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MEMORANDUM

Date:	October 22, 2020	Project #: 23858
To:	Project Management Team	
From:	Mark Heisinger, EIT, Russ Doubleday, Nick Foster, AICP, RSP, and Matt Hughart, AICP; Kittelson & Associates Andrew Holder, Margot Halpin, Chris Weaver, and Mike Faha; Greenworks	
Project:	City of Ontario, Active Transportation Update and East Idaho Avenue Refinement Area Plan	
Subject:	Technical Memo #8: Revised Design Concept	

This memorandum is part of the City of Ontario's update to its 2006 Transportation System Plan (TSP). This memorandum presents the revised design concept and proposed revisions and guidance for City street standards. This memorandum presents material that has been updated or revised from *Technical Memorandum #6: Draft Design Concepts* (Reference 1).

DRAFT DESIGN CONCEPT

The East Idaho Avenue Refinement Area includes East Idaho Avenue from the I-84 westbound ramp terminal intersection to the Snake River, and the adjacent commercial areas. *Technical Memorandum #6* presented a draft design concept for the East Idaho Avenue Refinement Area. The draft design concept leveraged planned intersection improvements on East Idaho Avenue and available ODOT right-of-way south of the roadway, to implement upgrades outside the roadway that would benefit people walking and biking and enhance the identity of Ontario. The concept included a shared-use path south of the road, gateway treatments, future connections to the planned trail along the Snake River, and an overlook of the river. Enlargements of the Goodfellow Lane and East Lane intersections and the Snake River overlook area were also included.

Feedback Received on the Draft Design Concept

Efforts to collect feedback on the draft design concept included a booth at the Ontario Saturday Market, an online workshop, a Technical Advisory Committee (TAC) meeting, and opportunities to provide comments via the project website. The Project Management Team (PMT) also provided feedback on the draft design concept.

Feedback from TAC and PMT

The draft design concept was reviewed during meetings with the TAC and PMT. A summary of feedback received from the TAC and PMT on the draft design concept is as follows:

- Explore ways to increase comfort of the bicycle and pedestrian crossing on the southern leg of East Lane intersection where the new channelized eastbound right-turn is proposed
- Look into possibility of adding pedestrian refuges on East Idaho Avenue crossings
- Study the possibility of including dual eastbound left-turn lanes at the East Lane intersection as an alternative to extended westbound left-turn lane storage at Goodfellow Street
- Review a map of utilities near the proposed overlook to identify and avoid potential conflicts

Feedback from Public

Generally, attendees of the public involvement efforts were supportive of the East Idaho Avenue Draft Design Concept and were glad to see proposed improvements to walking and biking in the area, especially if the proposed pathway connected to a river trail. There were concerns raised about policing on the shared use paths (mainly the river trail) as there have been camps along the river. Other comments on the draft design concept included:

Saturday Market Booth

- Consider business sponsors or partnerships for trail networks
- Have East Idaho Avenue path and river trail be ADA accessible
- The East Idaho Avenue improvements are good, but lack connectivity to the rest of town
- There was concerns about congestion and safety near the Dutch Bros access

A detailed summary of the Task 4 outreach efforts and feedback received are shown in Attachment "A."

REVISED DESIGN CONCEPT

The following section presents the revised design concept for the East Idaho Avenue Refinement Area. Included in the section is a summary of revisions made to the draft design concept, revised concept figures, and cost estimates.

Revisions to Draft Design Concept

Revisions were made to the draft design concept based on direction from the PMT and TAC, feedback received as part of the Task 4 outreach efforts, and additional traffic analysis that was conducted on East Idaho Avenue. The two key revisions made to the draft design concept include:

- **Westbound Bike Lane Buffer:** A three-foot painted buffer was added between the westbound bike lane and the adjacent travel lane from Snake River to the I-84 eastbound ramp terminal intersection. The buffer was added to meet the updated City street standards for active transportation facilities and to create a more comfortable environment for people biking on East Idaho Avenue. In order to create enough space for the buffer, the westbound travel lanes were reduced from 12 feet to 11 feet.
- **Dual Eastbound Left-Turn Lanes at East Lane:** Participants at the August PMT meeting expressed interest in having dual eastbound left-turn lanes on East Idaho Avenue at East Lane. At the same time, they wanted to maintain the additional storage for the outer left-turn lane shown in the draft design concept since there is likely to be more demand for that lane. This could be accomplished by leaving the current left-turn lanes between East Lane and Goodfellow Street as they are today and then adding an additional eastbound left-turn lane on the south side of the current lanes.[1]

Other minor revisions to the draft design concept include:

- **Removal of the sidewalk on the south side of East Idaho Avenue from the I-84 westbound ramp terminal intersection to the Snake River:** People will be able to walk on the shared-use path on this portion of East Idaho Avenue. Removing the sidewalk from the concept decreases construction and maintenance costs associated with the sidewalk.
- **Relocation of the future riverfront trail and trail junction:** Through discussions with the City, it was determined that the future riverfront trail would likely follow a path closer to the Snake River than what was previously shown in the draft design concept.
- **Removal of the eastbound channelized right-turn at the East Lane intersection:** There was concerns from the TAC that adding a channelized right-turn at this location would create an

[1] A trade-off of the dual eastbound left-turn configuration at East Lane is it does not increase the storage for westbound left-turns at Goodfellow Street. Therefore, the project team conducted additional traffic analysis on the East Lane and Goodfellow Street intersections to evaluate vehicle queuing and intersection capacity under the revised draft design concept. This analysis considered additional growth that could occur in the area as properties south of Idaho Avenue develop and Goodfellow Street is extended south to SE 5th Avenue. The results of this analysis showed that the existing storage for the westbound left-turn lane at Goodfellow Street is expected to be adequate to accommodate 95th percentile queues, even with this development. The traffic operations and queuing analysis results are shown in Attachment "B."

uncomfortable environment for bicyclists or pedestrians crossing the intersection. The channelized right-turn was removed from the design so that the right-turn will follow a similar profile as existing conditions.

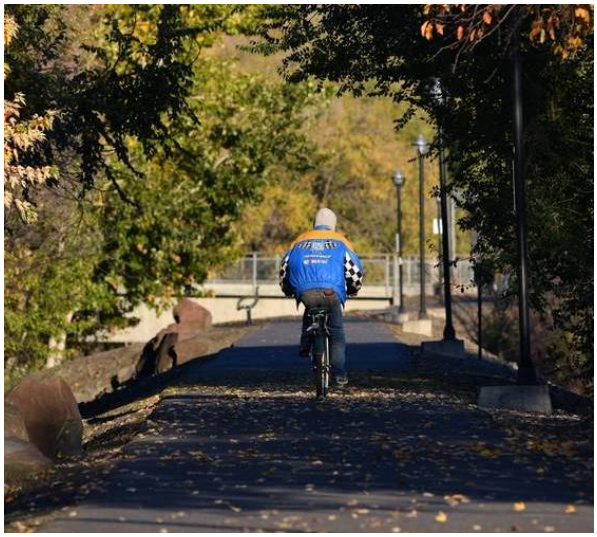
Revised Design Concept Components

Figure 1 shows the revised design concept for the East Idaho Avenue Refinement Area. The concept includes a shared-use path south of the road, gateway and overlook treatments, future connections to the planned trail along the Snake River, and an overlook of the river. Enlargements of the Goodfellow Lane and East Lane intersections and the Snake River overlook area are included in Attachment "C."

Shared-Use Path

The primary upgrade proposed is to remove the south side sidewalk and the eastbound bike lane from East Idaho Avenue and replace them with a shared-use path running through the publicly owned tracts on the south side of the road. Since the speed limit on East Idaho Avenue is 35 miles-per-hour (mph), this off-street path will be more comfortable to a wider range of bicyclists than the existing on-street bike lane. It will also be more attractive to pedestrians since it is further from the busy road.

The shared-use path will create a key connection to a future riverfront trail along the Snake River, adding to the riverfront trail's planned connectivity to parks, natural areas, and other future trails around Ontario. The intersection with the future riverfront trail is proposed to be a roundabout with special paving to match the overlook. This roundabout will minimize traffic conflicts as well as create a focal point in the middle for enhanced planting and a gateway element.



Example of a Shared-Use Path in Pendleton Oregon *(Source: Eastern Oregonian)*

HOME DEPOT

WALMART

BEST WESTERN

ONTARIO MARKETPLACE

QUALITY INN

GOODFELLOW ST

NE EAST LN

SNAKE RIVER

MOVE ROAD BARRIER TO CREATE 10' WIDE SEPARATED SHARED-USE PATH ON BRIDGE (EXISTING CONDITION IS ON-STREET BIKE LANE AND SEPARATED SIDEWALK)

SHARED-USE PATH BECOMES STANDARD SIDEWALK AND ON-STREET BIKE LANE AT END OF BRIDGE

FUTURE FOOTBRIDGE OVER SLOUGH

CONNECTION BETWEEN SIDEWALK AND FUTURE RIVERFRONT TRAIL

I-84

30

E IDAHO AVE

EAST LN. INTERSECTION ENLARGEMENT

GOODFELLOW ST. INTERSECTION ENLARGEMENT

TRAIL JUNCTION AND OVERLOOK ENLARGEMENT

OHL

MOVE ROAD BARRIER TO CREATE 12' WIDE SEPARATED SHARED-USE PATH ON OVERPASS (EXISTING CONDITION IS ON-STREET BIKE LANE AND SEPARATED SIDEWALK)

PRIMARY GATEWAY ELEMENT, VISIBLE FROM BOTH E. IDAHO AVE. AND I-84 WESTBOUND

WALGREENS

SIDEWALK AND EASTBOUND ON-STREET BIKE LANE REPLACED BY 12' WIDE SHARED-USE PATH

EXISTING STORMWATER SWALE, ENHANCED

BIG 5

TRAIL JUNCTION

OVERLOOK

POTENTIAL RIVERFRONT PARK, AND ALTERNATIVE LOCATION FOR OVERLOOK

FUTURE RIVERFRONT TRAIL

AARON'S

WINCO

MARSHALLS

DOLLAR TREE

OREGON DHS

WATER TREATMENT PLANT

LEGEND

TYPE 1 LANDSCAPE: ENHANCED IRRIGATED PLANTING

TYPE 2 LANDSCAPE: BASIC IRRIGATED - STREET TREES & PLANTS OR GRAVEL MULCH

TYPE 3 LANDSCAPE: NON-IRRIGATED FIELD GRASS

TYPE 4 LANDSCAPE: STORMWATER TREATMENT AREA PLANTING

PROPOSED STREET TREE

EXISTING STREET TREE

PRIMARY GATEWAY ELEMENT

SECONDARY GATEWAY ELEMENT

WAYFINDING ELEMENT

PROPOSED SHARED-USE PATH

FUTURE RIVERFRONT TRAIL

N

0 75 150 300

SCALE: 1" = 150'

Figure 1

OVERALL PLAN

EAST IDAHO AVENUE REFINEMENT AREA PLAN

Oregon Department of Transportation

ONTARIO Where Oregon Begins...

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

GREENWORKS

11.10.2020

To make the new multi-use path most effective, it should extend across both the I-84 overpass and the Highway 30 bridge across the Snake River. This will create a more comfortable and safe experience for bicyclists traveling through the corridor and set the stage for similar improvements in the future beyond this corridor. Currently both bridges have on-street eastbound bike lanes plus sidewalks separated from the road by concrete barriers. Based on the information available, it appears that by moving the barriers toward the centerline (leaving 2 feet shy distance to the vehicular lanes) there will be room for a 12 feet wide shared use path on the I-84 overpass, and an at least 10 feet wide shared use path on the Snake River bridge, both separated from traffic by the barriers.

The guardrail on the Snake River bridge appears to be the minimum 42 inches in height, but taller protection is recommended for cyclists. A "rub rail" should be added to the existing guardrail to raise the height to 54 inches. The guardrail/barrier on the I-84 bridge is much taller.

Overlook

Two nodes are proposed along the shared-use path where users can rest and take in the surroundings. The first is a simple rest stop with a bench, planting, trees for shade, and a view of the enhanced swale, located just east of Goodfellow Street The other is a scenic overlook plaza, located at the edge of the upper river terrace near the toe of the Snake River bridge. This overlook is positioned for a view over the Snake River and the lower river terrace, and to be visible from East Idaho Avenue. Some existing trees may need to be thinned to create the best views. The overlook may feature special paving, enhanced planting, benches, interpretive signage, and gateway elements. An enlargement of the overlook area is shown in Attachment "C."

Gateway

East Idaho Avenue is the route many take to enter and leave Ontario and the state of Oregon, and I-84 crosses under East Idaho Avenue shortly after it enters Oregon. As such, the East Idaho Avenue Refinement Area is a highly visible opportunity to create a gateway that welcomes visitors (and returning residents) to the city and the state, as well as to create a strong visual identity for Ontario.

Gateways can take many forms, such as arches, columns, walls, banners, signage, special planting, sculpture, or combinations of these elements. A gateway may occupy a single spot or may consist of repeated elements along a route. Gateways are an opportunity to display public art, to highlight the unique local character, and to express civic pride.

Because of the major entry moments at either end of the East Idaho Avenue Refinement Area, we propose creating a series of gateway features that span the whole corridor. Primary gateway features would be prominently displayed near the toe of the Snake River bridge and at the east end of the I-84 overpass. The feature at the I-84 overpass would be visible both from East Idaho Avenue and from I-84 westbound. ODOT has restrictions regarding welcome signage and public art near highways, which may limit the possibilities for gateway elements. Exceptions to these restrictions are common though, for

example the Oregon welcome sign and imagery on the I-84 overpass for E. Idaho Ave. Any gateway concepts that are developed in the future will need to be coordinated with and reviewed by ODOT.

Between the primary gateway features, there would be several secondary gateway features along the south side of East Idaho Avenue. These secondary features would be smaller and simpler, but of the same theme and materials as the primary gateway features. Taken together, the series of gateway elements can create a visual identity that ties the East Idaho Avenue Refinement Area together and expresses Ontario's character on a large scale.

Wayfinding

The City of Ontario has recently engaged in conceptual designs for a system of wayfinding elements. Two of these element types are proposed to be located at key points along the shared-use path, both to aid in navigation and to express the City's branded identity. The taller Pedestrian Directional Sign will be placed at intersection decision points, and the smaller bollard version will be placed at intervals along the route. The conceptual designs of the wayfinding elements are shown in Attachment "D."

Example Wayfinding Sign

Planting

The proposed planting is divided into four general landscape types, and the overall intention is to maximize the aesthetic impact of the planting while keeping irrigation and maintenance minimal. Only native and drought-adapted plant species will be used. Examples of the landscape types are shown in Figure 2 and are further described in the following section.

Figure 2 Landscape Types

Type 1 Landscape is enhanced irrigated shrub and tree planting, the densest and most ornamental planting type proposed. It also occupies the smallest proportion of the planted areas, limited to areas where it is most visible and where it supports other key features, such as the gateway elements and the overlook.

Type 2 Landscape includes more basic irrigated planting and trees, primarily located adjacent to the curb. The planting in some places may be replaced by ornamental rock mulch to reduce maintenance needs. Where the shared-use path is near the curb, the area between the two is all Type 2 Landscape. Where the path is further from the curb there is an even-width strip of Type 2 Landscape at the curb, similar to a typical sidewalk planting strip. Without the shared-use path to define the edge, a 12" wide concrete mow band provides a clear distinction between Type 2 and other landscape types which have different maintenance needs.

Type 3 Landscape is non-irrigated field grass with sparse trees. It occupies by far the largest proportion of the planted areas and requires the least maintenance. The grass is intended to be mowed only a few times a year, mainly to minimize fire risk but also to periodically keep weeds down. Since there is no irrigation, trees will need to be watered using "gator bags" or similar for establishment.

Type 4 Landscape is the treatment area planting in the flat bottom of the swales. This is the part that provides the water-quality benefits for the storm runoff, and will include drought-adapted sedges and rushes, plus grass species from the Type 3 field grass. Similar to Type 3, it will only require minimal maintenance, mainly mowing at a few strategic points during the year.

Revised Design Concept Cost Estimate

The total estimated project cost of the East Idaho Avenue Refinement Area Revised Design Concept is approximately $3.8 million. The total estimated construction cost is approximately $2.5 million and the total estimated engineering and contingency costs are approximately $1.3 million. A detailed breakdown of the cost estimate is shown in Attachment "E."

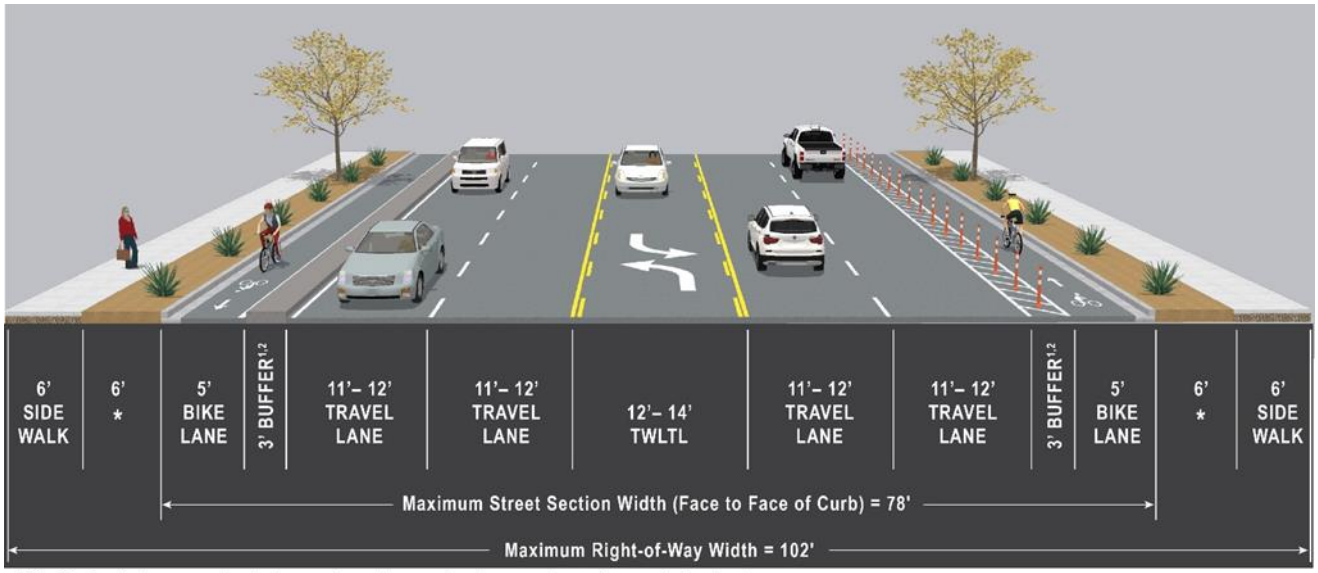
UPDATES TO STREET STANDARDS REVISIONS

The City's Existing Transportation System Plan defines cross-sectional street standards for different roadway functional classifications. The street standards relate the design of the roadway to its desired function. *Technical Memorandum #6* proposed draft updates to the street standards to incorporate best practices for active transportation accommodation. The proposed updates were based on the recommendations and guidance of the Oregon Department of Transportation (ODOT), the National Association of City Transportation Officials (NACTO), and Oregon Transportation and Growth Management (TGM).

The draft street standards presented in *Technical Memorandum #6* were updated based on feedback from the City, PMT, and TAC. The primary updates made to the draft street standards were made to maintain consistency with existing City code requirements and are as follows:

- Added maximum right-of-way width and maximum street section width to each section
- Clarified that street sections could utilize landscape buffers or bioretention swales
- Changed bike lane widths to 5 feet
- Changed local street sidewalk widths to 5 feet
- Changed local street widths to a minimum of 20 feet to meet Fire Code Requirements
- Added a street section for local streets with grades equal to or less that 2%
- Removed the "Skinny Local Street" section

Figures 3-10 show the updated cross-section standards.



[1] Buffer includes a vertical element, such as raised concrete or flexposts/bollards.
[2] If the bike lane is grade separated (i.e., a raised bike lane) the buffer can be reduced to the curb separating the bike lane from the motor vehicle lane.
* Bioretention Swales or Landscape Buffer

Figure 3 Principal Arterial and Five-Lane Minor Arterial Proposed Cross-Section

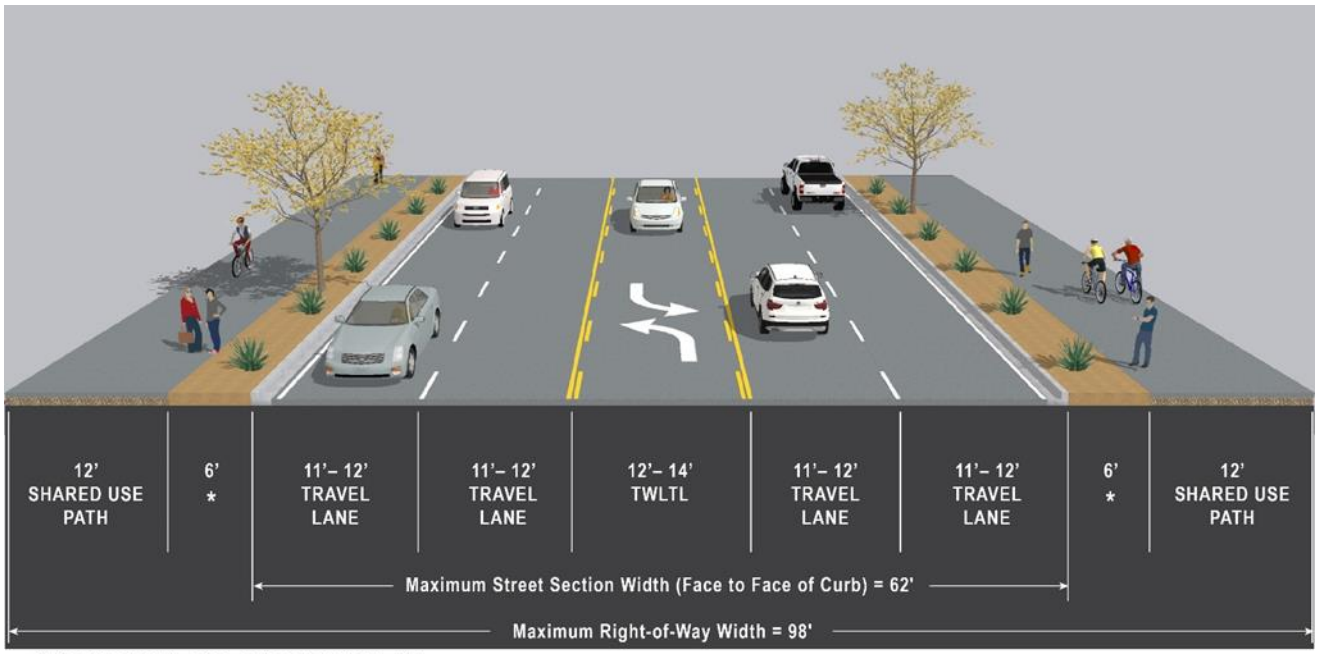


Figure 4 Principal Arterial and Five-Lane Minor Arterial Proposed Cross-Section – Shared-Use Path Option

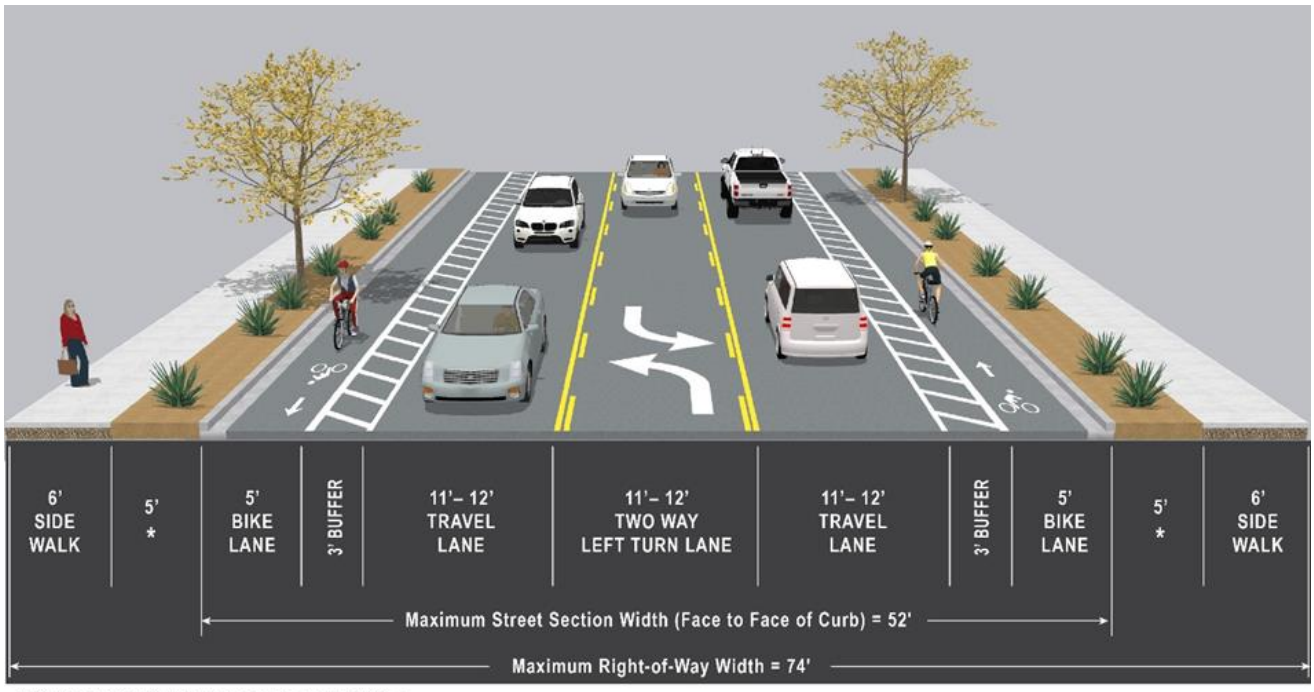
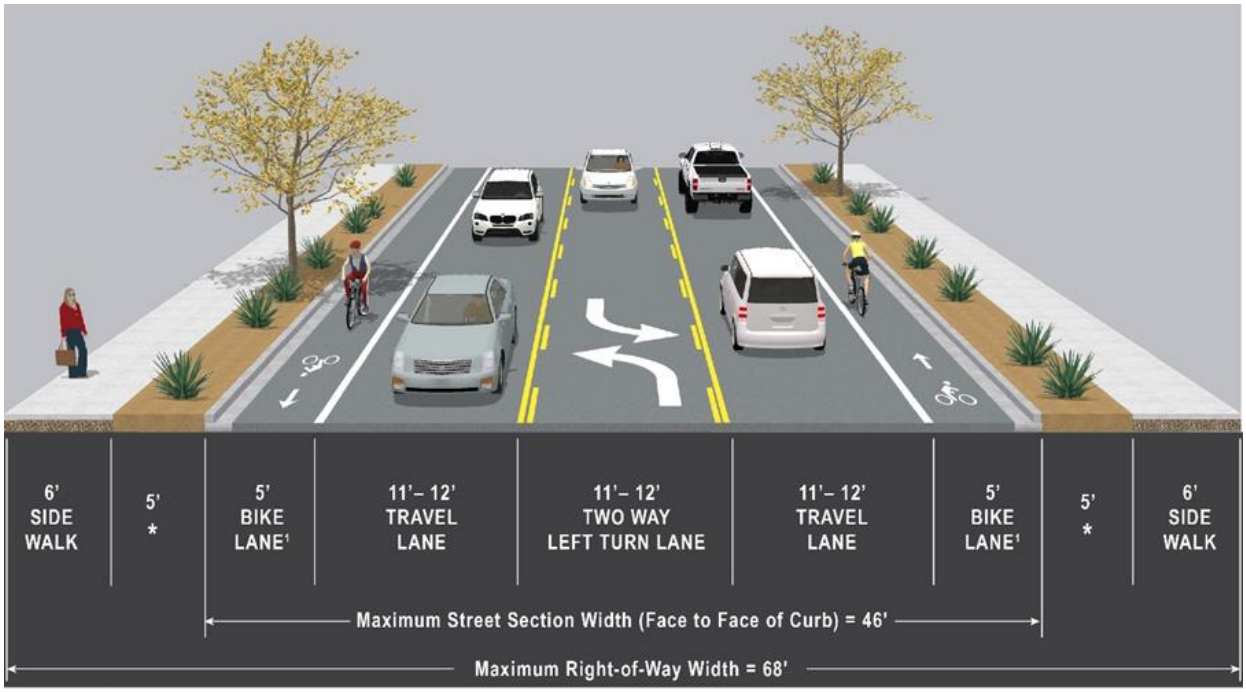
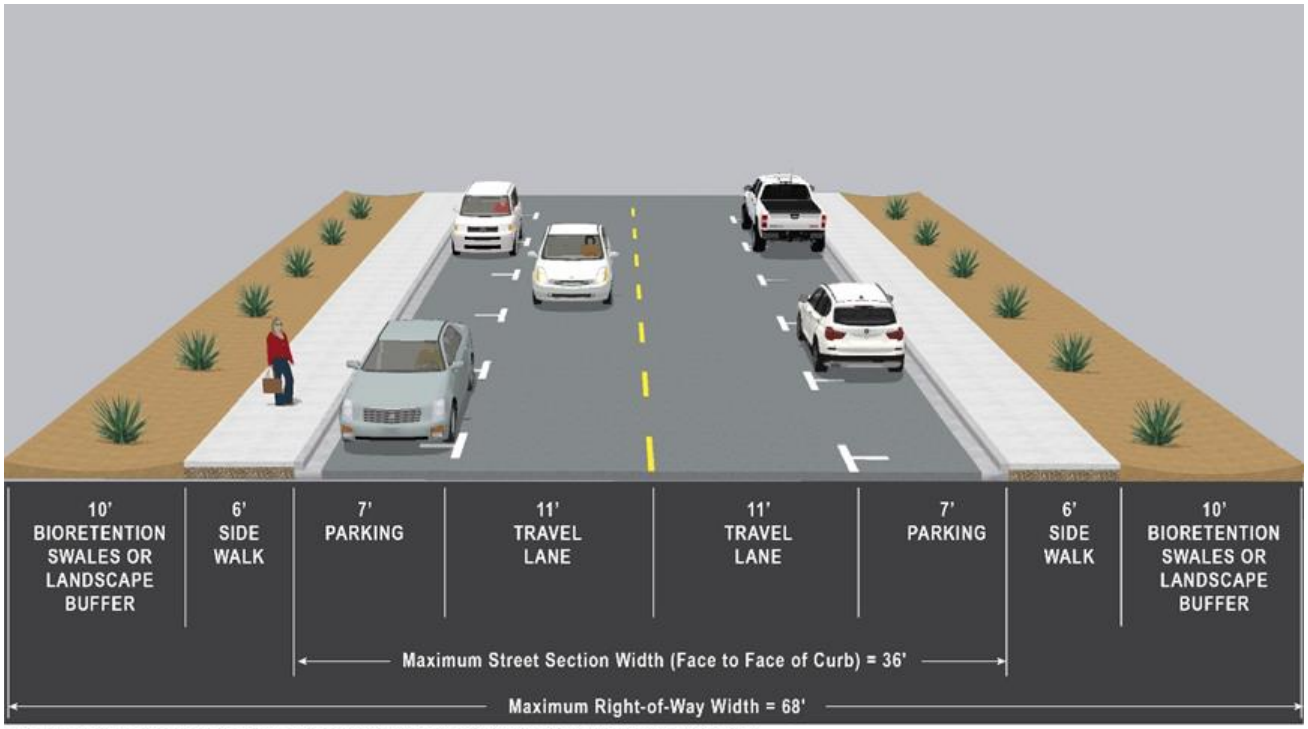


Figure 5 Three-Lane Minor Arterial Cross-Section



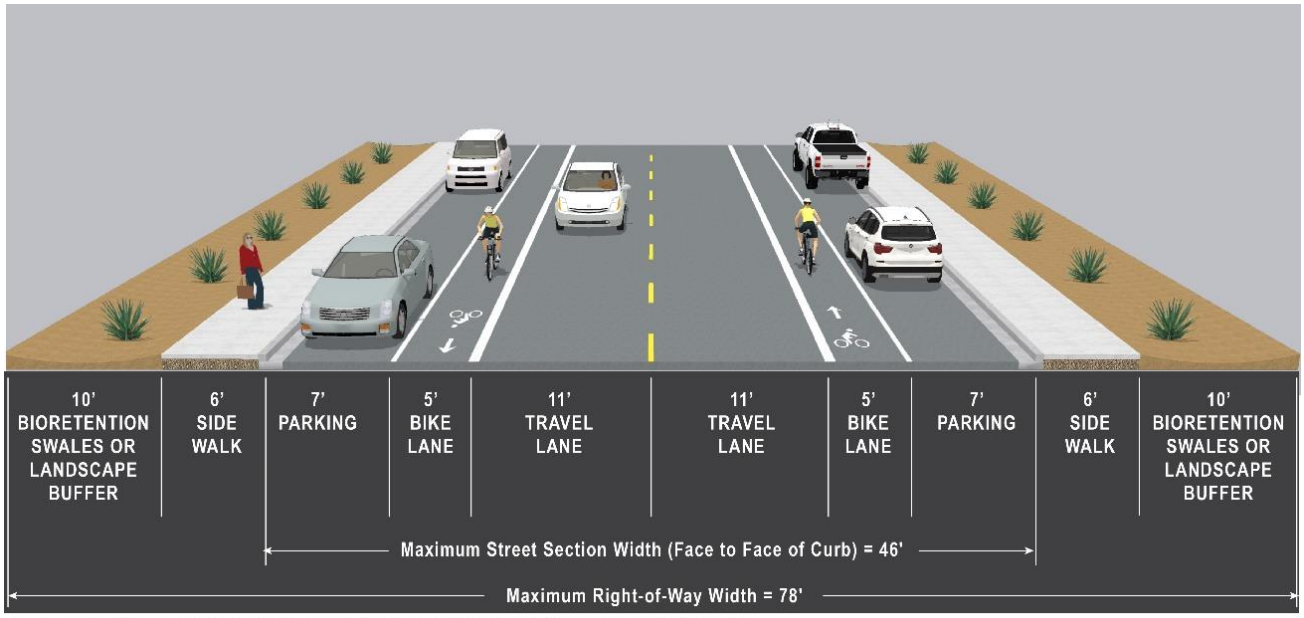
* Bioretention Swales or Landscape Buffer
¹Bike lane buffer recommended when roadway width is available

Figure 6 Three-Lane Collector Proposed Cross-Section



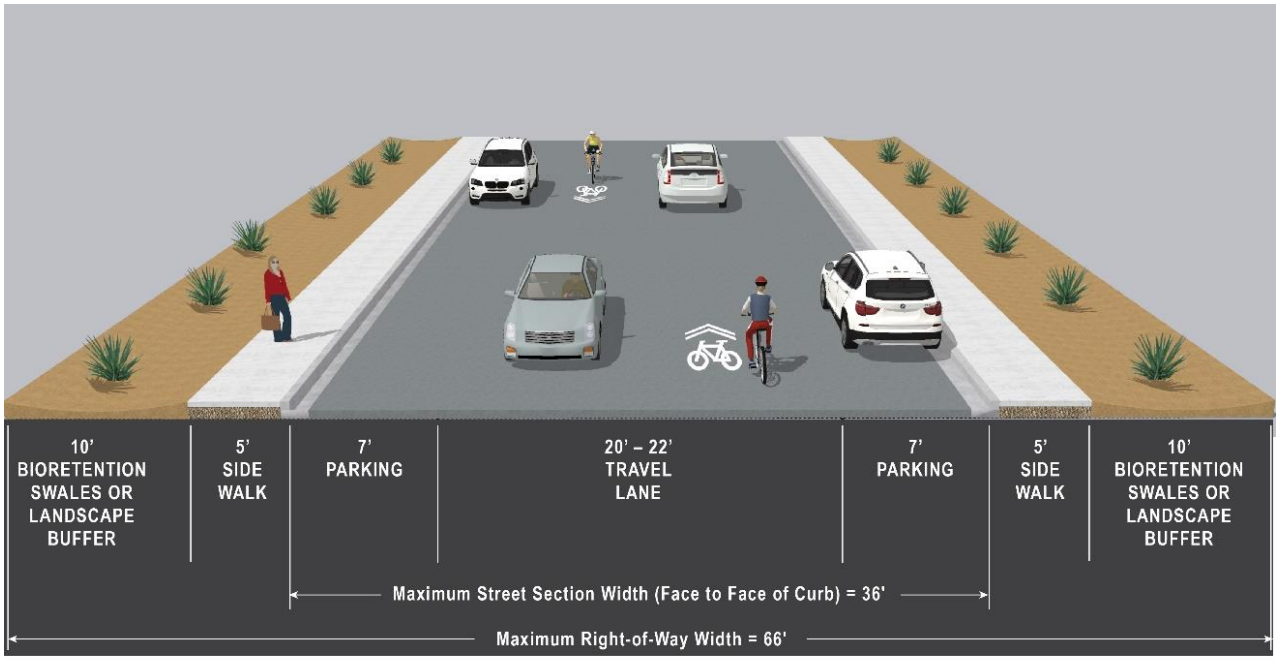
Note: Bioretention swales are not required on streets with grades greater than 2%

Figure 7 Neighborhood Collector Proposed Cross-Section



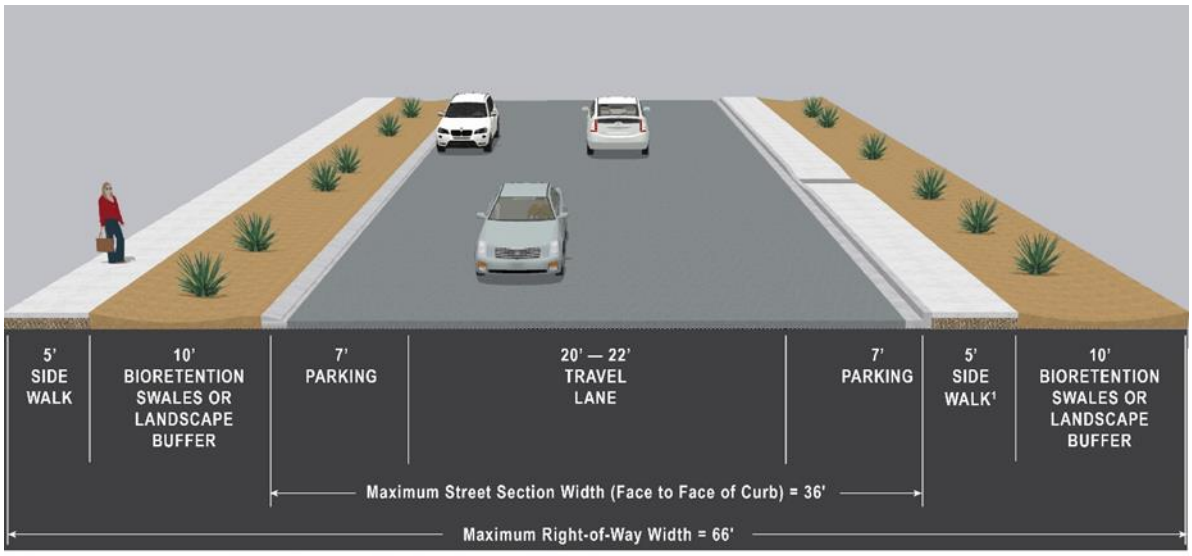
Note: Bioretention swales are not required on streets with grades greater than 2%

Figure 8 Neighborhood Collector with Bike Lanes Proposed Cross-Section



Note: Bioretention swales are not required on streets with grades greater than 2%

Figure 9 Local Street (With Optional Bikeway Designation) Proposed Cross-Section



¹ Curb opening drainage channel through sidewalk with expanded metal cover.
Note: Ribbon curbs or curb openings with drainage channels can be use for final street sections

Figure 10 Local Streets with Grades Equal or Less Than 2 percent

NEXT STEPS

The findings of the memorandum were presented at TAC Meeting #3, an online community open house, and an Ontario Saturday Market. Feedback received from the TAC and the community will be used create the final design concept of East Idaho Avenue and to refine the other elements contained in this memorandum.

REFERENCES

1. Kittelson and Associates. *City of Ontario, Active Transportation Update and East Idaho Avenue Refinement Area Plan Technical Memorandum #6: Draft Design Concepts*. 2020.

ATTACHMENTS

A. Outreach Summary
B. East Idaho Avenue Traffic Analysis Results
C. Revised Design Concept Graphics
D. Wayfinding Graphics
E. Revised Design Concept Cost Estimate

Attachment A Outreach Summary

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MEMORANDUM

Date: September 11, 2020 Project #: 23858

To: Project Management Team

From: Russ Doubleday, Mark Heisinger, EIT, and Nick Foster, AICP, RSP

Project: City of Ontario, Active Transportation Update and East Idaho Avenue Refinement Area Plan

Subject: Task 4 Outreach Summary

The project team and City of Ontario recently completed outreach efforts related to the Draft Design Concept for the East Idaho Avenue Refinement Area, safe routes to school (SRTS) improvements, roadway cross-section updates, and the healthy community impact analysis. These efforts included:

- A booth at the Ontario Saturday Market on August 8, 2020.
- An online workshop held from August 7, 2020 to August 28, 2020.
- Opportunities to provide comments via the project website.

This memorandum summarizes the feedback received from the Saturday Market outreach, online workshop, and any email comments received as of September 10, 2020.

SATURDAY MARKET OUTREACH

Members of the project team had a booth at the Ontario Saturday Market (held at Moore Park) on August 8, 2020 from 10 a.m. to 2 p.m. This provided the opportunity to present the Draft Design Concept and proposed SRTS improvements to the Saturday Market attendees, answer questions related to the project, and solicit feedback on the Task 4 materials. The project team spoke with approximately 44 attendees. Verbal feedback was written down by the project team and the attendees were encouraged to provide additional feedback via the online workshop

Saturday Market Booth

Specific comments and feedback received at the Saturday Market are as follows:

- **East Idaho Avenue Comments**
  - Consider business sponsors or partnerships for trail networks
  - Would like East Idaho Avenue path and river trail to be ADA accessible
  - The East Idaho Avenue improvements are good, but lack connectivity to the rest of town
  - There was concern about congestion and safety near the Dutch Bros access
- **SRTS Comments**
  - Areas west/northwest of Aiken Elementary needs sidewalk and crosswalk improvements.
    - There are gaps in the sidewalk (especially on Verde Drive) and limited crosswalks.
  - Enhanced crossings on 4th Ave are needed
    - Grade-separated crossing in front of hospital would be ideal
    - Cars run the light at 9th St/4th Ave.
  - Alameda Elementary has sidewalk gaps around the immediate vicinity of the school
- **General Comments**
  - Oregon St/Idaho Ave is uncomfortable from a driver perspective especially for WB traffic. Consider removing lanes where not necessary (it's not always clear when a lane is going to be a left-only, shared through/left, etc.).
  - Make sure that beautification focuses on cost-effective treatments. More trees are needed in Ontario.
  - The newspaper is a good way to share information about the project
  - Would like improved ADA accessibility at the rest of the parks, especially river access points.
    - It would be nice to have a list or website that specifies which parks and Fish and Game facilities are ADA accessible.
  - TVCC pathway is a great improvement that has a lot of bike/ped activity (x2)
  - It is good that the City is making a public outreach effort (x2)
  - A river trail like the Greenbelt would be great
  - Have we considered ways to police the river trail? There are issues with homeless camps in the area (x2)
  - Would like to see more green and pleasant places to walk in Ontario – especially 4th Ave
  - Removing goatheads should be a priority on bike facilities

Generally, attendees were supportive of the East Idaho Avenue Draft Design Concept and were glad to see proposed improvements to walking and biking in the area, especially if the proposed pathway connected to a river trail. There were concerns raised about policing on the shared use paths (mainly the river trail) as there have been camps along the river.

Attendees identified 4th Avenue (near 9th Street), Verde Drive, and the streets adjacent to Alameda elementary as locations to prioritize for SRTS improvements.

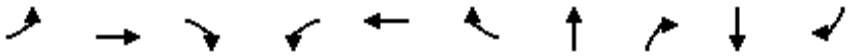
Other general themes in the attendees' comments included the need to create more walking and biking facilities in areas with trees/greenery and praise for the TVCC pathway. Attendees were also glad to see that the City was making a public outreach effort.

ONLINE WORKSHOPS

An online workshop was held from August 7, 2020 to August 28, 2020. The online workshop presented the East Idaho Avenue Draft Design Concept, SRTS findings, proposed updated street standards, and the healthy communities impact assessment. The online workshop also provided an opportunity for attendees to provide feedback on the materials.

One comment was received through the online workshop. The comment expressed support for the Draft Design Concept and wanted to see separate through and left-turn lanes on Goodfellow Lane since that person believes this would reduce the potential for crashes.

Attachment B East Idaho Avenue Traffic Analysis Results



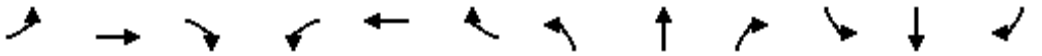
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	282	1256	362	152	1232	65	376	181	135	158
v/c Ratio	1.00	0.81	0.43	0.87	0.92	0.11	1.12	0.33	0.70	0.28
Control Delay	100.9	28.7	4.8	69.1	27.6	2.8	132.6	15.7	66.3	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Total Delay	100.9	28.7	4.8	69.1	27.9	2.8	132.6	15.7	66.3	6.4
Queue Length 50th (ft)	~270	493	35	158	668	4	~422	44	116	0
Queue Length 95th (ft)	m#463	443	39	m#220	m653	m4	#631	110	#223	53
Internal Link Dist (ft)		859			728		381		497	
Turn Bay Length (ft)	510		215	275		110		150		
Base Capacity (vph)	282	1658	890	175	1334	594	335	547	192	565
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	7	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.76	0.41	0.87	0.93	0.11	1.12	0.33	0.70	0.28

Intersection Summary

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

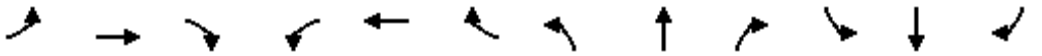
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	274	1218	351	147	1195	63	303	62	176	88	43	153
Future Volume (vph)	274	1218	351	147	1195	63	303	62	176	88	43	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0		4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	1599	3197	1473	1662	3228	1377		1647	1473		1670	1444
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.62	1.00		0.35	1.00
Satd. Flow (perm)	1599	3197	1473	1662	3228	1377		1061	1473		607	1444
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	282	1256	362	152	1232	65	312	64	181	91	44	158
RTOR Reduction (vph)	0	0	135	0	0	26	0	0	81	0	0	108
Lane Group Flow (vph)	282	1256	227	152	1232	39	0	376	100	0	135	50
Heavy Vehicles (%)	4%	4%	1%	0%	3%	8%	1%	7%	1%	2%	0%	3%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	26.5	72.7	72.7	15.8	62.0	62.0		47.5	47.5		47.5	47.5
Effective Green, g (s)	26.5	72.7	72.7	15.8	62.0	62.0		47.5	47.5		47.5	47.5
Actuated g/C Ratio	0.18	0.48	0.48	0.11	0.41	0.41		0.32	0.32		0.32	0.32
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0		4.5	4.5		4.5	4.5
Vehicle Extension (s)	2.5	4.8	4.8	2.5	4.8	4.8		2.5	2.5		2.5	2.5
Lane Grp Cap (vph)	282	1549	713	175	1334	569		335	466		192	457
v/s Ratio Prot	c0.18	0.39		0.09	c0.38							
v/s Ratio Perm			0.15			0.03		c0.35	0.07		0.22	0.03
v/c Ratio	1.00	0.81	0.32	0.87	0.92	0.07		1.12	0.22		0.70	0.11
Uniform Delay, d1	61.8	32.8	23.6	66.1	41.8	26.6		51.2	37.6		45.1	36.3
Progression Factor	0.95	0.78	0.63	0.70	0.52	0.24		1.00	1.00		1.00	1.00
Incremental Delay, d2	43.0	3.1	0.8	15.8	5.4	0.1		86.5	0.2		10.3	0.1
Delay (s)	101.7	28.8	15.7	62.1	27.0	6.5		137.7	37.8		55.4	36.4
Level of Service	F	C	B	E	C	A		F	D		E	D
Approach Delay (s)		37.1			29.7			105.2			45.1	
Approach LOS		D			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	44.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	274	1218	351	147	1195	63	303	62	176	88	43	153
Future Volume (veh/h)	274	1218	351	147	1195	63	303	62	176	88	43	153
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	1695	1695	1736	1750	1709	1641	1654	1654	1736	1750	1750	1709
Adj Flow Rate, veh/h	282	1256	362	152	1232	65	312	64	181	91	44	158
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	1	0	3	8	7	7	1	0	0	3
Cap, veh/h	285	1388	634	260	1342	575	44	0	466	40	11	459
Arrive On Green	0.35	0.86	0.86	0.31	0.83	0.83	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1615	3221	1471	1667	3247	1391	0	0	1471	0	36	1448
Grp Volume(v), veh/h	282	1256	362	152	1232	65	376	0	181	135	0	158
Grp Sat Flow(s),veh/h/ln	1615	1611	1471	1667	1624	1391	0	0	1471	36	0	1448
Q Serve(g_s), s	26.0	36.7	10.0	11.5	40.9	1.3	0.0	0.0	14.4	0.0	0.0	12.6
Cycle Q Clear(g_c), s	26.0	36.7	10.0	11.5	40.9	1.3	47.5	0.0	14.4	47.5	0.0	12.6
Prop In Lane	1.00		1.00	1.00		1.00	0.83		1.00	0.67		1.00
Lane Grp Cap(c), veh/h	285	1388	634	260	1342	575	44	0	466	51	0	459
V/C Ratio(X)	0.99	0.90	0.57	0.59	0.92	0.11	8.56	0.00	0.39	2.62	0.00	0.34
Avail Cap(c_a), veh/h	285	1671	763	260	1342	575	44	0	466	51	0	459
HCM Platoon Ratio	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.56	0.56	0.56	0.26	0.26	0.26	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.3	8.4	6.6	47.6	11.2	7.7	75.0	0.0	39.9	64.7	0.0	39.3
Incr Delay (d2), s/veh	36.8	6.1	2.1	0.8	3.6	0.1	3448.7	0.0	0.4	783.2	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(95%),veh/ln	16.3	7.3	4.2	6.1	7.0	0.8	74.9	0.0	9.1	23.7	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.1	14.5	8.7	48.3	14.7	7.8	3523.7	0.0	40.3	847.9	0.0	39.6
LnGrp LOS	F	B	A	D	B	A	F	A	D	F	A	D
Approach Vol, veh/h		1900			1449			557			293	
Approach Delay, s/veh		23.9			17.9			2391.8			412.1	
Approach LOS		C			B			F			F	

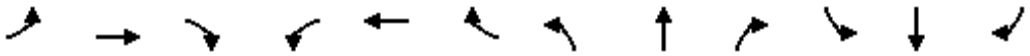
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.4	69.6		52.0	31.0	67.0		52.0				
Change Period (Y+Rc), s	5.0	* 5		4.5	4.5	5.0		4.5				
Max Green Setting (Gmax), s	10.7	* 78		47.5	26.5	62.0		47.5				
Max Q Clear Time (g_c+I1), s	13.5	38.7		49.5	28.0	42.9		49.5				
Green Ext Time (p_c), s	0.0	25.9		0.0	0.0	13.5		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	363.0	
HCM 6th LOS	F	

Notes

User approved pedestrian interval to be less than phase max green.

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



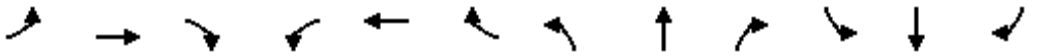
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	352	1164	175	395	1088	122	179	185	516	261	266	211
v/c Ratio	0.97	0.93	0.28	0.80	1.03	0.23	0.76	0.76	1.05	0.93	0.97	0.49
Control Delay	113.7	39.9	13.0	73.9	86.0	9.1	82.2	81.2	76.4	98.5	106.2	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	113.7	39.9	13.0	73.9	86.0	9.1	82.2	81.2	76.4	98.5	106.2	10.5
Queue Length 50th (ft)	362	305	20	194	~604	9	180	185	~266	267	274	0
Queue Length 95th (ft)	#557	#764	m62	245	#744	57	#303	#310	#499	#448	#465	75
Internal Link Dist (ft)		728			448			1219			507	
Turn Bay Length (ft)	275		150	440		240	250		250	280		280
Base Capacity (vph)	367	1252	618	600	1052	540	235	244	492	283	278	429
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.93	0.28	0.66	1.03	0.23	0.76	0.76	1.05	0.92	0.96	0.49

Intersection Summary

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

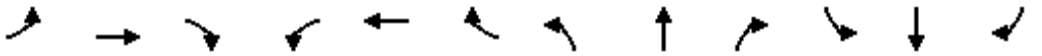
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	1059	159	359	990	111	209	122	470	349	130	192
Future Volume (vph)	320	1059	159	359	990	111	209	122	470	349	130	192
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00	0.95	0.98	1.00
Satd. Flow (prot)	1646	3228	1473	3162	3260	1444	1548	1608	1458	1548	1521	1403
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00	0.95	0.98	1.00
Satd. Flow (perm)	1646	3228	1473	3162	3260	1444	1548	1608	1458	1548	1521	1403
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	352	1164	175	395	1088	122	230	134	516	384	143	211
RTOR Reduction (vph)	0	0	47	0	0	74	0	0	271	0	0	173
Lane Group Flow (vph)	352	1164	128	395	1088	48	179	185	245	261	266	38
Heavy Vehicles (%)	1%	3%	1%	2%	2%	3%	2%	2%	2%	2%	11%	6%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	33.1	58.2	58.2	23.3	48.4	48.4	22.8	22.8	22.8	27.2	27.2	27.2
Effective Green, g (s)	33.1	58.2	58.2	23.3	48.4	48.4	22.8	22.8	22.8	27.2	27.2	27.2
Actuated g/C Ratio	0.22	0.39	0.39	0.16	0.32	0.32	0.15	0.15	0.15	0.18	0.18	0.18
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	2.5	4.8	4.8	2.5	4.8	4.8	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	363	1252	571	491	1051	465	235	244	221	280	275	254
v/s Ratio Prot	c0.21	0.36		0.12	c0.33		0.12	0.12		0.17	c0.17	
v/s Ratio Perm			0.09			0.03			c0.17			0.03
v/c Ratio	0.97	0.93	0.23	0.80	1.04	0.10	0.76	0.76	1.11	0.93	0.97	0.15
Uniform Delay, d1	58.0	43.9	30.8	61.2	50.8	35.6	61.0	61.0	63.6	60.5	61.0	51.7
Progression Factor	1.41	0.63	0.66	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	33.2	10.9	0.7	9.0	37.3	0.4	13.0	12.1	92.2	36.0	44.8	0.2
Delay (s)	115.0	38.6	20.9	70.2	88.1	36.0	74.0	73.0	155.8	96.5	105.8	51.9
Level of Service	F	D	C	E	F	D	E	E	F	F	F	D
Approach Delay (s)		52.7			79.7			121.7			87.1	
Approach LOS		D			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	79.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	320	1059	159	359	990	111	209	122	470	349	130	192
Future Volume (veh/h)	320	1059	159	359	990	111	209	122	470	349	130	192
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	1736	1709	1736	1723	1723	1709	1723	1723	1723	1723	1600	1668
Adj Flow Rate, veh/h	352	1164	175	395	1088	122	182	201	516	264	312	211
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	3	1	2	2	3	2	2	2	2	11	6
Cap, veh/h	368	1310	594	446	1050	465	246	258	219	301	293	259
Arrive On Green	0.30	0.54	0.54	0.14	0.32	0.32	0.15	0.15	0.15	0.18	0.18	0.18
Sat Flow, veh/h	1654	3247	1471	3183	3273	1448	1641	1723	1460	1641	1600	1414
Grp Volume(v), veh/h	352	1164	175	395	1088	122	182	201	516	264	312	211
Grp Sat Flow(s),veh/h/ln	1654	1624	1471	1591	1637	1448	1641	1723	1460	1641	1600	1414
Q Serve(g_s), s	31.4	47.6	9.8	18.3	48.1	9.4	15.9	16.8	22.5	23.5	27.5	21.5
Cycle Q Clear(g_c), s	31.4	47.6	9.8	18.3	48.1	9.4	15.9	16.8	22.5	23.5	27.5	21.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	368	1310	594	446	1050	465	246	258	219	301	293	259
V/C Ratio(X)	0.96	0.89	0.29	0.89	1.04	0.26	0.74	0.78	2.36	0.88	1.06	0.81
Avail Cap(c_a), veh/h	369	1310	594	605	1050	465	246	258	219	301	293	259
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)	0.58	0.58	0.58	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.1	31.8	23.0	63.3	50.9	37.8	60.9	61.3	63.7	59.6	61.3	58.8
Incr Delay (d2), s/veh	25.2	5.7	0.7	10.9	37.5	1.4	10.7	13.5	624.3	23.8	70.4	17.3
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(95%),veh/ln	19.8	23.2	5.7	12.7	33.9	6.4	11.9	13.2	73.2	17.5	24.5	14.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.3	37.5	23.8	74.2	88.5	39.1	71.7	74.8	688.0	83.4	131.7	76.1
LnGrp LOS	E	D	C	E	F	D	E	E	F	F	F	E
Approach Vol, veh/h		1691			1605			899			787	
Approach Delay, s/veh		44.4			81.2			426.2			100.6	
Approach LOS		D			F			F			F	

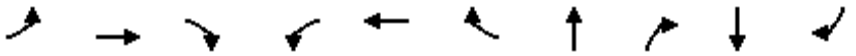
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	25.5	65.5		32.0	37.9	53.1		27.0				
Change Period (Y+Rc), s	4.5	5.0		4.5	4.5	5.0		4.5				
Max Green Setting (Gmax), s	28.5	53.0		27.5	33.5	48.0		22.5				
Max Q Clear Time (g_c+I1), s	20.3	49.6		29.5	33.4	50.1		24.5				
Green Ext Time (p_c), s	0.7	2.9		0.0	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	134.0	
HCM 6th LOS	F	

Notes

User approved pedestrian interval to be less than phase max green.

User approved volume balancing among the lanes for turning movement.



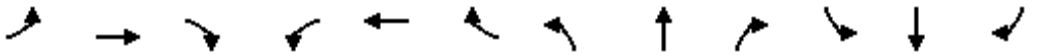
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	282	1256	362	152	1232	65	376	181	135	158
v/c Ratio	1.00	0.81	0.43	0.47	0.93	0.11	1.10	0.33	0.68	0.28
Control Delay	100.9	28.7	4.8	53.9	37.7	3.5	125.3	15.7	63.1	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Total Delay	100.9	28.7	4.8	53.9	38.0	3.5	125.3	15.7	63.1	6.4
Queue Length 50th (ft)	~270	493	35	80	668	5	~421	44	116	0
Queue Length 95th (ft)	m#463	443	39	m98	#752	m6	#630	110	#218	53
Internal Link Dist (ft)		859			728		381		497	
Turn Bay Length (ft)	510		215	275		110		150		
Base Capacity (vph)	282	1658	890	323	1334	594	341	554	200	571
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	7	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.76	0.41	0.47	0.93	0.11	1.10	0.33	0.68	0.28

Intersection Summary

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

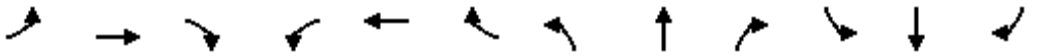
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	274	1218	351	147	1195	63	303	62	176	88	43	153
Future Volume (vph)	274	1218	351	147	1195	63	303	62	176	88	43	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0		4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	1599	3197	1473	3225	3228	1377		1647	1473		1670	1444
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.62	1.00		0.36	1.00
Satd. Flow (perm)	1599	3197	1473	3225	3228	1377		1064	1473		623	1444
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	282	1256	362	152	1232	65	312	64	181	91	44	158
RTOR Reduction (vph)	0	0	135	0	0	26	0	0	80	0	0	107
Lane Group Flow (vph)	282	1256	227	152	1232	39	0	376	101	0	135	51
Heavy Vehicles (%)	4%	4%	1%	0%	3%	8%	1%	7%	1%	2%	0%	3%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	26.5	72.7	72.7	15.0	61.2	61.2		48.3	48.3		48.3	48.3
Effective Green, g (s)	26.5	72.7	72.7	15.0	61.2	61.2		48.3	48.3		48.3	48.3
Actuated g/C Ratio	0.18	0.48	0.48	0.10	0.41	0.41		0.32	0.32		0.32	0.32
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0		4.5	4.5		4.5	4.5
Vehicle Extension (s)	2.5	4.8	4.8	2.5	4.8	4.8		2.5	2.5		2.5	2.5
Lane Grp Cap (vph)	282	1549	713	322	1317	561		342	474		200	464
v/s Ratio Prot	c0.18	0.39		0.05	c0.38							
v/s Ratio Perm			0.15			0.03		c0.35	0.07		0.22	0.04
v/c Ratio	1.00	0.81	0.32	0.47	0.94	0.07		1.10	0.21		0.68	0.11
Uniform Delay, d1	61.8	32.8	23.6	63.8	42.5	27.1		50.9	37.0		44.1	35.7
Progression Factor	0.95	0.78	0.63	0.78	0.66	0.29		1.00	1.00		1.00	1.00
Incremental Delay, d2	43.0	3.1	0.8	0.5	9.2	0.1		78.1	0.2		7.9	0.1
Delay (s)	101.7	28.8	15.7	50.0	37.4	8.1		128.9	37.2		52.0	35.8
Level of Service	F	C	B	D	D	A		F	D		D	D
Approach Delay (s)		37.1			37.4			99.1			43.3	
Approach LOS		D			D			F			D	

Intersection Summary			
HCM 2000 Control Delay	45.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	274	1218	351	147	1195	63	303	62	176	88	43	153
Future Volume (veh/h)	274	1218	351	147	1195	63	303	62	176	88	43	153
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	1695	1695	1736	1750	1709	1641	1654	1654	1736	1750	1750	1709
Adj Flow Rate, veh/h	282	1256	362	152	1232	65	312	64	181	91	44	158
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	1	0	3	8	7	7	1	0	0	3
Cap, veh/h	285	1388	634	504	1342	575	44	0	466	40	11	459
Arrive On Green	0.35	0.86	0.86	0.31	0.83	0.83	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1615	3221	1471	3233	3247	1391	0	0	1471	0	36	1448
Grp Volume(v), veh/h	282	1256	362	152	1232	65	376	0	181	135	0	158
Grp Sat Flow(s),veh/h/ln	1615	1611	1471	1617	1624	1391	0	0	1471	36	0	1448
Q Serve(g_s), s	26.0	36.7	10.0	5.4	40.9	1.3	0.0	0.0	14.4	0.0	0.0	12.6
Cycle Q Clear(g_c), s	26.0	36.7	10.0	5.4	40.9	1.3	47.5	0.0	14.4	47.5	0.0	12.6
Prop In Lane	1.00		1.00	1.00		1.00	0.83		1.00	0.67		1.00
Lane Grp Cap(c), veh/h	285	1388	634	504	1342	575	44	0	466	51	0	459
V/C Ratio(X)	0.99	0.90	0.57	0.30	0.92	0.11	8.56	0.00	0.39	2.62	0.00	0.34
Avail Cap(c_a), veh/h	285	1671	763	504	1342	575	44	0	466	51	0	459
HCM Platoon Ratio	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.56	0.56	0.56	0.54	0.54	0.54	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.3	8.4	6.6	45.4	11.2	7.7	75.0	0.0	39.9	64.7	0.0	39.3
Incr Delay (d2), s/veh	36.8	6.1	2.1	0.1	6.8	0.2	3448.7	0.0	0.4	783.2	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(95%),veh/ln	16.3	7.3	4.2	3.8	8.6	0.8	74.9	0.0	9.1	23.7	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.1	14.5	8.7	45.6	18.0	8.0	3523.7	0.0	40.3	847.9	0.0	39.6
LnGrp LOS	F	B	A	D	B	A	F	A	D	F	A	D
Approach Vol, veh/h		1900			1449			557			293	
Approach Delay, s/veh		23.9			20.4			2391.8			412.1	
Approach LOS		C			C			F			F	

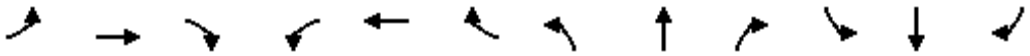
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.4	69.6		52.0	31.0	67.0		52.0				
Change Period (Y+Rc), s	5.0	* 5		4.5	4.5	5.0		4.5				
Max Green Setting (Gmax), s	10.7	* 78		47.5	26.5	62.0		47.5				
Max Q Clear Time (g_c+I1), s	7.4	38.7		49.5	28.0	42.9		49.5				
Green Ext Time (p_c), s	0.1	25.9		0.0	0.0	13.5		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		363.9
HCM 6th LOS		F

Notes

User approved pedestrian interval to be less than phase max green.

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



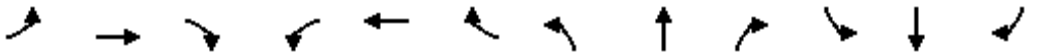
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	352	1164	175	395	1088	122	179	185	516	261	266	211
v/c Ratio	0.77	0.93	0.28	0.80	0.83	0.19	0.76	0.76	1.05	0.93	0.97	0.49
Control Delay	86.3	39.9	13.0	73.9	47.6	7.5	82.2	81.2	76.4	98.5	106.2	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	86.3	39.9	13.0	73.9	47.6	7.5	82.2	81.2	76.4	98.5	106.2	10.5
Queue Length 50th (ft)	184	305	20	194	501	8	180	185	~266	267	274	0
Queue Length 95th (ft)	236	#764	m62	245	#667	53	#303	#310	#499	#448	#465	75
Internal Link Dist (ft)		728			448			1219			507	
Turn Bay Length (ft)	275		150	440		240	250		250	280		280
Base Capacity (vph)	713	1252	618	600	1306	643	235	244	492	283	278	429
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.93	0.28	0.66	0.83	0.19	0.76	0.76	1.05	0.92	0.96	0.49

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.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	1059	159	359	990	111	209	122	470	349	130	192
Future Volume (vph)	320	1059	159	359	990	111	209	122	470	349	130	192
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00	0.95	0.98	1.00
Satd. Flow (prot)	3193	3228	1473	3162	3260	1444	1548	1608	1458	1548	1521	1403
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00	0.95	0.98	1.00
Satd. Flow (perm)	3193	3228	1473	3162	3260	1444	1548	1608	1458	1548	1521	1403
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	352	1164	175	395	1088	122	230	134	516	384	143	211
RTOR Reduction (vph)	0	0	47	0	0	65	0	0	271	0	0	173
Lane Group Flow (vph)	352	1164	128	395	1088	57	179	185	245	261	266	38
Heavy Vehicles (%)	1%	3%	1%	2%	2%	3%	2%	2%	2%	2%	11%	6%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	21.4	58.2	58.2	23.3	60.1	60.1	22.8	22.8	22.8	27.2	27.2	27.2
Effective Green, g (s)	21.4	58.2	58.2	23.3	60.1	60.1	22.8	22.8	22.8	27.2	27.2	27.2
Actuated g/C Ratio	0.14	0.39	0.39	0.16	0.40	0.40	0.15	0.15	0.15	0.18	0.18	0.18
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	2.5	4.8	4.8	2.5	4.8	4.8	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	455	1252	571	491	1306	578	235	244	221	280	275	254
v/s Ratio Prot	0.11	c0.36		c0.12	0.33		0.12	0.12		0.17	c0.17	
v/s Ratio Perm			0.09			0.04			c0.17			0.03
v/c Ratio	0.77	0.93	0.23	0.80	0.83	0.10	0.76	0.76	1.11	0.93	0.97	0.15
Uniform Delay, d1	62.0	43.9	30.8	61.2	40.4	28.0	61.0	61.0	63.6	60.5	61.0	51.7
Progression Factor	1.25	0.63	0.66	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.0	10.9	0.7	9.0	6.3	0.3	13.0	12.1	92.2	36.0	44.8	0.2
Delay (s)	83.4	38.7	21.0	70.2	46.8	28.4	74.0	73.0	155.8	96.5	105.8	51.9
Level of Service	F	D	C	E	D	C	E	E	F	F	F	D
Approach Delay (s)		46.1			51.1			121.7			87.1	
Approach LOS		D			D			F			F	

Intersection Summary			
HCM 2000 Control Delay	67.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM 6th Edition methodology does not support turning movements with shared & exclusive lanes.

Attachment C Revised Design Concept Graphics

GOODFELLOW ST

CARL'S JR.

E IDAHO AVE

OHL

ADD PAINTED BUFFER TO BIKE LANE

EXTENDED STORAGE FOR EASTBOUND LEFT-TURN AT EAST LANE

WAYFINDING ELEMENT

SIDEWALK AND EASTBOUND ON-STREET BIKE LANE REPLACED BY 12' WIDE SHARED-USE PATH

EXISTING STORMWATER SWALE, ENHANCED

REST STOP WITH BENCH

EXISTING OVERHEAD POWERLINES

LEGEND

TYPE 1 LANDSCAPE: ENHANCED IRRIGATED PLANTING

TYPE 2 LANDSCAPE: BASIC IRRIGATED - STREET TREES & PLANTS OR GRAVEL MULCH

TYPE 3 LANDSCAPE: NON-IRRIGATED FIELD GRASS

TYPE 4 LANDSCAPE: STORMWATER TREATMENT AREA PLANTING

N

0 10 20 40

SCALE: 1" = 20'

GOODFELLOW ST. INTERSECTION ENLARGEMENT PLAN

EAST IDAHO AVENUE REFINEMENT AREA PLAN

Oregon Department of Transportation

ONTARIO Where Oregon Begins...

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

GREENWORKS

11.10.2020

VERIZON

NE EAST LN

START SECOND NORTHBOUND LANE INTO ONTARIO MARKETPLACE SOONER

ADD PAINTED BUFFER TO BIKE LANE

ADD SECOND EASTBOUND LEFT-TURN LANE

SIDEWALK AND EASTBOUND ON-STREET BIKE LANE REPLACED BY 12' WIDE SHARED-USE PATH

WAYFINDING ELEMENT

CONVERT EXISTING RIGHT-TURN LANE INTO SHARED THROUGH/ RIGHT-TURN LANE

ADD SECOND WESTBOUND LEFT-TURN LANE

E IDAHO AVE

EXISTING STORMWATER SWALE, ENHANCED

EXISTING OVERHEAD POWERLINES

OHL

N

0 10 20 40

SCALE: 1" = 20'

LEGEND

TYPE 2 LANDSCAPE: BASIC IRRIGATED - STREET TREES & PLANTS OR GRAVEL MULCH

TYPE 3 LANDSCAPE: NON-IRRIGATED FIELD GRASS

TYPE 4 LANDSCAPE: STORMWATER TREATMENT AREA PLANTING

EAST LN. INTERSECTION ENLARGMENT PLAN

EAST IDAHO AVENUE REFINEMENT AREA PLAN

Oregon Department of Transportation

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GREENWORKS

11.10.2020

CONNECTION TO FUTURE RIVERFRONT TRAIL FROM EXISTING SIDEWALK

EXISTING BRIDGE HAS A WESTBOUND BIKE LANE BUT NO SIDEWALK ON THE NORTH SIDE

EXISTING BRIDGE HAS EASTBOUND BIKE LANE AND A SEPARATED SIDEWALK ON THE SOUTH SIDE.

E IDAHO AVE 30

SNAKE RIVER

MOVE TRAFFIC BARRIER TO CREATE A 10' WIDE SEPARATED SHARED-USE PATH

EXISTING SLOUGH

EXISTING VEHICULAR CROSSING OVER SLOUGH (FILL)

2' WIDE GRAVEL SHOULDERS

12' WIDE SHARED-USE PATH REPLACES SIDEWALK AND EASTBOUND BIKE LANE

TRAIL JUNCTION WITH SPECIAL PAVING

FUTURE RIVERFRONT TRAIL

12' WIDE SHARED-USE PATH CONNECTS TO FUTURE RIVERFRONT TRAIL

SCENIC OVERLOOK WITH BENCHES, LOW WALL, SPECIAL PAVING, AND INTERPRETIVE SIGNAGE

EXISTING POWER POLES AND OVERHEAD LINES

EXISTING TRANSFORMER / UTILITY BOX

SYMBOL LEGEND

- WAYFINDING ELEMENT
- PRIMARY GATEWAY ELEMENT
- SECONDARY GATEWAY ELEMENT

PLANTING LEGEND

TYPE 1 LANDSCAPE: ENHANCED IRRIGATED PLANTING

TYPE 2 LANDSCAPE: BASIC IRRIGATED - STREET TREES & PLANTS OR GRAVEL MULCH

TYPE 3 LANDSCAPE: NON-IRRIGATED FIELD GRASS

TYPE 4 LANDSCAPE: STORMWATER TREATMENT AREA PLANTING

TRAIL JUNCTION AND OVERLOOK ENLARGEMENT

EAST IDAHO AVENUE REFINEMENT AREA PLAN

N

0 10 20 40

SCALE: 1" = 20'

Oregon Department of Transportation

ONTARIO Where Oregon Begins...

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

GREENWORKS

09.10.2020

Attachment D Wayfinding Graphics

OPTION 2 : VIEW POINT

6 / 18 / 2020

WELCOME TO ONTARIO (at major decision points- off highway)

VEHICULAR DIRECTIONAL SIGN (at major decision points)

PEDESTRIAN DIRECTIONAL SIGN (throughout walkable dt)

INFORMATIONAL SIGNAGE

VEHICULAR DIRECTIONAL SIGN (mid-neighborhood)

PEDESTRIAN DIRECTIONAL SIGN (at major decisions throughout trails)

PEDESTRIAN DIRECTIONAL SIGN (throughout trails)

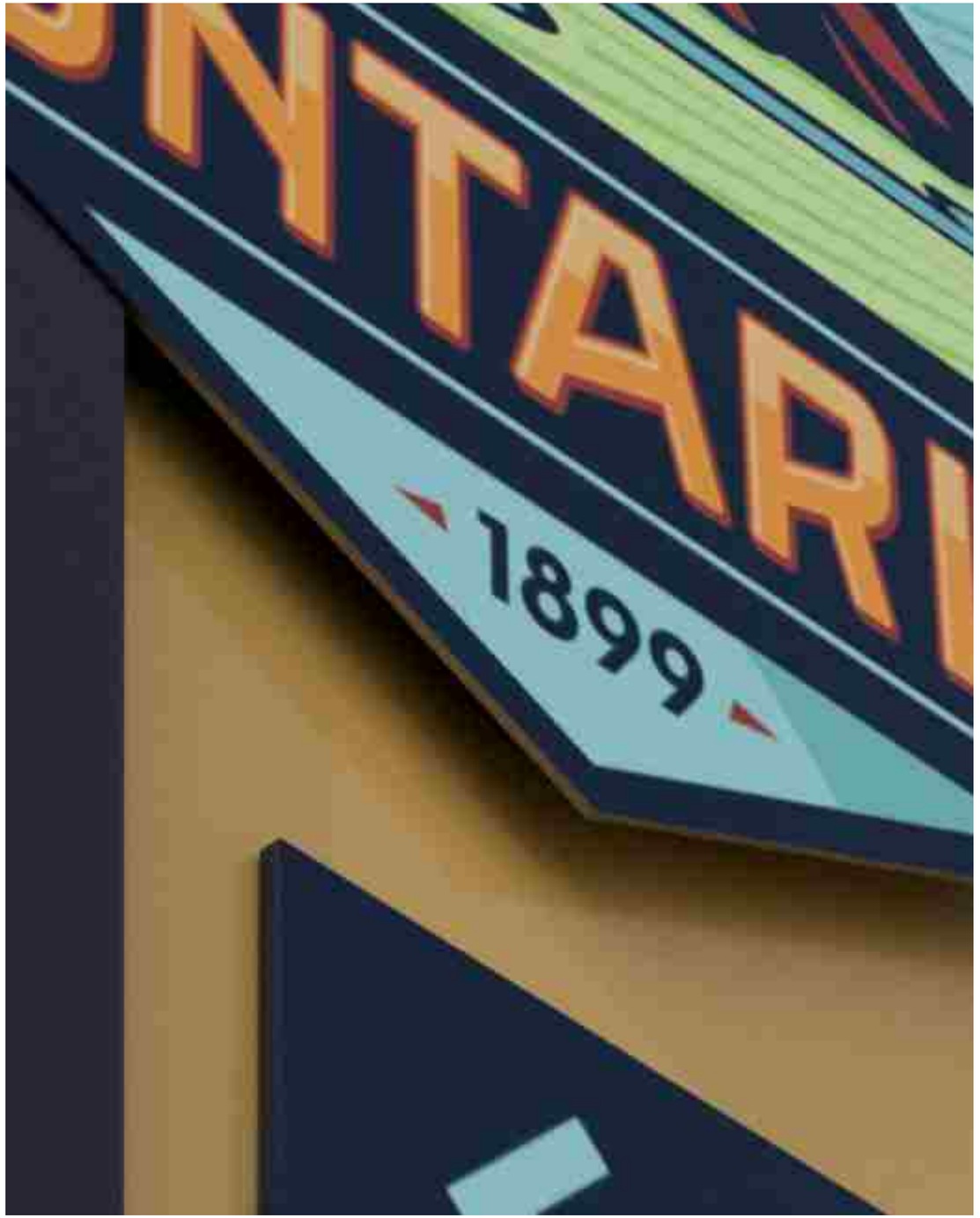
FLAG POLE DESIGN

NEIGHBORHOOD SIGNAGE

208.949.1160
915 West Royal Boulevard
Boise, Idaho 83706

TRADEMARK
DESIGN | FABRICATION

OPTION 2 : VIEW POINT



CONCEPTUAL RENDERS

208.949.1160
915 West Royal Boulevard
Boise, Idaho 83706

TRADEMARK
DESIGN | FABRICATION

Attachment E Revised Design Concept Cost Estimate

CITY OF ONTARIO, OREGON
ACTIVE TRANSPORTATION UPDATE AND EAST IDAHO AVENUE REFINEMENT PLAN
PRELIMINARY COST ESTIMATE
(YEAR 2020 COSTS)
September 11, 2020

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 230,000	All Req'd	$ 230,000
2	Temporary Protection and Direction of Traffic/Project Safety	LS	67,000	All Req'd	67,000
3	Asphalt Concrete Pavement	TON	100	825	82,500
4	Aggregate Base	TON	30	4,600	138,000
5	Geotextile Fabric	SY	2	11,250	22,500
6	12-foot by 4-inch Concrete Multi-use Path	SY	50	6,050	302,500
7	4-inch Concrete (Roundabout/Overlook/Median)	SY	50	630	31,500
8	Type 1 Landscaping	ACRE	2,000	0.5	1,000
9	Type 2 Landscaping	ACRE	1,800	0.6	1,100
10	Type 3 Landscaping	ACRE	1,500	2.7	4,100
11	Type 4 Landscaping	ACRE	2,500	1	2,500
12	Topsoil for Landscaping	CY	30	8,500	255,000
13	Small Tree	EA	400	67	26,800
14	Large Tree	EA	1,000	12	12,000
15	12-inch Concrete Flush Curb	LF	50	2,550	127,500
16	6-inch Concrete Curb and Gutter	LF	25	2,000	50,000
17	Primary Gateway Element	EA	1,000	3	3,000
18	Secondary Gateway Element	EA	500	6	3,000
19	Irrigation for Landscaping (Types 1 and 2)	LF	25	3,900	97,500
20	Pedestrian Bridge	SF	225	1,800	405,000
21	Additional for Curb Ramps	EA	2,000	9	18,000
22	Stormwater Improvements (Inlet/Outlet)	LS	20,000	All Req'd	20,000
23	Relocate Concrete Barriers on Bridges	LS	12,000	All Req'd	12,000
24	Sawcut Asphalt/Concrete	LF	4	6,300	25,200
25	Relocate Signalized Pedestrian Crossing Post	EA	50,000	2	100,000
26	Relocate Streetlight	EA	15,000	1	15,000
27	Remove and Relocate Existing Sign	EA	500	4	2,000
28	Remove and Relocate Storm Inlet	EA	5,000	2	10,000
29	Permanent Signing and Striping	LS	25,000	All Req'd	25,000
30	Demolition of Concrete Sidewalk	SY	20	10,000	200,000
31	Demolition of Concrete Curb and Gutter	LF	5	1,400	7,000
32	Demolition of Roadway	SY	3	32,000	96,000
33	Demolition of Concrete Tree Boxes	EA	50	13	700
34	Demolition of Tree Removal (0- to 24-inch diameter)	EA	700	18	12,600
35	Earthwork	LS	20,000	All Req'd	20,000
36	Erosion Control	LS	107,000	All Req'd	107,000
				Total Estimated Construction Cost	**$ 2,533,000**
				Preliminary Engineering (15%)	380,000
				Construction Engineering (15%)	380,000
				Construction Contingencies (20%)	507,000
				TOTAL ESTIMATED PROJECT COST (2020)	**$ 3,800,000**