model serves as a baseline representing a basic hotel. Feeding into the pro forma is an analysis of the local hotel market. For this, we used historical market data for the Kenai Peninsula which originate from Costar. They, through their subsidiary, STR Global, obtain operating data from hotels. We use industry standards and current market conditions to determine development costs and required rate of return.

The table below shows the details of our assumptions.

Exhibit 10. Baseline Pro Forma Assumptions for Hotel

Source: ECONorthwest, Costar, STR Global, HVS

Note: All costs are adjusted for inflation. ECONorthwest projects inflation of 4.2 percent in 2025 with it gradually falling to 3.4 percent per year in later years.

Variable	Assumption
Hotel scale	Upper mid-scale to upscale
Room count	62
Average daily room rate (ADR) (Jan 2023 $)	$169.40
Construction year	2025
Opening year	2026
Last operating year of forecast	2040
Net Occupancy Rate (NOR)	66.2%
Occupancy rate ramp-up year 1	.77
Occupancy rate ramp-up year 2	.91
Occupancy rate ramp-up year 3	1.00
CPI January 2023	300.5
Terminal value discount rate	7%
Required IRR	14%
Development Costs *Based on HVS Hotel Cost Estimating Guide 2021 and 1.26 construction cost escalation for Alaska	
Land	$1,496,082
Building site & improvements	$12,452,397
OSE (Operating supplies and equipment)	$2,102,604
FFE (Furniture, fixtures, and equipment)	$1,763,126
Preopening & working capital	$549,320
Developer fees	$519,310
Operating Costs and Revenues *Based on STR P&L 2022/2021 data for Anchorage	
Operating costs	Varies by year due to inflation and ramp-up
Fixed charges	Varies by year due to inflation and ramp-up
Revenue (aside from room sales)	Varies by year due to inflation and ramp-up
Results – Projected IRR	
Projected IRR w/baseline assumptions	7.3%
w/higher room rate ($199.40) and occupancy (68.2%)	12%
w/higher room rate and occupancy and restaurant w/$125,000 EBITDA	13%