Community & Economic
Development Department
www.adcogov.org

ADAMS COUNTY
COLORADO

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
PHONE 720.523.6800
FAX 720.523.6998

SUBDIVISION-MINOR / FINAL

Application submittals must include all documents on this checklist as well as this page. Please use the reference guide (pg. 3) included in this packet for more information on each submittal item.

All applications shall be submitted electronically to epermitcenter@adcogov.org. If the submittal is too large to email as an attachment, the application may be sent as an unlocked OneDrive link. Alternatively, the application may be delivered on a flash drive to the One-Stop Customer Service Center. All documents should be combined in a single PDF. Once a complete application has been received, fees will be invoiced and payable online at https://permits.adcogov.org/CitizenAccess/.

- [x] 1. Development Application Form (pg. 5)
- [ ] 2. Application Fees (pg. 2)
- [x] 3. Written Explanation of the Project
- [x] 4. Site Plan Showing Proposed Development
- [x] 5. Copy of Plat prepared by Registered Land Surveyor (pg. 7)
- [ ] 6. Subdivision Improvement Agreement (SIA) Application Not applicable
- [x] 7. School Impact Analysis (contact applicable District)
- [x] 8. Fire Protection Report (required prior to public hearing)
- [x] 9. Proof of Ownership
- [x] 10. Proof of Water and Sewer Services
- [x] 11. Proof of Utilities
- [x] 12. Legal Description
- [x] 13. Statement of Taxes Paid
- [ ] 14. Certificate of Notice to Mineral Estate Owners/and Lessees (pg. 12) Not applicable
- [ ] 15. Certificate of Surface Development (pg. 13) Not applicable
- [x] 16. Subdivision Engineering Review application (***2 hard copies***)

continued on next page...

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Application Fees	Amount	Due
Minor Subdivision (final plat)	$1,600	After complete application received
Adams County Health Dept.	$150 (public utilities - Level 1), $210 (individual septic system - Level 2)	After 1st Staff Review is Completed
Soil Conservation	$100 (less than 5 lots), $150 (more than 5 lots)	After complete application received
Colorado Geological Survey	$600 (1-3 dwellings and less than 100 ac)$900 (< 3 dwellings and less than 100 ac) $1,550 (between 100 and 500 acres) $2,500 (500 acres or more)	After complete application received
Engineering Review	$1,000 (less than 5 lots) $2,500 (5-25 lots) $7,500 (greater than 25 lots)	After complete application received
Copying	$5 per page	Prior to public hearing
Recording *Check made payable to Clerk and Recorder	$13 first page, $10 each additional page	Prior to public hearing
Public Land Dedication	Determined during staff review of project	Prior to public hearing

Minor Subdivision (Preliminary/Final Plat) - Guide to Development Application Submittal

The submittal documents for all Land Use/Development Applications are listed below. Detailed explanations of the submittal documents are also provided.

All development application submittals shall comprise of one (1) electronic copy (emailed or delivered on a USB). **Application submittals that do not conform to these guidelines shall not be accepted.**

---

3. Written Explanation of the Project:

- A clear and concise, yet thorough, description of the proposal. Please include, if applicable, timeframe, purpose of project, and improvements that will be made to the site

4. Site Plan Showing Proposed Development:

- A detailed drawing of existing and proposed improvements
- Including:
  - Streets, roads, and intersections
  - Driveways, access points, and parking areas
  - Existing and proposed structures, wells, and septic systems,
  - Easements, utility lines, and no build or hazardous areas
  - Scale, north arrow, and date of preparation
- An Improvement Location Certificate or Survey may be required during the official review

5. Copy of Plat Prepared by Registered Land Surveyor

- A map or maps together with supporting documentation of certain described land providing permanent and accurate record of the legal description, dedications, exact size, shape, and location of lots, blocks, streets, easements, and parcels

6. Subdivision Improvements Agreement:

- This agreement addresses the manner, timing, and responsibility of completion of all required public improvements (i.e. curb, gutter, and sidewalk)
- Shall include the Word version of the Subdivision Improvements Agreement, all exhibits, and a collateral estimate

7. School Impact Analysis:

- Contact the applicable school district for the analysis
- Should include the increase in elementary, middle, and high school students and the existing school sites and structure of the applicable district in which the subdivision is proposed to be located

8. Fire Protection Report:

- Shall discuss the adequacy of protection within the propose subdivision and be approved by the appropriate fire district

9. Proof of Ownership:

- A deed may be found in the Office of the Clerk and Recorder
- A title commitment is prepared by a professional title company

10. Proof of Water:

- Public utilities - A written statement from the appropriate water district indicating that they will provide service to the property **OR** a copy of a current bill from the service provider
- Private utilities - Well permit(s) information can be obtained from the Colorado State Division of Water Resources at (303) 866-3587

Proof of Sewer:

- Public utilities - A written statement from the appropriate sanitation district indicating that they will provide service to the property **OR** a copy of a current bill from the service provider
- Private utilities - A written statement from Adams County Health indicating the viability of obtaining Onsite Wastewater Treatment Systems

11. Proof of Utilities (Gas, Electric, etc):

- A written statement from the appropriate utility provider indicating that they will provide service to the property
- Copy of a current bill from the service provider

12. Legal Description:

- Geographical description used to locate and identify a property
- Visit http://gisapp.adcogov.org/quicksearch/ to find the legal description for your property

13. Statement of Taxes Paid:

- All taxes on the subject property must be paid in full. Please contact the Adams County Treasurer's Office
- Or https://adcotax.com/treasurer/web/

14-15. Certificate of Notice to Mineral Estate Owners/ Certificate of Surface Development:

- The State of Colorado requires notification to mineral rights owners of applications for surface development (i.e. zoning, plats, etc.)
- Mineral or Surface right owners may be found in the title commitment for the subject property
- You may also search the Office of the Clerk and Recorder for any recorded deeds, easements, or other documents.

<u>Subdivision Engineering Review</u>

Level 1-Storm Drainage Plan:

- A level 1 Storm Drainage Plan is a preliminary design plan showing existing and proposed site drainage features or improvements and, is intended to show how the storm drainage will be mitigated.
- See Appendix B of the Development Standards for a plan preparation checklist

Level 2-Storm Drainage Study (SDS):

- A level 2 SDS is a preliminary design report that describes the existing and proposed drainage features and, includes a hydrologic analysis of the proposed site. A Level 2 SDS also includes a drainage plan.
- See Appendix B of the Development Standards for a plan preparation checklist

Level 3-Storm Drainage Study (SDS):

- A level 3 SDS is a preliminary design report that describes the existing and proposed drainage features, includes a hydrologic analysis of the proposed site and hydraulic analysis of all proposed drainage mitigation measures. A Level 3 SDS also includes a drainage plan and construction plans for all drainage mitigation features.
- See Appendix B of the Development Standards for a plan preparation checklist

Traffic Impact Study:

- Intended to forecast and mitigate the transportation and traffic impacts of a proposed land use development or redevelopment project
- See Chapter 8 of the Adams County Development Standards for requirements

Erosion and Sediment Control Plans:

- Erosion and Sediment Control (ESC) plans are construction plans showing the proposed Best Management Practices, or BMP's, that will be used to mitigate erosion and the transport of sediment from a site under construction.
- ESC plans are often done in three (3) phases: Initial, Interim and, Final.
- These plans must also include installation details for each of the BMP's.

Construction / Engineering Design Plans:

- A set of maps and/or drawings showing how a proposed development is to be constructed.
- The plans must include:
  - site maps of the existing conditions and proposed improvements,
  - installation/construction details for all proposed improvements,
  - survey control (horizontal and vertical) for locating the improvements and,
  - all necessary specification for the products to be used.
- Construction plans are often broken out for specific improvements; for example: site plan, grading plan, waterline improvement plans, roadways improvements plans, etc.

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DEVELOPMENT APPLICATION FORM

Application Type:

☐ Conceptual Review	☐ Preliminary PUD	☐ Temporary Use
☐ Subdivision, Preliminary	☐ Final PUD	☐ Variance
☒ Subdivision, Final	☐ Rezone	☐ Conditional Use
☐ Plat Correction/ Vacation	☐ Special Use	☐ Other: _____

PROJECT NAME: 5800 Federal Industrial

APPLICANT

Name(s): Opus Development Company, L.L.C.; Opus AE Group, L.L.C. Phone #: Joe Swensson: (303) 515 8810

Address: 950 17th Street, Suite 1500

City, State, Zip: Denver, Colorado 80202

2nd Phone #: Email: joe.swensson@opus-group.com

OWNER

Name(s): Fed57, LLC; Fed58, LLC Phone #: Kevin Preblud: (303) 297 8151

Address: 3535 Larimer Street

City, State, Zip: Denver, Colorado 80205

2nd Phone #: Email: kevin@exdogroup.com

TECHNICAL REPRESENTATIVE (Consultant, Engineer, Surveyor, Architect, etc.)

Name: John Wade, AIA Phone #: 952-656-4563

Address: 10350 Bren Road West

City, State, Zip: Minnetonka, MN 55343

2nd Phone #: Email: john.wade@opus-group.com

Architect

DESCRIPTION OF SITE

Address:	5690, 5790, and 5800 Federal Boulevard
City, State, Zip:	Denver, Colorado 80221
Area (acres or square feet):	533,720 square feet / 12.25 acres
Tax Assessor Parcel Number	0182508400041; 0182508400047; 0182508400031; 0182508400050
Existing Zoning:	I-1: 5800 Federal Boulevard; I-2: 5690 and 5790 Federal Boulevard
Existing Land Use:	Light industrial uses - autoshop, storage, existing cell tower
Proposed Land Use:	Light Industrial

Have you attended a Conceptual Review? YES [x] NO [ ]

If Yes, please list PRE#: 2023-00014

I hereby certify that I am making this application as owner of the above described property or acting under the authority of the owner (attached authorization, if not owner). I am familiar with all pertinent requirements, procedures, and fees of the County. I understand that the Application Review Fee is non-refundable. All statements made on this form and additional application materials are true to the best of my knowledge and belief.

Name: Joe Swensson Date: 08.07.2023

Owner's Printed Name

Name: 

Owner's Signature

BERKELEY WATER AND SANITATION DISTRICT
4455 WEST 58th AVENUE, UNIT A
ARVADA, COLORADO 80002
303-477-1914
Email: berkeleywater@gmail.com

3/6/2023

Joe Swensson
OPUS Development Company LLC
950 17th St, STE 1500
Denver, CO 80202

Re: 5800 Federal Blvd, Denver, CO 80221
Availability of sanitary sewer services

Dear Joe:

This conditional will serve letter confirms that Berkeley Water and Sanitation District ("District") has the capacity to provide sewer services to above described property (the "Property"), under the following terms and conditions:

1. If any of these conditions are not met, this "will serve" letter will be rescinded and the appropriate parties will be notified that the District can no longer provide sewer service to this property.

2. The District owns an 8" sewer main in W. 60th Ave. The property owner may be required to install sewer main extensions, feeding into this present system, to facilitate development, depending upon design.

3. Each unit served must have its own sewer service lines, on its own land or easement. The engineering design and/or plans must be submitted and approved by the District prior to installation of any sewer service lines or tapping into any District sewer mains.

4. If a property is removing existing structures, the existing sewer service line(s) must be capped or plugged at the sewer main prior to demolition. The District must be called to observe and inspect this action before further construction begins.

5. The property owner will be required to pay tap fees, review fees and costs, and all other applicable fees and charges prior to receiving sewer service from the District. The District may require a review deposit for District costs, including engineering and legal reviews, contract development, construction, observation and

inspections. If the Developer makes a review deposit with the District, over payments will be refunded and shortages will be billed to the property owner.

6. If the extension of sewer mains is required, the District's engineering firm must review and approve the designs. The District's review and approval of the construction contract for the extension is also required before the work can commence. A contract must be developed, appropriate Certificates of Insurance presented, and Warranty and Performance Bonds must be posted. In addition, the property owner will be required to dedicate easements for any public improvements.

7. The design specifications for the Project must comply with the District's Rules and Regulations, Adams County Fire Protection District regulations, and Adams County regulations. All sewer service will be subject to the District's Rules and Regulations.

8. Sewer tap fees will be payable to the District, which also collects Metro Wastewater's "connection fees." Fees to all agencies will be at prevailing rates at the time of application.

9. No representations are made regarding the availability of water service to the Property.

To reiterate, all costs incurred by the District and fees charged by the District, including without limitation tap fees, review costs, contract development, construction, observation and inspections, are the responsibility of the property owner as a condition of receipt of sewer service. If expenses are incurred and no payment is made, no taps will be issued and a lien will be placed against the property until paid per the District's Rules and Regulations and current Fee Schedule.

This conditional will serve letter is valid through March 6, 2024. If tap fees are not paid by that date, this agreement to service must be renewed through the District.

We look forward to providing services to the Property.

Sincerely,

Dawn Wade

BERKELEY WATER AND SANITATION DISTRICT

CRESTVIEW WATER & SANITATION DISTRICT

Mr. Joe Swensson
Opus Development Company, LLC
950 17th Street, Suite 1500
Denver, CO 80202

March 6, 2023

Re: 5800 N. Federal Blvd. Will Serve Water Service

To Whom It May Concern:

Please be advised that water service is currently being provided to 5800 N. Federal Blvd., Adams County Parcel number 0082508400041 by the Crestview Water & Sanitation District.

The property is wholly within the boundaries of this District and Crestview will continue to provide service to the property, provided the account is in good standing and District Rules and Regulations are met.

The land owner/developer is responsible for all engineering studies and plan development/review costs.

Prior to creating a layout and filing a plat for any future development of the above described parcel, the petitioning owner/developer (developer) should have a pre-design meeting with Crestview, as the developer MUST allow for the installation of adequate water mains in strict accordance with Denver Water Engineering Standards and Crestview Rules and Regulations and engineering requirements.

Crestview provides drinking water to its customers by means of a wholesale water purchasing contract with Denver Water. As part of the Contract, Denver Water requires Crestview to adhere to Denver Water's Engineering Standards.

If required by the District, after engineering studies have been performed, the land owner/developer shall install new water mains in accordance with District Rules and Regulations and Engineering Standards in order to maintain adequate fire flows and water service.

All water mains and appurtenances shall be installed at the land owner/developer's expense and deeded free and clear to the District prior to the issuance of any additional water taps.

Current connection fees can be provided by contacting our office.

CRESTVIEW WATER & SANITATION DISTRICT

Crestview requires a signature of acceptance of this Will Serve letter by the developer prior to scheduling a pre-design meeting with Crestview. Please provide a copy of this signed Will Serve letter when scheduling a pre-design meeting to Crestview's engineer, Clarice O'Hanlon, at cohanlon@crestviewwater.net.

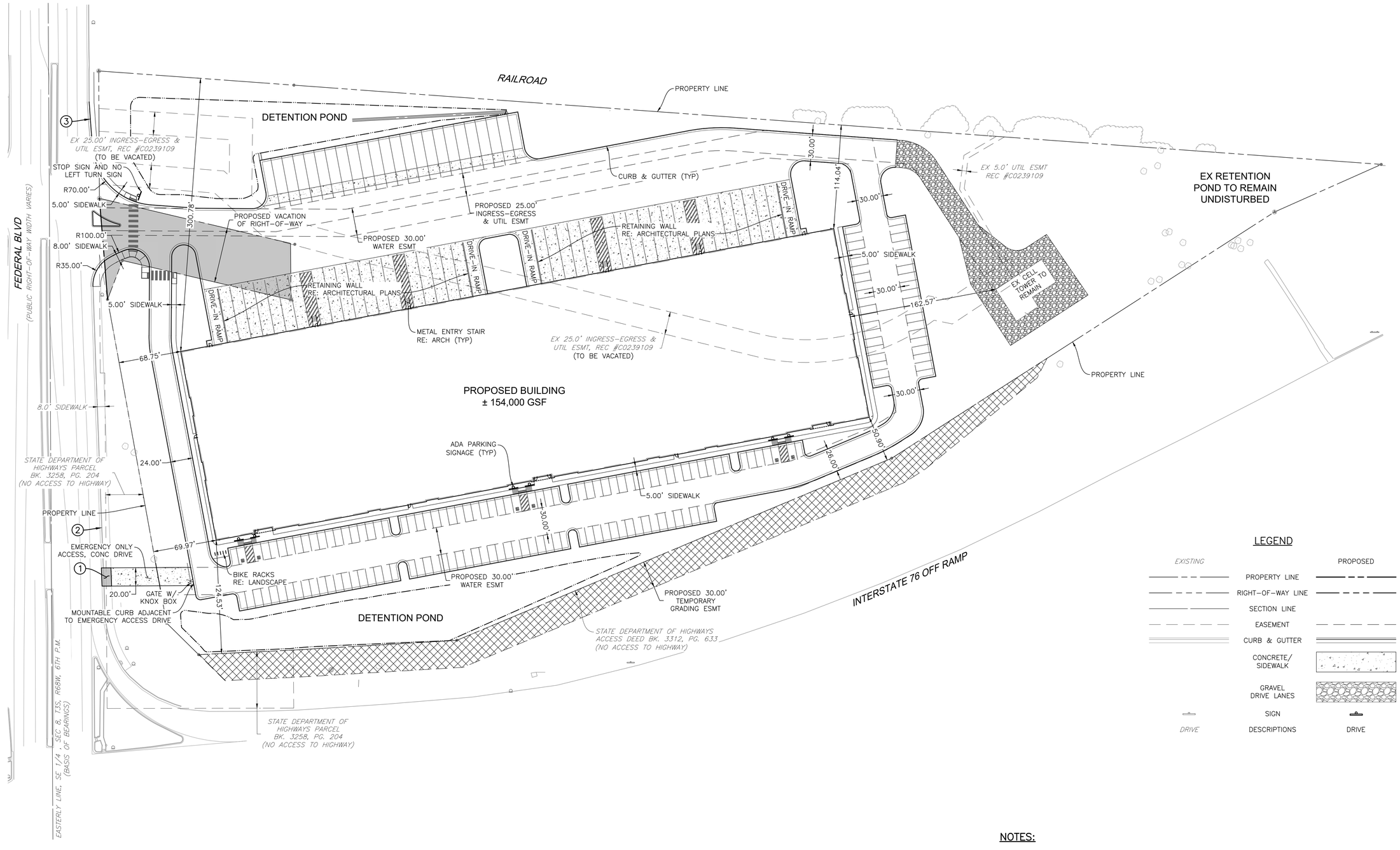
_____ _____

Signature of developer representative Date

If you have any questions or require additional information, please contact our office.

Sincerely,

Mitchell T. Terry
District Manager
Crestview Water & Sanitation District



LEGEND

EXISTING		PROPOSED
	PROPERTY LINE	
	RIGHT-OF-WAY LINE	
	SECTION LINE	
	EASEMENT	
	CURB & GUTTER	
	CONCRETE/ SIDEWALK	
	GRAVEL DRIVE LANES	
	SIGN	
DRIVE	DESCRIPTIONS	DRIVE

NOTES:

1. ALL WASTE/RECYCLING ARE TO BE HANDLED INTERNAL TO BUILDING ALONG LOADING DOCK FACE, CONSEQUENTLY, NO TRASH ENCLOSURE IS ANTICIPATED AT THIS TIME. IF EXTERNAL TRASH/RECYCLING IS NEEDED IN THE FUTURE, A SEPARATE SUBMITTAL WILL BE MADE FOR PERMITTING THE ENCLOSURE.
2. EXISTING FENCING AROUND SITE IS TO BE REMOVED, NO NEW FENCING IS PROPOSED AT THIS TIME.

KEY NOTES:

(1) REMOVE AND REPLACE EXISTING CURB, GUTTER AND SIDEWALK TO NEAREST JOINTS WITH MOUNTABLE CURB & GUTTER AND MINIMUM 6" THICK CONCRETE SIDEWALK.

(2) REPLACE ANY DAMAGED EXISTING CURB, GUTTER AND SIDEWALK ALONG PROPERTY FRONTAGE BASED ON FIELD INSPECTION WITH COUNTY ENGINEER.

(3) REMOVE EXISTING DRIVEWAY, INSTALL NEW CURB, GUTTER AND SIDEWALK.

N

50 25 0 50 100
SCALE: 1"=50'
ALL LINEAL DIMENSIONS ARE IN U.S. SURVEY FEET

PLOT DATE: 8/3/2023 3:36 PM

OPUS
THE OPUS GROUP

Opus AE Group, L.L.C.
10350 Bren Road West
Minnetonka, MN 55343-9110
952-656-4444

Opus Design Build, L.L.C.
950 17th St, Suite 1500
Denver, CO 80202
303-515-8800

MARTIN/MARTIN
CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
303.431.6100 MARTINMARTIN.COM

PROJECT
5800 FEDERAL INDUSTRIAL

PROJECT ADDRESS
ADAMS COUNTY, CO

PROJECT NUMBER
32183

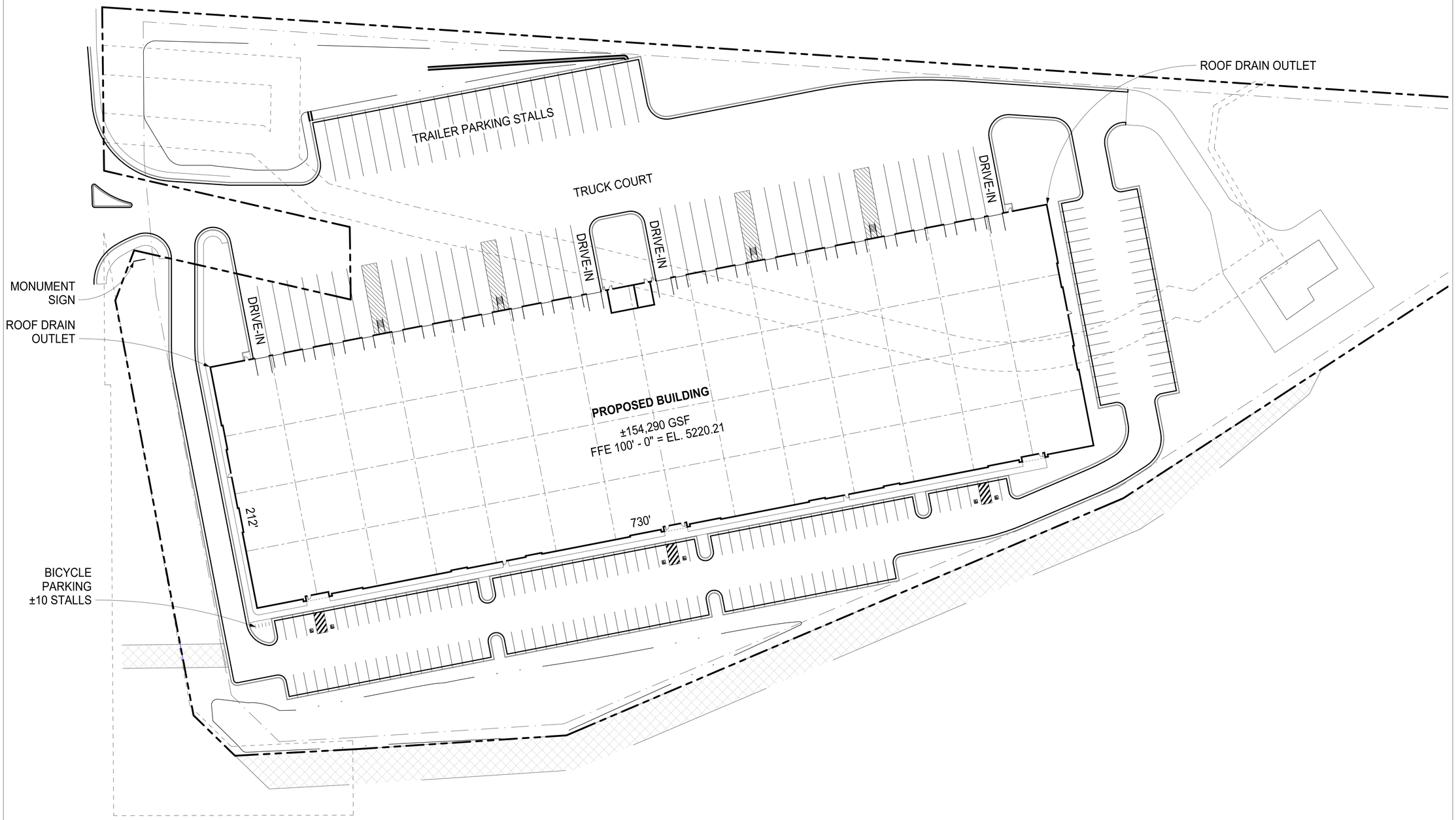
ISSUE RECORD

DATE
08/04/23
PROJECT MANAGER
R. FRANKENBERGER
DRAWN BY
D. BEHM
CHECKED BY
R. FRANKENBERGER

REGISTRATION

SHEET TITLE
SITE PLAN

SHEET NUMBER
1.0



1 Architectural Plan
1" = 40'-0"

0' 20' 40' 80'

PLOT DATE: 8/7/2023 5:04:44 PM

OPUS
THE OPUS GROUP

Opus AE Group, L.L.C.
10350 Bren Road West
Minnetonka, MN 55343-0110
952-656-4444

Opus Design Build, L.L.C.
950 17th St, Suite 1500
Denver, CO 80202
303-515-8800

DESIGN ARCHITECT

PROJECT
5800 FEDERAL INDUSTRIAL

PROJECT ADDRESS
ADAMS COUNTY, CO

PROJECT NUMBER
32183

ISSUE RECORD

08/04/2023	Change In Use Permit
08/04/2023	Subdivision - Minor/Final Permit

DATE
07/24/23
PROJECT MANAGER
J. KRALICEK
DRAWN BY
C. MCKENZIE
CHECKED BY
J. WADE | J. FOURNIEA

REGISTRATION

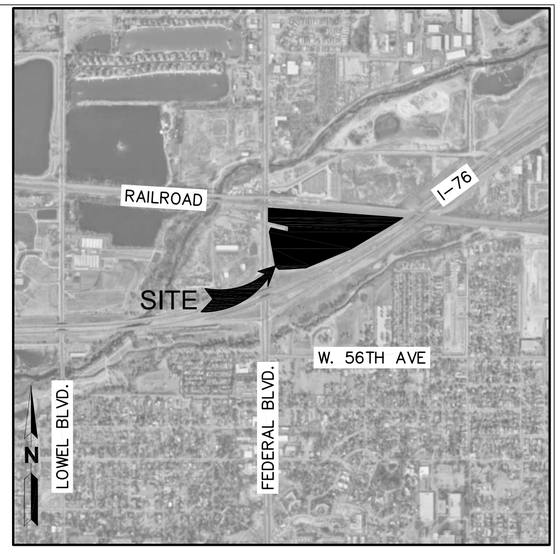
SHEET TITLE
ARCHITECTURAL PLANS

SHEET NUMBER
5.0

5800 FEDERAL INDUSTRIAL

A PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 8,
TOWNSHIP 3 SOUTH, RANGE 66 WEST OF THE 6TH P.M.,
COUNTY OF ADAMS,
STATE OF COLORADO

SHEET 1 OF 5
COVER SHEET



VICINITY MAP
NTS

SHEET INDEX:

DEDICATIONS:

KNOW ALL PEOPLE BY THESE PRESENTS THAT THE UNDERSIGNED WARRANT THEY ARE THE OWNERS OF PARCELS OF LAND SITUATED IN THE SOUTHEAST QUARTER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO MORE PARTICULARLY DESCRIBED AS FOLLOWS:

SEE SHEET 2 FOR DESCRIPTION

HAVE LAID OUT, PLATTED AND SUBDIVIDED THE SAME INTO A LOT AND A BLOCK AS SHOWN ON THIS PLAT UNDER THE NAME AND STYLE OF 5800 FEDERAL INDUSTRIAL. THE UNDERSIGNED DOES HEREBY DEDICATE, GRANT AND CONVEY TO ADAMS COUNTY THOSE PUBLIC EASEMENTS AS SHOWN ON THE PLAT; AND FURTHER RESTRICTS THE USE OF ALL PUBLIC EASEMENTS TO ADAMS COUNTY AND/OR ITS ASSIGNS, PROVIDED HOWEVER, THAT THE SOLE RIGHT AND AUTHORITY TO RELEASE OR QUITCLAIM ALL OR ANY SUCH PUBLIC EASEMENTS SHALL REMAIN EXCLUSIVELY VESTED IN ADAMS COUNTY.

NOTES:

1. RIGHT-OF-WAY FOR INGRaESS AND EGRESS FOR SERVICE AND EMERGENCY VEHICLES IS GRANTED OVER, ACROSS, ON AND THROUGH ANY AND ALL PRIVATE ROADS, WAYS, AND FIRE LANES NOW OR HEREAFTER ESTABLISHED ON THE DESCRIBED PROPERTY. THE SAME ARE HEREBY DESIGNATED AS FIRE LANES AND EMERGENCY AND SERVICE VEHICLE ROADS, AND SHALL BE POSTED "NO PARKING – FIRE LANE."
2. THIS SURVEY DOES NOT CONSTITUTE A TITLE OR OWNERSHIP SEARCH BY MARTIN/MARTIN ENGINEERING. ALL OWNERSHIP, EASEMENT AND PUBLIC RECORD INFORMATION WAS BASED ON THE TITLE COMMITMENT PREPARED BY FIRST AMERICAN TITLE INSURANCE COMPANY COMMITMENT NO. NCS-1167769-MPLS WITH AN EFFECTIVE DATE OF JULY 17, 2023 AT 5:00 P.M.
3. ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR LAND BOUNDARY MONUMENT OR ACCESSORY, COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO STATE STATUTE 18-4-580, C.R.S.
4. BEARINGS ARE BASED ON THE WESTERLY LINE OF THE SOUTHEAST QUARTER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN ASSUMED TO BEAR N00°19'25"W AND BEING MONUMENTED BY A FOUND 3-1/4" ALUM. CAP PLS #23519 IN RANGE BOX AT THE SOUTH QUARTER CORNER AND A FOUND 3-1/4" ALUM. CAP PLS #23519 IN RANGE BOX AT THE CENTER QUARTER CORNER.
5. ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT, MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON.
6. ALL LINEAL DIMENSIONS ARE IN U.S. SURVEY FEET.
7. THE EASEMENT AREA WITHIN EACH LOT OR TRACT IS TO BE CONTINUOUSLY MAINTAINED BY THE OWNER OF THE LOT OR TRACT EXCEPTING THE CITY OF AURORA FROM SUCH RESPONSIBILITY. ANY STRUCTURES INCONSISTENT WITH THE USE GRANTED IN THE EASEMENT ARE PROHIBITED.

OWNER:

FED57, LLC, A COLORADO LIMITED LIABILITY COMPANY

BY: _____

TITLE: _____

NOTARY:

STATE OF _____)
)ss.
COUNTY OF _____)

THE FOREGOING INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 2023,

IT WILL BE EXECUTED BY _____, OF FED57, LLC, A COLORADO LIMITED LIABILITY COMPANY

WITNESS MY HAND AND OFFICIAL SEAL.

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

OWNER:

FED58, LLC, A COLORADO LIMITED LIABILITY COMPANY

BY: _____

TITLE: _____

NOTARY:

STATE OF _____)
)ss.
COUNTY OF _____)

THE FOREGOING INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 2023,

IT WILL BE EXECUTED BY _____, OF FED58, LLC, A COLORADO LIMITED LIABILITY COMPANY

WITNESS MY HAND AND OFFICIAL SEAL.

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

SURVEYOR'S CERTIFICATE:

I HEREBY CERTIFY THAT I WAS IN RESPONSIBLE CHARGE OF THE SURVEY WORK USED IN THE PREPARATION OF THIS PLAT; THE POSITIONS OF THE PLATTED POINTS SHOWN HEREON HAVE AN ACCURACY OF NOT LESS THAN ONE (1) FOOT IN TEN THOUSAND (10,000) FEET PRIOR TO ADJUSTMENTS; AND ALL BOUNDARY MONUMENTS AND CONTROL CORNERS SHOWN HEREON WERE IN PLACE AS DESCRIBED ON _____.
I FURTHER CERTIFY THAT THE INFORMATION CONTAINED HEREIN IS ACCURATE AND IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE TO MY KNOWLEDGE, INFORMATION AND BELIEF. THIS CERTIFICATION IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.

_____
RICHARD A. NOBBE
PROFESSIONAL L.S. NO. 23899

AUGUST 08, 2023

MARTIN/MARTIN
CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
MAIN 303.431.6100 MARTINMARTIN.COM
SURVEY@MARTINMARTIN.COM

5800 FEDERAL INDUSTRIAL

A PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 8,
TOWNSHIP 3 SOUTH, RANGE 66 WEST OF THE 6TH P.M.,
COUNTY OF ADAMS,
STATE OF COLORADO

DESCRIPTION SHEET

LEGAL DESCRIPTION (PER TITLE COMMITMENT)

PARCEL 1:

A PARCEL OF LAND LOCATED IN THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
COMMENCING AT THE SOUTH 1/4 CORNER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN; THENCE NORTH 00°18'16" WEST ALONG THE WEST LINE OF SAID SOUTHEAST 1/4 A DISTANCE OF 1766.13 FEET; THENCE SOUTH 76°45'25" EAST A DISTANCE OF 56.52 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD AND THE TRUE POINT OF BEGINNING; THENCE NORTH 00°18'16" WEST ALONG THE EASTERLY RIGHT OF WAY LINE A DISTANCE OF 139.93 FEET TO THE SOUTH RIGHT OF WAY LINE OF D&RGW RAILROAD; THENCE SOUTH 85°48'34" EAST ALONG THE SOUTH RIGHT OF WAY LINE A DISTANCE OF 215.00 FEET; THENCE SOUTH 00°18'16" EAST A DISTANCE OF 174.72 FEET; THENCE NORTH 76°45'25" WEST A DISTANCE OF 220.47 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD AND THE TRUE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

PARCEL 2:

A PARCEL OF LAND LOCATED IN THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
COMMENCING AT THE SOUTH 1/4 CORNER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN; THENCE NORTH 00°18'16" WEST ALONG THE WEST LINE OF SAID SOUTHEAST 1/4 A DISTANCE OF 1766.13 FEET; THENCE SOUTH 76°45'25" EAST A DISTANCE OF 276.99 FEET TO THE TRUE POINT OF BEGINNING; THENCE NORTH 00°18'16" WEST A DISTANCE OF 174.72 FEET TO THE SOUTH RIGHT OF WAY LINE OF THE D&RGW RAILROAD; THENCE SOUTH 85°45'34" EAST A DISTANCE OF 1197.69 FEET TO THE COLORADO STATE HIGHWAY DEPARTMENT WESTERLY RIGHT OF WAY LINE; THENCE CONTINUING ALONG SAID WESTERLY RIGHT OF WAY LINE SOUTH 66°03'42" WEST A DISTANCE OF 128.49 FEET; THENCE CONTINUING ALONG SAID RIGHT OF WAY SOUTH 57°15'47" WEST A DISTANCE OF 500.00 FEET; THENCE NORTH 01°22'03" WEST A DISTANCE OF 81.53 FEET; THENCE NORTH 76°45'25" WEST A DISTANCE OF 671.45 FEET TO THE TRUE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

PARCEL 3:

A TRACT OF LAND LOCATED IN THE NORTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
COMMENCING AT THE SOUTH 1/4 OF SAID SECTION 8 FROM WHICH THE NORTH 1/4 CORNER BEARS N 00°19'08" W; THENCE N 11°35'48" E A DISTANCE OF 1283.49 FEET TO THE POINT OF BEGINNING; THENCE N 00°19'08" W AND PARALLEL WITH THE CENTER OF SAID SECTION 8, A DISTANCE OF 446.43 FEET; THENCE S 76°30'37" E A DISTANCE OF 676.75 FEET; THENCE S 00°19'08" E A DISTANCE OF 76.86 FEET TO THE POINT OF THE NORTH RIGHT OF WAY OF INTERSTATE 76; THENCE S 67°06'30" W ALONG SAID NORTH RIGHT OF WAY A DISTANCE OF 517.06 FEET; THENCE S 86°38'02" W ALONG SAID NORTH RIGHT OF WAY A DISTANCE OF 180.00 FEET TO THE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

PARCEL 4:

A REMAINDER PARCEL OF LAND NO. 214RB2 OF THE DEPARTMENT OF TRANSPORTATION, STATE OF COLORADO, PROJECT NO. I 76–1(35) SECTION 2, IN THE S.E. 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST, OF THE SIXTH PRINCIPAL MERIDIAN, IN ADAMS COUNTY, COLORADO, SAID REMAINDER PARCEL BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
COMMENCING AT THE S.1 4/ CORNER OF SAID SECTION 8;
THENCE N. 00°19'08" W., ALONG THE WEST LINE OF THE S.E. 1/4 OF SAID SECTION 8, A DISTANCE OF 1,642.42 FEET; THENCE S. 89°40'52" E., A DISTANCE OF 63.62 FEET TO A POINT ON THE WESTERLY BOUNDARY OF PARCEL 214RB, AS DESCRIBED IN BOOK 3258, PAGE 316 OF THE ADAMS COUNTY CLERK AND RECORDER'S OFFICE, SAID POINT BEING THE TRUE POINT OF BEGINNING;
1. THENCE ALONG THE SAID WESTERLY BOUNDARY LINE S. 10°14'46" E., A DISTANCE OF 361.28 FEET A S.W. PROPERTY CORNER OF SAID PARCEL 214RB;
2. THENCE ALONG THE SOUTHERLY BOUNDARY OF SAID PARCEL 214RB S. 45°20'06" E., A DISTANCE OF 49.50 FEET, TO A S.W. PROPERTY CORNER OF SAID PARCEL;
3. THENCE CONTINUING ALONG THE SOUTH BOUNDARY LINE OF PARCEL 214RB N. 87°19'41" E., A DISTANCE OF 104.17 FEET, TO THE S.E. PROPERTY CORNER OF SAID PARCEL;
4. THENCE ALONG THE EAST BOUNDARY LINE OF SAID PARCEL 214RB N. 00°19'08" W., A DISTANCE OF 384.71 FEET;
5. THENCE N 76°46'08" W., A DISTANCE OF 190.00 FEET;
6. THENCE S. 21°01'43" W., A DISTANCE OF 45.78 FEET, MORE OR LESS TO THE TRUE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

COMBINED OVERALL LEGAL DESCRIPTION

A PARCEL OF LAND LOCATED IN THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER 1/4 CORNER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN; THENCE S00°19'25"E ALONG THE WEST LINE OF SAID SOUTHEAST 1/4 A DISTANCE OF 744.89 FEET; THENCE S89°40'35"E A DISTANCE OF 55.07 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD AND THE POINT OF BEGINNING; THENCE S85°49'57"E A DISTANCE OF 1412.69 FEET; THENCE S65°59'19"W A DISTANCE OF 128.49 FEET; THENCE S57°15'03"W A DISTANCE OF 500.02 FEET; THENCE S67°16'49"W A DISTANCE OF 517.77 FEET; THENCE S86°35'39"W A DISTANCE OF 179.98 FEET; THENCE S87°14'57"W A DISTANCE OF 104.17 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD; THENCE ALONG SAID EASTERLY RIGHT OF WAY LINE THE FOLLOWING THREE (3) CONSECUTIVE COURSES: 1) N45°24'50"W A DISTANCE OF 49.50 FEET; 2) THENCE N10°19'30"W A DISTANCE OF 409.27 FEET; 3) THENCE N00°19'09"W A DISTANCE OF 203.71 FEET TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINS 12.566 ACRES OR 547,355 SQUARE FEET MORE OR LESS.

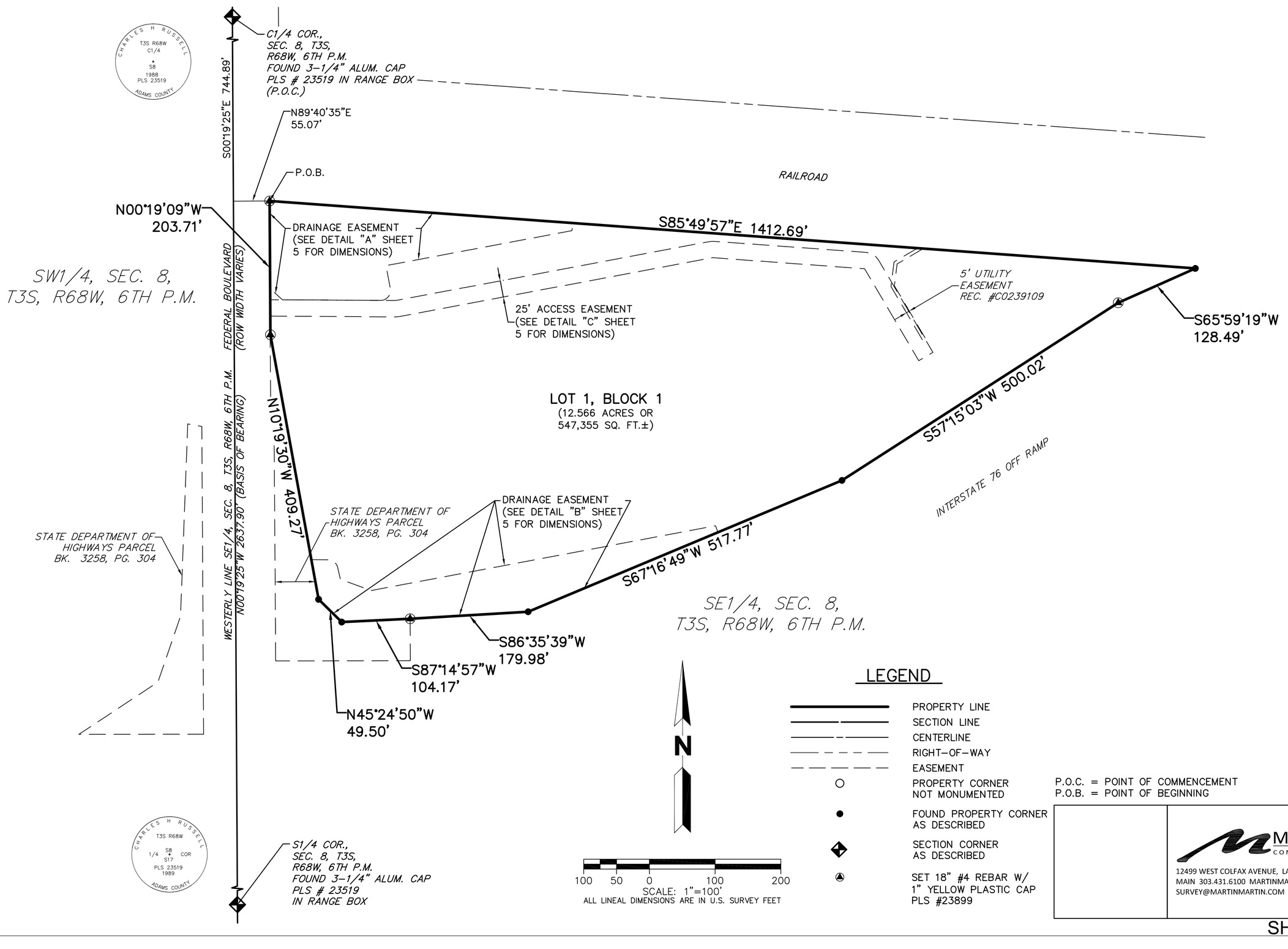
AUGUST 08, 2023

MARTIN/MARTIN
CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
MAIN 303.431.6100 MARTINMARTIN.COM
SURVEY@MARTINMARTIN.COM

5800 FEDERAL INDUSTRIAL

A PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 8,
TOWNSHIP 3 SOUTH, RANGE 66 WEST OF THE 6TH P.M.,
COUNTY OF ADAMS,
STATE OF COLORADO

PLAT SHEET



LEGEND

- PROPERTY LINE
- SECTION LINE
- CENTERLINE
- RIGHT-OF-WAY
- EASEMENT
- PROPERTY CORNER NOT MONUMENTED
- FOUND PROPERTY CORNER AS DESCRIBED
- SECTION CORNER AS DESCRIBED
- SET 18" #4 REBAR W/ 1" YELLOW PLASTIC CAP PLS #23899

P.O.C. = POINT OF COMMENCEMENT
P.O.B. = POINT OF BEGINNING

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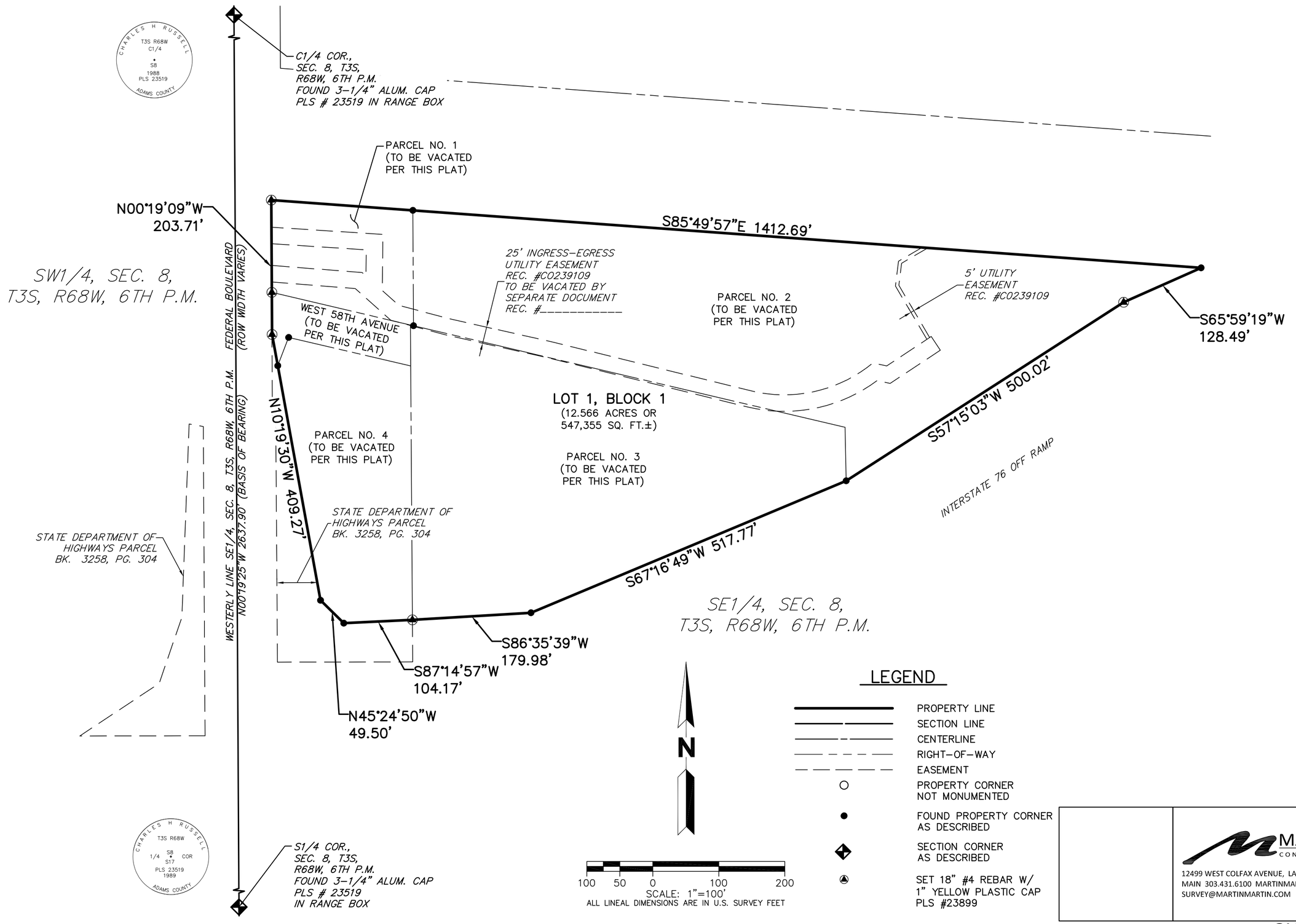
STATE OF COLORADO

VACATIONS SHEET



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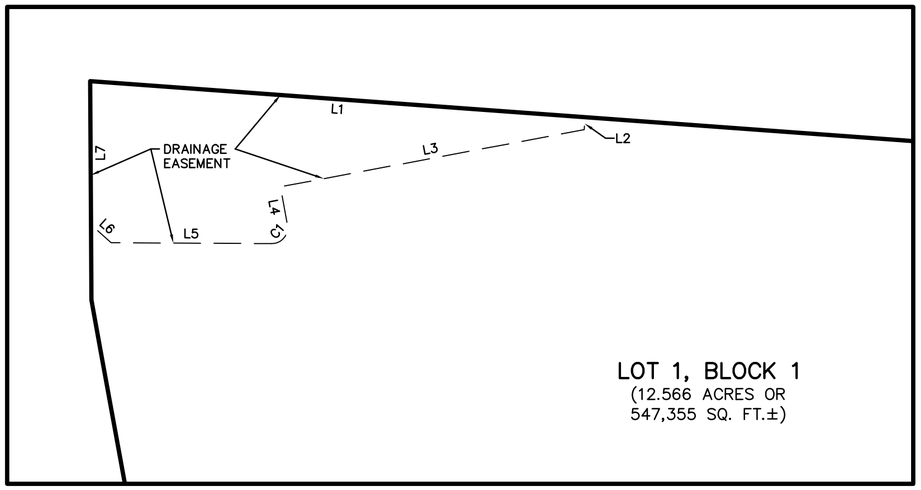
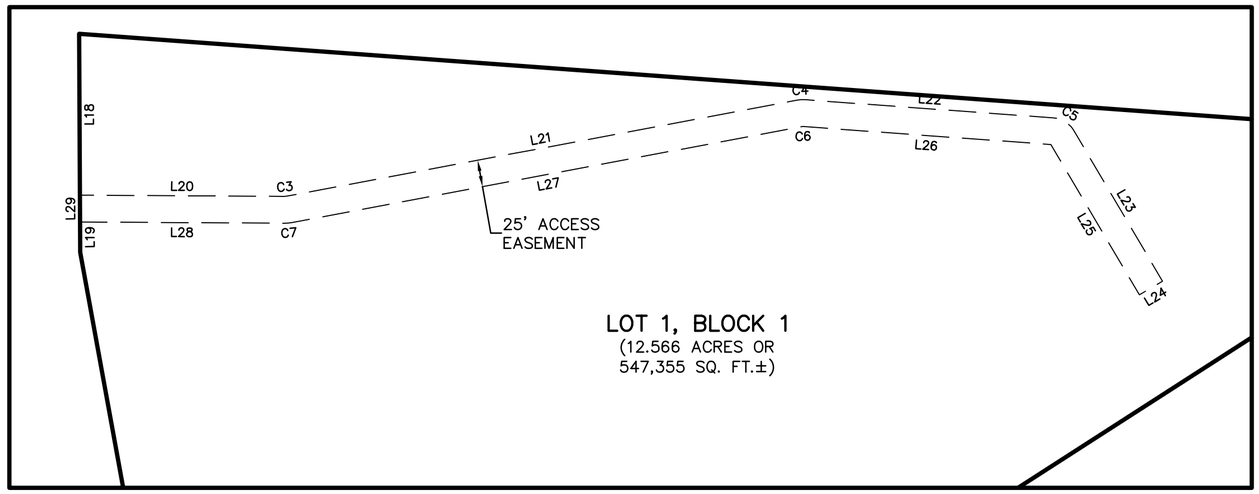
STATE OF COLORADO

SHEET 5 OF 5

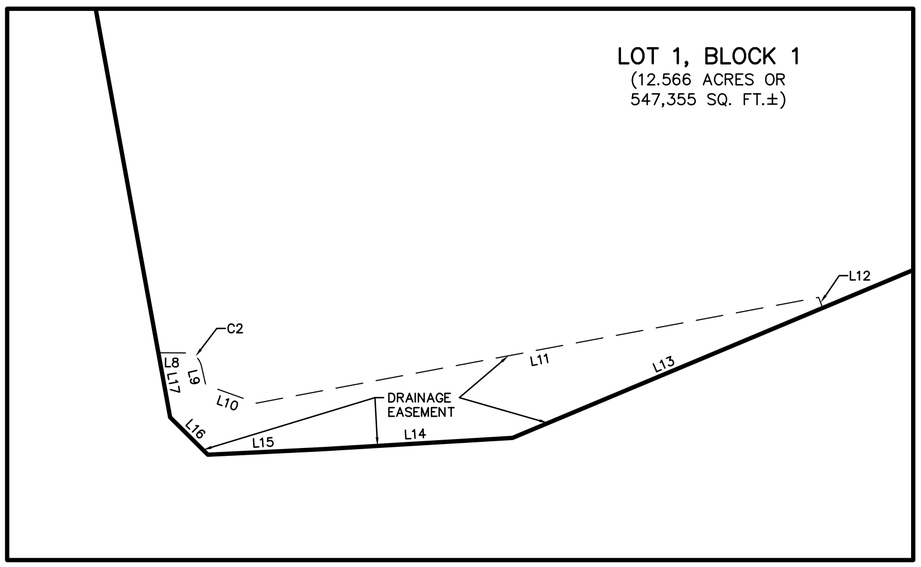
PLATTED EASEMENTS



DETAIL "A"
1" = 100'



DETAIL "C"
1" = 100'



DETAIL "B"
1" = 100'

LINE TABLE		
NUMBER	DIRECTION	DISTANCE
L1	S85°49'57"E	462.28'
L2	S04°11'28"W	11.61'
L3	S79°20'46"W	288.00'
L4	S10°39'14"E	35.77'
L5	N89°39'03"W	149.43'
L6	N47°59'39"W	25.28'
L7	N00°19'09"W	133.52'
L8	S89°39'03"E	25.41'
L9	S13°23'57"E	18.81'
L10	S70°09'53"E	50.02'
L11	N79°20'46"E	533.00'
L12	S20°30'14"E	10.58'
L13	S67°16'49"W	313.21'
L14	S86°35'39"W	179.98'
L15	S87°14'57"W	104.17'
L16	N45°24'50"W	49.50'
L17	N10°19'30"W	61.22'
L18	S00°19'09"E	150.32'
L19	N00°19'09"W	28.39'
L20	S89°39'03"E	190.29'

LINE TABLE		
NUMBER	DIRECTION	DISTANCE
L21	N79°20'46"E	483.13'
L22	S85°49'57"E	231.93'
L23	S30°29'38"E	162.91'
L24	S59°30'22"W	25.00'
L25	N30°29'38"W	162.38'
L26	N85°49'57"W	231.41'
L27	S79°20'46"W	483.13'
L28	N89°39'03"W	190.00'
L29	N00°19'09"W	25.00'

CURVE TABLE					
NUMBER	DELTA ANGLE	RADIUS	ARC LENGTH	CHORD DIRECTION	CHORD LENGTH
C1	101°00'11"	15.00'	26.44'	S39°50'51"W	23.15'
C2	76°15'06"	15.00'	19.96'	S51°31'30"E	18.52'
C3	11°00'11"	15.00'	2.88'	N84°50'51"E	2.88'
C4	14°49'17"	30.00'	7.76'	N86°45'25"E	7.74'
C5	55°20'19"	24.00'	23.18'	S58°09'48"E	22.29'
C6	14°49'17"	5.00'	1.29'	S86°45'25"W	1.29'
C7	11°00'11"	40.00'	7.68'	S84°50'51"W	7.67'

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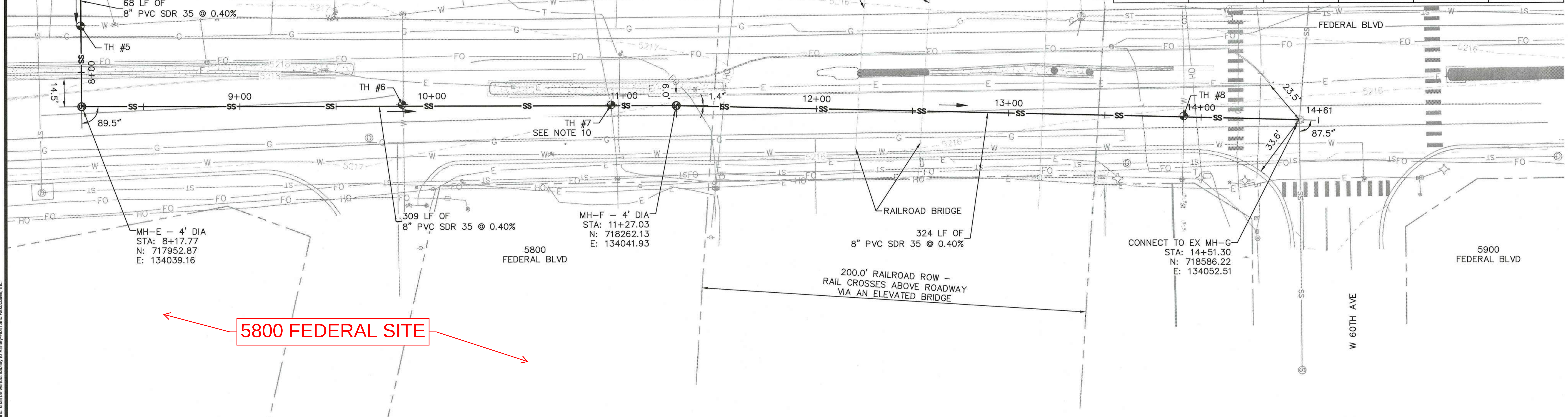
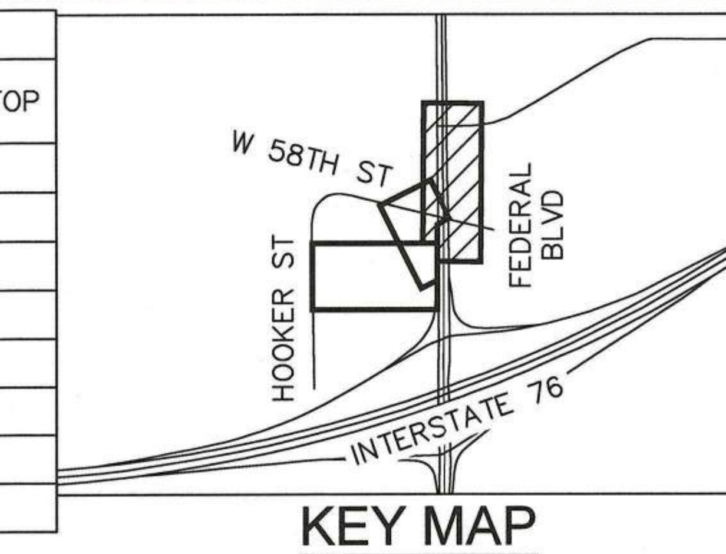
TEST HOLE TABLE PER GOODBEE FIELD STUDY

TEST HOLE #	UTILITY TYPE	UTILITY SIZE (INCHES)	MATERIAL	TOP ELEVATION	DEPTH TO TOP
1	ELECTRIC	2	PE	5222.99	1.43
2	TELECOM	2	PE	5213.99	2.07
3	UNK	2	PE	5212.45	3.35
4	GAS	3	PE	5213.16	2.80
5	WATER	12	CIP	5212.19	5.24
6	WATER	10	PVC	5213.06	4.54
7	WATER	UNK	UNK	UNK	UNK
8	WATER	2	STL	5210.55	5.37





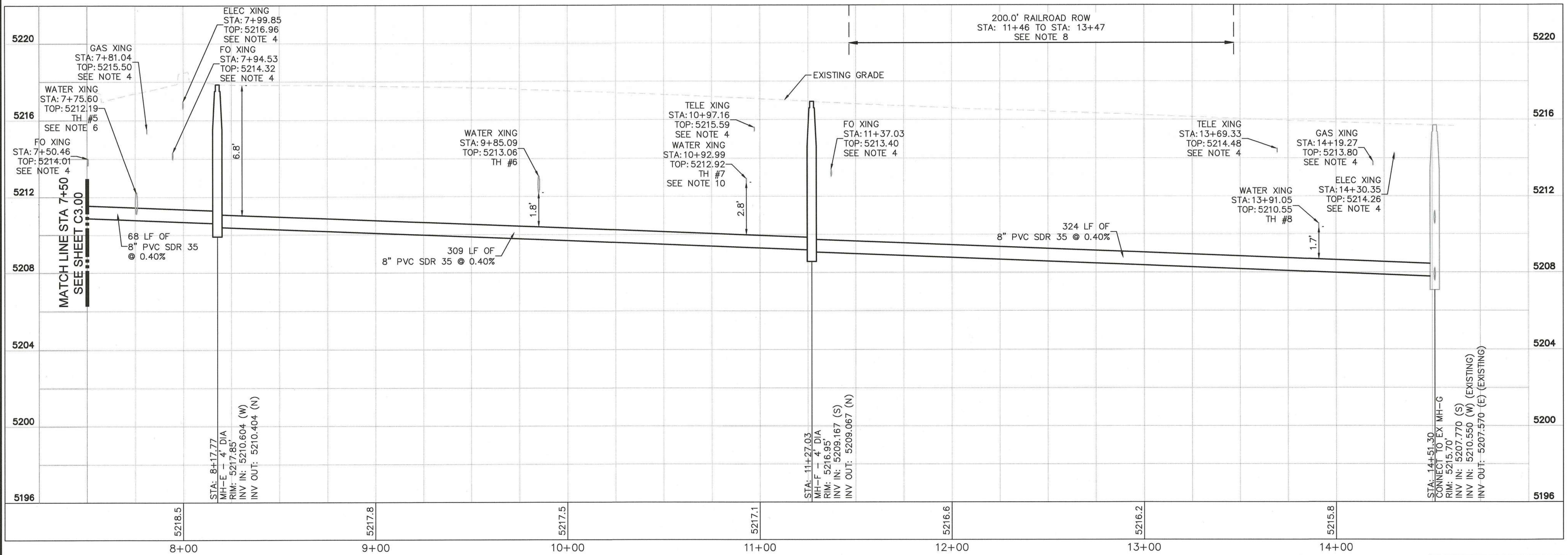
KEY MAP
SCALE: 1" = 500'

LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY LINE
- ASPHALT/PAVEMENT EXTENTS
- EXISTING GAS LINE
- EXISTING FIBER OPTIC
- EXISTING SANITARY SEWER
- EXISTING WATER LINE
- EXISTING OVERHEAD ELECTRIC
- EXISTING STORM LINE
- EXISTING TELEPHONE LINE
- EXISTING ELECTRIC LINE
- EXISTING FENCE
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING FIBER VAULT
- EXISTING POWER STRUCTURE
- EXISTING STORM INLET
- EXISTING WATER METER/VALVE/HYDRANT
- EXISTING GAS VALVE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED SEWER LINE

GENERAL NOTES

1. CONTRACTOR TO VERIFY EXISTING GRADES SHOWN ON THE PLAN.
2. IF A CONFLICT OCCURS BETWEEN THESE PLANS AND FIELD CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY.
3. ALL EXISTING UTILITY LOCATIONS SHOWN HEREIN ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.
4. ELEVATIONS OF INDICATED UTILITIES HAVE BEEN ASSUMED BASED ON TYPICAL BURY DEPTH.
5. FIBER OPTIC LINE OWNED BY COLORADO DEPARTMENT OF TRANSPORTATION (CDOT). CONTRACTOR TO COORDINATE RELOCATION OF FIBER OPTIC LINE WITH CDOT. VERTICAL SEPARATION BETWEEN UTILITIES SHALL BE 1.5'.
6. WATER LINE OWNED BY DENVER WATER. CONTRACTOR TO COORDINATE RELOCATION OF WATER LINE WITH DENVER WATER. VERTICAL SEPARATION BETWEEN UTILITIES SHALL BE 1.5' AND SHOULD ADHERE TO STANDARD DETAIL 33216 ON SHEET C4.01.
7. UNKNOWN UTILITY CROSSING. IF UTILITY IS ABANDONED, CONFLICTING PORTION OF PIPE SHALL BE REMOVED. CONTRACTOR TO COORDINATE RELOCATION OF UTILITY WITH OWNER IF UTILITY IS IN USE; VERTICAL SEPARATION BETWEEN UTILITIES SHALL BE 1.5'.
8. RAILROAD CROSSES ABOVE ROADWAY VIA ELEVATED BRIDGE. EXISTING GRADE IS THE ROADWAY SURFACE UNDER THE BRIDGE. CONTRACTOR TO CONFIRM SPACE BETWEEN EXISTING GRADE AND BOTTOM OF BRIDGE DECK.
9. ELEVATIONS OF INDICATED UTILITIES HAVE BEEN CONFIRMED PER TEST HOLES COMPLETED AS PART OF SUE EXPLORATION. THE TEST HOLE LOCATIONS ARE INDICATED WITH A TEST HOLE NUMBER "TH#" AS SHOWN IN THE PROFILE.
10. CONCRETE AND REBAR WERE EXPERIENCED DURING TEST HOLING AT A DEPTH OF 6". DEPTH OF WATER LINE DETERMINED BY MEASURING TOP OF WATER LINE AT THE METER PITS ON EITHER SIDE OF THE UTILITY CROSSING.
11. EXISTING SANITARY SEWER LINES SHALL BE FLOW FILLED AND ABANDONED IN PLACE. PLUG AND GROUT EXISTING INVERT OF ABANDONED LINE.
12. EXISTING MANHOLE RING AND COVER SHALL BE REMOVED AND MANHOLE SHALL BE COVERED WITH A PLATE AND PAVED OVER.
13. SEWER PIPE LENGTHS SHOWN ARE 2D LENGTHS MEASURED FROM CENTER OF MANHOLE TO CENTER MANHOLE AND ROUNDED TO THE NEAREST FOOT.



VERTICAL 6 3 1.5 0

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60
HORIZONTAL

811 Know what's below. Call before you dig.

CAUTION: NOTICE TO CONTRACTOR
THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR SHALL CALL UTILITY NOTIFICATION CENTER OF COLORADO (UNCC) AT 1-800-922-1987 OR DIAL 811 FOR UTILITY LOCATES 48 HOURS PRIOR TO ANY EXCAVATION WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

Kimley»Horn
4582 South Ulster Street, Suite 1500 | Denver, CO 80237 | Tel. No. (720) 943-9961

SANITARY SEWER PLAN & PROFILE

SUPERSHED SEWER CONNECTION
COLORADO DEPARTMENT OF TRANSPORTATION
COUNTY OF ADAMS, STATE OF COLORADO

DRAWN BY: MCW 4/7/2022
DESIGNED BY: MCW 4/7/2022
CHECKED BY: ATM 4/7/2022
PROJECT No.: 096925006
SCALE: AS SHOWN

DESCRIPTION | DATE

SEAL
COLORADO REGISTERED PROFESSIONAL ENGINEER 46008 3/30/22

SHEET
C3.01

ALTA/NSPS LAND TITLE SURVEY

5800 FEDERAL INDUSTRIAL

PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 8,
TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
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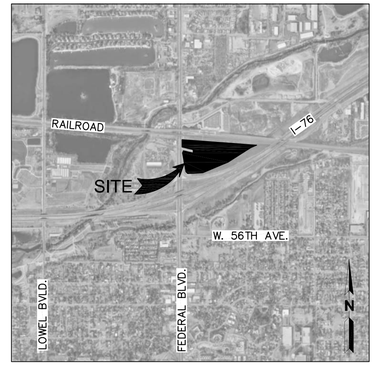

VICINITY MAP
NTS

LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF ADAMS, STATE OF COLORADO, AND IS DESCRIBED AS FOLLOWS:

PARCEL 1:

A PARCEL OF LAND LOCATED IN THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTH 1/4 CORNER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN; THENCE NORTH 00°18'16" WEST ALONG THE WEST LINE OF SAID SOUTHEAST 1/4 A DISTANCE OF 1766.13 FEET; THENCE SOUTH 76°45'25" EAST A DISTANCE OF 56.52 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD AND THE TRUE POINT OF BEGINNING; THENCE NORTH 00°18'16" WEST ALONG THE EASTERLY RIGHT OF WAY LINE A DISTANCE OF 139.93 FEET TO THE SOUTH RIGHT OF WAY LINE OF D&RGW RAILROAD; THENCE SOUTH 85°48'34" EAST ALONG THE SOUTH RIGHT OF WAY LINE A DISTANCE OF 215.00 FEET; THENCE SOUTH 00°18'16" EAST A DISTANCE OF 174.72 FEET; THENCE NORTH 76°45'25" WEST A DISTANCE OF 220.47 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD AND THE TRUE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

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A PARCEL OF LAND LOCATED IN THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTH 1/4 CORNER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN; THENCE NORTH 00°18'16" WEST ALONG THE WEST LINE OF SAID SOUTHEAST 1/4 A DISTANCE OF 1766.13 FEET; THENCE SOUTH 76°45'25" EAST A DISTANCE OF 276.99 FEET TO THE TRUE POINT OF BEGINNING; THENCE NORTH 00°18'16" WEST A DISTANCE OF 174.72 FEET TO THE SOUTH RIGHT OF WAY LINE OF THE D&RGW RAILROAD; THENCE SOUTH 85°45'34" EAST A DISTANCE OF 1197.69 FEET TO THE COLORADO STATE HIGHWAY DEPARTMENT WESTERLY RIGHT OF WAY LINE; THENCE CONTINUING ALONG SAID WESTERLY RIGHT OF WAY LINE SOUTH 66°03'42" WEST A DISTANCE OF 128.49 FEET; THENCE CONTINUING ALONG SAID RIGHT OF WAY SOUTH 57°15'47" WEST A DISTANCE OF 500.00 FEET; THENCE NORTH 01°22'03" WEST A DISTANCE OF 81.53 FEET; THENCE NORTH 76°45'25" WEST A DISTANCE OF 671.45 FEET TO THE TRUE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

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A TRACT OF LAND LOCATED IN THE NORTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTH 1/4 OF SAID SECTION 8 FROM WHICH THE NORTH 1/4 CORNER BEARS N 00°19'08" W; THENCE N 11°35'48" E A DISTANCE OF 1283.49 FEET TO THE POINT OF BEGINNING; THENCE N 00°19'08" W AND PARALLEL WITH THE CENTER OF SAID SECTION 8, A DISTANCE OF 446.43 FEET; THENCE S 76°30'37" E A DISTANCE OF 676.75 FEET; THENCE S 00°19'08" E A DISTANCE OF 76.86 FEET TO THE POINT OF THE NORTH RIGHT OF WAY OF INTERSTATE 76; THENCE S 67°06'30" W ALONG SAID NORTH RIGHT OF WAY A DISTANCE OF 517.06 FEET; THENCE S 86°38'02" W ALONG SAID NORTH RIGHT OF WAY A DISTANCE OF 180.00 FEET TO THE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

PARCEL 4:

A REMAINDER PARCEL OF LAND NO. 214RB2 OF THE DEPARTMENT OF TRANSPORTATION, STATE OF COLORADO, PROJECT NO. I 76-1(35) SECTION 2, IN THE S.E. 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST, OF THE SIXTH PRINCIPAL MERIDIAN, IN ADAMS COUNTY, COLORADO, SAID REMAINDER PARCEL BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
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2. THENCE ALONG THE SOUTHERLY BOUNDARY OF SAID PARCEL 214RB S. 45°20'06" E., A DISTANCE OF 49.50 FEET, TO A S.W. PROPERTY CORNER OF SAID PARCEL;
3. THENCE CONTINUING ALONG THE SOUTH BOUNDARY LINE OF PARCEL 214RB N. 87°19'41" E., A DISTANCE OF 104.17 FEET, TO THE S.E. PROPERTY CORNER OF SAID PARCEL;
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6. THENCE S. 21°01'43" W., A DISTANCE OF 45.78 FEET, MORE OR LESS TO THE TRUE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO.

NOTES

1. THIS SURVEY DOES NOT CONSTITUTE A TITLE OR OWNERSHIP SEARCH BY MARTIN/MARTIN ENGINEERING. ALL OWNERSHIP, EASEMENT AND PUBLIC RECORD INFORMATION WAS BASED ON THE TITLE COMMITMENT PREPARED BY FIRST AMERICAN TITLE INSURANCE COMPANY, COMMITMENT NO. NCS-1167769-MPLS, REVISION NO. 2 WITH AN EFFECTIVE DATE OF JULY 17, 2023 AT 5:00 PM.
2. FIELD WORK WAS DONE JUNE 2023.
3. ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR LAND BOUNDARY MONUMENT OR ACCESSORY, COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO STATE STATUTE 18-4-580, C.R.S.
4. PROPERTY ADDRESS IS 5800 FEDERAL BOULEVARD, DENVER, CO 80221
5. UTILITIES DEPICTED HEREON, DO NOT COMPLY WITH ASCE 38 UTILITY LOCATE STANDARD QUALITY LEVEL A OR B, UNLESS A SEPARATE PLAN SHEET ENTITLED "ASCE 38 UTILITY QUALITY LEVEL B PLAN (A&B)", STAMPED BY A COLORADO PE, IS INCLUDED IN THE PLAN SET. THE UTILITY LOCATES SHOWN HEREON REPRESENT ASCE QUALITY LEVEL D, THUS THE CONTRACTOR IS REQUIRED TO VERIFY THE ACTUAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL COMPLY WITH ALL THE PROVISIONS OF SENATE BILL 18-167 THAT REQUIRE NOTIFICATION OF THE NOTIFICATION ASSOCIATION AND COMPLIANCE WITH CURRENT 811 PROGRAM REQUIREMENTS.

   FOR UNDERGROUND UTILITIES MARTIN / MARTIN INC. RELIED UPON LOCATIONS AND MARKINGS PROVIDED BY UNDERGROUND CONSULTING SOLUTIONS.
6. NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING, BUILDING CONSTRUCTION OR BUILDING REPAIRS
7. THE RIGHT-OF-WAY FOR 58TH AVENUE ON THE EAST SIDE OF FEDERAL BOULEVARD IS PLANNED ON BEING VACATED.

TITLE COMMITMENT SCHEDULE B-2 EXCEPTIONS

8. PROPERTY IS SUBJECT TO ANY EXISTING LEASES OR TENANCIES. (NOT SURVEY RELATED)
9. THIS ITEM IS INTENTIONALLY DELETED.
10. EACH AND EVERY RIGHT OR RIGHTS OF ACCESS TO AND FROM ANY PART OF THE RIGHT OF WAY FOR COLORADO STATE HIGHWAY NO. I-76, FROM AND TO ANY PART OF THE SUBJECT PROPERTY ABUTTING UPON SAID HIGHWAY, AS GRANTED TO THE DEPARTMENT OF HIGHWAYS, STATE OF COLORADO, BY DEED RECORDED JUNE 9, 1987 IN BOOK 3258 AT PAGE 304. (AFFECTS PARCEL 4) (SHOWN, OFF PROPERTY)
11. PROPERTY IS SUBJECT TO EACH AND EVERY RIGHT OR RIGHTS OF ACCESS TO AND FROM ANY PART OF THE RIGHT OF WAY FOR COLORADO STATE HIGHWAY NO. I-76, FROM AND TO ANY PART OF THE SUBJECT PROPERTY ABUTTING UPON SAID HIGHWAY, AS GRANTED TO THE DEPARTMENT OF HIGHWAYS, STATE OF COLORADO, BY DEED RECORDED MAY 6, 1987 IN BOOK 3312 AT PAGE 633. (AFFECTS PARCEL 1) (SHOWN)
12. PROPERTY IS SUBJECT TO THE LEASE BY AND BETWEEN JOHN E. WHITE, JR, AS LESSOR, AND SPRINT SPECTRUM L.P., A DELAWARE LIMITED PARTNERSHIP, AS LESSEE, AS EVIDENCED BY MEMORANDUM OF PCS SITE AGREEMENT RECORDED DECEMBER 18, 1996 AT RECEPTION NO. C0239109. (AFFECTS PARCEL 1 AND 2) (SHOWN)
    SITE DESIGNATION SUPPLEMENT TO MASTER LEASE AND SUBLEASE AGREEMENT IN CONNECTION THEREWITH RECORDED JULY 27, 2005 AT RECEPTION NO. 20050727000795420.
    AFFIDAVIT OF FACTS RELATING TO TITLE IN CONNECTION THEREWITH RECORDED OCTOBER 26, 2005 AT RECEPTION NO. 20051026001178110.
13. PROPERTY IS SUBJECT TO THE LEASE BY AND BETWEEN JOHN E. WHITE, JR, AS LESSOR, AND NEXTEL WEST CORP., A DELAWARE CORPORATION, D/B/A NEXTEL COMMUNICATIONS, AS LESSEE, AS EVIDENCED BY MEMORANDUM OF AGREEMENT RECORDED JULY 5, 2000 AT RECEPTION NO. C0686598 AND CORRECTED MEMORANDUM OF AGREEMENT RECORDED AUGUST 6, 2001 AT RECEPTION NO. C0838319. (AFFECTS ALL PARCELS)
    MEMORANDUM OF PURCHASE AND SALE OF LEASE AND SUCCESSOR LEASE IN CONNECTION THEREWITH RECORDED AUGUST 8, 2005 AT RECEPTION NO. 20050808000839710.
    MEMORANDUM OF ASSIGNMENT IN CONNECTION THEREWITH RECORDED JUNE 4, 2007 AT RECEPTION NO. 2007000053786.
    MEMORANDUM OF FIRST AMENDMENT TO PURCHASE AND SALE OF LEASE AND SUCCESSOR LEASE IN CONNECTION THEREWITH RECORDED SEPTEMBER 13, 2011 AT RECEPTION NO. 2011000058884.
    LEASEHOLD DEED OF TRUST FROM MW CELL REIT 1 LLC, A DELAWARE LIMITED LIABILITY COMPANY TO THE PUBLIC TRUSTEE OF ADAMS COUNTY FOR THE USE OF DEUTSCHE BANK TRUST COMPANY AMERICAS, A NEW YORK BANKING CORPORATION TO SECURE AN INDEBTEDNESS IN THE PRINCIPAL SUM OF $AS STATED THEREIN, AND ANY OTHER AMOUNTS AND/OR OBLIGATIONS SECURED THEREBY, DATED NOVEMBER 9, 2010 AND RECORDED NOVEMBER 24, 2010 AT RECEPTION NO. 2010000081792. (NOT SURVEY RELATED)

TITLE COMMITMENT SCHEDULE B-2 EXCEPTIONS CONTINUED

14. PROPERTY IS SUBJECT TO THE LEASE BY AND BETWEEN JOHN E. WHITE, JR., AS LESSOR, AND SPRINT SPECTRUM REALTY COMPANY, LP., A DELAWARE LIMITED PARTNERSHIP, AS LESSEE, AS EVIDENCED BY MEMORANDUM OF AGREEMENT RECORDED NOVEMBER 27, 2001 AT RECEPTION NO. C0891417. (AFFECTS ALL PARCELS)
    MEMORANDUM OF PURCHASE AND SALE OF LEASE AND SUCCESSOR LEASE IN CONNECTION THEREWITH RECORDED AUGUST 8, 2005 AT RECEPTION NO. 20050808000839720.
    MEMORANDUM OF ASSIGNMENT IN CONNECTION THEREWITH RECORDED JUNE 4, 2007 AT RECEPTION NO. 2007000053791.
    MEMORANDUM OF THIRD AMENDMENT TO PCS SITE AGREEMENT IN CONNECTION THEREWITH RECORDED MAY 19, 2010 AT RECEPTION NO. 2010000033220.
    MEMORANDUM OF FIRST AMENDMENT TO PURCHASE AND SALE OF LEASE AND SUCCESSOR LEASE IN CONNECTION THEREWITH RECORDED SEPTEMBER 13, 2011 AT RECEPTION NO. 2011000058882.
    LEASEHOLD DEED OF TRUST FROM MW CELL REIT 1 LLC, A DELAWARE LIMITED LIABILITY COMPANY TO THE PUBLIC TRUSTEE OF ADAMS COUNTY FOR THE USE OF DEUTSCHE BANK TRUST COMPANY AMERICAS, A NEW YORK BANKING CORPORATION TO SECURE AN INDEBTEDNESS IN THE PRINCIPAL SUM OF $AS STATED THEREIN, AND ANY OTHER AMOUNTS AND/OR OBLIGATIONS SECURED THEREBY, DATED NOVEMBER 9, 2010 AND RECORDED NOVEMBER 24, 2010 AT RECEPTION NO. 2010000081789. (NOT SURVEY RELATED)
15. THIS ITEM IS INTENTIONALLY DELETED.
16. PROPERTY IS SUBJECT TO THE RESOLUTION 2023-142, FOR ZONING MAPS, RECORDED JUNE 8, 2023 AT RECEPTION NO. 2023000032315 (BLANKET)

FLOOD CERTIFICATION

BY GRAPHIC PLOTTING ONLY THIS PROPERTY IS IN FLOOD ZONES AE BASE FLOOD ELEVATIONS DETERMINED AND AE REGULATORY FLOODWAY PER THE FLOOD INSURANCE RATE MAP FOR ADAMS COUNTY, STATE OF COLORADO, PANEL NUMBER 08001C0592H, DATED MARCH 05, 2007.

PARKING

THERE ARE NO CLEARLY MARKED PARKING SPACES ON SUBJECT PROPERTY.

BASIS OF BEARINGS

BEARINGS ARE BASED ON THE EASTERLY LINE OF THE SOUTHEAST QUARTER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN ASSUMED TO BEAR N00°19'25"W AND BEING MONUMENTED BY A FOUND 3-1/4" ALUM. CAP PLS #23519 IN RANGE BOX AT THE SOUTH QUARTER CORNER AND A FOUND 3-1/4" ALUM. CAP PLS #23519 IN RANGE BOX AT THE CENTER QUARTER CORNER.

BENCHMARK

ELEVATIONS ARE BASED ON A GPS DERIVED BENCHMARK ONSITE BETWEEN THE NORTHWEST AND NORTHEAST CORNERS OF PARCEL 4, BEING A CHISELED "X" IN A CONCRETE WALL, SOUTHWEST OF THE INTERSECTION OF FEDERAL BOULEVARD AND WEST 58TH AVENUE, AND AT THE SOUTHERLY END OF CONC. WALL AT A NORTHEASTERLY ANGLE.

ELEVATION = 5219.30 FEET (NAVD1988).

SURVEYOR'S CERTIFICATION

TO: FED58, LLC, A COLORADO LIMITED LIABILITY COMPANY (AS TO PARCELS 1, 2 AND 3); AND FED57, LLC, A COLORADO LIMITED LIABILITY COMPANY (AS TO PARCEL 4); OPUS DEVELOPMENT COMPANY, LLC AND FIRST AMERICAN TITLE INSURANCE COMPANY NATIONAL COMMERCIAL SERVICES:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2021 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1, 2, 3, 4, 5, 7(a), 7(b)(1), 7(c), 8, 9, 11(b), 14, 16, 17, 18, 19, OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON JUNE 29, 2023.

DATE OF PLAT MAP: AUGUST 3, 2023.

RICHARD A. NOBBE
PLS #23899
FOR AND ON BEHALF OF
MARTIN/MARTIN, INC.

NOTICE

ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON A DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THIS CERTIFICATION SHOWN HEREON.

INDEXING STATEMENT

DEPOSITED THIS _____ DAY OF _____, 20__ AT _____ .M., IN BOOK _____ OF THE COUNTY SURVEYOR'S LAND SURVEY/RIGHT-OF-WAY SURVEYS AT PAGE(S) _____, RECEPTION NUMBER _____.

REV. AUGUST 08, 2023
JUNE 30, 2023

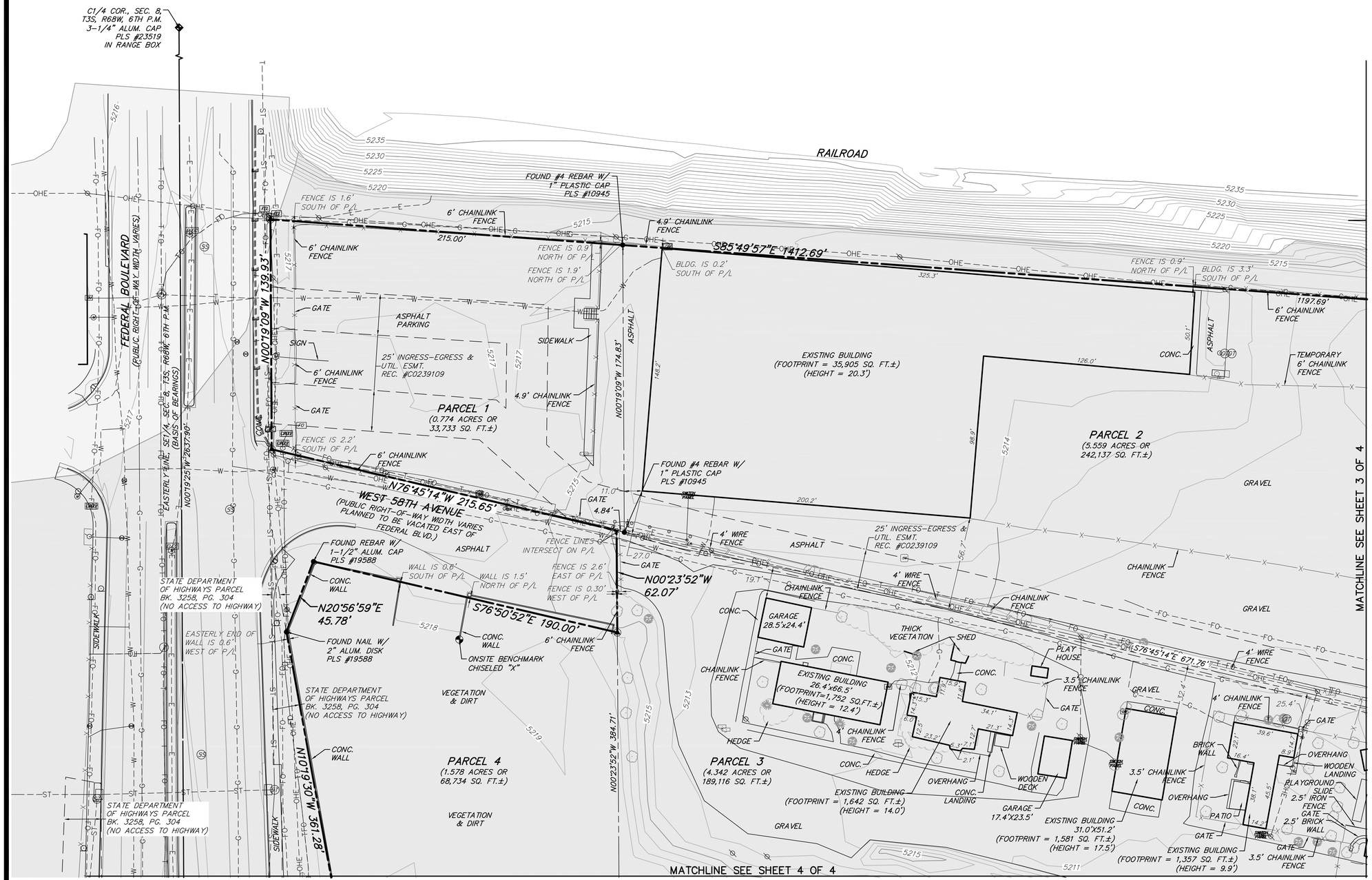
MARTIN/MARTIN
CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
MAIN 303.431.6100 MARTINMARTIN.COM
SURVEY@MARTINMARTIN.COM

Plot Date: 08/03/23 vjuarez
Project Manager: R. NOBBE
Surveyed By:
Drawn By: JUAREZ
Location: G:\SCHLAPPE\23.0269-5800 Federal Industrial\SURVEY\ALTA06-23\Alta06-23.dwg
Job Number: 23.0269.C.86
Sheet Number: 1 OF 4

ALTA/NSPS LAND TITLE SURVEY

5800 FEDERAL INDUSTRIAL

PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 8,
TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
COUNTY OF ADAMS,
STATE OF COLORADO



LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY
- EASEMENT
- CURB AND GUTTER
- 5500 CONTOUR
- SS SANITARY SEWER
- ST STORM SEWER
- W WATER LINE
- E ELECTRIC LINE
- OHU OVERHEAD UTILITY LINE
- T TELEPHONE CABLE
- FO FIBER OPTIC LINE
- G GAS LINE
- TV CABLE TV
- FIRE HYDRANT
- LIGHT POLE-METAL
- UTILITY POLE
- SANITARY MANHOLE
- STORM MANHOLE
- WATER MANHOLE
- WATER VALVE
- WATER METER
- FIRE STAND PIPE
- CLEAN OUT
- CURB INLET
- AREA INLET
- TEL TELEPHONE BOX
- ELEC ELECTRIC BOX
- CATV CABLE TV BOX
- IRRIG IRRIGATION BOX
- GM GAS METER
- SIGN
- PROPERTY CORNER
- DECIDUOUS TREE
- PINE TREE
- BUSH/SHRUB
- SET 18" #4 REBAR W/ 1" YELLOW PLASTIC CAP PLS #23899

FLOODZONES

- "AE" BASE FLOOD ELEVATIONS DETERMINED
- "AE" REGULATORY FLOODWAY

N

30 15 0 30 60
SCALE: 1"=30'
ALL LINEAL DIMENSIONS ARE IN U.S. SURVEY FEET

REV. AUGUST 08, 2023
JUNE 30, 2023

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MARTIN/MARTIN assumes no responsibility for utility locations. The utilities shown on this drawing have been plotted from the best available information. It is, however, the contractors responsibility to field verify the location of all utilities prior to the commencement of any construction.

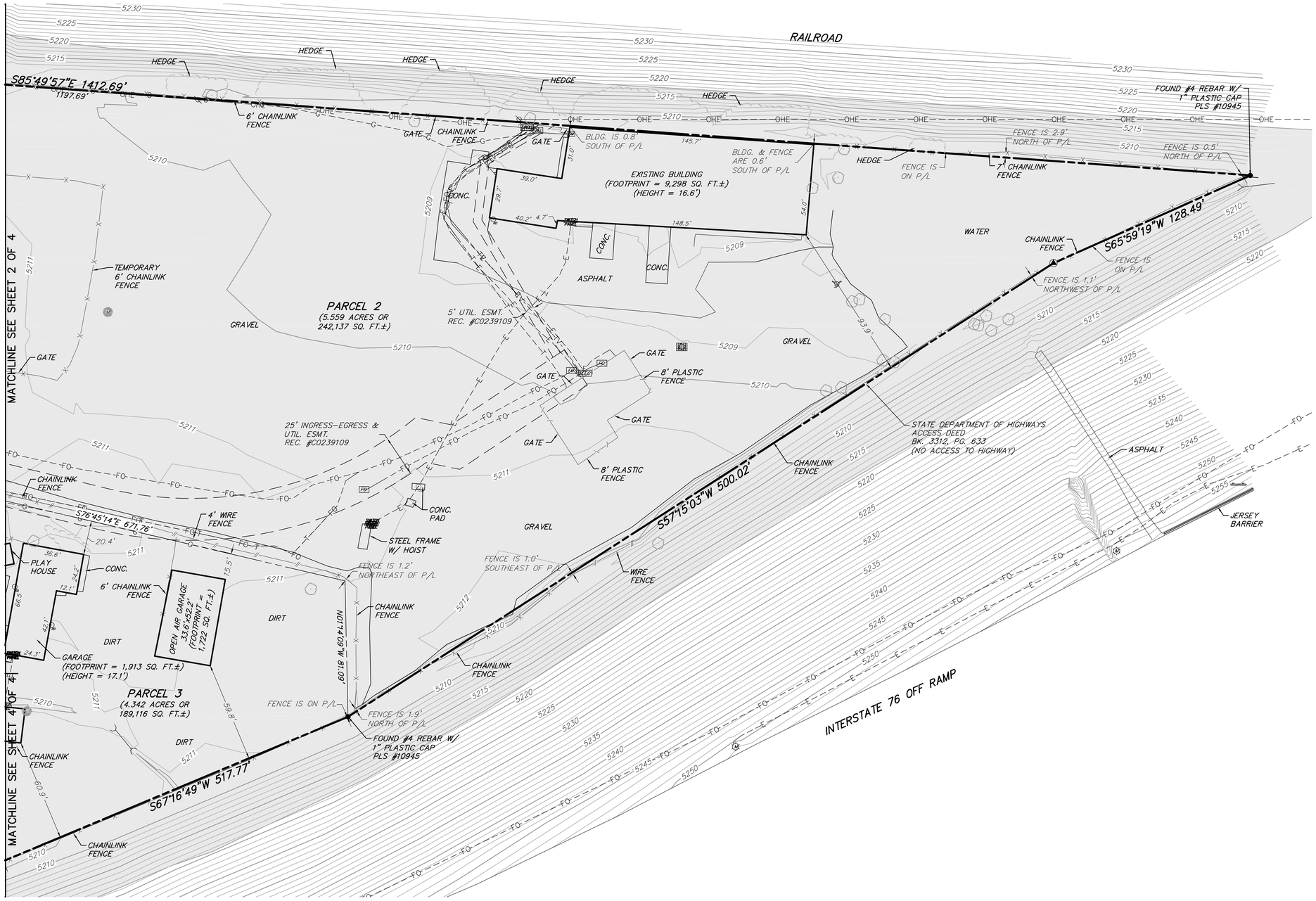
Location: G:\SCHLAPPE\23.0269-5800 Federal Industrial\SURVEY\ALTA06-23\Alta06-23.dwg
Project Manager: R. NOBBE
Drawn By: JUAREZ
Surveyed By:
Job Number: 23.0269.C.86
Sheet Number: 2 OF 4
Plot Date: 08/03/23 vjuarez

ALTA/NSPS LAND TITLE SURVEY

5800 FEDERAL INDUSTRIAL

PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 8,
TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
COUNTY OF ADAMS,
STATE OF COLORADO

SHEET 3 OF 4



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Project Manager: R. NOBBE
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ALTA/NSPS LAND TITLE SURVEY

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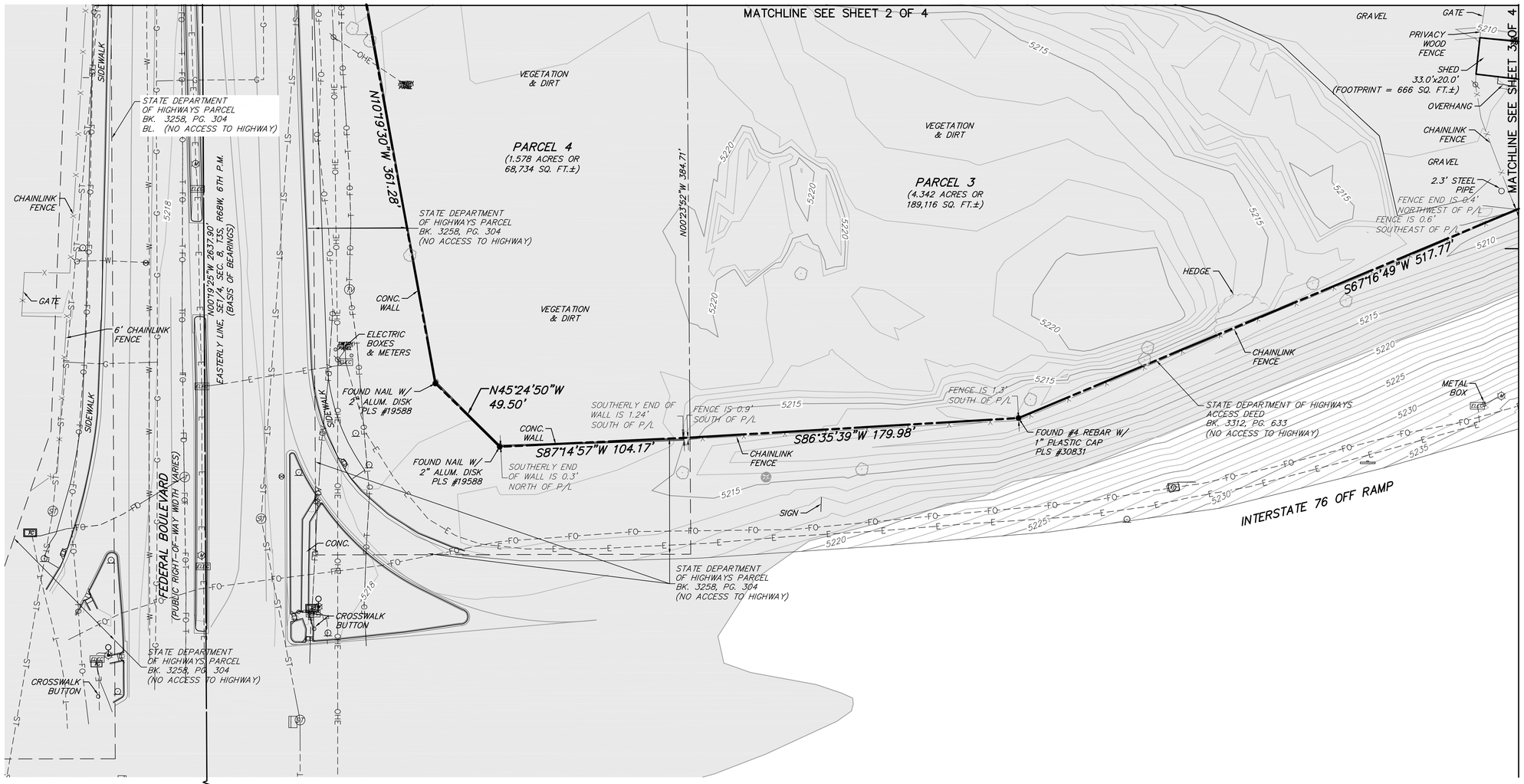

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Project Manager: R. NOBBE
Drawn By: JUAREZ
Surveyed By:
Job Number: 23.0269.C.86
Sheet Number: 4 OF 4
Plot Date: 08/03/23 vjuarez

Community & Economic
Development Department
www.adcogov.org

ADAMS COUNTY
COLORADO

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
PHONE 720.523.6800
FAX 720.523.6998

Minor Subdivision Final Plat Requirements

1. **Subdivision Name, Subtitle:** Name of subdivision at the top of the sheet, followed by a subtitle identifying the section, township and range information along with County and State.

2. **Property Description:** An accurate and clear property (legal) description of the overall boundary of the subdivision with the acreage of the subdivision. All courses in the property (legal) description shall be shown and labeled on the plat drawing, with all bearings having the same direction as called out in the legal description. The only exception being where more than one description is required, going a different direction over the same course. The direction shall then hold for the description having more weight (i.e., the overall boundary) for purposes of the plat. If both record and "as-measured" dimensions are being used, show both and clearly label on the plat drawing. Point of commencement and/or point of beginning shall be clearly labeled on the plat drawing.

3. **Ownership Certificate:**
    a. Know all men by these presents that (owner name(s)), being the sole owner of the following described tract of land:

    b. Legal Description

    c. Have (Has) by these presents laid out, platted and subdivided the same into lots, streets and easements as shown on this plat under the name and style of (subdivision name).

4. **Dedication Statements:** Statements of land to be dedicated to the County for parks or other public uses, grants of easements and dedication of public streets to the Adams County are required.

    a. All plats with public streets shall have the following sentence in the dedication statement: *All public streets are hereby dedicated to Adams County for public use.*

    b. All plats with public easements and/or tracts must have the following sentence in the dedication statement: *The undersigned does hereby dedicate, grant and convey to Adams County those Public Easements (and tracts) as shown on the plat; and further restricts the use of all Public Easement to Adams County and/or its assigns, provided however, that the sole right and authority to release or quitclaim all or any such Public Easements shall remain exclusively vested in Adams County.*

    c. All plats with private streets shall have the following sentence in the dedication statement: *All private streets (insert names) are privately owned and maintained by (list owner name, Owner's Association, etc.).*

    d. All plats with other tracts being dedicated to the County shall have:

i. A sentence in the dedication statement similar to "Tract X is hereby dedicated to Adams County for public use".

ii. A special numbered plat note defining the purpose and perpetual maintenance responsibility for the tract such as "Tract X is for public drainage, landscaping, trail and open space with maintenance of the surface being vested in the (District Name) Special Maintenance District".

5. **Surveyor's Statement:** Statement by a registered land surveyor, professionally licensed by the State of Colorado, to the effect that the layout represents a survey made by him and that the monuments thereon actually exist as located and that all dimensional and other details are correct.

6. **Access Provisions:**

   a. Statement Restricting Access: A statement restricting access rights across the right-of-way lines of major highways, parkways, streets or freeways, where required as a provision of approval.

7. **Easement Statement:**

   a. Six-foot (6') wide utility easements are hereby dedicated on private property adjacent to the front lot lines of each lot in the subdivision. In addition, eight-foot (8') wide dry utility easements are hereby dedicated around the perimeter of tracts, parcels and/or open space areas. These easements are dedicated to Adams County for the benefit of the applicable utility providers for the installation, maintenance, and replacement of utilities. Utility easements shall also be granted within any access easements and private streets in the subdivision. Permanent structures, improvements, objects, buildings, wells, water meters and other objects that may interfere with the utility facilities or use thereof (Interfering Objects) shall not be permitted within said utility easements and the utility providers, as grantees, may remove any Interfering Objects at no cost to such grantees, including, without limitation, vegetation.

8. **Storm Drainage Facilities Statement:**

   a. The policy of the County requires that maintenance access shall be provided to all storm drainage facilities to assure continuous operational capability of the system. The property owners shall be responsible for the maintenance of all drainage facilities including inlets, pipes, culverts, channels, ditches, hydraulic structures, and detention basins located on their land unless modified by the subdivision development agreement. Should the owner fail to maintain said facilities, the County shall have the right to enter said land for the sole purpose of operations and maintenance. All such maintenance cost will be assessed to the property owners.

9. **Layout:**

   a. **Boundary Lines:** The subdivision boundary will be clearly distinguishable from other map lines by use of a distinct line type and/or thickness. All lines will be labeled with a complete bearing

and distance, and all curves will be labeled with a central angle (delta), radius and arc length. Radial bearings and/or chord bearings will be provided for all nontangent curves. All dimensions to be determined by accurate field survey which must balance and close within limit of one in five thousand (5,000). Show adjacent and/or intersecting plat/deed lines and label appropriately to include recording information (book and page and/or reception number).

b. **Streets:** All street rights of way defined by the plat will be clearly distinguishable from other map lines by use of a distinct line type and/or thickness. All lines will be labeled with a complete bearing and distance, and all curves will be labeled with a central angle (delta), radius and arc length. Radial bearings and/or chord bearings will be provided for all nontangent curves. Widths shall be labeled from each right-of-way line normal to the corresponding street center line. All street center lines defined by the plat will be clearly distinguishable from other map lines by use of distinct line type and/or thickness. All lines will be labeled with a complete bearing and distance and all curves will be labeled with a central angle (delta), radius and arc length. Radial bearings and/or chord bearings will be provided for all nontangent curves. The plat shall show the right-of-way lines, widths, locations and street names of all existing and proposed public or private streets:

    i. Within the proposed subdivision, and

    ii. Immediately abutting the proposed subdivision, and

    iii. Any private street shall include the designation "(Private)" immediately following street name; any other private right of way that is not named shall include the designation "(Private)" in a manner that clearly conveys such a status.

c. **Easements:** All easements as required by Adams County and other public and quasi-public agencies. Said easements shall be clearly labeled to include width, use and identification as public or private, if necessary. Tie to property lines and annotate with bearings and distances as necessary. Clearly show and label all existing easements, to include width and recording information, that cross, abut or are located within the subdivision boundary.

d. **Lots and Blocks:** All lines of lots, blocks and other parcels of land defined by the plat will be clearly distinguishable from other map lines by use of a distinct line type and/or thickness. All lines will be labeled with a complete bearing and distance and all curves will be labeled with a radius and arc length. Lots must close to one in five thousand (5,000).

e. **Readability:** All line annotation and all other text will be easily and clearly readable. No text shall overwrite other text or be overwritten by map lines.

f. **Leader Lines:** Use leader lines whenever a dimension is not clearly and unmistakably associated with a given line, line segment or arc.

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
PHONE 720.523.6800
FAX 720.523.6998

g. **Multiple Sheets:** Whenever a plat drawing spans multiple sheets, clear and well labeled match lines and a key map shall be included on each sheet. Labels will be of the nature "See Sheet of ". Duplicate street names, widths, lot numbers, tract names, easement labeling or any such labeling when any feature is shown on multiple sheets.

h. **Identification System:** All lots and blocks in the subdivision shall be numbered, beginning with the numeral "1" and continuing consecutively throughout the tract, with no omissions or duplications. All tracts shall be likewise labeled beginning with the letter "A". Lots and tracts shall be labeled with the area of the lot or tract.

i. **Legend:** Provide a legend which designates all lines and symbols except where called out on plat drawing.

j. **Inundation Mark:** The plat shall clearly show the 100-year floodplain line. Reference the appropriate FEMA panel by which the location of this line has been determined.

10. **Easements:** Book and page and/or reception number for all existing and newly created easements.

11. **Adjacent Subdivision:** Names of adjacent platted areas along with the reception and/or plat book and page number shall be shown. If unplatted, so indicate. Existing street rights of way that intersect the subdivision boundary or are adjacent to said boundary lines shall be clearly labeled with the street name, right of way width and appropriate deed or plat recording information wherein the right of way is defined. Show and label all existing lots and blocks that are immediately adjacent to the subdivision boundary.

12. **Basis of Bearings:** A clearly defined basis of bearings shall be provided, both verbally and graphically. All monumentation defining said line shall be shown and labeled on the plat drawing. When said line is not common with the subdivision boundary, it shall be accurately tied to the boundary with bearings and distances.

13. **Monuments:** All monuments used to determine and/or describe a boundary (including basis of bearings, point of beginning and point of commencement) shall be shown and clearly labeled on the plat drawing. Monuments for corners defined by the plat, or otherwise found to be missing in the field, shall be placed and set in accord with the requirements of the State of Colorado.

14. **Not A Part Of Subdivision:** All areas enclosed within the subdivision boundary which do not constitute a part of the subdivision shall be labeled "Not a part of this subdivision". All lines pertaining to such areas shall be dashed.

15. **Square Footage:** The area in square feet of all lot and tracts sought to be platted.

16. **Operation and Maintenance Manual reference:**

Community & Economic
Development Department
www.adcogov.org

ADAMS COUNTY
COLORADO

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
PHONE 720.523.6800
FAX 720.523.6998

REFER TO THE OPERATION AND MAINTENANCE MANUEL RECORDED _____ AT RECEPTION NO. _____ FOR ADDITIONAL DRAINAGE GUIDELINES.

17. All other information required by State law.

Opus AE Group, L.L.C.
10350 Bren Road West
Minnetonka, MN 55343

Written Explanation

INTRODUCTION

The Opus Development Company is pleased to submit a proposed 154,290 SF industrial development for a Subdivision Permit by Adams County. The project is tentatively named 5800 Federal Industrial.

SITE BACKGROUND

The Opus Development Company is set to acquire a 12.53-acre site situated at the northeast quadrant of Interstate 76 and Federal Boulevard. The site is also adjacent to the Clear Creek – Federal Station rail platform. The proposed development is consistent with the existing zoning classification (I-1 and 1-2) for industrial uses. Previously, the site has been home to various businesses, such as Johnny's Auto Body Paint & Frame, Resolution Glass, and Look At That Bus. The existing facilities and site improvements are planned to be demolished and removed, except for the existing cell tower, which will be increased in height. The site falls within the Enterprise Zone overlay designated by Adams County.

PROJECT OVERVIEW

The Opus Development Company is proposing to construct a speculative industrial building in Adams County, Colorado. The building is designed with maximum flexibility to meet the diverse needs of prospective tenants, ranging from Occupancy Types B, F, M, or S. The exterior walls will consist of concrete tilt-up panels with aluminum windows, hollow metal frames and doors, and steel dock doors. The structure will feature steel columns, steel beams, steel roof joists, and a steel roof deck. The building will be of Construction Type IIB (noncombustible) and fully sprinklered with a compliant NFPA 13 ESFR system.

The proposed development will incorporate earth-tone colors, architectural plane changes, and clerestory windows around the exterior. The project includes loading docks and trailer parking stalls on the north side of the building. The primary façade faces south towards Interstate 76, featuring inviting tenant entrances. The site will accommodate approximately 162 automobile parking stalls. As a speculative industrial building, the primary use is yet to be defined, but the Opus Development Company believes that industrial, warehouse, or flex-tech type users are in the market for a facility in this location. Landscaping around the site will complement the architecture and blend into the local environment. The use of storm detention areas on the north and south edges of the site will help manage stormwater.

The project is anticipated to apply for a building permit in the fourth quarter of 2023. Construction is expected to commence in the second quarter of 2024, with occupancy targeted for the first quarter of 2025. Overall, the construction of 5800 Federal Industrial will revitalize the land area, offering a state-of-the-art industrial building in Adams County that caters to a diverse range of potential tenants for years to come.

August 2, 2023

Adams County Planning & Development Department
4430 South Adams County Parkway
Brighton, CO 80601-8216

Westminster Public Schools
Where Education is Personal

To Whom It May Concern:

RE: Proposed Development at 5690, 5790, and 5800 Federal Blvd.

The District welcomes both residential and commercial development within its boundaries and, while the District takes no position on the specific plans presented by *OPUS Development Company*, we believe that a vibrant community should include a wide choice of economic activity. This project proposes to provide additional economic options to the community.

In reviewing the *OPUS Development Company* current proposal for the development of the site, to include mixed use flex office and warehouse facilities, we have determined that the proposed development would have no impact on student enrollment. Using an average number of students generated by housing type, based on information provided by *OPUS Development Company,* the District has conservatively calculated the following student yield:

	Housing Units	Elementary School Yield	Potential Elementary Students	Middle School Yield	Potential Middle School Students	High School Yield	Potential High School Students	Total Potential Students
5690, 5790 and 5800 Federal Blvd.	0	0.8	0	0.3	0	0.2	0	0

In considering the minimal impact to the District by new students who may reside in the development, the District believes it is important to focus on the quality of the development and the degree to which it will revitalize the community in the years ahead. The District believes development on the south end of the District will provide economic benefit for the citizens of the community and, in general, will have an overall positive impact on the existing neighborhood.

Sincerely,

James Duffy, Ed.D.
Chief Operating Officer
Westminster Public Schools

August 3, 2023

Ms. Layla Bajelan, Senior Long Range Planner
Adams County Community and Economic Development
4430 S. Adams County Parkway, 1st Floor, Suite W2000A
Denver, CO 80601

RE: Fire Protection Report
5800 Federal Highway Industrial
Adams County, Colorado

Dear Layla,

We are providing you a summary of the planned site and building fire protection elements for this project. The project will be designed to comply with the Adams County applicable building codes which currently includes the 2018 International Building and Fire Codes. The proposed building is planned as a speculative warehouse / industrial facility and will be designed on the assumption a future tenant could have high-piled combustible storage.

SITE

- A 26'-0" wide fire apparatus access road around the building.
- A primary fire department access entrance off Federal Boulevard in the northwest corner of the site and a secondary fire department access entrance off Federal Boulevard in the southwest corner of the site.

BUILDING

- The building will be designed as an Unlimited Area building and will have a future tenant(s) as Occupancy Groups B, F, M, or S and located a minimum of 60'-0" clear to a public way or open yard.
- The exterior walls will be concrete tilt-up panels with aluminum windows, hollow metal frames and doors, and steel dock doors. The super structure will be steel columns, steel beams, steel roof joists, and steel roof deck.
- The building will be Construction Type IIB (noncombustible construction).
- The building will be fully sprinklered with a compliant NFPA 13 ESFR system.
- The building will have portable fire extinguishers installed throughout the building.
- The building will have fire department access doors on the west, north, and east sides of the building.
- The building will be identified with an address number on either the west or north elevation fronting Federal Boulevard.

If you have any questions, please contact me at 952-656-4460.

Sincerely,

Opus AE Group, L.L.C.

By: Steve Kovalik, AIA
Its: Vice President, Architecture

ATTACH: Architectural Site Plan

C: Jaymes Kralicek Opus Design Build
John Wade Opus AE Group

Transaction Identification Data, for which the Company assumes no liability as set forth in Commitment Condition 5.e.:
Issuing Agent: First American Title Insurance Company National Commercial Services
Issuing Office: 121 South 8th Street, Suite 1250, Minneapolis, MN 55402
Issuing Office's ALTA® Registry ID: 0005802
Commitment Number: NCS-1167769-MPLS
Issuing Office File Number: NCS-1167769-MPLS
Property Address: 5800 Federal Boulevard, Denver, CO 80221
Revision Number: 2

SCHEDULE A

1. Commitment Date: July 17, 2023 at 5:00 P.M.

2. Policy to be issued:
   a. ALTA® Owner's Policy (7-1-21)
      Proposed Insured: Opus Development Company, L.L.C., a Delaware limited liability company
      Proposed Amount of Insurance: $9,338,175.00
      The estate or interest to be insured: See Item 3 below
   b. ALTA® Loan Policy (7-1-21)
      Proposed Insured: A Lender To Be Determined
      Proposed Amount of Insurance: $1,000.00
      The estate or interest to be insured: See Item 3 below

3. The estate or interest in the Land at the Commitment Date is:

   Fee Simple

4. The Title is, at the Commitment Date, vested in:

   Fed57, LLC, a Colorado limited liability company, as to Parcel 4 and Fed58, LLC, a Colorado limited liability company, as to Parcels 1, 2 and 3

5. The Land is described as follows:

   See Exhibit A attached hereto and made a part hereof

Commitment No. NCS-1167769-MPLS

EXHIBIT A

The Land referred to herein below is situated in the County of Adams, State of Colorado, and is described as follows:

Parcel 1:

A parcel of land located in the Southeast 1/4 of Section 8, Township 3 South, Range 68 West of the 6th Principal Meridian, County of Adams, State of Colorado, more particularly described as follows:

Commencing at the South 1/4 corner of Section 8, Township 3 South, Range 68 West of the 6th Principal Meridian; thence North 00°18'16" West along the West line of said Southeast 1/4 a distance of 1766.13 feet; thence South 76°45'25" East a distance of 56.52 feet to the Easterly right of way line of Federal Boulevard and the true point of beginning; thence North 00°18'16" West along the Easterly right of way line a distance of 139.93 feet to the South right of way line of D&RGW Railroad; thence South 85°48'34" East along the South right of way line a distance of 215.00 feet; thence South 00°18'16" East a distance of 174.72 feet; thence North 76°45'25" West a distance of 220.47 feet to the Easterly right of way line of Federal Boulevard and the true point of beginning,

County of Adams,
State of Colorado.

Parcel 2:

A parcel of land located in the Southeast 1/4 of Section 8, Township 3 South, Range 68 West of the 6th Principal Meridian, County of Adams, State of Colorado, more particularly described as follows:

Commencing at the South 1/4 corner of Section 8, Township 3 South, Range 68 West of the 6th Principal Meridian; thence North 00°18'16" West along the West line of said Southeast 1/4 a distance of 1766.13 feet; thence South 76°45'25" East a distance of 276.99 feet to the true point of beginning; thence North 00°18'16" West a distance of 174.72 feet to the South right of way line of the D&RGW Railroad; thence South 85°45'34" East a distance of 1197.69 feet to the Colorado State Highway Department Westerly right of way line; thence continuing along said Westerly right of way line South 66°03'42" West a distance of 128.49 feet; thence continuing along said right of way South 57°15'47" West a distance of 500.00 feet; thence North 01°22'03" West a distance of 81.53 feet; thence North 76°45'25" West a distance of 671.45 feet to the true point of beginning,

County of Adams,
State of Colorado.

Parcel 3:

A tract of land located in the Northeast 1/4 of Section 8, Township 3 South Range 68 West of the 6th Principal Meridian, County of Adams, State of Colorado, more particularly described as follows:

Commencing at the South 1/4 of said Section 8 from which the North 1/4 corner bears N 00°19'08" W; thence N 11°35'48" E a distance of 1283.49 feet to the point of beginning; thence N 00°19'08" W and parallel with the center of said Section 8, a distance of 446.43 feet; thence S 76°30'37" E a distance of 676.75 feet; thence S 00°19'08" E a distance of 76.86 feet to the point of the North right of way of Interstate 76; thence S 67°06'30" W along said North right of way a distance of 517.06 feet; thence S 86°38'02" W along said North right of way a distance of 180.00 feet to the point of beginning,

County of Adams,
State of Colorado.

Parcel 4:

A remainder parcel of land No. 214RB2 of the Department of Transportation, State of Colorado, Project No. I 76-1(35) Section 2, in the S.E. 1/4 of Section 8, Township 3 South, Range 68 West, of the Sixth Principal Meridian, in Adams County, Colorado, said remainder parcel being more particularly described as follows:

Commencing at the S.1 4/ corner of said Section 8;
Thence N. 00°19'08" W., along the West line of the S.E. 1/4 of said Section 8, a distance of 1,642.42 feet; Thence S. 89°40'52" E., a distance of 63.62 feet to a point on the Westerly boundary of Parcel 214RB, as described in Book 3258, Page 316 of the Adams County Clerk and Recorder's Office, said point being the true point of beginning;
1. Thence along the said Westerly boundary line S. 10°14'46" E., a distance of 361.28 feet a S.W. Property corner of said Parcel 214RB;
2. Thence along the Southerly boundary of said Parcel 214RB S. 45°20'06" E., a distance of 49.50 feet, to a S.W. property corner of said parcel;
3. Thence continuing along the South boundary line of Parcel 214RB N. 87°19'41" E., a distance of 104.17 feet, to the S.E. property corner of said parcel;
4. Thence along the East boundary line of said Parcel 214RB N. 00°19'08" W., a distance of 384.71 feet;
5. Thence N 76°46'08" W., a distance of 190.00 feet;
6. Thence S. 21°01'43" W., a distance of 45.78 feet, more or less to the true point of beginning,

County of Adams,
State of Colorado.

For informational purposes only: APN(s): 0182508400041, 0182508400047, 0182508400031 and 0182508400050

Commitment No. NCS-1167769-MPLS

SCHEDULE B, PART I—Requirements

All of the following Requirements must be met:

1. The Proposed Insured must notify the Company in writing of the name of any party not referred to in this Commitment who will obtain an interest in the Land or who will make a loan on the Land. The Company may then make additional Requirements or Exceptions.

2. Pay the agreed amount for the estate or interest to be insured.

3. Pay the premiums, fees, and charges for the Policy to the Company.

4. Documents satisfactory to the Company that convey the Title or create the Mortgage to be insured, or both, must be properly authorized, executed, delivered, and recorded in the Public Records.

5. Payment of all taxes and assessments now due and payable as shown on a certificate of taxes due from the County Treasurer or the County Treasurer's Authorized Agent.

   NOTE: Tax certificate(s) must be ordered by or provided to the Company at least one week prior to closing.

6. Local ordinances may impose inchoate liens on the Land for unpaid water, sewer, stormwater drainage, or other utilities charges. If this transaction includes a sale of the Land, a Utilities Agreement and/or escrow is required.

7. Evidence that all assessments for common expenses, if any, have been paid.

8. Receipt by the Company of an ALTA/NSPS Land Title Survey, certified to First American Title Insurance Company, and in form and content satisfactory to the Company. The Company reserves the right to make further requirements and/or exceptions upon review of this survey.

9. Receipt by the Company of the following documentation for Fed58, LLC, a Colorado limited liability company:

   Operating Agreement, and all amendments thereto, if any.

   NOTE: The Company reserves the right to make further requirements and/or exceptions upon review of the above item(s).

10. Receipt by the Company of the following documentation for Fed57, LLC, a Colorado limited liability company:

Operating Agreement, and all amendments thereto, if any.

NOTE: The Company reserves the right to make further requirements and/or exceptions upon review of the above item(s).

11. Receipt by the Company of the following documentation for Opus Development Company, LLC, a Delaware limited liability company:

    Operating Agreement, and all amendments thereto, if any.

    Certificate of Good Standing issued by the Delaware Secretary of State.

    NOTE: The Company reserves the right to make further requirements and/or exceptions upon review of the above item(s).

12. Receipt by the Company of a satisfactory Final Affidavit and Indemnity, executed by Fed58, LLC, a Colorado limited liability company.

13. Receipt by the Company of a satisfactory Final Affidavit and Indemnity, executed by Fed57, LLC, a Colorado limited liability company.

14. Receipt by the Company of a satisfactory Final Affidavit and Indemnity, executed by Opus Development Company, LLC, a Delaware limited liability company.

Commitment No. NCS-1167769-MPLS

SCHEDULE B, PART II—Exceptions

Some historical land records contain Discriminatory Covenants that are illegal and unenforceable by law. This Commitment and the Policy treat any Discriminatory Covenant in a document referenced in Schedule B as if each Discriminatory Covenant is redacted, repudiated, removed, and not republished or recirculated. Only the remaining provisions of the document will be excepted from coverage.

The Policy will not insure against loss or damage resulting from the terms and conditions of any lease or easement identified in Schedule A, and will include the following Exceptions unless cleared to the satisfaction of the Company:

1. Any facts, rights, interests or claims which are not shown by the Public Records, but which could be ascertained by an inspection of the Land or by making inquiry of persons in possession thereof.

2. Easements, or claims of easements, not shown by the Public Records.

3. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, and any facts which a correct land survey and inspection of the Land would disclose, and which are not shown by the Public Records.

4. Any lien or right to a lien for services, labor, material or equipment, unless such lien is shown by the Public Records at Date of Policy and not otherwise excepted from coverage herein.

5. Any defect, lien, encumbrance, adverse claim, or other matter that appears for the first time in the Public Records or is created, attaches, or is disclosed between the Commitment Date and the date on which all of the Schedule B, Part I—Requirements are met.

   Note: Exception number 5 will be removed from the policy provided the Company conducts the closing and settlement service for the transaction identified in the commitment.

6. Any and all unpaid taxes, assessments and unredeemed tax sales.

7. Any water rights, claims of title to water, in, on or under the Land.

8. Any existing leases or tenancies.

9. This item has been intentionally deleted.

10. Each and every right or rights of access to and from any part of the right of way for Colorado State Highway No. I-76, from and to any part of the subject property abutting upon said highway, as

granted to The Department of Highways, State of Colorado, by Deed recorded June 9, 1987 in Book 3258 at Page 304. (Affects Parcel 4)

11. Each and every right or rights of access to and from any part of the right of way for Colorado State Highway No. I-76, from and to any part of the subject property abutting upon said highway, as granted to The Department of Highways, State of Colorado, by Deed recorded May 6, 1987 in Book 3312 at Page 633. (Affects Parcel 1)

12. Lease by and between John E. White, Jr, as lessor, and Sprint Spectrum L.P., a Delaware limited partnership, as lessee, as evidenced by Memorandum of PCS Site Agreement recorded December 18, 1996 at Reception No. C0239109. (Affects Parcel 1 and 2)

    Site Designation Supplement to Master Lease and Sublease Agreement in connection therewith recorded July 27, 2005 at Reception No. 20050727000795420.

    Affidavit of Facts Relating to Title in connection therewith recorded October 26, 2005 at Reception No. 20051026001178110.

13. Lease by and between John E. White, Jr, as lessor, and Nextel West Corp., a Delaware corporation, d/b/a Nextel Communications, as lessee, as evidenced by Memorandum of Agreement recorded July 5, 2000 at Reception No. C0686598 and Corrected Memorandum of Agreement recorded August 6, 2001 at Reception No. C0838319. (Affects All Parcels)

    Memorandum of Purchase and Sale of Lease and Successor Lease in connection therewith recorded August 8, 2005 at Reception No. 20050808000839710.

    Memorandum of Assignment in connection therewith recorded June 4, 2007 at Reception No. 2007000053786.

    Memorandum of First Amendment to Purchase and Sale of Lease and Successor Lease in connection therewith recorded September 13, 2011 at Reception No. 2011000058884.

14. Lease by and between John E. White, Jr., as lessor, and Sprint Spectrum Realty Company, LP., a Delaware limited partnership, as lessee, as evidenced by Memorandum of Agreement recorded November 27, 2001 at Reception No. C0891417. (Affects All Parcels)

    Memorandum of Purchase and Sale of Lease and Successor Lease in connection therewith recorded August 8, 2005 at Reception No. 20050808000839720.

    Memorandum of Assignment in connection therewith recorded June 4, 2007 at Reception No. 2007000053791.

    Memorandum of Third Amendment to PCS Site Agreement in connection therewith recorded May 19, 2010 at Reception No. 2010000033220.

Memorandum of First Amendment to Purchase and Sale of Lease and Successor Lease in connection therewith recorded September 13, 2011 at Reception No. 2011000058882.

15. This item has been intentionally deleted.

16. Resolution 2023-142, for zoning maps, recorded June 8, 2023 at Reception No. 2023000032315.

DISCLOSURE STATEMENT

Pursuant to C.R.S. 30-10-406(3)(a) all documents received for recording or filing in the Clerk and Recorder's office shall contain a top margin of at least one inch and a left, right and bottom margin of at least one-half of an inch. The Clerk and Recorder will refuse to record or file any document that does not conform to the requirements of this section.

NOTE: If this transaction includes a sale of the property and the price exceeds $100,000.00, the seller must comply with the disclosure/withholding provisions of C.R.S. 39-22-604.5 (Nonresident withholding).

NOTE: Colorado Division of Insurance Regulations 8-1-2 requires that "Every title insurance company shall be responsible to the proposed insured(s) subject to the terms and conditions of the title commitment, other than the effective date of the title commitment, for all matters which appear of record prior to the time of recording whenever the title insurance company, or its agent, conducts the closing and settlement service that is in conjunction with its issuance of an owner's policy of title insurance and is responsible for the recording and filing of legal documents resulting from the transaction which was closed.

Pursuant to C.R.S. 10-11-122, the company will not issue its owner's policy or owner's policies of title insurance contemplated by this commitment until it has been provided a Certificate of Taxes due or other equivalent documentation from the County Treasurer or the County Treasurer's authorized agent; or until the Proposed Insured has notified or instructed the company in writing to the contrary.

The subject property may be located in a special taxing district. A Certificate of Taxes due listing each taxing jurisdiction shall be obtained from the County Treasurer or the County Treasurer's authorized agent. Information regarding special districts and the boundaries of such districts may be obtained from the Board of County Commissioners, the County Clerk and Recorder, or the County Assessor.

C.R.S. 10-11-122 (4), Colorado Notaries may remotely notarize real estate deeds and other documents using real-time audio-video communication technology. You may choose not to use remote notarization for any document.

NOTE: Pursuant to CRS 10-11-123, notice is hereby given:

This notice applies to owner's policy commitments containing a mineral severance instrument exception, or exceptions, in Schedule B, Section 2.

A. **That there is recorded evidence that a mineral estate has been severed, leased, or otherwise conveyed from the surface estate and that there is a substantial likelihood that a third party holds some or all interest in oil, gas, other minerals, or geothermal energy in the property; and**
B. **That such mineral estate may include the right to enter and use the property without the surface owner's permission.**

NOTE: Pursuant to Colorado Division of Insurance Regulations 8-1-2, Affirmative mechanic's lien protection for the Owner may be available (typically by deletion of Exception no. 4 of Schedule B, Section 2 of the Commitment from the Owner's Policy to be issued) upon compliance with the following conditions:

A. **The land described in Schedule A of this commitment must be a single family residence which includes a condominium or townhouse unit.**
B. **No labor or materials have been furnished by mechanics or material-men for purposes of construction on the land described in Schedule A of this Commitment within the past 6 months.**
C. **The Company must receive an appropriate affidavit indemnifying the Company against un-filed mechanic's and material-men's liens.**
D. **The Company must receive payment of the appropriate premium**.
E. **If there has been construction, improvements or major repairs undertaken on the property to be purchased within six months prior to the Date of the Commitment, the requirements to obtain coverage for unrecorded liens will include: disclosure of certain construction information; financial information as to the seller, the builder and or the contractor; payment of the appropriate premium, fully executed Indemnity Agreements satisfactory to the company, and, any additional requirements as may be necessary after an examination of the aforesaid information by the Company.**

No coverage will be given under any circumstances for labor or material for which the insured has contracted for or agreed to pay.

NOTE: Pursuant to C.R.S. 38-35-125(2) no person or entity that provides closing and settlement services for a real estate transaction shall disburse funds as a part of such services until those funds have been received and are available for immediate withdrawal as a matter of right.

NOTE: C.R.S. 39-14-102 requires that a real property transfer declaration accompany any conveyance document presented for recordation in the State of Colorado. Said declaration shall be completed and signed by either the grantor or grantee.

NOTE: Pursuant to CRS 10-1-128(6)(a), It is unlawful to knowingly provide false, incomplete, or misleading facts or information to an insurance company for the purpose of defrauding or attempting to defraud the company. Penalties may include imprisonment, fines, denial of insurance and civil damages. Any insurance company or agent of an insurance company who knowingly provides false, incomplete, or misleading facts or information to a policyholder or claimant for the purpose of defrauding or attempting to defraud the policyholder or claimant with regard to a settlement or award payable from insurance proceeds shall be reported to the Colorado division of insurance within the department of regulatory agencies.

Nothing herein contained will be deemed to obligate the company to provide any of the coverages referred to herein unless the above conditions are fully satisfied.

ALTA COMMITMENT FOR TITLE INSURANCE
issued by
FIRST AMERICAN TITLE INSURANCE COMPANY

NOTICE

IMPORTANT—READ CAREFULLY: THIS COMMITMENT IS AN OFFER TO ISSUE ONE OR MORE TITLE INSURANCE POLICIES. ALL CLAIMS OR REMEDIES SOUGHT AGAINST THE COMPANY INVOLVING THE CONTENT OF THIS COMMITMENT OR THE POLICY MUST BE BASED SOLELY IN CONTRACT.

THIS COMMITMENT IS NOT AN ABSTRACT OF TITLE, REPORT OF THE CONDITION OF TITLE, LEGAL OPINION, OPINION OF TITLE, OR OTHER REPRESENTATION OF THE STATUS OF TITLE. THE PROCEDURES USED BY THE COMPANY TO DETERMINE INSURABILITY OF THE TITLE, INCLUDING ANY SEARCH AND EXAMINATION, ARE PROPRIETARY TO THE COMPANY, WERE PERFORMED SOLELY FOR THE BENEFIT OF THE COMPANY, AND CREATE NO EXTRACONTRACTUAL LIABILITY TO ANY PERSON, INCLUDING A PROPOSED INSURED.

THE COMPANY'S OBLIGATION UNDER THIS COMMITMENT IS TO ISSUE A POLICY TO A PROPOSED INSURED IDENTIFIED IN SCHEDULE A IN ACCORDANCE WITH THE TERMS AND PROVISIONS OF THIS COMMITMENT. THE COMPANY HAS NO LIABILITY OR OBLIGATION INVOLVING THE CONTENT OF THIS COMMITMENT TO ANY OTHER PERSON.

COMMITMENT TO ISSUE POLICY

Subject to the Notice; Schedule B, Part I—Requirements; Schedule B, Part II—Exceptions; and the Commitment Conditions, First American Title Insurance Company, a Nebraska Corporation (the "Company"), commits to issue the Policy according to the terms and provisions of this Commitment. This Commitment is effective as of the Commitment Date shown in Schedule A for each Policy described in Schedule A, only when the Company has entered in Schedule A both the specified dollar amount as the Proposed Amount of Insurance and the name of the Proposed Insured.

If all of the Schedule B, Part I—Requirements have not been met within six months after the Commitment Date, this Commitment terminates and the Company's liability and obligation end.

FIRST AMERICAN TITLE INSURANCE COMPANY

By: _____
Kenneth D. DeGiorgio, President

By: _____
Lisa W. Cornehl, Secretary

This page is only a part of a 2021 ALTA Commitment for Title Insurance issued by First American Title Insurance Company. This Commitment is not valid without the Notice; the Commitment to Issue Policy; the Commitment Conditions; Schedule A; Schedule B, Part I—Requirements; and Schedule B, Part II—Exceptions; and a counter-signature by the Company or its issuing agent that may be in electronic form.

COMMITMENT CONDITIONS

1. DEFINITIONS

a. "Discriminatory Covenant": Any covenant, condition, restriction, or limitation that is unenforceable under applicable law because it illegally discriminates against a class of individuals based on personal characteristics such as race, color, religion, sex, sexual orientation, gender identity, familial status, disability, national origin, or other legally protected class.

b. "Knowledge" or "Known": Actual knowledge or actual notice, but not constructive notice imparted by the Public Records.

c. "Land": The land described in Item 5 of Schedule A and improvements located on that land that by State law constitute real property. The term "Land" does not include any property beyond that described in Schedule A, nor any right, title, interest, estate, or easement in any abutting street, road, avenue, alley, lane, right-of-way, body of water, or waterway, but does not modify or limit the extent that a right of access to and from the Land is to be insured by the Policy.

d. "Mortgage": A mortgage, deed of trust, trust deed, security deed, or other real property security instrument, including one evidenced by electronic means authorized by law.

e. "Policy": Each contract of title insurance, in a form adopted by the American Land Title Association, issued or to be issued by the Company pursuant to this Commitment.

f. "Proposed Amount of Insurance": Each dollar amount specified in Schedule A as the Proposed Amount of Insurance of each Policy to be issued pursuant to this Commitment.

g. "Proposed Insured": Each person identified in Schedule A as the Proposed Insured of each Policy to be issued pursuant to this Commitment.

h. "Public Records": The recording or filing system established under State statutes in effect at the Commitment Date under which a document must be recorded or filed to impart constructive notice of matters relating to the Title to a purchaser for value without Knowledge. The term "Public Records" does not include any other recording or filing system, including any pertaining to environmental remediation or protection, planning, permitting, zoning, licensing, building, health, public safety, or national security matters.

i. "State": The state or commonwealth of the United States within whose exterior boundaries the Land is located. The term "State" also includes the District of Columbia, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, and Guam.

j. "Title": The estate or interest in the Land identified in Item 3 of Schedule A.

2. If all of the Schedule B, Part I—Requirements have not been met within the time period specified in the Commitment to Issue Policy, this Commitment terminates and the Company's liability and obligation end.

3. The Company's liability and obligation is limited by and this Commitment is not valid without:
   a. the Notice;
   b. the Commitment to Issue Policy;
   c. the Commitment Conditions;
   d. Schedule A;
   e. Schedule B, Part I—Requirements; and
   f. Schedule B, Part II—Exceptions; and
   g. a counter-signature by the Company or its issuing agent that may be in electronic form.

4. COMPANY'S RIGHT TO AMEND
The Company may amend this Commitment at any time. If the Company amends this Commitment to add a defect, lien, encumbrance, adverse claim, or other matter recorded in the Public Records prior to the Commitment Date, any liability of the Company is limited by Commitment Condition 5. The Company is not liable for any other amendment to this Commitment.

5. LIMITATIONS OF LIABILITY
   a. The Company's liability under Commitment Condition 4 is limited to the Proposed Insured's actual expense incurred in the interval between the Company's delivery to the Proposed Insured of the Commitment and the delivery of the amended Commitment, resulting from the Proposed Insured's good faith reliance to:
      i. comply with the Schedule B, Part I—Requirements;
      ii. eliminate, with the Company's written consent, any Schedule B, Part II—Exceptions; or
      iii. acquire the Title or create the Mortgage covered by this Commitment.
   b. The Company is not liable under Commitment Condition 5.a. if the Proposed Insured requested the amendment or had Knowledge of the matter and did not notify the Company about it in writing.
   c. The Company is only liable under Commitment Condition 4 if the Proposed Insured would not have incurred the expense had the Commitment included the added matter when the Commitment was first delivered to the Proposed Insured.
   d. The Company's liability does not exceed the lesser of the Proposed Insured's actual expense incurred in good faith and described in Commitment Condition 5.a. or the Proposed Amount of Insurance.
   e. The Company is not liable for the content of the Transaction Identification Data, if any.
   f. The Company is not obligated to issue the Policy referred to in this Commitment unless all of the Schedule B, Part I—Requirements have been met to the satisfaction of the Company.
   g. The Company's liability is further limited by the terms and provisions of the Policy to be issued to the Proposed Insured.

6. LIABILITY OF THE COMPANY MUST BE BASED ON THIS COMMITMENT; CHOICE OF LAW AND CHOICE OF FORUM

a. Only a Proposed Insured identified in Schedule A, and no other person, may make a claim under this Commitment.

b. Any claim must be based in contract under the State law of the State where the Land is located and is restricted to the terms and provisions of this Commitment. Any litigation or other proceeding brought by the Proposed Insured against the Company must be filed only in a State or federal court having jurisdiction.

c. This Commitment, as last revised, is the exclusive and entire agreement between the parties with respect to the subject matter of this Commitment and supersedes all prior commitment negotiations, representations, and proposals of any kind, whether written or oral, express or implied, relating to the subject matter of this Commitment.

d. The deletion or modification of any Schedule B, Part II—Exception does not constitute an agreement or obligation to provide coverage beyond the terms and provisions of this Commitment or the Policy.

e. Any amendment or endorsement to this Commitment must be in writing and authenticated by a person authorized by the Company.

f. When the Policy is issued, all liability and obligation under this Commitment will end and the Company's only liability will be under the Policy.

7. IF THIS COMMITMENT IS ISSUED BY AN ISSUING AGENT

The issuing agent is the Company's agent only for the limited purpose of issuing title insurance commitments and policies. The issuing agent is not the Company's agent for closing, settlement, escrow, or any other purpose.

8. PRO-FORMA POLICY

The Company may provide, at the request of a Proposed Insured, a pro-forma policy illustrating the coverage that the Company may provide. A pro-forma policy neither reflects the status of Title at the time that the pro-forma policy is delivered to a Proposed Insured, nor is it a commitment to insure.

9. CLAIMS PROCEDURES

This Commitment incorporates by reference all Conditions for making a claim in the Policy to be issued to the Proposed Insured. Commitment Condition 9 does not modify the limitations of liability in Commitment Conditions 5 and 6.

10. CLASS ACTION

ALL CLAIMS AND DISPUTES ARISING OUT OF OR RELATING TO THIS COMMITMENT, INCLUDING ANY SERVICE OR OTHER MATTER IN CONNECTION WITH ISSUING THIS COMMITMENT, ANY BREACH OF A COMMITMENT PROVISION, OR ANY OTHER CLAIM OR DISPUTE ARISING OUT OF OR RELATING TO THE TRANSACTION GIVING RISE TO THIS COMMITMENT, MUST BE BROUGHT IN AN INDIVIDUAL CAPACITY. NO PARTY MAY SERVE AS PLAINTIFF, CLASS MEMBER, OR PARTICIPANT IN ANY CLASS OR REPRESENTATIVE PROCEEDING. ANY POLICY ISSUED PURSUANT TO THIS COMMITMENT WILL CONTAIN A CLASS ACTION CONDITION.

11. ARBITRATION

The Policy contains an arbitration clause. All arbitrable matters when the Proposed Amount of Insurance is $2,000,000 or less may be arbitrated at the election of either the Company or the Proposed Insured as the exclusive remedy of the parties. A Proposed Insured may review a copy of the arbitration rules at http://www.alta.org/arbitration.

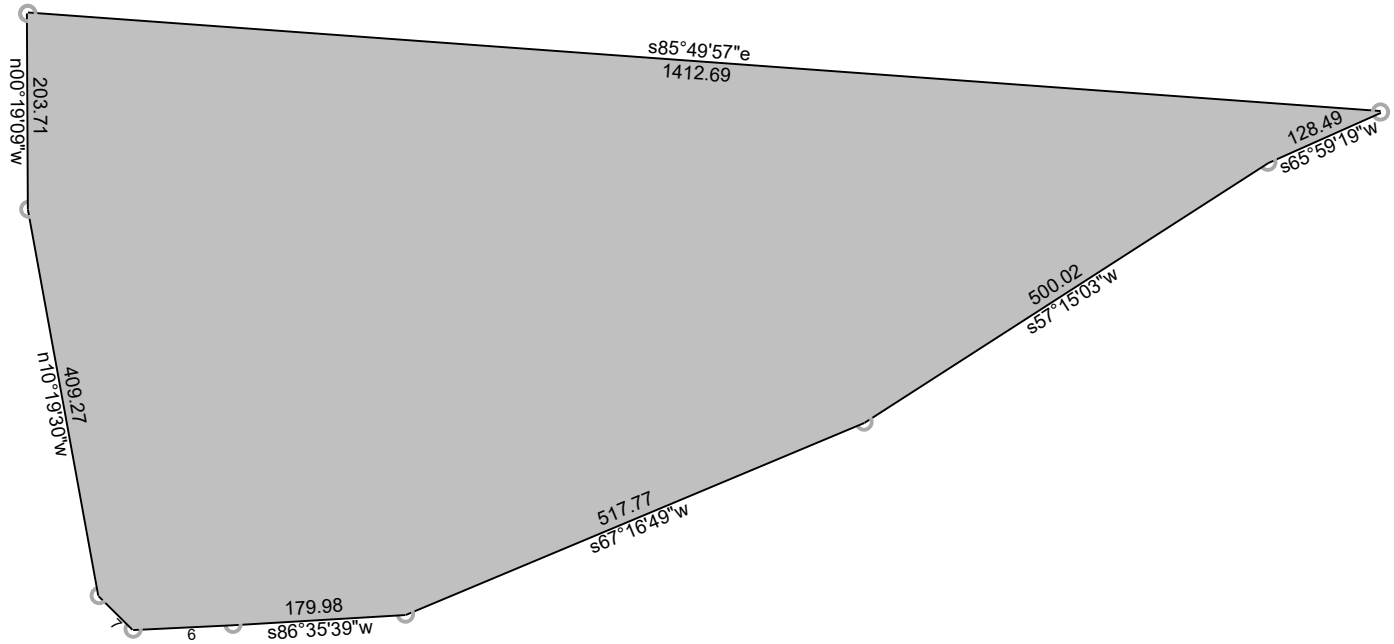
LEGAL DESCRIPTION FOR 5800 FEDERAL BLVD (FROM PAGE 2 OF PLAT)

COMBINED OVERALL LEGAL DESCRIPTION

A PARCEL OF LAND LOCATED IN THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER 1/4 CORNER OF SECTION 8, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN; THENCE S00°19'25"E ALONG THE WEST LINE OF SAID SOUTHEAST 1/4 A DISTANCE OF 744.89 FEET; THENCE S89°40'35"E A DISTANCE OF 55.07 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD AND THE POINT OF BEGINNING; THENCE S85°49'57"E A DISTANCE OF 1412.69 FEET; THENCE S65°59'19"W A DISTANCE OF 128.49 FEET; THENCE S57°15'03"W A DISTANCE OF 500.02 FEET; THENCE S67°16'49"W A DISTANCE OF 517.77 FEET; THENCE S86°35'39"W A DISTANCE OF 179.98 FEET; THENCE S87°14'57"W A DISTANCE OF 104.17 FEET TO THE EASTERLY RIGHT OF WAY LINE OF FEDERAL BOULEVARD; THENCE ALONG SAID EASTERLY RIGHT OF WAY LINE THE FOLLOWING THREE (3) CONSECUTIVE COURSES: 1) N45°24'50"W A DISTANCE OF 49.50 FEET; 2) THENCE N10°19'30"W A DISTANCE OF 409.27 FEET; 3) THENCE N00°19'09"W A DISTANCE OF 203.71 FEET TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINS 12.566 ACRES OR 547,355 SQUARE FEET MORE OR LESS.



	8/8/2023
Scale: 1 inch= 200 feet	File: Overall Boundary.ndp

Tract 1: 12.5655 Acres, Closure: n27.3855e 0.01 ft. (1/322169), Perimeter=3506 ft.

01 s85.4957e 1412.69
02 s65.5919w 128.49
03 s57.1503w 500.02
04 s67.1649w 517.77
05 s86.3539w 179.98
06 s87.1457w 104.17
07 n45.2450w 49.50
08 n10.1930w 409.27
09 n00.1909w 203.71

Adams County Treasurer & Public Trustee

RECEIPT OF PAYMENT (Tax, Fees, Costs, Interests, Penalties)

Account	Parcel Number	Receipt Date	Effective Date	Receipt Number
R0103270	0182508400031	May 3, 2022	Apr 30, 2022	2022-05-03-NetVantage-24574

FED58 LLC
3535 LARIMER ST
DENVER, CO 80205-2421

Situs Address

5690 FEDERAL BLVD

Payor

Legal Description

SECT,TWN,RNG:8-3-68 DESC: TRACT OF LAND IN THE NE4 OF SEC 8 DESC AS FOLS BEG AT THE S 1/4 OF SD SEC 8 FROM WHICH THE N 1/4 COR BRS N 00D 19M 08S W TH N 11D 35M 48S E 1283/49 FT TO THE POB TH N 00D 19M 08S W AND // WITH THE CEN OF SD SEC 8 A DIST OF 446/43 FT TH S 76D 30M 37S E 676/75 FT TH S 00D 19M 08S E 76/86 FT TO A PT ON THE N ROW OF INTERSTATE 76 TH S 67D 06M 30S W 517/06 FT TH S 86D 38M 02S W 180 FT TO THE POB 4/3045A

Property Code	Actual	Assessed	Year	Area	Mill Levy
RES IMPRV LAND - 1112	937,525	67,030	2021	460	116.324
SINGLE FAMILY RES - 1212	245,746	17,570	2021	460	116.324
1217 - 1217	74,114	5,300	2021	460	116.324

Payments Received

Check		$10,457.52
Check Number 00040028		

Payments Applied

Year	Charges	Billed	Prior Payments	New Payments	Balance
2021	Tax Charge	$10,457.52	$0.00	$10,457.52	$0.00
				$10,457.52	$0.00
			Balance Due as of Apr 30, 2022		**$0.00**

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4430 S ADAMS COUNTY PKWY C2436
BRIGHTON CO 80601
[Stay Safe! Please use website services www.adcotax.com]

Email: treasurer@adcogov.org
Telephone: 720-523-6160

ALL CHECKS ARE SUBJECT TO FINAL COLLECTION. THANK YOU FOR YOUR PAYMENT!

Adams County Treasurer & Public Trustee

RECEIPT OF PAYMENT (Tax, Fees, Costs, Interests, Penalties)

Account	Parcel Number	Receipt Date	Effective Date	Receipt Number
R0103277	0182508400047	May 3, 2022	Apr 30, 2022	2022-05-03-NetVantage-24868

FED58 LLC
3535 LARIMER ST
DENVER, CO 80205-2421

Situs Address	Payor
5800 FEDERAL BLVD	

Legal Description

SECT,TWN,RNG:8-3-68 DESC: PARCEL NO 3 PARC OF LAND IN THE SE4 SEC 8 DESC AS FOLS BEG AT THE S 1/4 COR SD SEC TH N 00D 18M 16S W 1766/13 FT TH S 76D 45M 25S E 276/99 FT TO THE TRUE POB TH N 00D 18M 16S W 174/72 FT TO THE S ROW LN OF D & RGW RR TH S 85D 45M 34S E 1197/69 FT TO THE COLO S/H DEPT WLY ROW LN TH CONT ALG SD WLY ROW LN S 66D 03M 42S W 128/49 FT TH CONT ALG SD ROW S 57D 15M 47S W 500 FT TH N 01D 22M 03S W 81/53 FT TH N 76D 45M 25S W 671/45 FT TO THE TRUE POB 5/554A

Property Code	Actual	Assessed	Year	Area	Mill Levy
COMM LND MERCHANDIS - 2112	967,729	280,640	2021	480	121.72
MERCHANDISING - 2212	507,723	147,240	2021	480	121.72
RECREATION - 2225	153,914	44,640	2021	480	121.72

Payments Received

Check	$57,515.14
Check Number 00100015	

Payments Applied

Year	Charges	Billed	Prior Payments	New Payments	Balance
2021	Tax Charge	$57,515.14	$0.00	$57,515.14	$0.00
				$57,515.14	$0.00

Balance Due as of Apr 30, 2022 **$0.00**

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BRIGHTON CO 80601
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Email: treasurer@adcogov.org
Telephone: 720-523-6160

ALL CHECKS ARE SUBJECT TO FINAL COLLECTION. THANK YOU FOR YOUR PAYMENT!

Adams County Treasurer & Public Trustee

RECEIPT OF PAYMENT (Tax, Fees, Costs, Interests, Penalties)

Account	Parcel Number	Receipt Date	Effective Date	Receipt Number
R0103273	0182508400041	May 3, 2022	Apr 30, 2022	2022-05-03-NetVantage-24870

FED58 LLC
3535 LARIMER ST
DENVER, CO 80205-2421

Situs Address	Payor
5800 FEDERAL BLVD	

Legal Description

SECT,TWN,RNG:8-3-68 DESC: PARCEL NO 2 PARC OF LAND IN THE SE4 SEC 8 DESC AS FOLS BEG AT THE S 1/4 COR SD SEC TH N 00D 18M 16S W 1766/13 FT TH S 76D 45M 25S E 56/52 FT TO THE ELY ROW LN OF FEDERAL BLVD AND THE TRUE POB TH N 00D 18M 16S W 139/93 FT TO THE S ROW LN OF D & RGW RR TH S 85D 48M 34S E 215 FT TH S 00D 18M 16S E 174/72 FT TH N 76D 45M 25S W 220/47 FT TO THE ELY ROW LN OF FEDERAL BLVD AND TRUE POB 0/774A

Property Code	Actual	Assessed	Year	Area	Mill Levy
VACANT COMMERCIAL LD - 0200	269,720	78,220	2021	495	121.447

Payments Received

Check	$9,499.58
Check Number 00100017	

Payments Applied

Year	Charges	Billed	Prior Payments	New Payments	Balance
2021	Tax Charge	$9,499.58	$0.00	$9,499.58	$0.00
				$9,499.58	$0.00
			Balance Due as of Apr 30, 2022		**$0.00**

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Telephone: 720-523-6160

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Adams County Treasurer & Public Trustee

RECEIPT OF PAYMENT (Tax, Fees, Costs, Interests, Penalties)

Account	Parcel Number	Receipt Date	Effective Date	Receipt Number
R0138746	0182508400050	May 3, 2022	Apr 30, 2022	2022-05-03-NetVantage-25251

FED57 LLC
3535 LARIMER ST
DENVER, CO 80205-2421

Situs Address

5790 FEDERAL BLVD

Payor

Legal Description

SECT,TWN,RNG:8-3-68 DESC: PT OF THE SE4 OF SEC 8 DESC AS FOLS BEG AT THE S4 COR OF SD SEC 8 TH N 00D 19M 08S W 1642/42 FT TH S 89D 40M 52S E 63/62 FT TO A PT SD PT BEING THE TRUE POB TH WLY S 10D 14M 46S E 361/28 FT TH S 45D 20M 06S E 49/50 FT TH CONT N 87D 19M 41S E 104/17 FT TH N 00D 19M 08S W 384/71 FT TH N 76D 46M 08S W 190 FT TH S 21D 01M 43S W 45/78 FT TO THE TRUE POB 1/58A

Property Code	Actual	Assessed	Year	Area	Mill Levy
VACANT COMMERCIAL LD - 0200	674,483	195,600	2021	460	116.324

Payments Received

Check	$22,752.98
Check Number 00180016	

Payments Applied

Year	Charges	Billed	Prior Payments	New Payments	Balance
2021	Tax Charge	$22,752.98	$0.00	$22,752.98	$0.00
				$22,752.98	$0.00
			Balance Due as of Apr 30, 2022		**$0.00**

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Email: treasurer@adcogov.org
Telephone: 720-523-6160

ALL CHECKS ARE SUBJECT TO FINAL COLLECTION. THANK YOU FOR YOUR PAYMENT!

May 4, 2023

Opus Development Company, LLC
950 17th Street, Suite 1500
Denver, Colorado 80202
Attn: Joe Swensson

Re: 5800 Federal Floodplain Due Diligence
Martin/Martin, Inc. Project No.: 23.0269

Mr. Swensson

Introduction

5800 Federal is an industrial development being proposed adjacent to Clear Creek in Denver, Colorado. Based on Effective FIRM map 08001C0592H, the proposed improvements are located within a Zone AE Special Flood Hazard Area(SFHA), within the floodfringe, outside of the floodway, as shown in Appendix A. Because the proposed site is in a FEMA SFHA, Adams County will require a floodplain development permit through documentation of no adverse impact to adjacent properties or existing insurable structures prior to construction activities. The purpose of this preliminary floodplain study is to demonstrate that the proposed conceptual grading plan for 5800 Federal Industrial Park will satisfy the requirements for an Adams County floodplain development permit. Because the 2022 FHAD is currently being reviewed by FEMA to be adopted as the effective floodplain mapping, it is required that we analyze the impacts for both the Effective 2005 FHAD model and the in-progress 2022 FHAD model to meet the no adverse impact criteria. The content of this preliminary floodplain study is in accordance with *Adams County Development standards and Regulations – Chapter 3 – Zone District regulations.*

Mapping

Effective 2005 Mapping

The effective SFHA is shown on Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM), Map Number 08001C0592H, effective date March 5, 2007. The floodplain is designated Zone AE. A Zone AE floodplain is defined as the base floodplain (1.0%-annual-chance/100-year) where base flood elevations (BFEs) are provided. A regulatory 0.5-foot rise floodway has been delineated for this reach of Clear Creek. The floodway is defined as the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1.0%-annual-chance (100-year) flood can be conveyed without substantial increases in flood depths. Effective mapping for this reach is based upon data from the 2005 *Flood Hazard Area Delineation – Clear Creek (Adams County)* (2005 FHAD). See Appendix A for supporting documentation.

In Progress 2022(soon to be effective) Mapping

FEMA is currently updating its flood hazard mapping based on the 2022 *Flood Hazard Area Delineation - Clear Creek (2022 FHAD*) which includes the proposed 5800 Federal property. Once FEMA completes its update, the 2022 FHAD floodplain mapping for Clear Creek will become effective and FIRM 08001C0592H will be updated. Similar to the 2005 FHAD, the 2022 FHAD delineation shows the project site is mapped outside of the regulatory Floodway within the 100-year floodplain.

Hydrology

2005 FHAD Hydrology

The 2005 FHAD shows that the reach of Clear Creek downstream of Federal Boulevard, XS 78, has a 100-year discharge of 16,918 cfs up to cross section 77.4, where the peak discharge increases to 20,590 cfs for the remainder of the cross sections included in the study. The cross sections extend to the northern boundary of 5800 Federal and are hydraulicly separated by the Rio Grande Railroad embankment, indicating a backwater condition through the site.

2022 FHAD Hydrology

The hydrology has been updated in the 2022 FHAD. Notably rainfall depths have been decreased to reflect NOAA Atlas 14 rainfall depths. The addition of the "Federal Split" split flow also impacts changes to the hydrology showing additional flow being conveyed towards the site as opposed to the backwater condition reflected in the 2005 FHAD model. In comparing the 2005 FHAD to the 2022 FHAD models, there is a reduction in flow along Clear Creek due to recent hydrology revisions. The 2022 FHAD shows that the reach of Clear Creek downstream of Federal Boulevard, XS 25833, has a 100-year discharge of 12,800 cfs. At the Federal Split, XS 1075 has a 100-year discharge of 414 cfs. A summary of the hydrological conditions has been provided below.

HYDROLOGY SUMMARY				
MODEL	LOCATION	CROSS SECTION	Q10 (CFS)	Q100 (CFS)
2005 FHAD	DS FEDERAL BLVD	78	8450	16918
2005 FHAD		77.4	8450	20590
2022 FHAD	FEDERAL BLVD(MAIN)	25833	4500	12800
2022 FHAD	FEDERAL SPLIT	1075	0.1	414

Floodplain Zoning Regulations

Adams County Development standards dictate that a floodplain use permit is mandatory for any development within the floodplain. If the development falls within the floodway, a certified engineer must provide a no-rise certification. In this case, the boundaries of the proposed development lie outside of the floodway. After conducting a preliminary hydraulic analysis, we have concluded that the proposed design satisfies the requirements for a floodplain development permit and does not cause adverse impacts to adjacent properties or existing insurable structures. The relevant information from the zoning code has been included below for reference.

From Adams County Development standards and Regulations – Chapter 3 – Zone District regulations

3-41-07 GENERAL PROVISIONS 3-41-07-01 PERMIT REQUIRED
A floodplain use permit is required for any structure, facility, fill, development, storage or processing of materials or equipment, or change in the channel of a watercourse in the Flood Control Overlay Zone District. These uses may only be permitted if the use meets the requirements of these standards and regulations including all applicable performance standards.

3-41-07-06-02 NO REDUCTION IN FLOODWAY EFFICIENCY OR CAPACITY
No new construction, substantial improvement, fill, (including fill for roads and levees), deposit, obstruction, storage of materials, or other floodplain uses which acting alone or in combination with existing or future floodway uses, shall be permitted which decreases the efficiency or the capacity of a channel or floodway of any river, stream, tributary, drainage ditch, or any other drainage facilities or systems.

3-41-07-06-03 NO INCREASE IN BASE FLOOD ELEVATION
Encroachments within the floodway are prohibited, including fill, new construction, substantial improvements, and other development, unless certification by a registered professional engineer is provided demonstrating the cumulative effect of the proposed development, when combined with all other existing and anticipated development, shall not result in any increase in the base flood elevation.

Hydraulics

Effective and Duplicate Effective Model

The Effective 2005 FHAD model, received from Mile High Flood District, was modeled using HEC-RAS version 6.1.0 and used as the 2005 Duplicate Effective model. The vertical datum of the model is NAVD88. The base flood elevations (BFEs) for the 2005 Duplicate Effective and Effective models are consistent. In the effective 2005 model, base flood elevations for the proposed site are outside of the cross section limits and have been mapped as backwater condition with a constant base flood elevation(BFE) of 5218 throughout the site. Relevant information from the 2022 FHAD is included in Appendix A.

The 2022 FHAD model, received from Mile High Flood District, was also run on HEC-RAS version 6.1.0 and used as the 2022 Duplicate Effective model. The vertical datum of the model is NAVD88. In the 2022 model, the site is mapped along the “Federal Split” reach, split flow from Clear Creek. Cross sections 773 through 980 represent the existing site conditions for 5800 Federal along the “Federal Split” reach. A BFE comparison table has been included below. Additional information on the 2022 FHAD is included in Appendix A.

Post-Project Conditions

In the 2005 FHAD model, cross sections 74 through 78 are located along the northern boundaries of the site, but do not extend past the embankment formed by the Rio Grande railroad. As a result, the effective model delineates the site as a backwater condition, holding approximately 5,218 as the base flood elevation across the site. Based on this backwater mapping technique, the proposed improvements have no impact on flood elevations.

The 2022 Post-Project Conditions model was developed utilizing the Duplicate Effective Model and the proposed 5800 Federal conceptual grading plan by Martin/Martin. The site grading concept updated the topography for cross sections 627 through 1075 within the site boundaries and includes the Federal Boulevard improvements within the CDOT Right of Way. The results of updating the proposed topography in the 2022 FHAD model shows a consistent 0.04 to 0.06 foot decrease in BFE, documenting a "No-Rise" condition. In addition to checking the impacts along the Federal Split, the Clear Creek BFE's were back checked along the mainstem. The results show no impact. Post -project modeling results indicate the proposed improvements do not adversely impact upstream, downstream, or adjacent properties. Based on the assumption that the finished floor elevation is set 1.5' above the highest onsite BFE, 5218.71, the recommended finished floor elevation would be 5220.21. The BFE comparison tables are shown below. HEC-RAS results are included in the appendix.

FEDERAL SPLIT BFE SUMMARY

XS	2022 EFFECTIVE	2022 DUPLICATE EFFECTIVE	2022 POST-PROJECT	DELTA EFF VS PP
1075	5218.71	5218.71	5218.66	-0.05
980	5218.70	5218.70	5218.65	-0.05
923	5218.71	5218.71	5218.65	-0.06
773	5218.69	5218.69	5218.65	-0.04
627	5218.56	5218.56	5218.56	0

CLEAR CREEK BFE SUMMARY

XS	2022 EFFECTIVE	2022 DUPLICATE EFFECTIVE	2022 POST-PROJECT	DELTA EFF VS PP
26340	5219.47	5219.47	5219.47	0
26179	5219.34	5219.34	5219.34	0
24755	5208.65	5208.65	5208.65	0
24720	5208.61	5208.61	5208.61	0

Summary

Martin/Martin's analysis has compared base flood elevations for the proposed 5800 Federal development to the existing conditions. The analysis includes hydraulic modeling for both the 2005 FHAD and the 2022 FHAD to address both the current and soon to be adopted information. Early results indicate that the proposed improvements will be able to achieve a "No-rise" condition in accordance with Adams County's floodplain regulations.

Sincerely,

Ryan Byrne, PE, CFM
Senior Project Engineer

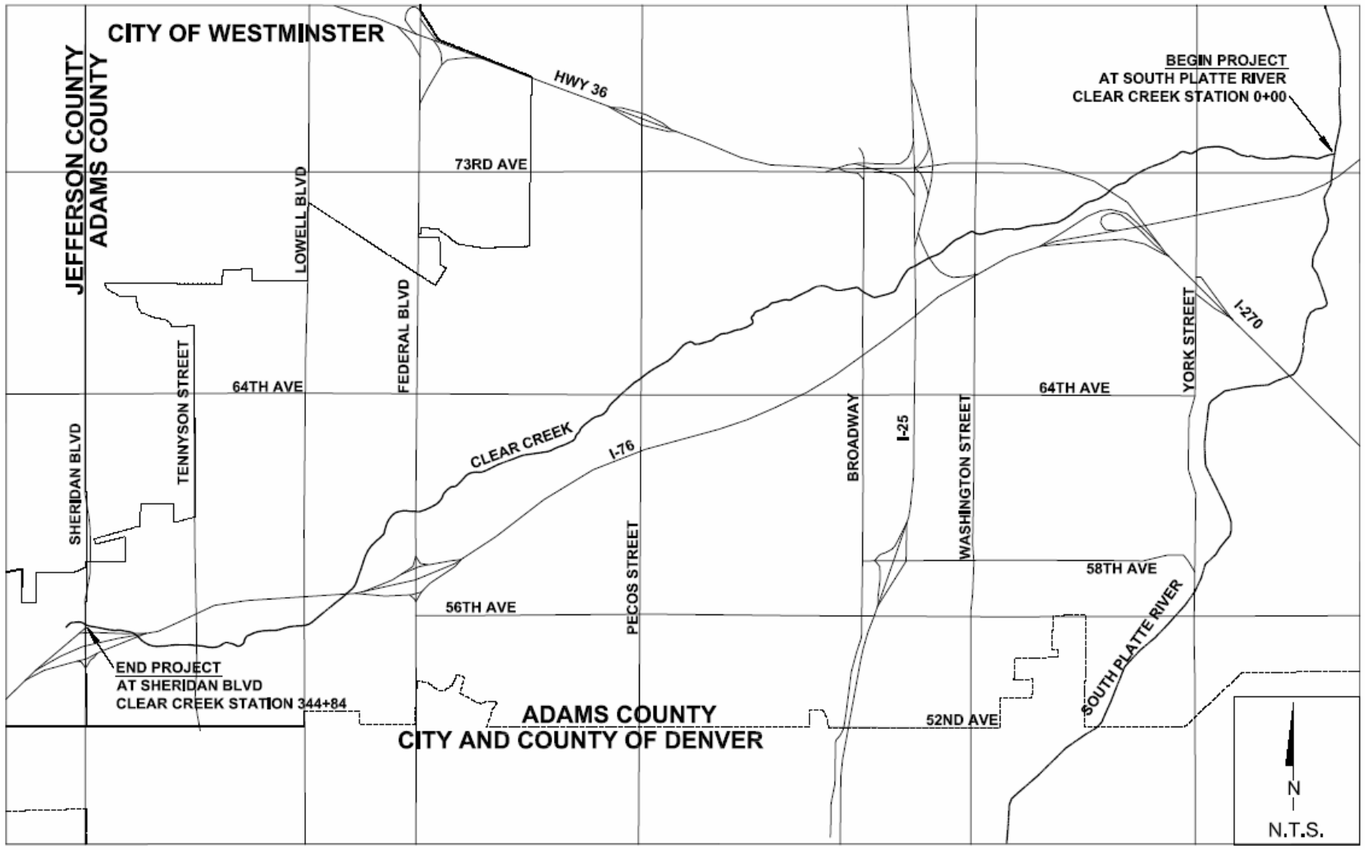
Attachments

Appendix A – Supporting Documents
Appendix B – Hydraulic Computations

APPENDIX A
SUPPORTING DOCUMENTS

FLOOD HAZARD AREA DELINEATION

CLEAR CREEK (ADAMS COUNTY)



Prepared for:

ADAMS COUNTY

COLORADO DEPARTMENT OF TRANSPORTATION

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

December 2005

AYRES ASSOCIATES

360 INTERLOCKEN BOULEVARD, SUITE 125
BROOMFIELD, CO 80021
PHONE NO: (303) 938-8874
FAX NO: (303) 938-8211

PREFACE

Authorization

This report was authorized by the Urban Drainage and Flood Control District (District) and under joint sponsorship with Adams County and the Colorado Department of Transportation (CDOT) under the August 18, 2004, agreement regarding “Flood Hazard Area Delineation Clear Creek (Adams County),” Agreement No. 04-03.05. The District joins with local communities to make floodplain information and mapping available for local governments to adopt and administer their own floodplain regulations with the assistance of the District. The cities, incorporated towns, and counties within the study area may adopt these zoning regulations…

> "...to establish, regulate, restrict and limit such uses on or along any storm or floodwater runoff channel or basin, as such storm or floodwater runoff basin has been designated and approved by the Colorado Water Conservation Board, in order to lessen or avoid the hazards to persons and damage to property resulting from the accumulation of storm or floodwaters…."

as stated in Section 30-28-201 for county governments and Section 31-23-201 for municipal governments of the Colorado Revised Statutes 1973.

Upon acceptance of this report by the District and the designation and approval of this report by the Colorado Water Conservation Board (CWCB), the areas described as being inundated by the 100-year flood (Intermediate Regional Flood) may be designated as flood hazard areas and their use regulated accordingly.

It should be noted that the terms "Intermediate Regional Flood," "100-year flood," and "one percent flood" can be used interchangeably as they all define the same magnitude flood event.

Purpose and Scope

This report was prepared for the guidance of local officials in planning the use and regulation of the 100-year floodplain. The report includes information on past floods and the nature and extent of probable future floods along the study reach. The 100-year flood should be given appropriate consideration before planning for development in flood prone areas.

Flood Hazard Area Delineation Maps are included in this report and they indicate the approximate floodplain areas inundated by the 100-year flood event. Flood profiles are also included and show the water depths relative to the streambed and flood elevations for the 100-year and 10-year flood events. Water surface elevations are provided at each channel cross section in Table 1 and Table 2. These elevations indicate a constant water depth across the full width of the stream valley. Valley cross sections are plotted on the profile sheets at specified locations with predicted water depths during the 100-year and 10-year events shown on the drawing. The flood profiles and flooded area data presented are based on future, developed conditions in the Clear Creek basin. Possible future improvements to control floods are not a consideration of this report.

The information in this report does not imply any state action to zone or regulate use of floodplains. The District has the authority to regulate floodplains, but to date has chosen to leave floodplain regulation responsibility with local governments. The report provides a suitable basis for the adoption of land use controls to guide floodplain management, with consideration for environmental attributes, and thereby prevent intensification of flood losses.

Floodwater surface elevations and floodplain boundaries are often revised by road and bridge construction, floodplain development, flood control improvements or natural processes. Prior to using this report for planning or design purposes, the user is advised to contact the District to determine if the information in this report has been amended.

Mapping

Mapping for this project is based on aerial photography obtained by Adams County, the District, and Metro Wastewater Reclamation District (MWRD) in 1995 and updated in 1998. Base map horizontal control is based on the Colorado High Accuracy Reference Network (HARN), NAD 83-92 Modified State Plane U.S. feet, Colorado Central Zone (50). Modified coordinate system is:

- Northing State Plane Value/Combined Project Factor –1,000,000
- Easting State Plane Value/Combined Project Factor – 3,000,000
- The Combined Project Factor equals 0.999791999

Vertical control is in U.S. feet, based on National Geodetic Reference System first order marks, North American Vertical Datum (NAVD) 1988 datum. Elevation of the project grid is 5,000 feet-mean sea level (msl). The mapping was prepared at a contour interval of 2 feet at a scale of 1:1,200 and conforms to National Map Accuracy Standards (NAMAS).

Acknowledgements

The cooperation of local officials and public and private interests in providing assistance and information was most helpful. We would also like to acknowledge the assistance received from the District, Adams County, and the CDOT.

STUDY AREA DESCRIPTION

The study area includes the reach of Clear Creek from its confluence with the South Platte River to Sheridan Boulevard. Within this reach, Clear Creek passes through unincorporated areas of Adams County.

Clear Creek, a left bank tributary to the South Platte River, has its source in the Rocky Mountains west of Denver. Flowing in a generally easterly direction from the Continental Divide, Clear Creek enters the high plains at Golden. The drainage area at the Golden gage near the bluff line is 400 square miles. From Golden, Clear Creek flows in a northeasterly direction to its confluence with the South Platte River near Derby. The Derby gage, which is located 0.6 miles upstream from the mouth of Clear Creek, has a drainage area of 575 square miles. Elevations in the basin range from 5,100 feet above mean sea level to over 14,000 feet above mean sea level (Landmark 1995-1998).

The Clear Creek floodplain through Adams County is largely comprised of a mix of developed and undeveloped land and gravel mining operations. Residential areas in the vicinity of 52nd Avenue and Sheridan Boulevard in Adams County would be inundated by a 100-year frequency flood.

The entire basin boundary is shown on the Basin Boundary Map (Figure 1)

of a 100-year event. The peak flows for the 10-year event should be used in the planning and engineering of improvements where the higher risk of failure or damage is economically feasible and the hazard to life and property is lower or nonexistent.

Flood magnitudes greater than the 100-year magnitude can and will occur. Land improvements adjacent to the 100-year floodplain limits should also consider the chance for possible flood damage.

Flooded Areas

The 100-year floodplain limits and water surface profiles are shown on the Flood Hazard Area Delineation Maps and Profiles appended to this report. The computed elevations at each reference point are tabulated in Tables 1 and 2. A description of the extent of flooding is discussed in the following paragraphs.

South Platte to York Street

The flooding along the lower part of Clear Creek in Adams County from the South Platte River to York Street is primarily confined to lowlands and gravel pits. No residential areas or commercial establishments, except for the gravel mining operations, are threatened in this reach.

York Street to I-25

At York Street, flows overtop the street north and south of the bridge, but the bridge structure is not overtopped. Upstream of York Street, on the south side of Clear Creek, a regional park-and-ride parking area has been constructed and an interchange connecting the newly extended I-270 to I-76 is being completed. The extension of I-270 added a two-bridge overpass crossing Clear Creek and except for the support piers, the bridge decks are well above the 100-year flood elevation in this area.

From I-270 to Washington Street, the I-76 embankment on the south side of the creek contains the flood plain, and the north side spills across Colorado Highway 224. At Washington Street, the flood plain is contained between Colorado Highway 224 and the I-76 embankment. Washington Street has 100-year capacity and is not overtopped.

Between Washington Street and I-25, there are two ramps with bridges that cross Clear Creek well above the 100-year floodplain. In this area the floodplain is contained between Colorado Highway 224, (East 70th Avenue), and I-76. CDOT has replaced a dangerous single drop structure in the reach under I-25 with 3 smaller, safer drop structures. These structures were incorporated into the hydraulic model using field-surveyed data for each structure.

I-25 to Federal Boulevard

In the reach between I-25 and Federal Boulevard, the floodplain remains mostly undeveloped up to the irrigation dam downstream of Pecos Street. On the west side of Broadway, north of Clear Creek, a commercial strip has been filled and developed. This was discovered during a field inspection and the floodplain modified to reflect the filled area based on field observations.

On the south side of Clear Creek, downstream of Pecos Street to the irrigation dam, commercial infilling has occurred following a recent Letter of Map Revision (LOMR), while upstream of Pecos the gravel operations have created significant changes to the topography. We were unable to replicate the LOMR floodplain and conveyance zones in this reach, and there is also a small amount of overtopping of Pecos Street on the north side of Clear Creek at the intersection with West 64th Avenue. After an extensive comparison of the LOMR model with the model developed for this FHAD, we believe that differences in Manning's 'n' values for the channel and revised topographic information contributed to the higher water surface elevations predicted in this FHAD. Our delineation on the south side of Clear Creek downstream of Pecos Street was based on field-surveyed data.

Upstream of Pecos Street at the Colorado & Southern Railroad bridge the outfall for Little Dry Creek has been relocated upstream of the railroad bridge. The railroad overtops for most of the floodplain width and a small spill occurs south of Clear Creek where the railroad crosses under I-76. This inundates an area south of I-76 with some of the spill outletting to the east, with the potential for sheet flows on Pecos Street.

Downstream of Federal Boulevard, there is an area of shallow flooding around commercial structures on the north side of Clear Creek resulting from the overtoping of Federal Boulevard.

Federal Boulevard to Sheridan Boulevard

Federal Boulevard is overtopped for its entire length where it crosses the floodplain. Flows from upstream of the Rio Grande Railroad divide at the Rio Grande Railroad bridge with the majority passing under the railroad to Federal Boulevard. A significant portion of the flow is diverted easterly along the south side of the railroad to Federal Boulevard where the flow passes under the railroad at the Federal Boulevard underpass, returning to the Clear Creek floodplain downstream of Federal Boulevard. This flow diversion was analyzed and incorporated into the hydraulic model. The Rio Grande Railroad bridge is not overtopped.

The backwater effects from Federal Boulevard on Lake Sangraco were analyzed and will raise the water surface elevation in Lake Sangraco to 5216.9 msl This elevation will not inundate the existing houses around the lake.

Upstream of the Rio Grande Railroad to Sheridan Boulevard, I-76 splits the Clear Creek flows in two separate flow paths that rejoin between I-76 and the Rio Grande Railroad. The two paths are called the Clear Creek Main flows and the North Overflow. The analysis of the split flows proceeded as follows:

- Clear Creek flows begin separating upstream of Sheridan Boulevard so two additional cross sections were added upstream of Sheridan Boulevard to assist in analyzing the distribution of flows overtopping Sheridan Boulevard.

- Downstream of Sheridan Boulevard to the I-76 western crossing, a split flow line was established based on the topographic divide between Clear Creek Main and the North Overflow floodplain, and a lateral weir was modeled in HEC-RAS to determine the flows diverting to the North Overflow (flowing at a significantly lower elevation) through this portion of the reach.

- Clear Creek Main then crosses under I-76 western crossing and from this point downstream to the eastern crossing of Clear Creek Main under I-76, the flows are divided and the water surface elevations modeled separately with the flows recombining between the eastern crossing of I-76 and the Rio Grande Railroad.

- Rating curves were developed for evaluating the flows passing between the Main Channel and the North Overflow under I-76 at Tennyson Street and Lowell Boulevard and the spill direction and values were incorporated into the model. The water surface elevations for the main and the North Overflow at Tennyson were essentially the same so no cross flow was considered to occur at Tennyson. At Lowell Boulevard, significant flows would occur to the north from the main flow to the

North Overflow. These values were incorporated into the model using a lateral weir with a rating curve, diverting the flow prior to the Lowell Boulevard Bridge.

The Lowell Boulevard Bridge is not overtopped. However, Lowell Boulevard north of the bridge will have overtopping flows that will pass under I-76 to the North Overflow floodplain.

The berm on the south side of the main channel downstream of the west crossing of I-76 was not considered a levee due to inadequate freeboard and was ignored in the delineation per FEMA guidance. A portion of the mobile home park south of this berm is included in the floodplain.

The limits of 100-year flooding for Clear Creek are graphically outlined on the Flood Hazard Area Delineation maps and tabulated in Table 1, Floodplain and Floodway Reference Data. The table lists the potential flood elevations, floodplain and floodway widths, floodway location, floodway surcharge elevation and thalweg elevation at each cross section studied.

A floodway represents a part of the floodplain that is required to pass a 100-year flood event without raising the flood profiles more than an acceptable amount and also represents the part of the floodplain most hazardous to personal safety and welfare. Throughout this study, the floodway was defined for two conditions. The limit of encroachment into the floodplain that raises the existing energy grade line elevations by no more than 0.5 foot and for no more than 1 foot.

Flood Velocities

Average flow velocities characteristic of a 100-year and 10-year flood events for Clear Creek are shown on the profile sheets included with the Flood Hazard Area Delineation drawings. In the main reach, the flow velocity in the channel ranges generally between 3 and 19 feet per second (fps) for a 100-year flood event in the study area. Overbank velocities range from 1 to 10 fps.

Water flowing at a rate greater than 6 to 8 fps will cause severe erosion of stream banks and is capable of transporting large rocks. Velocities in the range of 6 to 8 fps could erode fill around bridge abutments. Water flowing at about 2 fps or less will deposit debris and silt.

SUMMARY

This report has identified the probable flooding limits of a potential 100-year flood event in the Clear Creek drainage basin in Adams County from Sheridan Boulevard to the South Platte River.

The floodplain limits are based on (1) planned, future development in the basin; (2) existing and mapped floodplain conditions; and, (3) no blockage at the existing culvert and bridge structures. Floods of greater magnitude can and will occur in which the limits of flooding would exceed those shown in the report.

Presently, portions of Clear Creek are considered to have a high flood damage potential. The preservation of the floodplain will serve, at least, to maintain the present level of damage potential while any improvements will minimize or reduce the flood damage potential. Reducing the flood hazard potential can be accomplished through structural improvements to bridges and channels, flood proofing, and by an effective floodplain management program.

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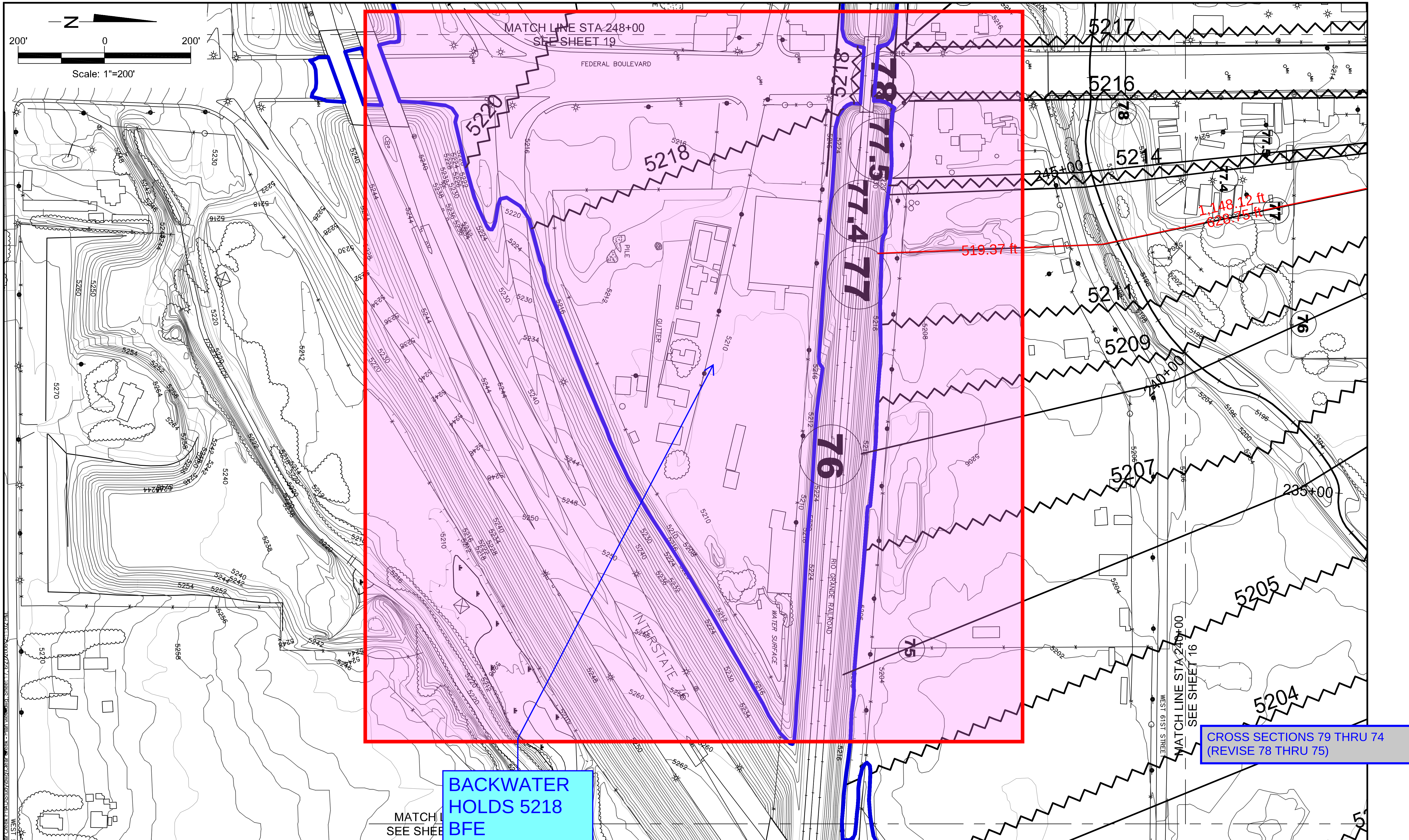

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BASEMAP PRODUCED BY:
LANDMARK MAPPING LTD., 1995
UPDATED IN 1998

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DESIGNED	RTS	DATE	12/05
DRAWN	CRF	DATE	12/05
CHECKED	WCP	DATE	12/05
REVISED		DATE	
AS-BUILT		DATE	

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
ADAMS COUNTY
COLORADO DEPARTMENT OF TRANSPORTATION

FLOOD HAZARD AREA DELINEATION
CLEAR CREEK
ADAMS COUNTY

CLEAR CREEK
STA. 240+00 to 248+00

SHEET
17 OF 27

MATCH LINE STA 278+00
SEE SHEET 20

MATCH LINE
SEE SHEET 24

MATCH LINE STA 252+00
SEE SHEET 18

MATCH LINE
SEE SHEET 17

NOTE: THE MAPPED FLOODPLAIN IS BASED ON REVISED GRADING IN THIS AREA

NORTH OVERFLOW FLOODWAY REFERENCE LINE

NORTH OVERFLOW HYDRAULIC CONFLUENCE WITH DOWNSTREAM STATION 0+00 NORTH OVERFLOW REACH

CLEAR CREEK

INTERSTATE 76

RIO GRANDE RAILROAD

WEST 58TH AVENUE

CONSTRUCTION UNDER

N.F.

PILE

RAPIDS

WATER SURFACE

Z

200' 0 200'

Scale: 1"=200'

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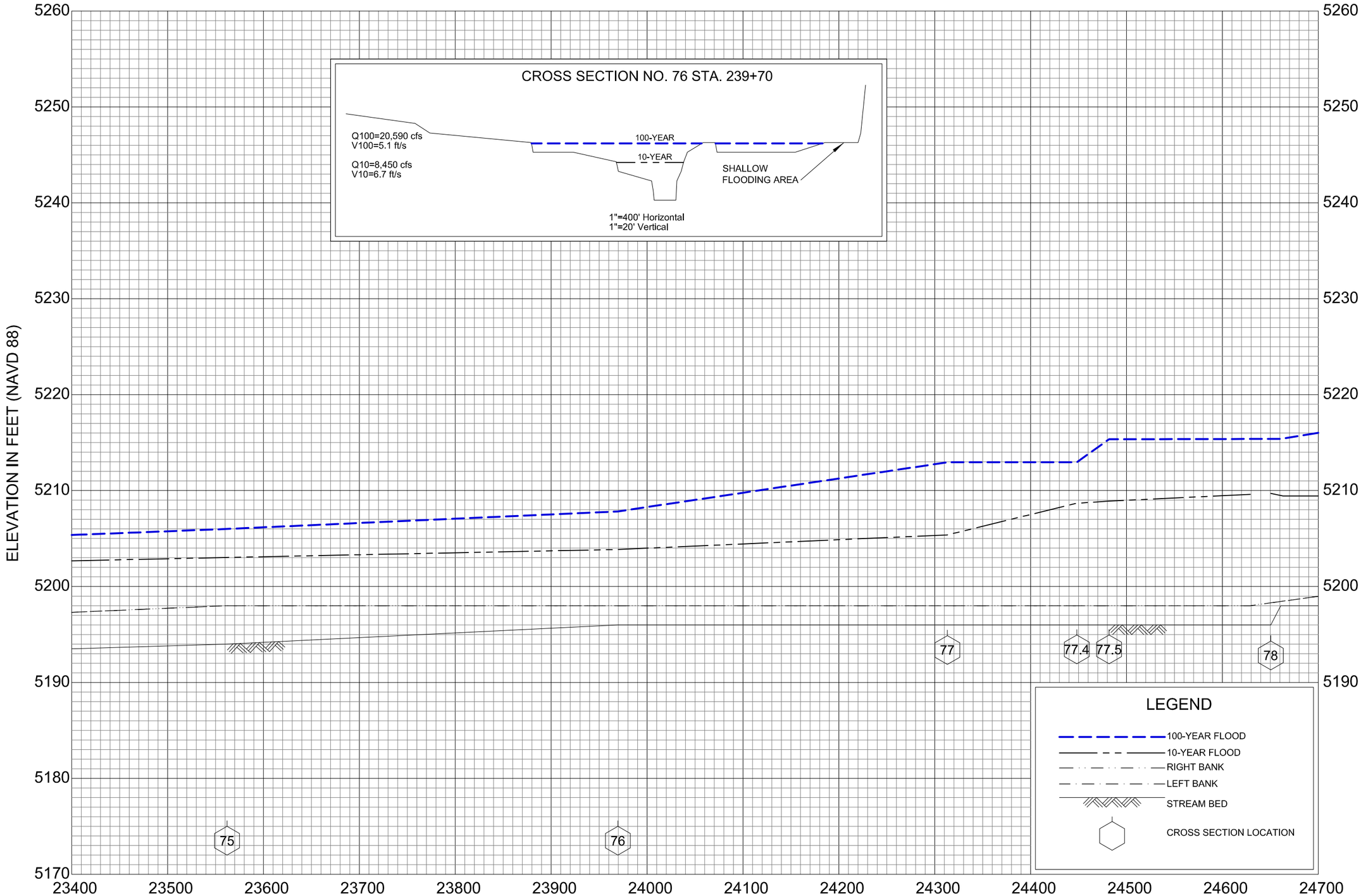
FLOOD HAZARD AREA DELINEATION
CLEAR CREEK
ADAMS COUNTY

CLEAR CREEK
STA. 252+00 to 278+00

SHEET
19 OF 27



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CHECKED	WCP	DATE	12/05
REVISED		DATE	
AS-BUILT		DATE	

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
ADAMS COUNTY
COLORADO DEPARTMENT OF TRANSPORTATION

FLOOD HAZARD AREA DELINEATION
CLEAR CREEK
ADAMS COUNTY

CLEAR CREEK-PROFILE
STA. 234+00 to 247+00

SHEET
19 OF 33

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Table 1: Floodplain and Floodway Data Table for Clear Creek Main Reach – Cont'd

Ref Location	Reach	Cross Section Ref. Pt.	River Station in feet	Thalweg Elev. in feet	Peak Discharge		Water Surface Elevation		100-Yr Floodplain Data		100-Yr Floodway (FW) Data (0.5 ft rise in WSEL)					100-Yr Floodway (FW) Data (1.0 ft rise in WSEL)				
					10-yr	100-yr	10-yr	100-yr	Width[1]	Ave. Vel.	FW Width Left[2]	FW Width Right[2]	FW Width Total	Ave. Vel.	Floodway Elev.	FW Width Left[2]	FW Width Right[2]	FW Width Total	Ave. Vel.	Floodway Elev.
			(ft)	(ft)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft)
	Clear Creek Main Reach (cont'd)	45	133+49	5142.0	10100	23100	5156.1	5159.9	543	4.1	294	170	464	4.3	5160.0	294	170	464	4.3	5159.9
		46	138+08	5142.0	10100	23100	5156.4	5160.4	517	3.7	415	70	485	3.7	5160.4	415	70	485	3.7	5160.4
		47	140+28	5142.0	10100	23100	5156.6	5160.8	561	3.2	451	86	537	3.2	5160.8	451	86	537	3.2	5160.8
		48	144+40	5144.0	10100	23100	5156.8	5161.3	770	2.1	490	279	769	2.1	5161.3	490	279	769	2.1	5161.3
		49	146+57	5144.0	10100	23100	5156.9	5161.4	784	2.1	487	297	784	2.1	5161.4	487	297	784	2.1	5161.4
		50	149+89	5144.0	10100	23100	5156.9	5161.4	639	2.7	321	318	639	2.7	5161.4	321	318	639	2.7	5161.4
		51	153+93	5146.0	10100	23100	5157.0	5161.6	1262	3.1	503	222	725	3.1	5161.6	503	222	725	3.1	5161.6
		52	155+56	5146.4	10100	23100	5157.0	5161.5	1162	4.1	425	176	601	4.1	5161.5	425	176	601	4.1	5161.5
		53	159+29	5150.1	10100	23100	5157.1	5161.9	1031	5.4	388	140	528	5.4	5161.9	388	140	528	5.4	5161.9
		54	162+91	5154.0	10100	23100	5161.4	5165.1	209	14.3	96	98	194	14.3	5165.2	96	98	194	14.3	5165.2
		55	166+81	5161.5	10100	23100	5167.1	5171.1	364	9.2	165	113	278	10.0	5171.1	165	113	278	10.0	5171.1
Lower Clear Creek Diversion Dam		55.5	166+85																	
		56	167+05	5167.7	10100	23100	5175.5	5177.0	856	8.1	206	376	582	8.6	5177.5	207	336	543	8.5	5177.8
		57	170+86	5169.5	10100	23100	5177.9	5179.7	1400	6.8	127	423	550	8.6	5179.8	127	323	450	9.4	5180.1
		58	174+37	5170.8	10100	23100	5180.3	5182.1	1609	6.6	323	467	790	6.6	5182.6	323	355	678	7.0	5183.0
		59	177+84	5172.0	10100	23100	5181.7	5183.3	1420	9.5	146	379	525	8.8	5183.6	146	379	525	7.8	5184.3
		60	181+61	5173.3	10100	23100	5182.3	5185.3	1720	6.8	415	250	665	7.2	5185.3	365	250	615	7.0	5185.5
Pecos Street		60.5	181+91																	
		61	183+42	5173.3	10100	23100	5183.3	5187.8	1070	4.8	495	205	700	5.2	5188.1	205	210	415	6.2	5188.7
		61.74	185+99	5173.8	10100	23100	5183.2	5188.0	1004	5.3	438	567	1005	4.9	5188.3	75	592	667	6.6	5188.8
		62	186+91	5174.0	10100	23100	5185.5	5188.0	1837	5.6	677	342	1019	5.1	5188.5	320	380	700	7.1	5188.8
		63	190+21	5174.6	10100	23100	5186.3	5189.8	1215	5.4	183	807	990	5.9	5189.7	193	347	540	7.6	5190.0
		64	193+62	5175.2	10100	23100	5189.4	5191.6	1540	2.6	641	900	1541	2.5	5191.8	477	373	850	3.4	5192.5
		65	197+99	5176.4	10100	23100	5189.4	5191.8	1422	3.5	520	902	1422	3.3	5192.0	387	393	780	4.4	5192.8
		66	201+90	5177.5	10100	23100	5190.4	5192.2	1106	3.9	367	739	1106	3.9	5192.4	263	240[3]	503	5.8	5193.2
		66.1	202+00	5186.0	10100	23100	5189.7	5192.1	1090	6.1	355	735	1090	5.9	5192.2	355	42	397	10.0	5192.7
C&S RR Bridge		66.5	202+23																	
		67	202+76	5186.6	10100	23100	5195.2	5199.4	1845	1.8	614	771	1385	1.7	5199.7	365	80	445	4.6	5200.1
		68	206+84	5188.0	8450	20590	5195.7	5199.6	1751	4.1	560	393	953	3.9	5199.8	397	303	700	4.5	5200.5
		69	211+00	5186.7	8450	20590	5196.9	5200.3	1406	3.5	380	410	790	3.4	5200.5	222	308	530	4.2	5201.2
		70	214+20	5187.0	8450	20590	5197.0	5200.6	895	3.6	215[3]	555	770	3.6	5200.7	168	382	550	4.6	5201.5
		71	217+87	5190.0	8450	20590	5197.5	5201.1	992	4.5	84	607	691	5.3	5201.1	83	437	520	5.5	5202.0
		72	223+12	5190.4	8450	20590	5200.1	5202.5	1294	3.3	91	931	1022	3.9	5202.7	91	631	722	4.7	5203.3
		73	225+75	5191.0	8450	20590	5200.8	5202.7	1357	4.2	129	1104	1233	4.1	5203.1	129	614	743	5.6	5203.6
		74	229+59	5192.2	8450	20590	5201.7	5203.7	1463	4.5	80	1383	1463	4.1	5203.9	80	476	556	7.8	5204.4
		75	235+62	5194.0	8450	20590	5203.0	5206.0	1524	5.1	279	1121	1400	4.9	5206.1	79	371	450	7.0	5207.0
		76	239+70	5196.0	8450	20590	5203.9	5207.8	1158	5.1	580	635	1215	5.0	5207.9	457	393	850	6.0	5207.8

[1] Excludes "islands", this is the top width of the wetted cross section.
[2] Measured from the reference line looking downstream.
[3] Line adjusted in this location for curve smoothing or to match local boundary conditions – mapped distances are shown in the table.
[4] Values to left edge of Main Reach cross section. – floodway continues across North Overflow Channel.
[5] Values to right edge of North Overflow cross section – floodway continues across Main Reach Channel.

100-YEAR
20590

Table 1: Floodplain and Floodway Data Table for Clear Creek Main Reach – Cont'd

Ref Location	Reach	Cross Section Ref. Pt.	River Station in feet	Thalweg Elev. in feet	Peak Discharge		Water Surface Elevation		100-Yr Floodplain Data		100-Yr Floodway (FW) Data (0.5 ft rise in WSEL)					100-Yr Floodway (FW) Data (1.0 ft rise in WSEL)				
					10-yr	100-yr	10-yr	100-yr	Width[1]	Ave. Vel.	FW Width Left[2]	FW Width Right[2]	FW Width Total	Ave. Vel.	Floodway Elev.	FW Width Left[2]	FW Width Right[2]	FW Width Total	Ave. Vel.	Floodway Elev.
			(ft)	(ft)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft)
	Clear Creek Main Reach (cont'd)	77	243+13	5196.0	8450	20590	5205.4	5213.0	1831	3.8	813	381	1194	3.9	5212.9	813	380	1193	3.9	5212.9
		77.4	244+48	5196.0	8450	20590	5208.7	5213.0	1681	5.8	743	277	1020	6.0	5212.9	743	277	1020	6.0	5212.9
		77.5	244+82	5196.0	8450	16918	5208.9	5215.4	1967	2.9	757	246	1003	3.1	5215.3	757	246	1003	3.1	5215.3
		78	246+51	5196.0	8450	16918	5209.7	5215.4	1931	4.5	710	157	867	4.7	5215.4	410	157	567	5.4	5215.4
Federal Blvd		78.5	246+63																	
		79	247+75	5198.0	8450	16918	5210.0	5216.9	1848	3.8	109	121	230	5.6	5217.3	109	121	230	5.6	5217.3
		80	251+17	5198.8	8450	16918	5210.4	5217.3	604	4.9	86	154	240	5.1	5217.7	86	154	240	5.1	5217.7
		81	255+32	5200.0	8450	16918	5210.3	5216.9	1176	9.7	106	63	169	9.2	5217.4	106	63	169	9.2	5217.4
Rio Grande RR		81.5	256+21																	
		82	256+64	5200.0	8450	16918	5211.7	5218.6	1200	7.4	170	76	246	7.2	5218.9	170	76	246	7.1	5219.0
Flow Diversion (right)		82.15	260+57																	
		83	260+67	5202.0	8450	20590	5214.1	5220.8	1188	3.0	237	188	425	3.8	5220.9	237	188	425	3.8	5221.0
		84	263+97	5204.0	8450	20590	5214.3	5221.2	1434	2.5	315	163	478	3.5	5221.3	315	163	478	3.5	5221.3
		85	267+20	5204.0	8450	20590	5213.9	5221.1	1284	3.4	848	59	907	4.0	5221.2	848	59	907	4.0	5221.2
		86	271+98	5206.0	8450	20590	5215.6	5221.4	1539	4.4	1310[3]	437	1747	4.5	5221.7	1310[3]	437	1747	4.4	5221.7
		87	273+69	5206.0	6761	8981	5216.0	5222.3	485	3.6	290	195	485	3.8	5222.5	290	195	485	3.8	5222.6
East Crossing of I-76		88	274+49																	
		89	278+04	5210.0	6761	8981	5217.2	5222.5	395	4.9	190	205	395	4.8	5222.7	190	205	395	4.8	5222.7
		90	281+13	5214.0	6761	8981	5219.4	5222.3	181	8.6	117	64	181	8.2	5222.6	117	64	181	8.2	5222.6
		91	284+15	5216.0	6761	8981	5224.4	5225.5	172	10.9	101	168	269	10.8	5225.5	101	168	269	10.8	5225.5
		91.5	285+86	5216.0	6761	8981	5226.7	5227.8	115	8.1	59	56	115	8.1	5227.8	59	56	115	8.1	5227.8
		91.8	286+60	5217.0	6761	8981	5227.4	5228.9	191	4.1	77	114	191	4.1	5228.9	77	114	191	4.1	5228.9
Fischer Ditch Diversion		91.85	286+60																	
		91.9	286+75	5225.0	6761	8981	5230.3	5230.5	437	8.2	186	115	301	7.3	5231.0	91	115	206	7.3	5231.5
		92	287+06	5225.0	6761	8981	5229.8	5231.2	463	7.9	432	121	553	7.9	5231.2	432	121	553	7.7	5231.2
Lowell Blvd		92.5	287+26																	
		93	287+76	5226.0	6761	8981	5232.3	5233.2	555	4.0	436	119	555	4.0	5233.2	436	119	555	4.0	5233.2
Flow Diversion (left)		93.05	289+63																	
		94	289+63	5226.0	7359	10079	5232.8	5233.7	628	2.9	407	221	628	2.9	5233.7	407	221	628	2.9	5233.6
		95	292+81	5228.0	7359	10079	5233.1	5234.0	1024	2.7	419	304	723	3.2	5234.0	419	304	723	3.2	5234.0
		96	295+83	5228.0	7359	10079	5233.5	5234.3	1198	2.2	361	389	750	2.8	5234.4	361	389	750	2.8	5234.4
		97	299+82	5228.0	7359	10079	5233.9	5234.7	1310	2.4	417	355	772	3.3	5234.8	417	355	772	3.3	5234.8
		98	305+13	5228.0	7359	10079	5234.6	5235.4	830	4.8	499	206	705	4.8	5235.7	499	206	705	4.8	5235.7
		99	310+99	5230.0	7359	10079	5237.5	5238.2	732	7.4	500	90	590	8.3	5238.3	500	90	590	8.3	5238.3
		100	312+92	5230.0	7359	10079	5238.5	5240.0	690	4.2	457	93	550	5.5	5240.0	457	93	550	5.5	5240.0

[1] Excludes "islands", this is the top width of the wetted cross section.
[2] Measured from the reference line looking downstream.
[3] Line adjusted in this location for curve smoothing or to match local boundary conditions – mapped distances are shown in the table.
[4] Values to left edge of Main Reach cross section. – floodway continues across North Overflow Channel.
[5] Values to right edge of North Overflow cross section – floodway continues across Main Reach Channel.

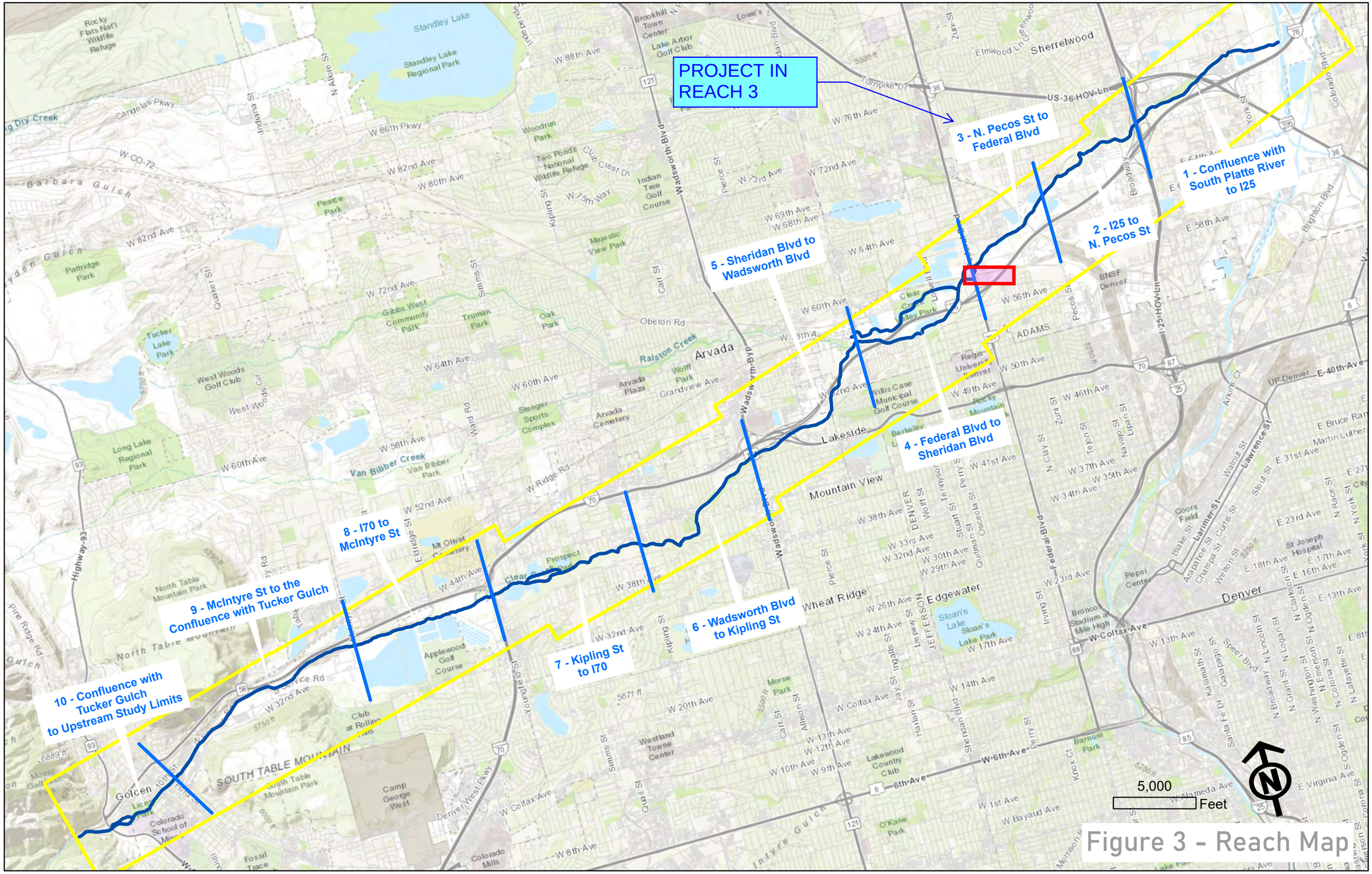


Figure 3 - Reach Map

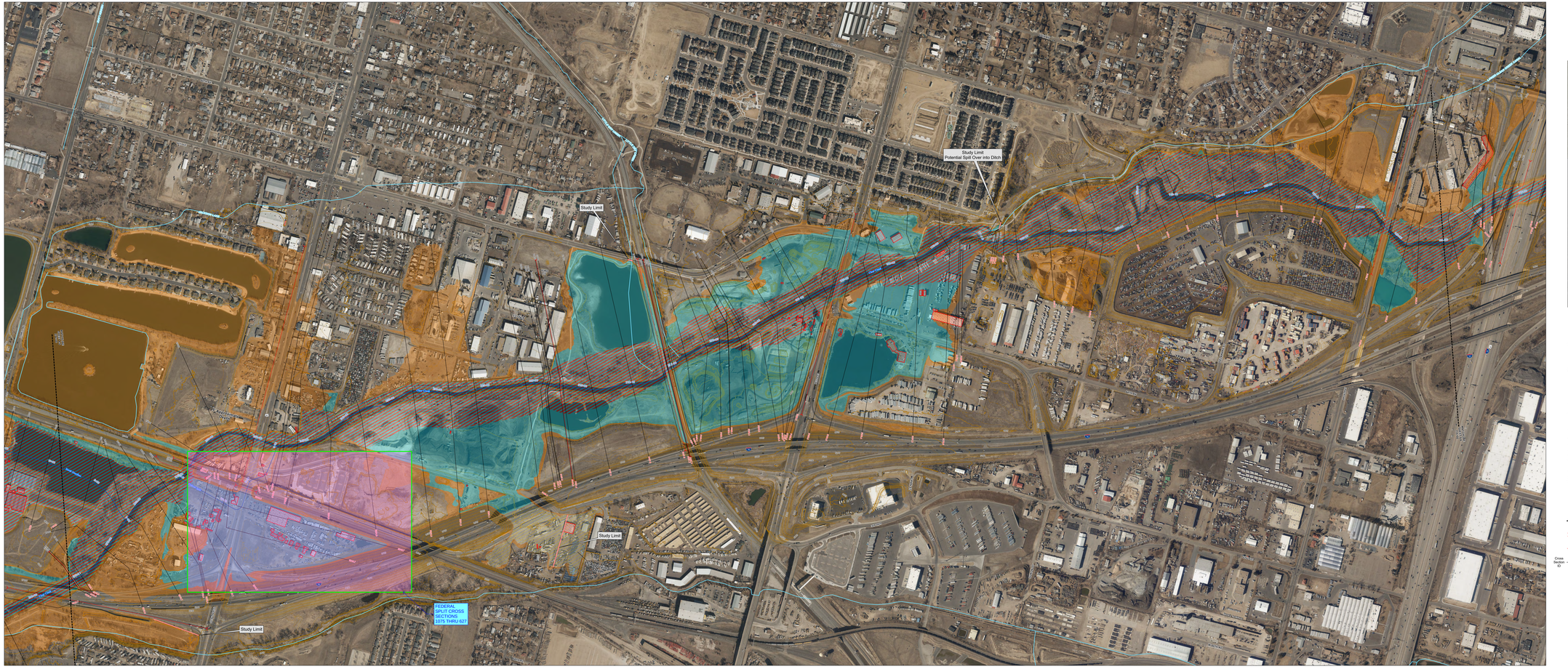
Table 4. 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year Peak Discharge Profiles, Clear Creek, U.S. Highway 6 to South Platte River

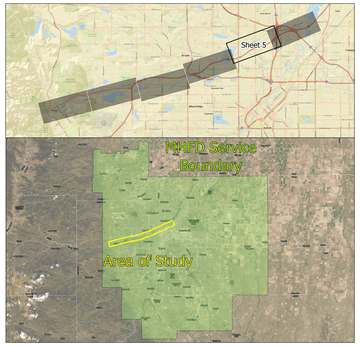
Clear Creek Station	2-yr (cfs)	5-yr (cfs)	10-yr (cfs)	25-yr (cfs)	50-yr (cfs)	100-yr (cfs)	200-yr (cfs)	500-yr (cfs)
U.S. Highway 6	1,300	2,300	3,300	5,100	6,900	8,600	12,600	18,300
DS Arapahoe Gulch	1,300	2,300	3,300	5,200	7,000	8,800	12,800	18,600
Washington Street	1,300	2,300	3,300	5,200	7,000	8,800	12,800	18,600
Ford Street	1,300	2,300	3,300	5,200	7,000	8,800	12,800	18,600
US Tucker Gulch	1,300	2,300	3,300	5,200	7,100	8,800	12,800	18,700
DS Tucker Gulch	1,400	2,400	3,500	5,500	7,500	9,500	13,600	19,800
Coors Railroad	1,400	2,400	3,500	5,500	7,500	9,500	13,600	19,800
McIntyre Street	1,400	2,400	3,500	5,500	7,500	9,500	13,600	19,800
Coors Railroad	1,400	2,400	3,500	5,500	7,500	9,500	13,600	19,800
I-70	1,400	2,400	3,500	5,500	7,500	9,500	13,600	19,800
US Lena Gulch/Kipling Street	1,400	2,400	3,500	5,500	7,500	9,500	13,600	19,800
DS Lena Gulch	1,400	2,600	3,700	5,800	8,000	10,200	14,400	21,100
44th Avenue	1,400	2,600	3,700	5,800	8,000	10,200	14,400	21,100
Wadsworth Boulevard	1,400	2,600	3,700	5,800	8,000	10,200	14,400	21,100
Marshall Street	1,400	2,600	3,700	5,800	8,000	10,200	14,400	21,100
US Ralston Creek/I-76	1,400	2,600	3,700	5,800	8,000	10,200	14,400	21,100
DS Ralston Creek	1,800	3,100	4,500	7,000	9,600	12,800	17,400	25,500
Sheridan Boulevard	1,800	3,100	4,500	7,000	9,600	12,600[1]	14,800[1]	19,200[1]
Tennyson Street	1,800	3,100	4,500	6,500[1]	7,900[1]	9,200[1]	10,000[1]	11,500[1]
Lowell Boulevard	1,800	3,100	4,500	6,500[1]	7,900[1]	9,100[1]	9,900[1]	11,400[1]
Fischer Ditch Diversion	1,800	3,100	4,500	6,500[1]	7,900[1]	9,000[1]	9,800[1]	11,300[1]
Rio Grande Railroad	1,800	3,100	4,500	7,000	9,600	12,800	17,400	25,500
Federal Boulevard	1,800	3,100	4,500	7,000	9,600	12,800	17,400	25,500
US Little Dry Creek/C&S Railroad Bridge	1,800	3,100	4,500	7,000	9,600	12,800	17,400	25,400
DS Little Dry Creek/Pecos Street	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
Lower Clear Creek Diversion Dam	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
Broadway	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
I-25	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
I-25 Ramp	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
Washington Street	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
I-270	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
York Street	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700
Clear Creek at South Platte River	1,900	3,400	4,900	7,600	10,400	14,100	19,000	27,700

[1] Reflects flow spills to Clear Creek North Overflow

Clear Creek

Flood Hazard Area Delineation | September 2022





Notes to User:
Projection: Colorado State Plane Central; EPSG Code : 2232
Horizontal Datum: North American Datum of 1983
Vertical Datum: North American Vertical Datum of 1988
Topography Data Derived from FEMA 2013 Post-Flood DEM
Aerial Sourced From DRCOG 2018 DRAPP

Printing to Map Scale Instructions:
1. Using the "Snapshot" tool, select the desired area to print.
2. Click 'File' -> Print
3. Select your printer from the printer dropdown menu.
4. Set the desired size using the printer 'Properties' menu.
5. Choose the 'Selected Graphic' option under 'Print Range'.
6. Select 'None' from the 'Page Scaling' dropdown menu,
7. Unselect 'Choose paper source by PDF page size'.
8. Click 'OK' to print selection.

Legend

- Matchline
- Bridge
- Lateral Structure
- Cross Section (Cross Section ID, Flow Elevation)
- Floodway
- 100-Yr Floodplain
- 100-Yr Shallow Flooding
- 500-Yr Floodplain
- Insurable Structure
- Stream Centerline
- Ditch, Canal, Creek
- Municipal Boundary
- Major Contour; 10-ft
- Minor Contour; 2-ft

0 200 400 800 1,200 1,600 Feet

1 inch = 200 feet

N

ICONENGINEERING

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC- 3, #9202
1315 East- West Highway
Silver Spring, MD 20910- 3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided by the Adams County and Commerce City GIS departments. The coordinate system used for the production of the digital FIRM is Universal Transverse Mercator, Zone 13N, referenced to North American Datum of 1983 and the GRS 80 spheroid, Western Hemisphere.

This map reflects more detailed and up- to- date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the *Flood Insurance Study report* (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de- annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

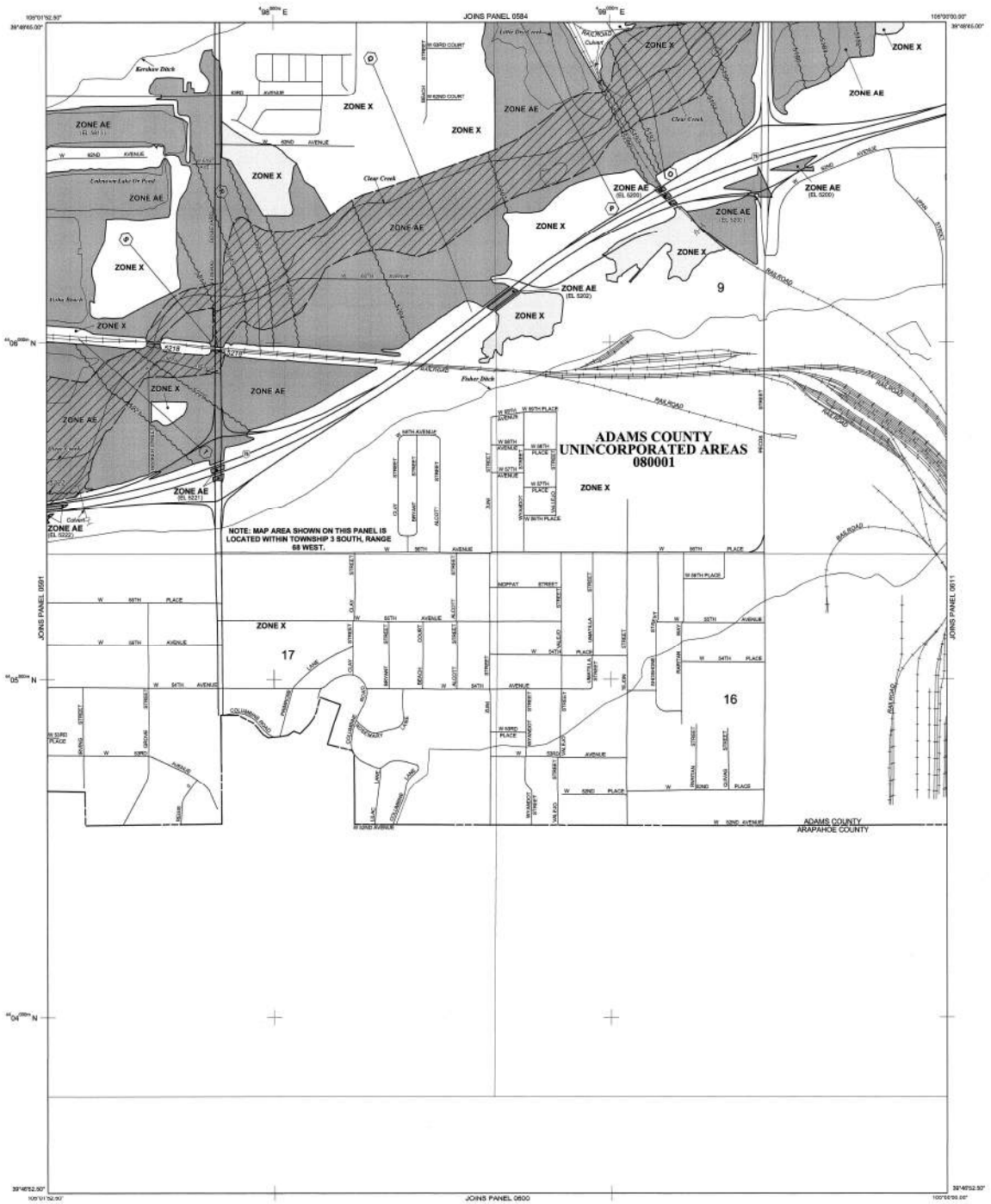
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1- 800- 358- 9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a *Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1- 800- 358- 9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1- 877- 336- 2627) or visit the FEMA website at http://www.fema.gov/.

This digital Flood Insurance Rate Map (FIRM) was produced through a cooperative partnership between the State of Colorado Water Conservation Board, the Urban Drainage and Flood Control District, and the Federal Emergency Management Agency (FEMA). The State of Colorado Water Conservation Board and the Urban Drainage and Flood Control District have implemented a long-term approach of floodplain management to reduce the costs associated with flooding. As part of this effort, both the State of Colorado and the Urban Drainage and Flood Control District have joined in Cooperating Technical Partner agreements with FEMA to produce this digital FIRM.

Additional flood hazard information and resources are available from local communities, the Colorado Water Conservation Board, and the Urban Drainage and Flood Control District.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** No Base Flood Elevations determined.
- **ZONE AE** Base Flood Elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 Base Flood Elevation line and value; elevation in feet*
- (EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A Cross section line
- 23 — 23 Transect line
- 97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000 mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 M 5000-foot grid ticks: Alabama State Plane coordinate system, east zone (FIPSZONE 0101), Transverse Mercator
- DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
March 5, 2007 - to update map format.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1- 800- 638- 6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0592H

FIRM
FLOOD INSURANCE RATE MAP
ADAMS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 592 OF 1150
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ADAMS COUNTY	080001	0592	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

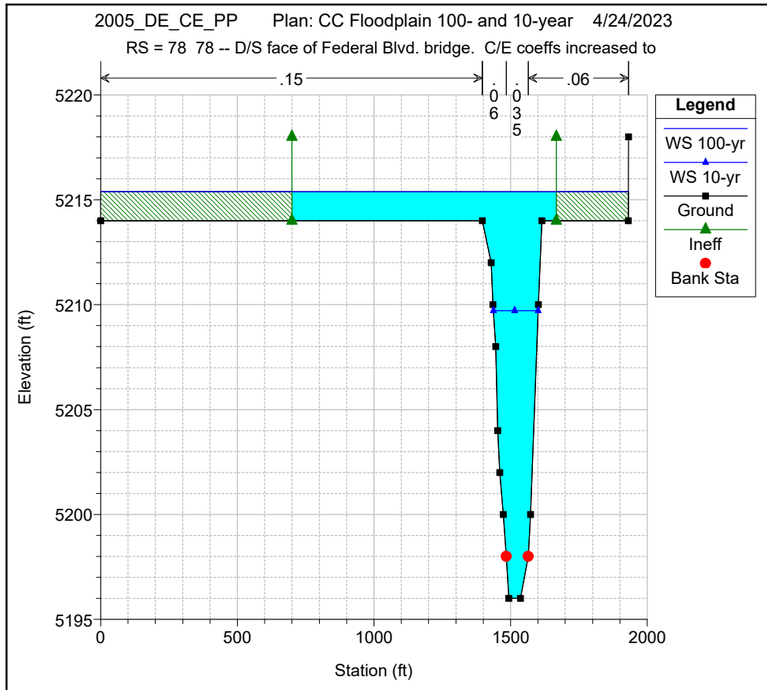
MAP NUMBER
08001C0592H

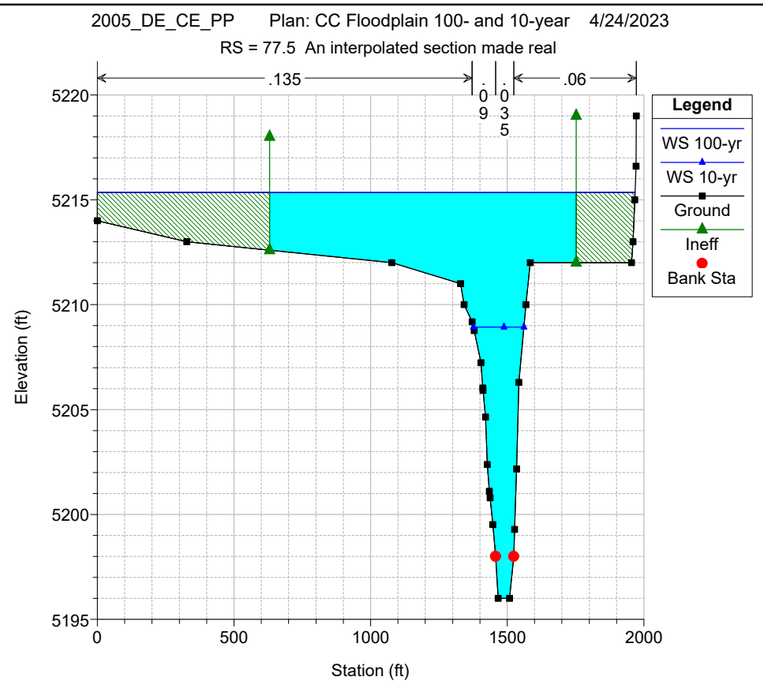
MAP REVISED
MARCH 5, 2007

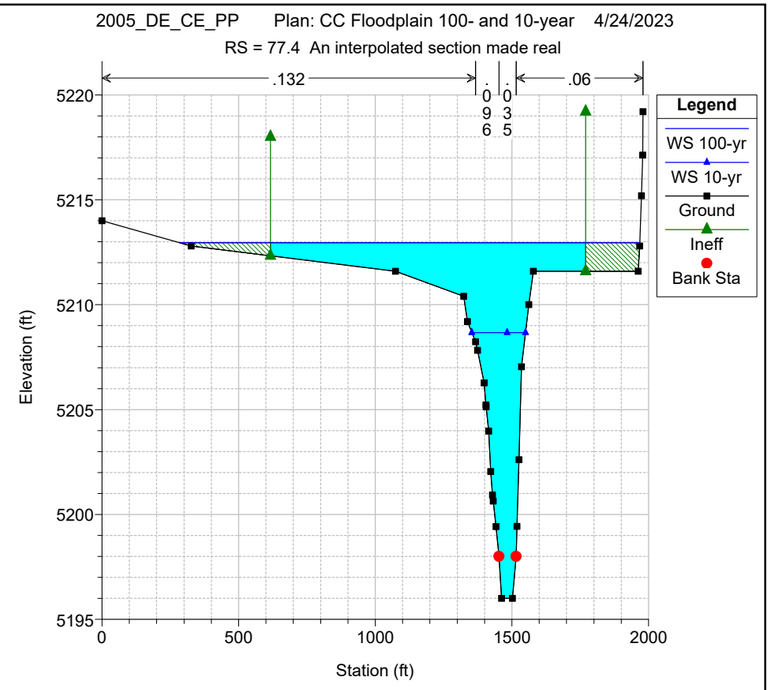
Federal Emergency Management Agency

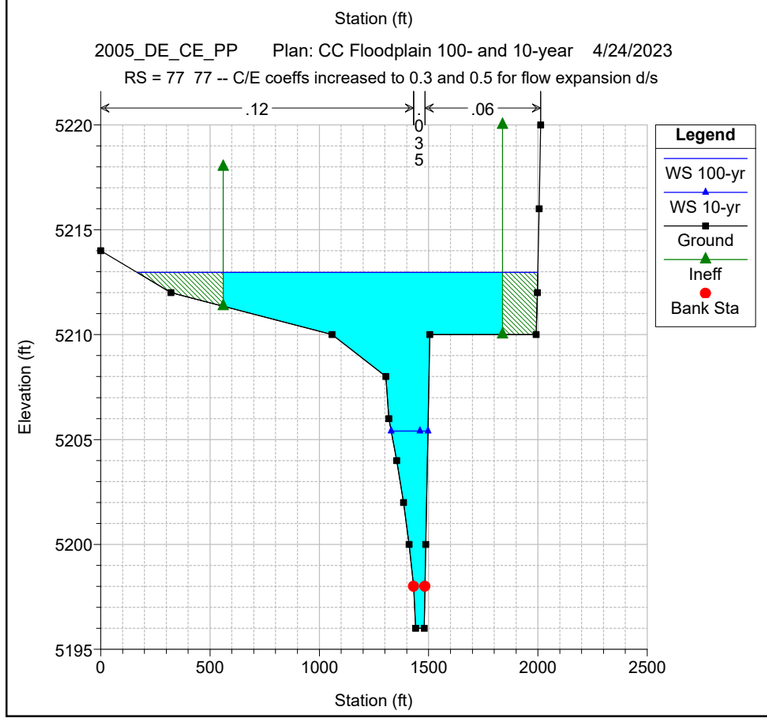
APPENDIX B
HYDRAULIC COMPUTATIONS

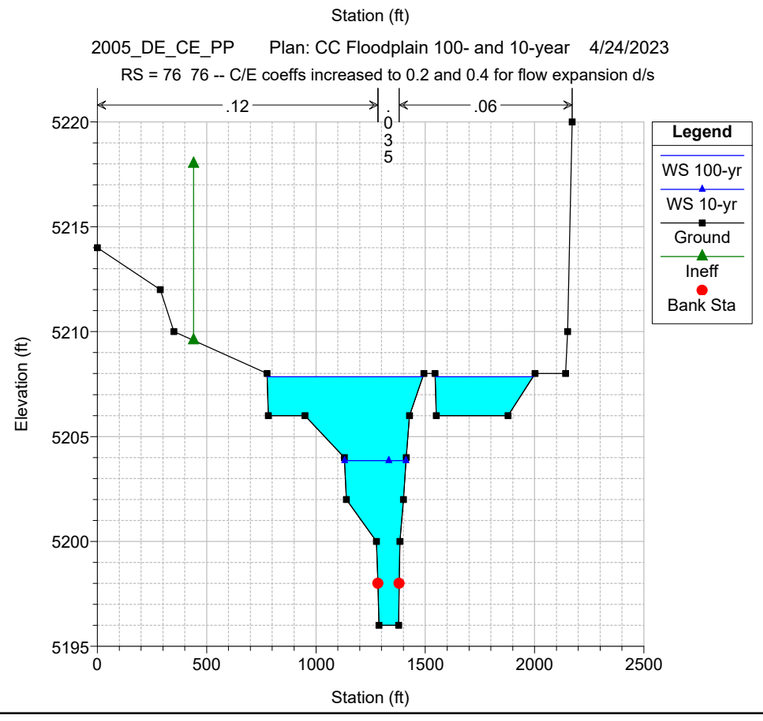
2005 DUPLICATE EFFECIVE MODEL

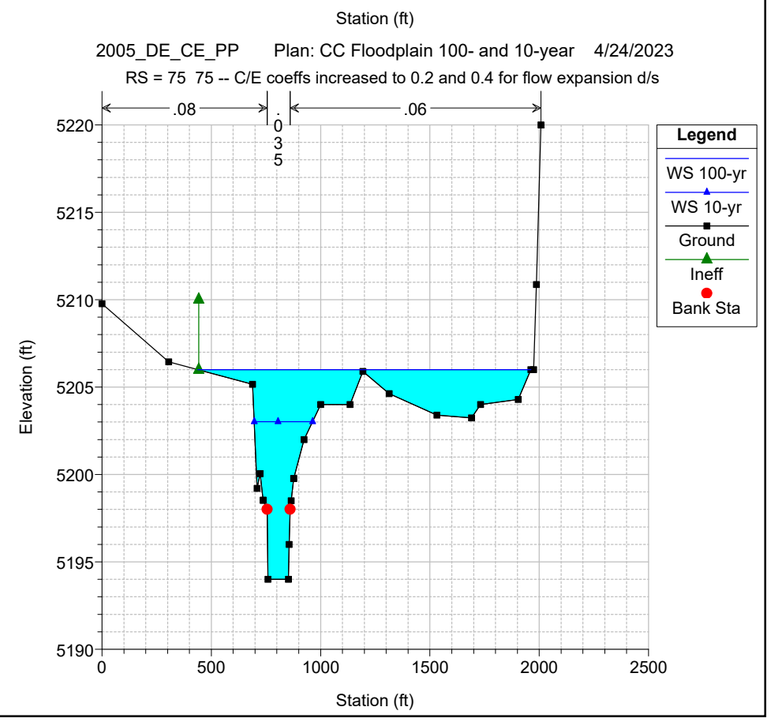




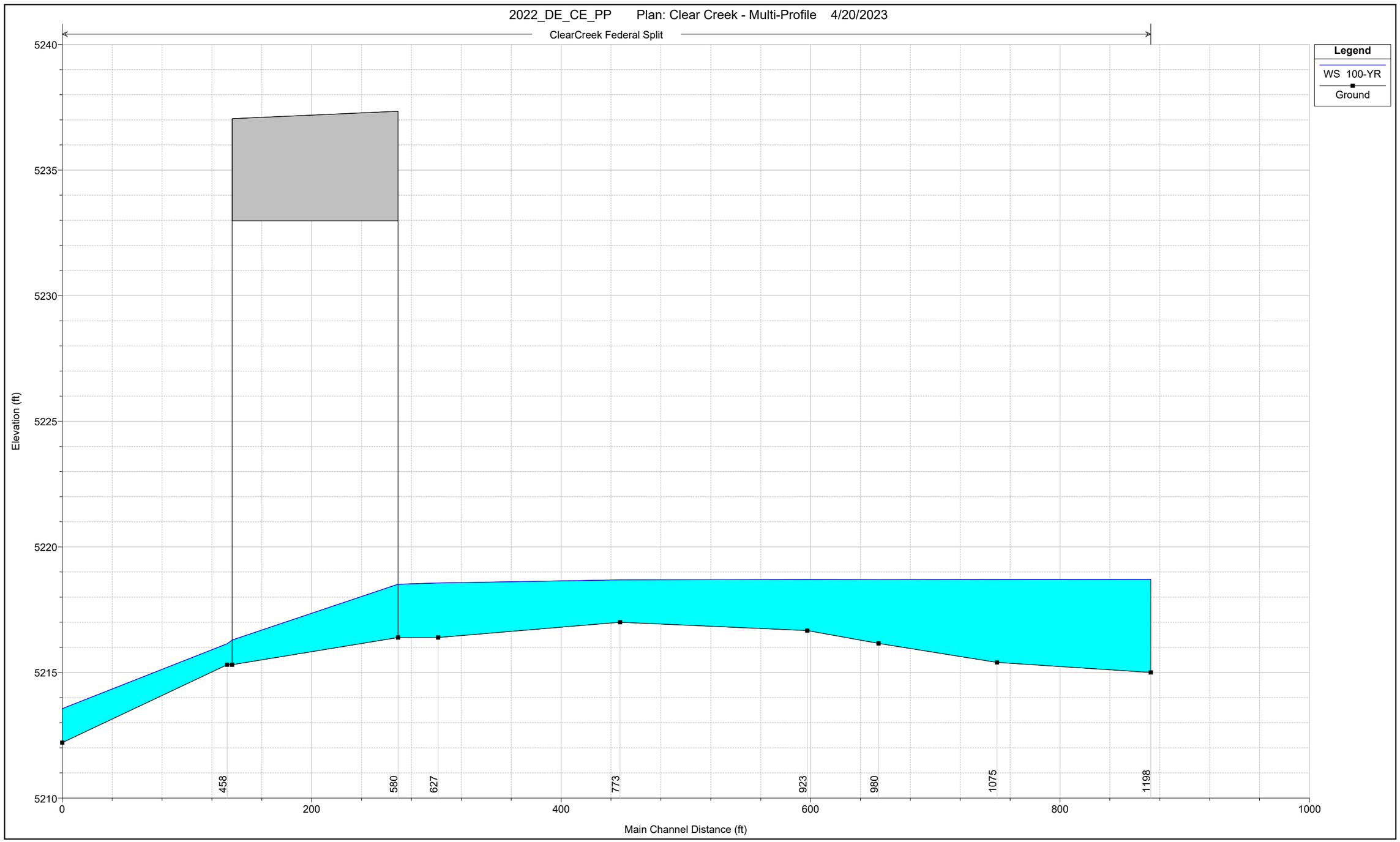




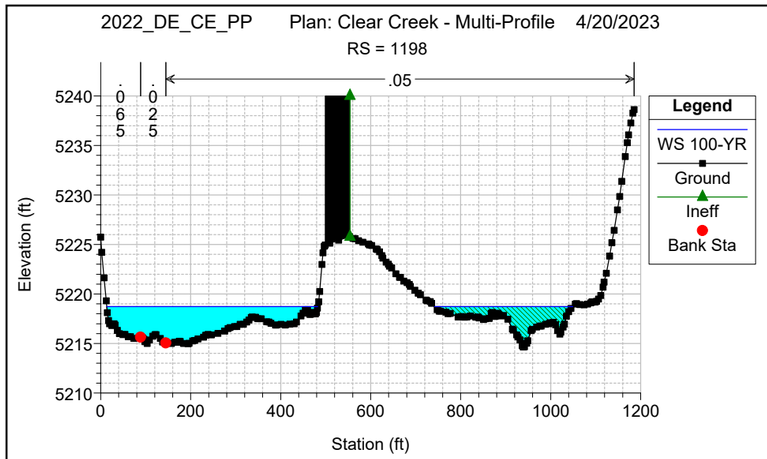


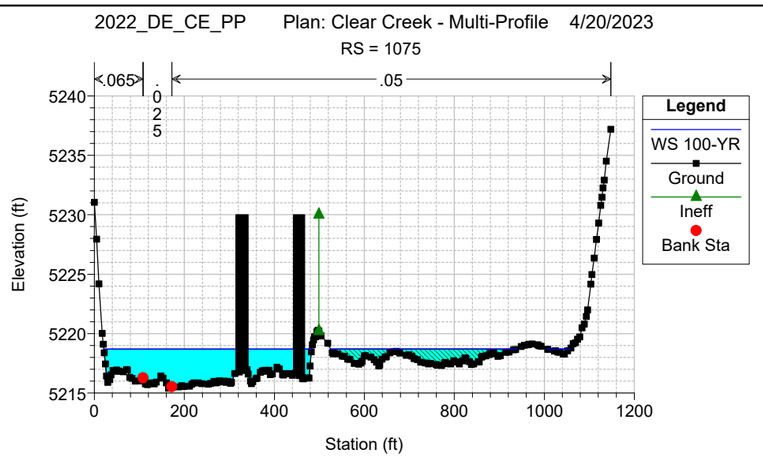


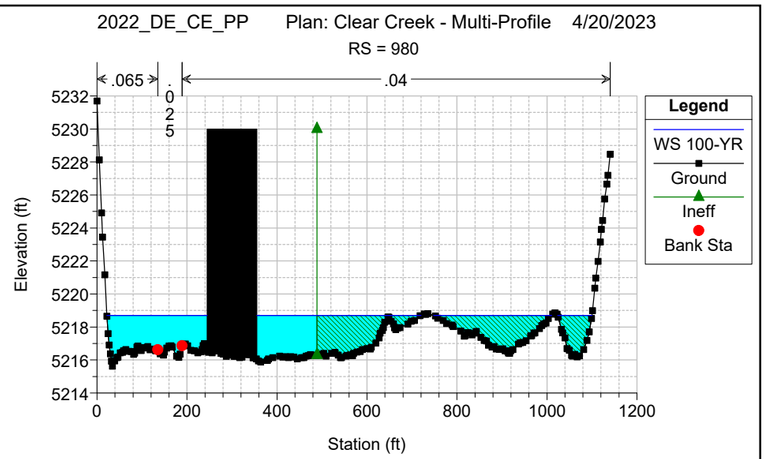
DUPLICATE EFFECTIVE 2022 HEC-RAS MODEL

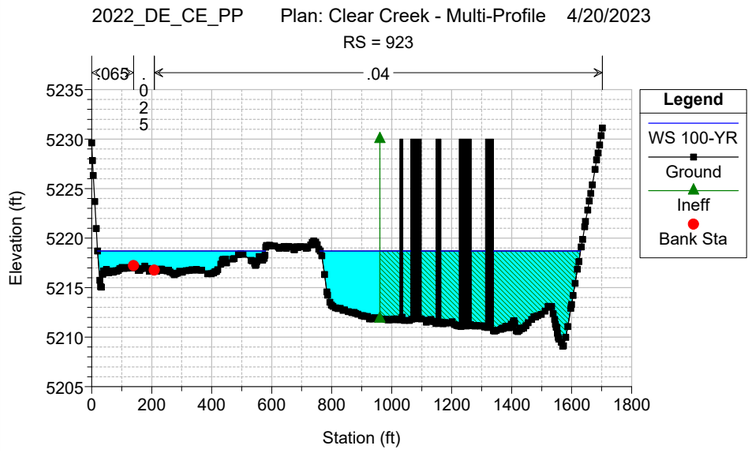


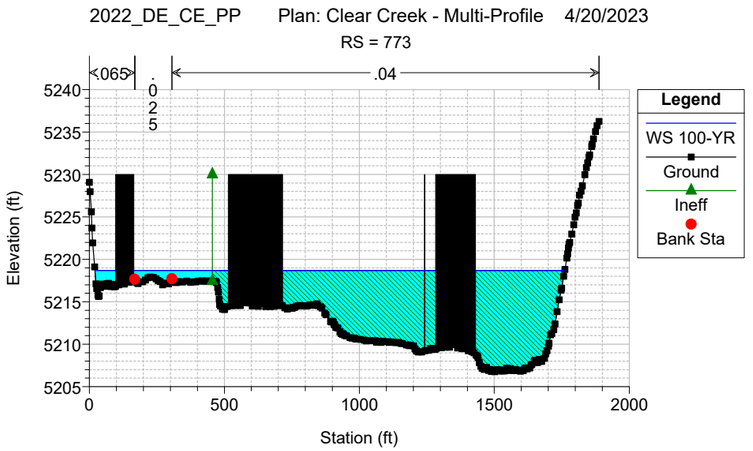
DUPLICATE EFFECTIVE 2022 HEC-RAS MODEL

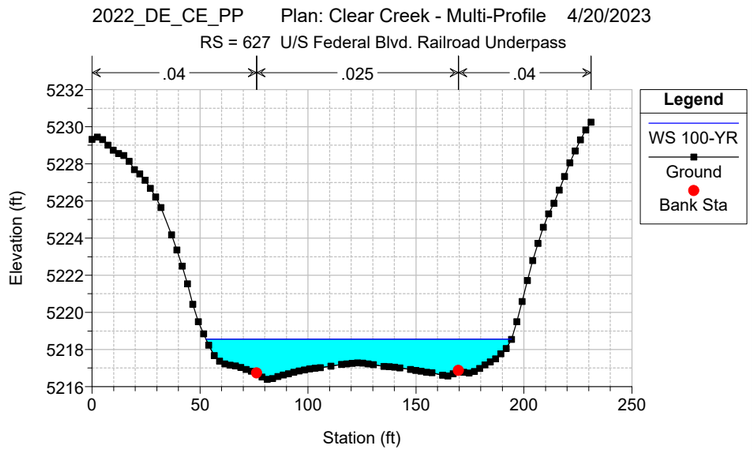


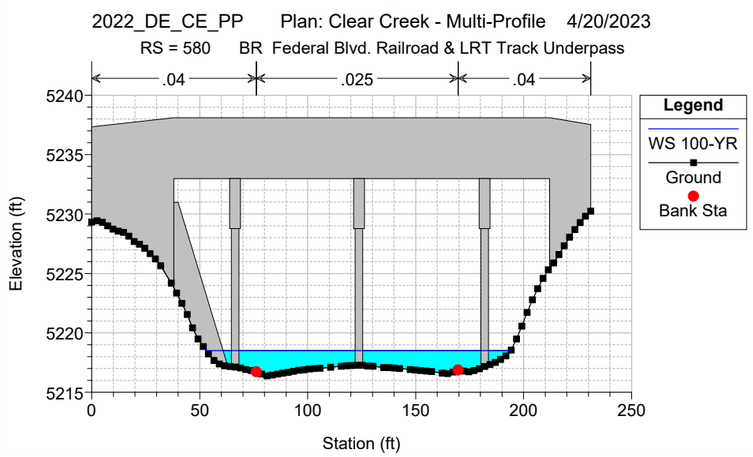


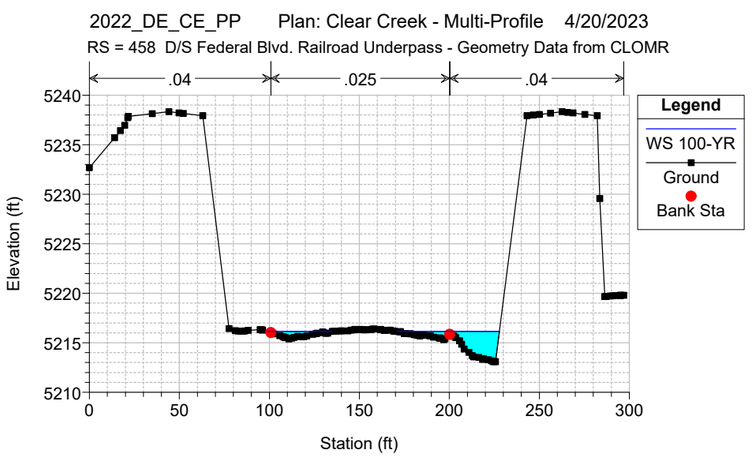


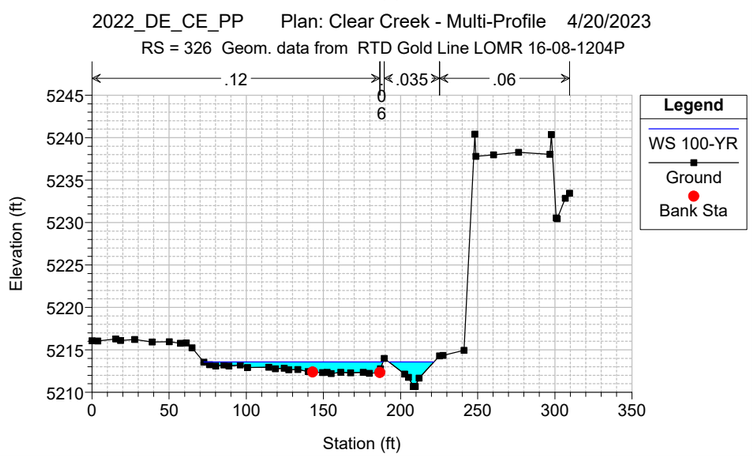










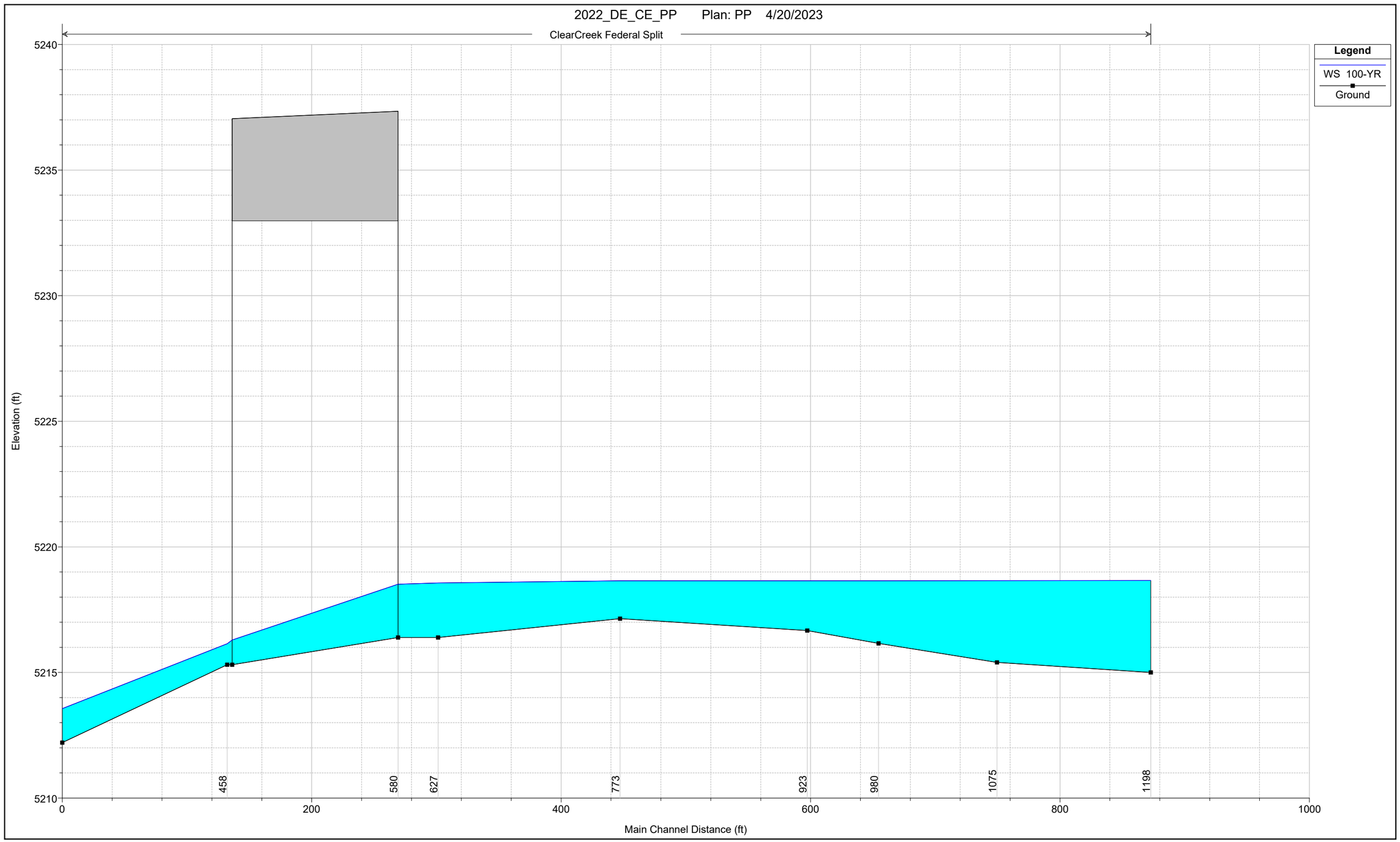


DUPLICATE EFFECTIVE 2022 HEC-RAS MODEL

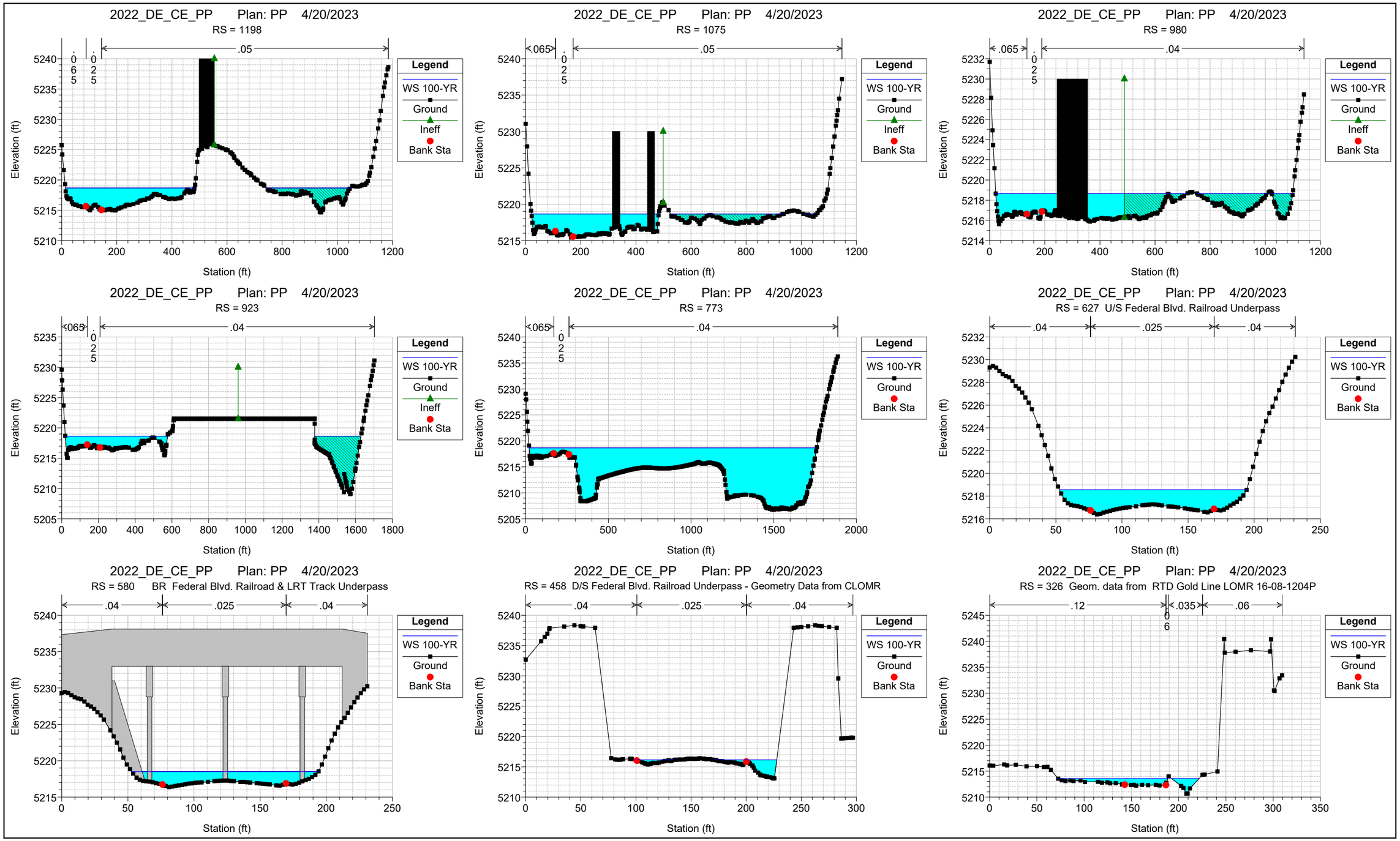
HEC-RAS Plan: CC-MultiProf River: ClearCreek Reach: Federal Split Profile: 100-YR

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Federal Split	1198	100-YR	414.00	5215.00	5218.71	5215.91	5218.72	0.000037	0.79	1100.19	775.99	0.08
Federal Split	1075	100-YR	414.00	5215.40	5218.71	5216.38	5218.71	0.000041	0.76	1021.23	874.08	0.08
Federal Split	980	100-YR	414.00	5216.16	5218.70	5216.72	5218.71	0.000066	0.81	815.09	925.67	0.10
Federal Split	923	100-YR	414.00	5216.67	5218.71	5212.96	5218.71	0.000005	0.20	2067.28	1297.94	0.03
Federal Split	773	100-YR	414.00	5217.00	5218.69	5217.63	5218.70	0.000270	1.13	511.57	1322.30	0.18
Federal Split	627	100-YR	414.00	5216.39	5218.56	5217.65	5218.63	0.000706	2.21	216.58	141.49	0.30
Federal Split	580 Federal Blvd		Bridge									
Federal Split	458	100-YR	414.00	5215.31	5216.15	5216.15	5216.62	0.011121	3.36	80.38	93.04	0.94
Federal Split	326	100-YR	414.00	5212.21	5213.56	5213.56	5213.99	0.018749	1.97	137.23	145.15	0.31

POST-PROJECT HEC-RAS MODEL



POST-PROJECT HEC-RAS MODEL

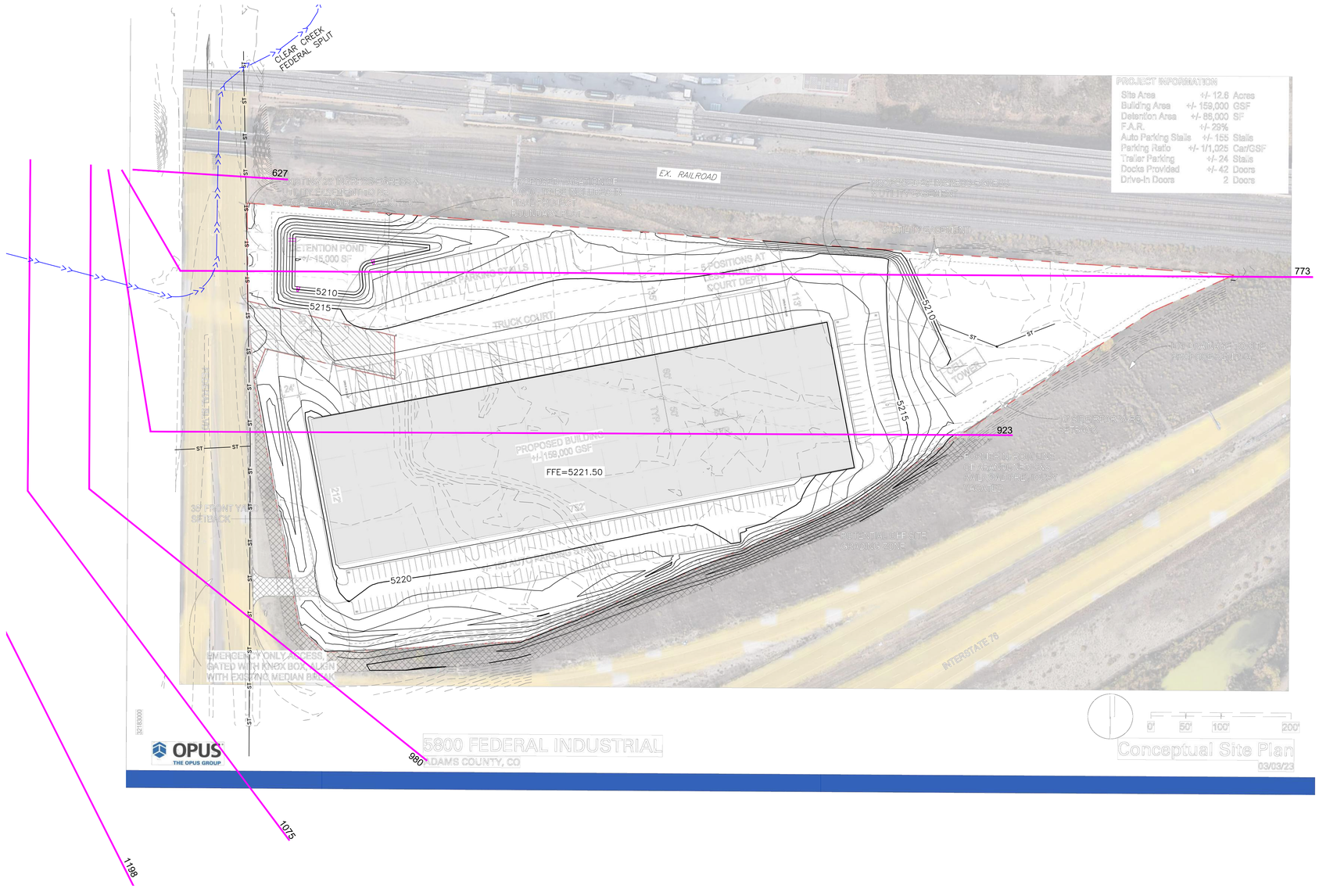


POST-PROJECT HEC-RAS MODEL

HEC-RAS Plan: PP River: ClearCreek Reach: Federal Split Profile: 100-YR

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Federal Split	1198	100-YR	414.00	5215.00	5218.66	5215.91	5218.67	0.000040	0.81	1076.62	773.57	0.08
Federal Split	1075	100-YR	414.00	5215.40	5218.66	5216.38	5218.66	0.000044	0.78	1000.44	864.81	0.08
Federal Split	980	100-YR	414.00	5216.16	5218.65	5216.72	5218.66	0.000071	0.83	796.82	914.50	0.10
Federal Split	923	100-YR	414.00	5216.67	5218.65	5216.95	5218.65	0.000074	0.74	939.78	808.62	0.10
Federal Split	773	100-YR	414.00	5217.14	5218.65		5218.65	0.000000	0.02	10080.97	1740.23	0.00
Federal Split	627	100-YR	414.00	5216.39	5218.56	5217.65	5218.63	0.000706	2.21	216.58	141.49	0.30
Federal Split	580 Federal Blvd		Bridge									
Federal Split	458	100-YR	414.00	5215.31	5216.15	5216.15	5216.62	0.011121	3.36	80.38	93.04	0.94
Federal Split	326	100-YR	414.00	5212.21	5213.56	5213.56	5213.99	0.018749	1.97	137.23	145.15	0.31

APPENDIX C
FLOODPLAIN EXHIBIT



LEGEND

EFFECTIVE CROSS SECTION (PER SEPT. 2022 FHAD BY ICON ENGINEERING) — 773

N

80 40 0 80 160
SCALE: 1"=80'
ALL LINEAL DIMENSIONS ARE IN U.S. SURVEY FEET

XS	2022 EFFECTIVE	2022 DUPLICATE EFFECTIVE	2022 POST-PROJECT	DELTA EFF VS PP
1075	5218.71	5218.71	5218.66	-0.05
980	5218.70	5218.70	5218.65	-0.05
923	5218.71	5218.71	5218.65	-0.06
773	5218.69	5218.69	5218.65	-0.04
627	5218.56	5218.56	5218.56	0

NOTES:

1. THE PROJECT SITE AND SURROUNDING DEVELOPMENTS ARE LOCATED WITHIN THE 100-YEAR FLOODPLAIN (ZONE AE) AS INDICATED ON THE FEMA FLOOD INSURANCE RATE MAP (FIRM) FOR ADAMS COUNTY, COLORADO, MAP NUMBER 0800010592H, MAP REVISED: MARCH 5, 2007
2. BASED ON ABOVE REFERENCED FIRM MAP, THE ONSITE BASE FLOOD ELEVATION IS 5220 (NAVD 88 DATUM). MINIMUM FINISHED FLOOR ELEVATION OF PROPOSED BUILDING IS 1.0' OR GREATER ABOVE BASE FLOOD ELEVATION.

MARTIN/MARTIN
CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
303.431.6100 MARTINMARTIN.COM

NOT FOR CONSTRUCTION

FEDERAL INDUSTRIAL

FLOODPLAIN EXHIBIT

No.	Issue / Revision	Date	Name
		05/01/23	

Job Number 23.0269
Project Manager J. DICKERSON
Design By J. DICKERSON
Drawn By E. BEDNAR
Principal In Charge A. SCHLAPPE

Sheet Number:

WM

PLOT DATE: Monday, May 1, 2023 3:54 PM LAST SAVED BY: EBEDNAR
DRAWING LOCATION: G:\SCHLAPPE\23.0269-5800 Federal Industrial\ENG\DRAINAGE\FLOODPLAIN DUE DILIGENCE\DWG\WORKMAP 2022.dwg

July 20, 2023

Matt Emmens, PE
Adams County, Colorado
4430 South Adams County Parkway, W2000B
Brighton, Colorado 80601

Re: 5800 Federal Boulevard – Federal Storm Main Analysis
Martin/Martin, Inc. Project No.: 23.0269

Dear Mr. Emmens:

The purpose of this drainage letter is to document the impact of discharging stormwater runoff from the proposed Project at 5800 Federal Boulevard to the existing storm sewer main in Federal Boulevard. The Federal Boulevard storm sewer has been analyzed for the existing conditions and proposed stormwater runoff from the 5800 Federal Boulevard Project in the minor (five-year) and major (100-year) storm events. The storm sewer analysis was conducted using StormCAD software by Bentley-Haestad.

The Federal Industrial development (hereafter referred to as 5800 Federal Project) is located in the southeast quarter of Section 8, Township 3 South, Range 68 West of the Sixth Principal Meridian, County of Adams, State of Colorado. The site is bounded by railroad tracks to the north, Interstate 76 off-ramp to the south and east, and Federal Boulevard to the west. The proposed site improvements include an industrial building, paving, landscaping, site utilities, and site drainage improvements.

The following previous studies were referenced for the storm sewer analysis. Excerpts from each study referenced have been attached at the end of this letter:

- *City and County of Denver Storm Drainage Master Plan*, prepared for the City and County of Denver Department of Public Works by Enginuity Engineering Solutions, LLC, HDR Engineering, Inc., ICON Engineering, Inc., and Zoeller Consulting, LLC, dated October 2019 (hereafter referred to as 2019 SDMP).
- *Flood Hazard Area Delineation Clear Creek*, prepared by ICON Engineering, Inc., dated September 2022 (hereafter referred to as 2022 FHAD).

Existing Condition Analysis:

The Federal Boulevard storm sewer is within Master Basin 4300-03 in the 2019 SDMP. The Federal Boulevard storm main tributary area extends from I-70 at Federal Boulevard northerly to an outfall at Clear Creek at Federal Boulevard. The tributary area to the Clear Creek outfall at Federal Boulevard includes Catchments 4300-03-380, 4300-03-382, 4300-03-384, and 4300-03-386 per the 2019 SDMP. The storm sewer analysis assumed the entirety of Catchments 4300-03-380 through 4300-03-384, and a portion of 4300-03-386 to be tributary to the Federal Boulevard storm sewer. Based on USGS topography and surveyed storm sewer, it was determined that a portion of Catchment 4300-03-386 drains via overland flow

directly to Clear Creek. Catchment basin characteristics and runoff rates for the portion of Catchment 4300-03-386 were determined using the Rational Method, with a combination of USGS topography, surveyed topography, and aerial imagery. Catchment basin characteristics and peak runoff rates for Catchments 4300-03-380 through 4300-03-384 were obtained from Table 1 in Appendix B of the 2019 SDMP. In the existing conditions, the 5800 Federal Project site drains easterly to an on-site retention pond. No stormwater runoff from the 5800 Federal Project is included in the Federal Boulevard storm sewer analysis in the existing conditions. The tailwater condition at the storm sewer outfall into Clear Creek was determined based on the water surface elevations (WSEL) provided on the Flood Profile in the 2022 FHAD. The five-year WSEL was estimated to be at elevation 5201.00 by interpolating between the thalweg of Clear Creek and the 10-year WSEL. The 100-year WSEL was provided in the Flood Profile at elevation 5210.00. The Federal Boulevard storm sewer pipe sizes and inverts were surveyed north of I-76 and modeled south of I-76 based on storm sewer as-builts provided by CDOT.

The StormCAD analysis of the existing conditions found the five-year hydraulic grade line (HGL) remains within the pipe, while the 100-year HGL is above finished grade. Federal Boulevard from the 5800 Federal Project site to the outfall at Clear Creek is within the 100-year floodplain.

Proposed Condition Analysis:

The analysis of the proposed condition follows the same assumptions mentioned in the existing conditions analysis above, while adding the anticipated stormwater runoff from the proposed Project site to the Federal Boulevard storm sewer. The proposed Project will include one or more detention ponds on-site per Adams County and Mile High Flood District criteria prior to discharging to the Federal Boulevard storm sewer. Based on preliminary calculations, the on-site detention pond is anticipated to release a peak runoff rate of 0.2 cfs in the five-year storm event, and 3.5 cfs in the 100-year storm event. The stormwater runoff from the 5800 Federal Project site was added to structure CB-5 within the StormCAD model, which represents an existing inlet within Federal Boulevard adjacent to the 5800 Federal Project site. The proposed conditions StormCAD analysis shows the additional stormwater runoff to have a negligible impact on the hydraulic results in the existing Federal Boulevard storm sewer. The 5-HGL remains within the existing pipes and the 100-year HGL is above finished grade. The 0.2 cfs discharged from the 5800 Federal Project site in the five-year storm event is a 0.3% increase in the Federal Boulevard storm sewer system, compared to the 63.4 cfs in the pipe downstream of CB-5 (Pipe-14) in the existing conditions. The 3.5 cfs discharged from the 5800 Federal Project site in the 100-year storm event is a 1.6% increase in the Federal Boulevard storm sewer system, compared to the 222.1 cfs in the pipe downstream of CB-5 (Pipe-14) in the existing conditions.

Conclusion:

Based on our analysis of the existing and proposed conditions during five-year and 100-year storm events, discharging detained stormwater runoff from the proposed 5800 Federal Project appears to have a minimal impact on the Federal Boulevard storm sewer, and is not anticipated to have adverse impacts downstream.

Should you have any questions, please contact me at 303-431-6100 or rfrankenberger@martinmartin.com.

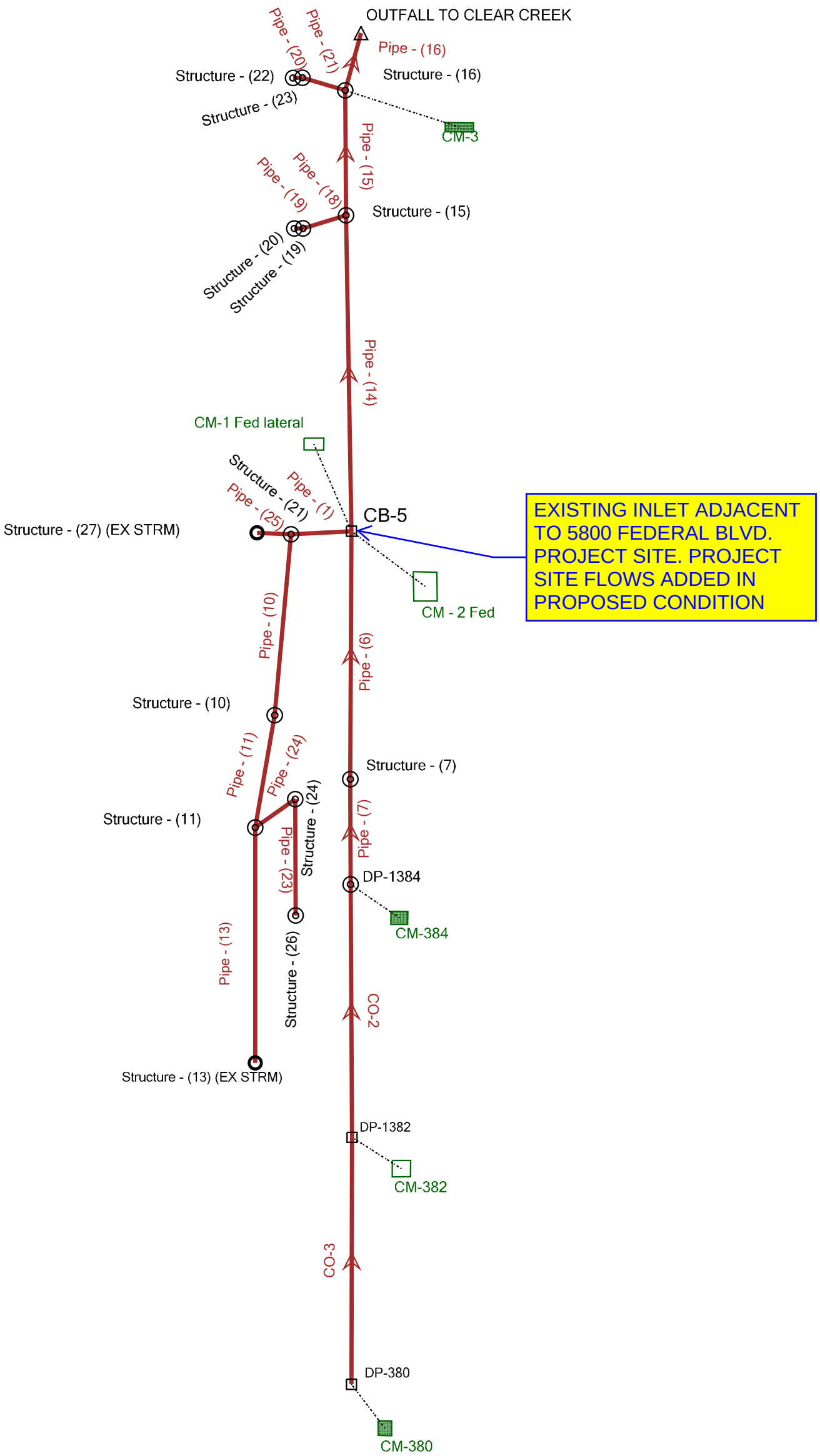
Regards,

Rob E. Frankenberger, PE, LEED BD+C
Associate

Attachments:

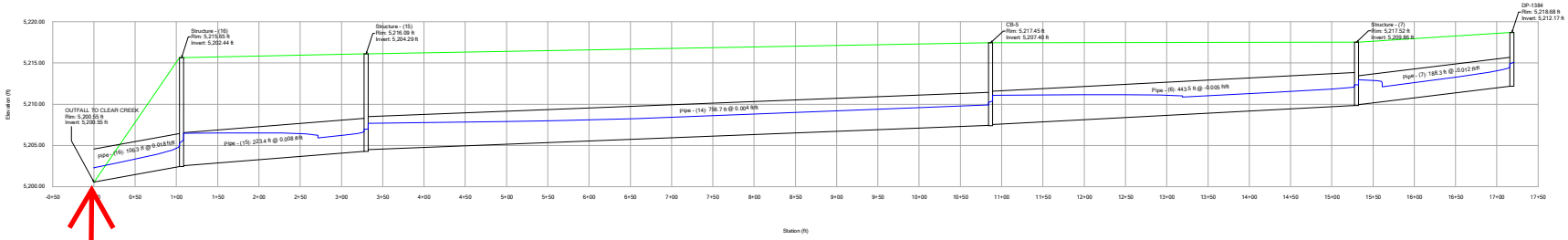
- StormCAD Analysis
- Drainage Exhibit North of I-76
- 2019 SDMP Excerpt
- 2022 FHAD Excerpt

MODEL LAYOUT (NTS)



Profile Report
Engineering Profile - Federal Storm Main (5800 Federal.stsw)

EXISTING 5-YR PROFILE



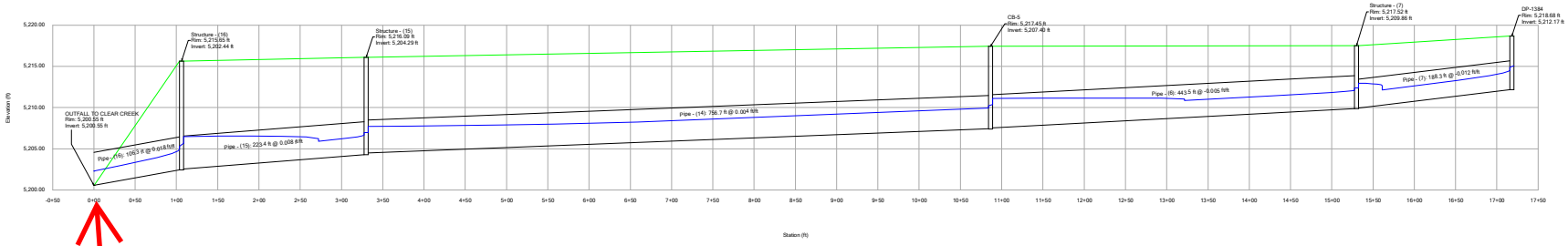
5-YEAR TAILWATER=5201.00
-ESTIMATED FROM 2022 CLEAR CREEK FHAD REPORT APPENDIX F (FLOOD PROFILES).

Profile Report
Engineering Profile - Federal Storm Main (5800 Federal.stsw)

PROPOSED 5-YR PROFILE

PROPOSED FLOWS FROM ONSITE (5800 FEDERAL BLVD) POND OUTLET STRUCTURE:

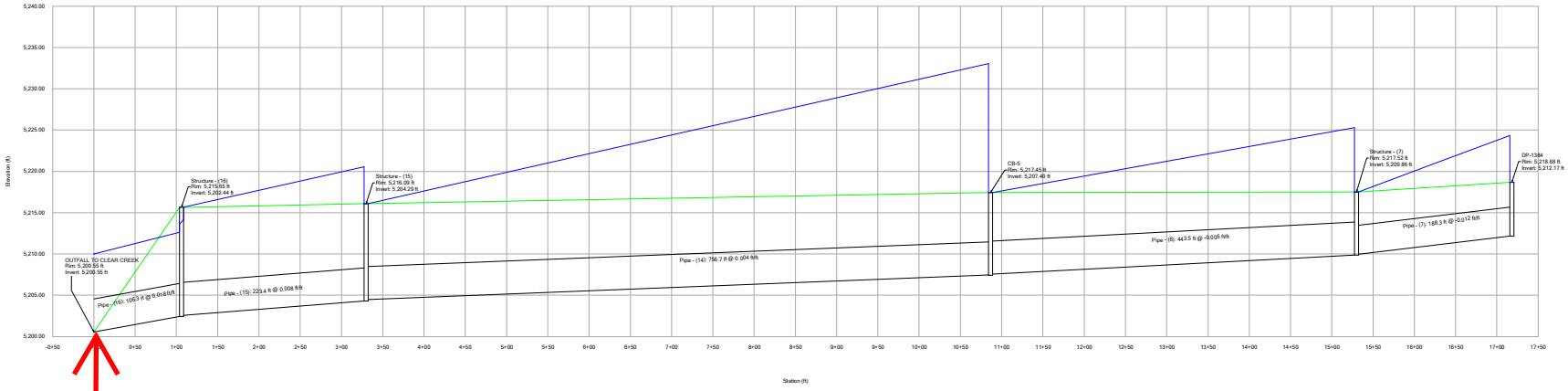
5-YR = 0.20 CFS



5-YEAR TAILWATER=5201.00
-ESTIMATED FROM 2022 CLEAR CREEK FHAD REPORT APPENDIX F (FLOOD PROFILES).

Profile Report
Engineering Profile - Federal Storm Main (5800 Federal.stsw)

EXISTING 100-YR PROFILE



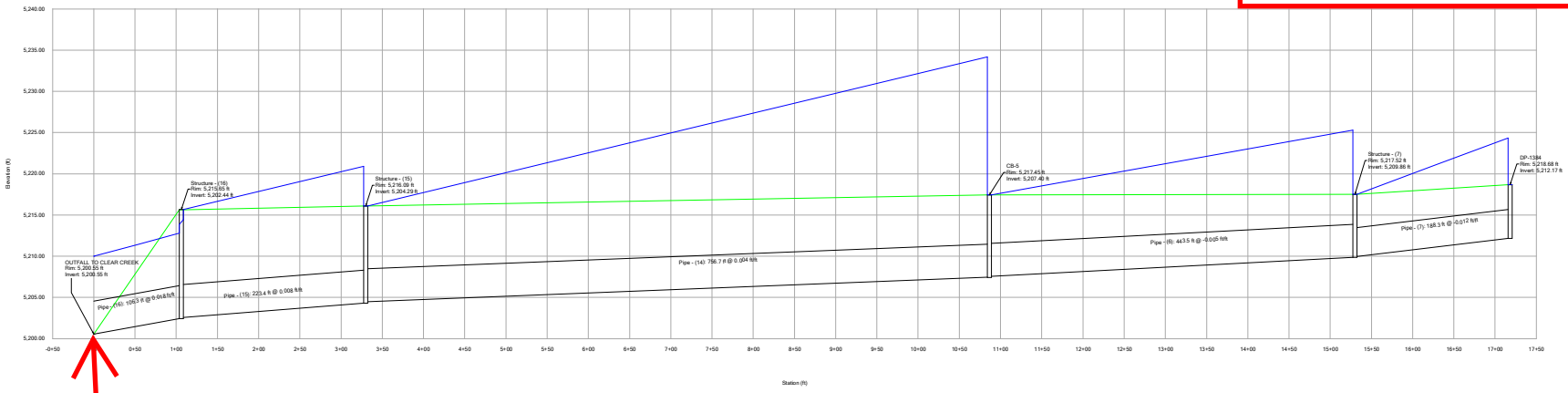
100-YEAR TAILWATER=5210.00
-FROM 2022 CLEAR CREEK FHAD REPORT APPENDIX F (FLOOD PROFILES).

Profile Report
Engineering Profile - Federal Storm Main (5800 Federal.stsw)

PROPOSED 100-YR PROFILE

PROPOSED FLOWS FROM ONSITE POND (5800 FEDERAL BLVD) OUTLET STRUCTURE:

100-YR = 3.50 CFS



100-YEAR TAILWATER=5210.00
-FROM 2022 CLEAR CREEK FHAD REPORT APPENDIX F (FLOOD PROFILES).

Scenario: Existing-5 Year
Current Time Step: 0.000 h
FlexTable: Catchment Table

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)	Notes
71	CM-3	Structure - (16)	8.310	0.590	0.260	15.64	Captures additional stormwater downstream of CB-5 that enters federal main
73	CM-1 Fed lateral	CB-5	13.040	0.400	0.320	15.00	Captures stormwater west of Federal and the flow that enters storm laterals upstream of CB 5
108	CM-384	DP-1384	62.080	0.400	0.810	41.31	Captures stormwater south of I-76 and north of Columbine Rd.
109	CM-382	DP-1382	12.800	0.384	0.740	8.67	Captures stormwater south of Columbine Rd and north of 52nd Ave
110	CM-380	DP-380	26.240	0.532	1.150	18.36	Captures stormwater south of 52nd Ave and north of I-70
111	CM - 2 Fed	CB-5	0.910	0.860	0.170	3.01	Captures stormwater to the south of existing inlet at proposed site (CB-5) and north of I-76 (DP-1384)

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Scenario: Proposed-5 Year
Current Time Step: 0.000 h
FlexTable: Catchment Table

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)	Notes
71	CM-3	Structure - (16)	8.310	0.590	0.260	15.64	Captures additional stormwater downstream of CB-5 that enters federal main
73	CM-1 Fed lateral	CB-5	13.040	0.400	0.320	15.00	Captures stormwater west of Federal and the flow that enters storm laterals upstream of CB 5
108	CM-384	DP-1384	62.080	0.400	0.810	41.31	Captures stormwater south of I-76 and north of Columbine Rd.
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110	CM-380	DP-380	26.240	0.532	1.150	18.36	Captures stormwater south of 52nd Ave and north of I-70
111	CM - 2 Fed	CB-5	0.910	0.860	0.170	3.01	Captures stormwater to the south of existing inlet at proposed site (CB-5) and north of I-76 (DP-1384)

Scenario: Existing-100 Year
Current Time Step: 0.000 h
FlexTable: Catchment Table

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)	Notes
71	CM-3	Structure - (16)	5.800	0.690	0.260	24.36	Captures additional stormwater downstream of CB-5 that enters federal main
73	CM-1 Fed lateral	CB-5	12.770	0.530	0.320	37.15	Captures stormwater west of Federal and the flow that enters storm laterals upstream of CB 5
108	CM-384	DP-1384	62.080	0.540	0.510	142.02	Captures stormwater south of I-76 and north of Columbine Rd.
109	CM-382	DP-1382	12.800	0.524	0.427	31.49	Captures stormwater south of Columbine Rd and north of 52nd Ave
110	CM-380	DP-380	26.240	0.639	0.720	57.44	Captures stormwater south of 52nd Ave and north of I-70
111	CM - 2 Fed	CB-5	0.910	0.890	0.173	5.90	Captures stormwater to the south of existing inlet at proposed site (CB-5) and north of I-76 (DP-1384)

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Scenario: Proposed-100 Year
Current Time Step: 0.000 h
FlexTable: Catchment Table

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)	Notes
71	CM-3	Structure - (16)	5.800	0.690	0.260	24.36	Captures additional stormwater downstream of CB-5 that enters federal main
73	CM-1 Fed lateral	CB-5	12.770	0.530	0.320	37.15	Captures stormwater west of Federal and the flow that enters storm laterals upstream of CB 5
108	CM-384	DP-1384	62.080	0.540	0.510	142.02	Captures stormwater south of I-76 and north of Columbine Rd.
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111	CM - 2 Fed	CB-5	0.910	0.890	0.173	5.90	Captures stormwater to the south of existing inlet at proposed site (CB-5) and north of I-76 (DP-1384)

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Scenario: Existing-5 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Length (User Defined) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Notes
52	Pipe - (1)	Structure - (21)	5,208.28	CB-5	108.1	5,207.46	0.008	24.0	0.013	0.00	0.00	19.70	5,211.30	5,211.30	RCP
53	Pipe - (14)	CB-5	5,207.45	Structure - (15)	756.7	5,204.49	0.004	48.0	0.013	63.40	7.75	89.83	5,209.93	5,207.69	RCP
54	Pipe - (6)	CB-5	5,207.56	Structure - (7)	443.5	5,209.86	-0.005	48.0	0.013	56.22	8.40	103.44	5,212.12	5,211.10	RCP
55	Pipe - (23)	Structure - (26)	5,211.65	Structure - (24)	207.8	5,210.61	0.005	18.0	0.013	0.00	0.00	7.43	5,211.65	5,211.30	RCP
56	Pipe - (24)	Structure - (24)	5,210.41	Structure - (11)	87.6	5,209.97	0.005	18.0	0.013	0.00	0.00	7.43	5,211.30	5,211.30	RCP
57	Pipe - (10)	Structure - (10)	5,208.71	Structure - (21)	325.1	5,208.27	0.001	24.0	0.013	0.00	0.00	8.33	5,211.30	5,211.30	RCP
58	Pipe - (11)	Structure - (10)	5,208.91	Structure - (11)	204.0	5,209.78	-0.004	18.0	0.013	0.00	0.00	6.86	5,211.30	5,211.30	RCP
59	Pipe - (7)	Structure - (7)	5,209.96	DP-1384	188.3	5,212.17	-0.012	42.0	0.013	56.37	11.43	108.99	5,214.52	5,212.96	RCP
60	Pipe - (25)	Structure - (21)	5,208.27	Structure - (27) (EX STRM)	60.9	5,208.88	-0.010	24.0	0.013	0.00	0.00	22.65	5,211.30	5,211.30	RCP
61	Pipe - (15)	Structure - (15)	5,204.29	Structure - (16)	223.4	5,202.55	0.008	48.0	0.013	62.43	10.05	126.75	5,206.67	5,206.48	RCP
62	Pipe - (18)	Structure - (15)	5,204.31	Structure - (19)	80.3	5,205.07	-0.009	24.0	0.013	0.00	0.00	21.94	5,207.97	5,207.97	RCP
63	Pipe - (19)	Structure - (19)	5,204.88	Structure - (20)	15.7	5,204.96	-0.005	24.0	0.013	0.00	0.00	16.12	5,207.97	5,207.97	RCP
64	Pipe - (16)	Structure - (16)	5,202.44	OUTFALL TO CLEAR CREEK	106.3	5,200.55	0.018	48.0	0.013	68.35	13.96	191.49	5,204.94	5,202.31	RCP
65	Pipe - (21)	Structure - (23)	5,203.74	Structure - (16)	79.7	5,202.54	0.015	12.0	0.013	0.00	0.00	4.37	5,206.71	5,206.71	RCP
66	Pipe - (20)	Structure - (22)	5,211.90	Structure - (23)	17.0	5,211.56	0.020	12.0	0.013	0.00	0.00	5.04	5,211.90	5,211.56	RCP
67	Pipe - (13)	Structure - (11)	5,209.67	Structure - (13) (EX STRM)	420.9	5,219.63	-0.024	18.0	0.013	0.00	0.00	16.16	5,219.63	5,211.30	RCP
100	CO-2	DP-1384	5,212.17	DP-1382	508.0	5,324.50	-0.221	36.0	0.013	24.42	26.35	313.62	5,326.09	5,216.01	-
102	CO-3	DP-1382	5,324.50	DP-380	1,172.0	5,354.50	-0.026	24.0	0.013	18.36	11.57	36.19	5,356.04	5,326.62	-

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Scenario: Proposed-5 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Length (User Defined) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Notes
52	Pipe - (1)	Structure - (21)	5,208.28	CB-5	108.1	5,207.46	0.008	24.0	0.013	0.00	0.00	19.70	5,211.31	5,211.31	RCP
53	Pipe - (14)	CB-5	5,207.45	Structure - (15)	756.7	5,204.49	0.004	48.0	0.013	63.60	7.75	89.83	5,209.93	5,207.70	RCP
54	Pipe - (6)	CB-5	5,207.56	Structure - (7)	443.5	5,209.86	-0.005	48.0	0.013	56.22	8.40	103.44	5,212.12	5,211.11	RCP
55	Pipe - (23)	Structure - (26)	5,211.65	Structure - (24)	207.8	5,210.61	0.005	18.0	0.013	0.00	0.00	7.43	5,211.65	5,211.31	RCP
56	Pipe - (24)	Structure - (24)	5,210.41	Structure - (11)	87.6	5,209.97	0.005	18.0	0.013	0.00	0.00	7.43	5,211.31	5,211.31	RCP
57	Pipe - (10)	Structure - (10)	5,208.71	Structure - (21)	325.1	5,208.27	0.001	24.0	0.013	0.00	0.00	8.33	5,211.31	5,211.31	RCP
58	Pipe - (11)	Structure - (10)	5,208.91	Structure - (11)	204.0	5,209.78	-0.004	18.0	0.013	0.00	0.00	6.86	5,211.31	5,211.31	RCP
59	Pipe - (7)	Structure - (7)	5,209.96	DP-1384	188.3	5,212.17	-0.012	42.0	0.013	56.37	11.43	108.99	5,214.52	5,212.96	RCP
60	Pipe - (25)	Structure - (21)	5,208.27	Structure - (27) (EX STRM)	60.9	5,208.88	-0.010	24.0	0.013	0.00	0.00	22.65	5,211.31	5,211.31	RCP
61	Pipe - (15)	Structure - (15)	5,204.29	Structure - (16)	223.4	5,202.55	0.008	48.0	0.013	62.63	10.06	126.75	5,206.68	5,206.49	RCP
62	Pipe - (18)	Structure - (15)	5,204.31	Structure - (19)	80.3	5,205.07	-0.009	24.0	0.013	0.00	0.00	21.94	5,207.98	5,207.98	RCP
63	Pipe - (19)	Structure - (19)	5,204.88	Structure - (20)	15.7	5,204.96	-0.005	24.0	0.013	0.00	0.00	16.12	5,207.98	5,207.98	RCP
64	Pipe - (16)	Structure - (16)	5,202.44	OUTFALL TO CLEAR CREEK	106.3	5,200.55	0.018	48.0	0.013	68.55	13.97	191.49	5,204.94	5,202.32	RCP
65	Pipe - (21)	Structure - (23)	5,203.74	Structure - (16)	79.7	5,202.54	0.015	12.0	0.013	0.00	0.00	4.37	5,206.72	5,206.72	RCP
66	Pipe - (20)	Structure - (22)	5,211.90	Structure - (23)	17.0	5,211.56	0.020	12.0	0.013	0.00	0.00	5.04	5,211.90	5,211.56	RCP
67	Pipe - (13)	Structure - (11)	5,209.67	Structure - (13) (EX STRM)	420.9	5,219.63	-0.024	18.0	0.013	0.00	0.00	16.16	5,219.63	5,211.31	RCP
100	CO-2	DP-1384	5,212.17	DP-1382	508.0	5,324.50	-0.221	36.0	0.013	24.42	26.35	313.62	5,326.09	5,216.01	-
102	CO-3	DP-1382	5,324.50	DP-380	1,172.0	5,354.50	-0.026	24.0	0.013	18.36	11.57	36.19	5,356.04	5,326.62	-

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Scenario: Existing-100 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Length (User Defined) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Notes
52	Pipe - (1)	Structure - (21)	5,208.28	CB-5	108.1	5,207.46	0.008	24.0	0.013	0.00	0.00	19.70	5,217.45	5,217.45	RCP
53	Pipe - (14)	CB-5	5,207.45	Structure - (15)	756.7	5,204.49	0.004	48.0	0.013	215.07	17.11	89.83	5,233.05	5,216.09	RCP
54	Pipe - (6)	CB-5	5,207.56	Structure - (7)	443.5	5,209.86	-0.005	48.0	0.013	191.15	15.21	103.44	5,225.31	5,217.45	RCP
55	Pipe - (23)	Structure - (26)	5,211.65	Structure - (24)	207.8	5,210.61	0.005	18.0	0.013	0.00	0.00	7.43	5,213.28	5,213.28	RCP
56	Pipe - (24)	Structure - (24)	5,210.41	Structure - (11)	87.6	5,209.97	0.005	18.0	0.013	0.00	0.00	7.43	5,213.28	5,213.28	RCP
57	Pipe - (10)	Structure - (10)	5,208.71	Structure - (21)	325.1	5,208.27	0.001	24.0	0.013	0.00	0.00	8.33	5,217.45	5,217.45	RCP
58	Pipe - (11)	Structure - (10)	5,208.91	Structure - (11)	204.0	5,209.78	-0.004	18.0	0.013	0.00	0.00	6.86	5,217.45	5,217.45	RCP
59	Pipe - (7)	Structure - (7)	5,209.96	DP-1384	188.3	5,212.17	-0.012	42.0	0.013	191.59	19.91	108.99	5,224.35	5,217.52	RCP
60	Pipe - (25)	Structure - (21)	5,208.27	Structure - (27) (EX STRM)	60.9	5,208.88	-0.010	24.0	0.013	0.00	0.00	22.65	5,217.45	5,217.45	RCP
61	Pipe - (15)	Structure - (15)	5,204.29	Structure - (16)	223.4	5,202.55	0.008	48.0	0.013	212.83	16.94	126.75	5,220.56	5,215.65	RCP
62	Pipe - (18)	Structure - (15)	5,204.31	Structure - (19)	80.3	5,205.07	-0.009	24.0	0.013	0.00	0.00	21.94	5,216.09	5,216.09	RCP
63	Pipe - (19)	Structure - (19)	5,204.88	Structure - (20)	15.7	5,204.96	-0.005	24.0	0.013	0.00	0.00	16.12	5,215.94	5,215.94	RCP
64	Pipe - (16)	Structure - (16)	5,202.44	OUTFALL TO CLEAR CREEK	106.3	5,200.55	0.018	48.0	0.013	225.33	17.93	191.49	5,212.62	5,210.00	RCP
65	Pipe - (21)	Structure - (23)	5,203.74	Structure - (16)	79.7	5,202.54	0.015	12.0	0.013	0.00	0.00	4.37	5,215.65	5,215.65	RCP
66	Pipe - (20)	Structure - (22)	5,211.90	Structure - (23)	17.0	5,211.56	0.020	12.0	0.013	0.00	0.00	5.04	5,215.61	5,215.61	RCP
67	Pipe - (13)	Structure - (11)	5,209.67	Structure - (13) (EX STRM)	420.9	5,219.63	-0.024	18.0	0.013	0.00	0.00	16.16	5,219.63	5,213.28	RCP
100	CO-2	DP-1384	5,212.17	DP-1382	508.0	5,324.50	-0.221	36.0	0.013	79.17	36.98	313.62	5,327.26	5,218.68	-
102	CO-3	DP-1382	5,324.50	DP-380	1,172.0	5,354.50	-0.026	24.0	0.013	57.44	18.28	36.19	5,402.23	5,326.67	-

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Scenario: Proposed-100 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Length (User Defined) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Notes
52	Pipe - (1)	Structure - (21)	5,208.28	CB-5	108.1	5,207.46	0.008	24.0	0.013	0.00	0.00	19.70	5,217.45	5,217.45	RCP
53	Pipe - (14)	CB-5	5,207.45	Structure - (15)	756.7	5,204.49	0.004	48.0	0.013	222.07	17.67	89.83	5,234.18	5,216.09	RCP
54	Pipe - (6)	CB-5	5,207.56	Structure - (7)	443.5	5,209.86	-0.005	48.0	0.013	191.15	15.21	103.44	5,225.31	5,217.45	RCP
55	Pipe - (23)	Structure - (26)	5,211.65	Structure - (24)	207.8	5,210.61	0.005	18.0	0.013	0.00	0.00	7.43	5,213.28	5,213.28	RCP
56	Pipe - (24)	Structure - (24)	5,210.41	Structure - (11)	87.6	5,209.97	0.005	18.0	0.013	0.00	0.00	7.43	5,213.28	5,213.28	RCP
57	Pipe - (10)	Structure - (10)	5,208.71	Structure - (21)	325.1	5,208.27	0.001	24.0	0.013	0.00	0.00	8.33	5,217.45	5,217.45	RCP
58	Pipe - (11)	Structure - (10)	5,208.91	Structure - (11)	204.0	5,209.78	-0.004	18.0	0.013	0.00	0.00	6.86	5,217.45	5,217.45	RCP
59	Pipe - (7)	Structure - (7)	5,209.96	DP-1384	188.3	5,212.17	-0.012	42.0	0.013	191.59	19.91	108.99	5,224.35	5,217.52	RCP
60	Pipe - (25)	Structure - (21)	5,208.27	Structure - (27) (EX STRM)	60.9	5,208.88	-0.010	24.0	0.013	0.00	0.00	22.65	5,217.45	5,217.45	RCP
61	Pipe - (15)	Structure - (15)	5,204.29	Structure - (16)	223.4	5,202.55	0.008	48.0	0.013	219.90	17.50	126.75	5,220.89	5,215.65	RCP
62	Pipe - (18)	Structure - (15)	5,204.31	Structure - (19)	80.3	5,205.07	-0.009	24.0	0.013	0.00	0.00	21.94	5,216.09	5,216.09	RCP
63	Pipe - (19)	Structure - (19)	5,204.88	Structure - (20)	15.7	5,204.96	-0.005	24.0	0.013	0.00	0.00	16.12	5,215.94	5,215.94	RCP
64	Pipe - (16)	Structure - (16)	5,202.44	OUTFALL TO CLEAR CREEK	106.3	5,200.55	0.018	48.0	0.013	232.42	18.50	191.49	5,212.78	5,210.00	RCP
65	Pipe - (21)	Structure - (23)	5,203.74	Structure - (16)	79.7	5,202.54	0.015	12.0	0.013	0.00	0.00	4.37	5,215.65	5,215.65	RCP
66	Pipe - (20)	Structure - (22)	5,211.90	Structure - (23)	17.0	5,211.56	0.020	12.0	0.013	0.00	0.00	5.04	5,215.61	5,215.61	RCP
67	Pipe - (13)	Structure - (11)	5,209.67	Structure - (13) (EX STRM)	420.9	5,219.63	-0.024	18.0	0.013	0.00	0.00	16.16	5,219.63	5,213.28	RCP
100	CO-2	DP-1384	5,212.17	DP-1382	508.0	5,324.50	-0.221	36.0	0.013	79.17	36.98	313.62	5,327.26	5,218.68	-
102	CO-3	DP-1382	5,324.50	DP-380	1,172.0	5,354.50	-0.026	24.0	0.013	57.44	18.28	36.19	5,402.23	5,326.67	-

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Scenario: Existing-5 Year
Current Time Step: 0.000 h
FlexTable: Catch Basin Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Capture Efficiency (Calculated) (%)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
105	DP-1382	5,330.00	5,330.00	5,324.50	Full Capture	100.0	8.67	5,326.30	5,326.25
106	DP-380	5,360.00	5,360.00	5,354.50	Full Capture	100.0	18.36	5,356.69	5,356.31
112	CB-5	5,217.45	5,217.45	5,207.40	Full Capture	100.0	17.25	5,210.36	5,210.24

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Scenario: Proposed-5 Year
Current Time Step: 0.000 h
FlexTable: Catch Basin Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Capture Efficiency (Calculated) (%)	Flow (Additional Subsurface) (cfs)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
105	DP-1382	5,330.00	5,330.00	5,324.50	Full Capture	100.0	0.00	8.67	5,326.30	5,326.25
106	DP-380	5,360.00	5,360.00	5,354.50	Full Capture	100.0	0.00	18.36	5,356.69	5,356.31
112	CB-5	5,217.45	5,217.45	5,207.40	Full Capture	100.0	0.20	17.25	5,210.37	5,210.24

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Scenario: Existing-100 Year
Current Time Step: 0.000 h
FlexTable: Catch Basin Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Capture Efficiency (Calculated) (%)	Flow (Additional Subsurface) (cfs)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
105	DP-1382	5,330.00	5,330.00	5,324.50	Full Capture	100.0	0.00	31.49	5,327.68	5,327.68
106	DP-380	5,360.00	5,360.00	5,354.50	Full Capture	100.0	0.00	57.44	5,360.00	5,360.00
112	CB-5	5,217.45	5,217.45	5,207.40	Full Capture	100.0	0.00	41.60	5,217.45	5,217.45

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Scenario: Proposed-100 Year
Current Time Step: 0.000 h
FlexTable: Catch Basin Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Capture Efficiency (Calculated) (%)	Flow (Additional Subsurface) (cfs)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
105	DP-1382	5,330.00	5,330.00	5,324.50	Full Capture	100.0	0.00	31.49	5,327.68	5,327.68
106	DP-380	5,360.00	5,360.00	5,354.50	Full Capture	100.0	0.00	57.44	5,360.00	5,360.00
112	CB-5	5,217.45	5,217.45	5,207.40	Full Capture	100.0	3.50	41.60	5,217.45	5,217.45

Scenario: Existing-5 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
34	Structure - (26)	5,219.36	5,219.36	(N/A)	0.00	(N/A)	(N/A)	HEC-22 Energy (Third Edition)	(N/A)	TYPE R INLET
35	Structure - (24)	5,218.09	5,218.09	5,210.61	0.00	1.30	5,211.30	HEC-22 Energy (Third Edition)	5,211.30	TYPE R INLET
36	Structure - (10)	5,217.61	5,217.61	5,208.91	0.00	4.30	5,211.30	HEC-22 Energy (Third Edition)	5,211.30	CONCENTRIC MH
37	Structure - (7)	5,217.52	5,217.52	5,209.96	56.22	2.51	5,212.37	HEC-22 Energy (Third Edition)	5,212.37	TYPE R INLET
38	Structure - (21)	5,217.48	5,217.48	5,208.27	0.00	6.30	5,211.30	HEC-22 Energy (Third Edition)	5,211.30	TYPE R INLET
39	DP-1384	5,218.68	5,218.68	5,212.17	56.37	2.72	5,214.89	HEC-22 Energy (Third Edition)	5,215.08	TYPE R INLET
40	Structure - (15)	5,216.09	5,216.09	5,204.49	62.43	2.69	5,206.98	HEC-22 Energy (Third Edition)	5,206.98	TYPE R INLET
41	Structure - (19)	5,215.94	5,215.94	5,204.88	0.00	5,219.65	5,207.97	HEC-22 Energy (Third Edition)	5,207.97	CONCENTRIC MH
42	Structure - (16)	5,215.65	5,215.65	5,202.55	68.35	2.85	5,205.29	HEC-22 Energy (Third Edition)	5,205.65	TYPE R INLET
43	Structure - (23)	5,215.61	5,215.61	5,211.56	0.00	5,211.15	5,206.71	HEC-22 Energy (Third Edition)	5,206.71	CONCENTRIC MH
44	Structure - (20)	5,215.28	5,215.28	(N/A)	0.00	5,219.81	5,207.97	HEC-22 Energy (Third Edition)	5,207.97	CDOT Type 13
45	Structure - (22)	5,215.21	5,215.21	(N/A)	0.00	(N/A)	(N/A)	HEC-22 Energy (Third Edition)	(N/A)	CDOT Type 13
46	Structure - (11)	5,213.28	5,213.28	5,209.97	0.00	1.70	5,211.30	HEC-22 Energy (Third Edition)	5,211.30	CDOT Type 13

Scenario: Proposed-5 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
34	Structure - (26)	5,219.36	5,219.36	(N/A)	0.00	(N/A)	(N/A)	HEC-22 Energy (Third Edition)	(N/A)	TYPE R INLET
35	Structure - (24)	5,218.09	5,218.09	5,210.61	0.00	1.31	5,211.31	HEC-22 Energy (Third Edition)	5,211.31	TYPE R INLET
36	Structure - (10)	5,217.61	5,217.61	5,208.91	0.00	4.31	5,211.31	HEC-22 Energy (Third Edition)	5,211.31	CONCENTRIC MH
37	Structure - (7)	5,217.52	5,217.52	5,209.96	56.22	2.51	5,212.37	HEC-22 Energy (Third Edition)	5,212.37	TYPE R INLET
38	Structure - (21)	5,217.48	5,217.48	5,208.27	0.00	6.31	5,211.31	HEC-22 Energy (Third Edition)	5,211.31	TYPE R INLET
39	DP-1384	5,218.68	5,218.68	5,212.17	56.37	2.72	5,214.89	HEC-22 Energy (Third Edition)	5,215.08	TYPE R INLET
40	Structure - (15)	5,216.09	5,216.09	5,204.49	62.63	2.69	5,206.98	HEC-22 Energy (Third Edition)	5,206.98	TYPE R INLET
41	Structure - (19)	5,215.94	5,215.94	5,204.88	0.00	5,219.66	5,207.98	HEC-22 Energy (Third Edition)	5,207.98	CONCENTRIC MH
42	Structure - (16)	5,215.65	5,215.65	5,202.55	68.55	2.85	5,205.29	HEC-22 Energy (Third Edition)	5,205.65	TYPE R INLET
43	Structure - (23)	5,215.61	5,215.61	5,211.56	0.00	5,211.16	5,206.72	HEC-22 Energy (Third Edition)	5,206.72	CONCENTRIC MH
44	Structure - (20)	5,215.28	5,215.28	(N/A)	0.00	5,219.82	5,207.98	HEC-22 Energy (Third Edition)	5,207.98	CDOT Type 13
45	Structure - (22)	5,215.21	5,215.21	(N/A)	0.00	(N/A)	(N/A)	HEC-22 Energy (Third Edition)	(N/A)	CDOT Type 13
46	Structure - (11)	5,213.28	5,213.28	5,209.97	0.00	1.71	5,211.31	HEC-22 Energy (Third Edition)	5,211.31	CDOT Type 13

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Scenario: Existing-100 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
34	Structure - (26)	5,219.36	5,219.36	(N/A)	0.00	1.63	5,213.28	HEC-22 Energy (Third Edition)	5,213.28	TYPE R INLET
35	Structure - (24)	5,218.09	5,218.09	5,210.61	0.00	3.28	5,213.28	HEC-22 Energy (Third Edition)	5,213.28	TYPE R INLET
36	Structure - (10)	5,217.61	5,217.61	5,208.91	0.00	10.45	5,217.45	HEC-22 Energy (Third Edition)	5,217.45	CONCENTRIC MH
37	Structure - (7)	5,217.52	5,217.52	5,209.96	191.15	7.66	5,217.52	HEC-22 Energy (Third Edition)	5,217.52	TYPE R INLET
38	Structure - (21)	5,217.48	5,217.48	5,208.27	0.00	12.45	5,217.45	HEC-22 Energy (Third Edition)	5,217.45	TYPE R INLET
39	DP-1384	5,218.68	5,218.68	5,212.17	191.59	6.51	5,218.68	HEC-22 Energy (Third Edition)	5,218.68	TYPE R INLET
40	Structure - (15)	5,216.09	5,216.09	5,204.49	212.83	11.80	5,216.09	HEC-22 Energy (Third Edition)	5,216.09	TYPE R INLET
41	Structure - (19)	5,215.94	5,215.94	5,204.88	0.00	5,227.62	5,215.94	HEC-22 Energy (Third Edition)	5,215.94	CONCENTRIC MH
42	Structure - (16)	5,215.65	5,215.65	5,202.55	225.33	11.18	5,213.62	HEC-22 Energy (Third Edition)	5,214.15	TYPE R INLET
43	Structure - (23)	5,215.61	5,215.61	5,211.56	0.00	5,220.04	5,215.61	HEC-22 Energy (Third Edition)	5,215.61	CONCENTRIC MH
44	Structure - (20)	5,215.28	5,215.28	(N/A)	0.00	5,227.12	5,215.28	HEC-22 Energy (Third Edition)	5,215.28	CDOT Type 13
45	Structure - (22)	5,215.21	5,215.21	(N/A)	0.00	5,219.38	5,215.21	HEC-22 Energy (Third Edition)	5,215.21	CDOT Type 13
46	Structure - (11)	5,213.28	5,213.28	5,209.97	0.00	3.68	5,213.28	HEC-22 Energy (Third Edition)	5,213.28	CDOT Type 13

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Scenario: Proposed-100 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
34	Structure - (26)	5,219.36	5,219.36	(N/A)	0.00	1.63	5,213.28	HEC-22 Energy (Third Edition)	5,213.28	TYPE R INLET
35	Structure - (24)	5,218.09	5,218.09	5,210.61	0.00	3.28	5,213.28	HEC-22 Energy (Third Edition)	5,213.28	TYPE R INLET
36	Structure - (10)	5,217.61	5,217.61	5,208.91	0.00	10.45	5,217.45	HEC-22 Energy (Third Edition)	5,217.45	CONCENTRIC MH
37	Structure - (7)	5,217.52	5,217.52	5,209.96	191.15	7.66	5,217.52	HEC-22 Energy (Third Edition)	5,217.52	TYPE R INLET
38	Structure - (21)	5,217.48	5,217.48	5,208.27	0.00	12.45	5,217.45	HEC-22 Energy (Third Edition)	5,217.45	TYPE R INLET
39	DP-1384	5,218.68	5,218.68	5,212.17	191.59	6.51	5,218.68	HEC-22 Energy (Third Edition)	5,218.68	TYPE R INLET
40	Structure - (15)	5,216.09	5,216.09	5,204.49	219.90	11.80	5,216.09	HEC-22 Energy (Third Edition)	5,216.09	TYPE R INLET
41	Structure - (19)	5,215.94	5,215.94	5,204.88	0.00	5,227.62	5,215.94	HEC-22 Energy (Third Edition)	5,215.94	CONCENTRIC MH
42	Structure - (16)	5,215.65	5,215.65	5,202.55	232.42	11.41	5,213.85	HEC-22 Energy (Third Edition)	5,214.41	TYPE R INLET
43	Structure - (23)	5,215.61	5,215.61	5,211.56	0.00	5,220.04	5,215.61	HEC-22 Energy (Third Edition)	5,215.61	CONCENTRIC MH
44	Structure - (20)	5,215.28	5,215.28	(N/A)	0.00	5,227.12	5,215.28	HEC-22 Energy (Third Edition)	5,215.28	CDOT Type 13
45	Structure - (22)	5,215.21	5,215.21	(N/A)	0.00	5,219.38	5,215.21	HEC-22 Energy (Third Edition)	5,215.21	CDOT Type 13
46	Structure - (11)	5,213.28	5,213.28	5,209.97	0.00	3.68	5,213.28	HEC-22 Energy (Third Edition)	5,213.28	CDOT Type 13

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Scenario: Existing-5 Year
Current Time Step: 0.000 h
FlexTable: Outfall Table

ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
69	OUTFALL TO CLEAR CREEK	5,200.55	5,200.55	5,201.00	5,202.31	68.26

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Scenario: Proposed-5 Year
Current Time Step: 0.000 h
FlexTable: Outfall Table

ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
69	OUTFALL TO CLEAR CREEK	5,200.55	5,200.55	5,201.00	5,202.32	68.47

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Scenario: Existing-100 Year
Current Time Step: 0.000 h
FlexTable: Outfall Table

ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
69	OUTFALL TO CLEAR CREEK	5,200.55	5,200.55	5,210.00	5,210.00	225.02

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Scenario: Proposed-100 Year
Current Time Step: 0.000 h
FlexTable: Outfall Table

ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
69	OUTFALL TO CLEAR CREEK	5,200.55	5,200.55	5,210.00	5,210.00	232.12

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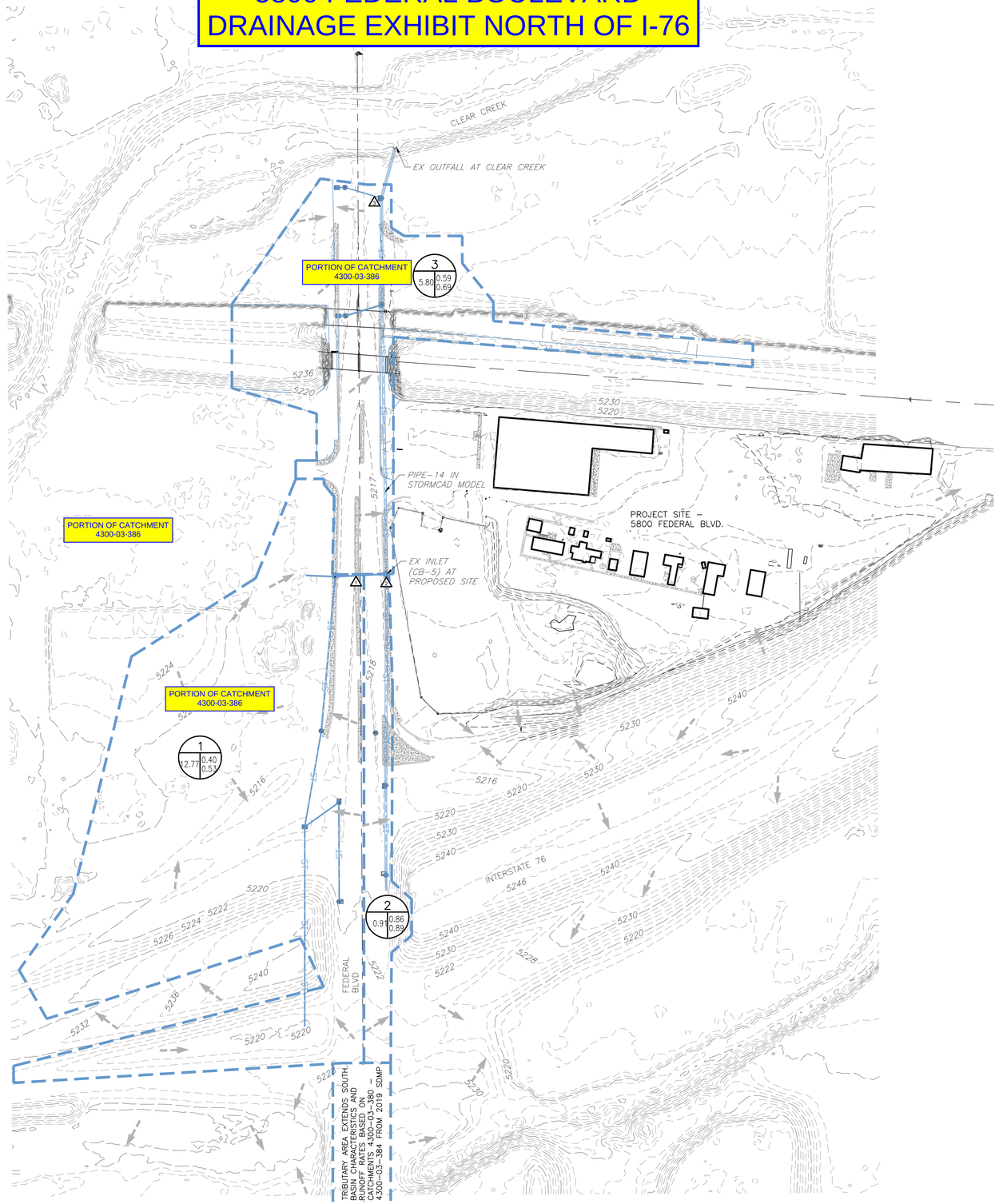
5800 FEDERAL BOULEVARD
DRAINAGE EXHIBIT NORTH OF I-76



EXISTING CONDITIONS

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
1	1	12.77	54.4%	0.40	0.53	11.06	32.02
2	2	0.91	100.0%	0.86	0.89	2.26	5.00
3	3	5.80	74.7%	0.59	0.69	8.25	20.66
SITE COMPOSITE		**19.48**	**62.6%**	**0.48**	**0.60**	**21.56**	**57.69**

PROPOSED CONDITIONS

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
PR SITE	2	12.56	60.8%	0.46	0.58	16.08	39.25
SITE COMPOSITE		**12.56**	**60.8%**	**0.46**	**0.58**	**16.08**	**39.25**

LEGEND

BASIN BOUNDARY

SUB-BASIN BOUNDARY

DIRECTION OF FLOW

DESIGN POINT 1

BASIN B (1.25) — C5 .88 / C100 .93

AREA IN ACRES

120 60 0 120 240

SCALE 1" = 120'

ALL LINEAL DIMENSIONS ARE IN U.S. SURVEY FEET

N

07/18/2023

MARTIN/MARTIN CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
303.431.6100 MARTINMARTIN.COM

PLOT DATE: Tuesday, July 18, 2023 11:59 AM LAST SAVED BY: MBAUM
DRAWING LOCATION: G:\SCHLAPPE\23.0269-5800 Federal Industrial\BASE\V-SITE_23.0269-Drainage.dwg

CITY & COUNTY OF DENVER

STORM DRAINAGE MASTER PLAN

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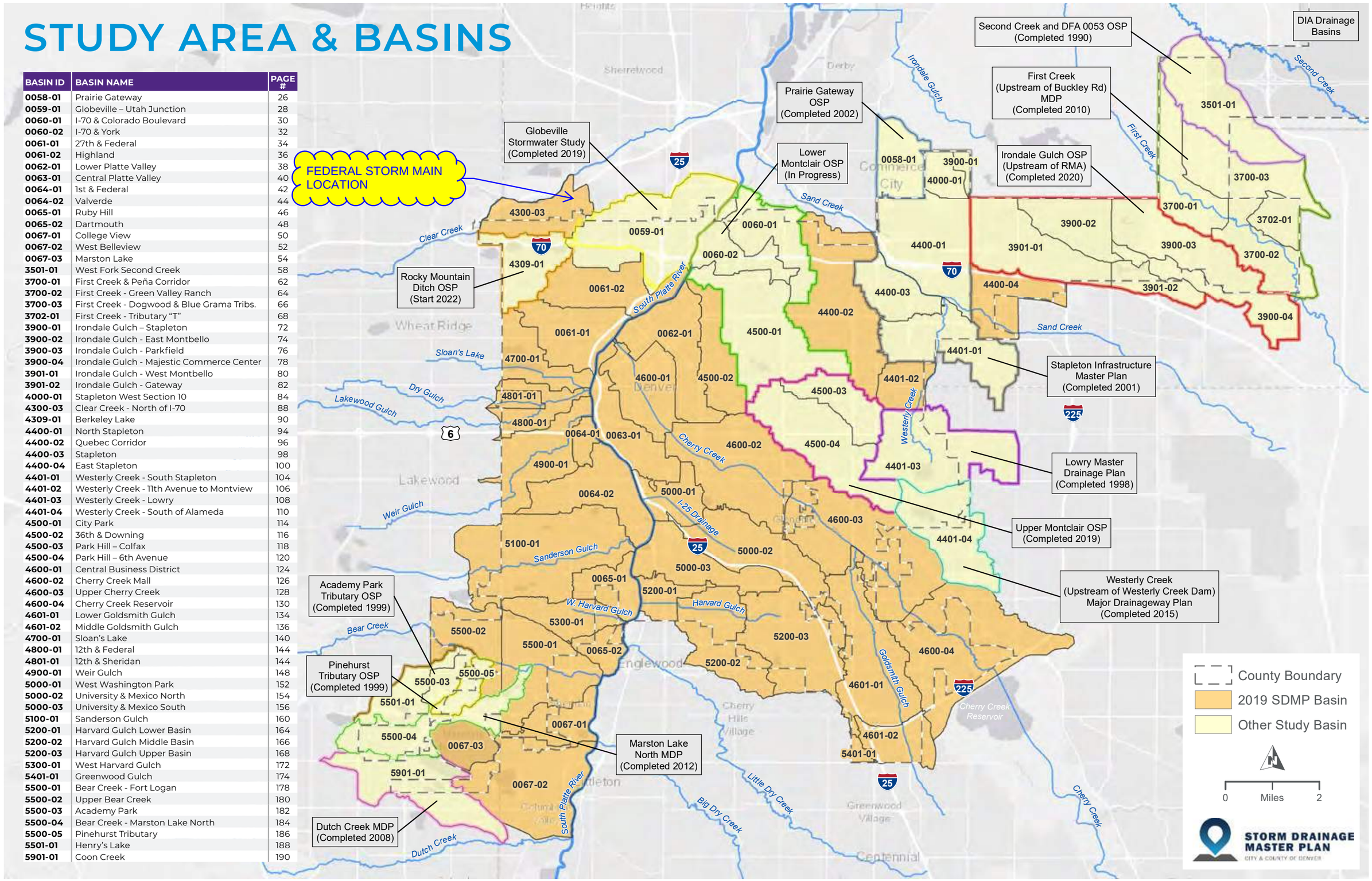
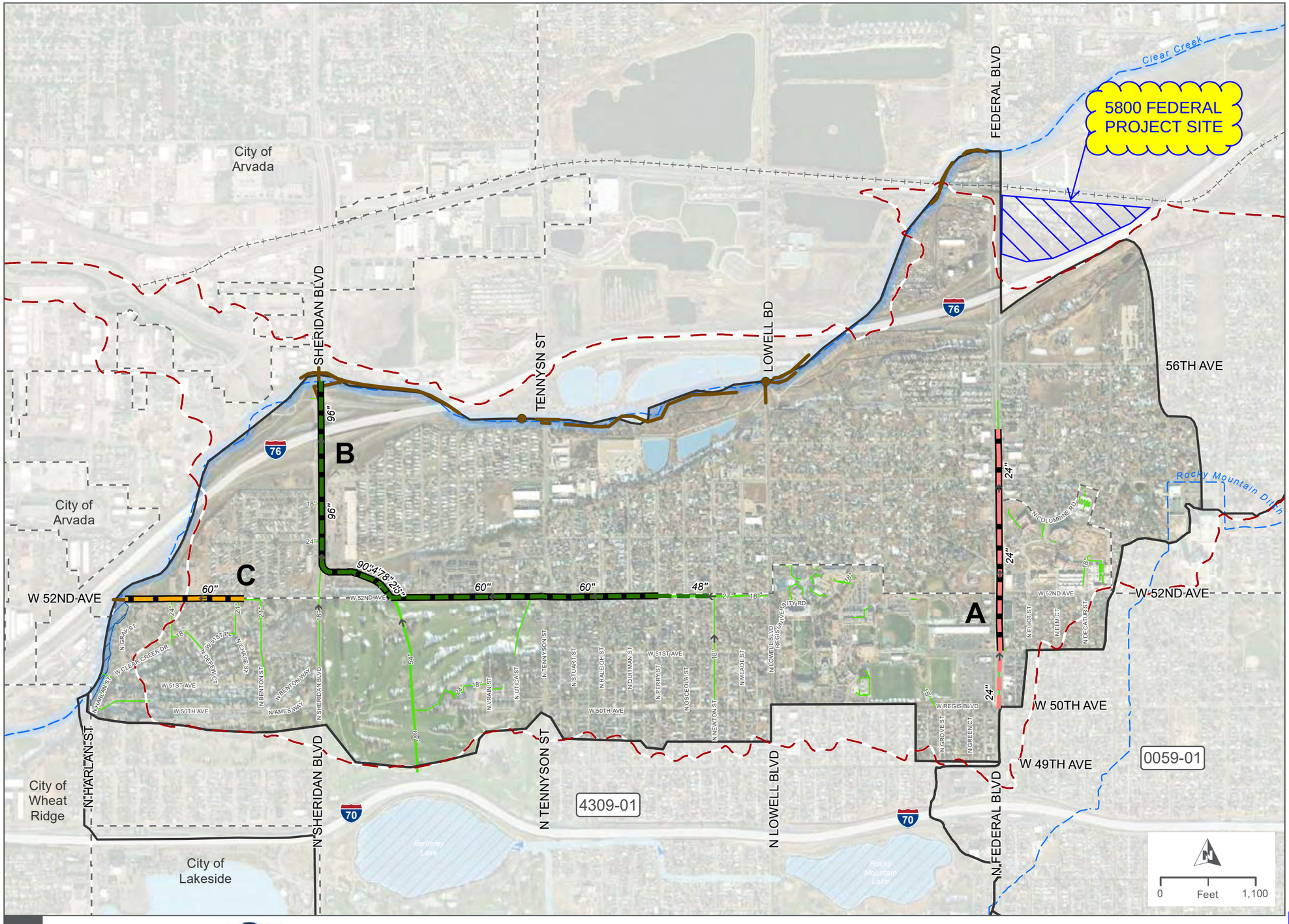
October 2019

STUDY AREA & BASINS

BASIN ID	BASIN NAME	PAGE #
0058-01	Prairie Gateway	26
0059-01	Globeville – Utah Junction	28
0060-01	I-70 & Colorado Boulevard	30
0060-02	I-70 & York	32
0061-01	27th & Federal	34
0061-02	Highland	36
0062-01	Lower Platte Valley	38
0063-01	Central Platte Valley	40
0064-01	1st & Federal	42
0064-02	Valverde	44
0065-01	Ruby Hill	46
0065-02	Dartmouth	48
0067-01	College View	50
0067-02	West Belleview	52
0067-03	Marston Lake	54
3501-01	West Fork Second Creek	58
3700-01	First Creek & Peña Corridor	62
3700-02	First Creek - Green Valley Ranch	64
3700-03	First Creek - Dogwood & Blue Grama Tribs.	66
3702-01	First Creek - Tributary "T"	68
3900-01	Irondale Gulch – Stapleton	72
3900-02	Irondale Gulch - East Montbello	74
3900-03	Irondale Gulch - Parkfield	76
3900-04	Irondale Gulch - Majestic Commerce Center	78
3901-01	Irondale Gulch - West Montbello	80
3901-02	Irondale Gulch - Gateway	82
4000-01	Stapleton West Section 10	84
4300-03	Clear Creek - North of I-70	88
4309-01	Berkeley Lake	90
4400-01	North Stapleton	94
4400-02	Quebec Corridor	96
4400-03	Stapleton	98
4400-04	East Stapleton	100
4401-01	Westerly Creek - South Stapleton	104
4401-02	Westerly Creek - 11th Avenue to Montview	106
4401-03	Westerly Creek - Lowry	108
4401-04	Westerly Creek - South of Alameda	110
4500-01	City Park	114
4500-02	36th & Downing	116
4500-03	Park Hill – Colfax	118
4500-04	Park Hill – 6th Avenue	120
4600-01	Central Business District	124
4600-02	Cherry Creek Mall	126
4600-03	Upper Cherry Creek	128
4600-04	Cherry Creek Reservoir	130
4601-01	Lower Goldsmith Gulch	134
4601-02	Middle Goldsmith Gulch	136
4700-01	Sloan's Lake	140
4800-01	12th & Federal	144
4801-01	12th & Sheridan	144
4900-01	Weir Gulch	148
5000-01	West Washington Park	152
5000-02	University & Mexico North	154
5000-03	University & Mexico South	156
5100-01	Sanderson Gulch	160
5200-01	Harvard Gulch Lower Basin	164
5200-02	Harvard Gulch Middle Basin	166
5200-03	Harvard Gulch Upper Basin	168
5300-01	West Harvard Gulch	172
5401-01	Greenwood Gulch	174
5500-01	Bear Creek - Fort Logan	178
5500-02	Upper Bear Creek	180
5500-03	Academy Park	182
5500-04	Bear Creek - Marston Lake North	184
5500-05	Pinehurst Tributary	186
5501-01	Henry's Lake	188
5901-01	Coon Creek	190





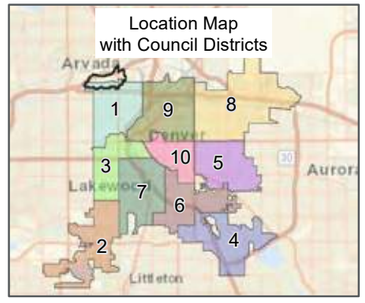
RECOMMENDATIONS

- Modeled Recommendation
- Unmodeled Recommendation

Project Name

- A: N Federal Blvd Outfall
- B: Clear Creek Outfall
- C: W 52nd Ave Outfall

- UDFCD Study Recommendations
- FEMA 100-Year Floodplain
- Existing Storm Main
- Collection System Basin
- Topographic Basin Boundary
- Major Drainageway
- Thalweg
- Existing Storm Detention
- Light Rail
- City Boundary



DATA SOURCE: City and County of Denver, Enginuity Engineering, HDR Engineering, UDFCD

DENVER THE MILE HIGH CITY

SDMP

BASIN 4300-03
CLEAR CREEK - NORTH OF I-70
2019 SDMP

2019 STORM DRAINAGE MASTER PLAN UPDATE

SDMP
STORM DRAINAGE MASTER PLAN
CITY & COUNTY OF DENVER

APPENDIX ~ B

DENVER
THE MILE HIGH CITY

Table 2: Comparison Results of 2014 SDMP and 2019 SDMP

	2014 SDMP	2019 SDMP
Project A 0067-01	Install new 18" and 24" RCPs from W. Quinn Place to W. Stanford Ave. and S. Quitman St.	No proposed updates
Project B 0067-01	Upsize to 42" on storm mains	No proposed improvements to the existing pipe network within the City and County of Denver. As a portion of the existing pipe system is within the City of Englewood a proposed pipe network is needed for the City of Englewoods infrastructure.
Project C 0067-01	No proposal recommended	Upsize to a 42x27-inch Horizontal elliptical pipe
Project D 0067-01	No proposal recommended	Upsize to the City of Englewood pipe network
Project A 0067-02	Install new system along W. Grand Ave connecting to Englewood's storm drain system at W. Grand Ave. and S. Meade St.	Install new system along W. Grand Ave connecting to Englewood's storm drain system at W. Grand Ave. and S. Meade St.
Project B 0067-02	No proposal given	Upsize existing system along W. Grant Ranch Blvd. to a 54-inch and 60-inch outlet pipe

DENVER PUBLIC WORKS

City and County of Denver

2019 Storm Drainage Master Plan Technical Memorandum

Basin 4300-03 (Clear Creek-North of I-70)

Prepared by:
Enginuity Engineering Solutions
10106 W. San Juan Way, Ste. 215
Littleton, CO 80127

Enginuity ENGINEERING SOLUTIONS

2019

Table of Contents

Introduction

As part of the City and County of Denver's 2019 Storm Drainage Master Plan (SDMP), hydrologic and hydraulic modeling were updated for the existing and proposed conditions on a portion of City Basin 4300-03 (Clear Creek-North of I-70). Hydrologic updates include converting the existing modeling to the latest version of the Colorado Urban Hydrograph Procedure (CUHP 2.0.0, Release Date 9/9/16) and using the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 8, Version 2 rainfall depths. Hydraulic modeling was rebuilt in EPA-SWMM 5.1 based on the City's Storm GIS database. Analysis was based on criteria from the City and County of Denver, Urban Drainage and Flood Control District (UDFCD), as well as the User's Manuals for CUHP and EPA SWM. The overall goals and technical criteria behind the modeling update are documented in a separate technical memorandum: *Project-Wide H&H Modeling Criteria*. Please see that memorandum for additional information.

Basin Description

Basin 4300-03 (Clear Creek-North of I-70) describes an area which drains to Clear Creek and is generally bound by Regis Boulevard on the south, Clear Creek on the north and west, and Alcott Street on the east. A 60-inch RCP drains into the basin from the south from Basin 4309-01 (Berkeley lake) and continues through Willis Case Golf Course and then along Sheridan Boulevard to Clear Creek. The majority of the basin is residential, but also includes Regis University and Willis Case Golf Course. Flows travel from the south to the north with overland flows meandering along street corridors.

Design Storms

As stated in the *Project-Wide H&H Modeling Criteria* memorandum, the design study uses the 2-, 5-, and 100-year storm recurrence intervals. 1-hour rainfall depths of 0.795-, 1.06-, and 2.28- inches were used for each storm event respectfully. The details of the street depth criteria is described in the *Project-Wide H&H Modeling Criteria* memorandum.

Hydrology

No changes have been made to the 2014 SDMP drainage basins as part of this 2019 SDMP Update. All drainage basin delineations and their parameters, except the expansion of the naming convention, were maintained from the previous study. Table 1 summarizes the CUHP hydrologic parameters for each sub-basin. The same CUHP model runs were used for both existing and proposed 2019 EPA SWMM model runs. To import the previous analysis CUHP basin parameters, UDFCD's CUHP SWMM Converter Program was used to update CUHP to the current version, CUHP 2.0.0. These basins and their parameters were originally generated using the City's 2004 two-foot topographic mapping, aerial photographs, and the City's GIS pipe data. The percent impervious for each basin was determined based on the *Blueprint Denver: An Integrated Land Use and Transportation Plan* and a impervious surface G.I.S. layer. The updated NOAA Atlas 14 Point

Precipitation Frequency Estimates were used in conjunction with CUHP 2.0, as recommended by UDFCD.

Table 1: Summary of CUHP Hydrologic Parameters Consistent with the 2014 SDMP for Basin 4300-03

						Peak Flow Rate			
Catchment Name/ID	*Area (sq.mi.)*	*Dist. to Centroid (miles)*	*Length (miles)*	*Slope (ft./ft.)*	*Percent Imperv.*	*2-yr (cfs)*	*5-yr (cfs)*	*100-yr (cfs)*	*100-yr Runoff per Unit Area (cfs/acre)*
4300-03-310	0.170	0.398	0.829	0.015	48.66	34.39	52.48	198.16	1.82
4300-03-320	0.183	0.331	0.597	0.041	8.83	5.35	14.98	161.13	1.38
4300-03-330	0.128	0.403	0.639	0.010	55.00	29.34	43.68	151.54	1.85
4300-03-340	0.058	0.303	0.483	0.055	46.35	12.53	19.25	75.17	2.01
4300-03-350	0.065	0.275	0.521	0.052	40.78	11.69	18.53	79.03	1.90
4300-03-360	0.139	0.256	0.530	0.023	69.98	67.83	96.39	277.57	3.11
4300-03-370	0.617	0.530	1.250	0.017	55.00	164.06	244.54	846.47	2.14
4300-03-380	0.041	0.194	0.440	0.011	68.18	13.37	18.99	57.46	2.18
4300-03-382	0.020	0.112	0.242	0.030	52.97	6.03	9.01	31.46	2.46
4300-03-384	0.097	0.312	0.628	0.043	55.00	27.62	41.25	141.97	2.29
4300-03-386	0.075	0.260	0.360	0.016	55.00	21.42	31.98	109.47	2.29
4300-03-390	0.032	0.161	0.313	0.016	55.00	8.52	12.70	43.42	2.15
4300-03-392	0.186	0.350	0.843	0.033	55.00	55.65	82.17	284.04	2.38

SUBCATCHMENTS TRIBUTARY TO FEDERAL MAIN

Hydraulics

The City's existing GIS and topographic data were used to build hydraulic flood routing models in EPA SWMM ver. 5.1. The previous 2014 SDMP models were developed in UDSWMM 2000. The 2019 Update effort did not convert the previous models, but instead developed new models based on the City's Storm GIS data. This rebuild effort allows for more detailed storm drain hydraulic analysis, full integration of results into the City's GIS database, and accurate geospatial referencing of the model. By incorporating the entire storm trunk line into the SWMM model, the 2019 update can more accurately model the system using the full dynamic wave solution (solves for the complete one-dimensional Saint Venant equations) compared to the kinematic solutions (the maximum flow a conduit can convey is the at the conduit's normal depth) that were employed previously. Using the dynamic wave allows for accounting for backwater effects, pipe entrance and exist losses, flow reversal, pressurized flow, multiple conduits and overflow routes exiting a node, developing HGL pipe profiles, and in general provides a more accurate representation of the system.
Using the GIS data to construct the model directly has allowed for a more detailed look at individual pipe segments compared to the previous 2014 SDMP. In addition, the naming of nodes in the

models corresponds to the matching manhole in the GIS database. The naming of the model links also corresponds to the City's GIS pipe data.

Drainage Patterns

In Basin 4300-03 flows generally move north. Basin 4300-03-380 and 4300-03-382 move north along Federal Blvd before connecting with Adams County pipe network. Basin 4300-03-310 flows west along W. 52nd Ave. in a 36-inch pipe before connecting with Basin 4300-03-320 and 4309-01 (Berkeley Lake) heading north in a 54-inch pipe. Basin 4300-03-340 and 4300-03-350 head west in a 36-inch pipe leading into Clear Creek.

Specific problem areas are largely the same as the 2014 SDMP identifies. This includes N. Federal Blvd. outfall as well as Clear Creek outfall running along Sheridan Blvd.

Trans-Basin Flow

Trans-Basin Flow is present from 4309-01 (Berkeley Lake) through a 60-inch pipe through Willis Case Golf Course which consists of 475 C.F.S. in the 100-year event.

Major Split Flows/Diversions

No Major Split Flows/Diversions are present in this portion of Basin 4300-03

Potential Proposed Improvements

As mentioned in the *Project-Wide H&H Modeling Criteria memorandum*, the potential proposed improvements are the estimated improvements that should alleviate flooding such that there is 1 foot of flooding during a 100-year storm event and contain the 5-year storm event. Below is a summary of the comparison between the 2014 SDMP improvements and the 2019 SDMP potential proposed improvements.

Project A: N. Federal Blvd Outfall

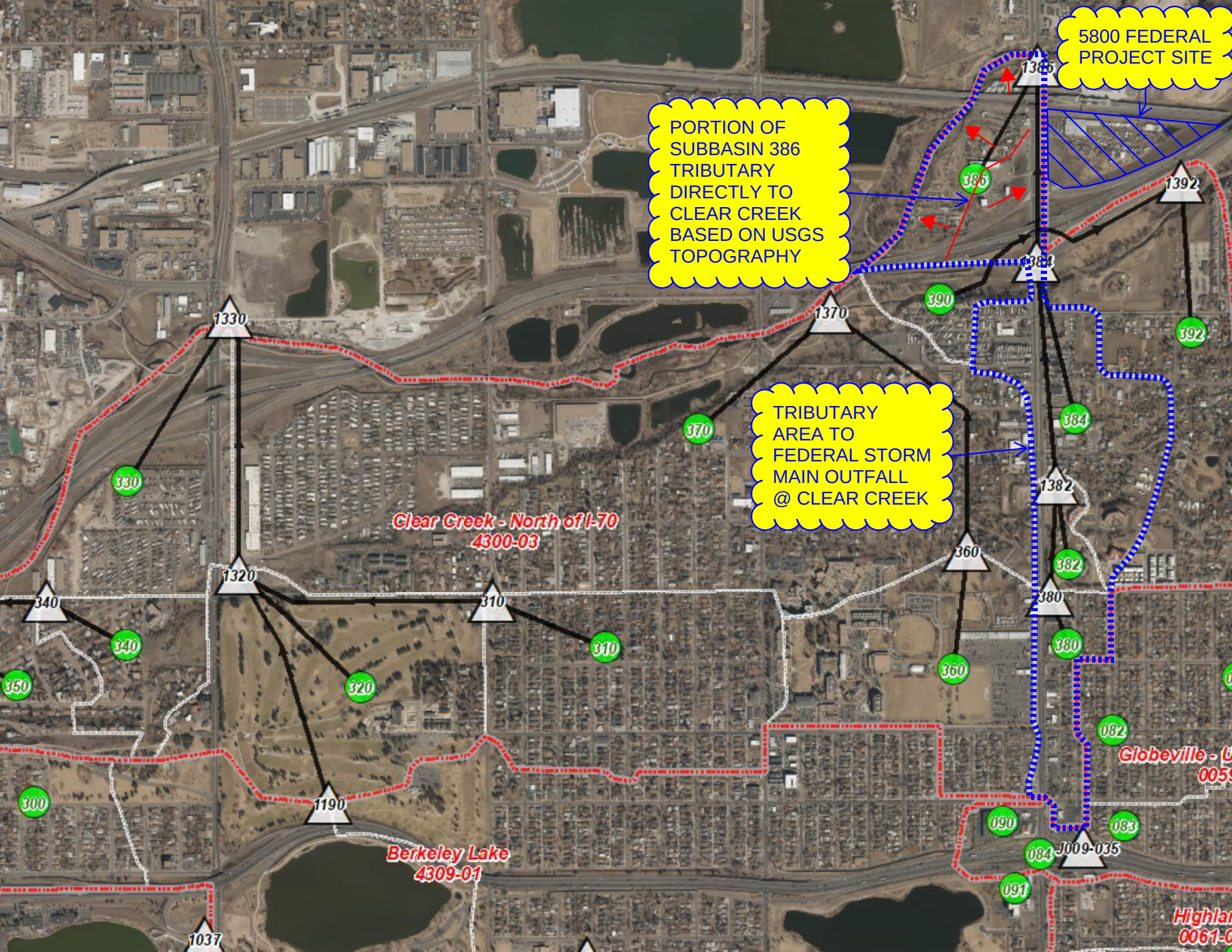
In order to convey the 5-year flow the 12-inch pipe system is upsized to a 24-inch pipe network within the City of Denver.

Project B: Clear Creek Outfall

A proposed upsize of a 60-inch pipe network on the east side of Sheridan Blvd. running along W. 52nd Ave. increases in size to a 66-inch pipe where the Willis Case Golf Course connects. After the connection flows head north along Sheridan Blvd. with a proposed upsizing to a 96-inch pipe.

Project C: W. 52nd Ave. Outfall

An upsize from 36-inch pipe to 60-inch pipe on the West side of Sheridan Blvd running along W. 52nd Ave. before entering Clear Creek.


5800 FEDERAL PROJECT SITE
PORTION OF SUBBASIN 386 TRIBUTARY DIRECTLY TO CLEAR CREEK BASED ON USGS TOPOGRAPHY
TRIBUTARY AREA TO FEDERAL STORM MAIN OUTFALL @ CLEAR CREEK
Clear Creek - North of I-70
4300-03
Berkeley Lake
4309-01
Globeville -
0059
Highlan
0061-C
1386
1392
1384
1330
1370
1382
1320
1190
1037
J009-035
386
390
392
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330
360
382
380
340
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300
090
083
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091
082

FLOOD HAZARD AREA DELINEATION
CLEAR CREEK

Prepared for:

Mile High Flood District

Jefferson County

Adams County

City and County of Denver

City of Golden

City of Wheat Ridge

City of Arvada

September 2022

Prepared by:

ICON ENGINEERING, INC.

7000 S. Yosemite Street, Suite 120
Centennial, CO 80112
303.221.0802 | www.iconeng.com

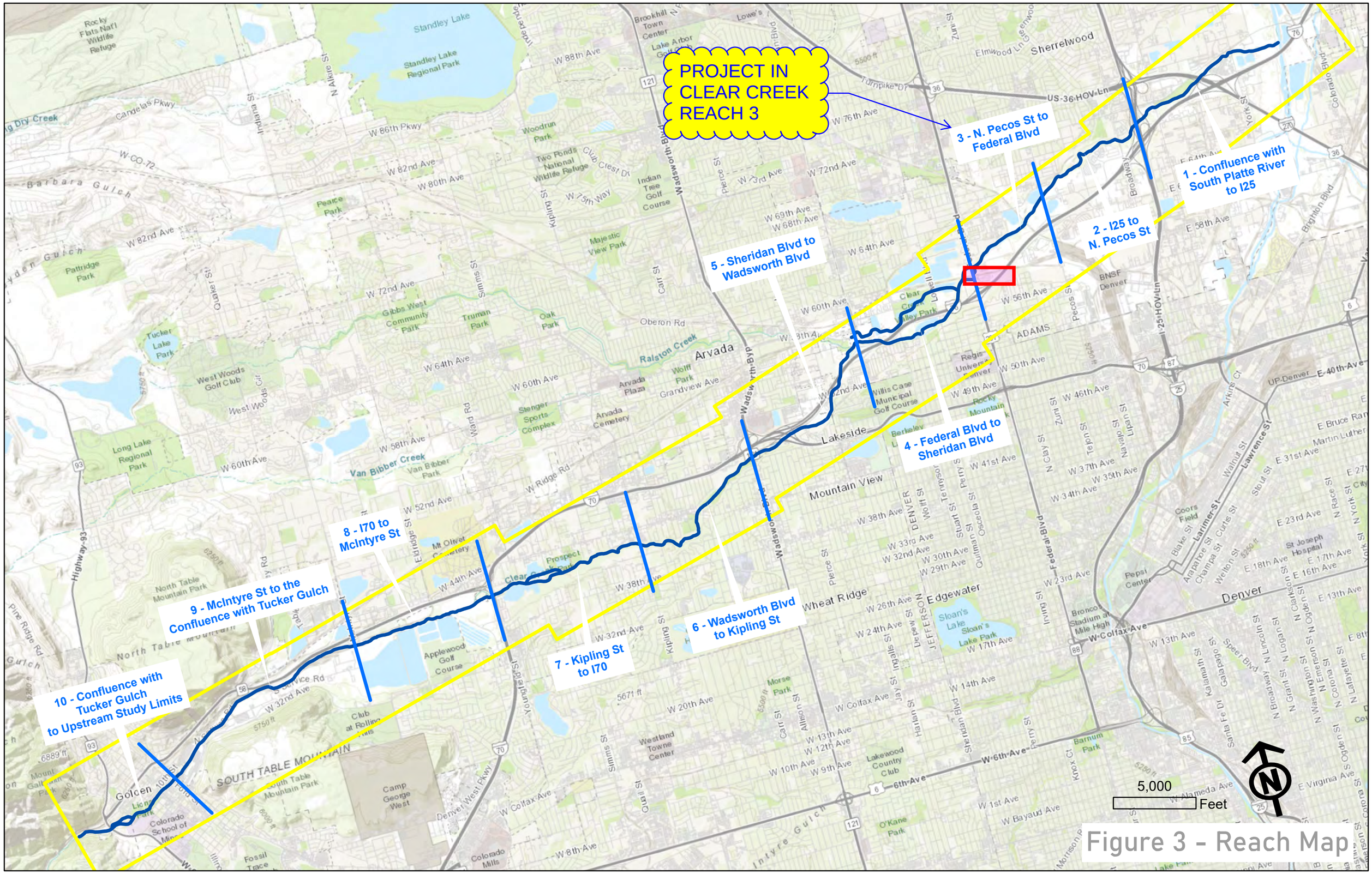
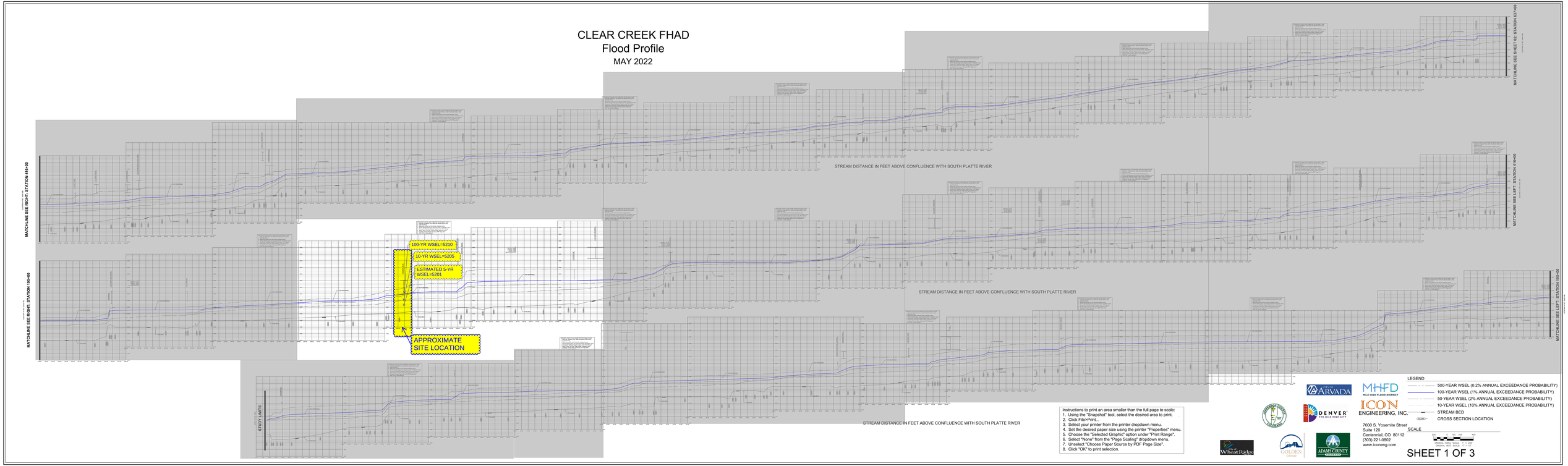


Figure 3 - Reach Map

CLEAR CREEK FHAD
Flood Profile
MAY 2022



Instructions to print an area smaller than the full page to scale:
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2. Click File>Print...
3. Select your printer from the printer dropdown menu.
4. Set the desired paper size using the printer "Properties" menu.
5. Choose the "Selected Graphic" option under "Print Range".
6. Select "None" from the "Page Scaling" dropdown menu.
7. Unselect "Choose Paper Source by PDF Page Size".
8. Click "OK" to print selection.

LEGEND
- 500-YEAR WSEL (0.2% ANNUAL EXCEEDANCE PROBABILITY)
- 100-YEAR WSEL (1% ANNUAL EXCEEDANCE PROBABILITY)
- 50-YEAR WSEL (2% ANNUAL EXCEEDANCE PROBABILITY)
- 10-YEAR WSEL (10% ANNUAL EXCEEDANCE PROBABILITY)
- STREAM BED
- CROSS SECTION LOCATION (XXXXX)

ICON ENGINEERING, INC.
7000 S. Yosemite Street
Suite 120
Centennial, CO 80112
(303) 221-0802
www.iconeng.com

SCALE
0 100 200 400
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 20'

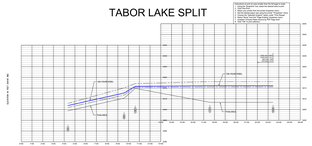
SHEET 1 OF 3

CLEAR CREEK FHAD
Flood Profile
MAY 2022

6TH AVE SPLIT

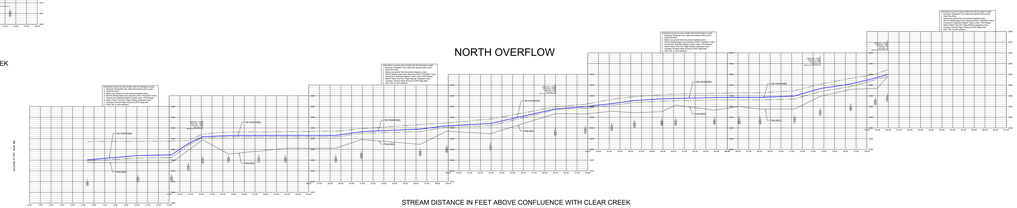
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH CLEAR CREEK

TABOR LAKE SPLIT

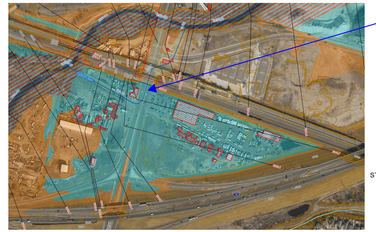


STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH CLEAR CREEK

NORTH OVERFLOW

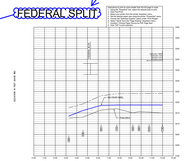


STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH CLEAR CREEK



ADDITIONAL FLOOD PROFILE

FEDERAL SPLIT



STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH CLEAR CREEK

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- 10-YEAR WSEL (10% ANNUAL EXCEEDANCE PROBABILITY)
- STREAM BED
- CROSS SECTION LOCATION

SCALE
0 100 200
ORIGINAL SIZE: 30x42 1" = 200'
ARCHIVAL SIZE: 11x17 1" = 100'

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SHEET 3 OF 3

Level III

TRAFFIC IMPACT STUDY

5800 Federal Boulevard

Adams County, Colorado

June 19, 2023

20230010

Prepared by:

CivTrans ENGINEERING INC.
Arvada, Colorado
(303) 653-9200

This report has been prepared by the staff of CivTrans Engineering Inc. on behalf of Opus Development Company, LLC under the direction of the undersigned professional engineer whose seal and signature appears hereon.

Craig A. MacPhee, PE, PTOE

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TECHNICAL APPENDIX

EXECUTIVE SUMMARY

This Level III Traffic Impact Study (TIS) document has been prepared to supplement a proposed land development and building permit application in unincorporated Adams County, Colorado. The following is a summary of the traffic information and findings included in this report.

1. The proposed project is located along the east side of Federal Boulevard north of I-76 at 58th Avenue within the Adams County, Colorado. A vicinity map is included as **Exhibit 1**.

2. Opus Development Company, LLC is proposing to redevelop the site into a 159,000 square feet industrial building. The site will be accessed from Federal Boulevard at 58th Avenue, which is an existing full-movement access for the site. A separate emergency-only access is also proposed to Federal between 58th Avenue and I-76. The ultimate tenant is not yet identified, but could include warehousing, manufacturing or general light-industrial uses. Completion of the project is anticipated by the end of 2024 with occupancy phased over the next year (2025). A conceptual site plan is included as **Exhibit 2** and a recent aerial of the study area has been provided and is shown on **Exhibit 3**, herein.

3. The proposed site is anticipated to generate 774 daily trips with approximately 118 during the AM peak hour and 103 during the PM peak hour. Of the daily trips, approximately 40 are anticipated to be truck trips, 74 are anticipated to be transit oriented and the remaining 660 are anticipated to be non-truck vehicular trips.

4. The study area was identified to include the following intersections.

    - I-76 Eastbound Ramps & Federal Boulevard
    - I-76 Westbound Ramps & Federal Boulevard
    - 58th Avenue & Federal Boulevard
    - 60th Avenue & Federal Boulevard
    - 64th Avenue & Federal Boulevard

    These intersections were analyzed for the weekday AM and PM peak hour.

5. The analysis horizons considered and evaluated in this report include:

    - Existing Condition (Year 2023)
    - Short-term Condition (Year 2026) without the project
    - Short-term Condition (Year 2026) with the project
    - Long-range Condition (Year 2045) without the project
    - Long-range Condition (Year 2045) with the project

    Each of these analysis horizons included intersection capacity analysis. The short-term build condition includes auxiliary lane evaluation. A gap study was conducted for the intersection of 58th Avenue & Federal Boulevard.

6. Level of service (LOS) D should be used as a guideline to maintain overall operations of signalized intersections and unsignalized intersection approaches. Mitigation measures should be considered for overall signalized intersections or unsignalized approaches reported to be operating at LOS E or F.

7. The analysis results indicate all of the intersections are currently operating at acceptable levels of service except the westbound and eastbound approaches of 58th Avenue.

   The 58th Avenue approaches currently carry very little volume during peak hours. The intersection also lies between two adjacent signals (60th and I-76 westbound ramps), which provide a significant number of gaps in traffic for vehicles from 58th Avenue to make a maneuver. Synchro and the Highway Capacity Manual (HCM) does not account for gaps from adjacent signalized intersections well. Therefore, a gap study was conducted to determine if there are sufficient gaps at 58th Avenue to accommodate the existing approach volume and potentially more for the proposed project. Per the gap study, the existing northbound-southbound combined gaps would allow for at least 108 vehicles during the AM peak and 99 vehicles during the PM peak to make a turning maneuver from 58th Avenue. Therefore, there are a sufficient number of adequate gaps to accommodate the left turning traffic from 58th Avenue.

   The eastbound right turn movement at 64th Avenue & Federal Boulevard is also shown to operate at LOS F during the AM peak hour with over 200 vehicles making this maneuver. Through observations, this movement does not appear to be experiencing the delay shown in the HCM results. However, a right-turn overlap signal may be appropriate for this movement to allow it to operate with a protected phase during the northbound left phase.

   Future Background Conditions (without Project)

8. The study area intersections are anticipated to continue to operate at acceptable levels of service for the short-term and long-range conditions except the 58th Avenue & Federal Boulevard intersection. The 58th Avenue intersection is shown to operate at LOS F for both conditions, but will likely have sufficient gaps in the short-term for vehicles to make maneuvers from 58th. For the long-range condition, the higher volume of traffic projected for Federal Boulevard may result in fewer available gaps at the intersection of 58th Avenue & Federal Boulevard, which may require the intersection to be restricted to ¾ movement or right-in / right-out.

   Future Build Conditions (with Project)

9. With the additional traffic generated by the proposed project, all of the study area intersections are anticipated to operate at acceptable levels of service with little change to the overall level of service shown in the no-project conditions. The gap study shows that there are adequate gaps to accommodate the egress traffic from the site for the short-term condition.

Higher volume of traffic projected for Federal Boulevard for the long-range condition may result in fewer available gaps at the intersection of 58th Avenue & Federal Boulevard, which may require the intersection to be restricted to ¾ movement or right-in / right-out. The conversion of the 58th Avenue access to ¾ movement is not anticipated to result in significant impacts to the other study area intersections. Therefore, the site access should be monitored and converted to ¾ movement when appropriate. This conversion could either be completed with a raised median that permits left turns from Federal, but prohibits left turns and crossing maneuvers from 58th OR installation of a "pork chop" island on the 58th Avenue approach from the site to force vehicle into a right turn.

If the site access at 58th Avenue & Federal Boulevard is restricted to a ¾ movement intersection (left/through movements prohibited), then all of the egress trips from the site would be right turn and those destined for I-76 or other areas to the south would seek alternate routes. Northbound u-turn maneuvers are prohibited at 60th Avenue & Federal Boulevard. However, there is a dedicated left turn lane approximately 1,000' north of 60th Avenue (south of 62nd Avenue) that can accommodate u-turns. A portion of the egress site traffic that has a destination to the south is likely to utilize this location to make a u-turn. Others are likely to utilize 64th Avenue to access Pecos Street or Sheridan Boulevard to get to I-76, I-70 or travel southbound to their destination.

10. An evaluation was conducted to determine if auxiliary lanes are required at the site access (58th Avenue) as a result of the proposed project. The Colorado Department of Transportation (CDOT) State Highway Access Code (SHAC) (2002) was utilized to determine the need for auxiliary lanes. There is an existing southbound left turn lane on Federal Boulevard at 58th Avenue. The existing lane does not meet current standards, but is unable to be elongated due to the proximity of the railroad bridge columns. The 100' storage provided should adequately accommodate the 95th percentile queue for this movement. There are three travel lanes along northbound Federal Boulevard and the third travel lane operates as an auxiliary lane for this roadway. Therefore, no additional right turn deceleration lane should be required.

11. The CDOT State Highway Access Code (2002) was consulted for determining the required sight distance for vehicles entering Federal Boulevard (US 287) from the site access driveway (58th Avenue). Table 4-2 provides required entering sight distances (in feet) based on the highway posted speed, number of lanes and design vehicle. Federal Boulevard has a posted speed of 45 mph through this segment and is a 6-lane arterial (highway) and relatively flat (< 3% grade). Left turns from the site access will only include passenger cars. All trucks will be routed to the north and egress as right turns. Based on these variables, the required entering sight distance is 585 feet for passenger cars and 945 feet for multi-unit trucks. This sight distance should be provided for the proposed site access to Federal, which is measured 10' back from the edge of the roadway at a height of 3.5 feet. The oncoming vehicle height is assumed to be 4.25 feet. Since trucks will

only need line-of-sight to make a right turn, the 945 feet should be applied to the south of the intersection and 585 feet applied to the north of the intersection.

Based on observations during a site visit, there appears to be adequate sight distance for this access. However, the line-of-sight is obscured by the grade-separated bridge columns in the median of Federal south of 60th Avenue. Also, northbound Federal vehicles queued at a red light at 60th Avenue can block the line-of-sight looking north. Furthermore, the westbound I-76 offramp south of the site access has a free right turn that is within the 945 feet required distance, which makes judging adequate gaps more difficult. When developing construction plans for this access, the line-of-sight (sight triangle) should be shown on the plans and any plantings or other visual obstructions within this triangle area should not exceed 3.5 feet in height.

Based on the analysis, findings and conclusions discussed in this report, this project is not anticipated to have significant impact on the surrounding transportation system and no mitigation should be required. The intersection of 58th Avenue & Federal Boulevard is shown to currently have an adequate number of gaps to accommodate the egress traffic from the site. Egress truck trips should be routed to the north due to the additional time it takes trucks to make a left turn maneuver and the obstructed line of sight from the 58th Avenue intersection. As traffic volumes grow along Federal Boulevard over the next twenty years, the number of adequate gaps at 58th Avenue may diminish to a point where there are not enough to accommodate egress traffic from the site. At that point, the intersection may require movement restrictions in the form of a ¾ movement intersection or right-in / right-out. Sight distance at the 58th Avenue & Federal Boulevard intersection appears to be adequate, but has several obstructions that can obscure line-of-sight looking to the north, which include the grade-separated rail bridge columns. A more detailed sight distance investigation should be conducted to confirm there is adequate sight distance.

What would this entail, what is the trigger, and who would typically provide a "more detailed site investigation" to confirm adequate sight distance? This seems too open ended. Clarify if this is only needed in the future for a 3/4 movement conversion.

Please add discussion of the emergency only fire access at the southwest corner of the site and list any traffic related accomodations that are needed (or not needed) to accomodate that access point. CDOT mentioned that they wanted to see an appropriate sight triangle from the emergency only access drive looking backward up the off ramp from I-76. I'm not sure how to apply the sight distance criteria to that scenario, so we would appreciate some guidance in this report in that regard.

Any recommendations for the curb return radius at the new proposed driveway? Should the new driveway have only one lane in the east and west bound directions, or do you recommend a middle left turn lane? If so, what length?

INTRODUCTION

Project Overview

Opus Development Company, LLC is proposing to redevelop a site located along the east side of Federal Boulevard north of Interstate 76, 5800 Federal Boulevard. A 159,000 square foot industrial building is planned for the site with associated parking, truck court and loading docks. The site will be accessed from Federal Boulevard at 58th Avenue, which is an existing full-movement access for the site. A separate emergency-only access is also proposed to Federal Boulevard between 58th Avenue and I-76. The ultimate tenant is not yet identified, but could include warehousing, manufacturing or general light-industrial uses. Completion of the project is anticipated by the end of 2024 with occupancy phased over the next year (2025).

The existing site consists of four parcels totaling approximately 12.2-acres that are currently occupied by Tendit Group, Johnny's Auto Body, 3 Boyz Trucking LLC, outdoor storage areas, a cell tower easement and several vacant residences. Tendit Group performs pressure washing, window cleaning and landscape services. Johnny's Auto Body is an auto body and collision repair shop. 3 Boyz is a trucking and logistics company specializing in asphalt, mill and construction materials. The existing uses will be removed from the site to accommodate the proposed development.

The site is bound by Federal Boulevard to the west, Interstate 76 (I-76) to the south/east and Union Pacific (heavy) and RTD (light) rail to the north. Because of the interstate and rail bordering the site, the only roadway access available is Federal Boulevard, which is a north-south principal arterial and US highway (US 287). Federal Boulevard provides connections to I-76, I-70 and US 6 south of the site and US 36 north of the site.

Purpose of Report

The purpose of this study is to review, assess and identify potential traffic related impacts that the proposed project may have on the transportation network and recommend mitigation to minimize these impacts where necessary and possible. **Exhibit 1** shows the general vicinity of the project in Adams County. A current site plan is shown in **Exhibit 2** and a current aerial image of the study area is included as **Exhibit 3**.

As part of the Adams County engineering submittal requirements, a traffic impact study is required. Based on the anticipated daily trips that will be generated by the project, which is over 500 trips per day, and the Adams County Development Standards and Regulations, a level III traffic impact study is being completed. The assumptions utilized in conducting the traffic analysis are based on direction received from the Standards and Regulations, coordination with Adams County and CDOT staff and standard traffic engineering practices.

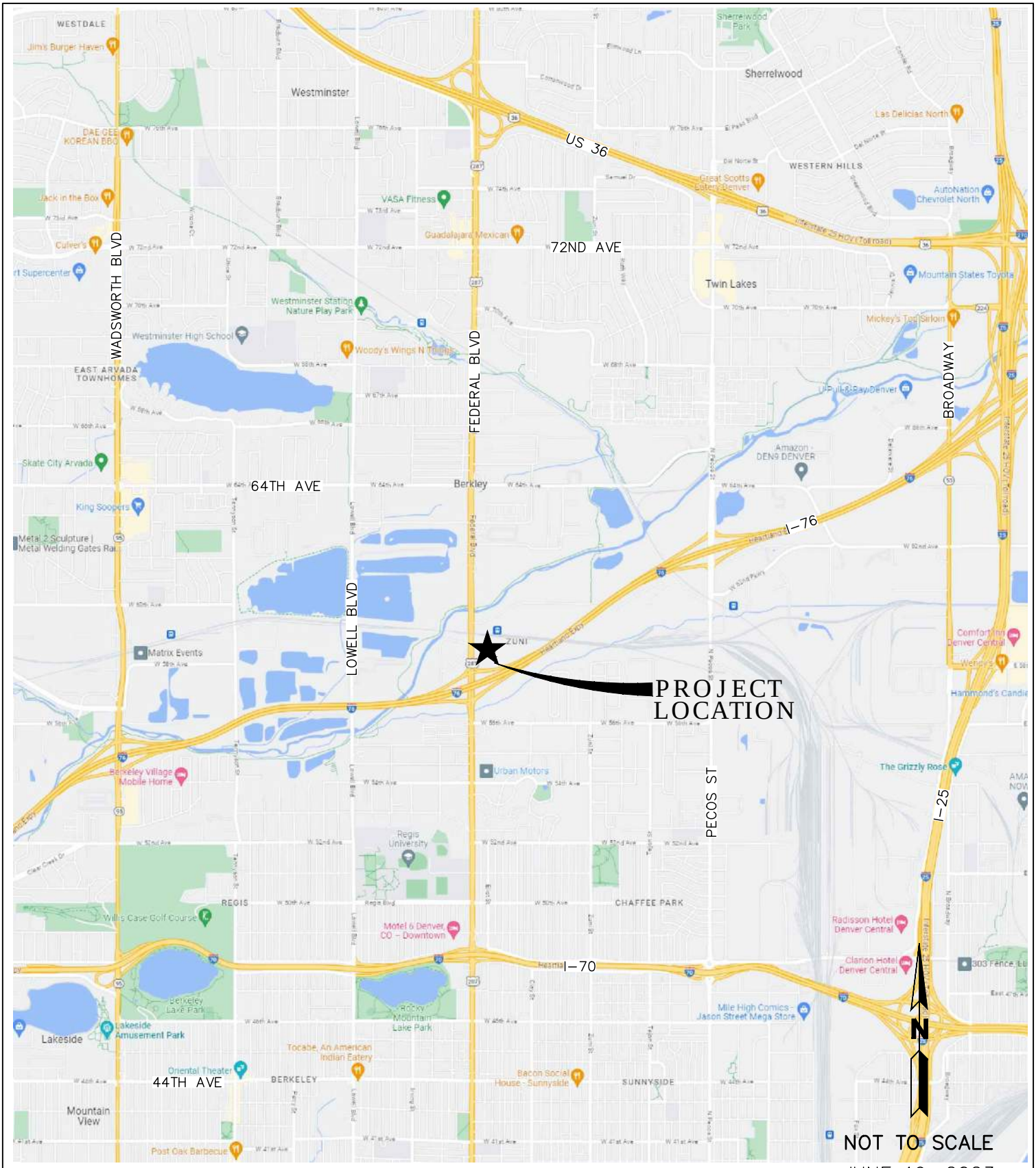
This report includes an evaluation and assessment of the study area for the existing and short-term conditions. The short-term condition considers the traffic in three years (2026)

when the project is completed and has been operational for approximately one year. The long-range (2045) conditions consider the potential growth in traffic within the study area and how the existing transportation will handle those volumes with and without the proposed project approximately 20 years into the future. Weekday AM and PM peak hours of traffic operation were used as the basis of this study.

Resources

The key resources referenced in this TIS included the following:

1. Adams County's *Development Standards and Regulations, 2014*, which provides the criteria and requirements for a traffic impact study within chapter 8.
2. The Colorado Department of Transportation's (CDOT) *State Highway Access Code (2002)*, which provides auxiliary turn lane criteria.
3. The Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 11th Edition*, which compiles and quantifies empirical trip generation rates for specific land uses within the US, UK and Canada.
4. The *Highway Capacity Manual (HCM)* published by the Transportation Research Board, which includes methodologies and procedures for analyzing intersection capacity based on geometry, traffic volumes, intersection control and various other parameters and variables.

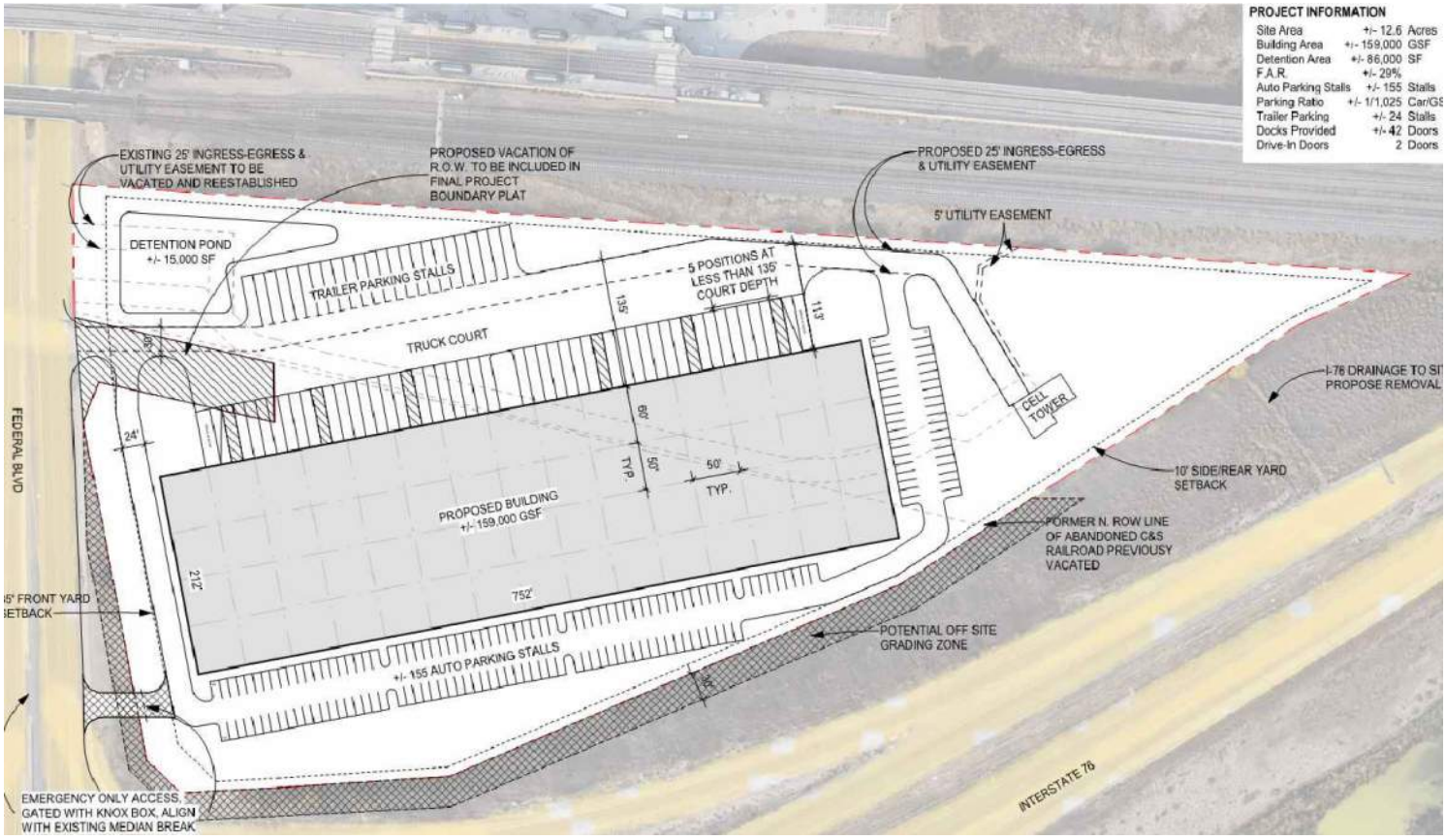


JUNE 19, 2023

EXHIBIT 1

Vicinity Map

CivTrans ENGINEERING INC.



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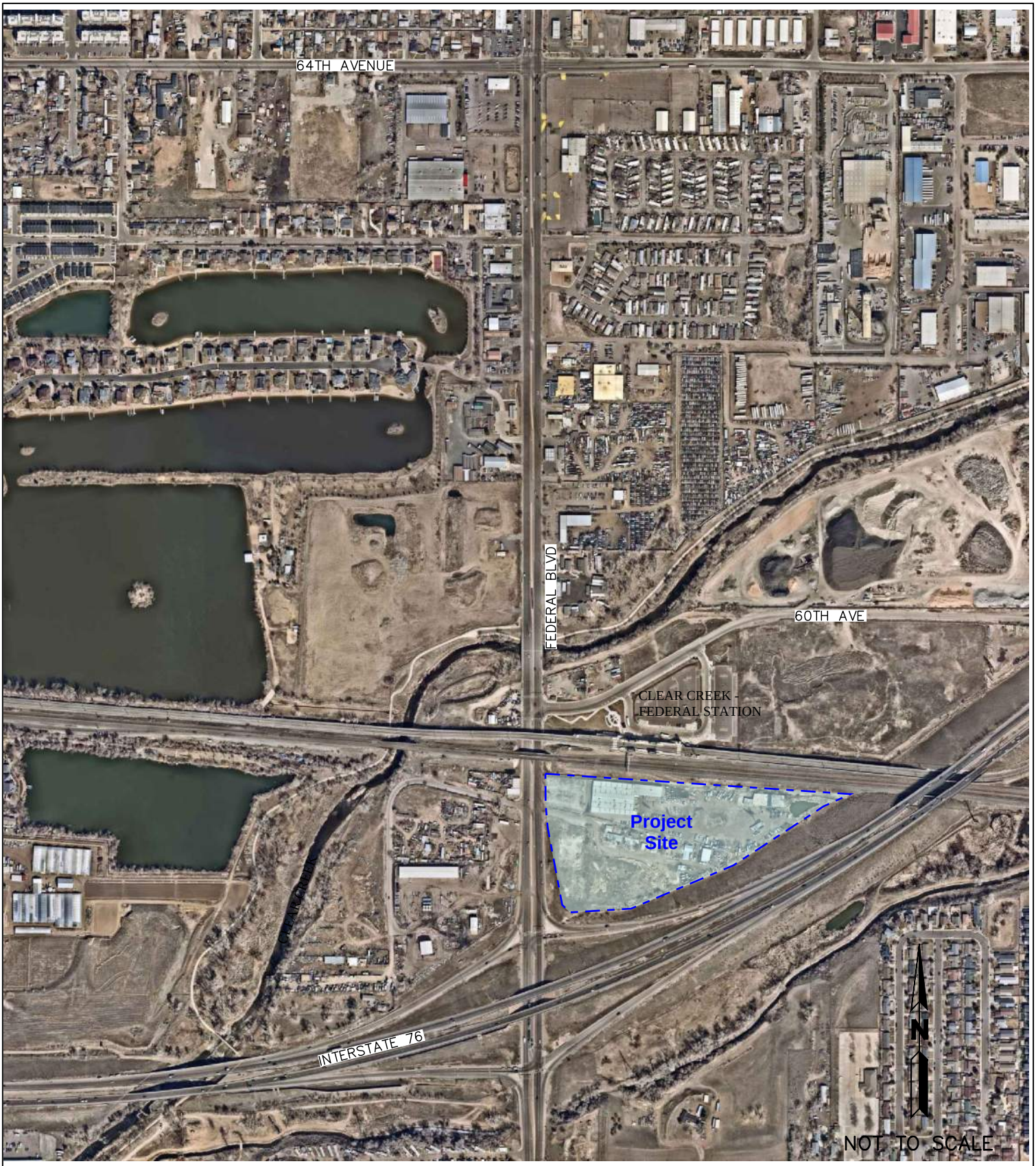
NOT TO SCALE

JUNE 19, 2023

EXHIBIT 2

Current Site Plan

CivTrans ENGINEERING INC.



JUNE 19, 2023

EXHIBIT 3

Current Aerial

Civil Trans ENGINEERING INC.

ANALYSIS METHODOLOGY

The various analyses conducted and reported in this document include intersection capacity analysis auxiliary lane evaluation and sight distance analysis.

Capacity Analysis

The analyses described in this report were performed in accordance with the procedures in the *Highway Capacity Manual* (HCM) and as described below. The analyses and procedures conducted are based upon the worst-case conditions that occur during a typical weekday. Therefore, most of each weekday and the weekends will experience traffic conditions better than those described within this document, which represent the peak hours of operation only.

Level of Service (LOS) is an empirical premise developed by the transportation profession to quantify driver perception for such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles afforded to drivers who utilize the transportation network. LOS has been defined by the Transportation Research Board in the *Highway Capacity Manual, 6th Edition*. This document has quantified level of service into a range from "A" which indicates little, if any, vehicle delay, to "F" which indicates significant vehicle delay and traffic congestion that may lead to system breakdown due to volumes that may far exceed capacity.

The *Highway Capacity Manual* defines the level of service for a signalized intersection as the average delay per vehicle (amount of time a vehicle must spend at the intersection) for the overall intersection. For unsignalized intersections that include both stop-controlled and uncontrolled approaches (known as through/stop controlled), the *Highway Capacity Manual* defines the level of service as the average delay per vehicle for the worst approach, not the overall intersection.

The level of service letter grades as defined by the Transportation Research Board and the associated amount of delay in seconds per vehicle, as well as a brief description of the operating condition, for both signalized and unsignalized intersections are included for reference in **Table 1** on the next page.

Adams County has established level of service D as the minimum acceptable intersection operating condition. Analysis results indicating operations worse than the minimum acceptable level were considered for mitigation measures. In the cases where existing conditions currently operate at or future background conditions are projected to operate at states poorer than the minimum acceptable level, the future with project conditions will be evaluated to maintain the current or projected operating conditions.

Table 1 – Intersection Analysis Criteria

Signalized Intersection Level of Service Criteria

Level of Service	Delay Range (seconds/vehicle)	Expected Delay at Intersection
A	≤ 10	Very low delay. Most vehicles do not stop.
B	> 10 and ≤ 20	Generally good progression of vehicles. Slight delays.
C	> 20 and ≤ 35	Fair progression. Increased number of stopped vehicles.
D	> 35 and ≤ 55	Noticeable congestion. Large portion of vehicles stopped.
E	> 55 and ≤ 80	Poor progression. High delays and frequent cycle failure.
F	> 80	Oversaturation. Forced flow. Extensive queuing.

Unsignalized Intersection Level of Service Criteria

Level of Service	Delay Range (seconds/vehicle)	Expected Delay to Minor Street Traffic
A	≤ 10	Little or no conflicting traffic for minor street approach.
B	> 10 and ≤ 15	Minor street approach begins to notice absence of available gaps.
C	> 15 and ≤ 25	Minor street approach begins experiencing delays for available gaps.
D	> 25 and ≤ 35	Minor street approach experiences queuing due to a reduction in available gaps.
E	> 35 and ≤ 50	Extensive minor street queuing due to insufficient gaps.
F	> 50	Insufficient gaps of suitable size to allow minor street traffic demand to cross safely through a major traffic stream.

Source: Highway Capacity Manual (Transportation Research Board, 2000).

Auxiliary Lane Evaluation

The Colorado Department of Transportation *State Highway Access Code* was used for determining the need for auxiliary lanes for the intersections within the study area. The roadway classification, design speed, and design hourly turning volume are all factors used to determine the need for acceleration, deceleration and turn lanes.

Sight Distance Analysis

The CDOT State Highway Access Code (2002) was consulted for determining the required sight distance for vehicles entering Federal Boulevard (US 287) from the site access driveway (58th Avenue). Table 4-2 provides required entering sight distances (in feet) based on the highway posted speed, number of lanes and design vehicle. When developing construction plans for this access, the line of sight (sight triangle) should be shown on the plans and any plantings or other visual obstructions within this triangle area should not exceed 3.5 feet in height.

Analysis Horizons

The following scenarios were analyzed as part of this study during both the AM and PM peak hours, with the corresponding volume and network configurations as indicated:

1. Existing Conditions

   Analysis of the existing conditions at the study area intersections was based on the turning movement volumes collected in April 2023 and the intersection geometry as observed in the field. Existing traffic control and signal timing was provided by CDOT in a Synchro model for the AM and PM peak hours.

2. Short-term without Project Conditions

   The short-term future year analysis includes the same roadway geometry as for the existing conditions. The forecast volumes were calculated by applying the anticipated ambient growth rate over the next three years.

3. Short-term with Project Conditions

   The short-term “build” condition takes the short-term no-project traffic volumes and adds the trips associated with the proposed project. Any transportation improvements that might be needed for the no-project scenario are included in the build evaluation.

4. Long-range without Project Conditions

   The long-range future year analysis includes the same roadway geometry as for the short-term no-project conditions. The forecast volumes were calculated taking the traffic counts and applying the anticipated ambient growth rate over the next 20+ years.

5. Long-range with Project Conditions

   The long-range “build” analysis includes the same roadway geometry as for the existing conditions. The forecast volumes were calculated by adding the trips associated with the proposed project to the long-range no project volumes.

EXISTING CONDITIONS

Existing Conditions within the Study Area

The purpose of this section is to document the existing conditions within the study area for the proposed project.

Land Use

The site for the proposed project is currently occupied by three businesses, outdoor storage areas, a cell tower easement and several vacant residences. The existing uses will be removed to accommodate the proposed project. The Federal Boulevard corridor to the north of I-76 is a mix of commercial and light-industrial uses until 64th Avenue. North of 64th, Federal serves residential and commercial uses. South of I-76, uses along Federal Boulevard include commercial, residential, and education (Regis University). An RTD light-rail station is located at the southeast corner of 60th Avenue & Federal Boulevard, which accesses the G-line. Federal Boulevard provides interchange access to I-76, I-70 and US 6 south of the site and US 36 north of the site.

Existing Roadways

As shown on the site plan, the site currently provides direct public access to Federal Boulevard at 58th Avenue. A Union Pacific rail and Interstate 76 create barriers for any other access to and from the site. The following is a list of the surrounding streets, their functional classification, and general geometry.

Interstate 76 is an east-west limited-access interstate freeway that travels from I-70 to I-80 through the northeast portion of Colorado. It connects to I-80 in Nebraska and provides regional access for various communities along its length, including Brighton, Fort Morgan, Sterling and Julesburg. Within the study area, it provides a grade-separated diamond interchange with Federal Boulevard and runs in a southwest-northwest alignment.

Federal Boulevard (US 287) is a north-south, six-lane principal arterial and US Highway that extends from Bowles Avenue in Littleton to 120th Avenue in Westminster. Beyond 120th Avenue, the roadway continues as Federal Parkway and connects to Zuni Street at 128th Avenue. Within the study area, it has a CDOT roadway classification of NR-A (Non-rural Principal Highway). Immediately south of the site, Federal Boulevard provides a full-movement diamond interchange access to Interstate 76. Federal Boulevard is posted at 45 mph through the study area.

58th Avenue is an east-west, two-lane local access roadway that provides access for a few industrial parcels west of Federal and the site, which dead-end within a couple blocks of Federal. The roadway has no posted speed limit.

60th Avenue is an east-west, two-lane local access roadway that extends from Federal Boulevard less than a mile to the east where it dead ends. It provides access for the Clear Creek – Federal RTD light-rail station, a grade separated crossing of I-76, an at-grade crossing of the RTD G-line and access for a few industrial uses. The roadway is posted at 30 mph.

64th Avenue is an east-west, three-lane minor arterial that extends from Carr Street to Pecos Boulevard. It provides one travel lane in each direction with a center turn lane along most of its length and serves a mix of residential, industrial and commercial uses. 64th Avenue is posted at 30 mph west and 35 mph east of Federal Boulevard in the study area.

Study Area Intersections

The project study area intersections were identified through conversations with Adams County and Colorado Department of Transportation staff and as outline within the Adams County Development Standards and Regulations. The study area includes the following intersections:

- I-76 Eastbound Ramps & Federal Boulevard
- I-76 Westbound Ramps & Federal Boulevard
- 58th Avenue & Federal Boulevard
- 60th Avenue & Federal Boulevard
- 64th Avenue & Federal Boulevard

These intersections have been analyzed for level of service (LOS) for the weekday AM & PM peak hours and form the basis of this document.

Traffic Control and Descriptions

I-76 Eastbound Ramps & Federal Boulevard is a signalized intersection with the following lane configuration. Federal is oriented north-south. The ramp is one-way eastbound.

- Eastbound (ramp): One left turn lane, one shared left-through lane, one channelized right turn lane
- Northbound (Federal): Three through lanes, one channelized right-turn lane
- Southbound (Federal): Two left turn lanes, two through lanes

The traffic signal is actuated with vehicle detection present at the intersection and coordinated with other signalized intersections along Federal Boulevard from 54th Avenue to 67th Avenue. Very few through movements occur from the eastbound approach and the shared left-through lane operates like a de-facto left turn lane. Left turns from Federal Boulevard operate with a protected (arrow) phase. Right turns are channelized on the eastbound and northbound approaches, each of which discharge into short acceleration lanes. Pedestrian crossings with signals and pushbuttons are provided for the west, south and east legs. Pedestrian crossing is prohibited on the north leg.

I-76 Westbound Ramps & Federal Boulevard is a signalized intersection with the following lane configuration. Federal is oriented north-south. The ramp is one-way westbound.

- Westbound (ramp): One left turn lane, one shared left-through-right lane, one channelized right turn lane
- Northbound (Federal): One left turn lane, two through lanes
- Southbound (Federal): Three left turn lanes, one channelized right turn lane

The traffic signal is actuated-coordinated with vehicle detection present at the intersection. Very few through or right turn movements occur from the westbound shared left-through-right lane, which operates like a de-facto left turn lane. Left turns from Federal Boulevard operate with permissive (flashing yellow arrow) and protected (solid arrow) phases. Right turns are channelized on the westbound and southbound approaches, each of which discharge into add lanes and operate freely. Pedestrian crossings with signals and pushbuttons are provided for the west, north and east legs. Pedestrian crossing is prohibited on the south leg.

58th Avenue & Federal Boulevard is an unsignalized, stop-controlled intersection with 58th Avenue stopping for free-flowing traffic on Federal. 58th Avenue forms the eastbound and westbound approaches with a single lane in each direction. The northbound and southbound approaches each have a left turn lane and three through lanes. Right turns are made from the curbside through lane.

60th Avenue & Federal Boulevard is a signalized intersection with the following lane configuration. Federal is oriented north-south. 60th Avenue forms the westbound approach, which aligns with a private driveway for a used car dealership.

- Eastbound (driveway): single lane driveway
- Westbound (60th): One left turn lane, one right turn lane
- Northbound (Federal): Two through lanes, one through-right lane
- Southbound (Federal): One left turn lane, two through lanes, one through-right lane

The traffic signal is actuated-coordinated with vehicle detection present at the intersection. Northbound left turns are prohibited. Southbound left turns operate with permissive (flashing yellow arrow) and protected (solid arrow) phases. East-west left turns operate with permissive (yield to oncoming traffic) phasing. Pedestrian crossings are provided on all legs of the intersection.

64th Avenue & Federal Boulevard is a signalized intersection with the following lane configuration. Federal is oriented north-south. 64th Avenue is oriented east-west.

- Eastbound (64th): One left turn lane, one through lane, one right turn lane
- Westbound (64th): One left turn lane, one through lane, one right turn lane
- Northbound (Federal): One left turn lane, two through lanes, one through-right lane
- Southbound (Federal): One left turn lane, two through lanes, one through-right lane

The traffic signal is actuated-coordinated with vehicle detection present at the intersection. All left turns operate with permissive (yield to oncoming traffic) and protected (arrow) phases. Pedestrian crossings are provided on all legs of the intersection.

The existing geometry at each of the study area intersections is depicted in **Exhibit 4**, which follows.

Traffic Volumes and Peak Hours of Operation

Turning movement counts were collected under the direction of CivTrans Engineering by All Traffic Data at the study area intersection during the morning (7:00 – 9:00 AM) and afternoon (4:00 – 6:00 PM) peak periods on April 27, 2023, a Thursday. The peak hours of the study area occurred from 7:30-8:30 AM and 4:45-5:45 PM. The existing peak hour volumes from these counts are shown in **Exhibit 5**.

Background Projects

Background projects are land development projects that have not yet been constructed but are anticipated to be completed in the near future. Therefore, their traffic would not have been included in the traffic counts collected, but should be included for future analyses. For this project, no background projects were identified by Adams County for inclusion in this study.

Planned Transportation Improvements

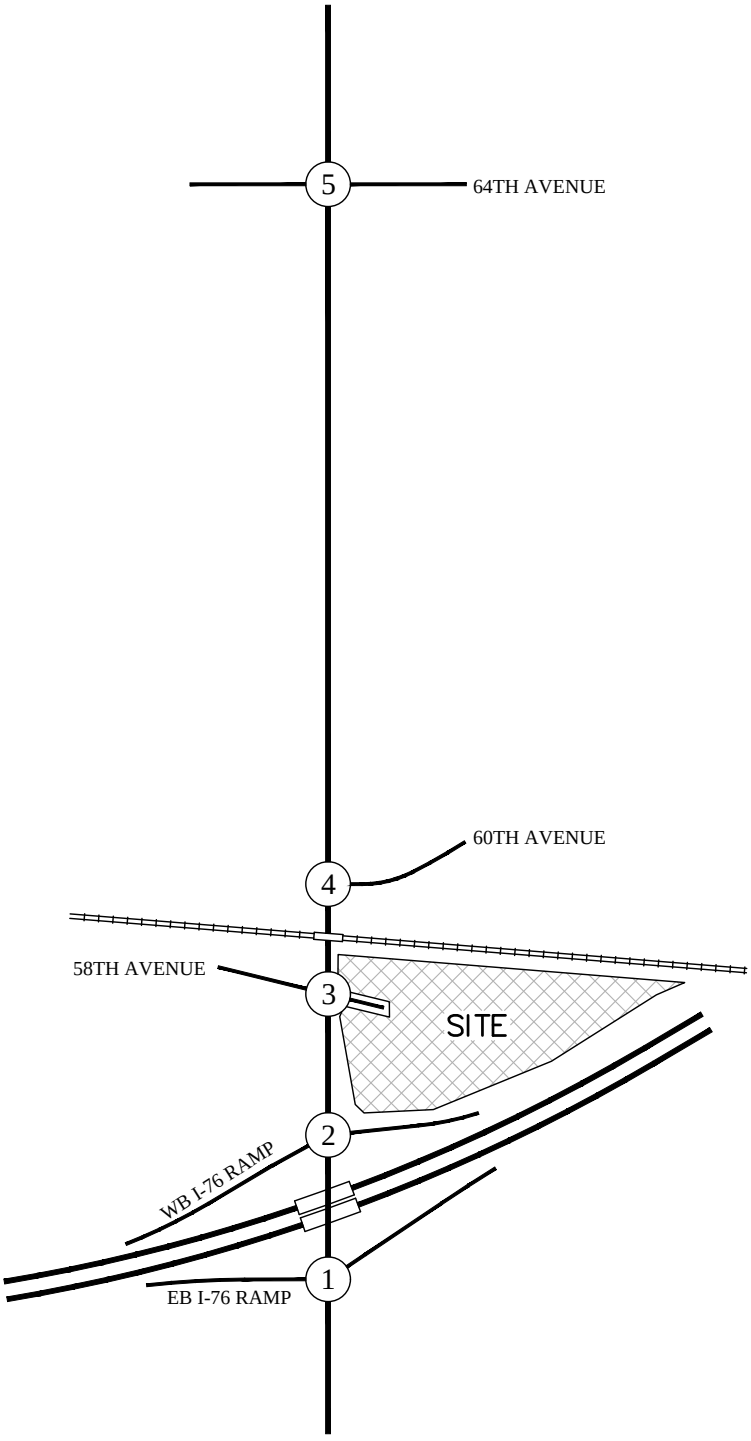
There are no known planned transportation improvements in the vicinity of the site that will impact the study area.

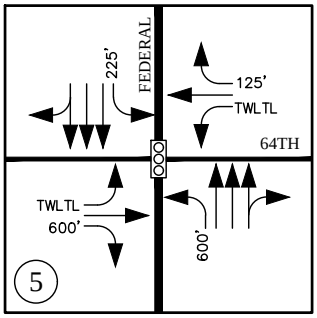
Ambient Traffic Growth

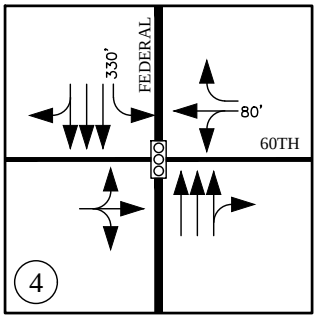
The Colorado Department of Transportation's (CDOT) Online Transportation Information System (OTIS) shows a 20-year growth rate along US Highway 287 (Federal Boulevard) through the study area of 1.16. This 20-year rate corresponds to a 0.75% annual growth rate. Therefore, an annual ambient traffic growth rate of 0.75% was utilized for projecting future traffic at the study area intersections. This results in a growth factor of 1.023 for year 2026 (short-term) and 1.179 for year 2045 (long-range).

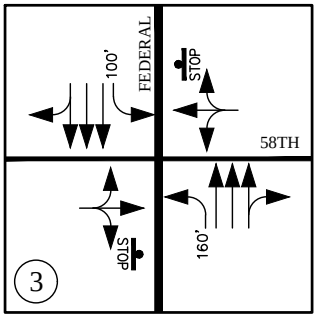
Peak Hour Factor

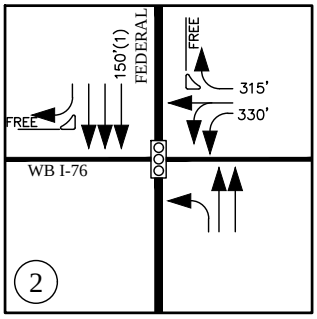
A peak hour factor (PHF) is used to convert the hourly traffic volume into a flow rate that represents the busiest 15 minutes of the peak hour. The intersection PHF derived from the traffic count was utilized for existing and future year evaluations.

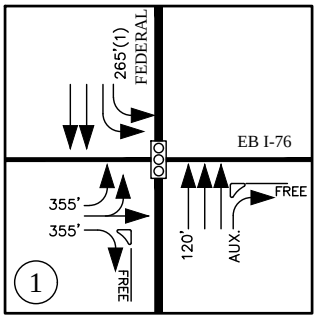












NOT TO SCALE

JUNE 19, 2023

– Signalized intersection

STOP – Stop controlled intersection

XXX' – Approximate storage length of turn lane without transition taper

TWLTL – Two–way left–turn lane becomes dedicated left–turn lane at intersection

AUX. – Auxiliary lane from previous intersection

EXHIBIT 4

Existing Lane Geometry

Civtrans ENGINEERING INC.

EXISTING LEVEL OF SERVICE AND TRAFFIC ANALYSIS

Level of Service

The existing levels of service at the subject intersections were calculated using the methods from the *6th Edition Highway Capacity Manual (HCM)* as implemented in Synchro*, Version 11*. The existing levels of service (LOS) for the intersections within the study area are summarized on the following table. The existing traffic volumes used for this report are shown on Exhibit 5.

Table 2 -2023 Existing Intersections Levels of Service

INTERSECTION (S)ignalized (U)nsignalized		Approach Or Overall	AM Peak		PM Peak	
			Delay (sec)	LOS	Delay (sec)	LOS
I-76 EB Ramps & Federal Blvd	S	Ovr	9.4	A	20.7	C
I-76 WB Ramps & Federal Blvd	S	Ovr	4.2	A	4.1	A
58th Avenue & Federal Blvd	U	EB WB	134.3 13.4	F B	121.7 95.9	F F
60th Avenue & Federal Blvd	S	Ovr	1.2	A	1.6	A
64th Avenue & Federal Blvd	S	Ovr	32.4*	C*	24.9	C

*one or more movement is operating at LOS F

Level of service (LOS) D should be used as a guideline to maintain overall operations of signalized intersections and unsignalized intersection approaches. Mitigation measures should be considered for overall signalized intersections or unsignalized approaches reported to be operating at LOS E or F.

As shown in the table above, all of the intersections are operating at acceptable levels of service except the westbound and eastbound approaches of 58th Avenue. The eastbound right turn movement at 64th Avenue & Federal Boulevard is also shown to operate at LOS F during the AM peak hour.

The 58th Avenue approaches currently carry very little volume during peak hours. The intersection also lies between two adjacent signals (60th and I-76 westbound ramps), which provide a significant number of gaps in traffic for vehicles from 58th Avenue to make a maneuver. Synchro and the Highway Capacity Manual (HCM) does not account for gaps from adjacent signalized intersections well. Therefore, a gap study was conducted to determine if there are sufficient gaps at 58th Avenue to accommodate the existing approach volume and potentially more for the proposed project. The results are shown in the following section and within the technical appendix.

The eastbound right turn at 64th Avenue & Federal Boulevard is shown to be currently operating at LOS F with over 200 vehicles making this maneuver during the AM peak hour. Through observations, this movement does not appear to be experiencing the delay shown in the HCM results. However, a right-turn overlap signal may be appropriate for

this movement to allow it to operate with a protected phase during the northbound left phase.

The HCM level of service reports are included within the technical appendix. Also, table 10 at the end of this document (prior to the technical appendix) shows the intersection and approach delay and level of service for all of the scenarios evaluated.

Gap Study

Intersection gap data was obtained hourly along Federal Boulevard at 58th Avenue during a 24-hour period on April 27, 2023. The number of gaps for various interval durations were counted. Northbound-only and northbound-southbound combined were counted. The following table shows the gaps that occurred from 7:00 AM to 8:00 AM and at 4:00 PM to 5:00 PM.

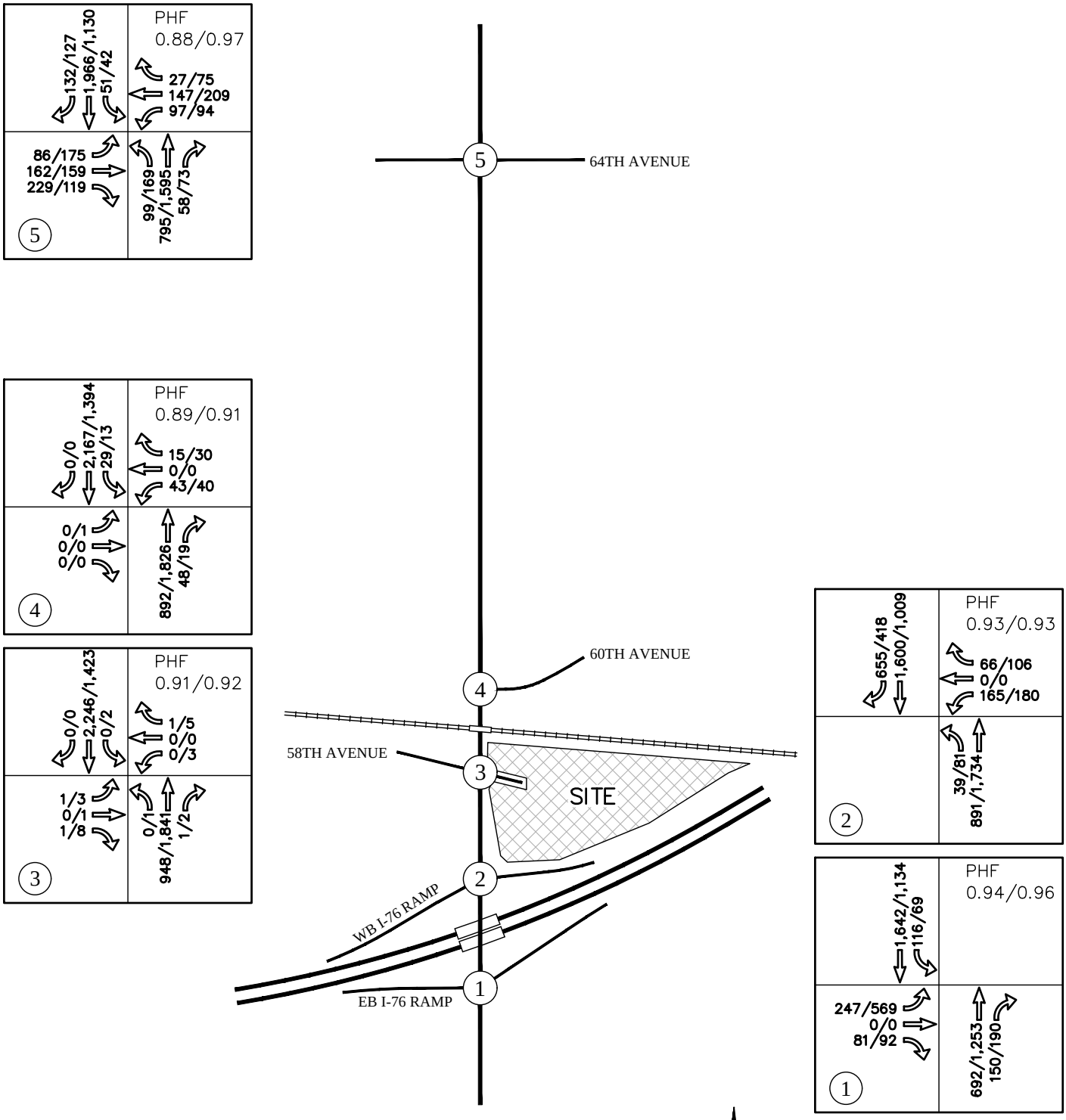
Table 3 -Gap Data for 58th Avenue & Federal Boulevard

Time	Gap (seconds)					Total
	0-4	4-8	8-16	16-32	32+	
Northbound-Southbound Combined						
7:00-8:00a	2,078	165	124	72	18	2,457
4:00-5:00p	2,534	152	72	65	17	2,840
Northbound-Only						
7:00-8:00a	663	81	66	52	7	869
4:00-5:00p	1412	90	36	20	7	1565

Per the American Association of State Highway and Transportation Officials' (AASHTO) *A Policy on Geometric Design of Highways and Streets (2018)*, the necessary gap for a passenger car to make a left turn from a stop-controlled approach is calculated as 7.5 seconds plus 0.5 seconds for each lane or median beyond the first lane that the vehicle must cross. For a vehicle to make a left from 58th Avenue, it must cross three travel lanes on Federal, a 6' wide median and a left turn lane. This equates to requiring an 8.75 second gap. For combination trucks to make a left turn from 58th Avenue, they would a require 13.25 second gap. With a follow up time of 3.5 seconds, two passenger cars could make a left turn maneuver sequentially with a gap greater than 21.0 seconds.

Based on the data shown above, the existing northbound-southbound combined gaps would allow for at least 108 vehicles during the AM peak and 99 vehicles during the PM peak. Therefore, there are a sufficient number of adequate gaps to accommodate the left turning traffic from 58th Avenue.

Left turns from the major roadway (Federal) would also require gaps in traffic to make their maneuver. Per AASHTO, a passenger car making a southbound left at 58th & Federal would require a 7.75 second gap in northbound traffic. Per the data above, the existing northbound-only gaps would allow for at least 152 vehicles during the AM peak and 70 vehicles during the PM peak.



12/34 – AM Peak Hour/PM Peak Hour
PHF – Peak Hour Factor

NOT TO SCALE

JUNE 19, 2023

Source: Traffic counts collected by All Traffic Data Services April 27, 2023.

EXHIBIT 5

Existing (2023) Traffic Volumes

Civtrans ENGINEERING INC.

TRIP GENERATION AND DISTRIBUTION

Trip Generation

The *Trip Generation Manual, 11th Edition* published by the Institute of Transportation Engineers (ITE) is typically used to determine the number of trips generated by a proposed land use. The purpose of the Trip Generation Manual (TGM) is to compile and quantify empirical trip generation rates for specific land uses within the US, UK and Canada. The tenant(s) for the site have not yet been identified and could include manufacturing, warehousing, or another light-industrial use. The closest matching land use category within the Trip Generation Manual is 110 "General Light Industrial." Manufacturing and warehousing tend to generate fewer trips than a general light industrial use. Therefore, land use category 110 should be viewed as a conservative use for estimating trips for the site.

The table below summarizes the trip generation estimate for the site. It includes the total vehicle trips estimated to be generated per the Trip Generation Manual rates and the number of those vehicle trips that are anticipated to be truck trips.

Table 4 – Project Trip Generation

Land Use	ITE Code	Size	Units	Daily Trips	AM Peak Hour			PM Peak Hour		
					In	Out	Total	In	Out	Total
General Light Industrial	110	159.0	KSF*	774	104	14	118	14	89	103
• Trucks				40	1	1	2	1	1	2
• Non-truck trips				734	103	13	116	13	88	101

*KSF = 1,000 square feet

As shown above, the site is estimated to generate approximately 118 vehicular trips during the AM peak and 103 trips during the PM Peak with 774 trips daily. A vehicle entering and exiting the site creates two trips.

Trips for a similar sized manufacturing facility would be comparable to the general light-industrial use. Should the tenant be a warehousing user, the estimated trips would be approximately 25% of the estimate shown in the table above.

Trip Types

Nearly all developments are made up of the following six trip types: new (destination) trips, pass-by trips, diverted trips, shared (internal) trips, multi-modal (non-vehicular) trips, and transit-oriented trips. In order to better understand the trip types available for land access and how they relate to this project, a description of each specific type follows.

New (Destination) Trips – These types of trips occur to access a specific land use such as a new retail development or a new residential subdivision. These types of trips will

travel to and from the new site and a single other destination such as home or work. This is the only trip type that will result in a net increase in the total amount of traffic within the study area. The reason primarily is that these trips represent planned trips to a specific destination that never took trips to that part of the City prior to the development being constructed and occupied. This project will develop new trips.

Pass-by Trips – These trips represent vehicles which currently use adjacent roadways providing primary access to new land uses or projects. These trips, however, have an ultimate destination other than the project in question. They should be viewed as drop-in customers who stop in on their way home from work. A good example is a quick stop at the grocery store to pick up an ingredient for dinner on the way home from work or at a latte stand to grab a coffee on the way to work. This can make this trip pre-determined, but the stop is still on the way by. Another example would be on payday, where an individual generally drives by their bank every day without stopping, except on payday. On that day, this driver would drive into the bank, perform the prerequisite banking and then continue home. In this example, the trip started from work with a destination of home, however on the way, the driver stopped at the grocery store/latte stand and/or bank directly adjacent to their path. Pass-by trips are most always associated with commercial/retail types of developments. Therefore, no pass-by trips are anticipated for this project.

Diverted (Linked) Trips - Diverted trips are like pass-by trips, but diverted trips occur from roadways that do not provide direct access to the site. Instead, one or more streets must be utilized to get to and from the site. Similar to pass-by trips, diverted trips are most always associated with commercial/retail type developments. Due to the type of use diverted trips are not anticipated for this project.

Shared Trips - Internal trips are the portion of trips generated by a mixed-use development that both begin and end within the development. When estimating trip generation for a development with several uses, each use will generate its own trips. If those trips occur between two of the onsite uses without using the external roadway system, it is considered a shared or internal trip. This trip type reduces the number of new trips generated on the public road system and is most commonly used for commercial or mix-use developments. Determining these trip types is more difficult to quantify and without specific guidance are usually determined by engineering judgment on a project by project basis. For this project, the proposed use is the only use on the site. Therefore, no shared (internal) trip reduction was applied to this project.

Multi-Modal Trips - These are non-vehicular trips to and from the site, mostly comprised of pedestrian and bicycle trips. Generally, they are local trips from the surrounding neighborhood or adjacent businesses. If a development is in an area with a high amount of bicycle and pedestrian activity, such as a downtown setting or college campus, a reduction of vehicular trips would be anticipated. The type of use does not experience a significant portion of pedestrian or bicycle trips. Additionally, very few pedestrians or bicycles were counted at the study area intersections.

Transit Trip - The Denver Metro area is served by Regional Transportation District (RTD) with public bus and light rail. The nearest light rail station is approximately ¼ of a mile from the site to the north along the G-Line at the Clear Creek - Federal Station. The nearest bus route to the site is along Federal Boulevard with northbound and southbound bus stops at 58th Avenue immediately adjacent to the site. The distance from the site to a regular bus route and a light rail station is very convenient and employees of the facility could easily utilize transit to commute to and from work. There isn't substantial data on the modal split of trips for industrial facilities close to transit. The Trip Generation Manual does provide transit data for residential and office uses. For these uses, transit trips comprise 10% to 20% of the peak hour trips. It would be reasonable to assume this proposed light-industrial use, that will experience a significant portion of its peak hour trips as commuter trips like an office building, will have approximately 10% of those commuter trips be transit oriented and not vehicular. Therefore, a 10% reduction of the non-truck trips shown in Table 4 could be applied to estimate the number of vehicular trips that will be generated by the project to account for the portion that will be transit oriented.

Based on the various trip types depicted above and the nature of the proposed project, a 10% reduction from the non-truck trips shown in table 3 was applied to account for the proximity of transit for the site. This is depicted in the table below.

Table 5 - Project Trips by Type

Trip Type	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Total (from Table 3)	104	14	118	14	89	103
Truck Trips	1	1	2	1	1	2
Transit-Oriented Trips	10	1	11	1	9	10
Non-truck Vehicular Trips	93	12	105	12	79	91

Trip Distribution

As shown in the site plan, the site is proposed to be accessed by Federal Boulevard at 58th Avenue. The traffic associated with the project is generally oriented to and from I-76, but can also travel north and south on Federal Boulevard to I-70, US 6 and US 36. Trucks are anticipated to primarily utilize I-76. Right-in/right-out may be applied at the 58th Avenue access to Federal Boulevard for the truck routing to improve safety and reduce delay for truck egress. Egress trucks would travel north on Federal to US 36 or to 64th Avenue and travel eastbound to Pecos Street to access I-76. Considering many factors such as the surrounding transportation facilities, areas of residential housing, typical commuter patterns and the geography of the area, traffic for the proposed development is anticipated as follows.

- Federal Boulevard south of the site – 70%
    - Federal Boulevard south of I-76 – 30%
    - I-76 west of Federal Boulevard – 25%
    - I-76 east of Federal Boulevard – 15%

- Federal Boulevard north of the site – 30%
    - Federal Boulevard north of 64th Avenue – 24%
    - 64th Avenue west of Federal Boulevard – 5%
    - 64th Avenue east of Federal Boulevard – 1%

These trip distribution percentages are illustrated in **Exhibit 6**. The site-generated peak hour vehicular trips are illustrated in **Exhibit 7**.

If the site access at 58th Avenue & Federal Boulevard is restricted to a ¾ movement intersection (left/through out prohibited), then all of the egress trips from the site would be right turn and those destined for I-76 or other areas to the south would route differently than above. Northbound u-turn maneuvers are prohibited at 60th Avenue & Federal Boulevard. However, there is a dedicated left turn lane approximately 1,000' north of 60th Avenue (south of 62nd Avenue) that can accommodate u-turns. A portion of the 70% that has a destination to the south is likely to utilize this location to make a u-turn. Others are likely to utilize 64th Avenue to access Pecos Street or Sheridan Boulevard to get to I-76, I-70 or travel southbound to their destination. The following is the anticipated egress trip distribution if the 58th Avenue intersection is restricted to ¾ movement. Ingress trip distribution is anticipated to be as shown above as it would not be restricted.

<u>Egress for ¾ Movement</u>

- Federal Boulevard northbound from the site – 100%
    - U-Turn to head southbound south of 62nd – 35%
        - Federal Boulevard south of I-76 – 15%
        - I-76 west of Federal Boulevard – 5%
        - I-76 east of Federal Boulevard – 15%
    - Federal Boulevard north of the 62nd – 65%
        - Federal Boulevard north of 64th Avenue – 25%
        - 64th Avenue west of Federal Boulevard – 25%
        - 64th Avenue east of Federal Boulevard – 15%

The ¾ movement egress trip distribution is also shown in **Exhibit 6** and site-generated trips for this distribution are shown in **Exhibit 8**.

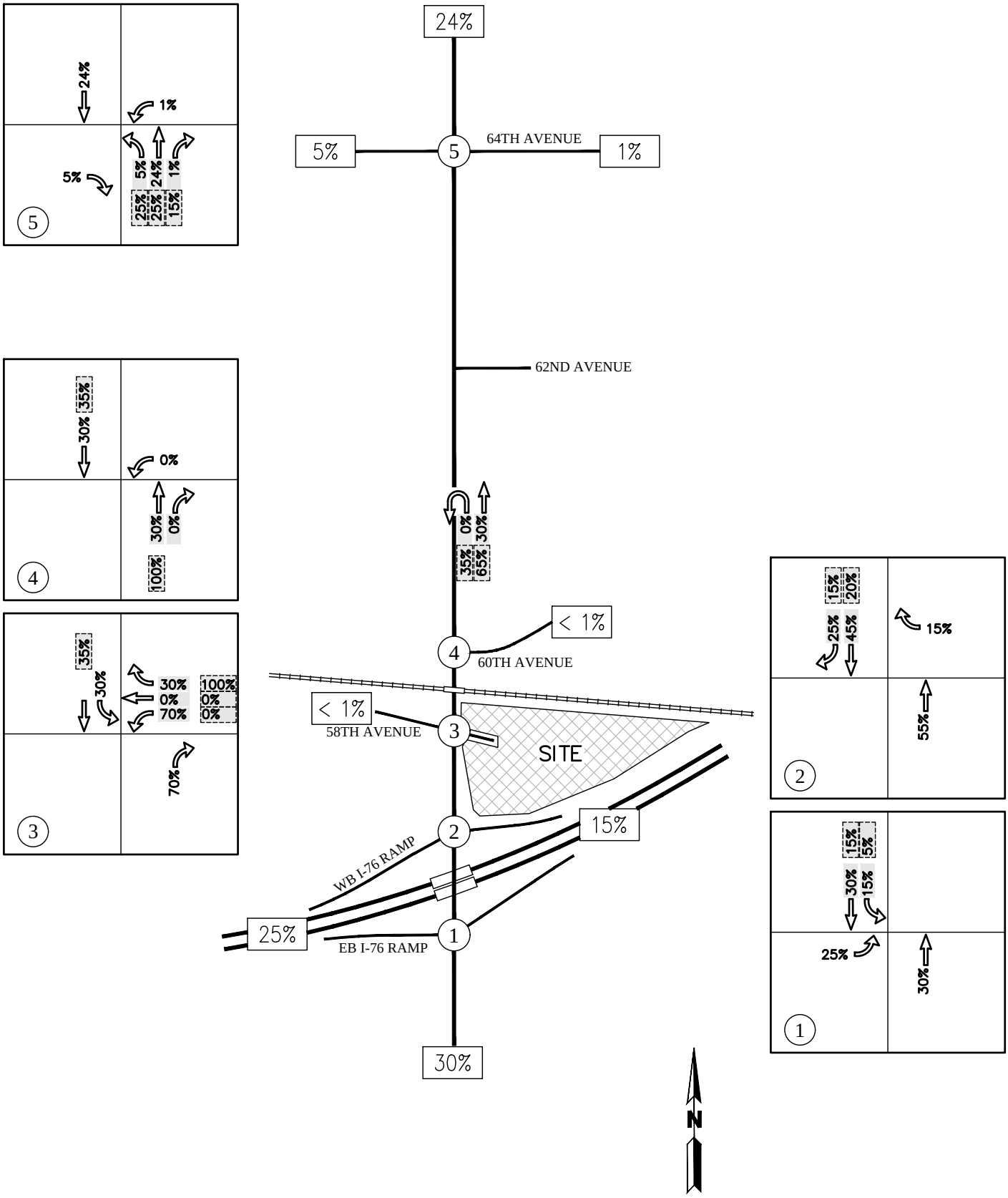
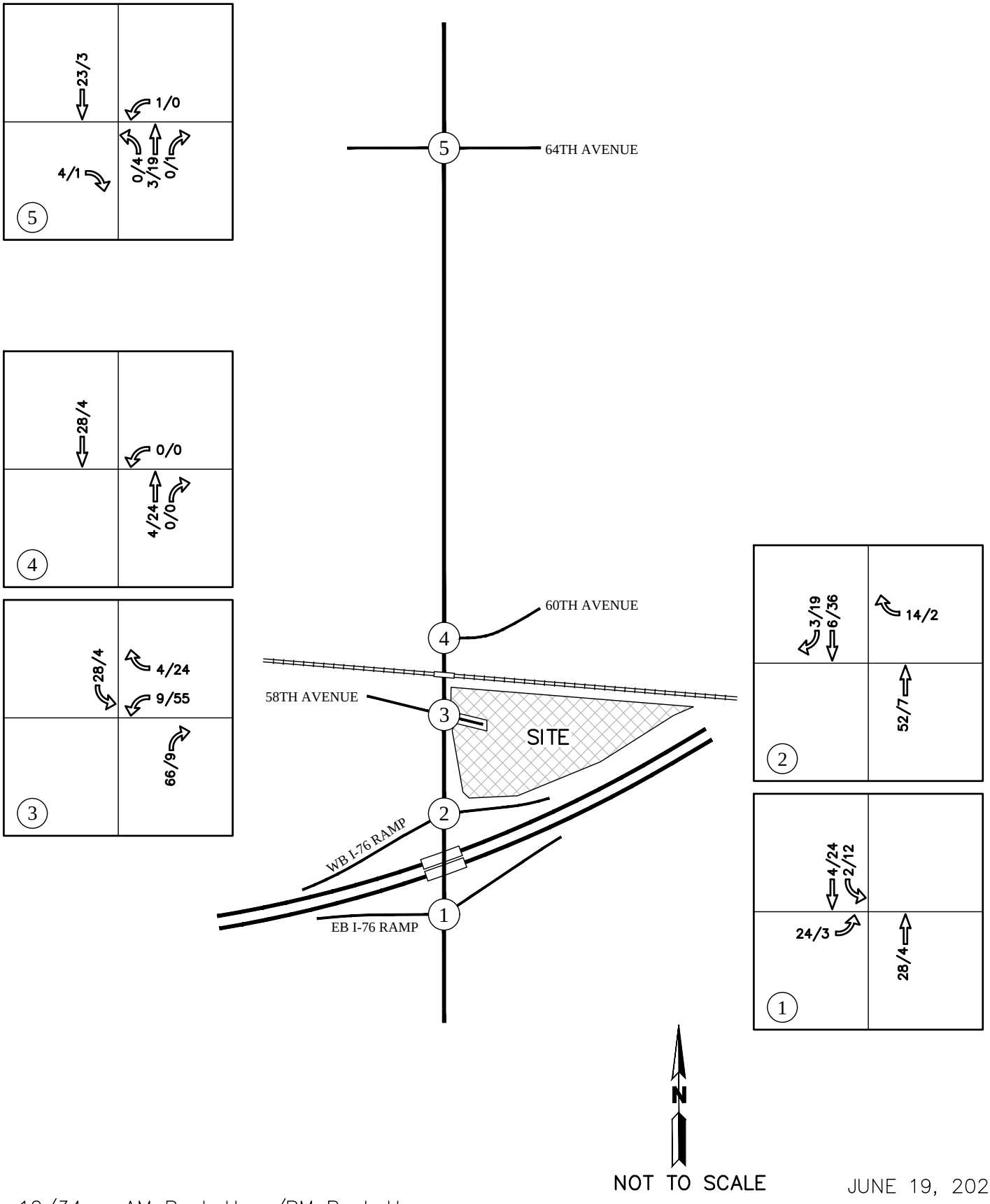


EXHIBIT 6

General Site Distribution

Civtrans ENGINEERING INC.



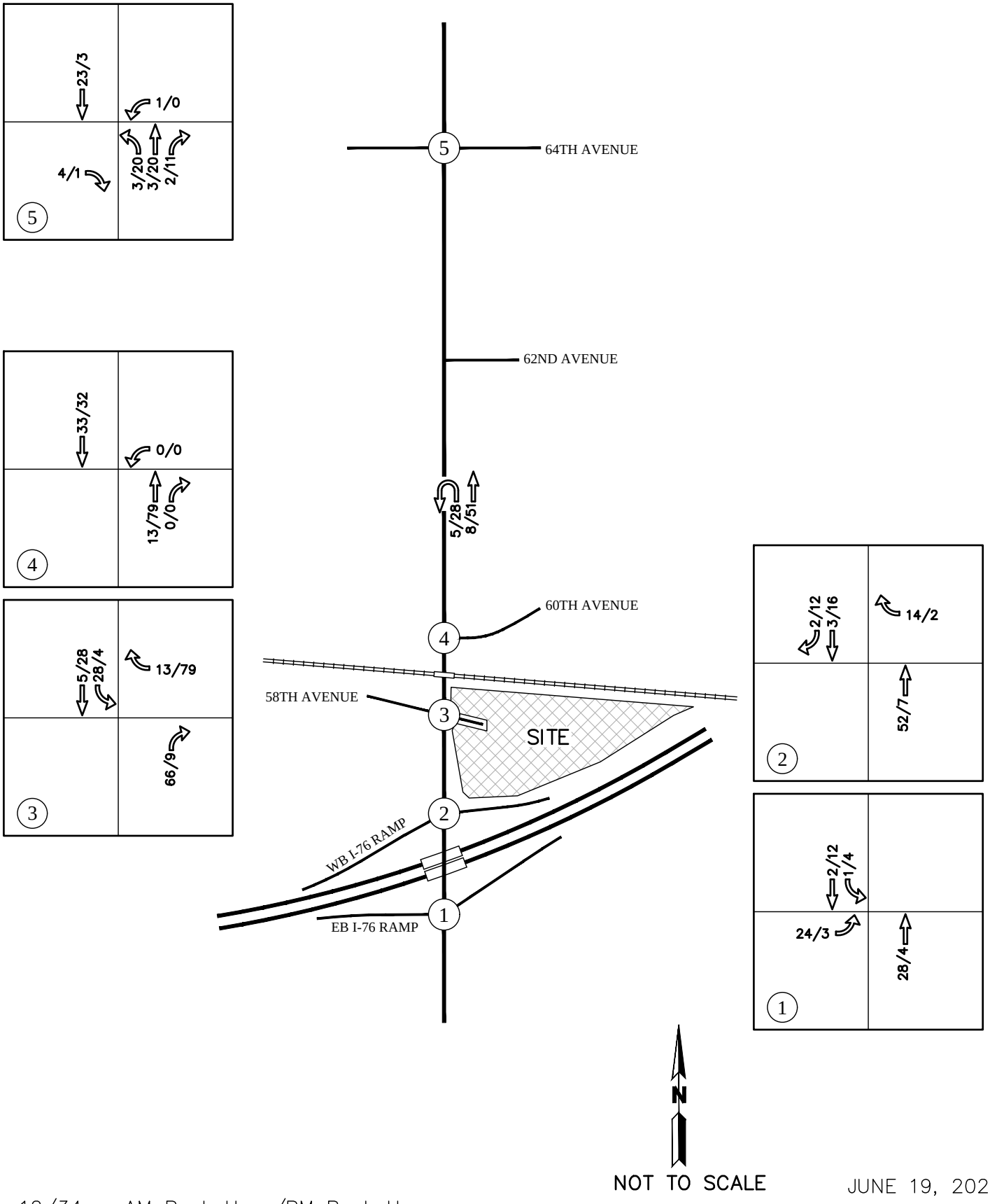
12/34 – AM Peak Hour/PM Peak Hour

JUNE 19, 2023

EXHIBIT 7

Site-Generated Trips

Civtrans ENGINEERING INC.



NOT TO SCALE

JUNE 19, 2023

12/34 – AM Peak Hour/PM Peak Hour

EXHIBIT 8

Site-Generated Trips (3/4 Movement)

CivTrans ENGINEERING INC.

FUTURE YEAR TRAFFIC IMPACT ANALYSIS

Level of service calculations for the short-term (Year 2026) and long-range (Year 2045) conditions assumed that the existing traffic volumes as shown on Exhibit 5 experience a background increase above the 2023 volumes at 0.75% per year along the study area roadways. Two scenarios were examined for each of the future scenarios, one without the proposed project and one with the proposed project completed. A list of the future scenarios follows.

- Short-term Condition (Year 2026) without the project
- Short-term Condition (Year 2026) with the project
- Long-range Condition (Year 2045) without the project
- Long-range Condition (Year 2045) with project

These scenarios will allow a specific comparison of impacts to the study area intersections and allow a determination to be made as to the extent of the project's impact and if any mitigation measures will be required.

Short-Term Condition (Year 2026) without the project

Level of Service

The intersections were analyzed for capacity, delay and level of service using Highway Capacity Manual methodologies as implemented within the Synchro software, version 11. The traffic volumes for this scenario include the existing (Year 2023) traffic volumes as shown on Exhibit 5 with three years of ambient growth applied. The total traffic volumes anticipated under this condition are shown on Exhibit 9. A summary of the results is shown in Table 6, which follow.

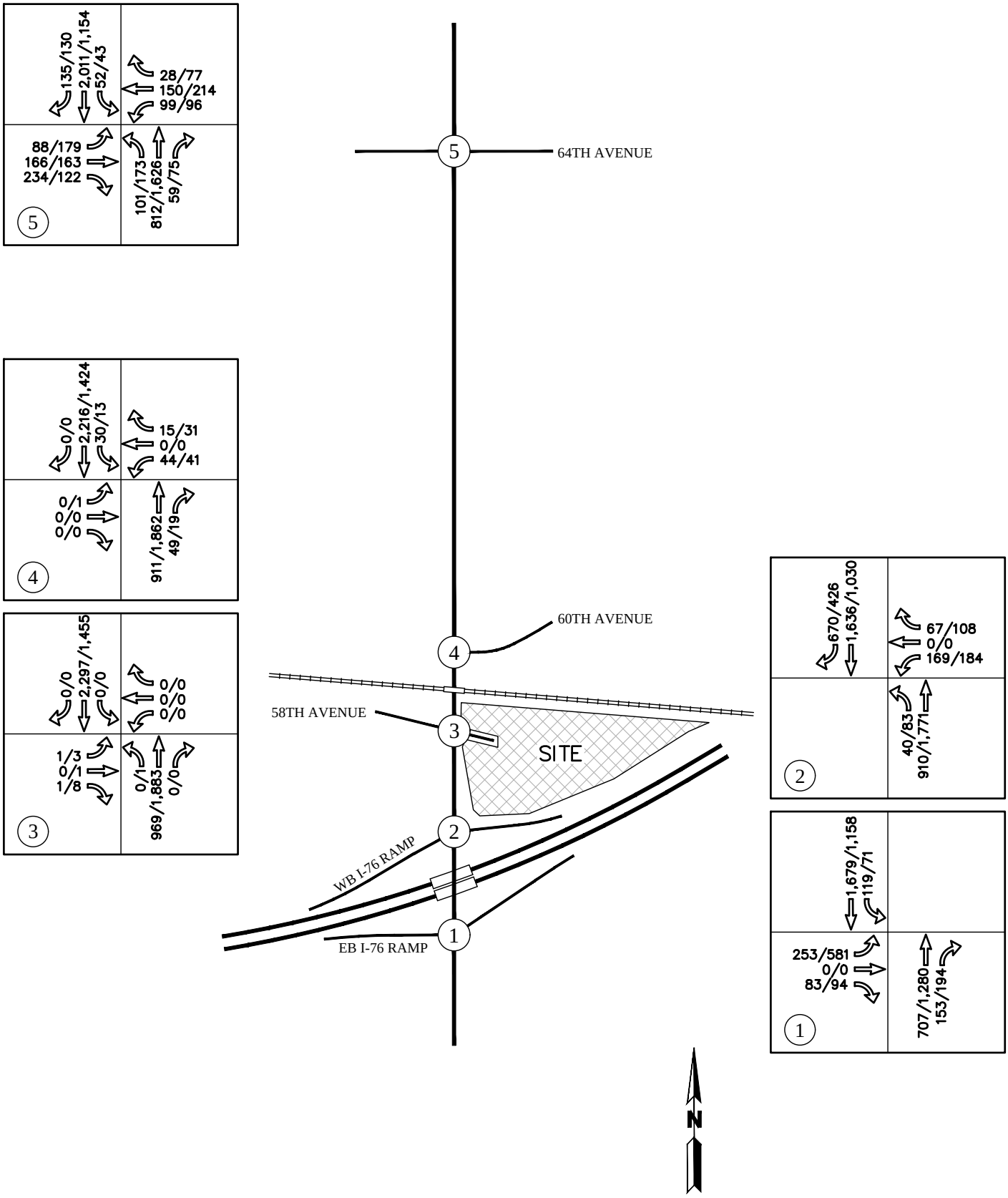
Table 6 -Year 2026 Levels of Service without Project

INTERSECTION (S)ignalized (U)nsignalized		Approach Or Overall	AM Peak		PM Peak	
			Delay (sec)	LOS	Delay (sec)	LOS
I-76 EB Ramps & Federal Blvd	S	Ovr	9.5	A	20.8	C
I-76 WB Ramps & Federal Blvd	S	Ovr	4.2	A	4.2	A
58th Avenue & Federal Blvd	U	EB WB	139.1 -	F -	142.9 -	F -
60th Avenue & Federal Blvd	S	Ovr	1.2	A	1.7	A
64th Avenue & Federal Blvd	S	Ovr	33.3*	C*	25.6	C

*one or more movement is operating at LOS F

With the anticipated increase in traffic over the next three years, the intersections within the study area are anticipated to continue to operate at acceptable levels of service. The intersection of 58th Avenue & Federal Boulevard, which is shown to operate at LOS F in the Highway Capacity Manual results is currently experiencing an adequate number of

gaps in traffic created by the adjacent signals at 60th and the I-76 ramps to accommodate 108 AM peak hour and 99 PM peak hour entering vehicles from 58th Avenue.



NOT TO SCALE

JUNE 19, 2023

12/34 – AM Peak Hour/PM Peak Hour

Note: Existing trips associated with the uses on the 5800 Federal site have been removed for analysis purposes.

EXHIBIT 9

Short-term (2026) No Project Traffic Volumes

CivTrans ENGINEERING INC.

Short-term Condition (Year 2026) with the Project

The traffic volumes included in this scenario include the short-term (year 2026) no-project traffic volumes as shown on Exhibit 9 plus the additional traffic from the proposed project, as shown on Exhibit 7. The total traffic volumes anticipated under this condition are shown on Exhibit 10. A summary of the Highway Capacity Manual results is shown in Table 7, which follows.

Table 7 -Year 2026 Levels of Service with Project

INTERSECTION (S)ignalized (U)nsignalized		Approach Or Overall	AM Peak		PM Peak	
			Delay (sec)	LOS	Delay (sec)	LOS
I-76 EB Ramps & Federal Blvd	S	Ovr	10.0	A	20.8	C
I-76 WB Ramps & Federal Blvd	S	Ovr	4.2	A	4.1	A
58th Avenue & Federal Blvd	U	EB WB	169.6 79.7	F F	153.6 >300	F F
60th Avenue & Federal Blvd	S	Ovr	1.2	A	1.7	A
64th Avenue & Federal Blvd	S	Ovr	34.1*	C*	25.6	C

*one or more movement is operating at LOS F

With the additional traffic generated by the proposed project, all of the study area intersections are anticipated to operate at acceptable levels of service with little change to the overall level of service shown in the existing conditions. The intersection of 58th Avenue & Federal Boulevard, which is shown to operate at LOS F in the Highway Capacity Manual results is currently experiencing an adequate number of gaps in traffic created by the adjacent signals at 60th and the I-76 ramps to accommodate 108 AM peak hour and 99 PM peak hour entering vehicles from 58th Avenue. The proposed project is anticipated to add 55 left turning vehicles from 58th Avenue during the PM peak hour, which should be able to be accommodated by the available gaps. The level of service reports for the short-term with the project condition are provided in the technical appendix.

Auxiliary Lane Evaluation

An evaluation was conducted to determine if auxiliary lanes are required at the site access (58th Avenue) as a result of the proposed project. The Colorado Department of Transportation (CDOT) State Highway Access Code (SHAC) (2002) was utilized to determine the need for auxiliary lanes. Federal Boulevard (US 287) has a roadway classification of NR-A (non-rural arterial) from I-70 to 120th Avenue. Federal Boulevard is posted at 45 mph through the 58th Avenue intersection.

Federal Boulevard already has left turn lanes in both directions at 58th Avenue The northbound left turn lane is approximately 175’ with a 185’ taper. The southbound left turn lane is approximately 100’ with a 50’ taper. Bridge columns for the Union Pacific and RTD rail are located in the median of Federal Boulevard immediately north of the southbound left turn lane.

The CDOT access code states the following for category NR-A.

“Auxiliary turn lanes shall be installed according to the criteria below.

a) A left turn deceleration lane and taper with storage length is required for any access with a projected peak hour ingress turning volume greater than 10 vph *(vehicles per hour)*. The taper length will be included within the required deceleration length.
b) A right turn deceleration lane and taper is required for any access with a projected peak hour ingress turning volume greater than 25 vph. The taper length will be included within the required deceleration length.
c) Right turn acceleration lane and taper is required for any access with a projected peak hour right turning volume greater than 50 vph when the posted speed on the highway is greater than 40 mph. The taper length will be included within the required acceleration length. A right turn acceleration lane may also be required at signalized intersections if a free-right turn is needed to maintain an appropriate level of service.
d) Right turn deceleration and acceleration lanes are generally not required on roadways with three or more travel lanes in the direction of the right turn except as provided in subsection 3.5.
e) A left turn acceleration lane may be required if it would be a benefit to the safety and operation of the roadway or as determined by subsection 3.5. A left turn acceleration lane is generally not required where; the posted speed is less than 45 mph, or the intersection is signalized, or the acceleration lane would interfere with the left turn ingress movements to any other access.

Based on the CDOT auxiliary lane requirements listed above, the following applies for the intersection of 58th Avenue & Federal Boulevard, the site access.

- Northbound left turn traffic volumes are anticipated to be less than 10 vehicles per hour, which indicates a left turn deceleration lane is not required. However, there is already an existing turn lane that should remain.
- Southbound left turn traffic volumes are anticipated to be 28 vehicles per hour during the AM peak hour. This exceeds the CDOT threshold of 10 vph to require a left turn deceleration lane. The existing lane does not meet current standards, but is unable to be elongated due to the proximity of the railroad bridge columns. The 100’ storage provided should adequately accommodate the 95th percentile queue for this movement.
- Northbound right turn traffic volumes are anticipated to be 66 vph during the AM peak hour and 9 vph during the PM peak hour. The AM peak hour volume exceeds the 25 vph threshold, which indicates a right turn deceleration lane would be required. However, there are three travel lanes along northbound Federal Boulevard. The third travel lane operates as an auxiliary lane for this roadway. No additional right turn deceleration lane should be added.
- Westbound right turn traffic volumes are anticipated to be 4 vph during the AM peak and 24 vph during the PM peak, which falls below the 50 vph threshold for

requiring an acceleration lane. If the access is restricted to ¾ movement, all of the egress traffic for the site would be a right turn, which would correspond to 13 AM and 79 PM peak hour vehicles per hour making this maneuver. In this case, the acceleration lane threshold would be exceeded. However, there is not adequate space to construct an acceleration lane between the access and the grade-separated rail crossing to the north. Furthermore, northbound Federal Boulevard has three travel lanes through the intersection and the third lane operates as an auxiliary lane, which includes acceleration lane usage. Therefore, no acceleration lane should be added.

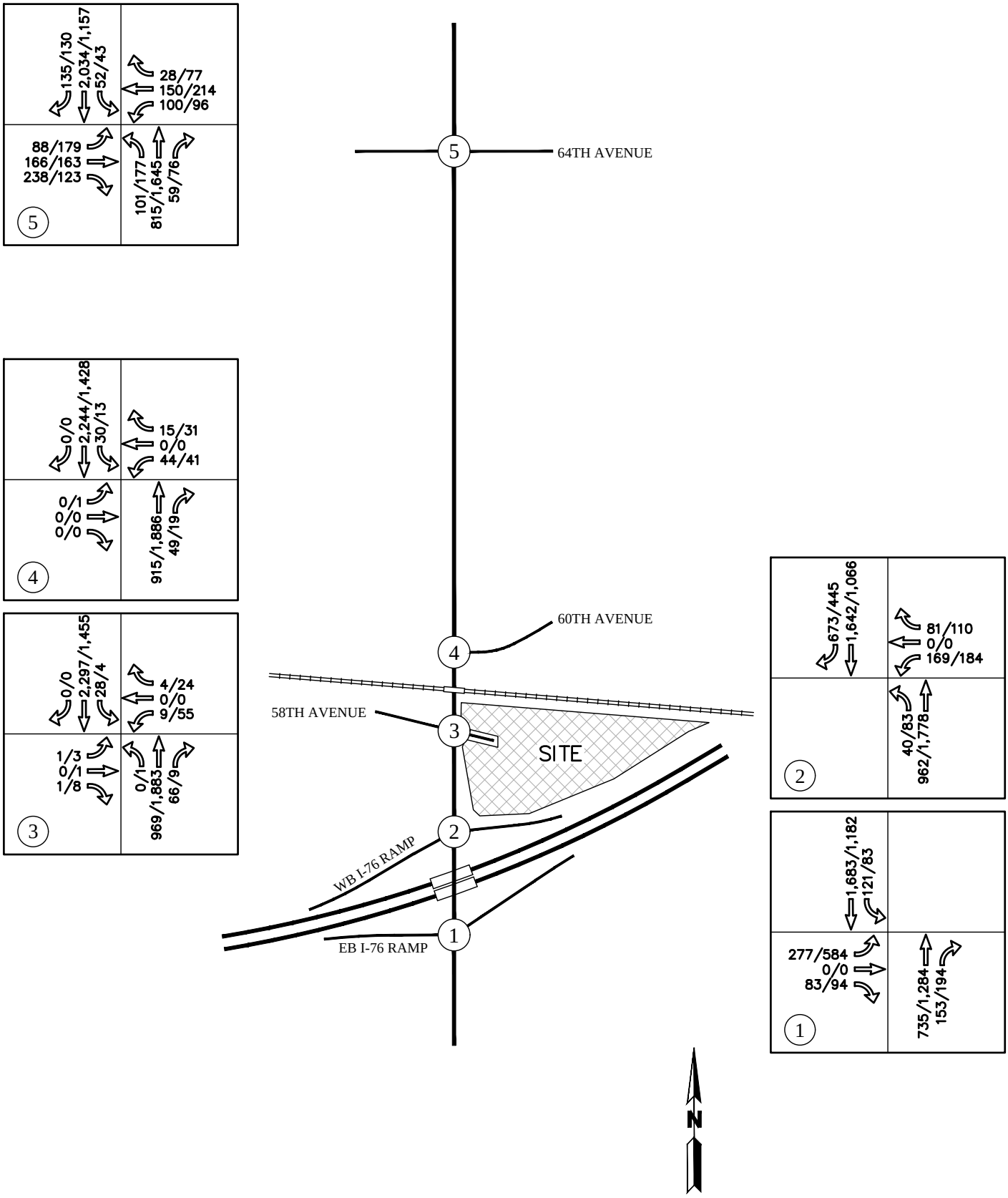
- A left turn acceleration lane would be beneficial for this access to accommodate a two-stage movement for left turning vehicles from the site. However, it would interfere with the northbound left turn for the west 58th Avenue access.

Based on the evaluation presented above, no modifications to the existing auxiliary lanes at the intersection or addition of new auxiliary lanes should be required.

Sight Distance Analysis

The CDOT State Highway Access Code (2002) was consulted for determining the required sight distance for vehicles entering Federal Boulevard (US 287) from the site access driveway (58th Avenue). Table 4-2 provides required entering sight distances (in feet) based on the highway posted speed, number of lanes and design vehicle. Federal Boulevard has a posted speed of 45 mph through this segment and is a 6-lane arterial (highway) and relatively flat (< 3% grade). Left turns from the site access will only include passenger cars. All trucks will be routed to the north and egress as right turns. Based on these variables, the required entering sight distance is 585 feet for passenger cars and 945 feet for multi-unit trucks. This sight distance should be provided for the proposed site access to Federal, which is measured 10' back from the edge of the roadway at a height of 3.5 feet. The oncoming vehicle height is assumed to be 4.25 feet. Since trucks will only need line-of-sight to make a right turn, the 945 feet should be applied to the south of the intersection and 585 feet applied to the north of the intersection.

Based on observations during a site visit, there appears to be adequate sight distance for this access. However, the line-of-sight is obscured by the grade-separated bridge columns in the median of Federal south of 60th Avenue. Also, northbound Federal vehicles queued at a red light at 60th Avenue can block the line-of-sight looking north. Furthermore, the westbound I-76 offramp south of the site access has a free right turn that is within the 945 feet required distance, which makes judging adequate gaps more difficult. When developing construction plans for this access, the line-of-sight (sight triangle) should be shown on the plans and any plantings or other visual obstructions within this triangle area should not exceed 3.5 feet in height.



12/34 – AM Peak Hour/PM Peak Hour

Note: Existing trips associated with the uses on the 5800 Federal site have been removed for analysis purposes.

JUNE 19, 2023

EXHIBIT 10

Short-term (2026) with Project Traffic Volumes

CivTrans ENGINEERING INC.

Long-Range Condition (Year 2045) without the Project

This section focuses on the long-range scenario of the year 2045. This scenario assumes that the project has not been constructed and the site essentially remains undeveloped. This analysis will show how the future traffic volumes will be handled by the existing facilities and what new elements may be needed for the traffic system to continue functioning at an acceptable level of service. The traffic volumes for this condition include the existing traffic, as shown on Exhibit 5 with an ambient background growth applied over the next twenty-two years. Please see Exhibit 11 for the traffic volumes used for this scenario. A summary of the level of service results are shown in Table 7, which follows.

Table 7 -Year 2045 Levels of Service without Project

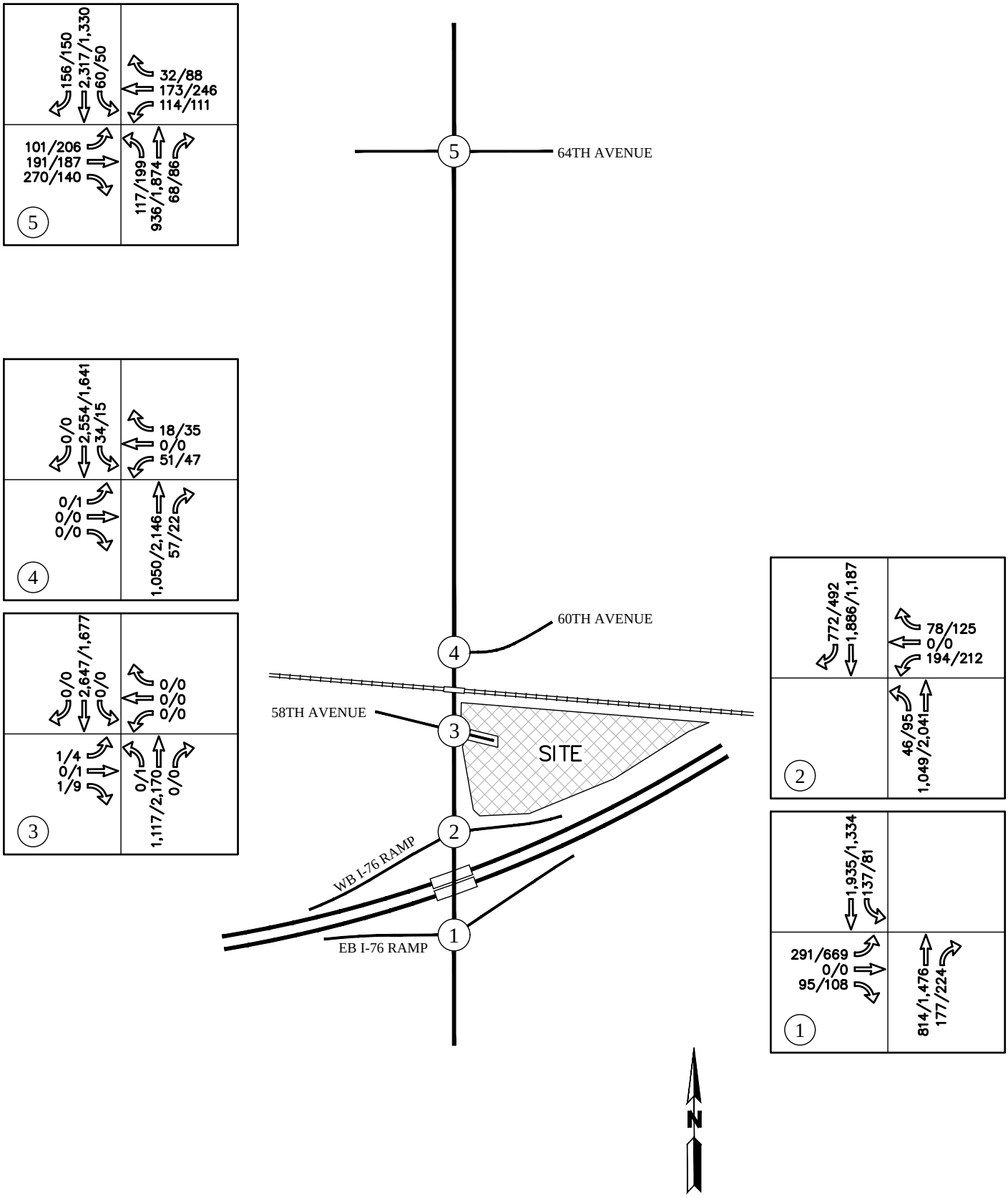
INTERSECTION (S)ignalized (U)nsignalized		Approach Or Overall	AM Peak		PM Peak	
			Delay (sec)	LOS	Delay (sec)	LOS
I-76 EB Ramps & Federal Blvd	S	Ovr	9.9	A	22.0	C
I-76 WB Ramps & Federal Blvd	S	Ovr	4.5	A	4.3	A
58th Avenue & Federal Blvd	U	EB WB	>300 -	F -	>300 -	F -
60th Avenue & Federal Blvd	S	Ovr	1.2	A	1.9	A
64th Avenue & Federal Blvd	S	Ovr	44.5*	D*	30.3	C

*one or more movement is operating at LOS F

For the long-range condition without the proposed project, the study area intersections are generally anticipated to operate at acceptable levels of service and within capacity. Gaps at the 58th Avenue & Federal Boulevard intersection may diminish over the next 20+ years and the 58th Avenue approaches may need to be restricted to ¾ movement or right-in / right-out.

The intersection of 64th Avenue & Federal Boulevard is anticipated to have several movements operating at or near capacity. The eastbound right turn movement is shown to operate above capacity at a volume to capacity ratio (v/c) of 1.42, which may require a modification to this movement's phasing, timing or geometry. The southbound approach is also anticipated to operate at capacity with a v/c of 1.00.

The level of service reports for the long-range no project conditions are provided in the technical appendix.



12/34 – AM Peak Hour/PM Peak Hour

Note: Existing trips associated with the uses on the 5800 Federal site have been removed for analysis purposes.

JUNE 19, 2023

EXHIBIT 11

Long-range (2045) No Project Traffic Volumes

Civtrans ENGINEERING INC.

Long-Range Conditions (Year 2045) with the Project

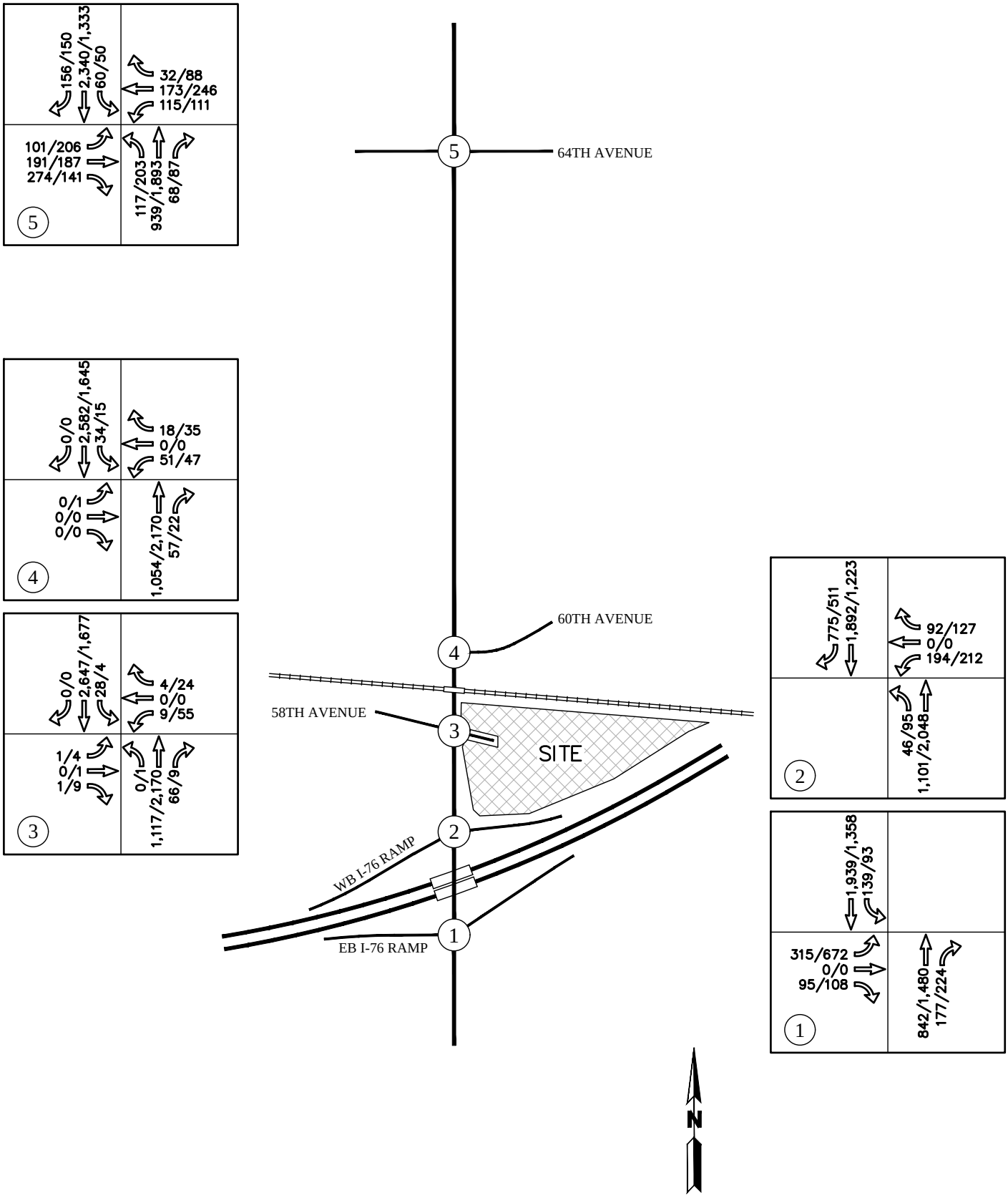
The traffic volumes included in this scenario include the long-range (Year 2045) traffic volumes as shown on Exhibit 11, and the additional traffic from the proposed project, as shown on Exhibit 8 or Exhibit 9. By the year 2045, the volume of traffic on Federal Boulevard may result in fewer gaps at 58th Avenue and the intersection may need to operate as a ¾ movement intersection or right-in/right-out. The total traffic volumes anticipated under this condition, assuming 58th Avenue remains full-movement, are shown on Exhibit 12. If 58th Avenue is restricted to ¾ movement, those the corresponding traffic volumes are shown in Exhibit 13. A summary of the results is shown in Table 8, which follows.

Table 8 - Year 2045 Levels of Service with the Project

INTERSECTION (S)ignalized (U)nsignalized		Approach Or Overall	AM Peak		PM Peak	
			Delay (sec)	LOS	Delay (sec)	LOS
I-76 EB Ramps & Federal Blvd - ¾ movement at 58th Avenue	S	Ovr	10.4 (10.4)	B (B)	22.0 (22.0)	C (C)
I-76 WB Ramps & Federal Blvd - ¾ movement at 58th Avenue	S	Ovr	4.5 (4.5)	A (A)	4.3 (4.4)	A (A)
58th Avenue & Federal Blvd - ¾ movement at 58th Avenue	U	EB WB (EB) (WB)	>300 143.3 (41.1) (15.6)	F F (E) (C)	>300 >300 (21.6) (53.2)	F F (C) (F)
60th Avenue & Federal Blvd - ¾ movement at 58th Avenue	S	Ovr	1.2 (1.2)	A (A)	1.9 (1.9)	A (A)
64th Avenue & Federal Blvd - ¾ movement at 58th Avenue	S	Ovr	45.9* (46.2)	D* (D)	30.3 (30.5)	C (C)

*one or more movement is operating at LOS E/F
- delay and level of service shown in parentheses is associated with ¾ movement at 58th Avenue

The long-range condition with the proposed project results in similar operations at the study area intersection as the no-project condition. The higher volume of traffic projected for Federal Boulevard may result in fewer available gaps at the intersection of 58th Avenue & Federal Boulevard, which may require the intersection to be restricted to ¾ movement or right-in / right-out. The conversion of the 58th Avenue access to ¾ movement is not anticipated to result in significant impacts to the other study area intersections. Therefore, the site access should be monitored and converted to ¾ movement when appropriate. This conversion could either be completed with a raised median that permits left turns from Federal, but prohibits left turns and crossing maneuvers from 58th OR installation of a “pork chop” island on the 58th Avenue approach from the site. The level of service reports for the long-range with the project condition (Year 2045) are provided in the technical appendix.



NOT TO SCALE

JUNE 19, 2023

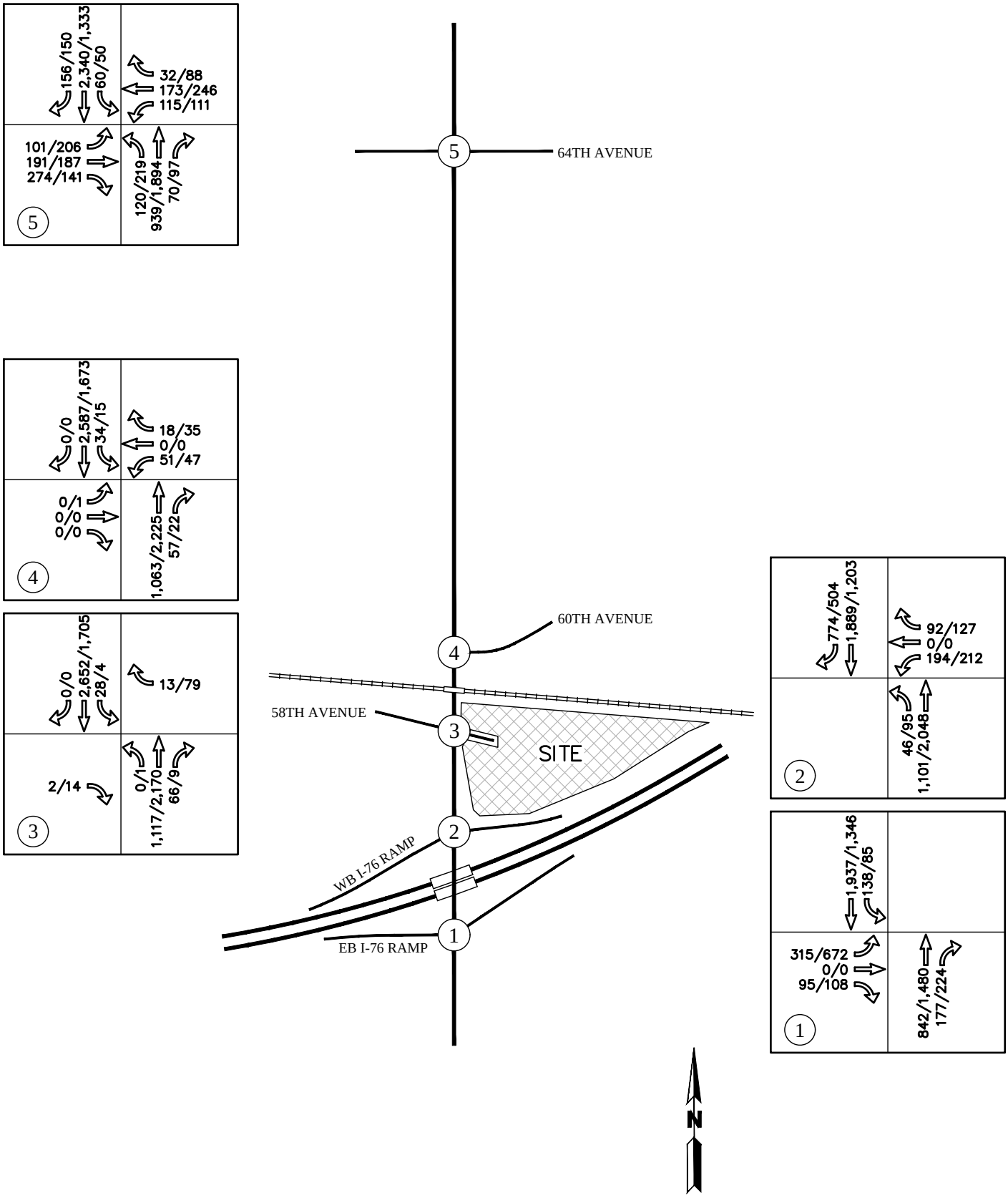
12/34 – AM Peak Hour/PM Peak Hour

Note: Existing trips associated with the uses on the 5800 Federal site have been removed for analysis purposes.

EXHIBIT 12

Long-range (2045) with Project Traffic Volumes

CivTrans ENGINEERING INC.



12/34 – AM Peak Hour/PM Peak Hour

Note: Existing trips associated with the uses on the 5800 Federal site have been removed for analysis purposes.

JUNE 19, 2023

EXHIBIT 13

Long-range (2045) with Project Traffic Volumes (3/4 Movement)

CivTrans ENGINEERING INC.

CONCLUSIONS & RECOMMENDATIONS

Based on the analysis, findings and conclusions discussed in this report, this project is not anticipated to have significant impact on the surrounding transportation system and no mitigation should be required.

The analysis results indicate that all of the intersections within the study are currently operating at acceptable levels of service except the minor street approaches of 58th Avenue & Federal Boulevard. Future year conditions, short-term (2026) and long-range (2045), with and without the project, indicate that the study area intersections will continue to function at similar levels.

A gap study was conducted along Federal Boulevard at 58th Avenue to determine if there are sufficient gaps in traffic to accommodate the existing minor street approach volume and potentially more for the proposed project. Per the gap study, the existing northbound-southbound combined gaps would allow for at least 108 vehicles during the AM peak and 99 vehicles during the PM peak to make a turning maneuver from 58th Avenue. Therefore, there are a sufficient number of adequate gaps to accommodate the existing and proposed left turning traffic from 58th Avenue. There are also sufficient gaps in northbound Federal Boulevard traffic to accommodate the southbound left turn volume at 58th Avenue. The increase in traffic projected for Federal Boulevard may reduce the number of adequate gaps for the long-range condition to a point where the 58th Avenue intersection requires movement restrictions in the form of a ¾ movement intersection or right-in / right-out. The intersection should be monitored to determine if this is necessary in the future.

An auxiliary lane evaluation was conducted for the site access to Federal Boulevard. Based on the CDOT State Highway Access Code, the current geometry of 58th Avenue & Federal Boulevard and the volume of traffic anticipated for the intersection, no modifications to the existing auxiliary lanes at the intersection or addition of new auxiliary lanes should be required.

Per CDOT requirements, sight distance at the 58th Avenue & Federal Boulevard intersection should provide 585 feet looking to the north and 945 feet looking to the south to accommodate the design vehicles for the proposed project. Based on observations during a site visit, there appears to be adequate sight distance for this access. However, the line-of-sight is obscured by the grade-separated bridge columns in the median of Federal south of 60th Avenue. Also, northbound Federal vehicles queued at a red light at 60th Avenue can block the line-of-sight looking north. Furthermore, the westbound I-76 offramp south of the site access has a free right turn that is within the 945 feet required distance, which makes judging adequate gaps more difficult. A more detailed sight distance investigation should be conducted to confirm there is adequate sight distance.

Table 10 - Delay and Level of Service Summary (All Conditions)

Intersection and Movments	S or U	Existing				Short-term (2026) No Project				Short-term (2026) with Project				Long-range (2042) No Project				Long-range (2042) with Project				Long-range (2042) with Project			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Federal Blvd & I-76 EB	**S**	Unchanged				Unchanged				Unchanged				Unchanged				Unchanged				3/4 Movement at 58th			
		9.4	**A**	**20.7**	**C**	**9.5**	**A**	**20.8**	**C**	**10.0**	**A**	**20.8**	**C**	**9.9**	**A**	**22.0**	**C**	**10.4**	**B**	**22.0**	**C**	**10.4**	**B**	**22.0**	**C**
Eastbound		56.2	E	54.2	D	56.1	E	54.4	D	55.7	E	54.4	D	55.4	E	56.1	E	55.9	E	56.1	E	55.9	E	56.1	E
Northbound		5.7	A	23.1	C	5.8	A	23.3	C	6.2	A	23.3	C	6.7	A	24.9	C	7.2	A	25.0	C	7.1	A	25.0	C
Southbound		4.4	A	2.3	A	4.4	A	2.4	A	4.5	A	2.7	A	4.8	A	2.9	A	4.9	A	3.1	A	4.9	A	3.0	A
Federal Blvd & I-76 WB	**S**	Unchanged				Unchanged				Unchanged				Unchanged				Unchanged				3/4 Movement at 58th			
		4.2	**A**	**4.1**	**A**	**4.2**	**A**	**4.2**	**A**	**4.2**	**A**	**4.1**	**A**	**4.5**	**A**	**4.4**	**A**	**4.5**	**A**	**4.3**	**A**	**4.5**	**A**	**4.4**	**A**
Westbound		57.7	E	57.3	E	57.6	E	57.2	E	57.6	E	57.2	E	57.1	E	56.6	E	57.1	E	56.6	E	57.1	E	56.6	E
Northbound		0.4	A	0.9	A	0.4	A	0.9	A	0.4	A	0.9	A	0.5	A	1.4	A	0.5	A	1.3	A	0.5	A	1.3	A
Southbound		0.9	A	0.4	A	1.0	A	0.5	A	1.0	A	0.5	A	1.4	A	0.6	A	1.5	A	0.6	A	1.4	A	0.6	A
Federal Blvd & 58th Ave	**U**	Unchanged				Unchanged				Unchanged				Unchanged				Unchanged				3/4 Movement at 58th			
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eastbound		**134.3**	**F**	**121.7**	**F**	**139.1**	**F**	**142.9**	**F**	**169.6**	**F**	**153.6**	**F**	**282.5**	**F**	**>300**	**F**	**>300**	**F**	**>300**	**F**	**41.1**	**E**	21.6	C
Westbound		13.4	B	95.9	F	0.0	-	0.0	-	**79.7**	**F**	**>300**	**F**	0.0	-	0.0	-	143.3	F	**>300**	**F**	15.6	C	53.2	F
Northbound Left		0.0	-	22.1	C	0.0	-	22.8	C	0.0	-	22.8	C	0.0	-	28.5	D	0.0	-	28.5	D	0.0	-	29.5	D
Southbound Left		0.0	-	34.3	D	0.0	-	0.0	-	16.8	C	37.0	E	0.0	-	0.0	-	19.4	C	52.0	F	19.4	C	52.0	F
Federal Blvd & 60th Ave	**S**	Unchanged				Unchanged				Unchanged				Unchanged				Unchanged				3/4 Movement at 58th			
		1.2	**A**	**1.6**	**A**	**1.2**	**A**	**1.7**	**A**	**1.2**	**A**	**1.7**	**A**	**1.2**	**A**	**1.9**	**A**	**1.2**	**A**	**1.9**	**A**	**1.2**	**A**	**1.9**	**A**
Eastbound		0.0	-	53.9	D	0.0	-	53.9	D	0.0	-	53.9	D	0.0	-	54.1	D	0.0	-	54.1	D	0.0	-	54.1	D
Westbound		63.9	D	53.2	D	53.9	D	53.2	D	53.9	D	53.2	D	54.0	D	53.3	D	54.0	D	53.3	D	54.0	D	53.3	D
Northbound		0.3	A	0.9	A	0.3	A	0.9	A	0.3	A	0.9	A	0.4	A	1.2	A	0.4	A	1.3	A	0.4	A	1.4	A
Southbound		0.3	A	0.2	A	0.3	A	0.2	A	0.3	A	0.2	A	0.2	A	0.3	A	0.2	A	0.3	A	0.2	A	0.3	A
Federal Blvd & 64th Ave	**S**	Unchanged				Unchanged				Unchanged				Unchanged				Unchanged				3/4 Movement at 58th			
		32.4	**C**	**24.9**	**C**	**33.3**	**C**	**25.6**	**C**	**34.1**	**C**	**25.6**	**C**	**44.5**	**D**	**30.3**	**C**	**45.9**	**D**	**30.3**	**D**	**46.2**	**D**	**30.5**	**D**
Eastbound		**135.5**	**F**	57.9	E	**137.1**	**F**	59.7	E	**141.7**	**F**	59.6	E	**167.3**	**F**	**73.7**	**E**	**171.9**	**F**	73.6	E	**171.9**	**F**	73.6	E
Westbound		56.7	E	59.7	E	56.9	E	60.1	E	57.1	E	60.1	E	66.3	E	62.1	E	66.6	E	62.1	E	66.6	E	62.1	E
Northbound		3.0	A	15.8	B	3.3	A	16.3	B	3.4	A	16.5	B	5.9	A	20.2	C	5.9	A	20.4	C	6.2	A	20.6	C
Southbound		20.5	C	16.8	B	21.6	C	17.3	B	21.9	C	17.4	B	32.7	C	20.9	C	33.9	C	21.0	C	34.5	C	21.5	C

Traffic Impact Study
Opus - 5800 Federal

TECHNICAL APPENDIX
June 19, 2023

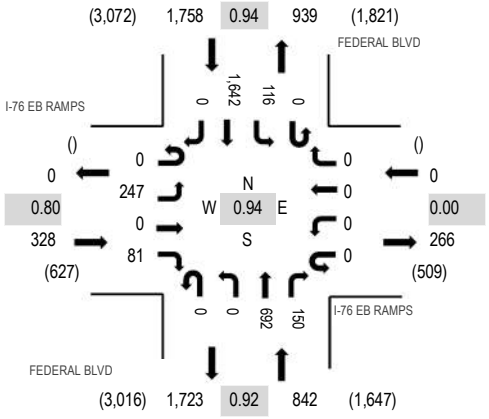
CivTrans
ENGINEERING INC.

RAW TRAFFIC COUNTS

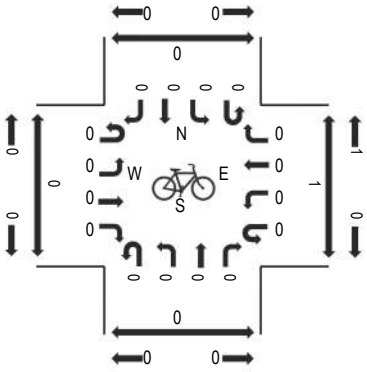
ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 1 FEDERAL BLVD & I-76 EB RAMPS AM
Date: Thursday, April 27, 2023
Peak Hour: 07:30 AM - 08:30 AM
Peak 15-Minutes: 07:45 AM - 08:00 AM

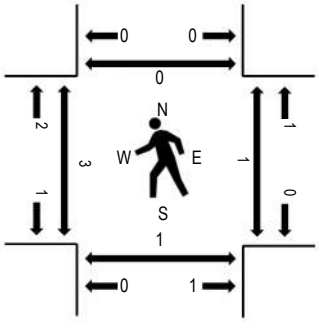
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

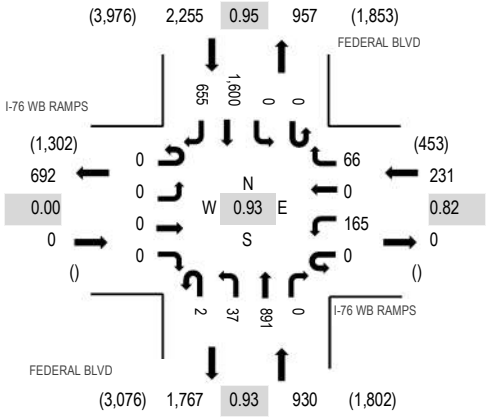
Traffic Counts - Motorized Vehicles

Interval Start Time	I-76 EB RAMPS Eastbound				I-76 EB RAMPS Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
7:00 AM	0	47	0	15	0	0	0	0	0	0	149	40	0	17	330	0	598	2,750	1	0	0	0
7:15 AM	0	65	2	10	0	0	0	0	0	0	144	45	0	23	328	0	617	2,826	0	0	0	0
7:30 AM	0	60	0	22	0	0	0	0	0	0	192	38	0	30	416	0	758	2,928	0	0	0	0
7:45 AM	0	65	0	18	0	0	0	0	0	0	184	44	0	33	433	0	777	2,788	0	1	1	0
8:00 AM	0	41	0	20	0	0	0	0	0	0	159	33	0	30	391	0	674	2,596	2	0	0	0
8:15 AM	0	81	0	21	0	0	0	0	0	0	157	35	0	23	402	0	719		1	0	0	0
8:30 AM	0	54	0	22	0	0	0	0	0	0	188	42	0	22	290	0	618		0	0	0	0
8:45 AM	0	68	0	16	0	0	0	0	0	0	167	30	0	22	282	0	585		0	0	0	0
Count Total	0	481	2	144	0	0	0	0	0	0	1,340	307	0	200	2,872	0	5,346		4	1	1	0
Peak Hour	0	247	0	81	0	0	0	0	0	0	692	150	0	116	1,642	0	2,928		3	1	1	0

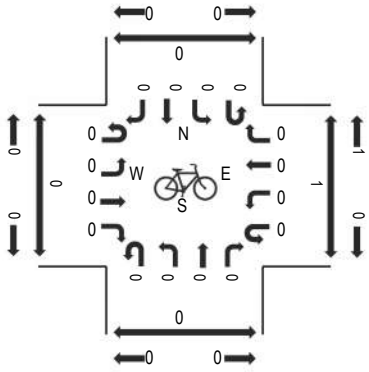
ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 2 FEDERAL BLVD & I-76 WB RAMPS AM
Date: Thursday, April 27, 2023
Peak Hour: 07:30 AM - 08:30 AM
Peak 15-Minutes: 07:45 AM - 08:00 AM

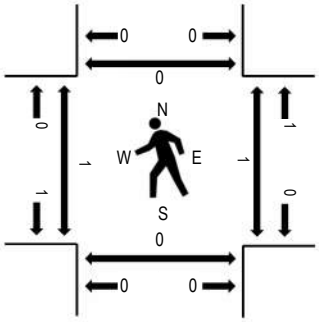
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

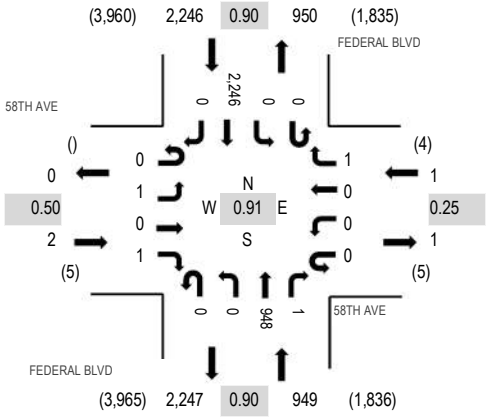
Traffic Counts - Motorized Vehicles

Interval Start Time	I-76 WB RAMPS Eastbound				I-76 WB RAMPS Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
7:00 AM	0	0	0	0	0	30	0	18	0	15	173	0	0	0	318	151	705	3,244	0	0	0	0
7:15 AM	0	0	0	0	0	45	0	18	0	6	204	0	0	0	313	154	740	3,317	0	0	0	0
7:30 AM	0	0	0	0	0	27	0	16	0	7	242	0	0	0	414	179	885	3,416	0	0	0	0
7:45 AM	0	0	0	0	0	51	0	22	0	10	241	0	0	0	419	171	914	3,215	0	1	0	0
8:00 AM	0	0	0	0	0	42	0	15	2	10	184	0	0	0	372	153	778	2,987	0	0	0	0
8:15 AM	0	0	0	0	0	45	0	13	0	10	224	0	0	0	395	152	839		1	0	0	0
8:30 AM	0	0	0	0	0	33	0	18	1	13	215	0	0	0	276	128	684		0	1	0	0
8:45 AM	0	0	0	0	0	41	1	18	0	13	232	0	0	0	252	129	686		0	0	0	0
Count Total	0	0	0	0	0	314	1	138	3	84	1,715	0	0	0	2,759	1,217	6,231		1	2	0	0
Peak Hour	0	0	0	0	0	165	0	66	2	37	891	0	0	0	1,600	655	3,416		1	1	0	0

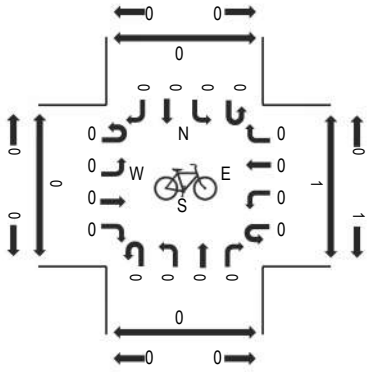
ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 3 FEDERAL BLVD & 58TH AVE AM
Date: Thursday, April 27, 2023
Peak Hour: 07:30 AM - 08:30 AM
Peak 15-Minutes: 07:45 AM - 08:00 AM

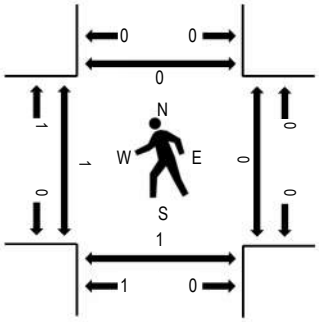
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	58TH AVE Eastbound				58TH AVE Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
7:00 AM	0	0	0	1	0	2	0	0	1	0	188	0	0	0	451	0	643	3,067	0	1	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	212	1	0	0	497	0	710	3,123	0	0	1	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	265	0	0	0	567	0	832	3,198	0	0	0	0
7:45 AM	0	1	0	0	0	0	0	0	0	0	256	0	0	0	625	0	882	3,002	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	1	0	0	202	1	0	0	495	0	699	2,738	1	0	0	0
8:15 AM	0	0	0	1	0	0	0	0	0	0	225	0	0	0	559	0	785		0	0	1	0
8:30 AM	0	1	0	1	0	0	0	0	0	0	247	1	0	0	386	0	636		0	1	0	0
8:45 AM	0	0	0	0	0	0	0	1	0	0	236	1	0	1	379	0	618		1	0	0	0
Count Total	0	2	0	3	0	2	0	2	1	0	1,831	4	0	1	3,959	0	5,805		2	2	2	0
Peak Hour	0	1	0	1	0	0	0	1	0	0	948	1	0	0	2,246	0	3,198		1	0	1	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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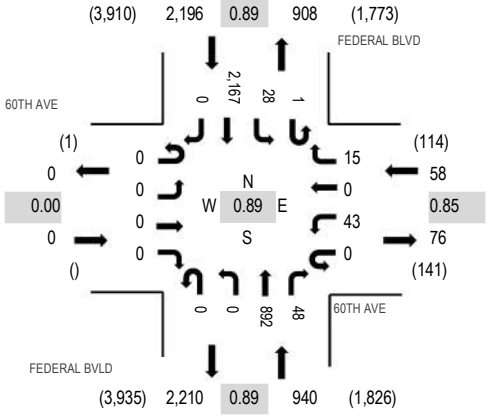
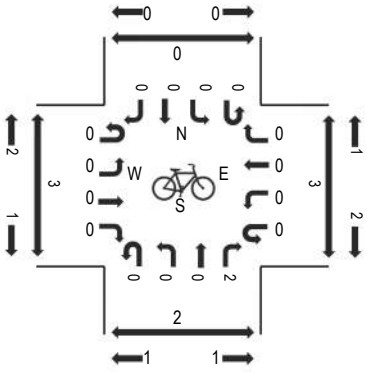
Location: 4 FEDERAL BVLD & 60TH AVE AM
Date: Thursday, April 27, 2023
Peak Hour: 07:30 AM - 08:30 AM
Peak 15-Minutes: 07:45 AM - 08:00 AM

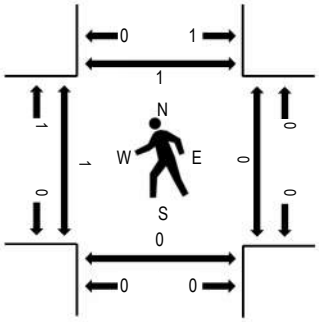
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	60TH AVE Eastbound				60TH AVE Westbound				FEDERAL BVLD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
7:00 AM	0	0	0	0	0	11	0	4	0	0	173	12	0	2	441	0	643	3,087	0	0	0	0
7:15 AM	0	0	0	0	0	6	0	4	0	0	204	11	1	7	496	0	729	3,137	0	1	0	0
7:30 AM	0	0	0	0	0	10	0	2	0	0	242	11	0	6	548	0	819	3,194	0	0	0	0
7:45 AM	0	0	0	0	0	12	0	6	0	0	248	15	1	9	605	0	896	3,029	1	0	0	0
8:00 AM	0	0	0	0	0	7	0	3	0	0	176	13	0	9	485	0	693	2,763	0	0	0	0
8:15 AM	0	0	0	0	0	14	0	4	0	0	226	9	0	4	529	0	786		0	0	0	1
8:30 AM	0	0	0	0	0	10	0	5	0	0	240	8	0	7	383	1	654		0	1	0	0
8:45 AM	0	0	0	0	0	9	0	7	0	0	226	12	1	6	369	0	630		1	0	0	0
Count Total	0	0	0	0	0	79	0	35	0	0	1,735	91	3	50	3,856	1	5,850		2	2	0	1
Peak Hour	0	0	0	0	0	43	0	15	0	0	892	48	1	28	2,167	0	3,194		1	0	0	1

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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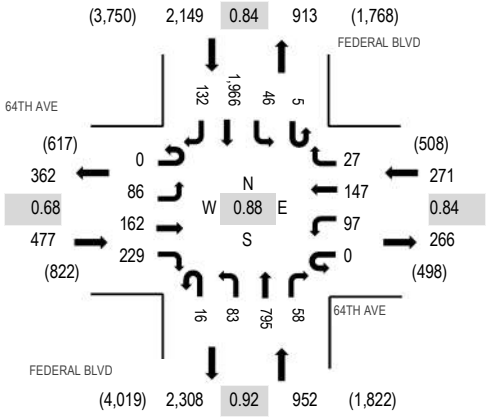
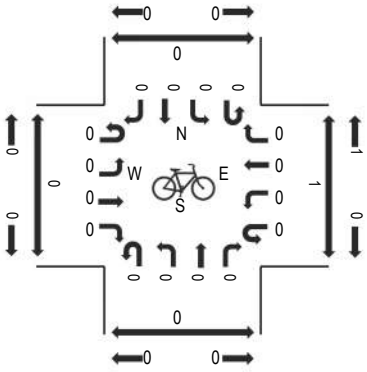
Location: 5 FEDERAL BLVD & 64TH AVE AM
Date: Thursday, April 27, 2023
Peak Hour: 07:30 AM - 08:30 AM
Peak 15-Minutes: 07:30 AM - 07:45 AM

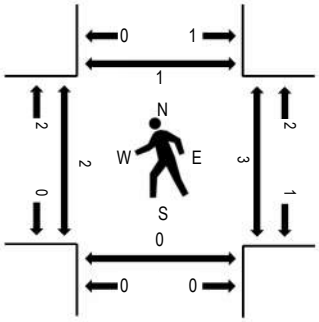
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	64TH AVE Eastbound				64TH AVE Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
7:00 AM	0	16	34	32	0	21	16	5	5	11	144	9	2	11	407	20	733	3,706	2	0	0	0
7:15 AM	0	24	39	32	0	28	23	8	6	10	175	17	0	13	437	31	843	3,806	0	0	0	0
7:30 AM	0	20	48	52	0	30	47	4	3	24	217	15	1	7	596	34	1,098	3,849	1	0	0	0
7:45 AM	0	33	55	94	0	23	33	7	4	22	213	18	4	10	473	43	1,032	3,527	0	0	0	0
8:00 AM	0	18	31	46	0	25	29	9	5	14	157	15	0	15	442	27	833	3,196	0	0	0	0
8:15 AM	0	15	28	37	0	19	38	7	4	23	208	10	0	14	455	28	886		1	3	0	1
8:30 AM	0	19	40	36	0	19	49	6	5	16	222	17	4	5	318	20	776		1	0	0	0
8:45 AM	0	19	22	32	0	27	22	13	7	15	195	16	3	9	299	22	701		0	0	0	2
Count Total	0	164	297	361	0	192	257	59	39	135	1,531	117	14	84	3,427	225	6,902		5	3	0	3
Peak Hour	0	86	162	229	0	97	147	27	16	83	795	58	5	46	1,966	132	3,849		2	3	0	1

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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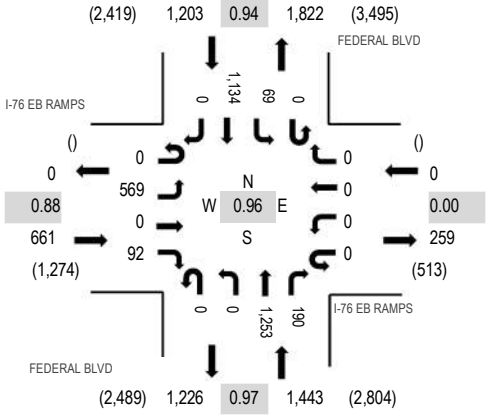
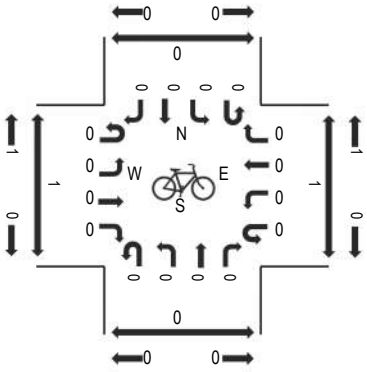
Location: 1 FEDERAL BLVD & I-76 EB RAMPS PM
Date: Thursday, April 27, 2023
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:15 PM - 05:30 PM

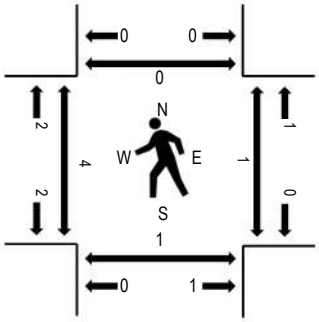
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	I-76 EB RAMPS Eastbound				I-76 EB RAMPS Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
4:00 PM	0	113	1	38	0	0	0	0	0	0	298	51	0	16	308	0	825	3,298	2	4	1	0
4:15 PM	0	132	0	31	0	0	0	0	0	0	327	49	0	18	314	0	871	3,274	0	1	0	0
4:30 PM	0	131	0	23	0	0	0	0	0	0	296	47	0	20	249	0	766	3,266	1	2	0	0
4:45 PM	0	121	0	23	0	0	0	0	0	0	321	48	0	19	304	0	836	3,307	3	0	0	0
5:00 PM	0	123	0	33	0	0	0	0	0	0	296	49	0	22	278	0	801	3,199	0	0	0	0
5:15 PM	0	152	0	21	0	0	0	0	0	0	327	46	0	10	307	0	863		0	0	1	0
5:30 PM	0	173	0	15	0	0	0	0	0	0	309	47	0	18	245	0	807		1	1	0	0
5:45 PM	0	119	0	25	0	0	0	0	0	0	257	36	0	16	275	0	728		0	1	0	0
Count Total	0	1,064	1	209	0	0	0	0	0	0	2,431	373	0	139	2,280	0	6,497		7	9	2	0
Peak Hour	0	569	0	92	0	0	0	0	0	0	1,253	190	0	69	1,134	0	3,307		4	1	1	0

ALL TRAFFIC DATA SERVICES

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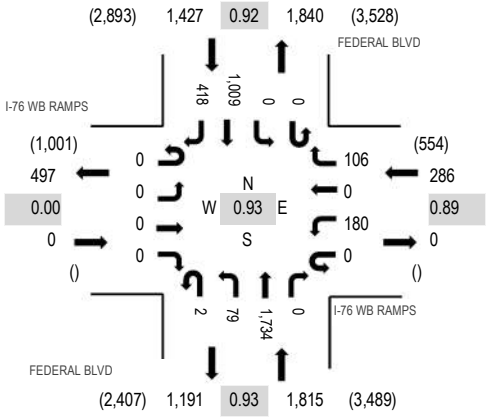
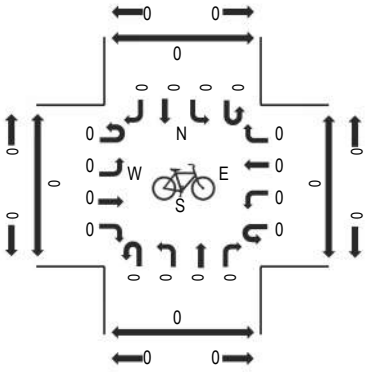
Location: 2 FEDERAL BLVD & I-76 WB RAMPS PM
Date: Thursday, April 27, 2023
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:15 PM - 05:30 PM

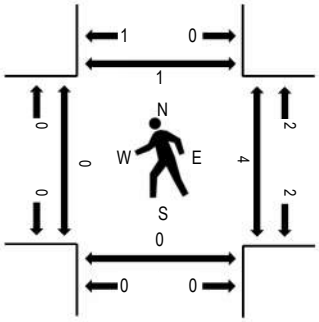
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	I-76 WB RAMPS Eastbound				I-76 WB RAMPS Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
4:00 PM	0	0	0	0	0	42	0	32	2	18	393	0	0	0	275	130	892	3,496	0	2	0	0
4:15 PM	0	0	0	0	0	44	1	23	1	25	433	0	0	0	279	114	920	3,459	0	2	0	0
4:30 PM	0	0	0	0	0	39	0	22	0	19	398	0	0	0	231	105	814	3,491	0	2	0	0
4:45 PM	0	0	0	0	0	51	0	27	0	25	412	0	0	0	269	86	870	3,528	0	2	0	0
5:00 PM	0	0	0	0	0	40	0	27	1	20	397	0	0	0	257	113	855	3,440	0	0	0	1
5:15 PM	0	0	0	0	0	53	0	27	0	18	472	0	0	0	258	124	952		0	1	0	0
5:30 PM	0	0	0	0	0	36	0	25	1	16	453	0	0	0	225	95	851		0	1	0	0
5:45 PM	0	0	0	0	0	42	0	23	2	19	364	0	0	0	259	73	782		1	0	0	0
Count Total	0	0	0	0	0	347	1	206	7	160	3,322	0	0	0	2,053	840	6,936		1	10	0	1
Peak Hour	0	0	0	0	0	180	0	106	2	79	1,734	0	0	0	1,009	418	3,528		0	4	0	1

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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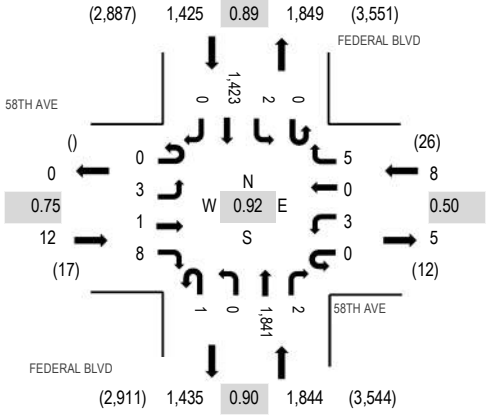
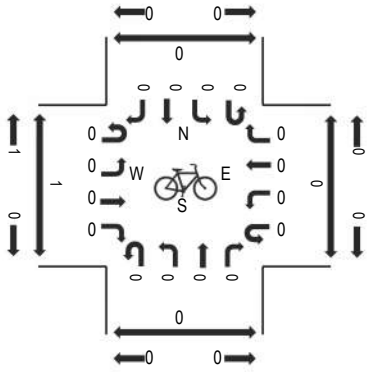
Location: 3 FEDERAL BLVD & 58TH AVE PM
Date: Thursday, April 27, 2023
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:15 PM - 05:30 PM

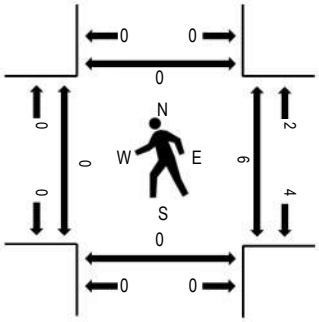
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	58TH AVE Eastbound				58TH AVE Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
4:00 PM	0	0	0	1	0	2	0	0	0	0	419	1	0	2	417	0	842	3,259	0	1	0	0
4:15 PM	0	0	0	2	0	3	0	2	0	0	464	0	0	1	385	0	857	3,222	0	2	0	0
4:30 PM	0	0	0	2	0	5	0	6	2	0	417	3	0	0	328	0	763	3,258	0	2	0	0
4:45 PM	0	0	0	1	0	0	0	1	1	0	440	0	0	1	353	0	797	3,289	0	1	0	0
5:00 PM	0	2	1	1	0	2	0	3	0	0	421	1	0	0	374	0	805	3,215	0	4	0	0
5:15 PM	0	0	0	3	0	1	0	0	0	0	509	1	0	0	379	0	893		0	0	0	0
5:30 PM	0	1	0	3	0	0	0	1	0	0	471	0	0	1	317	0	794		0	1	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	394	0	0	0	329	0	723		1	0	0	0
Count Total	0	3	1	13	0	13	0	13	3	0	3,535	6	0	5	2,882	0	6,474		1	11	0	0
Peak Hour	0	3	1	8	0	3	0	5	1	0	1,841	2	0	2	1,423	0	3,289		0	6	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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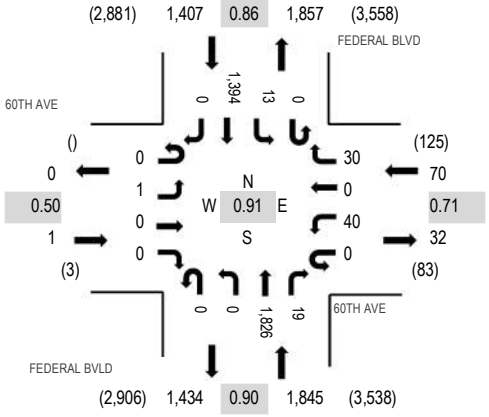
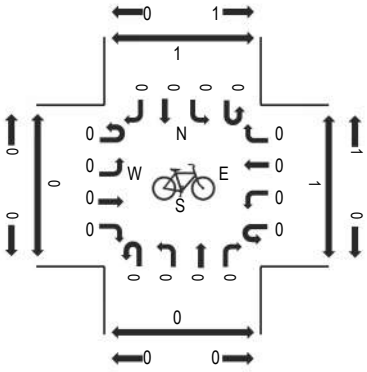
Location: 4 FEDERAL BVLD & 60TH AVE PM
Date: Thursday, April 27, 2023
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:15 PM - 05:30 PM

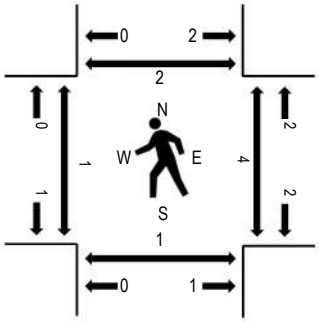
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

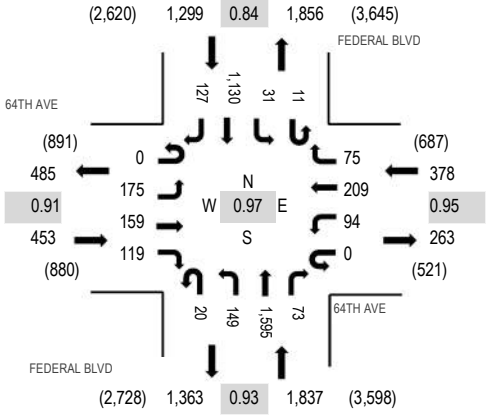
Traffic Counts - Motorized Vehicles

Interval Start Time	60TH AVE Eastbound				60TH AVE Westbound				FEDERAL BVLD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
4:00 PM	0	0	0	0	0	9	0	5	0	0	411	5	0	13	421	0	864	3,295	0	2	0	0
4:15 PM	0	0	0	0	0	5	0	8	0	0	445	5	1	11	377	0	852	3,231	0	2	0	0
4:30 PM	0	1	0	0	0	7	0	10	0	0	420	8	0	6	326	0	778	3,292	0	1	0	0
4:45 PM	0	0	0	0	0	10	0	8	0	0	430	7	0	2	344	0	801	3,323	0	2	0	0
5:00 PM	0	0	0	0	0	17	0	9	0	0	408	5	0	4	357	0	800	3,252	0	0	0	1
5:15 PM	0	0	0	0	0	6	0	6	0	0	513	2	0	4	382	0	913		0	1	0	1
5:30 PM	0	1	0	0	0	7	0	7	0	0	475	5	0	3	311	0	809		1	1	1	0
5:45 PM	0	1	0	0	0	9	0	2	0	0	397	2	0	1	318	0	730		2	0	0	0
Count Total	0	3	0	0	0	70	0	55	0	0	3,499	39	1	44	2,836	0	6,547		3	9	1	2
Peak Hour	0	1	0	0	0	40	0	30	0	0	1,826	19	0	13	1,394	0	3,323		1	4	1	2

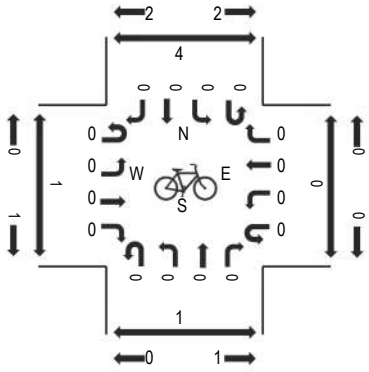
ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 5 FEDERAL BLVD & 64TH AVE PM
Date: Thursday, April 27, 2023
Peak Hour: 04:30 PM - 05:30 PM
Peak 15-Minutes: 05:00 PM - 05:15 PM

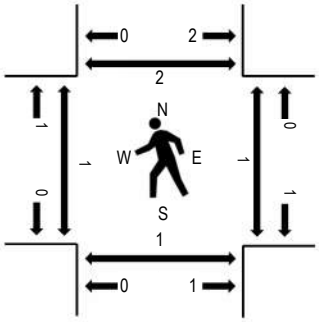
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	64TH AVE Eastbound				64TH AVE Westbound				FEDERAL BLVD Northbound				FEDERAL BLVD Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
4:00 PM	0	38	52	41	0	26	43	17	5	46	387	21	1	13	350	28	1,068	3,934	0	0	0	0
4:15 PM	0	45	43	24	0	25	45	27	2	35	369	11	7	15	276	15	939	3,892	0	3	0	0
4:30 PM	0	41	40	29	0	20	55	25	7	27	416	19	2	3	289	43	1,016	3,967	0	0	0	0
4:45 PM	0	51	44	28	0	24	48	17	4	41	353	19	3	10	248	21	911	3,944	0	0	0	1
5:00 PM	0	41	35	40	0	22	49	21	5	38	395	16	5	9	317	33	1,026	3,851	0	1	0	0
5:15 PM	0	42	40	22	0	28	57	12	4	43	431	19	1	9	276	30	1,014		1	0	1	1
5:30 PM	0	38	31	21	0	11	43	10	7	35	451	13	2	11	290	30	993		1	0	0	0
5:45 PM	0	43	29	22	0	15	33	14	3	29	333	14	7	5	247	24	818		2	1	1	1
Count Total	0	339	314	227	0	171	373	143	37	294	3,135	132	28	75	2,293	224	7,785		4	5	2	3
Peak Hour	0	175	159	119	0	94	209	75	20	149	1,595	73	11	31	1,130	127	3,967		1	1	1	2

TRIP GENERATION DATA

Trip Generation for Proposed 5800 Federal Industrial (Adams Co, Colorado)

Proposing 159,000 SF of industrial uses. As of 6/19/2023, the tenant has not been defined and could include manufacturing, warehousing, R&D. For the purpose of being conservative, light-industrial land use, category 110, was used from ITE's Trip Generation Manual.

Trip Generation

Per Trip Generation Manual, Land Use Category 110 "General Light Industrial"

Weekday	Equation	R^2	Rate	% in	%out
AM Peak:	T=0.68X+3.81	0.66	0.74	88%	12%
PM Peak:	LN(T)=0.72*LN(X)+0.38	0.55	0.65	14%	86%
ADT:	T=3.76X+50.47	0.61	4.87		

For X= 159.0

AM Peak= 118
PM Peak= 103
ADT= 774

Unadjusted

118 AM trips **104 enter** **14 exit**
103 PM trips **14 enter** **89 exit**

TGM Land Use Categor 140, "Manufacturing"

Weekday	Equation	R^2	Rate	% in	%out
AM Peak:	T=0.61X+9.54	0.62	0.68	76%	24%
PM Peak:	T=0.87X-17.50	0.64	0.74	31%	69%
ADT:	T=3.77X+201.98	0.68	4.75		

For X= 159.0

AM Peak= 108
PM Peak= 118
ADT= 755

Unadjusted

108 AM trips **82 enter** **26 exit**
118 PM trips **37 enter** **81 exit**

TGM Land Use Categor 150, "Warehousing"

Weekday	Equation	R^2	Rate	% in	%out
AM Peak:	T=0.12X+23.62	0.69	0.17	77%	23%
PM Peak:	T=0.12+26.48	0.65	0.18	28%	72%
ADT:	T=1.58X+38.29	0.92	1.71		

For X= 159.0

AM Peak= 27
PM Peak= 29
ADT= 290

Unadjusted

27 AM trips **21 enter** **6 exit**
29 PM trips **8 enter** **21 exit**

GAP STUDY DATA

MetroCount Traffic Executive
Separation Statistics by Hour

SepStatHour-344 -- English (ENU)

Datasets:

Site: **6. Federal Blvd (NB/SB) N/O W 58th Ave**
Attribute:
Direction: 1 - North bound, A trigger first. **Lane:** 0
Survey Duration: 8:01 Tuesday, April 25, 2023 => 13:17 Friday, April 28, 2023
Zone:
File: BASIC6
Identifier: WC815H6F MC5900-X13 (c)MetroCount 09Nov16
Algorithm: Factory default axle (v5.08)
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time: **0:00 Thursday, April 27, 2023 => 0:00 Friday, April 28, 2023**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 115 mph.
Direction: North, East, South, West (bound), P = North, Lane = 0-16
Separation: Headway > 0 sec, Span 0 - 328 ft
Name: Default Profile
Units: Non metric (ft, mi, ft/s, mph, lb, ton)
In profile: Vehicles = 35666 / 100417 (35.52%)

Separation Statistics by Hour

Site:
Description: **MetroCount Factory Test Setup**
Filter time: **0:00 Thursday, April 27, 2023 => 0:00 Friday, April 28, 2023**
Filter: Cls(1-13) Dir(NESW) Sp(0,115) Headway(>0) Span(0 - 328) Lane(0-16)

Hour Bins

Time	Bin	Mean	Sep 0.0 0.5	Sep 0.5 1.0	Sep 1.0 2.0	Sep 2.0 4.0	Sep 4.0 8.0	Sep 8.0 16.0	Sep 16.0 32.0	Sep 32.0 64.0	Sep 64.0 128.0	Sep 128.0 1000.0
12:00 AM	241	29.9	5	5	14	18	26	34	52	53	32	2
1:00 AM	146	49.2	6	2	4	5	5	21	34	31	23	15
2:00 AM	138	51.2	3	2	6	9	12	16	21	30	23	16
3:00 AM	142	51.6	5	2	1	7	11	13	22	38	30	13
4:00 AM	266	27.2	10	7	13	27	42	38	56	44	22	7
5:00 AM	776	9.2	83	40	157	160	91	102	90	46	7	0
6:00 AM	1755	24.7	317	202	506	340	154	112	98	23	1	1
7:00 AM	2460	22	407	394	818	459	165	124	72	14	1	3
8:00 AM	2249	4.1	303	356	777	420	156	132	96	5	0	3
9:00 AM	1901	9.5	246	257	602	395	167	124	92	15	1	0
10:00 AM	1803	7.7	178	245	550	398	186	151	74	17	0	2
11:00 AM	1888	6.7	209	251	574	420	212	112	100	7	0	1
12:00 PM	1887	7.8	200	255	592	427	181	126	90	13	0	2
1:00 PM	1995	6.2	221	249	670	444	189	125	83	10	0	2
2:00 PM	2371	7.6	272	445	768	487	209	112	65	9	0	3
3:00 PM	2854	4.8	334	604	1073	528	143	97	64	7	0	1
4:00 PM	2843	4.7	377	558	1064	535	152	72	65	16	1	0
5:00 PM	2815	4.1	362	571	1094	495	126	89	56	20	0	0
6:00 PM	2282	4.5	250	410	823	452	153	102	73	17	0	0
7:00 PM	1577	6.2	131	211	422	390	183	134	81	24	0	0
8:00 PM	1202	6	90	101	301	293	154	126	112	25	0	0
9:00 PM	1049	23.9	79	85	235	229	157	137	93	28	5	0
10:00 PM	665	10.8	47	36	103	132	102	89	93	55	8	0
11:00 PM	361	20	25	14	32	36	59	50	64	60	18	3
Totals:	35666		4160	5302	11199	7106	3035	2238	1746	607	172	74

MetroCount Traffic Executive
Separation Statistics by Hour

SepStatHour-350 -- English (ENU)

Datasets:

Site: **7. Federal Blvd (NB) S/O W 58th Ave**
Attribute:
Direction: 1 - North bound, A trigger first. **Lane:** 0
Survey Duration: 8:04 Tuesday, April 25, 2023 => 13:19 Friday, April 28, 2023
Zone:
File: BASIC7
Identifier: VZ428PQW MC5900-X13 (c)MetroCount 09Nov16
Algorithm: Factory default axle (v5.08)
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time: **0:00 Thursday, April 27, 2023 => 0:00 Friday, April 28, 2023 (1)**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 0 - 115 mph.
Direction: North, East, South, West (bound), P = North, Lane = 0-16
Separation: Headway > 0 sec, Span 0 - 328 ft
Name: Default Profile
Units: Non metric (ft, mi, ft/s, mph, lb, ton)
In profile: Vehicles = 17570 / 49056 (35.82%)

Separation Statistics by Hour

Site:
Description: **MetroCount Factory Test Setup**
Filter time: **0:00 Thursday, April 27, 2023 => 0:00 Friday, April 28, 2023**
Filter: Cls(1-13) Dir(NESW) Sp(0,115) Headway(>0) Span(0 - 328) Lane(0-16)

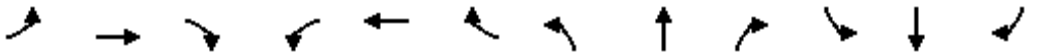
Hour Bins

Time	Bin	Mean	Sep 0.0 0.5	Sep 0.5 1.0	Sep 1.0 2.0	Sep 2.0 4.0	Sep 4.0 8.0	Sep 8.0 16.0	Sep 16.0 32.0	Sep 32.0 64.0	Sep 64.0 128.0	Sep 128.0 1000.0
12:00 AM	130	27.6	0	2	7	13	16	20	31	26	14	1
1:00 AM	84	42.6	2	2	1	4	3	12	24	19	11	6
2:00 AM	75	48.3	1	2	3	5	6	8	10	20	15	5
3:00 AM	70	50.9	1	0	0	5	6	6	8	22	16	6
4:00 AM	88	41.3	2	2	2	8	13	8	16	20	11	6
5:00 AM	226	15.9	7	2	35	33	26	41	51	26	5	0
6:00 AM	550	6.6	35	57	145	101	78	63	58	13	0	0
7:00 AM	870	53.2	90	148	279	146	81	66	52	7	0	0
8:00 AM	859	4.2	76	126	284	150	85	82	55	1	0	0
9:00 AM	854	12	70	119	268	177	92	73	51	3	0	0
10:00 AM	830	8.7	68	100	237	196	106	78	36	8	0	0
11:00 AM	935	3.8	76	114	293	229	120	53	49	1	0	0
12:00 PM	952	10.1	84	132	290	226	100	72	44	3	0	0
1:00 PM	1022	3.5	98	116	359	234	103	72	37	3	0	0
2:00 PM	1278	10.3	118	249	436	276	108	58	31	0	0	1
3:00 PM	1626	2.7	178	375	614	305	88	38	24	3	0	1
4:00 PM	1566	4.5	186	292	634	300	90	36	20	7	0	0
5:00 PM	1603	2.2	194	322	661	287	80	27	24	8	0	0
6:00 PM	1268	2.8	111	239	476	257	97	53	29	6	0	0
7:00 PM	883	4.1	60	135	240	226	96	78	45	3	0	0
8:00 PM	657	5.5	27	70	164	174	84	75	57	6	0	0
9:00 PM	576	37.2	26	56	138	140	89	66	47	12	1	0
10:00 PM	371	9.8	12	29	59	79	60	51	58	18	5	0
11:00 PM	197	18.3	7	10	18	17	40	30	37	31	6	1
Totals:	17570		1529	2699	5643	3588	1667	1166	894	266	84	27

LEVEL OF SERVICE
CALCULATIONS
EXISTING CONDITIONS

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/03/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	247	0	81	0	0	0	0	692	150	116	1642	0
Future Volume (veh/h)	247	0	81	0	0	0	0	692	150	116	1642	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	263	0	0				0	736	0	123	1747	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	332	0					0	3672		177	2886	0
Arrive On Green	0.10	0.00	0.00				0.00	0.72	0.00	0.10	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	263	0	0				0	736	0	123	1747	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	8.9	0.0	0.0				0.0	5.7	0.0	4.1	0.0	0.0
Cycle Q Clear(g_c), s	8.9	0.0	0.0				0.0	5.7	0.0	4.1	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	332	0					0	3672		177	2886	0
V/C Ratio(X)	0.79	0.00					0.00	0.20		0.69	0.61	0.00
Avail Cap(c_a), veh/h	634	0					0	3672		634	2886	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.87	0.87	0.00
Uniform Delay (d), s/veh	53.0	0.0	0.0				0.0	5.5	0.0	52.9	0.0	0.0
Incr Delay (d2), s/veh	3.2	0.0	0.0				0.0	0.1	0.0	1.6	0.8	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
%ile BackOfQ(50%),veh/ln	4.0	0.0	0.0				0.0	1.7	0.0	1.7	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.2	0.0	0.0				0.0	5.7	0.0	54.5	0.8	0.0
LnGrp LOS	E	A					A	A		D	A	A
Approach Vol, veh/h		263						736			1870	
Approach Delay, s/veh		56.2						5.7			4.4	
Approach LOS		E						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	11.2	92.3		16.5		103.5
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0
Max Green Setting (Gmax), s	22.0	60.0		22.0		87.0
Max Q Clear Time (g_c+I1), s	6.1	0.0		10.9		0.0
Green Ext Time (p_c), s	0.1	0.0		0.6		0.0

Intersection Summary	
HCM 6th Ctrl Delay	9.4
HCM 6th LOS	A

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	165	0	66	39	891	0	0	1600	655
Future Volume (veh/h)	0	0	0	165	0	66	39	891	0	0	1600	655
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				177	0	0	42	958	0	0	1720	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				244	0		610	2977	0	0	2893	
Arrive On Green				0.07	0.00	0.00	0.44	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				177	0	0	42	958	0	0	1720	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				244	0		610	2977	0	0	2893	
V/C Ratio(X)				0.73	0.00		0.07	0.32	0.00	0.00	0.59	
Avail Cap(c_a), veh/h				749	0		610	2977	0	0	2893	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.95	0.95	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.6	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.1	0.0	0.0	0.0	0.3	0.0	0.0	0.9	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
%ile BackOfQ(50%),veh/ln				2.7	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.7	0.0	0.0	2.5	0.3	0.0	0.0	0.9	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					177			1000			1720	
Approach Delay, s/veh					57.7			0.4			0.9	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8						
Phs Duration (G+Y+Rc), s	106.5		32.5	74.0		13.5						
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0						
Max Green Setting (Gmax), s	83.0		10.0	* 68		26.0						
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		8.0						
Green Ext Time (p_c), s	0.0		0.0	0.0		0.5						

Intersection Summary	
HCM 6th Ctrl Delay	4.2
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

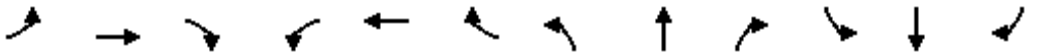
Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	1	0	0	1	0	948	1	0	2246	0
Future Vol, veh/h	1	0	1	0	0	1	0	948	1	0	2246	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	0	1	0	0	1	0	1042	1	0	2468	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2885	3511	1234	2030	3511	522	2468	0	0	1043	0	0
Stage 1	2468	2468	-	1043	1043	-	-	-	-	-	-	-
Stage 2	417	1043	-	987	2468	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	17	6	144	61	6	428	72	-	-	373	-	0
Stage 1	17	59	-	186	305	-	-	-	-	-	-	0
Stage 2	534	305	-	240	59	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	17	6	144	61	6	428	72	-	-	373	-	-
Mov Cap-2 Maneuver	17	6	-	61	6	-	-	-	-	-	-	-
Stage 1	17	59	-	186	305	-	-	-	-	-	-	-
Stage 2	533	305	-	238	59	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	134.3	13.4	0	0
HCM LOS	F	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	72	-	-	30	428	373	-
HCM Lane V/C Ratio	-	-	-	0.073	0.003	-	-
HCM Control Delay (s)	0	-	-	134.3	13.4	0	-
HCM Lane LOS	A	-	-	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	43	0	15	0	892	48	29	2167	0
Future Volume (veh/h)	0	0	0	43	0	15	0	892	48	29	2167	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	0	0	0	48	0	15	0	1002	48	33	2435	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	0	137	0	164	0	116	0	3823	183	521	4265	0
Arrive On Green	0.00	0.00	0.00	0.07	0.00	0.07	0.00	1.00	1.00	0.06	1.00	0.00
Sat Flow, veh/h	0	1870	0	1418	0	1585	0	5161	239	1781	5274	0
Grp Volume(v), veh/h	0	0	0	48	0	15	0	683	367	33	2435	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1418	0	1585	0	1702	1827	1781	1702	0
Q Serve(g_s), s	0.0	0.0	0.0	3.9	0.0	1.1	0.0	0.0	0.0	0.4	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	3.9	0.0	1.1	0.0	0.0	0.0	0.4	0.0	0.0
Prop In Lane	0.00		0.00	1.00		1.00	0.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	0	137	0	164	0	116	0	2607	1399	521	4265	0
V/C Ratio(X)	0.00	0.00	0.00	0.29	0.00	0.13	0.00	0.26	0.26	0.06	0.57	0.00
Avail Cap(c_a), veh/h	0	421	0	379	0	357	0	2607	1399	709	4265	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.49	0.49	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	53.4	0.0	52.0	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.0	0.0	0.5	0.0	0.2	0.5	0.0	0.3	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	0.0	0.0	1.4	0.0	0.4	0.0	0.1	0.2	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	0.0	54.3	0.0	52.5	0.0	0.2	0.5	2.2	0.3	0.0
LnGrp LOS	A	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		0			63			1050			2468	
Approach Delay, s/veh		0.0			53.9			0.3			0.3	
Approach LOS					D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.3	97.9		13.8		106.2		13.8				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.4	2.0		0.0		2.0		5.9				
Green Ext Time (p_c), s	0.0	7.8		0.0		42.3		0.2				

Intersection Summary												
HCM 6th Ctrl Delay			1.2									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	86	162	229	97	147	27	99	795	58	51	1966	132
Future Volume (veh/h)	86	162	229	97	147	27	99	795	58	51	1966	132
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	98	184	234	110	167	28	112	903	60	58	2234	139
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	198	216	180	182	216	180	172	3022	200	456	2962	183
Arrive On Green	0.06	0.12	0.12	0.06	0.12	0.12	0.08	1.00	1.00	0.03	0.60	0.60
Sat Flow, veh/h	1781	1870	1564	1781	1870	1564	1781	4890	324	1781	4915	303
Grp Volume(v), veh/h	98	184	234	110	167	28	112	628	335	58	1542	831
Grp Sat Flow(s),veh/h/ln	1781	1870	1564	1781	1870	1564	1781	1702	1810	1781	1702	1814
Q Serve(g_s), s	5.8	11.6	13.8	6.5	10.4	1.9	3.0	0.0	0.0	1.5	39.5	40.3
Cycle Q Clear(g_c), s	5.8	11.6	13.8	6.5	10.4	1.9	3.0	0.0	0.0	1.5	39.5	40.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.18	1.00		0.17
Lane Grp Cap(c), veh/h	198	216	180	182	216	180	172	2104	1119	456	2051	1093
V/C Ratio(X)	0.50	0.85	1.30	0.60	0.77	0.16	0.65	0.30	0.30	0.13	0.75	0.76
Avail Cap(c_a), veh/h	198	234	196	182	234	196	218	2104	1119	530	2051	1093
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.98	0.98	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.9	52.1	53.1	44.3	51.6	47.8	23.0	0.0	0.0	8.6	17.3	17.5
Incr Delay (d2), s/veh	0.7	22.2	168.6	4.0	12.2	0.1	2.0	0.4	0.7	0.0	2.6	5.0
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	2.6	6.8	13.8	3.1	5.6	0.8	1.9	0.1	0.2	0.5	14.4	16.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.6	74.2	221.7	48.3	63.7	48.0	25.0	0.4	0.7	8.6	19.9	22.5
LnGrp LOS	D	E	F	D	E	D	C	A	A	A	B	C
Approach Vol, veh/h		516			305			1075			2431	
Approach Delay, s/veh		135.5			56.7			3.0			20.5	
Approach LOS		F			E			A			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.0	80.2	12.0	19.8	9.9	78.3	12.0	19.8
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	3.0	68.0	7.0	15.0	8.0	68.0	7.0	15.0
Max Q Clear Time (g_c+I1), s	3.5	0.0	8.5	13.6	5.0	0.0	7.8	12.4
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

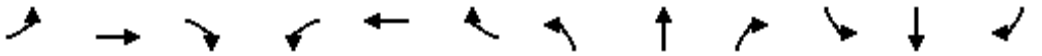
Intersection Summary	
HCM 6th Ctrl Delay	32.4
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/03/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	569	0	92	0	0	0	0	1253	190	69	1134	0
Future Volume (veh/h)	569	0	92	0	0	0	0	1253	190	69	1134	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	593	0	0				0	1305	0	72	1181	0
Peak Hour Factor	0.96	0.96	0.96				0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	676	0					0	2425		649	2533	0
Arrive On Green	0.20	0.00	0.00				0.00	0.47	0.00	0.38	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	593	0	0				0	1305	0	72	1181	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	20.0	0.0	0.0				0.0	21.6	0.0	1.6	0.0	0.0
Cycle Q Clear(g_c), s	20.0	0.0	0.0				0.0	21.6	0.0	1.6	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	676	0					0	2425		649	2533	0
V/C Ratio(X)	0.88	0.00					0.00	0.54		0.11	0.47	0.00
Avail Cap(c_a), veh/h	893	0					0	2425		649	2533	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.94	0.94	0.00
Uniform Delay (d), s/veh	46.9	0.0	0.0				0.0	22.2	0.0	30.9	0.0	0.0
Incr Delay (d2), s/veh	7.3	0.0	0.0				0.0	0.9	0.0	0.0	0.6	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
%ile BackOfQ(50%),veh/ln	9.2	0.0	0.0				0.0	8.3	0.0	0.7	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.2	0.0	0.0				0.0	23.1	0.0	31.0	0.6	0.0
LnGrp LOS	D	A					A	C		C	A	A
Approach Vol, veh/h		593						1305			1253	
Approach Delay, s/veh		54.2						23.1			2.3	
Approach LOS		D						C			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	28.5	63.0		28.5		91.5
Change Period (Y+Rc), s	6.0	* 6		5.0		6.0
Max Green Setting (Gmax), s	16.0	* 57		31.0		78.0
Max Q Clear Time (g_c+I1), s	3.6	0.0		22.0		0.0
Green Ext Time (p_c), s	0.1	0.0		1.5		0.0

Intersection Summary	
HCM 6th Ctrl Delay	20.7
HCM 6th LOS	C

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	180	0	106	81	1734	0	0	1009	418
Future Volume (veh/h)	0	0	0	180	0	106	81	1734	0	0	1009	418
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				194	0	0	87	1865	0	0	1085	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				263	0		772	2957	0	0	2723	
Arrive On Green				0.08	0.00	0.00	0.50	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				194	0	0	87	1865	0	0	1085	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				263	0		772	2957	0	0	2723	
V/C Ratio(X)				0.74	0.00		0.11	0.63	0.00	0.00	0.40	
Avail Cap(c_a), veh/h				864	0		772	2957	0	0	2723	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.80	0.80	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.3	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.0	0.0	0.0	0.0	0.8	0.0	0.0	0.4	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
%ile BackOfQ(50%),veh/ln				3.0	0.0	0.0	0.3	0.3	0.0	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.3	0.0	0.0	2.5	0.8	0.0	0.0	0.4	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					194			1952			1085	
Approach Delay, s/veh					57.3			0.9			0.4	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	105.9		35.9	70.0		14.1
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	79.0		10.0	* 64		30.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		8.6
Green Ext Time (p_c), s	0.0		0.0	0.0		0.6

Intersection Summary	
HCM 6th Ctrl Delay	4.1
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

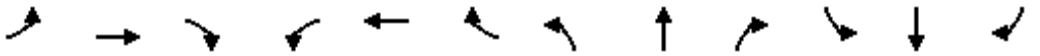
Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	1	8	3	0	5	1	1841	2	2	1423	0
Future Vol, veh/h	3	1	8	3	0	5	1	1841	2	2	1423	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	9	3	0	5	1	2001	2	2	1547	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2353	3556	774	2627	3555	1002	1547	0	0	2003	0	0
Stage 1	1551	1551	-	2004	2004	-	-	-	-	-	-	-
Stage 2	802	2005	-	623	1551	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	38	6	293	25	6	207	211	-	-	125	-	0
Stage 1	81	173	-	38	103	-	-	-	-	-	-	0
Stage 2	312	103	-	401	173	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	36	6	293	21	6	207	211	-	-	125	-	-
Mov Cap-2 Maneuver	36	6	-	21	6	-	-	-	-	-	-	-
Stage 1	81	170	-	38	102	-	-	-	-	-	-	-
Stage 2	302	102	-	380	170	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	121.7	95.9	0	0
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	211	-	-	43	48	125	-
HCM Lane V/C Ratio	0.005	-	-	0.303	0.181	0.017	-
HCM Control Delay (s)	22.1	-	-	121.7	95.9	34.3	-
HCM Lane LOS	C	-	-	F	F	D	-
HCM 95th %tile Q(veh)	0	-	-	1	0.6	0.1	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	0	40	0	30	0	1826	19	13	1394	0
Future Volume (veh/h)	1	0	0	40	0	30	0	1826	19	13	1394	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	1	0	0	44	0	28	0	2007	19	14	1532	0
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, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	133	0	0	177	0	120	0	4043	38	250	4250	0
Arrive On Green	0.08	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.03	1.00	0.00
Sat Flow, veh/h	957	0	0	1533	0	1585	0	5385	49	1781	5274	0
Grp Volume(v), veh/h	1	0	0	44	0	28	0	1309	717	14	1532	0
Grp Sat Flow(s),veh/h/ln	957	0	0	1533	0	1585	0	1702	1861	1781	1702	0
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.2	0.0	0.0
Cycle Q Clear(g_c), s	2.9	0.0	0.0	2.8	0.0	2.0	0.0	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	133	0	0	177	0	120	0	2639	1443	250	4250	0
V/C Ratio(X)	0.01	0.00	0.00	0.25	0.00	0.23	0.00	0.50	0.50	0.06	0.36	0.00
Avail Cap(c_a), veh/h	339	0	0	388	0	357	0	2639	1443	460	4250	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.88	0.88	0.00
Uniform Delay (d), s/veh	53.9	0.0	0.0	52.5	0.0	52.1	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	1.0	0.0	0.7	1.2	0.1	0.2	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	0.0	0.0	1.3	0.0	0.8	0.0	0.2	0.5	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.9	0.0	0.0	53.3	0.0	53.1	0.0	0.7	1.2	2.3	0.2	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		1			72			2026			1546	
Approach Delay, s/veh		53.9			53.2			0.9			0.2	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	6.9	99.0		14.1		105.9		14.1				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.2	2.0		4.9		2.0		4.8				
Green Ext Time (p_c), s	0.0	23.8		0.0		16.0		0.2				

Intersection Summary			
HCM 6th Ctrl Delay		1.6	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	159	119	94	209	75	169	1595	73	42	1130	127
Future Volume (veh/h)	175	159	119	94	209	75	169	1595	73	42	1130	127
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	180	164	98	97	215	67	174	1644	70	43	1165	121
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	212	269	228	238	244	206	338	2966	126	208	2598	270
Arrive On Green	0.08	0.14	0.14	0.06	0.13	0.13	0.06	0.59	0.59	0.02	0.55	0.55
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	5021	214	1781	4696	488
Grp Volume(v), veh/h	180	164	98	97	215	67	174	1114	600	43	844	442
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1702	1831	1781	1702	1780
Q Serve(g_s), s	9.0	9.9	6.8	5.6	13.6	4.6	4.9	23.9	23.9	1.3	17.7	17.7
Cycle Q Clear(g_c), s	9.0	9.9	6.8	5.6	13.6	4.6	4.9	23.9	23.9	1.3	17.7	17.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.27
Lane Grp Cap(c), veh/h	212	269	228	238	244	206	338	2011	1081	208	1883	985
V/C Ratio(X)	0.85	0.61	0.43	0.41	0.88	0.32	0.51	0.55	0.55	0.21	0.45	0.45
Avail Cap(c_a), veh/h	212	269	228	485	296	251	516	2011	1081	320	1883	985
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	0.87	0.87	0.87	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.0	48.2	46.9	41.8	51.3	47.4	12.0	14.9	14.9	13.0	15.9	15.9
Incr Delay (d2), s/veh	24.8	2.9	0.5	0.4	20.0	0.3	0.4	1.0	1.8	0.2	0.8	1.5
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	2.5	4.8	2.7	2.5	7.6	1.8	1.8	8.6	9.5	0.5	6.6	7.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	69.7	51.1	47.4	42.2	71.3	47.7	12.4	15.9	16.7	13.2	16.7	17.4
LnGrp LOS	E	D	D	D	E	D	B	B	B	B	B	B
Approach Vol, veh/h		442			379			1888			1329	
Approach Delay, s/veh		57.9			59.7			15.8			16.8	
Approach LOS		E			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.5	76.9	12.4	23.3	12.0	72.4	14.0	21.6
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	10.0	60.0	24.0	4.0	19.0	51.0	9.0	19.0
Max Q Clear Time (g_c+I1), s	3.3	0.0	7.6	11.9	6.9	0.0	11.0	15.6
Green Ext Time (p_c), s	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	24.9
HCM 6th LOS	C

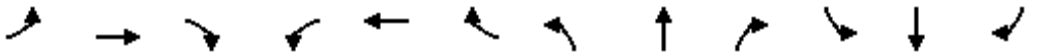
Notes

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

LEVEL OF SERVICE CALCULATIONS YEAR 2026 CONDITIONS WITHOUT PROJECT

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	253	0	83	0	0	0	0	707	153	119	1679	0
Future Volume (veh/h)	253	0	83	0	0	0	0	707	153	119	1679	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	269	0	0				0	752	0	127	1786	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	339	0					0	3657		182	2880	0
Arrive On Green	0.10	0.00	0.00				0.00	0.72	0.00	0.11	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	269	0	0				0	752	0	127	1786	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	9.1	0.0	0.0				0.0	5.9	0.0	4.3	0.0	0.0
Cycle Q Clear(g_c), s	9.1	0.0	0.0				0.0	5.9	0.0	4.3	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	339	0					0	3657		182	2880	0
V/C Ratio(X)	0.79	0.00					0.00	0.21		0.70	0.62	0.00
Avail Cap(c_a), veh/h	634	0					0	3657		634	2880	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.86	0.86	0.00
Uniform Delay (d), s/veh	52.9	0.0	0.0				0.0	5.7	0.0	52.8	0.0	0.0
Incr Delay (d2), s/veh	3.2	0.0	0.0				0.0	0.1	0.0	1.6	0.9	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
%ile BackOfQ(50%),veh/ln	4.1	0.0	0.0				0.0	1.8	0.0	1.8	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.1	0.0	0.0				0.0	5.8	0.0	54.3	0.9	0.0
LnGrp LOS	E	A					A	A		D	A	A
Approach Vol, veh/h		269						752			1913	
Approach Delay, s/veh		56.1						5.8			4.4	
Approach LOS		E						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	11.3	91.9		16.8		103.2
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0
Max Green Setting (Gmax), s	22.0	60.0		22.0		87.0
Max Q Clear Time (g_c+I1), s	6.3	0.0		11.1		0.0
Green Ext Time (p_c), s	0.1	0.0		0.6		0.0

Intersection Summary	
HCM 6th Ctrl Delay	9.5
HCM 6th LOS	A

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	169	0	67	40	910	0	0	1636	670
Future Volume (veh/h)	0	0	0	169	0	67	40	910	0	0	1636	670
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				182	0	0	43	978	0	0	1759	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				249	0		601	2972	0	0	2893	
Arrive On Green				0.07	0.00	0.00	0.44	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				182	0	0	43	978	0	0	1759	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				249	0		601	2972	0	0	2893	
V/C Ratio(X)				0.73	0.00		0.07	0.33	0.00	0.00	0.61	
Avail Cap(c_a), veh/h				749	0		601	2972	0	0	2893	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.95	0.95	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.5	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.1	0.0	0.0	0.0	0.3	0.0	0.0	1.0	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
%ile BackOfQ(50%),veh/ln				2.8	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.6	0.0	0.0	2.6	0.3	0.0	0.0	1.0	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					182			1021			1759	
Approach Delay, s/veh					57.6			0.4			1.0	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	106.4		32.4	74.0		13.6
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	83.0		10.0	* 68		26.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		8.2
Green Ext Time (p_c), s	0.0		0.0	0.0		0.5

Intersection Summary	
HCM 6th Ctrl Delay	4.2
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

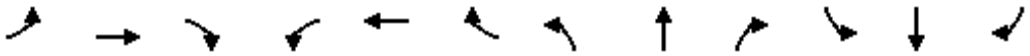
Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	1	0	0	0	0	969	0	0	2297	0
Future Vol, veh/h	1	0	1	0	0	0	0	969	0	0	2297	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	0	1	0	0	0	0	1065	0	0	2524	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2950	3589	1262	2075	3589	533	2524	0	-	1065	0	0
Stage 1	2524	2524	-	1065	1065	-	-	-	-	-	-	-
Stage 2	426	1065	-	1010	2524	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	16	5	138	57	5	421	67	-	0	364	-	0
Stage 1	16	55	-	179	297	-	-	-	0	-	-	0
Stage 2	528	297	-	232	55	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	16	5	138	57	5	421	67	-	-	364	-	-
Mov Cap-2 Maneuver	16	5	-	57	5	-	-	-	-	-	-	-
Stage 1	16	55	-	179	297	-	-	-	-	-	-	-
Stage 2	528	297	-	230	55	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	139.1	0	0	0
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	67	-	29	-	364	-
HCM Lane V/C Ratio	-	-	0.076	-	-	-
HCM Control Delay (s)	0	-	139.1	0	0	-
HCM Lane LOS	A	-	F	A	A	-
HCM 95th %tile Q(veh)	0	-	0.2	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	44	0	15	0	911	49	30	2216	0
Future Volume (veh/h)	0	0	0	44	0	15	0	911	49	30	2216	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	0	0	0	49	0	15	0	1024	49	34	2490	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	0	137	0	164	0	116	0	3819	183	513	4263	0
Arrive On Green	0.00	0.00	0.00	0.07	0.00	0.07	0.00	1.00	1.00	0.06	1.00	0.00
Sat Flow, veh/h	0	1870	0	1418	0	1585	0	5161	239	1781	5274	0
Grp Volume(v), veh/h	0	0	0	49	0	15	0	698	375	34	2490	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1418	0	1585	0	1702	1827	1781	1702	0
Q Serve(g_s), s	0.0	0.0	0.0	4.0	0.0	1.1	0.0	0.0	0.0	0.4	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.0	0.0	1.1	0.0	0.0	0.0	0.4	0.0	0.0
Prop In Lane	0.00		0.00	1.00		1.00	0.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	0	137	0	164	0	116	0	2604	1398	513	4263	0
V/C Ratio(X)	0.00	0.00	0.00	0.30	0.00	0.13	0.00	0.27	0.27	0.07	0.58	0.00
Avail Cap(c_a), veh/h	0	421	0	379	0	357	0	2604	1398	700	4263	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.46	0.46	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	53.4	0.0	52.0	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.0	0.0	0.5	0.0	0.3	0.5	0.0	0.3	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	0.0	0.0	1.5	0.0	0.4	0.0	0.1	0.2	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	0.0	54.4	0.0	52.5	0.0	0.3	0.5	2.2	0.3	0.0
LnGrp LOS	A	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		0			64			1073			2524	
Approach Delay, s/veh		0.0			53.9			0.3			0.3	
Approach LOS					D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.4	97.8		13.8		106.2		13.8				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.4	2.0		0.0		2.0		6.0				
Green Ext Time (p_c), s	0.0	8.0		0.0		44.3		0.2				

Intersection Summary			
HCM 6th Ctrl Delay		1.2	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	166	234	99	150	28	101	812	59	52	2011	135
Future Volume (veh/h)	88	166	234	99	150	28	101	812	59	52	2011	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		0.99
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	100	189	240	112	170	29	115	923	61	59	2285	142
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	198	220	184	181	220	184	168	3010	198	448	2946	181
Arrive On Green	0.06	0.12	0.12	0.06	0.12	0.12	0.08	1.00	1.00	0.03	0.60	0.60
Sat Flow, veh/h	1781	1870	1565	1781	1870	1565	1781	4892	323	1781	4915	303
Grp Volume(v), veh/h	100	189	240	112	170	29	115	642	342	59	1576	851
Grp Sat Flow(s),veh/h/ln	1781	1870	1565	1781	1870	1565	1781	1702	1810	1781	1702	1814
Q Serve(g_s), s	5.9	11.9	14.1	6.6	10.6	2.0	3.1	0.0	0.0	1.5	41.4	42.5
Cycle Q Clear(g_c), s	5.9	11.9	14.1	6.6	10.6	2.0	3.1	0.0	0.0	1.5	41.4	42.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.18	1.00		0.17
Lane Grp Cap(c), veh/h	198	220	184	181	220	184	168	2095	1114	448	2040	1087
V/C Ratio(X)	0.50	0.86	1.31	0.62	0.77	0.16	0.68	0.31	0.31	0.13	0.77	0.78
Avail Cap(c_a), veh/h	198	234	196	181	234	196	213	2095	1114	521	2040	1087
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.7	52.0	53.0	44.2	51.4	47.6	24.1	0.0	0.0	8.7	17.9	18.1
Incr Delay (d2), s/veh	0.8	23.7	171.1	4.6	12.4	0.1	3.3	0.4	0.7	0.0	2.9	5.6
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	2.6	7.0	14.2	3.1	5.7	0.8	2.0	0.1	0.2	0.5	15.2	17.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.5	75.7	224.1	48.8	63.8	47.8	27.4	0.4	0.7	8.8	20.8	23.8
LnGrp LOS	D	E	F	D	E	D	C	A	A	A	C	C
Approach Vol, veh/h		529			311			1099			2486	
Approach Delay, s/veh		137.1			56.9			3.3			21.6	
Approach LOS		F			E			A			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.1	79.8	12.0	20.1	10.0	77.9	12.0	20.1
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	8.0	68.0	7.0	15.0	8.0	68.0	7.0	15.0
Max Q Clear Time (g_c+I1), s	3.5	0.0	8.6	13.9	5.1	0.0	7.9	12.6
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

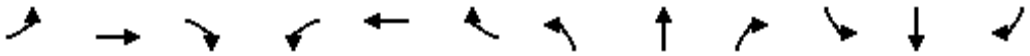
Intersection Summary	
HCM 6th Ctrl Delay	33.3
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	581	0	94	0	0	0	0	1280	194	71	1158	0
Future Volume (veh/h)	581	0	94	0	0	0	0	1280	194	71	1158	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	605	0	0				0	1333	0	74	1206	0
Peak Hour Factor	0.96	0.96	0.96				0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	688	0					0	2425		637	2521	0
Arrive On Green	0.20	0.00	0.00				0.00	0.47	0.00	0.37	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	605	0	0				0	1333	0	74	1206	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	20.4	0.0	0.0				0.0	22.3	0.0	1.7	0.0	0.0
Cycle Q Clear(g_c), s	20.4	0.0	0.0				0.0	22.3	0.0	1.7	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	688	0					0	2425		637	2521	0
V/C Ratio(X)	0.88	0.00					0.00	0.55		0.12	0.48	0.00
Avail Cap(c_a), veh/h	893	0					0	2425		637	2521	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.94	0.94	0.00
Uniform Delay (d), s/veh	46.7	0.0	0.0				0.0	22.4	0.0	31.4	0.0	0.0
Incr Delay (d2), s/veh	7.7	0.0	0.0				0.0	0.9	0.0	0.0	0.6	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
%ile BackOfQ(50%),veh/ln	9.4	0.0	0.0				0.0	8.6	0.0	0.7	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.4	0.0	0.0				0.0	23.3	0.0	31.5	0.6	0.0
LnGrp LOS	D	A					A	C		C	A	A
Approach Vol, veh/h		605						1333			1280	
Approach Delay, s/veh		54.4						23.3			2.4	
Approach LOS		D						C			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	28.1	63.0		28.9		91.1
Change Period (Y+Rc), s	6.0	* 6		5.0		6.0
Max Green Setting (Gmax), s	16.0	* 57		31.0		78.0
Max Q Clear Time (g_c+I1), s	3.7	0.0		22.4		0.0
Green Ext Time (p_c), s	0.1	0.0		1.5		0.0

Intersection Summary		
HCM 6th Ctrl Delay		20.8
HCM 6th LOS		C

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	184	0	108	83	1771	0	0	1030	426
Future Volume (veh/h)	0	0	0	184	0	108	83	1771	0	0	1030	426
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				198	0	0	89	1904	0	0	1108	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				267	0		764	2953	0	0	2723	
Arrive On Green				0.08	0.00	0.00	0.50	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				198	0	0	89	1904	0	0	1108	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				267	0		764	2953	0	0	2723	
V/C Ratio(X)				0.74	0.00		0.12	0.64	0.00	0.00	0.41	
Avail Cap(c_a), veh/h				864	0		764	2953	0	0	2723	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.79	0.79	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.2	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.0	0.0	0.0	0.0	0.9	0.0	0.0	0.5	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
%ile BackOfQ(50%),veh/ln				3.0	0.0	0.0	0.3	0.4	0.0	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.2	0.0	0.0	2.6	0.9	0.0	0.0	0.5	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					198			1993			1108	
Approach Delay, s/veh					57.2			0.9			0.5	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	105.7		35.7	70.0		14.3
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	79.0		10.0	* 64		30.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		8.7
Green Ext Time (p_c), s	0.0		0.0	0.0		0.6

Intersection Summary	
HCM 6th Ctrl Delay	4.2
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

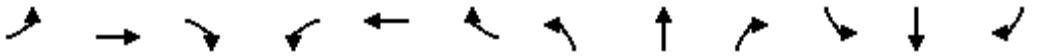
Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	1	8	0	0	0	1	1883	0	0	1455	0
Future Vol, veh/h	3	1	8	0	0	0	1	1883	0	0	1455	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	9	0	0	0	1	2047	0	0	1582	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2403	3631	791	2682	3631	1024	1582	0	-	2047	0	0
Stage 1	1582	1582	-	2049	2049	-	-	-	-	-	-	-
Stage 2	821	2049	-	633	1582	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	35	5	285	23	5	200	203	-	0	118	-	0
Stage 1	77	167	-	35	97	-	-	-	0	-	-	0
Stage 2	304	97	-	396	167	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	35	5	285	18	5	200	203	-	-	118	-	-
Mov Cap-2 Maneuver	35	5	-	18	5	-	-	-	-	-	-	-
Stage 1	77	167	-	35	97	-	-	-	-	-	-	-
Stage 2	303	97	-	381	167	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	142.9	0	0	0
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	203	-	38	-	118	-
HCM Lane V/C Ratio	0.005	-	0.343	-	-	-
HCM Control Delay (s)	22.8	-	142.9	0	0	-
HCM Lane LOS	C	-	F	A	A	-
HCM 95th %tile Q(veh)	0	-	1.1	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	0	41	0	31	0	1862	19	13	1424	0
Future Volume (veh/h)	1	0	0	41	0	31	0	1862	19	13	1424	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	1	0	0	45	0	29	0	2046	19	14	1565	0
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, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	133	0	0	177	0	121	0	4041	38	244	4247	0
Arrive On Green	0.08	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.03	1.00	0.00
Sat Flow, veh/h	949	0	0	1535	0	1585	0	5386	48	1781	5274	0
Grp Volume(v), veh/h	1	0	0	45	0	29	0	1335	730	14	1565	0
Grp Sat Flow(s),veh/h/ln	949	0	0	1535	0	1585	0	1702	1862	1781	1702	0
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.2	0.0	0.0
Cycle Q Clear(g_c), s	3.0	0.0	0.0	2.9	0.0	2.1	0.0	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	133	0	0	177	0	121	0	2637	1442	244	4247	0
V/C Ratio(X)	0.01	0.00	0.00	0.25	0.00	0.24	0.00	0.51	0.51	0.06	0.37	0.00
Avail Cap(c_a), veh/h	338	0	0	388	0	357	0	2637	1442	454	4247	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.87	0.87	0.00
Uniform Delay (d), s/veh	53.9	0.0	0.0	52.5	0.0	52.1	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	1.0	0.0	0.7	1.3	0.1	0.2	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	0.0	0.0	1.3	0.0	0.9	0.0	0.3	0.5	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.9	0.0	0.0	53.2	0.0	53.1	0.0	0.7	1.3	2.3	0.2	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		1			74			2065			1579	
Approach Delay, s/veh		53.9			53.2			0.9			0.2	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	6.9	99.0		14.2		105.8		14.2				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.2	2.0		5.0		2.0		4.9				
Green Ext Time (p_c), s	0.0	24.7		0.0		16.7		0.2				

Intersection Summary			
HCM 6th Ctrl Delay		1.7	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	179	163	122	96	214	77	173	1626	75	43	1154	130
Future Volume (veh/h)	179	163	122	96	214	77	173	1626	75	43	1154	130
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	168	101	99	221	69	178	1676	72	44	1190	124
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	212	273	231	240	249	211	332	2946	127	202	2576	268
Arrive On Green	0.08	0.15	0.15	0.06	0.13	0.13	0.06	0.59	0.59	0.02	0.55	0.55
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	5019	215	1781	4695	489
Grp Volume(v), veh/h	185	168	101	99	221	69	178	1136	612	44	863	451
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1702	1830	1781	1702	1780
Q Serve(g_s), s	9.0	10.1	7.0	5.7	13.9	4.7	5.0	24.8	24.9	1.3	18.4	18.4
Cycle Q Clear(g_c), s	9.0	10.1	7.0	5.7	13.9	4.7	5.0	24.8	24.9	1.3	18.4	18.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.27
Lane Grp Cap(c), veh/h	212	273	231	240	249	211	332	1998	1075	202	1868	976
V/C Ratio(X)	0.87	0.62	0.44	0.41	0.89	0.33	0.54	0.57	0.57	0.22	0.46	0.46
Avail Cap(c_a), veh/h	212	273	231	485	296	251	507	1998	1075	313	1868	976
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	0.86	0.86	0.86	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.1	48.1	46.7	41.4	51.1	47.1	12.4	15.4	15.4	13.4	16.4	16.4
Incr Delay (d2), s/veh	29.1	3.0	0.5	0.4	21.2	0.3	0.4	1.0	1.9	0.2	0.8	1.6
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	2.9	4.9	2.8	2.5	7.9	1.9	1.8	9.0	9.9	0.5	6.8	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.2	51.1	47.2	41.9	72.3	47.4	12.9	16.4	17.2	13.6	17.2	17.9
LnGrp LOS	E	D	D	D	E	D	B	B	B	B	B	B
Approach Vol, veh/h		454			389			1926			1358	
Approach Delay, s/veh		59.7			60.1			16.3			17.3	
Approach LOS		E			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.6	76.4	12.5	23.5	12.2	71.8	14.0	22.0
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	10.6	60.0	24.0	4.0	19.0	51.0	9.0	19.0
Max Q Clear Time (g_c+I1), s	3.3	0.0	7.7	12.1	7.0	0.0	11.0	15.9
Green Ext Time (p_c), s	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

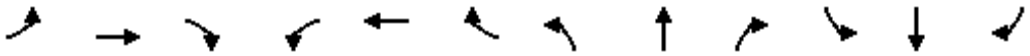
Notes

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

LEVEL OF SERVICE CALCULATIONS YEAR 2026 CONDITIONS WITH PROJECT

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	277	0	83	0	0	0	0	735	153	121	1683	0
Future Volume (veh/h)	277	0	83	0	0	0	0	735	153	121	1683	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	295	0	0				0	782	0	129	1790	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	365	0					0	3614		184	2852	0
Arrive On Green	0.11	0.00	0.00				0.00	0.71	0.00	0.11	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	295	0	0				0	782	0	129	1790	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	10.0	0.0	0.0				0.0	6.3	0.0	4.3	0.0	0.0
Cycle Q Clear(g_c), s	10.0	0.0	0.0				0.0	6.3	0.0	4.3	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	365	0					0	3614		184	2852	0
V/C Ratio(X)	0.81	0.00					0.00	0.22		0.70	0.63	0.00
Avail Cap(c_a), veh/h	634	0					0	3614		634	2852	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.86	0.86	0.00
Uniform Delay (d), s/veh	52.5	0.0	0.0				0.0	6.0	0.0	52.7	0.0	0.0
Incr Delay (d2), s/veh	3.2	0.0	0.0				0.0	0.1	0.0	1.6	0.9	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
%ile BackOfQ(50%),veh/ln	4.5	0.0	0.0				0.0	1.9	0.0	1.8	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.7	0.0	0.0				0.0	6.2	0.0	54.3	0.9	0.0
LnGrp LOS	E	A					A	A		D	A	A
Approach Vol, veh/h		295						782			1919	
Approach Delay, s/veh		55.7						6.2			4.5	
Approach LOS		E						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	11.4	90.9		17.7		102.3
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0
Max Green Setting (Gmax), s	22.0	60.0		22.0		87.0
Max Q Clear Time (g_c+I1), s	6.3	0.0		12.0		0.0
Green Ext Time (p_c), s	0.1	0.0		0.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	10.0
HCM 6th LOS	A

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	169	0	81	40	962	0	0	1642	673
Future Volume (veh/h)	0	0	0	169	0	81	40	962	0	0	1642	673
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				182	0	0	43	1034	0	0	1766	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				249	0		600	2972	0	0	2893	
Arrive On Green				0.07	0.00	0.00	0.44	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				182	0	0	43	1034	0	0	1766	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				249	0		600	2972	0	0	2893	
V/C Ratio(X)				0.73	0.00		0.07	0.35	0.00	0.00	0.61	
Avail Cap(c_a), veh/h				749	0		600	2972	0	0	2893	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.94	0.94	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.5	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.1	0.0	0.0	0.0	0.3	0.0	0.0	1.0	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
%ile BackOfQ(50%),veh/ln				2.8	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.6	0.0	0.0	2.6	0.3	0.0	0.0	1.0	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					182			1077			1766	
Approach Delay, s/veh					57.6			0.4			1.0	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	106.4		32.4	74.0		13.6
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	83.0		10.0	* 68		26.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		8.2
Green Ext Time (p_c), s	0.0		0.0	0.0		0.5

Intersection Summary	
HCM 6th Ctrl Delay	4.2
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

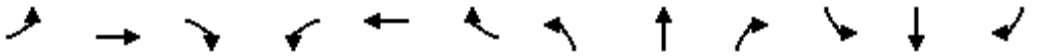
Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	1	9	0	4	0	969	66	28	2297	0
Future Vol, veh/h	1	0	1	9	0	4	0	969	66	28	2297	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	0	1	10	0	4	0	1065	73	31	2524	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3012	3724	1262	2174	3688	569	2524	0	0	1138	0	0
Stage 1	2586	2586	-	1102	1102	-	-	-	-	-	-	-
Stage 2	426	1138	-	1072	2586	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	14	4	138	49	5	399	67	-	-	336	-	0
Stage 1	14	51	-	169	286	-	-	-	-	-	-	0
Stage 2	528	275	-	212	51	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	13	4	138	45	5	399	67	-	-	336	-	-
Mov Cap-2 Maneuver	13	4	-	45	5	-	-	-	-	-	-	-
Stage 1	14	46	-	169	286	-	-	-	-	-	-	-
Stage 2	522	275	-	191	46	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	169.6	79.7	0	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	67	-	-	24	62	336	-
HCM Lane V/C Ratio	-	-	-	0.092	0.23	0.092	-
HCM Control Delay (s)	0	-	-	169.6	79.7	16.8	-
HCM Lane LOS	A	-	-	F	F	C	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.8	0.3	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	44	0	15	0	915	49	30	2244	0
Future Volume (veh/h)	0	0	0	44	0	15	0	915	49	30	2244	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	0	0	0	49	0	15	0	1028	49	34	2521	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	0	137	0	164	0	116	0	3820	182	511	4263	0
Arrive On Green	0.00	0.00	0.00	0.07	0.00	0.07	0.00	1.00	1.00	0.06	1.00	0.00
Sat Flow, veh/h	0	1870	0	1418	0	1585	0	5162	238	1781	5274	0
Grp Volume(v), veh/h	0	0	0	49	0	15	0	700	377	34	2521	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1418	0	1585	0	1702	1828	1781	1702	0
Q Serve(g_s), s	0.0	0.0	0.0	4.0	0.0	1.1	0.0	0.0	0.0	0.4	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.0	0.0	1.1	0.0	0.0	0.0	0.4	0.0	0.0
Prop In Lane	0.00		0.00	1.00		1.00	0.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	0	137	0	164	0	116	0	2604	1398	511	4263	0
V/C Ratio(X)	0.00	0.00	0.00	0.30	0.00	0.13	0.00	0.27	0.27	0.07	0.59	0.00
Avail Cap(c_a), veh/h	0	421	0	379	0	357	0	2604	1398	698	4263	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.44	0.44	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	53.4	0.0	52.0	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.0	0.0	0.5	0.0	0.3	0.5	0.0	0.3	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	0.0	0.0	1.5	0.0	0.4	0.0	0.1	0.2	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	0.0	54.4	0.0	52.5	0.0	0.3	0.5	2.2	0.3	0.0
LnGrp LOS	A	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		0			64			1077			2555	
Approach Delay, s/veh		0.0			53.9			0.3			0.3	
Approach LOS					D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.4	97.8		13.8		106.2		13.8				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.4	2.0		0.0		2.0		6.0				
Green Ext Time (p_c), s	0.0	8.1		0.0		45.4		0.2				

Intersection Summary												
HCM 6th Ctrl Delay			1.2									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	166	238	100	150	28	101	815	60	52	2034	135
Future Volume (veh/h)	88	166	238	100	150	28	101	815	60	52	2034	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		0.99
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	100	189	244	114	170	29	115	926	62	59	2311	142
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	198	220	184	181	220	184	167	3008	201	446	2949	179
Arrive On Green	0.06	0.12	0.12	0.06	0.12	0.12	0.08	1.00	1.00	0.03	0.60	0.60
Sat Flow, veh/h	1781	1870	1565	1781	1870	1565	1781	4887	326	1781	4919	299
Grp Volume(v), veh/h	100	189	244	114	170	29	115	644	344	59	1592	861
Grp Sat Flow(s),veh/h/ln	1781	1870	1565	1781	1870	1565	1781	1702	1810	1781	1702	1815
Q Serve(g_s), s	5.9	11.9	14.1	6.8	10.6	2.0	3.1	0.0	0.0	1.5	42.2	43.4
Cycle Q Clear(g_c), s	5.9	11.9	14.1	6.8	10.6	2.0	3.1	0.0	0.0	1.5	42.2	43.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.18	1.00		0.16
Lane Grp Cap(c), veh/h	198	220	184	181	220	184	167	2095	1114	446	2040	1088
V/C Ratio(X)	0.50	0.86	1.33	0.63	0.77	0.16	0.69	0.31	0.31	0.13	0.78	0.79
Avail Cap(c_a), veh/h	198	234	196	181	234	196	211	2095	1114	520	2040	1088
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.7	52.0	53.0	44.2	51.4	47.6	24.5	0.0	0.0	8.7	18.1	18.3
Incr Delay (d2), s/veh	0.8	23.7	179.8	5.2	12.4	0.1	3.7	0.4	0.7	0.0	3.0	5.9
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	2.6	7.0	14.7	3.2	5.7	0.8	2.0	0.1	0.2	0.5	15.5	17.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.5	75.7	232.8	49.4	63.8	47.8	28.1	0.4	0.7	8.8	21.1	24.2
LnGrp LOS	D	E	F	D	E	D	C	A	A	A	C	C
Approach Vol, veh/h		533			313			1103			2512	
Approach Delay, s/veh		141.7			57.1			3.4			21.9	
Approach LOS		F			E			A			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.1	79.8	12.0	20.1	10.0	77.9	12.0	20.1
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	8.0	68.0	7.0	15.0	8.0	68.0	7.0	15.0
Max Q Clear Time (g_c+I1), s	3.5	0.0	8.8	13.9	5.1	0.0	7.9	12.6
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

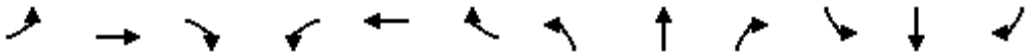
Intersection Summary	
HCM 6th Ctrl Delay	34.1
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	584	0	94	0	0	0	0	1284	194	83	1182	0
Future Volume (veh/h)	584	0	94	0	0	0	0	1284	194	83	1182	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	608	0	0				0	1338	0	86	1231	0
Peak Hour Factor	0.96	0.96	0.96				0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	691	0					0	2425		634	2518	0
Arrive On Green	0.20	0.00	0.00				0.00	0.47	0.00	0.37	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	608	0	0				0	1338	0	86	1231	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	20.5	0.0	0.0				0.0	22.4	0.0	2.0	0.0	0.0
Cycle Q Clear(g_c), s	20.5	0.0	0.0				0.0	22.4	0.0	2.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	691	0					0	2425		634	2518	0
V/C Ratio(X)	0.88	0.00					0.00	0.55		0.14	0.49	0.00
Avail Cap(c_a), veh/h	893	0					0	2425		634	2518	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.94	0.94	0.00
Uniform Delay (d), s/veh	46.6	0.0	0.0				0.0	22.4	0.0	31.6	0.0	0.0
Incr Delay (d2), s/veh	7.8	0.0	0.0				0.0	0.9	0.0	0.0	0.6	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
%ile BackOfQ(50%),veh/ln	9.4	0.0	0.0				0.0	8.6	0.0	0.8	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.4	0.0	0.0				0.0	23.3	0.0	31.7	0.6	0.0
LnGrp LOS	D	A					A	C		C	A	A
Approach Vol, veh/h		608						1338			1317	
Approach Delay, s/veh		54.4						23.3			2.7	
Approach LOS		D						C			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	28.0	63.0		29.0		91.0
Change Period (Y+Rc), s	6.0	* 6		5.0		6.0
Max Green Setting (Gmax), s	16.0	* 57		31.0		78.0
Max Q Clear Time (g_c+I1), s	4.0	0.0		22.5		0.0
Green Ext Time (p_c), s	0.1	0.0		1.5		0.0

Intersection Summary	
HCM 6th Ctrl Delay	20.8
HCM 6th LOS	C

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	184	0	110	83	1778	0	0	1066	445
Future Volume (veh/h)	0	0	0	184	0	110	83	1778	0	0	1066	445
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				198	0	0	89	1912	0	0	1146	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				267	0		755	2953	0	0	2723	
Arrive On Green				0.08	0.00	0.00	0.50	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				198	0	0	89	1912	0	0	1146	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				267	0		755	2953	0	0	2723	
V/C Ratio(X)				0.74	0.00		0.12	0.65	0.00	0.00	0.42	
Avail Cap(c_a), veh/h				864	0		755	2953	0	0	2723	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.78	0.78	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.2	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.0	0.0	0.0	0.0	0.9	0.0	0.0	0.5	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
%ile BackOfQ(50%),veh/ln				3.0	0.0	0.0	0.3	0.4	0.0	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.2	0.0	0.0	2.6	0.9	0.0	0.0	0.5	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					198			2001			1146	
Approach Delay, s/veh					57.2			0.9			0.5	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	105.7		35.7	70.0		14.3
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	79.0		10.0	* 64		30.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		8.7
Green Ext Time (p_c), s	0.0		0.0	0.0		0.6

Intersection Summary	
HCM 6th Ctrl Delay	4.1
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	33.2

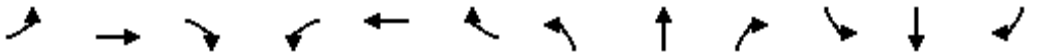
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑↑↑		↰	↑↑↑	
Traffic Vol, veh/h	3	1	8	55	0	24	1	1883	9	4	1455	0
Future Vol, veh/h	3	1	8	55	0	24	1	1883	9	4	1455	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	9	60	0	26	1	2047	10	4	1582	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2411	3649	791	2695	3644	1029	1582	0	0	2057	0	0
Stage 1	1590	1590	-	2054	2054	-	-	-	-	-	-	-
Stage 2	821	2059	-	641	1590	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	35	5	285	~ 23	5	198	203	-	-	117	-	0
Stage 1	76	166	-	~ 35	97	-	-	-	-	-	-	0
Stage 2	304	96	-	391	166	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	29	5	285	~ 18	5	198	203	-	-	117	-	-
Mov Cap-2 Maneuver	29	5	-	~ 18	5	-	-	-	-	-	-	-
Stage 1	76	160	-	~ 35	97	-	-	-	-	-	-	-
Stage 2	263	96	-	364	160	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	153.6	$ 1419.8	0	0.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	203	-	-	36	25	117	-
HCM Lane V/C Ratio	0.005	-	-	0.362	3.435	0.037	-
HCM Control Delay (s)	22.8	-	-	153.8	$ 1419.8	37	-
HCM Lane LOS	C	-	-	F	F	E	-
HCM 95th %tile Q(veh)	0	-	-	1.2	10.6	0.1	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	0	41	0	31	0	1886	19	13	1428	0
Future Volume (veh/h)	1	0	0	41	0	31	0	1886	19	13	1428	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	1	0	0	45	0	29	0	2073	19	14	1569	0
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, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	133	0	0	177	0	121	0	4042	37	240	4247	0
Arrive On Green	0.08	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.03	1.00	0.00
Sat Flow, veh/h	949	0	0	1535	0	1585	0	5386	48	1781	5274	0
Grp Volume(v), veh/h	1	0	0	45	0	29	0	1352	740	14	1569	0
Grp Sat Flow(s),veh/h/ln	949	0	0	1535	0	1585	0	1702	1862	1781	1702	0
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.2	0.0	0.0
Cycle Q Clear(g_c), s	3.0	0.0	0.0	2.9	0.0	2.1	0.0	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	133	0	0	177	0	121	0	2637	1442	240	4247	0
V/C Ratio(X)	0.01	0.00	0.00	0.25	0.00	0.24	0.00	0.51	0.51	0.06	0.37	0.00
Avail Cap(c_a), veh/h	338	0	0	388	0	357	0	2637	1442	450	4247	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.87	0.87	0.00
Uniform Delay (d), s/veh	53.9	0.0	0.0	52.5	0.0	52.1	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	1.0	0.0	0.7	1.3	0.1	0.2	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	0.0	0.0	1.3	0.0	0.9	0.0	0.3	0.5	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.9	0.0	0.0	53.2	0.0	53.1	0.0	0.7	1.3	2.3	0.2	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		1			74			2092			1583	
Approach Delay, s/veh		53.9			53.2			0.9			0.2	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	6.9	99.0		14.2		105.8		14.2				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.2	2.0		5.0		2.0		4.9				
Green Ext Time (p_c), s	0.0	25.3		0.0		16.8		0.2				

Intersection Summary			
HCM 6th Ctrl Delay		1.7	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	179	163	123	96	214	77	177	1645	76	43	1157	130
Future Volume (veh/h)	179	163	123	96	214	77	177	1645	76	43	1157	130
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	168	102	99	221	69	182	1696	73	44	1193	124
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	212	273	231	239	249	211	332	2946	127	199	2572	267
Arrive On Green	0.08	0.15	0.15	0.06	0.13	0.13	0.06	0.59	0.59	0.02	0.55	0.55
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	5019	216	1781	4696	488
Grp Volume(v), veh/h	185	168	102	99	221	69	182	1150	619	44	865	452
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1702	1830	1781	1702	1780
Q Serve(g_s), s	9.0	10.1	7.0	5.7	13.9	4.7	5.2	25.3	25.3	1.3	18.5	18.5
Cycle Q Clear(g_c), s	9.0	10.1	7.0	5.7	13.9	4.7	5.2	25.3	25.3	1.3	18.5	18.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.27
Lane Grp Cap(c), veh/h	212	273	231	239	249	211	332	1998	1075	199	1864	975
V/C Ratio(X)	0.87	0.62	0.44	0.41	0.89	0.33	0.55	0.58	0.58	0.22	0.46	0.46
Avail Cap(c_a), veh/h	212	273	231	485	296	251	506	1998	1075	310	1864	975
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	0.86	0.86	0.86	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.1	48.1	46.8	41.4	51.1	47.1	12.5	15.5	15.5	13.5	16.5	16.5
Incr Delay (d2), s/veh	29.1	3.0	0.5	0.4	21.2	0.3	0.5	1.0	1.9	0.2	0.8	1.6
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	2.9	4.9	2.8	2.5	7.9	1.9	1.9	9.1	10.1	0.5	6.9	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.2	51.1	47.3	41.9	72.3	47.4	13.0	16.5	17.4	13.7	17.3	18.0
LnGrp LOS	E	D	D	D	E	D	B	B	B	B	B	B
Approach Vol, veh/h		455			389			1951			1361	
Approach Delay, s/veh		59.6			60.1			16.5			17.4	
Approach LOS		E			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.6	76.4	12.5	23.5	12.3	71.7	14.0	22.0
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	10.6	60.0	24.0	4.0	19.0	51.0	9.0	19.0
Max Q Clear Time (g_c+I1), s	3.3	0.0	7.7	12.1	7.2	0.0	11.0	15.9
Green Ext Time (p_c), s	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

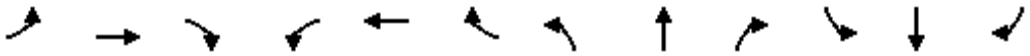
Notes

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

LEVEL OF SERVICE CALCULATIONS YEAR 2045 CONDITIONS WITHOUT PROJECT

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	291	0	95	0	0	0	0	814	177	137	1935	0
Future Volume (veh/h)	291	0	95	0	0	0	0	814	177	137	1935	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	310	0	0				0	866	0	146	2059	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	381	0					0	3565		202	2837	0
Arrive On Green	0.11	0.00	0.00				0.00	0.70	0.00	0.12	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	310	0	0				0	866	0	146	2059	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	10.5	0.0	0.0				0.0	7.4	0.0	4.9	0.0	0.0
Cycle Q Clear(g_c), s	10.5	0.0	0.0				0.0	7.4	0.0	4.9	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	381	0					0	3565		202	2837	0
V/C Ratio(X)	0.81	0.00					0.00	0.24		0.72	0.73	0.00
Avail Cap(c_a), veh/h	634	0					0	3565		634	2837	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.80	0.80	0.00
Uniform Delay (d), s/veh	52.2	0.0	0.0				0.0	6.6	0.0	52.1	0.0	0.0
Incr Delay (d2), s/veh	3.2	0.0	0.0				0.0	0.2	0.0	1.5	1.3	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
%ile BackOfQ(50%),veh/ln	4.7	0.0	0.0				0.0	2.3	0.0	2.0	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.4	0.0	0.0				0.0	6.7	0.0	53.5	1.3	0.0
LnGrp LOS	E	A					A	A		D	A	A
Approach Vol, veh/h		310						866			2205	
Approach Delay, s/veh		55.4						6.7			4.8	
Approach LOS		E						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	12.0	89.8		18.2		101.8
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0
Max Green Setting (Gmax), s	22.0	60.0		22.0		87.0
Max Q Clear Time (g_c+I1), s	6.9	0.0		12.5		0.0
Green Ext Time (p_c), s	0.2	0.0		0.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	9.9
HCM 6th LOS	A

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	194	0	78	46	1049	0	0	1886	772
Future Volume (veh/h)	0	0	0	194	0	78	46	1049	0	0	1886	772
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				209	0	0	49	1128	0	0	2028	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				278	0		551	2942	0	0	2893	
Arrive On Green				0.08	0.00	0.00	0.42	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				209	0	0	49	1128	0	0	2028	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				278	0		551	2942	0	0	2893	
V/C Ratio(X)				0.75	0.00		0.09	0.38	0.00	0.00	0.70	
Avail Cap(c_a), veh/h				749	0		551	2942	0	0	2893	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.94	0.94	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.1	0.0	0.0	0.0	0.4	0.0	0.0	1.4	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
%ile BackOfQ(50%),veh/ln				3.2	0.0	0.0	0.2	0.1	0.0	0.0	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.1	0.0	0.0	3.0	0.4	0.0	0.0	1.4	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					209			1177			2028	
Approach Delay, s/veh					57.1			0.5			1.4	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	105.3		31.3	74.0		14.7
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	83.0		10.0	* 68		26.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		9.1
Green Ext Time (p_c), s	0.0		0.0	0.0		0.6

Intersection Summary	
HCM 6th Ctrl Delay	4.5
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

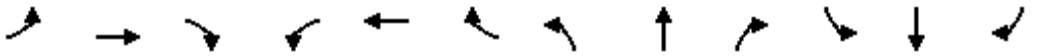
Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	1	0	0	0	0	1117	0	0	2647	0
Future Vol, veh/h	1	0	1	0	0	0	0	1117	0	0	2647	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	0	1	0	0	0	0	1227	0	0	2909	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3400	4136	1455	2391	4136	614	2909	0	-	1227	0	0
Stage 1	2909	2909	-	1227	1227	-	-	-	-	-	-	-
Stage 2	491	1227	-	1164	2909	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	8	2	102	36	2	373	42	-	0	304	-	0
Stage 1	8	34	-	138	249	-	-	-	0	-	-	0
Stage 2	482	249	-	186	34	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	8	2	102	36	2	373	42	-	-	304	-	-
Mov Cap-2 Maneuver	8	2	-	36	2	-	-	-	-	-	-	-
Stage 1	8	34	-	138	249	-	-	-	-	-	-	-
Stage 2	482	249	-	184	34	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	282.5	0	0	0
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	42	-	15	-	304	-
HCM Lane V/C Ratio	-	-	0.147	-	-	-
HCM Control Delay (s)	0	-	282.5	0	0	-
HCM Lane LOS	A	-	F	A	A	-
HCM 95th %tile Q(veh)	0	-	0.4	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	51	0	18	0	1050	57	34	2554	0
Future Volume (veh/h)	0	0	0	51	0	18	0	1050	57	34	2554	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	0	0	0	57	0	18	0	1180	58	38	2870	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	0	143	0	168	0	121	0	3790	186	455	4247	0
Arrive On Green	0.00	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.06	1.00	0.00
Sat Flow, veh/h	0	1870	0	1418	0	1585	0	5154	245	1781	5274	0
Grp Volume(v), veh/h	0	0	0	57	0	18	0	806	432	38	2870	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1418	0	1585	0	1702	1826	1781	1702	0
Q Serve(g_s), s	0.0	0.0	0.0	4.6	0.0	1.3	0.0	0.0	0.0	0.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.6	0.0	1.3	0.0	0.0	0.0	0.5	0.0	0.0
Prop In Lane	0.00		0.00	1.00		1.00	0.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	0	143	0	168	0	121	0	2588	1388	455	4247	0
V/C Ratio(X)	0.00	0.00	0.00	0.34	0.00	0.15	0.00	0.31	0.31	0.08	0.68	0.00
Avail Cap(c_a), veh/h	0	421	0	379	0	357	0	2588	1388	639	4247	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.16	0.16	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	53.3	0.0	51.8	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.2	0.0	0.6	0.0	0.3	0.6	0.0	0.1	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	0.0	0.0	1.7	0.0	0.5	0.0	0.1	0.2	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	0.0	54.5	0.0	52.3	0.0	0.3	0.6	2.2	0.1	0.0
LnGrp LOS	A	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		0			75			1238			2908	
Approach Delay, s/veh		0.0			54.0			0.4			0.2	
Approach LOS					D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.6	97.2		14.2		105.8		14.2				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.5	2.0		0.0		2.0		6.6				
Green Ext Time (p_c), s	0.0	10.0		0.0		57.4		0.3				

Intersection Summary			
HCM 6th Ctrl Delay		1.2	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	101	191	270	114	173	32	117	936	68	60	2317	156
Future Volume (veh/h)	101	191	270	114	173	32	117	936	68	60	2317	156
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		0.99
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	115	217	281	130	197	33	133	1064	71	68	2633	166
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	189	234	196	173	234	196	158	2955	197	400	2865	177
Arrive On Green	0.06	0.13	0.13	0.06	0.13	0.13	0.10	1.00	1.00	0.03	0.58	0.58
Sat Flow, veh/h	1781	1870	1566	1781	1870	1566	1781	4888	326	1781	4913	304
Grp Volume(v), veh/h	115	217	281	130	197	33	133	741	394	68	1810	989
Grp Sat Flow(s),veh/h/ln	1781	1870	1566	1781	1870	1566	1781	1702	1810	1781	1702	1814
Q Serve(g_s), s	6.8	13.8	15.0	7.0	12.4	2.3	4.1	0.0	0.0	1.8	56.8	60.1
Cycle Q Clear(g_c), s	6.8	13.8	15.0	7.0	12.4	2.3	4.1	0.0	0.0	1.8	56.8	60.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.18	1.00		0.17
Lane Grp Cap(c), veh/h	189	234	196	173	234	196	158	2058	1094	400	1985	1057
V/C Ratio(X)	0.61	0.93	1.44	0.75	0.84	0.17	0.84	0.36	0.36	0.17	0.91	0.94
Avail Cap(c_a), veh/h	189	234	196	173	234	196	187	2058	1094	468	1985	1057
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.96	0.96	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.5	52.0	52.5	45.2	51.3	46.9	29.2	0.0	0.0	9.4	22.3	23.0
Incr Delay (d2), s/veh	4.0	39.1	222.6	15.0	22.3	0.1	21.3	0.5	0.9	0.1	7.8	16.0
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	3.2	9.0	17.9	4.1	7.2	0.9	2.9	0.1	0.3	0.7	22.1	27.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.5	91.0	275.1	60.2	73.6	47.1	50.6	0.5	0.9	9.5	30.1	38.9
LnGrp LOS	D	F	F	E	E	D	D	A	A	A	C	D
Approach Vol, veh/h		613			360			1268			2867	
Approach Delay, s/veh		167.3			66.3			5.9			32.7	
Approach LOS		F			E			A			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.5	78.5	12.0	21.0	11.0	76.0	12.0	21.0
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	3.5	68.0	7.0	15.0	8.0	68.0	7.0	15.0
Max Q Clear Time (g_c+I1), s	3.8	0.0	9.0	15.8	6.1	0.0	8.8	14.4
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

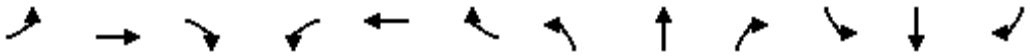
Intersection Summary	
HCM 6th Ctrl Delay	44.5
HCM 6th LOS	D

Notes

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

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	669	0	108	0	0	0	0	1476	224	81	1334	0
Future Volume (veh/h)	669	0	108	0	0	0	0	1476	224	81	1334	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	697	0	0				0	1538	0	84	1390	0
Peak Hour Factor	0.96	0.96	0.96				0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	773	0					0	2425		551	2433	0
Arrive On Green	0.22	0.00	0.00				0.00	0.47	0.00	0.32	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	697	0	0				0	1538	0	84	1390	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	23.5	0.0	0.0				0.0	27.2	0.0	2.1	0.0	0.0
Cycle Q Clear(g_c), s	23.5	0.0	0.0				0.0	27.2	0.0	2.1	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	773	0					0	2425		551	2433	0
V/C Ratio(X)	0.90	0.00					0.00	0.63		0.15	0.57	0.00
Avail Cap(c_a), veh/h	893	0					0	2425		551	2433	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.92	0.92	0.00
Uniform Delay (d), s/veh	45.3	0.0	0.0				0.0	23.7	0.0	35.1	0.0	0.0
Incr Delay (d2), s/veh	10.8	0.0	0.0				0.0	1.3	0.0	0.0	0.9	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
%ile BackOfQ(50%),veh/ln	11.1	0.0	0.0				0.0	10.5	0.0	0.9	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.1	0.0	0.0				0.0	24.9	0.0	35.1	0.9	0.0
LnGrp LOS	E	A					A	C		D	A	A
Approach Vol, veh/h		697						1538			1474	
Approach Delay, s/veh		56.1						24.9			2.9	
Approach LOS		E						C			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	25.1	63.0		31.9		88.1
Change Period (Y+Rc), s	6.0	* 6		5.0		6.0
Max Green Setting (Gmax), s	16.0	* 57		31.0		78.0
Max Q Clear Time (g_c+I1), s	4.1	0.0		25.5		0.0
Green Ext Time (p_c), s	0.1	0.0		1.3		0.0

Intersection Summary	
HCM 6th Ctrl Delay	22.0
HCM 6th LOS	C

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	212	0	125	95	2041	0	0	1187	492
Future Volume (veh/h)	0	0	0	212	0	125	95	2041	0	0	1187	492
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				228	0	0	102	2195	0	0	1276	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				299	0		709	2920	0	0	2723	
Arrive On Green				0.09	0.00	0.00	0.48	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				228	0	0	102	2195	0	0	1276	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				299	0		709	2920	0	0	2723	
V/C Ratio(X)				0.76	0.00		0.14	0.75	0.00	0.00	0.47	
Avail Cap(c_a), veh/h				864	0		709	2920	0	0	2723	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.70	0.70	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				53.6	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.0	0.0	0.0	0.0	1.3	0.0	0.0	0.6	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
%ile BackOfQ(50%),veh/ln				3.5	0.0	0.0	0.4	0.5	0.0	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				56.6	0.0	0.0	3.0	1.3	0.0	0.0	0.6	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					228			2297			1276	
Approach Delay, s/veh					56.6			1.4			0.6	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	104.6		34.6	70.0		15.4
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	79.0		10.0	* 64		30.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		9.7
Green Ext Time (p_c), s	0.0		0.1	0.0		0.7

Intersection Summary	
HCM 6th Ctrl Delay	4.4
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.5

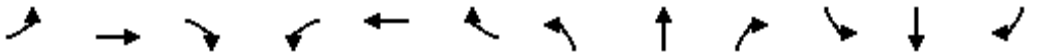
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	1	9	0	0	0	1	2170	0	0	1677	0
Future Vol, veh/h	4	1	9	0	0	0	1	2170	0	0	1677	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	1	10	0	0	0	1	2359	0	0	1823	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2769	4184	912	3091	4184	1180	1823	0	-	2359	0	0
Stage 1	1823	1823	-	2361	2361	-	-	-	-	-	-	-
Stage 2	946	2361	-	730	1823	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	21	2	237	13	2	157	154	-	0	82	-	0
Stage 1	52	127	-	21	67	-	-	-	0	-	-	0
Stage 2	254	67	-	345	127	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	21	2	237	7	2	157	154	-	-	82	-	-
Mov Cap-2 Maneuver	21	2	-	7	2	-	-	-	-	-	-	-
Stage 1	52	127	-	21	67	-	-	-	-	-	-	-
Stage 2	252	67	-	328	127	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 414.8	0	0	0
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	154	-	19	-	82	-
HCM Lane V/C Ratio	0.007	-	0.801	-	-	-
HCM Control Delay (s)	28.5	-	$ 414.8	0	0	-
HCM Lane LOS	D	-	F	A	A	-
HCM 95th %tile Q(veh)	0	-	2.2	-	0	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	0	47	0	35	0	2146	22	15	1641	0
Future Volume (veh/h)	1	0	0	47	0	35	0	2146	22	15	1641	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	1	0	0	52	0	33	0	2358	22	16	1803	0
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, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	130	0	0	182	0	125	0	4022	37	205	4237	0
Arrive On Green	0.08	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.03	1.00	0.00
Sat Flow, veh/h	891	0	0	1549	0	1585	0	5385	49	1781	5274	0
Grp Volume(v), veh/h	1	0	0	52	0	33	0	1538	842	16	1803	0
Grp Sat Flow(s),veh/h/ln	891	0	0	1549	0	1585	0	1702	1862	1781	1702	0
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.2	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	0.0	3.3	0.0	2.4	0.0	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	130	0	0	182	0	125	0	2624	1435	205	4237	0
V/C Ratio(X)	0.01	0.00	0.00	0.29	0.00	0.26	0.00	0.59	0.59	0.08	0.43	0.00
Avail Cap(c_a), veh/h	331	0	0	389	0	357	0	2624	1435	412	4237	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.78	0.78	0.00
Uniform Delay (d), s/veh	54.1	0.0	0.0	52.5	0.0	52.0	0.0	0.0	0.0	2.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.9	0.0	1.1	0.0	1.0	1.8	0.1	0.2	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	0.0	0.0	1.5	0.0	1.0	0.0	0.4	0.7	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.1	0.0	0.0	53.3	0.0	53.1	0.0	1.0	1.8	2.4	0.2	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		1			85			2380			1819	
Approach Delay, s/veh		54.1			53.3			1.2			0.3	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.1	98.5		14.4		105.6		14.4				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.2	2.0		5.4		2.0		5.3				
Green Ext Time (p_c), s	0.0	32.2		0.0		22.2		0.3				

Intersection Summary			
HCM 6th Ctrl Delay		1.9	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	187	140	111	246	88	199	1874	86	50	1330	150
Future Volume (veh/h)	206	187	140	111	246	88	199	1874	86	50	1330	150
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	212	193	119	114	254	81	205	1932	84	52	1371	145
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	211	292	248	246	281	238	295	2840	123	167	2448	259
Arrive On Green	0.08	0.16	0.16	0.07	0.15	0.15	0.07	0.57	0.57	0.03	0.52	0.52
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	5016	218	1781	4687	496
Grp Volume(v), veh/h	212	193	119	114	254	81	205	1310	706	52	996	520
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1702	1830	1781	1702	1778
Q Serve(g_s), s	9.0	11.7	8.2	6.4	16.0	5.5	6.1	32.6	32.7	1.6	23.7	23.7
Cycle Q Clear(g_c), s	9.0	11.7	8.2	6.4	16.0	5.5	6.1	32.6	32.7	1.6	23.7	23.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.28
Lane Grp Cap(c), veh/h	211	292	248	246	281	238	295	1927	1036	167	1778	929
V/C Ratio(X)	1.00	0.66	0.48	0.46	0.90	0.34	0.70	0.68	0.68	0.31	0.56	0.56
Avail Cap(c_a), veh/h	211	292	248	479	296	251	454	1927	1036	271	1778	929
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	0.80	0.80	0.80	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.7	47.6	46.2	39.6	50.1	45.6	17.2	18.4	18.4	16.8	19.4	19.4
Incr Delay (d2), s/veh	62.8	4.4	0.5	0.5	27.1	0.3	0.9	1.6	2.9	0.4	1.3	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	5.7	5.8	3.3	2.8	9.5	2.2	2.3	12.0	13.4	0.6	9.0	9.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	108.4	52.0	46.7	40.1	77.2	45.9	18.1	19.9	21.3	17.2	20.6	21.8
LnGrp LOS	F	D	D	D	E	D	B	B	C	B	C	C
Approach Vol, veh/h		524			449			2221			1568	
Approach Delay, s/veh		73.7			62.1			20.2			20.9	
Approach LOS		E			E			C			C	

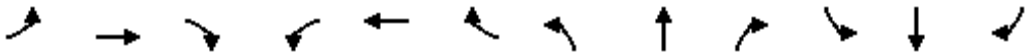
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.0	73.9	13.3	24.7	13.3	68.7	14.0	24.1
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	10.0	60.0	24.0	4.0	19.0	51.0	9.0	19.0
Max Q Clear Time (g_c+I1), s	3.0	0.0	8.4	13.7	8.1	0.0	11.0	18.0
Green Ext Time (p_c), s	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	30.3
HCM 6th LOS	C

Notes

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

LEVEL OF SERVICE CALCULATIONS YEAR 2045 CONDITIONS WITH PROJECT



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	315	0	95	0	0	0	0	842	177	139	1939	0
Future Volume (veh/h)	315	0	95	0	0	0	0	842	177	139	1939	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	335	0	0				0	896	0	148	2063	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	406	0					0	3525		204	2811	0
Arrive On Green	0.12	0.00	0.00				0.00	0.69	0.00	0.12	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	335	0	0				0	896	0	148	2063	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	11.4	0.0	0.0				0.0	7.9	0.0	5.0	0.0	0.0
Cycle Q Clear(g_c), s	11.4	0.0	0.0				0.0	7.9	0.0	5.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	406	0					0	3525		204	2811	0
V/C Ratio(X)	0.83	0.00					0.00	0.25		0.73	0.73	0.00
Avail Cap(c_a), veh/h	634	0					0	3525		634	2811	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.79	0.79	0.00
Uniform Delay (d), s/veh	51.8	0.0	0.0				0.0	7.0	0.0	52.0	0.0	0.0
Incr Delay (d2), s/veh	4.2	0.0	0.0				0.0	0.2	0.0	1.5	1.4	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
%ile BackOfQ(50%),veh/ln	5.1	0.0	0.0				0.0	2.5	0.0	2.0	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.9	0.0	0.0				0.0	7.2	0.0	53.5	1.4	0.0
LnGrp LOS	E	A					A	A		D	A	A
Approach Vol, veh/h		335						896			2211	
Approach Delay, s/veh		55.9						7.2			4.9	
Approach LOS		E						A			A	

Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	12.1	88.8		19.1		100.9						
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	22.0	60.0		22.0		87.0						
Max Q Clear Time (g_c+I1), s	7.0	0.0		13.4		0.0						
Green Ext Time (p_c), s	0.2	0.0		0.7		0.0						

Intersection Summary												
HCM 6th Ctrl Delay			10.4									
HCM 6th LOS			B									

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	194	0	92	46	1101	0	0	1892	775
Future Volume (veh/h)	0	0	0	194	0	92	46	1101	0	0	1892	775
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				209	0	0	49	1184	0	0	2034	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				278	0		551	2942	0	0	2893	
Arrive On Green				0.08	0.00	0.00	0.42	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				209	0	0	49	1184	0	0	2034	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				278	0		551	2942	0	0	2893	
V/C Ratio(X)				0.75	0.00		0.09	0.40	0.00	0.00	0.70	
Avail Cap(c_a), veh/h				749	0		551	2942	0	0	2893	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.93	0.93	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.1	0.0	0.0	0.0	0.4	0.0	0.0	1.5	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
%ile BackOfQ(50%),veh/ln				3.2	0.0	0.0	0.2	0.2	0.0	0.0	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.1	0.0	0.0	3.0	0.4	0.0	0.0	1.5	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					209			1233			2034	
Approach Delay, s/veh					57.1			0.5			1.5	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	105.3		31.3	74.0		14.7
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	83.0		10.0	* 68		26.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		9.1
Green Ext Time (p_c), s	0.0		0.0	0.0		0.6

Intersection Summary	
HCM 6th Ctrl Delay	4.5
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.8

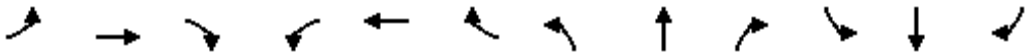
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	1	9	0	4	0	1117	66	28	2647	0
Future Vol, veh/h	1	0	1	9	0	4	0	1117	66	28	2647	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	0	1	10	0	4	0	1227	73	31	2909	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3462	4271	1455	2490	4235	650	2909	0	0	1300	0	0
Stage 1	2971	2971	-	1264	1264	-	-	-	-	-	-	-
Stage 2	491	1300	-	1226	2971	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	7	2	102	31	2	353	42	-	-	280	-	0
Stage 1	7	32	-	130	239	-	-	-	-	-	-	0
Stage 2	482	230	-	170	32	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	6	2	102	28	2	353	42	-	-	280	-	-
Mov Cap-2 Maneuver	6	2	-	28	2	-	-	-	-	-	-	-
Stage 1	7	28	-	130	239	-	-	-	-	-	-	-
Stage 2	476	230	-	150	28	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 400.9	143.3	0	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	42	-	-	11	39	280	-
HCM Lane V/C Ratio	-	-	-	0.2	0.366	0.11	-
HCM Control Delay (s)	0	-	-	$ 400.9	143.3	19.4	-
HCM Lane LOS	A	-	-	F	F	C	-
HCM 95th %tile Q(veh)	0	-	-	0.5	1.2	0.4	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	51	0	18	0	1054	57	34	2582	0
Future Volume (veh/h)	0	0	0	51	0	18	0	1054	57	34	2582	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	0	0	0	57	0	18	0	1184	58	38	2901	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	0	143	0	168	0	121	0	3791	186	454	4247	0
Arrive On Green	0.00	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.06	1.00	0.00
Sat Flow, veh/h	0	1870	0	1418	0	1585	0	5155	244	1781	5274	0
Grp Volume(v), veh/h	0	0	0	57	0	18	0	808	434	38	2901	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1418	0	1585	0	1702	1826	1781	1702	0
Q Serve(g_s), s	0.0	0.0	0.0	4.6	0.0	1.3	0.0	0.0	0.0	0.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.6	0.0	1.3	0.0	0.0	0.0	0.5	0.0	0.0
Prop In Lane	0.00		0.00	1.00		1.00	0.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	0	143	0	168	0	121	0	2588	1389	454	4247	0
V/C Ratio(X)	0.00	0.00	0.00	0.34	0.00	0.15	0.00	0.31	0.31	0.08	0.68	0.00
Avail Cap(c_a), veh/h	0	421	0	379	0	357	0	2588	1389	638	4247	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.14	0.14	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	53.3	0.0	51.8	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.2	0.0	0.6	0.0	0.3	0.6	0.0	0.1	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	0.0	0.0	1.7	0.0	0.5	0.0	0.1	0.2	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	0.0	54.5	0.0	52.3	0.0	0.3	0.6	2.2	0.1	0.0
LnGrp LOS	A	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		0			75			1242			2939	
Approach Delay, s/veh		0.0			54.0			0.4			0.2	
Approach LOS					D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.6	97.2		14.2		105.8		14.2				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.5	2.0		0.0		2.0		6.6				
Green Ext Time (p_c), s	0.0	10.0		0.0		58.4		0.3				

Intersection Summary			
HCM 6th Ctrl Delay		1.2	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	101	191	274	115	173	32	117	939	68	60	2340	156
Future Volume (veh/h)	101	191	274	115	173	32	117	939	68	60	2340	156
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		0.99
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	115	217	285	131	197	33	133	1067	71	68	2659	166
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	189	234	196	173	234	196	158	2955	196	399	2863	175
Arrive On Green	0.06	0.13	0.13	0.06	0.13	0.13	0.10	1.00	1.00	0.03	0.58	0.58
Sat Flow, veh/h	1781	1870	1566	1781	1870	1566	1781	4889	325	1781	4917	301
Grp Volume(v), veh/h	115	217	285	131	197	33	133	743	395	68	1826	999
Grp Sat Flow(s),veh/h/ln	1781	1870	1566	1781	1870	1566	1781	1702	1810	1781	1702	1814
Q Serve(g_s), s	6.8	13.8	15.0	7.0	12.4	2.3	4.2	0.0	0.0	1.9	58.0	61.5
Cycle Q Clear(g_c), s	6.8	13.8	15.0	7.0	12.4	2.3	4.2	0.0	0.0	1.9	58.0	61.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.18	1.00		0.17
Lane Grp Cap(c), veh/h	189	234	196	173	234	196	158	2058	1094	399	1982	1056
V/C Ratio(X)	0.61	0.93	1.46	0.76	0.84	0.17	0.84	0.36	0.36	0.17	0.92	0.95
Avail Cap(c_a), veh/h	189	234	196	173	234	196	185	2058	1094	466	1982	1056
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.96	0.96	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.5	52.0	52.5	45.3	51.3	46.9	29.7	0.0	0.0	9.4	22.6	23.3
Incr Delay (d2), s/veh	4.0	39.1	231.2	15.7	22.3	0.1	21.7	0.5	0.9	0.1	8.5	17.4
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	3.2	9.0	18.4	4.2	7.2	0.9	2.9	0.1	0.3	0.7	22.8	28.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.5	91.0	283.7	61.0	73.6	47.1	51.4	0.5	0.9	9.5	31.1	40.7
LnGrp LOS	D	F	F	E	E	D	D	A	A	A	C	D
Approach Vol, veh/h		617			361			1271			2893	
Approach Delay, s/veh		171.9			66.6			5.9			33.9	
Approach LOS		F			E			A			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.5	78.5	12.0	21.0	11.1	75.9	12.0	21.0
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	8.0	68.0	7.0	15.0	8.0	68.0	7.0	15.0
Max Q Clear Time (g_c+I1), s	3.5	0.0	9.0	15.8	6.2	0.0	8.8	14.4
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

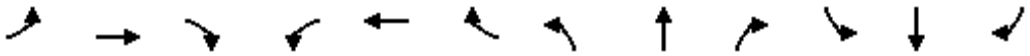
Intersection Summary	
HCM 6th Ctrl Delay	45.9
HCM 6th LOS	D

Notes

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

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	672	0	108	0	0	0	0	1480	224	93	1358	0
Future Volume (veh/h)	672	0	108	0	0	0	0	1480	224	93	1358	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	700	0	0				0	1542	0	97	1415	0
Peak Hour Factor	0.96	0.96	0.96				0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	776	0					0	2425		549	2430	0
Arrive On Green	0.22	0.00	0.00				0.00	0.47	0.00	0.32	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	700	0	0				0	1542	0	97	1415	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	23.6	0.0	0.0				0.0	27.3	0.0	2.4	0.0	0.0
Cycle Q Clear(g_c), s	23.6	0.0	0.0				0.0	27.3	0.0	2.4	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	776	0					0	2425		549	2430	0
V/C Ratio(X)	0.90	0.00					0.00	0.64		0.18	0.58	0.00
Avail Cap(c_a), veh/h	893	0					0	2425		549	2430	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.91	0.91	0.00
Uniform Delay (d), s/veh	45.2	0.0	0.0				0.0	23.7	0.0	35.3	0.0	0.0
Incr Delay (d2), s/veh	10.9	0.0	0.0				0.0	1.3	0.0	0.1	0.9	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
%ile BackOfQ(50%),veh/ln	11.2	0.0	0.0				0.0	10.5	0.0	1.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.1	0.0	0.0				0.0	25.0	0.0	35.3	0.9	0.0
LnGrp LOS	E	A					A	C		D	A	A
Approach Vol, veh/h		700						1542			1512	
Approach Delay, s/veh		56.1						25.0			3.1	
Approach LOS		E						C			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	25.0	63.0		32.0		88.0
Change Period (Y+Rc), s	6.0	* 6		5.0		6.0
Max Green Setting (Gmax), s	16.0	* 57		31.0		78.0
Max Q Clear Time (g_c+I1), s	4.4	0.0		25.6		0.0
Green Ext Time (p_c), s	0.1	0.0		1.3		0.0

Intersection Summary	
HCM 6th Ctrl Delay	22.0
HCM 6th LOS	C

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	212	0	127	95	2048	0	0	1223	511
Future Volume (veh/h)	0	0	0	212	0	127	95	2048	0	0	1223	511
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				228	0	0	102	2202	0	0	1315	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				299	0		701	2920	0	0	2723	
Arrive On Green				0.09	0.00	0.00	0.48	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				228	0	0	102	2202	0	0	1315	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				299	0		701	2920	0	0	2723	
V/C Ratio(X)				0.76	0.00		0.15	0.75	0.00	0.00	0.48	
Avail Cap(c_a), veh/h				864	0		701	2920	0	0	2723	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.66	0.66	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				53.6	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.0	0.0	0.0	0.0	1.2	0.0	0.0	0.6	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
%ile BackOfQ(50%),veh/ln				3.5	0.0	0.0	0.4	0.5	0.0	0.0	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				56.6	0.0	0.0	3.0	1.2	0.0	0.0	0.6	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					228			2304			1315	
Approach Delay, s/veh					56.6			1.3			0.6	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	104.6		34.6	70.0		15.4
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	79.0		10.0	* 64		30.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		9.7
Green Ext Time (p_c), s	0.0		0.1	0.0		0.7

Intersection Summary	
HCM 6th Ctrl Delay	4.3
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	107.2

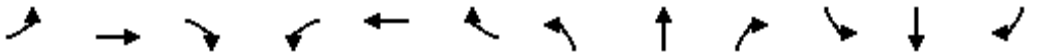
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	1	9	55	0	24	1	2170	9	4	1677	0
Future Vol, veh/h	4	1	9	55	0	24	1	2170	9	4	1677	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	1	10	60	0	26	1	2359	10	4	1823	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2777	4202	912	3104	4197	1185	1823	0	0	2369	0	0
Stage 1	1831	1831	-	2366	2366	-	-	-	-	-	-	-
Stage 2	946	2371	-	738	1831	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	20	2	237	~ 12	2	156	154	-	-	81	-	0
Stage 1	51	126	-	~ 21	67	-	-	-	-	-	-	0
Stage 2	254	66	-	341	126	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	16	2	237	~ 6	2	156	154	-	-	81	-	-
Mov Cap-2 Maneuver	16	2	-	~ 6	2	-	-	-	-	-	-	-
Stage 1	51	120	-	~ 21	67	-	-	-	-	-	-	-
Stage 2	210	66	-	308	120	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 448.2	$ 5285.2	0	0.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	154	-	-	18	8	81	-
HCM Lane V/C Ratio	0.007	-	-	0.845	10.734	0.054	-
HCM Control Delay (s)	28.5	-	-	$ 448.2	$ 5285.2	52	-
HCM Lane LOS	D	-	-	F	F	F	-
HCM 95th %tile Q(veh)	0	-	-	2.2	12.3	0.2	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	0	47	0	35	0	2170	22	15	1645	0
Future Volume (veh/h)	1	0	0	47	0	35	0	2170	22	15	1645	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	1	0	0	52	0	33	0	2385	22	16	1808	0
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, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	130	0	0	182	0	125	0	4022	37	202	4237	0
Arrive On Green	0.08	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.03	1.00	0.00
Sat Flow, veh/h	891	0	0	1549	0	1585	0	5386	48	1781	5274	0
Grp Volume(v), veh/h	1	0	0	52	0	33	0	1555	852	16	1808	0
Grp Sat Flow(s),veh/h/ln	891	0	0	1549	0	1585	0	1702	1862	1781	1702	0
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.2	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	0.0	3.3	0.0	2.4	0.0	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	130	0	0	182	0	125	0	2624	1435	202	4237	0
V/C Ratio(X)	0.01	0.00	0.00	0.29	0.00	0.26	0.00	0.59	0.59	0.08	0.43	0.00
Avail Cap(c_a), veh/h	331	0	0	389	0	357	0	2624	1435	409	4237	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.77	0.77	0.00
Uniform Delay (d), s/veh	54.1	0.0	0.0	52.5	0.0	52.0	0.0	0.0	0.0	2.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.9	0.0	1.1	0.0	1.0	1.8	0.1	0.2	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	0.0	0.0	1.5	0.0	1.0	0.0	0.4	0.7	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.1	0.0	0.0	53.3	0.0	53.1	0.0	1.0	1.8	2.4	0.2	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		1			85			2407			1824	
Approach Delay, s/veh		54.1			53.3			1.3			0.3	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.1	98.5		14.4		105.6		14.4				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.2	2.0		5.4		2.0		5.3				
Green Ext Time (p_c), s	0.0	32.9		0.0		22.3		0.3				

Intersection Summary												
HCM 6th Ctrl Delay			1.9									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	187	141	111	246	88	203	1893	87	50	1333	150
Future Volume (veh/h)	206	187	141	111	246	88	203	1893	87	50	1333	150
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	212	193	120	114	254	81	209	1952	85	52	1374	145
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	211	292	248	246	281	238	296	2840	123	165	2443	258
Arrive On Green	0.08	0.16	0.16	0.07	0.15	0.15	0.07	0.57	0.57	0.03	0.52	0.52
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	5016	218	1781	4688	495
Grp Volume(v), veh/h	212	193	120	114	254	81	209	1323	714	52	998	521
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1702	1830	1781	1702	1779
Q Serve(g_s), s	9.0	11.7	8.3	6.4	16.0	5.5	6.3	33.1	33.3	1.6	23.8	23.8
Cycle Q Clear(g_c), s	9.0	11.7	8.3	6.4	16.0	5.5	6.3	33.1	33.3	1.6	23.8	23.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.28
Lane Grp Cap(c), veh/h	211	292	248	246	281	238	296	1927	1036	165	1774	927
V/C Ratio(X)	1.00	0.66	0.48	0.46	0.90	0.34	0.71	0.69	0.69	0.32	0.56	0.56
Avail Cap(c_a), veh/h	211	292	248	479	296	251	453	1927	1036	268	1774	927
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	0.79	0.79	0.79	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.7	47.6	46.2	39.6	50.1	45.6	17.5	18.5	18.5	17.1	19.5	19.5
Incr Delay (d2), s/veh	62.8	4.4	0.5	0.5	27.1	0.3	0.9	1.6	3.0	0.4	1.3	2.5
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	5.7	5.8	3.3	2.8	9.5	2.2	2.3	12.2	13.6	0.6	9.1	9.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	108.4	52.0	46.8	40.1	77.2	45.9	18.5	20.1	21.5	17.5	20.8	21.9
LnGrp LOS	F	D	D	D	E	D	B	C	C	B	C	C
Approach Vol, veh/h		525			449			2246			1571	
Approach Delay, s/veh		73.6			62.1			20.4			21.0	
Approach LOS		E			E			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.0	73.9	13.3	24.7	13.4	68.5	14.0	24.1
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	10.0	60.0	24.0	4.0	19.0	51.0	9.0	19.0
Max Q Clear Time (g_c+I1), s	3.0	0.0	8.4	13.7	8.3	0.0	11.0	18.0
Green Ext Time (p_c), s	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0

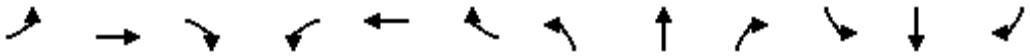
Intersection Summary	
HCM 6th Ctrl Delay	30.3
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/08/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	315	0	95	0	0	0	0	842	177	138	1937	0
Future Volume (veh/h)	315	0	95	0	0	0	0	842	177	138	1937	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	335	0	0				0	896	0	147	2061	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	406	0					0	3526		203	2811	0
Arrive On Green	0.12	0.00	0.00				0.00	0.69	0.00	0.12	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	335	0	0				0	896	0	147	2061	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	11.4	0.0	0.0				0.0	7.9	0.0	4.9	0.0	0.0
Cycle Q Clear(g_c), s	11.4	0.0	0.0				0.0	7.9	0.0	4.9	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	406	0					0	3526		203	2811	0
V/C Ratio(X)	0.83	0.00					0.00	0.25		0.73	0.73	0.00
Avail Cap(c_a), veh/h	634	0					0	3526		634	2811	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.80	0.80	0.00
Uniform Delay (d), s/veh	51.8	0.0	0.0				0.0	7.0	0.0	52.0	0.0	0.0
Incr Delay (d2), s/veh	4.2	0.0	0.0				0.0	0.2	0.0	1.5	1.4	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
%ile BackOfQ(50%),veh/ln	5.1	0.0	0.0				0.0	2.5	0.0	2.0	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.9	0.0	0.0				0.0	7.1	0.0	53.5	1.4	0.0
LnGrp LOS	E	A					A	A		D	A	A
Approach Vol, veh/h		335						896			2208	
Approach Delay, s/veh		55.9						7.1			4.9	
Approach LOS		E						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	12.0	88.9		19.1		100.9
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0
Max Green Setting (Gmax), s	22.0	60.0		22.0		87.0
Max Q Clear Time (g_c+I1), s	6.9	0.0		13.4		0.0
Green Ext Time (p_c), s	0.2	0.0		0.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	10.4
HCM 6th LOS	B

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	194	0	92	46	1101	0	0	1889	774
Future Volume (veh/h)	0	0	0	194	0	92	46	1101	0	0	1889	774
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				209	0	0	49	1184	0	0	2031	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				278	0		551	2942	0	0	2893	
Arrive On Green				0.08	0.00	0.00	0.42	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				209	0	0	49	1184	0	0	2031	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				278	0		551	2942	0	0	2893	
V/C Ratio(X)				0.75	0.00		0.09	0.40	0.00	0.00	0.70	
Avail Cap(c_a), veh/h				749	0		551	2942	0	0	2893	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.93	0.93	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				54.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.1	0.0	0.0	0.0	0.4	0.0	0.0	1.4	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
%ile BackOfQ(50%),veh/ln				3.2	0.0	0.0	0.2	0.2	0.0	0.0	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				57.1	0.0	0.0	3.0	0.4	0.0	0.0	1.4	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					209			1233			2031	
Approach Delay, s/veh					57.1			0.5			1.4	
Approach LOS					E			A			A	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		105.3			31.3	74.0		14.7				
Change Period (Y+Rc), s		6.0			6.0	* 6		5.0				
Max Green Setting (Gmax), s		83.0			10.0	* 68		26.0				
Max Q Clear Time (g_c+I1), s		0.0			2.0	0.0		9.1				
Green Ext Time (p_c), s		0.0			0.0	0.0		0.6				

Intersection Summary		
HCM 6th Ctrl Delay		4.5
HCM 6th LOS		A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

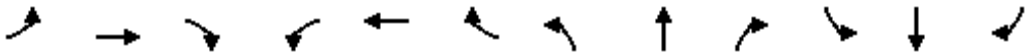
Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	2	0	0	13	0	1117	66	28	2652	0
Future Vol, veh/h	0	0	2	0	0	13	0	1117	66	28	2652	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	2	0	0	14	0	1227	73	31	2914	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	1457	-	-	650	2914	0	0	1300	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.14	-	-	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.92	-	-	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	0	0	102	0	0	353	42	-	-	280	-	0
Stage 1	0	0	-	0	0	-	-	-	-	-	-	0
Stage 2	0	0	-	0	0	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	-	-	102	-	-	353	42	-	-	280	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	41.1	15.6	0	0.2
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	42	-	-	102	353	280	-
HCM Lane V/C Ratio	-	-	-	0.022	0.04	0.11	-
HCM Control Delay (s)	0	-	-	41.1	15.6	19.4	-
HCM Lane LOS	A	-	-	E	C	C	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.4	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	51	0	18	0	1063	57	34	2587	0
Future Volume (veh/h)	0	0	0	51	0	18	0	1063	57	34	2587	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	0	0	0	57	0	18	0	1194	58	38	2907	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	0	143	0	168	0	121	0	3793	184	451	4247	0
Arrive On Green	0.00	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.06	1.00	0.00
Sat Flow, veh/h	0	1870	0	1418	0	1585	0	5157	242	1781	5274	0
Grp Volume(v), veh/h	0	0	0	57	0	18	0	815	437	38	2907	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1418	0	1585	0	1702	1827	1781	1702	0
Q Serve(g_s), s	0.0	0.0	0.0	4.6	0.0	1.3	0.0	0.0	0.0	0.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.6	0.0	1.3	0.0	0.0	0.0	0.5	0.0	0.0
Prop In Lane	0.00		0.00	1.00		1.00	0.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	0	143	0	168	0	121	0	2588	1389	451	4247	0
V/C Ratio(X)	0.00	0.00	0.00	0.34	0.00	0.15	0.00	0.31	0.31	0.08	0.68	0.00
Avail Cap(c_a), veh/h	0	421	0	379	0	357	0	2588	1389	635	4247	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.14	0.14	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	53.3	0.0	51.8	0.0	0.0	0.0	2.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.2	0.0	0.6	0.0	0.3	0.6	0.0	0.1	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	0.0	0.0	1.7	0.0	0.5	0.0	0.1	0.2	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	0.0	54.5	0.0	52.3	0.0	0.3	0.6	2.2	0.1	0.0
LnGrp LOS	A	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		0			75			1252			2945	
Approach Delay, s/veh		0.0			54.0			0.4			0.2	
Approach LOS					D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.6	97.2		14.2		105.8		14.2				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.5	2.0		0.0		2.0		6.6				
Green Ext Time (p_c), s	0.0	10.2		0.0		58.6		0.3				

Intersection Summary												
HCM 6th Ctrl Delay			1.2									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	101	191	274	115	173	32	120	939	70	60	2340	156
Future Volume (veh/h)	101	191	274	115	173	32	120	939	70	60	2340	156
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		0.99
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	115	217	285	131	197	33	136	1067	74	68	2659	166
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	189	234	196	173	234	196	161	2946	204	397	2854	175
Arrive On Green	0.06	0.13	0.13	0.06	0.13	0.13	0.11	1.00	1.00	0.03	0.58	0.58
Sat Flow, veh/h	1781	1870	1566	1781	1870	1566	1781	4874	338	1781	4917	301
Grp Volume(v), veh/h	115	217	285	131	197	33	136	745	396	68	1826	999
Grp Sat Flow(s),veh/h/ln	1781	1870	1566	1781	1870	1566	1781	1702	1808	1781	1702	1814
Q Serve(g_s), s	6.8	13.8	15.0	7.0	12.4	2.3	4.4	0.0	0.0	1.9	58.2	61.7
Cycle Q Clear(g_c), s	6.8	13.8	15.0	7.0	12.4	2.3	4.4	0.0	0.0	1.9	58.2	61.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.19	1.00		0.17
Lane Grp Cap(c), veh/h	189	234	196	173	234	196	161	2057	1092	397	1976	1053
V/C Ratio(X)	0.61	0.93	1.46	0.76	0.84	0.17	0.85	0.36	0.36	0.17	0.92	0.95
Avail Cap(c_a), veh/h	189	234	196	173	234	196	185	2057	1092	465	1976	1053
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.96	0.96	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.5	52.0	52.5	45.3	51.3	46.9	30.1	0.0	0.0	9.5	22.8	23.5
Incr Delay (d2), s/veh	4.0	39.1	231.2	15.7	22.3	0.1	22.9	0.5	0.9	0.1	8.8	17.9
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	3.2	9.0	18.4	4.2	7.2	0.9	3.0	0.1	0.3	0.7	22.9	28.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.5	91.0	283.7	61.0	73.6	47.1	53.0	0.5	0.9	9.6	31.6	41.4
LnGrp LOS	D	F	F	E	E	D	D	A	A	A	C	D
Approach Vol, veh/h		617			361			1277			2893	
Approach Delay, s/veh		171.9			66.6			6.2			34.5	
Approach LOS		F			E			A			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.5	78.5	12.0	21.0	11.4	75.6	12.0	21.0
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	8.0	68.0	7.0	15.0	8.0	68.0	7.0	15.0
Max Q Clear Time (g_c+I1), s	3.5	0.0	9.0	15.8	6.4	0.0	8.8	14.4
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

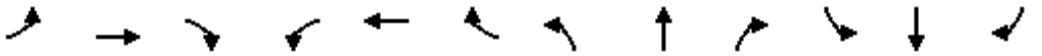
Intersection Summary	
HCM 6th Ctrl Delay	46.2
HCM 6th LOS	D

Notes

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

HCM 6th Signalized Intersection Summary
1: Federal Blvd (SH 287) & I-76 EB

06/07/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	672	0	108	0	0	0	0	1480	224	85	1346	0
Future Volume (veh/h)	672	0	108	0	0	0	0	1480	224	85	1346	0
Initial Q (Qb), veh	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
Parking Bus, Adj	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	
Adj Sat Flow, veh/h/ln	1870	0	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	700	0	0				0	1542	0	89	1402	0
Peak Hour Factor	0.96	0.96	0.96				0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	2				0	2	2	2	2	0
Cap, veh/h	776	0					0	2425		549	2430	0
Arrive On Green	0.22	0.00	0.00				0.00	0.47	0.00	0.32	1.00	0.00
Sat Flow, veh/h	3456	0	1585				0	5274	1585	3456	3647	0
Grp Volume(v), veh/h	700	0	0				0	1542	0	89	1402	0
Grp Sat Flow(s),veh/h/ln	1728	0	1585				0	1702	1585	1728	1777	0
Q Serve(g_s), s	23.6	0.0	0.0				0.0	27.3	0.0	2.2	0.0	0.0
Cycle Q Clear(g_c), s	23.6	0.0	0.0				0.0	27.3	0.0	2.2	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	776	0					0	2425		549	2430	0
V/C Ratio(X)	0.90	0.00					0.00	0.64		0.16	0.58	0.00
Avail Cap(c_a), veh/h	893	0					0	2425		549	2430	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.91	0.91	0.00
Uniform Delay (d), s/veh	45.2	0.0	0.0				0.0	23.7	0.0	35.2	0.0	0.0
Incr Delay (d2), s/veh	10.9	0.0	0.0				0.0	1.3	0.0	0.0	0.9	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
%ile BackOfQ(50%),veh/ln	11.2	0.0	0.0				0.0	10.5	0.0	0.9	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.1	0.0	0.0				0.0	25.0	0.0	35.3	0.9	0.0
LnGrp LOS	E	A					A	C		D	A	A
Approach Vol, veh/h		700						1542			1491	
Approach Delay, s/veh		56.1						25.0			3.0	
Approach LOS		E						C			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	25.0	63.0		32.0		88.0
Change Period (Y+Rc), s	6.0	* 6		5.0		6.0
Max Green Setting (Gmax), s	16.0	* 57		31.0		78.0
Max Q Clear Time (g_c+I1), s	4.2	0.0		25.6		0.0
Green Ext Time (p_c), s	0.1	0.0		1.3		0.0

Intersection Summary	
HCM 6th Ctrl Delay	22.0
HCM 6th LOS	C

Notes

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

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	212	0	127	95	2048	0	0	1203	504
Future Volume (veh/h)	0	0	0	212	0	127	95	2048	0	0	1203	504
Initial Q (Qb), veh				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
Parking Bus, Adj				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	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				228	0	0	102	2202	0	0	1294	0
Peak Hour Factor				0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				299	0		705	2920	0	0	2723	
Arrive On Green				0.09	0.00	0.00	0.48	1.00	0.00	0.00	1.00	0.00
Sat Flow, veh/h				3456	0	1585	1781	3647	0	0	5274	1585
Grp Volume(v), veh/h				228	0	0	102	2202	0	0	1294	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1777	0	0	1702	1585
Q Serve(g_s), s				7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				299	0		705	2920	0	0	2723	
V/C Ratio(X)				0.76	0.00		0.14	0.75	0.00	0.00	0.48	
Avail Cap(c_a), veh/h				864	0		705	2920	0	0	2723	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	0.66	0.66	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				53.6	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				3.0	0.0	0.0	0.0	1.2	0.0	0.0	0.6	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
%ile BackOfQ(50%),veh/ln				3.5	0.0	0.0	0.4	0.5	0.0	0.0	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				56.6	0.0	0.0	3.0	1.2	0.0	0.0	0.6	0.0
LnGrp LOS				E	A		A	A	A	A	A	
Approach Vol, veh/h					228			2304			1294	
Approach Delay, s/veh					56.6			1.3			0.6	
Approach LOS					E			A			A	

Timer - Assigned Phs	2		5	6		8
Phs Duration (G+Y+Rc), s	104.6		34.6	70.0		15.4
Change Period (Y+Rc), s	6.0		6.0	* 6		5.0
Max Green Setting (Gmax), s	79.0		10.0	* 64		30.0
Max Q Clear Time (g_c+I1), s	0.0		2.0	0.0		9.7
Green Ext Time (p_c), s	0.0		0.1	0.0		0.7

Intersection Summary	
HCM 6th Ctrl Delay	4.4
HCM 6th LOS	A

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.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

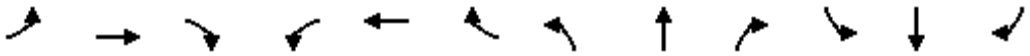
Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	14	0	0	79	1	2170	9	4	1705	0
Future Vol, veh/h	0	0	14	0	0	79	1	2170	9	4	1705	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	160	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	15	0	0	86	1	2359	10	4	1853	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	927	-	-	1185	1853	0	0	2369	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	7.14	-	-	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.92	-	-	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	0	0	232	0	0	156	148	-	-	81	-	0
Stage 1	0	0	-	0	0	-	-	-	-	-	-	0
Stage 2	0	0	-	0	0	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	-	-	232	-	-	156	148	-	-	81	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.6	53.2	0	0.1
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	148	-	-	232	156	81	-
HCM Lane V/C Ratio	0.007	-	-	0.066	0.55	0.054	-
HCM Control Delay (s)	29.5	-	-	21.6	53.2	52	-
HCM Lane LOS	D	-	-	C	F	F	-
HCM 95th %tile Q(veh)	0	-	-	0.2	2.8	0.2	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	0	47	0	35	0	2225	22	15	1673	0
Future Volume (veh/h)	1	0	0	47	0	35	0	2225	22	15	1673	0
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	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	1	0	0	52	0	33	0	2445	22	16	1838	0
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, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	130	0	0	182	0	125	0	4023	36	195	4237	0
Arrive On Green	0.08	0.00	0.00	0.08	0.00	0.08	0.00	1.00	1.00	0.03	1.00	0.00
Sat Flow, veh/h	891	0	0	1549	0	1585	0	5387	47	1781	5274	0
Grp Volume(v), veh/h	1	0	0	52	0	33	0	1594	873	16	1838	0
Grp Sat Flow(s),veh/h/ln	891	0	0	1549	0	1585	0	1702	1862	1781	1702	0
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.2	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	0.0	3.3	0.0	2.4	0.0	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	130	0	0	182	0	125	0	2624	1435	195	4237	0
V/C Ratio(X)	0.01	0.00	0.00	0.29	0.00	0.26	0.00	0.61	0.61	0.08	0.43	0.00
Avail Cap(c_a), veh/h	331	0	0	389	0	357	0	2624	1435	402	4237	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.76	0.76	0.00
Uniform Delay (d), s/veh	54.1	0.0	0.0	52.5	0.0	52.0	0.0	0.0	0.0	2.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.9	0.0	1.1	0.0	1.1	1.9	0.1	0.2	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	0.0	0.0	1.5	0.0	1.0	0.0	0.4	0.8	0.1	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.1	0.0	0.0	53.3	0.0	53.1	0.0	1.1	1.9	2.4	0.2	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		1			85			2467			1854	
Approach Delay, s/veh		54.1			53.3			1.4			0.3	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.1	98.5		14.4		105.6		14.4				
Change Period (Y+Rc), s	5.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	16.0	61.0		27.0		82.0		27.0				
Max Q Clear Time (g_c+I1), s	2.2	2.0		5.4		2.0		5.3				
Green Ext Time (p_c), s	0.0	34.3		0.0		23.1		0.3				

Intersection Summary			
HCM 6th Ctrl Delay		1.9	
HCM 6th LOS		A	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	187	141	111	246	88	219	1894	97	50	1333	150
Future Volume (veh/h)	206	187	141	111	246	88	219	1894	97	50	1333	150
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	212	193	120	114	254	81	226	1953	95	52	1374	145
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	211	292	248	246	281	238	302	2823	137	164	2420	255
Arrive On Green	0.08	0.16	0.16	0.07	0.15	0.15	0.08	0.57	0.57	0.03	0.52	0.52
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	4988	242	1781	4688	495
Grp Volume(v), veh/h	212	193	120	114	254	81	226	1331	717	52	998	521
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1702	1826	1781	1702	1778
Q Serve(g_s), s	9.0	11.7	8.3	6.4	16.0	5.5	6.8	33.4	33.7	1.7	24.1	24.1
Cycle Q Clear(g_c), s	9.0	11.7	8.3	6.4	16.0	5.5	6.8	33.4	33.7	1.7	24.1	24.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.13	1.00		0.28
Lane Grp Cap(c), veh/h	211	292	248	246	281	238	302	1927	1033	164	1757	918
V/C Ratio(X)	1.00	0.66	0.48	0.46	0.90	0.34	0.75	0.69	0.69	0.32	0.57	0.57
Avail Cap(c_a), veh/h	211	292	248	479	296	251	450	1927	1033	267	1757	918
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	0.78	0.78	0.78	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.7	47.6	46.2	39.6	50.1	45.6	18.5	18.6	18.6	17.3	19.9	19.9
Incr Delay (d2), s/veh	62.8	4.4	0.5	0.5	27.1	0.3	1.1	1.6	3.0	0.4	1.3	2.5
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	5.7	5.8	3.3	2.8	9.5	2.2	2.5	12.3	13.7	0.6	9.2	9.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	108.4	52.0	46.8	40.1	77.2	45.9	19.7	20.2	21.6	17.7	21.2	22.4
LnGrp LOS	F	D	D	D	E	D	B	C	C	B	C	C
Approach Vol, veh/h		525			449			2274			1571	
Approach Delay, s/veh		73.6			62.1			20.6			21.5	
Approach LOS		E			E			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.0	73.9	13.3	24.7	14.0	67.9	14.0	24.1
Change Period (Y+Rc), s	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Max Green Setting (Gmax), s	10.0	60.0	24.0	4.0	19.0	51.0	9.0	19.0
Max Q Clear Time (g_c+I1), s	3.7	0.0	8.4	13.7	8.8	0.0	11.0	18.0
Green Ext Time (p_c), s	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	30.5
HCM 6th LOS	C

Notes

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

AUTHORIZATION TO ACT AS REPRESENTATIVE

FED57, LLC, a Colorado limited liability company, and FED58, LLC, a Colorado limited liability company (collectively, the "**Owners**"), as legal owners of record of certain property located at 5690, 5790, and 5800 Federal Boulevard (the "**Property**") in the County of Adams, State of Colorado, hereby consent to and authorize OPUS DEVELOPMENT COMPANY, L.L.C., a Delaware limited liability company and OPUS AE GROUP, L.L.C., a Minnesota limited liability company (collectively, the "**Applicant**") to act as the Owners' agent and representative in all matters pertaining to the minor subdivision request for the Property (the "**Application**"). This authorization shall expire by its own terms upon the successful approval of the Application by the Adams County Board of County Commissions, or upon the written termination of this instrument by the Owners.

OWNERS:

FED57, LLC,
a Colorado limited liability company

By: _____
Name: Kevin Preblud
Title: Member

FED58, LLC,
a Colorado limited liability company

By: _____
Name: Kevin Preblud
Title: Member

STATE OF COLORADO)
) ss.
COUNTY OF Denver)

The foregoing instrument was acknowledged before me this 3rd day of Aug, 2023, by Kevin Preblud as member of FED57, LLC, a Colorado limited liability company and FED58, LLC, a Colorado limited liability company.

Witness my hand and official seal.

My commission expires: 2/17/2026

JO LYNN HOOD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 19974019155
MY COMMISSON EXPRIES FEBRUARY 17, 2026

Jo Lynn Hood
Notary Public