APPLICATION OVERVIEW

What: The Call for Projects for the FY 2024-2027 Regional Transportation Operations and Technology Set-Aside
Funding Available: at least $16,000,000
Call Dates: June 1, 2023 until July 7, 2023, 5 pm
Application Submittals: submit the items below to Jerry Luor (jluor@drcog.org)

1. REQUIRED: a **single PDF document** containing 1) this application (**before saving to PDF, press Ctrl-A to select all, and F9 to update all formulas**), 2) one location map/graphic, 3) cost estimate (your own or the CDOT cost estimate form), 4) CDOT/RTD concurrence response (if applicable), 5) completed CDOT SEA-Local Agency Template, 6) project support form(s), and 7) any required documentation based on the application text (i.e., FHWA emissions calculators). Please DO NOT attach additional cover pages, embed graphics in the application, or otherwise change the format of the application form.
2. OPTIONAL: Submit **one additional** PDF document containing any supplemental materials, if applicable.
3. REQUIRED: Submit a single zipped GIS shapefile of your project. At a minimum, the shapefile should consist of project limits and planned equipment locations.

Other Notable items:

- Eligibility: Projects must align with the eligibility guidelines in the *Policies for FY2024-2027 TIP Set-Aside Programs*. Proposed work on roadways must primarily be located on the DRCOG Regional Roadway System to be eligible for funding (the DRCOG RRS can also be viewed within the DRCOG Data Tool).
- Call-for-Projects Pre-Application Webinar: To be eligible to submit an application, at least one person from your agency must have attended the Regional Transportation Operations and Technology Set-Aside Pre-Application Webinar on April 26, 2023.
- Application Data: To assist sponsors in filling out the application, DRCOG has developed the DRCOG Data Tool. A link to the instructions is also included. Additionally, sponsors may download datasets to run their own analyses from this same site.
- Project Affirmation: The application must be affirmed by either the applicant's City or County Manager, Chief Elected Official (Mayor or County Commission Chair) for local governments, or agency director or equivalent for other applicants.
- Evaluation Process: DRCOG staff will post all applications. DRCOG staff will assemble an evaluation panel to review and make recommendations for funding, including a ranked waiting list. The recommended list of projects will be presented to the Regional Transportation Operations Working Group and Advanced Mobility Partnership Working Group prior to action by the DRCOG committees and Board.
- If you have any questions or need assistance, contact gmackinnon@drcog.org or jluor@drcog.org.

APPLICATION FORMAT

The Regional Transportation Operations and Technology set-aside application contains two parts: *project information* and *evaluation questions*.

Project Information

Applicants enter **foundational** information for the *project/program/study* (hereafter referred to as *project*), including a problem statement, project description, and concurrence documentation from CDOT and/or RTD, if applicable. This section is not scored.

Evaluation Questions

This part includes four sections (A-E) for the **applicant to provide qualitative and quantitative responses** to use for scoring projects. The checkboxes and data entry fields should guide the applicant's responses. They are not directly scored but provide context as reviewers consider the full response to each question. Applicants may access the DRCOG Data Tool as well as other relevant data resources.

Scoring Methodology: Each section will be scored on a scale of 0 to 5, relative to other applications received. All questions will be factored into the final score, with any questions left blank receiving 0 points. The four sections are weighted and scored as follows:

Section A. Deployment of RTO&T Initiatives in RTO&T Strategic Plan 30%

Projects will be evaluated on the degree to which they address a significant subregional problem or benefit people throughout the subregion. Relevant quantitative data should be included within narrative responses.

5	The project implements or advances several **Primary** initiatives.
4	The project implements or advances one **Primary** initiative
3	The project implements or advances several **Secondary** initiatives.
2	The project implements or advances one **Secondary** initiative.
1	The project implements or advances one or more **Tertiary** initiatives.
0	The project implements no initiatives.

Section B. Regional Impact of Proposed Project 25%

Projects will be evaluated on the degree to which they address a significant subregional problem or benefit people throughout the subregion. Relevant quantitative data should be included within narrative responses.

5	The project benefits will **substantially** address a **major** subregional problem and benefit people and businesses in multiple communities.
4	The project benefits will **significantly** address a **major** subregional problem primarily benefiting people and businesses in one community.
3	The project benefits will either **moderately** address a **major** subregional problem or **significantly** address a **moderate**-level subregional problem.
2	The project benefits will **moderately** address a **moderate**-level subregional problem.
1	The project benefits will address a **minor** subregional problem.
0	The project does not address a subregional problem.

Section C. Metro Vision Regional Transportation Plan Priorities 25%

The TIP set-aside's investments should implement the 2050 Metro Vision Regional Transportation Plan (2050 MVRTP) regional project and program investment priorities, which contribute to addressing the Board-adopted Metro Vision objectives and the federal performance-based planning framework required by the Federal Highway Administration and Federal Transit Administration as outlined in current federal transportation legislation and regulations. Therefore, projects will be evaluated on the degree to which they address the six priorities identified in the 2050 MVRTP: safety, active transportation, air quality, multimodal mobility, freight, and regional transit. It is anticipated that projects may not be able to address all six priorities, but it's in the

applicant's interest to address as many priority areas as possible. Relevant quantitative data is required to be included within narrative responses. The table below demonstrates how each priority area will be scored.

5	The project provides demonstrable **substantial** benefits in the 2050 MVRTP priority area and is determined to be in the **top fifth** of applications based on the magnitude of benefits in that priority area.
4	The project provides demonstrable **significant** benefits in the 2050 MVRTP priority area.
3	The project provides demonstrable **moderate** benefits in the 2050 MVRTP priority area and is determined to be in the **middle fifth** of applications based on the magnitude of benefits in that priority area.
2	The project provides demonstrable **modest** benefits in the 2050 MVRTP priority area.
1	The project provides demonstrable **slight** benefits in the 2050 MVRTP priority area and is determined to be in the **bottom fifth** of applications based on the magnitude of benefits in that priority area.
0	The project does not provide demonstrable benefits in the 2050 MVRTP priority area.

Section D. Financial Leveraging 5%

Scores are assigned based on the percent of other non-federal funding sources.

Score	% non-Federal Funds
5	36% and above
4	31 - 35.9%
3	26 - 30.9%
2	21 - 25.9%
1	17.21 - 20.9%*
0	17.21%

*(includes 100% eligible projects with no match)

Section E. Project Readiness 15%

Be sure to answer ALL questions. While "Yes" answers will generally reflect greater readiness, opportunities are given to provide additional details to assist reviewers in fully evaluating the readiness of your project.

5	**Substantial** readiness is demonstrated and all known obstacles that are likely to result in project delays have been mitigated.
4	**Significant** readiness is demonstrated and several known obstacles that are likely to result in project delays have been mitigated.
3	**Moderate** readiness is demonstrated and some known obstacles that are likely to result in project delays have been mitigated.
2	**Slight** readiness is demonstrated and some known obstacles that are likely to result in project delays have been mitigated.
1	**Few** mitigation or readiness activities have been demonstrated.
0	**No** mitigation or readiness activities have been demonstrated.

Project Information

1. Project Title	**Thornton Travel Time Monitoring Expansion**
2. Project Location *Provide a map, as appropriate (see Page 1)*	Start point: Click or tap here to enter text. End point: Click or tap here to enter text. OR Geographic Area: Various corridors in the city of Thornton – see overall map in Figure 1 and proposed locations in Figure 2
3. Project Sponsor *(entity that will be financially responsible for the project)*	City of Thornton

4. Project Contact Person:

Name: Marta Junyent	Title: Senior Civil Engineer - Traffic
Phone: 720 977 6486	Email: marta.junyent@thorntonco.gov

5. Required Concurrence and Project Support: Does this project touch CDOT Right-of-Way, involve a CDOT roadway, connect to a CDOT system, access RTD property, or request RTD involvement to operate service? Does this project directly involve other local agency partners.	☒ Yes ☐ No *If yes, provide a completed Peer Agency Support Form for each partner.*

6. What planning document(s) identifies this project?

Provide link to document(s) and referenced page number if possible, or provide documentation in the supplement

If this project is listed in the DRCOG 2050 Metro Vision Regional Transportation Plan (2050 MVRTP), provide the staging period: Click or tap here to enter text.

Local/Regional plan:	Planning Document Title: Thornton Transportation and Mobility Master Plan (TMMP) https://www.thorntonco.gov/government/citydevelopment/planning/Documents/master-plans/transportation-plan/tmmp-adopted-april-2022.pdf Adopting agency (local agency Council, CDOT, RTD, etc.): Thornton City Council Provide date of adoption by council/board/commission, if applicable: April 2022
Please describe public review/engagement to date:	Thornton's TMMP was developed through extensive public engagement using online surveys, interactive mapping tools, focus group meetings, and a virtual public meeting. (Chapter 3 Community Engagement).
Other pertinent details:	The TMMP identifies performance measures to quantify progress towards Thornton's transportation vision and goals. Corridor travel times and regional travel times are specifically identified in Table 11.10 of the TMMP for performance measure tracking. This project expansion of travel time monitoring equipment will cover all areas identified in Table 11.10 of the TMMP.

7. Identify the project's **key phases and the anticipated schedule of phase milestones**.
(phases and dates should correspond with the "Phase to be Initiated" in the Funding Breakdown table below)

Phases to be included:	**Major phase milestones**:	**Anticipated completion date (based on October 2023 DRCOG approval date)**: (MM/YYYY)
	☐ Preconstruction ☐ Construction ☐ Both	
REQUIRED FOR ALL PHASES	Intergovernmental Agreement (IGA) executed with CDOT/RTD (Assumed process is 4-9 months; any work performed before execution is NOT reimbursable)	06/2024
☐Design	Design contract Notice to Proceed (NTP) issued (if using a consultant):	Enter Date
	Design scoping meeting held with CDOT (if no consultant):	Enter Date
	FIR (Field Inspection Review):	Enter Date
	FOR (Final Office Review):	Enter Date
☐Environmental	Environmental contract Notice to Proceed (NTP) issued (if using a consultant):	Enter Date
	Environmental scoping meeting held with CDOT (if no consultant):	Enter Date
☐Right-of-Way	Initial set of ROW plans submitted to CDOT: Estimated number of parcels to acquire: Enter Number	Enter Date
	ROW acquisition completed:	Enter Date
☐Construction	Required clearances:	Enter Date
	Project publicly advertised:	Enter Date
☐Study	Kick-off meeting held after consultant NTP (or internal if no consultant):	Enter Date
☒Equipment Purchase (Procurement)	RFP/RFQ/RFB (bids) issued:	10/2024
☒Other Phase not Listed Describe: Equipment Installation	First invoice submitted to CDOT/RTD: Installation by Thornton's staff, no invoice to CDOT.	2/2025

8. Problem Statement: What specific subregional problem/issue will the transportation project address?

This project addresses transportation system performance and travel time reliability. As traffic volumes increase, delay on roadways can increased. Congestion and travel time reliability are a common complaint in suburban areas that also directly impact air quality and traffic safety. In addition, traffic professionals have come to recognize the importance of travel time reliability because it better quantifies the benefits of traffic management and operation activities than simple averages. Thornton installed a travel monitoring system in 2022 that provides continuous, real-time travel time information and performance measures that are currently used by Thornton's traffic operators to monitor travel time and level-of-service on key corridors.

The existing travel time monitoring network covers approximately 16 miles. This project will expand Thornton's existing travel time monitoring network to cover approximately 27.5 additional miles. The targeted corridors for the expansion are identified as either Major Regional Arterial or Principal Arterial on the Regional Roadway System in the 2050 Metro Vision Regional Transportation Plan. There are twenty-two (22) Bluetooth devices proposed to be installed at signalized intersections and, in addition to the existing devices, the expanded network will cover the following corridor segments: 144th Avenue (Lincoln to Holly St), 136th Avenue (I-25 to Yosemite St), 120th Avenue (I-25 to Quebec St), 104th Avenue (York St to McKay Rd), Thornton Pkwy (Pecos St to Colorado Blvd), 84th Ave (Huron St to Washington St), 88th Ave (Huron St to Colorado Blvd), Huron St (Thornton Pkwy to 88th Ave), Washington (120th Ave to 144th Ave), Washington (84th Ave to 120th Ave), Colorado (88th to 144th Ave), Holly Street (104th Ave to 144th Ave), Quebec St (120th Ave to E-470).

9. Identify the project's **key elements**. A single project may have multiple project elements.

Roadway

- ☒ Operational Improvements
- ☐ General Purpose Capacity (2050 MVRTP)
- ☐ Managed Lanes (2050 MVRTP)
- ☐ Pavement Reconstruction/Rehab
- ☐ Bridge Replace/Reconstruct/Rehab

Grade Separation

- ☐ Roadway
- ☐ Railway
- ☐ Bicycle
- ☐ Pedestrian

Regional Transit[1]

- ☐ Rapid Transit Capacity (2050 MVRTP)
- ☐ Mobility Hub(s)
- ☐ Transit Planning Corridors
- ☐ Transit Facilities (Expansion/New)

☒ **Safety Improvements**

Active Transportation Improvements

- ☐ Bicycle Facility
- ☐ Pedestrian Facility

☒ **Air Quality Improvements**

☐ **Improvements Impacting Freight**

Multimodal Mobility (i.e., accommodating a broad range of users)

- ☐ Complete Streets Improvements

☐ **Study**

☐ **Other**, briefly describe: Click or tap here to enter text.

[1]For any project with transit elements, the sponsor must coordinate with RTD to ensure RTD agrees to the scope and cost. Be sure to include RTD's concurrence in your application submittal.

10. Define the **scope** and **specific elements** of the project (including any elements checked in #9 above).
DO NOT include scope elements that will not be part of the DRCOG funded project or your IGA scope of work (i.e., adjacent locally funded improvements or the project merits and benefits). Please keep the response to this question tailored to details of the scope only and no more than five sentences.

The scope of the project is to expand the existing travel time monitoring network along targeted corridors in the city of Thornton. The scope will include procurement of twenty-two (22) Bluetooth reader field devices and its installation. The procurement will ensure that the equipment is fully compatible with Thornton's existing system and neighboring system. Thornton currently has 23 Bluetooth reader devices installed in the field and a web-based application to monitor the data, check performance measures, pull reports, and access the devices. It is anticipated that a Finding in the Public Interest (FIPI) will be requested to ensure the additional Bluetooth reader devices are fully compatible with the existing equipment and system. The new devices will be added to the existing virtual server host and web-based software. Installation of the devices will be completed by Thornton's staff. The devices are planned to be installed on existing traffic signal poles and use existing power training as needed. A data and monitoring sharing plan will be implemented with neighboring jurisdictions.

The project will provide **operational improvements** as the data is used by traffic operators to identify areas where traffic congestion is prevalent and to adjust signal timing to move traffic more efficiently. **Air quality improvements** are also anticipated as travel time reliability reduces delays and subsequent vehicle emissions. The project also addresses **transportation safety** by improving and expanding monitoring capabilities during incident management response.

11. What is the current status of the proposed scope as defined in Question 10 above? *Note that overall project readiness is addressed in more detail in Section E below.*

The corridors and locations of the devices have been identified, see proposed locations in Figure 2. Coordination with neighboring jurisdiction (Westminster) is ongoing and a data and monitoring sharing plan is under development. Thornton's staff is trained and experienced with this type of technology as a travel time monitoring system including twenty-three (23) devices are already deployed and functioning. The existing network is already being used to report performance measure metrics; Thornton is currently monitoring and reporting actual travel time versus planning index time and level-of-service on key corridors.

12. Would a smaller DRCOG-allocation than requested be acceptable, while maintaining the original intent of the project? ☐ Yes ☒ No

*If yes, smaller meaningful limits, size, service level, phases, or scopes, along with the cost, **MUST** be defined.*

Smaller DRCOG funding request: Click or tap here to enter text.

Outline the differences between the scope outlined above and the reduced scope: Click or tap here to enter text.

Project Financial Information and Funding Request

(All funding amounts in $1,000s)

To update the formulas below, enter your information, highlight the formulas, and press F9 or right-click and select Update Field.

Total amount of Federal Funding Request (in $1,000's) *(Not to exceed **82.79% of the total project cost**)*	**$101.2**	**80.00%** **of total project cost**
Match Funds (in $1,000's) List each funding source and contribution amount.	**Contribution Amount**	**% Contribution to Overall Project Total**
City of Thornton	$25.3	20.0%
Click or tap here to enter text.	$Match Amount	0.0%
Click or tap here to enter text.	$Match Amount	0.0%
Click or tap here to enter text.	$Match Amount	0.0%
Click or tap here to enter text.	$Match Amount	0.0%
Click or tap here to enter text.	$Match Amount	0.0%
Total Match *(private, local, state, regional, or federal)*	**$ 25.3**	**100.0%**
Project Total	**$ 126.5**	

Funding Breakdown (in $1,000s) (by program year)[1] (Total funding should match the Project Total from above)

To update the formulas below, enter your information, highlight the formulas (or Ctrl-A), and press F9. OR close and reopen the file.

	FY 2024	FY 2025	FY 2026	FY 2027	Total
DRCOG Requested Funds	$101.2	$Enter Amount	$Enter Amount	$Enter Amount	**$ 101.2**
CDOT or RTD Supplied Funds[2]	$Enter Amount	$Enter Amount	$Enter Amount	$Enter Amount	**$ 0**
Local Funds (Funding from sources other than DRCOG, CDOT, or RTD)	$25.3	$Enter Amount	$Enter Amount	$Enter Amount	**$ 25.3**
Total Funding	$ 126.5	$ 0	$ 0	$ 0	**$ 126.5**
Phase to be Initiated	Select Phase	Select Phase	Select Phase	Select Phase	
Notes:	1. Fiscal years are October 1 through September 30 (e.g., FY 2024 is October 1, 2023 through September 30, 2024). The proposed funding plan is not guaranteed if the project is selected for funding. While DRCOG attempts to accommodate applicants' requests, final funding will be assigned at DRCOG's discretion. Funding amounts must be provided in year of expenditure dollars using a recommended 3% inflation factor. 2. Only enter funding in this line if CDOT and/or RTD specifically give permission via concurrence letters or other written source.				
Affirmation:	By checking this box, the applicant's Chief Elected Official (Mayor or County Commission Chair/City or County Manager/Agency Director) has certified it allows this application to be submitted for potential DRCOG-allocated funding and will follow all local, DRCOG, state, and federal policies and regulations if funding is awarded. ☒				

	Evaluation Questions		
A. Deployment of RTO&T Initiatives in RTO&T Strategic Plan		**WEIGHT**	**30%**
Select the initiatives to be deployed or advanced by this proposed project. It is possible to select more than one initiative.			

Primary initiatives	
Develop a Regional Situational Awareness platform.	☒
Develop processes to share traffic camera view and control between jurisdictions and public safety.	☐
Develop a Regional Performance Monitoring Data Archive platform.	☒
Develop strategies and processes to coordinate performance-based management.	☒
Deploy additional supporting transportation surveillance and control systems and infrastructure.	☐
Develop Traffic Incident Management standard operating procedures.	☐
Standardize and implement transit signal priority performance management and system optimization procedures.	☐
Secondary initiatives	
Develop evacuation and recovery plans and exercises.	☐
Develop processes to coordinate traveler information messaging across the region.	☒
Develop active work zone monitoring and management in the field.	☐
Deploy additional safety-focused technology applications	☐
Expand the Regional Performance Monitoring Data Archive platform.	☒
Expand the Regional Situational Awareness platform.	☐
Expand transit signal priority deployment.	☐
Tertiary initiatives	
Develop a Regional Multimodal Traveler Information platform.	☐
Develop a process to monitor regional parking availability, capacity and pricing.	☐
Develop a multimodal trip planner and reservation/ payment system.	☐
Develop and deploy dynamic ride-sharing.	☐
Develop and implement curbside management standards.	☐
Develop continuity of operations plans.	☐

Describe how this project will deploy, advance or achieve the selected initiatives.

This project directly supports the primary initiatives of the 2050 Metro Vision Regional Transportation System to develop a regional situation awareness platform by providing continuous, real-time data of roadway conditions (congestion and travel time) and to develop a regional performance monitoring data archive platform by providing travel time reliability measures in regional arterials and data sharing. It also supports developing strategies and processes to coordinate performance-based management. Data from this system, such as TTI and TTR, is used to assess and prioritize needs for operational improvements based on performance measures.

It also supports secondary initiatives to develop a process to coordinate traveler information messaging across the region and expand the regional performance monitoring data archive. The travel time data will be shared with neighboring jurisdictions (Westminster) and at the regional level (DRCOG, CDOT). Data will also be shared with the public.

The Regional Transportation Operations and Technology Strategic Plan emphasizes a data management concept that requires interagency information sharing. Describe in detail how this project will share data with other regional entities.

In terms of neighboring jurisdictions, Thornton and Westminster are already in the process of coordinating data sharing and monitoring with their existing systems as both jurisdictions are using the same web-based system and Bluetooth reader devices and they are fully compatible.

Specifically, Westminster is deploying devices at the intersections of 136th Avenue and Huron Street, 136th Avenue and Orchard Parkway, 144th Avenue and Huron Street, and 144th and I-25. Thornton has devices deployed at 136th Avenue and I-25, 136th Avenue and Grant Street, and 136th Avenue and Washington Street. A linked pair

will be established between 136th Avenue and Orchard Parkway (Westminster) and 136th Avenue and I-25 (Thornton) and this will allow continuous travel time monitoring on 136th Avenue from Huron Street to Washington Street. With Thornton's expansion, additional devices will be installed on 136th Avenue extending the monitoring capabilities 5 miles east to Yosemite Street. With Thornton's expansion, additional devices will be installed on 144th Avenue, and a linked pair would be established between intersection of 144th Avenue and I-25 (Westminster) and a proposed location on 144th and Washington (Thornton). This will allow continuous travel time monitoring on 144th Avenue from Huron Street to Holly Street. Westminster also has units on the 92nd Avenue and 104th Avenue corridors and, even though the distance would not be sufficient to establish reliable linked pairs, data sharing could provide information on Origin/Destinations across the region.

At the regional level, DRCOG staff has access to the existing Thornton's web-based system and would seamlessly have access to the expanded network. Thornton staff has also been working with CDOT staff on data sharing efforts and is currently still in conversations.

B. Regional Impact of Proposed Project

WEIGHT **25%**

*Provide **qualitative and quantitative** responses to the following questions on the subregional impact of the proposed project. Be sure to provide all required information for each question. Quantitative data from is available from the DRCOG Data Tool.*

1. Why is this project regionally important? *Relevant quantitative data in your response is required.*

Travel time is a fundamental performance measure in transportation. Travel time reliability has an impact for many transportation system users, whether they are vehicle drivers, transit rides, or freight users. To be able to improve travel time reliability, the first step is to measure and monitor it. Additionally, measures of travel time reliability better represent drivers experience than a simple average travel time. Some quantitative examples are given in the FHWA brochure: "Travel Time Reliability: Making It There On Time, All The Time". https://ops.fhwa.dot.gov/publications/tt_reliability/brochure/

For example, it takes on average 15 minutes for a commuter to get to work. If one day a month the travel time increases to 40 minutes, the commuter tends to remember that day versus their typical travel time. Another example, while evaluating the benefits of an incident management program and looking at the before and after average travel time, the improvement may seem modest. However, travel time reliability provides a different perspective of the improvement: as the worst days could have been dramatically improved.

The Thornton Travel Time Monitoring expansion project is important because it will provide travel time data on most of major arterials where Thornton currently has no infrastructure to monitor travel time, including 136th Avenue and 144th Avenue where city the Westminster has deployed devices that will be linked to the Thornton network.

2. How will the proposed project address the specific transportation problem described in the **Problem Statement** *(as submitted in Project Information, #8)*? *Relevant quantitative data in your response is required.*

This project addresses transportation system performance and travel time reliability. Thornton successfully deployed infrastructure to provide travel time monitoring in 2022. The existing system provides continuous, real-time travel time information and performance measures that are used by Thornton's traffic operators to have more direct and frequent observation to monitor travel time and level-of-service on key corridors. The performance data from the system is used to adjust operational parameters and signal timing to improve efficiency and reliability of the transportation network. The data is also used by traffic operators to establish baseline conditions and define thresholds so the system can alert of degrading travel conditions based on real-time information. With this information, traffic operators can take action faster, adjust traffic signal timing as needed, and alert road users.

Reducing congestion and improving corridor mobility is one of Thornton's strategic planning goals. Data from the existing system is currently used as a strategic planning metric to assess variations of traffic patterns day by day, season by season, and under special events or incident management. Thornton is reporting monthly travel time index (TTI) to assess level of service for morning peak (7-8 am) and afternoon peak (5-6 pm) to the city's stakeholders. Figure 3 and Figure 4 show February 2023 reported data. As an example, data has been used to monitor the effects of travel time from construction along 120th Avenue between Sylvia Drive and the RTD N Line overpass for the 120th Avenue widening project in Northglenn. Thornton is currently working with the existing system vendor to expand the reporting to include Travel Time Reliability (TTR) and plans to share the data in traveler information system in the short-term future.

3. Does the proposed project benefit multiple municipalities and/or subregions? If yes, which ones and how? Also describe any funding partnerships *(other subregions, regional agencies, municipalities, private, etc.)* established in association with this project.

The proposed project benefits multiple municipalities in the northern Denver metro area. Specifically, the city of Westminster has deployed a similar system and Westminster staff has been actively coordinating with Thornton staff to be able to share data and monitor 136th Avenue and 144th Avenue across both jurisdictions. Thornton is the largest city in the northern Denver metro area and some of its roadways are used by residents of smaller neighboring jurisdictions such as Northglenn, Federal Heights, and Broomfield who will benefit from improved travel time reliability on major arterials.

No funding partnerships are established.

4. Disproportionately Impacted and Environmental Justice Communities
This data is available in the DRCOG Data Tool. *Completing the below table and referencing relevant quantitative data in your response is required.*

To update the formulas below, enter your information, highlight the formulas (or Ctrl-A), and press F9. OR close and reopen the file.

	DI & EJ Population Groups	Number within ½ mile	% of Total	Regional %
Use 2015-2019 American Community Survey Data (***Use a 0.5 mile buffer distance***) [Equity data tab]	a. Total population	230,083	-	-
	b. Total households	78,600	-	-
	c. Individuals with low-income	57,538	25%	20%
	d. Individuals of color	118,404	51%	33%
	e. Adults age 60 and over	32,480	14%	13%
	f. Youth under 18	61,499	27%	16%
	g. Individuals with limited English proficiency	23,476	10%	3%
	h. Individuals with a disability	23,660	10%	9%
	i. Households that are housing cost-burdened	26,513	34%	32%
	j. Households without a motor vehicle	2,804	4%	5%

For Lines c. – i. use definitions in the DRCOG Title VI Implementation Plan. For Line j., as defined in C.R.S. 24-38.5-302(3)(b)(I): "'cost-burdened' means a household that spends more than thirty percent of its income on housing."

Describe how this project will improve access and mobility for each of the applicable disproportionately impacted and environmental justice population groups identified in the table above, *including the required quantitative analysis:*

Travel time reliability provides improved mobility and reduces delay, improving living experience and a more efficient transportation system for road users. Travelers want travel time reliability, a consistency or dependability in travel times, to know how long a trip will take. Populations that will be mostly impacted within the limits of this project are disproportionately impacted and in environmental justice groups. Particularly, populations in the project area show significantly higher percentage than the average with 25% of individuals with low-income, 51% of individuals of color, 27% of populations under 18, and 10% of individuals with limited English proficiency (over 3 times the regional average).

5. How will this project move the subregion toward achieving the shared regional transportation outcomes established in Metro Vision in terms of…

- Land Use, community, urban development, housing, employment? *(Improve the diversity and livability of communities. Contain urban development in locations designated for urban growth and services. Increase housing and employment in urban centers. Diversify the region's housing stock. Improve the region's competitive position.)*
  - This project does not address land use, community, urban development, housing or employment.

- Multimodal transportation, safety, reliability, air quality? *(Improve and expand the region's multimodal transportation system, services, and connections. Operate, manage, and maintain a safe and reliable transportation system. Improve air quality and reduce greenhouse gas emissions. Reduce the risk of hazards and their impact.)*
  - This project directly supports air quality improvements. Travel time monitoring provides resources to improve travel times along monitored corridors, reducing delay and subsequently reducing greenhouse gas emissions from unnecessary congestion and delays.
  - This project directly supports transportation system reliability by improving travel time reliability.

- Connection/accessibility to particular locations supporting healthy and active choices? *(Connect people to natural resource and recreational areas. Increase access to amenities that support healthy, active choices. Improve transportation connections to health care facilities and service providers. Improve access to opportunity.)*
  - This project does not address healthy and active choices.

6. Items marked with an asterisk (*) below are available in the DRCOG Data Tool.

- Is there a DRCOG designated urban center within ½ mile of the project limits?*
  ☒ Yes ☐ No If yes, please provide the name: There are two DRCOG designated urban centers: North I-25 and Thornton City Center
- Does the project connect two or more urban centers?*
  ☒ Yes ☐ No If yes, please provide the names: Corridors included in this project provide direct connection to North I-25 urban center via 144th Avenue and 136th Avenue, and to the Thornton City Center via 88th Avenue, Washington Street and Thornton Parkway.
- Is there a transit stop or station within ½ mile of the project limits?*
  Bus stop: ☒ Yes ☐ No If yes, how many:178
  Rail station: ☒ Yes ☐ No If yes, how many: 2
- Is the project in a locally-defined priority growth and development area and/or an area with zoning that supports compact, mixed-use development patterns and a variety of housing options?
  ☒ Yes ☐ No
  If yes, provide a link to the relevant planning document:
  Thornton's 2020 Comprehensive Plan
  https://www.thorntonco.gov/government/citydevelopment/planning/Documents/2020-comp-plan/2020-comprehensive-plan-adopted.pdf
  If yes, provide how the area is defined in the relevant planning document:
  Sections of 104th Avenue between York Street and Colorado Boulevard, Holly Street between 120th Avenue and 136th Avenue, and sections of 88th Avenue, Thornton Parkway, 136th Avenue, and 144th Avenue near Colorado Boulevard are identified as existing and future complete neighborhoods in Thornton's Comprehensive Plan. Complete neighborhoods are intended to provide quality communities that offer a variety of housing choices and accommodate a wide range of lifestyles for Thornton residents.

Provide households and employment data* [Population and Employment tab]	2020	2050
Jobs within ½ mile	42,163	60,593
Households within ½ mile	66,560	102,974

Describe how this project will improve transportation options in and between key geographic areas including DRCOG-defined urban centers, multimodal corridors, mixed-use areas, Transit Oriented Development (transit near high-density development), or locally defined priority growth areas, *including the required quantitative analysis*:

The expansion of the travel time monitoring project will improve transportation system performance and travel time reliability along corridors that provide direct access to key geographic areas including several major RTD bus routes (7, 8, 92, 93L, 104, 104L, 120, and 120L), and two RTD light rail stations of the N line (Thornton Crossroads/104th Ave and Original Thornton/88th Ave). Several of the corridors included in the project will also connect to neighborhoods identified as complete neighborhoods. Attached is Figure 5 showing the Existing and Future Complete Neighborhood map from the Thornton's 2020 Comprehensive Plan.

7. Describe how this project will improve **access** and **connections** to key employment centers or subregional destinations. In your answer, define the key destination(s) and clearly explain how the project improves **access** and/or **connectivity**.

This project does not address access and connections improvements.

8. Congestion Mitigation Process Mobility Score

Completing the below table and referencing relevant quantitative data in your response is required. ***In the DRCOG Data Tool, use a 0.02 mile buffer distance.***

Provide congestion mobility parameters* [Congestion Mobility Score tab]	2021
Sum: length-weighted score	257.99
Sum: miles	133.28
Congestion Mobility Score	**1.94**

(The Congestion Mobility Score will automatically calculate based on values entered. If this has not updated, select the box and click F9)

C. Metro Vision Regional Transportation Plan Priorities

WEIGHT **25%**

- ***Qualitative and quantitative*** *responses are REQUIRED for the following items on how the proposed project contributes to the project and program investment priorities in the adopted 2050 Metro Vision Regional Transportation Plan.* ***To be considered for full points, you must fully answer all parts of the question, including incorporating quantitative data into your answer****. (see scoring section for details). Quantitative data from is available from the DRCOG Data Tool.*
- *Checkboxes and data tables help to provide context and guide responses, but do not account for the full range of potential improvements and are not directly scored, but are required to be completed.*
- *Not all proposed projects will necessarily be able to answer all questions, however it is in the applicant's interest to address as many priority areas as possible.*

Multimodal Mobility	**Provide improved travel options for all modes.** (drawn from 2050 MVRTP priorities; federal travel time reliability, infrastructure condition, & transit asset management performance measures; & Metro Vision objective 4) Examples of Project Elements: combinations of improvements that support options for a broad range of users, such as complete streets improvements, or an interchange project that incorporates transit and freight improvements, etc.

- What modes will project improvements directly address?
  ☐Walking ☐ Bicycling ☐ Transit ☐ SOV ☐ Freight ☐ Other: Click or tap here to enter text.
- List the elements of this project which will address the above modes (i.e., sidewalk, shared use path, bus stop improvements, new general purpose or managed lanes, etc.): Click or tap here to enter text.
- Will the completed project be a complete street as described in the Regional Complete Streets Toolkit? Complete Streets Typology is available in the DRCOG Data Tool.
  ☐ Yes ☒ No If yes, describe how it implements the Toolkit's strategies in your response. Click or tap here to enter text.
- Does this project improve travel time reliability and reduce delay?
  ☒ Yes ☐ No
- Does this project improve asset management of roadway infrastructure, active transportation facilities, and/or transit facilities or vehicle fleets?
  ☐ Yes ☒ No
- Does this project implement resilient infrastructure that helps the subregion mitigate natural and/or human-made hazards?
  ☐ Yes ☒ No

Question: Describe how this project will help increase mobility choices for people, goods, and/or services. Please include quantitative information, including any items referenced above, in your response. *Note that the proposed roadway operational improvements must be primarily on the DRCOG Regional Roadway System and/or Regional Managed Lanes System.*

This project does not address mobility choices.

Question: Describe how this project will help improve asset reliability and availability. Please include quantitative information in your response (for example, reduce mean time to repair and increase mean time between failures).

This project does not address improvement of asset reliability and availability.

Question: Describe how this project will reduce delays and improve travel time reliability. Please include quantitative information in your response (for example, vehicle-hours traveled and travel time index).

Travel time monitoring provides resources to improve travel times along corridors and reduce delay. The data from the system is used by traffic operators to establish baseline conditions and define thresholds so the system can alert of degrading travel conditions based on real-time information. With this information, traffic operators can take action, adjust traffic signal timing as needed, and alert road users.

Air Quality	**Improve air quality and reduce greenhouse gas emissions.** (drawn from 2050 MVRTP priorities; state greenhouse gas rulemaking; federal congestion & emissions reduction performance measures; Metro Vision objectives 2, 3, & 6a) Examples of Project Elements: active transportation, transit, or TDM elements; vehicle operational improvements; electric vehicle supportive infrastructure; etc.

- Does this project reduce congestion?
  ☒ Yes ☐ No
- Does this project reduce vehicle miles traveled (VMT)?
  ☐ Yes ☒ No
- Does this project reduce single-occupant vehicle (SOV) travel?
  ☐ Yes ☒ No

Emissions Reduced *(kg/day)*	CO	NOx	VOCs	PM 10	CO_2e
	117.953	24.149	4.480	8.600	12,576.335

Use the FHWA CMAQ Calculators or a similar reasonable methodology to determine emissions reduced. Base your calculations on the year of opening. Please attach a screenshot of your work (such as the FHWA calculator showing the inputs and outputs) as part of your submittal packet.
Note: if not using the FHWA Calculators, please describe your methodology and sources in your narrative below.

Question: Describe how this project helps reduce congestion and air pollutants, including but not limited to carbon monoxide, ground-level ozone precursors, particulate matter, and greenhouse gas emissions. Please include quantitative information, including any items referenced above, in your response.

This project will improve transportation operations and travel time reliability which will reduce delay and subsequent vehicle emissions. The project impact in terms of air quality was estimated using the Congestion Mitigation and Air Quality Improvement Program Emissions Calculator Toolkit (CMAQ Toolkit) Traffic Signal Synchronization Module. The Thornton Travel Time Monitoring Expansion will provide resources to improve travel times along the corridors were devices and monitoring are deployed. As previously mentioned, traffic operators use the performance data and real-time travel time data from the system to adjust operational parameters and signal timing to improve efficiency and reliability of the transportation network.

See Figure 6 attached to this application for inputs, assumptions, and outputs for each of the corridors in the project. The table above shows the total estimated emissions reduced. Additionally, the peak hour emission reduction in kg/day are estimated at:

- Carbon Monoxide (CO): 75.125 kg/day
- Nitrogen Oxide (NOx): 15.210 kg/day
- Volatile Organic Compounds (VOC): 2.626 kg/day
- Particulate Matter <10 µm (PM10): 5.441 kg/day
- Carbon Dioxide Equivalent (CO2e): 6,383.227 kg/day

Regional Transit	**Expand and improve the subregion's transit network.** (drawn from 2050 MVRTP priorities, Coordinated Transit Plan, RTD's Regional Bus Rapid Transit Feasibility Study) Examples of Project Elements: transit lanes, station improvements, etc. Note: For any project with transit elements, the sponsor must coordinate with RTD to ensure RTD agrees to the scope and cost. Be sure to include RTD's concurrence in your application submittal.

Items marked with an asterisk (*) below are available in the DRCOG Data Tool.

- Does this project implement a portion of the regional bus rapid transit (BRT) network (as defined in the 2050 MVRTP)?*
  ☐ Yes ☒ No If yes, which specific corridor will this project focus on: Click or tap here to enter text.
- Does this project involve a regional transit planning corridor (as defined in the 2050 MVRTP)?*
  ☐ Yes ☒ No If yes, which specific corridor will this project focus on: Click or tap here to enter text.
- Does this project implement a mobility hub (as defined in the 2050 MVRTP)?
  ☐ Yes ☒ No
- Does this project improve connections between transit and other modes?
  ☐ Yes ☒ No If yes, please describe in your response.
- Does this project improve transit travel time reliability?
  ☒ Yes ☐ No If yes, please describe in your response.
- Does this project add and/or improve transit access to or within a DRCOG-defined urban center?*
  ☐ Yes ☒ No

Question: Describe how this project improves connections to or expands the subregion's transit system, as outlined in the 2050 MVRTP. Also describe how this project improves transit travel time reliability. Please include quantitative information, including any items referenced above, in your response. *Note that rapid transit improvements must be on the Regional Rapid Transit System.*

This project includes several corridors in the city of Thornton that are RTD routes. Data from travel time monitoring is used to improve travel time reliability. By improving the overall travel time reliability along these corridors, transit time reliability will also be improved. These are the RTD routes on corridors where travel time monitoring is proposed to be deployed: 7, 8, 92, 93L, 104, 104L, 120, and 120L.

Safety	**Increase the safety for all users of the transportation system.** (drawn from 2050 MVRTP priorities, Taking Action on Regional Vision Zero, CDOT Strategic Transportation Safety Plan, & federal safety performance measures) Examples of Project Elements: bike/pedestrian crossing improvements, vehicle crash countermeasures, traffic calming, etc.

Items marked with an asterisk (*) below are available in the DRCOG Data Tool.

- Does this project address a location on the DRCOG High-Injury Network or Critical Corridors or corridors defined in a local Vision Zero or equivalent safety plan?* See Figure 7 attached
  ☒ Yes ☐ No
- Does this project implement a safety countermeasure listed in the countermeasure glossary?
  ☐ Yes ☒ No
- Will this project result in a reduction of average roadway clearance time and incident clearance time and/or secondary incidents?
  ☐ Yes ☒ No
- Will this project result in a reduction of first responder struck-bys?
  ☐ Yes ☒ No

Provide the current number of crashes involving motor vehicles, bicyclists, and pedestrians* *(using the 2016-2020 period – **in the DRCOG Data Tool, use a 0.02 mile buffer distance**)* [Crash Severity 2016-2020 tab] *NOTE: if constructing a new facility, report crashes along closest existing alternative route*		Sponsor must use industry accepted crash modification factors (CMF) or crash reduction factor (CRF) practices *(e.g., CMF Clearinghouse, NCHRP Report 617, or DiExSys methodology).*
Fatal crashes	Enter Data	
Serious Injury crashes	Enter Data	
Other: Non-Serious Injury and Property Damage Only crashes	Enter Data	
Estimated reduction in crashes applicable to the project scope *(per the five-year period used above)*		Provide the methodology and sources below:
Fatal crashes reduced	Enter Data	Click or tap here to enter text.
Serious Injury crashes reduced	Enter Data	
Other: Non-Serious Injury and Property Damage Only crashes	Enter Data	

Question: Describe how this project will implement safety improvements (roadway, active transportation facility, etc.), particularly improvements in line with the recommendations in Taking Action on Regional Vision Zero. Please include quantitative information, including any items referenced above, in your response. *Note that any improvements on roadways must be primarily on the DRCOG Regional Roadway System.*

This project does not directly address the implementation of specific safety improvements. However, data from the travel time monitoring system can assist traffic operators on making decision during an incident management event. Nine (9) segments of the corridors in this project are identified as high-injury corridors and three (3) segments are identified as critical corridors.

Question: Describe how this project will reduce average incident duration, secondary incidents and first responder struck-bys. Please include quantitative information in your response. *A "responder struck-by" incident is a collision between a motor vehicle in transit and a responder working a roadway incident. The responder may be a nonmotorist, an occupant of a stopped response vehicle or an unoccupied response vehicle.*

This project does not directly address the reduction of first responder struck-bys. However, data from the travel time monitoring system can assist traffic operators on making decision during an incident management event. Nine (9) segments of the corridors in this project are identified as high-injury corridors and three (3) segments are identified as critical corridors.

Freight	**Maintain efficient movement of goods within and beyond the subregion.** (drawn from 2050 MVRTP priorities; Regional Multimodal Freight Plan; Colorado Freight Plan, federal freight reliability performance measure; Metro Vision objective 14) Examples of Project Elements: bridge improvements, improved turning radii, increased roadway capacity, etc.

Items marked with an asterisk (*) below are available in the DRCOG Data Tool.

- Is this project located in or impact access to a Freight Focus Area?*
  ☐ Yes ☒ No If yes, please provide the name: Click or tap here to enter text.
- If this project is located in a Freight Focus Area does it address the relevant Needs and Issues identified in the Plan (see text located within each Focus Area)?
  ☐ Yes ☒ No If yes, please describe in your response below.
- Is the project located on the Tier 1 or Tier 2 Regional Highway Freight Vision Network?*
  ☐ Yes ☒ No
- Check any items from the Inventory of Current Needs which this project will address:
  ☐ Truck Crash Location ☐ Rail Crossing Safety (eligible locations)
  ☐ Truck Delay ☐ Truck Reliability ☐ Highway Bottleneck
  ☐ Low-Clearance or Weight-Restricted Bridge
  Please provide the location(s) being addressed: Click or tap here to enter text.
- Does this project include any innovative or non-traditional freight supportive elements (i.e., curb management strategies, cargo bike supportive infrastructure, etc.)?
  ☐ Yes ☒ No If yes, please describe in your response below.

Question: Describe how this project will improve the efficient movement of goods. In your response, identify those improvements identified in the Regional Multimodal Freight Plan, include quantitative information, and include any items referenced above. *Note that any improvements on roadways must be primarily on the DRCOG Regional Roadway System*.

This project does not address freight needs.

Active Transportation	**Expand and enhance active transportation travel options.** (drawn from 2050 MVRTP priorities; Denver Regional Active Transportation Plan; & Metro Vision objectives 10 & 13) Examples of Project Elements: shared use paths, sidewalks, regional trails, grade separations, etc.

Items marked with an asterisk (*) below are available in the DRCOG Data Tool.

- Does this project close a gap or extend a facility on a Regional Active Transportation Corridor or locally-defined priority corridor?*
  ☐ Yes ☒ No
- Does this project improve pedestrian accessibility and connectivity in a pedestrian focus area?*
  ☐ Yes ☒ No
- Does this project improve active transportation choices in a short trip opportunity zone?*
  ☐ Yes ☒ No
- Does this project include a high-comfort bikeway (like a sidepath, shared-use path, separated bike lane, bicycle boulevard)?
  ☐ Yes ☒ No If yes, please describe in your response.

Bicycle Use

NOTE: if constructing a new facility, report bike usage along closest existing alternative route

To update the formulas below, enter your information, highlight the formulas (or Ctrl-A), and press F9. OR close and reopen the file.

1.	Current Average Single Weekday Bicyclists:		Enter Data
	Bicycle Use Calculations	**Year of Opening**	**2050 Weekday Estimate**
2.	Enter estimated additional average weekday one-way bicycle trips on the facility after project is completed.	Enter Data	Enter Data
3.	Enter number of the bicycle trips (in #2 above) that will be diverting from a different bicycling route. (Example: **{#2 X 50%}** *or other percent, if justified on line 10 below)*	Enter Data	Enter Data
4.	= Initial number of new bicycle trips from project (#2 – #3)	0	0
5.	Enter number of the new trips produced (from #4 above) that are replacing a trip made by another non-SOV mode (bus, carpool, vanpool, walking, etc.). (Example: **{#4 X 30%}** *(or other percent, if justified on line 10 below)*	Enter Data	Enter Data
6.	= Number of SOV trips reduced per day (#4 - #5)	0.00	0.00
7.	Enter the value of **{#6 x 2 miles}**. (= the VMT reduced per day) *(Values other than 2 miles must be justified by sponsor on line 10 below)*	Enter Data	Enter Data
8.	= Number of pounds GHG emissions reduced (#7 x 0.95 lbs.)	0.00	0.00
9.	If values would be distinctly greater for weekends, describe the magnitude of difference: Click or tap here to enter text.		
10.	If different values other than the suggested are used, please explain here: Click or tap here to enter text.		

Pedestrian Use

NOTE: if constructing a new facility, report pedestrian usage along closest existing alternative route

To update the formulas below, enter your information, highlight the formulas (or Ctrl-A), and press F9. OR close and reopen the file.

1.	Current Average Single Weekday Pedestrians (including users of non-pedaled devices such as scooters and wheelchairs):		Enter Data
	Pedestrian Use Calculations	**Year of Opening**	**2050 Weekday Estimate**
2.	Enter estimated additional average weekday pedestrian one-way trips on the facility after project is completed	Enter Data	Enter Data
3.	Enter number of the new pedestrian trips (in #2 above) that will be diverting from a different walking route (Example: **{#2 X 50%}** *or other percent, if justified on line 10 below)*	Enter Data	Enter Data
4.	= Number of new trips from project (#2 – #3)	0	0
5.	Enter number of the new trips produced (from #4 above) that are replacing a trip made by another non-SOV mode (bus, carpool, vanpool, bike, etc.). (Example: **{#4 X 30%}** *or other percent, if justified on line 10 below)*	Enter Data	Enter Data
6.	= Number of SOV trips reduced per day (#4 - #5)	0.00	0.00
7.	Enter the value of **{#6 x .4 miles}**. (= the VMT reduced per day) *(Values other than .4 miles must be justified by sponsor on line 10 below)*	Enter Data	Enter Data

8.	= Number of pounds GHG emissions reduced (#7 x 0.95 lbs.)	0.00	0.00

9. If values would be distinctly greater for weekends, describe the magnitude of difference:

Click or tap here to enter text.

10. If different values other than the suggested are used, please explain here:

Click or tap here to enter text.

Question: Describe how this project helps expand the active transportation network, closes gaps, improves comfort, and/or improves connections to key destinations, particularly improvements in line with the recommendations in the Denver Regional Active Transportation Plan. Please include quantitative information, including any items referenced above, in your response.

This project does not address active transportation needs.

D. Financial Leveraging

WEIGHT 5%

What percent of outside funding sources (non-federal funds) does this project have? *(Match percentage will automatically calculate based on values entered in the Funding Request table. If this has not updated, select the box to the right and click F9.)* [*includes 100% eligible projects with no match]	Enter score: 100.0%	36%+ outside funding sources ..... 5 31 - 35.9%..... 4 26 - 30.9%..... 3 21 - 25.9%..... 2 17.21 - 20.9%*..... 1 17.21%..... 0

E. Project Readiness

WEIGHT 15%

Provide responses to the following items to demonstrate the readiness of the project. DRCOG is prioritizing those projects that have a higher likelihood to move forward in a timely manner and are less likely to experience a delay.

Subsection 1. Avoiding Pitfalls and Roadblocks

a. Has a licensed engineer (CDOT, consultant, local agency, etc.) reviewed the impact the proposed project will have on utilities, railroads, ROW, historic and environmental resources, etc. and have those impacts and pitfalls been mitigated as much as possible to date before this submittal?

☒ Yes ☐ No ☐ N/A (for projects which do not require engineering services)

If yes, please type in the engineer's name below which certifies their review and that impacts have been evaluated and mitigated as much as possible before your application is submitted:

Marta Junyent

Please describe the status to date on each, including 1) anticipated/known pitfalls/roadblocks, and 2) mitigation activities taken to date:

- Utilities: N/A
- Railroad: N/A
- Right-of-Way: N/A
- Environmental/Historic: N/A
- Other: Click or tap here to enter text.

b. Have additional project risks been identified?

☐ Yes ☒ No ☐ N/A

If yes, please provide a brief description of the known risks and planned mitigation activities.

Click or tap here to enter text.

c. Is this application for a single project phase only (i.e., design, environmental, ROW acquisition, construction only, study, equipment purchase, etc.)?

☒ Yes ☐ No

If yes, are the other prerequisite phases complete? ☐ Yes ☒ No ☐ N/A

d. Will this project seek a Finding in the Public Interest as part of equipment procurement?

☒ Yes ☐ No

If yes, please provide an explanation of the need for a Finding in the Public Interest. Do not reference specific products trade names.

Thornton currently has twenty-three (23) Bluetooth reader devices installed in the field and a web-based application to monitor the data, check performance measures, pull reports, and access the devices. It is anticipated that a Finding in the Public Interest (FIPI) will be requested to ensure the additional Bluetooth reader devices are fully compatible with the existing equipment and system.

e. Has all required ROW been identified? ☐ Yes ☐ No ☒ N/A

Has all required ROW already been acquired and cleared by CDOT? ☐ Yes ☐ No ☒ N/A

Is existing equipment within ROW? ☒ Yes ☐ No ☐ N/A

Will subsurface utility engineering be a factor in this project? ☐ Yes ☐ No

Has subsurface utility engineering been accounted for in the project scoping, phasing and estimate? ☐ Yes ☐ No ☒ N/A

f. Based on the current status provided in Project Information, question 11, do you foresee being able to execute your IGA by October 1 of your first year of funding (or if requesting first year funding, beginning discussions on your IGA as soon as possible), so you can begin your project on time?

☒ Yes ☐ No

Does your agency have the appropriate staff available to work on this project? ☒ Yes ☐ No

If yes, are they knowledgeable with the federal-aid process? ☒ Yes ☐ No ☐ N/A

g. Have other stakeholders in your project been identified and involved in project development?

☐ Yes ☐ No ☒ N/A

If yes, who are the stakeholders?

Click or tap here to enter text.

Please provide any additional details on any of the items in Subsection 1, if applicable.

This project is an expansion of a similar project which was awarded in a previous Set-Aside grant in 2020. The original project (Thornton Travel Time Monitoring System) was successfully executed on time, and it is fully operational. Because of the previous experience, Thornton's staff feels confident that this project expansion can be also successfully executed in a timely manner and without issues.

Subsection 2. Local Match Availability

a. Is all the local match identified in your application currently available and not contingent on any additional decisions, and if a partnering agency is also committing match, do you have a commitment letter?

☐ Yes ☒ No

Please describe:

The project is currently not budgeted. If awarded, the identified match will be added to the Thornton's Capital Improvement Program.

b. Is all funding for this project currently identified in the sponsor agency's Capital Improvement Program (CIP)?

☐ Yes ☒ No

Please describe:

The project is currently not budgeted. If awarded, the identified match will be added to the Thornton's Capital Improvement Program

Subsection 3. Systems Engineering Analysis Documentation

Systems Engineering Analysis (SEA) is a federally required process for deployment of transportation technology projects using funds from the Highway Trust Fund. CDOT established and administers a formal SEA process for transportation technology projects in the state, including local agency projects.

Please complete at least the first seven sections of the required SEA-Local Agency Template. Submit the completed form with this application.

Submit completed applications to jluor@drcog.org no later than 5pm on July 7, 2023.

Prior to submitting, press Ctrl+A to select all, then press F9 to update all formulas. You can then print to PDF.

Engineer's Detailed Estimate Method

Project Name: Thornton Travel Time Monitoring Expansion
Road/Facility Name: Several corridors throughout the City of Thornton
Route Number:

Quantity	Item	Unit Cost	Recommended Percentage Range	Percentage Selected			Costs	
Bid Items (estimate)								
22	Bluetooth field data device	4750				$	104,500	
1	Web-based server/yearly subscription	5500				$	5,500	
						$	-	
						$	-	
						$	-	
						$	-	
						$	-	
						$	-	
						$	-	
						$	-	
					Subtotal	$	110,000	(A)
Striping			0-5% of (A)	0	%	$	-	
					Subtotal	$	110,000	(B)
Construction Signing and Traffic Control			5-25% of (B)	0	%	$	-	
					Subtotal	$	110,000	(C)
Mobilization (Round up to next $1,000)			3-10% of (C)	0	%	$	-	
TOTAL COST OF CONSTRUCTION BID ITEMS (CBI)						$	110,000	
Contingencies			15% of CBI	15	%	$	16,500	
Force Account Items (enter as a percentage of CBI or a lump sum)								
Utilities				0	%	$	-	
Minor Contract Revisions				0	%	$	-	
Partnering				0	%	$	-	
Fuel Cost Adjustment				0	%	$	-	
Erosion Control				0	%	$	-	
Environmental Health & Safety				0	%	$	-	
TOTAL OF CONSTRUCTION ITEMS (CI)						$	126,500	
CDOT Construction Engineering (CE)		10-15% of CI for CDOT projects		0	%	$	-	
CE Indirects (25% of CE)						$	-	
Preliminary Engineering (PE) [preliminary engineering includes systems engineering and design]								
Project Preliminary Engineering						$	-	
Right-of-Way Acquisition						$	-	
CDOT PE						$	-	
PE Indirects (25% of CDOT PE)						$	-	
Entity PE (if applicable)						$	-	
Consultant PE (if applicable)						$	-	
					TOTAL COST	$	126,500	

Certification of Cost Estimate (Construction project costs must be certified by a registered professional engineer in the State of Colorado)

I, Marta Junyent 44848
(Name – print) *Colorado P.E. #*

certify that I have prepared/approved the cost estimate for this project.

Signature 7/6/2020
Date

FIGURE 1
Thornton Travel Time Monitoring Expansion - Overview of Corridors

144th Avenue (Lincoln to Holly St)
136th Avenue (I-25 to Yosemite St)
120th Avenue (I-25 to Quebec St)
104th Avenue (York St to McKay Rd)
Thornton Pkwy (Pecos St to Colorado Blvd)
84th Ave (Huron St to Washington St)
88th Ave (Huron St to Colorado Blvd)
Huron St (Thornton Pkwy to 88th Ave)
Washington (120th Ave to 144th Ave)
Washington (84th Ave to 120th Ave)
Colorado (88th to 144th Ave)
Holly Street (104th Ave to 144th Ave)
Quebec St (120th Ave to E-470)

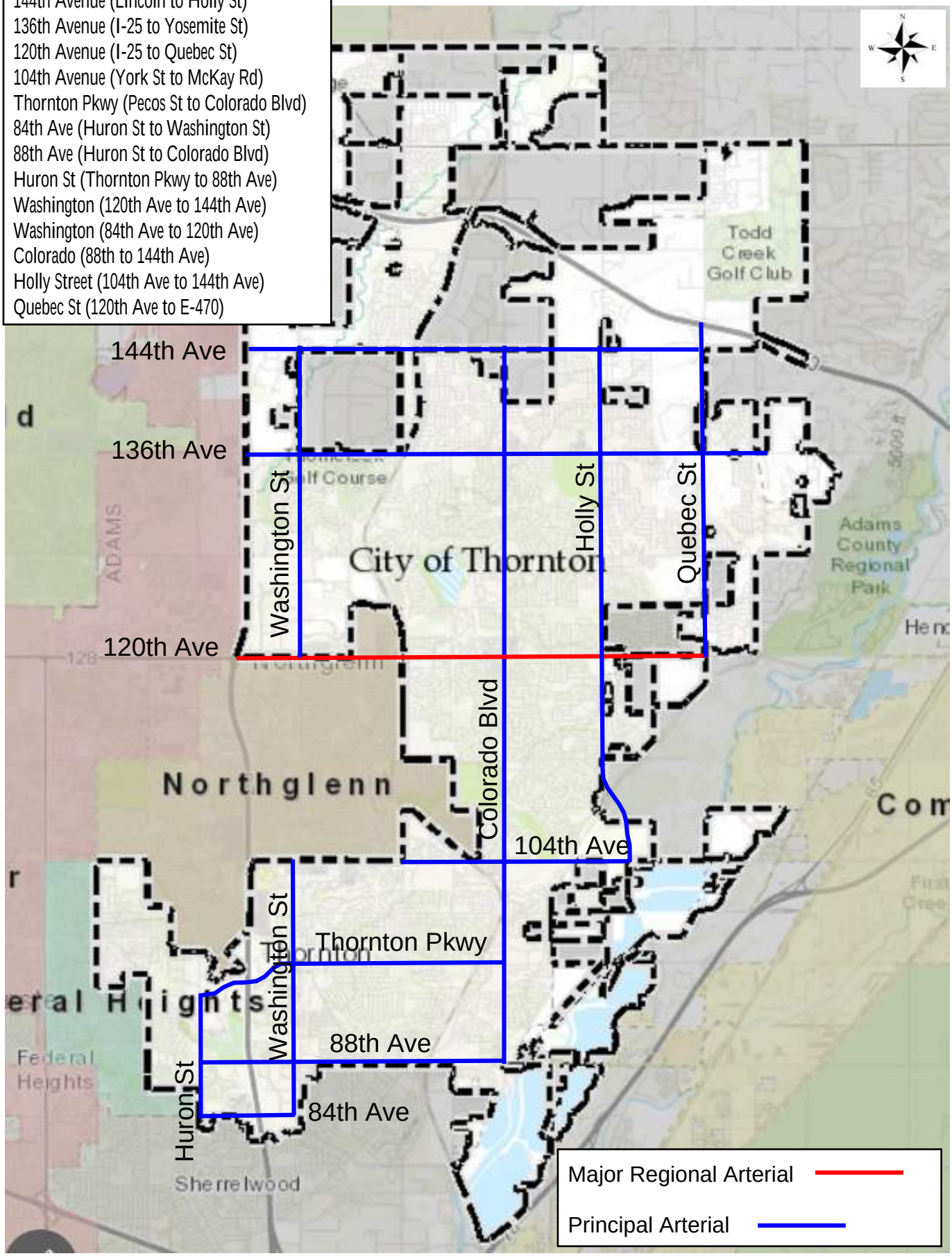
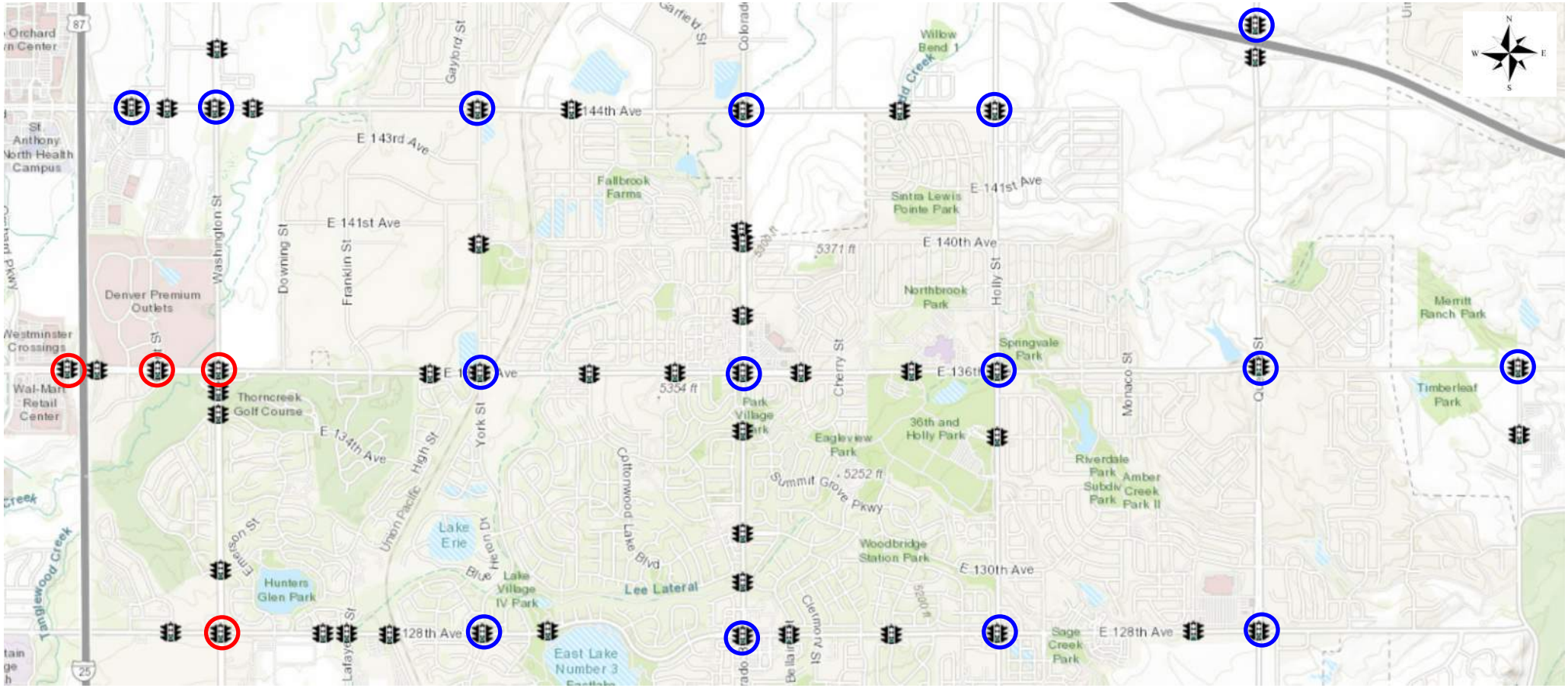
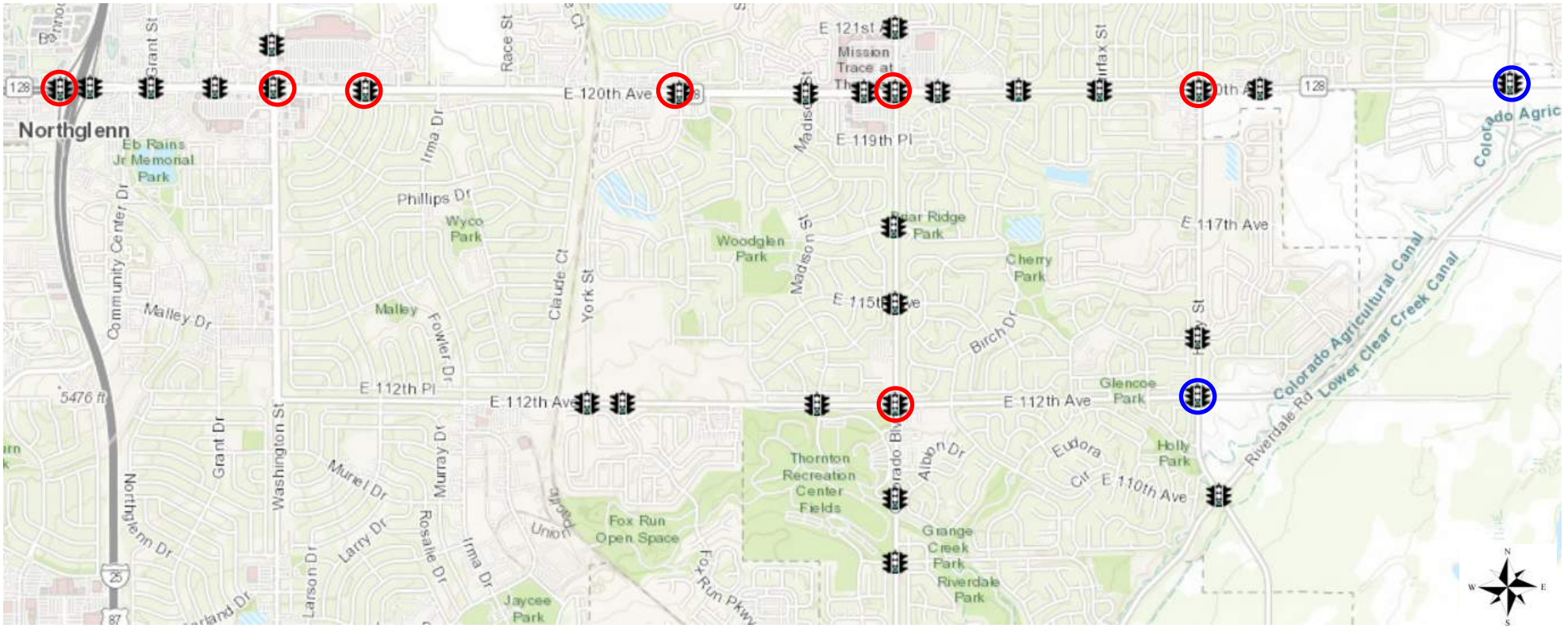


FIGURE 2
Thornton Travel Time Monitoring Expansion - Proposed Locations (1 of 3)



Existing BlueTOAD readers	
Proposed BlueTOAD readers	
Signalized Intersection	

FIGURE 2
Thornton Travel Time Monitoring Expansion - Proposed Locations (2 of 3)



Existing BlueTOAD readers

Proposed BlueTOAD readers

Signalized Intersection

FIGURE 2
Thornton Travel Time Monitoring Expansion - Proposed Locations (3 of 3)

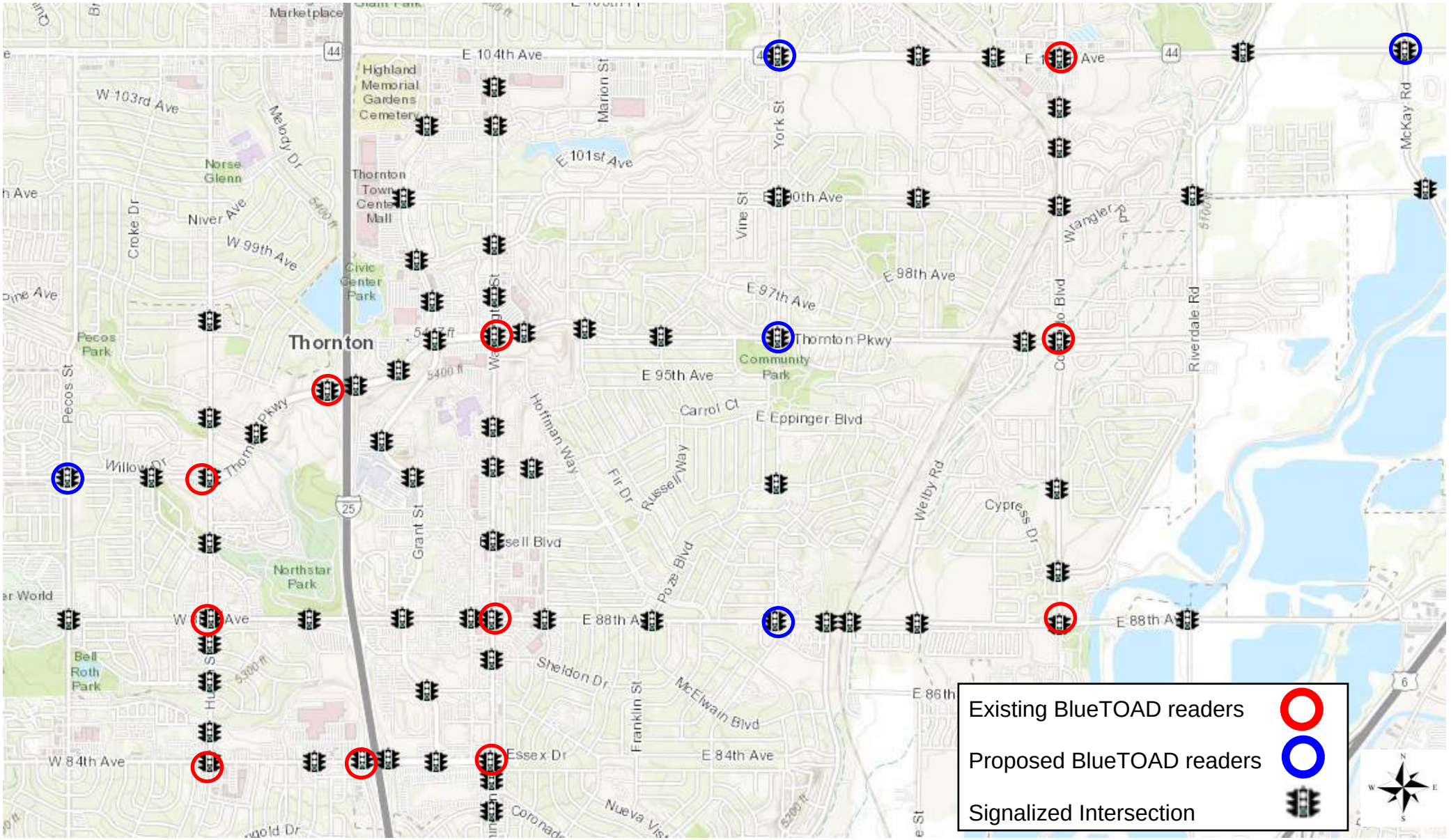
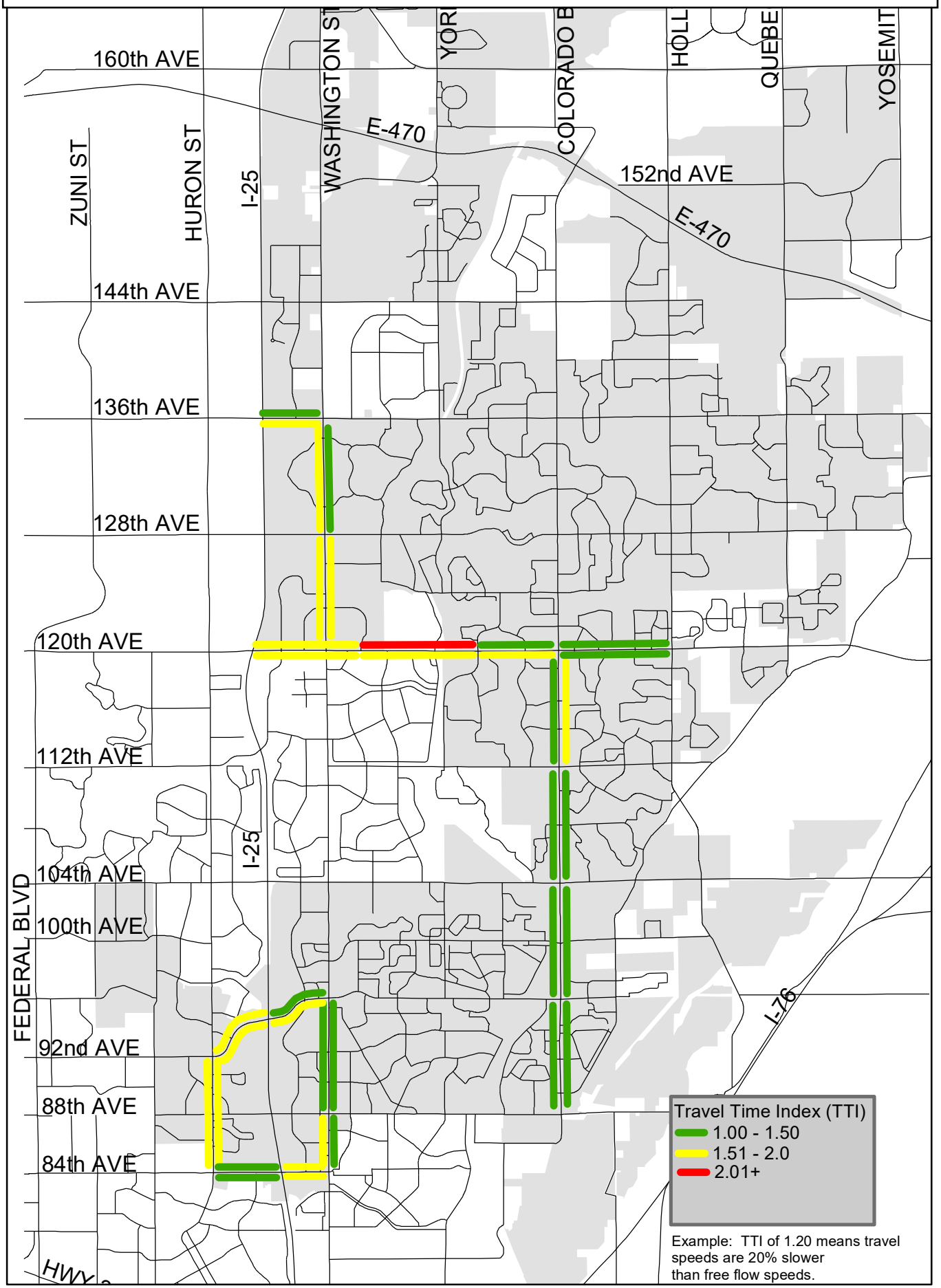


FIGURE 3
Thornton Travel Time Monitoring Expansion - TTI AM



1 in = 6,000 feet

4/6/2023

City of Thornton

12450 Washington St., Thornton, Colorado 80241. (720) 977-6210

February 2023 Travel Time Index

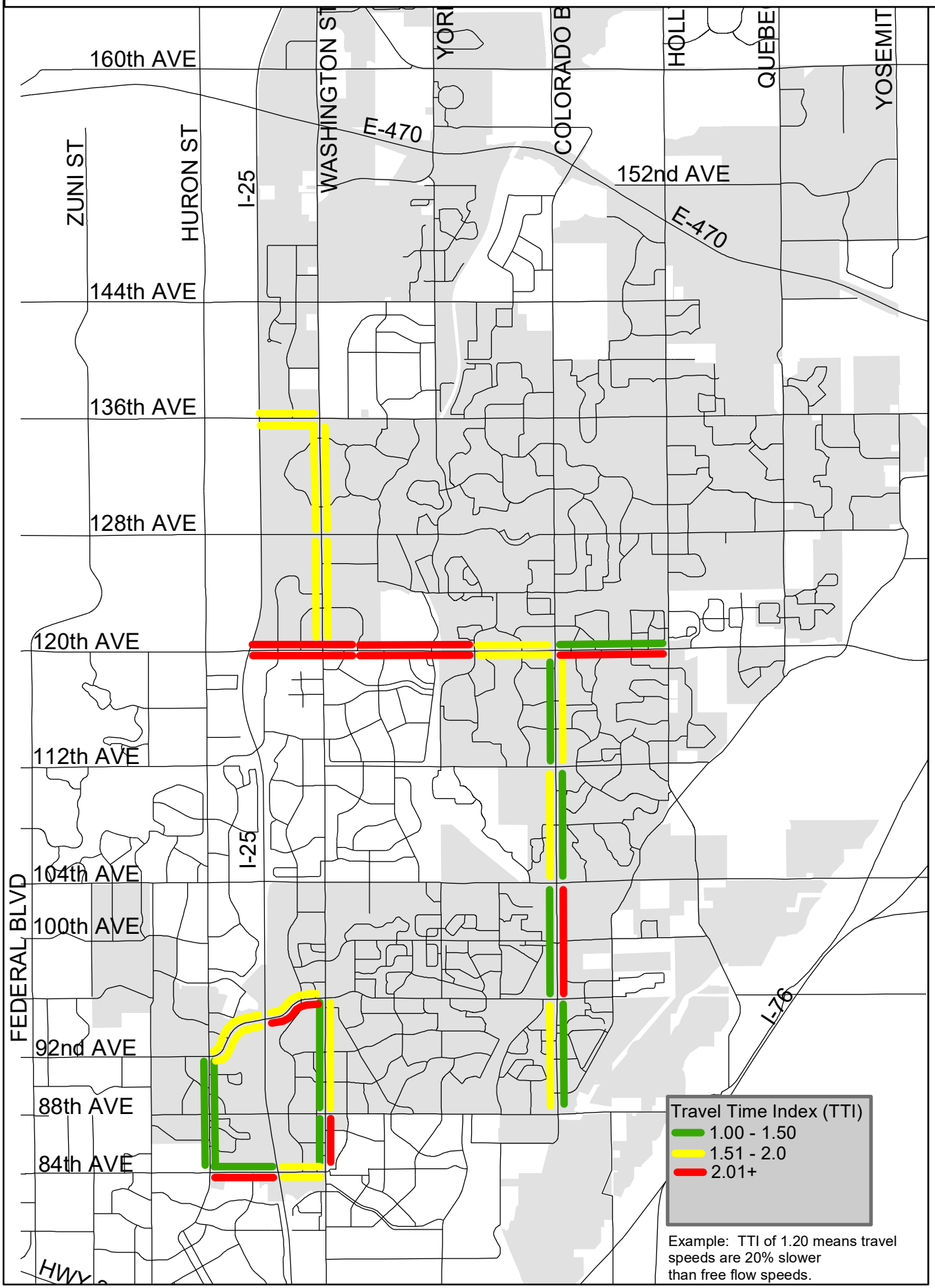
Morning Peak (7-8 am)

GIS DATA DISCLAIMER

The City of Thornton GIS has made every reasonable effort to represent geographic data as accurately as possible, and assumes no liability associated with the use or misuse of its products. Information contained herein is for representational purposes only and is not intended to be substituted for accurate boundary locations, legal or professional opinions.

\\it-filesrv\Shared\ID\Engineering\Traffic\Alston\Travel Time\AM Travel Time Index v2.mxd

FIGURE 4
Thornton Travel Time Monitoring Expansion - TTI PM



1 in = 6,000 feet
4/6/2023

City of Thornton
12450 Washington St., Thornton, Colorado 80241. (720) 977-6210

February 2023 Travel Time Index
Evening Peak (5-6 pm)

GIS DATA DISCLAIMER

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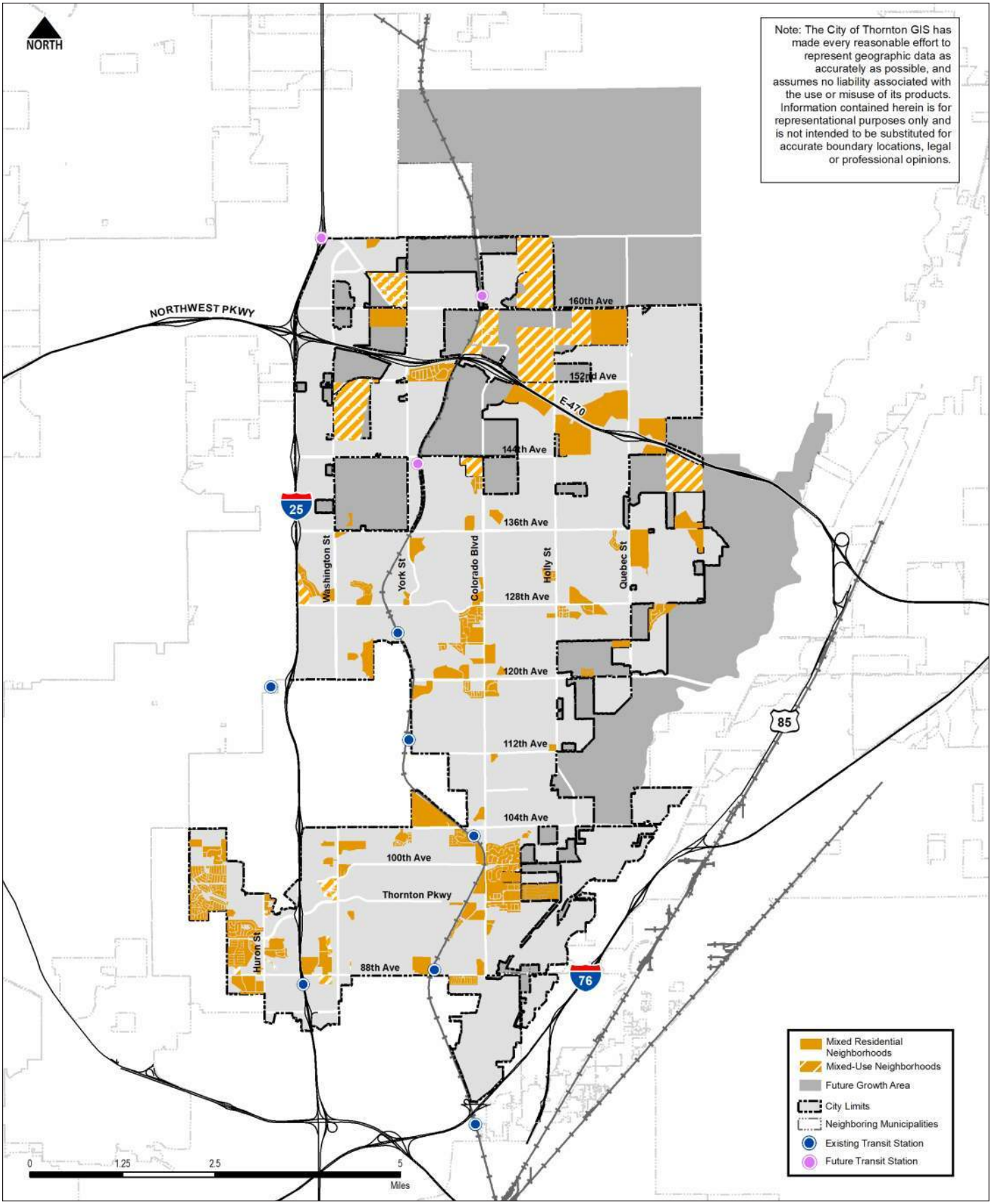
\\it-filesrv\Shared\ID\Engineering\Traffic\Alston\Travel Time\PM Travel Time Index v2.mxd

FIGURE 5

▶ EXISTING AND FUTURE COMPLETE NEIGHBORHOODS



Source: Thornton's Comprehensive Plan

FIGURE 6
Thornton Travel Time Monitoring Expansion - Emissions by corridor

Emissions Reduced *(kg/day)*	CO	NOx	VOCs	PM 10	CO_2e
	117.953	24.149	4.480	8.600	12,576.335
144th - I-25 to Holly	13.564	2.388	0.527	1.073	1,275.847
136th - Washington to Yosemite	31.648	7.087	1.069	2.189	2,844.346
120th - Holly to Quebec	7.107	1.693	0.337	0.666	1,058.161
104th - York to McKay	14.202	2.357	0.598	1.260	1,516.320
92nd - Pecos to Huron	4.311	0.751	0.152	0.242	446.911
Thornton Parkway - Washington to Colorado	12.630	2.704	0.545	0.984	1,691.002
88th - Washington to Colorado	14.954	2.851	0.541	0.738	1,776.661
Washington -136th to 144th	2.131	0.605	0.080	0.156	272.247
Colorado - 136th to 144th	4.483	0.874	0.170	0.323	474.807
Holly - 144th to 104th	9.521	2.068	0.346	0.720	921.160
Quebec - E-470 to 120th	3.402	0.771	0.115	0.249	298.873

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

144th Avenue

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	3.5	miles
Number of Signalized Intersections	9	
Number of Lanes (one direction)	2	
Posted Speed Limit	45	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	20,000	veh/day
Peak-hour Volume (both directions)	2,500	veh/hr
Existing Corridor Travel Time	6	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	2,500	500	veh/hr
Existing Average Speed	35	29	mph
Travel Time Savings	66	48	min
Proposed Average Speed	43	33	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	8.821	4.743	13.564
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.099	0.078	0.177
Particulate Matter <10 µm (PM_{10})	0.620	0.453	1.073
Nitrogen Oxide (NOx)	1.287	1.101	2.388
Volatile Organic Compounds (VOC)	0.297	0.230	0.527

Atmospheric Carbon Dioxide (CO2)	521.018	743.125	1,264.143
Carbon Dioxide Equivalent (CO2e)	528.022	747.824	1,275.847
Total Energy Consumption (MMBTU)	6.841	9.749	16.589

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

136th Avenue

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	5	miles
Number of Signalized Intersections	11	
Number of Lanes (one direction)	2	
Posted Speed Limit	45	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	30,000	veh/day
Peak-hour Volume (both directions)	3,500	veh/hr
Existing Corridor Travel Time	9	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	3,500	800	veh/hr
Existing Average Speed	33	31	mph
Travel Time Savings	101	61	min
Proposed Average Speed	41	34	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	20.138	11.510	31.648
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.263	0.167	0.431
Particulate Matter <10 µm (PM_{10})	1.440	0.749	2.189
Nitrogen Oxide (NOx)	4.038	3.049	7.087
Volatile Organic Compounds (VOC)	0.680	0.389	1.069

Atmospheric Carbon Dioxide (CO2)	1,569.863	1,253.126	2,822.988
Carbon Dioxide Equivalent (CO2e)	1,584.542	1,259.804	2,844.346
Total Energy Consumption (MMBTU)	20.519	16.321	36.840

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

120th Avenue

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	1	miles
Number of Signalized Intersections	3	
Number of Lanes (one direction)	2	
Posted Speed Limit	45	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	35,000	veh/day
Peak-hour Volume (both directions)	4,000	veh/hr
Existing Corridor Travel Time	2	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	4,000	950	veh/hr
Existing Average Speed	30	27	mph
Travel Time Savings	28	17	min
Proposed Average Speed	39	31	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	5.496	1.611	7.107
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.076	0.039	0.115
Particulate Matter <10 µm (PM_{10})	0.408	0.258	0.666
Nitrogen Oxide (NOx)	1.185	0.507	1.693
Volatile Organic Compounds (VOC)	0.201	0.136	0.337

Atmospheric Carbon Dioxide (CO2)	538.749	512.230	1,050.979
Carbon Dioxide Equivalent (CO2e)	542.883	515.278	1,058.161
Total Energy Consumption (MMBTU)	7.045	6.742	13.787

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

104th Avenue

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	2.25	miles
Number of Signalized Intersections	6	
Number of Lanes (one direction)	2	
Posted Speed Limit	45	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	31,000	veh/day
Peak-hour Volume (both directions)	3,500	veh/hr
Existing Corridor Travel Time	4	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	3,500	850	veh/hr
Existing Average Speed	34	28	mph
Travel Time Savings	55	33	min
Proposed Average Speed	44	32	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	10.039	4.164	14.202
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.117	0.084	0.201
Particulate Matter <10 µm (PM_{10})	0.713	0.547	1.260
Nitrogen Oxide (NOx)	1.578	0.958	2.537
Volatile Organic Compounds (VOC)	0.338	0.259	0.598

Atmospheric Carbon Dioxide (CO2)	633.202	869.604	1,502.806
Carbon Dioxide Equivalent (CO2e)	641.026	875.294	1,516.320
Total Energy Consumption (MMBTU)	8.304	11.440	19.744

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

92nd Avenue

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	0.5	miles
Number of Signalized Intersections	3	
Number of Lanes (one direction)	2	
Posted Speed Limit	40	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	26,000	veh/day
Peak-hour Volume (both directions)	3,000	veh/hr
Existing Corridor Travel Time	1	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	3,000	700	veh/hr
Existing Average Speed	30	19	mph
Travel Time Savings	24	16	min
Proposed Average Speed	40	22	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	2.243	2.068	4.311
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.031	0.015	0.046
Particulate Matter <10 µm (PM_{10})	0.166	0.076	0.242
Nitrogen Oxide (NOx)	0.471	0.280	0.751
Volatile Organic Compounds (VOC)	0.081	0.071	0.152

Atmospheric Carbon Dioxide (CO2)	212.802	230.861	443.663
Carbon Dioxide Equivalent (CO2e)	214.497	232.415	446.911
Total Energy Consumption (MMBTU)	2.783	3.033	5.816

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization Thornton Parkway

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	2	miles
Number of Signalized Intersections	7	
Number of Lanes (one direction)	2	
Posted Speed Limit	40	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	26,000	veh/day
Peak-hour Volume (both directions)	3,000	veh/hr
Existing Corridor Travel Time	4	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	3,000	700	veh/hr
Existing Average Speed	30	24	mph
Travel Time Savings	57	38	min
Proposed Average Speed	39	28	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	8.244	4.386	12.630
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.114	0.061	0.175
Particulate Matter <10 µm (PM_{10})	0.611	0.372	0.984
Nitrogen Oxide (NOx)	1.778	0.926	2.704
Volatile Organic Compounds (VOC)	0.301	0.243	0.545

Atmospheric Carbon Dioxide (CO2)	808.124	871.239	1,679.363
Carbon Dioxide Equivalent (CO2e)	814.325	876.677	1,691.002
Total Energy Consumption (MMBTU)	10.568	11.460	22.028

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

88th Avenue

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	3	miles
Number of Signalized Intersections	12	
Number of Lanes (one direction)	2	
Posted Speed Limit	35	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	22,000	veh/day
Peak-hour Volume (both directions)	2,600	veh/hr
Existing Corridor Travel Time	6	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	2,600	580	veh/hr
Existing Average Speed	30	21	mph
Travel Time Savings	89	64	min
Proposed Average Speed	35	24	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	6.382	8.571	14.954
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.100	0.052	0.152
Particulate Matter <10 µm (PM_{10})	0.492	0.245	0.738
Nitrogen Oxide (NOx)	1.679	1.172	2.851
Volatile Organic Compounds (VOC)	0.246	0.295	0.541

Atmospheric Carbon Dioxide (CO2)	794.518	971.306	1,765.823
Carbon Dioxide Equivalent (CO2e)	799.136	977.525	1,776.661
Total Energy Consumption (MMBTU)	10.377	12.756	23.133

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization Washington Street

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	1	miles
Number of Signalized Intersections	2	
Number of Lanes (one direction)	2	
Posted Speed Limit	45	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	14,000	veh/day
Peak-hour Volume (both directions)	2,000	veh/hr
Existing Corridor Travel Time	2	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	2,000	300	veh/hr
Existing Average Speed	30	32	mph
Travel Time Savings	13	10	min
Proposed Average Speed	34	35	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	1.304	0.828	2.131
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.021	0.013	0.034
Particulate Matter <10 µm (PM_{10})	0.102	0.054	0.156
Nitrogen Oxide (NOx)	0.353	0.252	0.605
Volatile Organic Compounds (VOC)	0.052	0.028	0.080
Atmospheric Carbon Dioxide (CO2)	173.840	96.974	270.814
Carbon Dioxide Equivalent (CO2e)	174.797	97.450	272.247
Total Energy Consumption (MMBTU)	2.271	1.262	3.533

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

Colorado Blvd

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	1	miles
Number of Signalized Intersections	5	
Number of Lanes (one direction)	2	
Posted Speed Limit	45	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	13,000	veh/day
Peak-hour Volume (both directions)	2,000	veh/hr
Existing Corridor Travel Time	2	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	2,000	250	veh/hr
Existing Average Speed	30	23	mph
Travel Time Savings	33	26	min
Proposed Average Speed	42	27	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	3.443	1.040	4.483
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.046	0.012	0.058
Particulate Matter <10 µm (PM_{10})	0.256	0.067	0.323
Nitrogen Oxide (NOx)	0.694	0.180	0.874
Volatile Organic Compounds (VOC)	0.124	0.046	0.170

Atmospheric Carbon Dioxide (CO2)	310.407	160.756	471.163
Carbon Dioxide Equivalent (CO2e)	313.026	161.781	474.807
Total Energy Consumption (MMBTU)	4.061	2.113	6.175

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

Holly Street

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	5	miles
Number of Signalized Intersections	10	
Number of Lanes (one direction)	2	
Posted Speed Limit	40	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	13,000	veh/day
Peak-hour Volume (both directions)	2,000	veh/hr
Existing Corridor Travel Time	9	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	2,000	250	veh/hr
Existing Average Speed	33	30	mph
Travel Time Savings	67	51	min
Proposed Average Speed	38	32	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	7.856	1.665	9.521
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.107	0.026	0.134
Particulate Matter <10 µm (PM_{10})	0.550	0.170	0.720
Nitrogen Oxide (NOx)	1.775	0.294	2.068
Volatile Organic Compounds (VOC)	0.266	0.080	0.346

Atmospheric Carbon Dioxide (CO2)	681.378	232.575	913.953
Carbon Dioxide Equivalent (CO2e)	686.868	234.291	921.160
Total Energy Consumption (MMBTU)	8.894	3.057	11.951

CMAQ Emissions Calculator Toolkit

Traffic Signal Synchronization

Quebec Street

This calculator will estimate the emission reductions resulting from synchronizing the traffic signals along a previously unsynchronized corridor.

Navigator

Intersection Improvements

Traffic Signal Synchronization

Roundabouts

Two Way Left Turn Lanes

INPUT

Evaluation Year	2030	
Area Type	Urban	
Corridor Length	3.25	miles
Number of Signalized Intersections	5	
Number of Lanes (one direction)	2	
Posted Speed Limit	45	miles per hour (1 - 75 MPH)
Average Cycle Length	120	seconds
Truck Percentage	6%	
Annual Average Daily Traffic (AADT) (both directions)	10,000	veh/day
Peak-hour Volume (both directions)	1,000	veh/hr
Existing Corridor Travel Time	6	minutes
Total peak hours per day (AM+PM)	4	

OUTPUT

PERFORMANCE

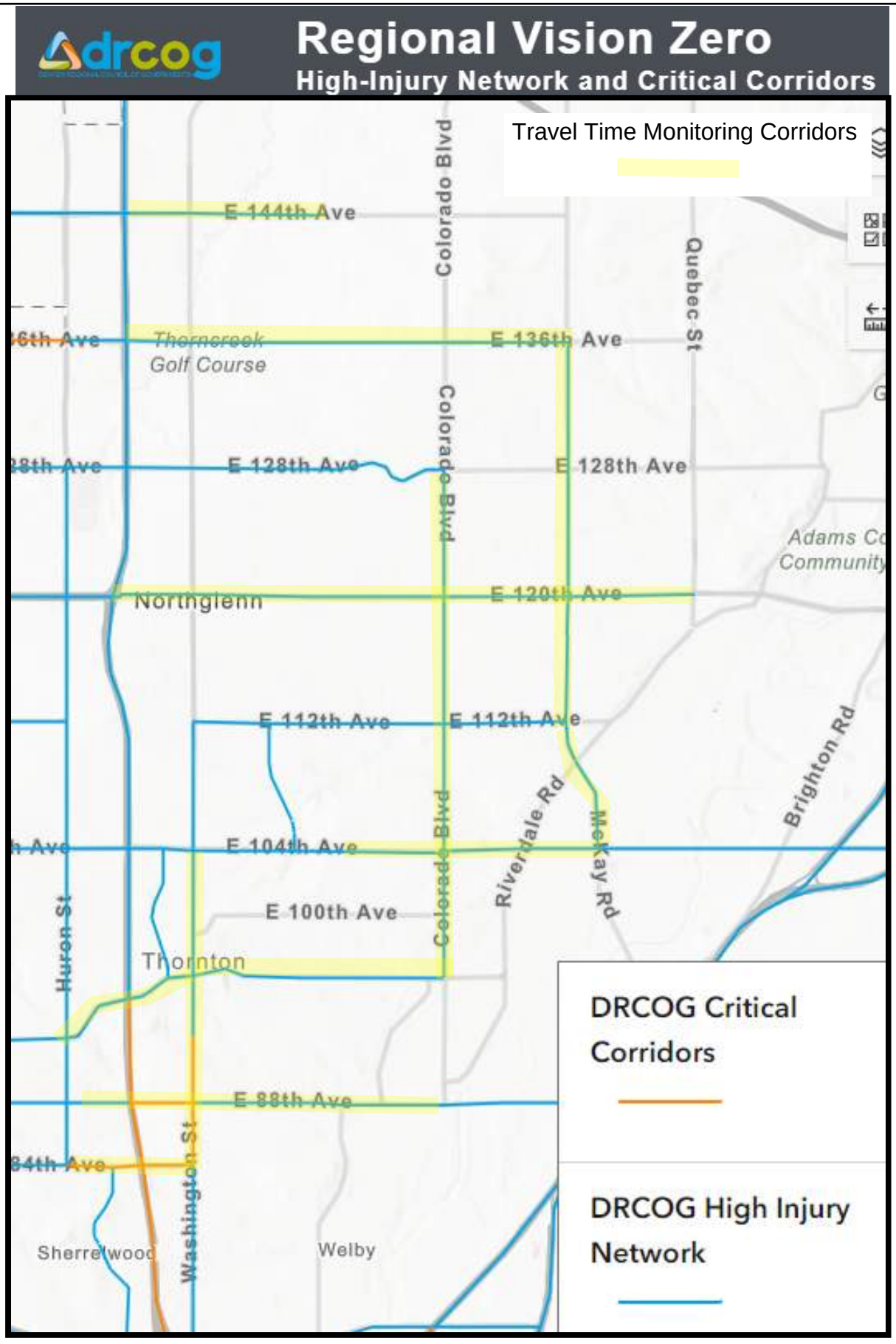
	PEAK-HOUR	OFF-PEAK	
Volume (both directions)	1,000	300	veh/hr
Existing Average Speed	33	34	mph
Travel Time Savings	28	26	min
Proposed Average Speed	35	37	mph

EMISSION REDUCTIONS

Pollutant	Peak-hour Kilograms/day	Off-Peak Kilograms/day	Total Kilograms/day
Carbon Monoxide (CO)	1.163	2.239	3.402
Particulate Matter <2.5 µm ($PM_{2.5}$)	0.020	0.028	0.048
Particulate Matter <10 µm (PM_{10})	0.084	0.165	0.249
Nitrogen Oxide (NOx)	0.374	0.397	0.771
Volatile Organic Compounds (VOC)	0.040	0.075	0.115

Atmospheric Carbon Dioxide (CO2)	139.327	157.182	296.509
Carbon Dioxide Equivalent (CO2e)	140.007	158.866	298.873
Total Energy Consumption (MMBTU)	1.812	2.058	3.870

FIGURE 7
Thornton Travel Time Monitoring Expansion - High Injury Network



FY2024-2027 REGIONAL TRANSPORTATION OPERATIONS AND TECHNOLOGY SET-ASIDE PROCESS: REQUEST FOR PROJECT SUPPORT FORM

Complete the sections with green headers below, then provide this form to the agency you are requesting support from. That agency will complete the blue section and return the form.

APPLICANT INFORMATION

1. Who is requesting project support? City of Thornton
2. Project Sponsor: Thornton
3. Other Project Partners: N/A
4. Contact Person: Marta Junyent
   Title: Senior Civil Engineer - Traffic
   Email: marta.junyent@thorntonco.gov
   Phone: 720 977 6486

PROJECT DESCRIPTION

5. Project Title: Thornton Travel Time Monitoring Expansion
   Total Project Cost: $ 126,500
   Project Location: Various Locations - See Map Attached
   Project Limits: (mileposts, intersecting roads, rivers, etc.) N/A
   County: Adams
   Municipality(ies): Thornton
   Project Length:

Brief Description of Project: This project will expand the existing traffic monitoring network along targeted corridors in the city of Thornton. There are twenty-two (22) devices proposed to be installed at signalized intersections and, in addition to the existing devices already deployed, the network will cover the following corridor segments: 144th Avenue (Lincoln to Holly St), 136th Avenue (I-25 to Yosemite St), 120th Avenue (I-25 to Quebec St), 104th Avenue (York St to McKay Rd), Thornton Pkwy (Pecos St to Colorado Blvd), 84th Ave (Huron St to Washington St), 88th Ave (Huron St to Colorado Blvd), Huron St (Thornton Pkwy to 88th Ave), Washington (120th Ave to 144th Ave), Washington (84th Ave to 120th Ave), Colorado (88th to 144th Ave), Holly Street (104th Ave to 144th Ave), Quebec St (120th Ave to E-470).

The expansion includes devices on 136th Avenue and 144th Avenue. These are major arterials that cross to the city of Westminster where compatible technology is deployed within sufficient distance to establish continuous travel time monitoring. Thornton is coordinating with Westminster to establish linked pairs across 136th Avenue and, upon expansion also across 144th Avenue, to share data and monitoring capabilities. The expansion also includes devices on 104th Avenue and Thornton Parkway/92nd Avenue. Westminster also has units on the 92nd Avenue and 104th Avenue corridors and, even though the distance would not be sufficient to establish reliable linked pairs, data sharing could provide information on Origin/Destinations across the region.

SUPPORT REQUEST

6. Based on who is requesting support (see #1), from whom are you are requesting support? *If you are requesting support from multiple entities, please fill out and send a separate form to each*.
   - ☒ Local Agency, Specify: City of Westminster
   - ☐ CDOT
   - ☐ RTD

7. Type of Support Requested:
   - ☒ Material Participation (e.g. staff, resources, operations responsibilities, etc.)
     Specify: Data sharing and Monitoring Coordination
   - ☐ Financial Commitment:
     - ☐ Local (non-DRCOG) Funds: Amount:
     - ☐ State Funds: Amount:
     - ☐ RTD Funds: Amount:

8. Please type your name and date below which certifies the above information is accurate and complete: Name: Marta Junyent Date: 7/3/2023

RESPONSE (to be completed by agency from whom support is requested)
9. The agency in #1 above has requested your support for their project. Who are you? City of Westminster
10. Contact person at supporting agency: Heath Klein Title: Transportation Engineer Email: hklein@cityofwestminster.us Phone: 303.658.2103
11. Will your agency participate in this project? ☒ Yes ☐ No 12. Does your agency commit financial support to this project, if requested? ☐ Yes ☒ No ☐ N/A If yes, provide amount: $ Fiscal year(s) funds are provided in: If yes, where are funds coming from:
13. Please enter your name and date below which certifies the above information is accurate and complete, and your subregion/agency will honor any financial commitments made above: Name: Heath Klein Date: 07/06/2023

Requirement: The systems engineering analysis (SEA) process is required per 23 CFR 940. The SEA is the project delivery process for the technology element of the project. If the project does not have technology, the project still needs documentation that the scope was evaluated and no additional SEA documentation is required beyond section two of this form. As a matter of policy, CDOT has committed to following the intent and requirements of the SEA process for all transportation projects, regardless whether the project is state or federally funded.

Purpose: The SEA is intended to help design a robust and sustainable technology system. The SEA prompts discussions during design with stakeholders and is intended to document those critical discussions. Since technology does require maintenance and has relatively short life cycles, the SEA also helps projects plan for how to keep the system maintained and operating after construction is completed.

Who is responsible: The local agency will be required to complete this form. This form shall be submitted to CDOT a minimum of two weeks prior to the FOR meeting. It must be reviewed and approved prior to receiving CDOT Concurrence to Advertise for construction. The ITS & Network Services Branch needs at least two weeks to review documents.

Section 1 - Project Overview
1.1 Local Public Agency Project Manager and Contact Information Marta Junyent, marta.junyent@thorntonco.gov 720 977 6486
1.2 Consultant Project Manager and Contact Information (☐ N/A) N/A
1.3 CDOT Project Manager and Contact Information TBD
1.4 Project Location, Route Beginning and Ending MM, or Nearest Intersection The project will deploy bluetooth reader devices along various corridors in the city of Thornton. The netwrok of devices once the expasion is completed will cover the following corridors: 144th Avenue (Lincoln to Holly St), 136th Avenue (I-25 to Yosemite St), 120th Avenue (I-25 to Quebec St), 104th Avenue (York St to McKay Rd), Thornton Pkwy (Pecos St to Colorado Blvd), 84th Ave (Huron St to Washington St), 88th Ave (Huron St to Colorado Blvd), Huron St (Thornton Pkwy to 88th Ave), Washington (120th Ave to 144th Ave), Washington (84th Ave to 120th Ave), Colorado (88th to 144th Ave), Holly Street (104th Ave to 144th Ave),

Quebec St (120th Ave to E-470).

1.5 Project Description, Title, and Type of Work – This should include identification of the problem and the purpose of the project

This project is titled: Thornton Travel Time Monitoring Expansion.

The scope of the project is to expand the existing travel time monitoring network along targeted corridors in the city of Thornton. The scope will include procurement of twenty-two (22) Bluetooth reader field devices and its installation. The procurement will ensure that the equipment is fully compatible with Thornton's existing system and neighboring system. Thornton currently has 23 Bluetooth reader devices installed in the field and a web-based application to monitor the data, check performance measures, pull reports, and access the devices. The new devices will be added to the existing virtual server host and web-based software. Installation of the devices will be completed by Thornton's staff. The devices are planned to be installed on existing traffic signal poles and use existing power training as needed. A data and monitoring sharing plan will be implemented with neighboring jurisdictions. Access to the web-based system will be available for regional partners such as DRCOG staff.

The project will provide operational improvements as the data is used by traffic operators to identify areas where traffic congestion is prevalent and to adjust signal timing to move traffic more efficiently. Air quality improvements are also anticipated as travel time reliability reduces delays and subsequent vehicle emissions. The project also addresses transportation safety by improving and expanding monitoring capabilities during incident management response.

1.6 CDOT Project Number and Sub Account Code

TBD

1.7 Federal-Aid ☐ Yes ☒ No

1.8 Is the project within CDOT's Right of Way (ROW)? ☐ Yes ☒ No

1.9 Funding and Source of Each (Including State and Federal)

RTO&T FY 2024-2027 Regional Transportation Operations and Technology Set-Aside

1.10 Fiscal Year of Funding: FY24

Section 2 - SEA Required?
Federal Requirement: 23 CFR 940.11 Project Implementation

2.1 Are there any technology elements included in the scope of the project?

The National Regulation (23 CFR 940) defines ITS as "electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system." An ITS project is "any project that in whole or in part funds the acquisition of technologies or systems of technologies that provide or significantly contribute to the provision of one or more ITS user services as defined in the National ITS Architecture."

Technology includes any type of device or system that is used to improve the roadways. This could include, but is not limited to, intelligent transportation systems devices. Examples are CCTV, DMS, VTMS, VSL, wrong way detection, RWIS, connected vehicles, non-traditional signals (click on link to understand which signals projects require an SEA), on board equipment in vehicles, and anything that has to be communicated to ATMS or other traffic management systems. Additionally, creating or modifying systems and software that impacts the roadway is included in the SEA classification. If there is still confusion on what is classified as technology, please reach out to the ITS & Network Services Branch.

☒ Yes ☐ No

If the answer to 2.1 is **"yes"** then a **SEA is required**.

If the answer to 2.1 is **"no"** then a **SEA is not required** and the rest of this form does not need to be completed, but Sections 1 and 2 will need to be submitted for documentation purposes.

2.2 Which SEA process should be followed?

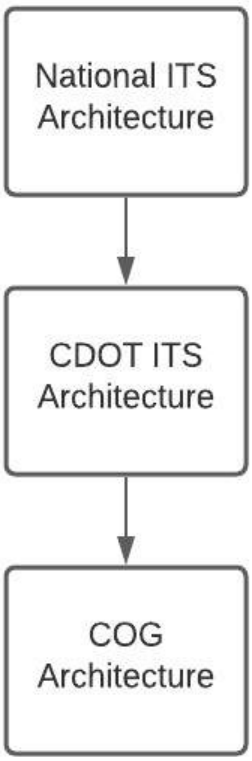
☐ Yes	☒ No	Will the system be owned, operated, or maintained by CDOT?
☐ Yes	☒ No	Does the project involve CDOT technology assets?
☐ Yes	☒ No	Will the project connect to the CDOT network?
☐ Yes	☒ No	Will the project be on CDOT right of way?
☐ Yes	☒ No	Does the project involve multiple municipalities?

If "**yes**" is selected for any of the above questions, then the Robust SEA Process needs to be followed and this form is no longer applicable.

If "**no**" is selected for all questions, then completing this entire form will fulfill the 23 CFR 940 requirements for local agency projects only.

Section 3 - ITS Architecture Conformance

Federal Requirement: 23 CFR 940.11(c)(1) - "Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture)"



Per 23 CFR 940, every project has to comply with an ITS Architecture Plan. For background information, there is a National ITS Architecture Plan that is maintained by FHWA. The National Architecture Plan consists of Service Packages that identifies a problem that needs to be solved or a certain application of a technology. A service package states the basic requirements the project must achieve to create consistency. CDOT is then required to select the service packages from the National ITS Architecture Plan that will assist in fulfilling CDOT's technology vision and make them CDOT specific. From there the local Council of Governments (COG's) have to make their ITS Architectures as well. The local agencies should use the COG's architecture plan if one exists. If one does not, the CDOT Architecture Plan should be followed.

Service packages are critical to identify as part of compiling required SEA documentation. Service packages focus on how the technology is being used rather than specific devices. For example, there is no Dynamic Message Sign (DMS) service package. It will be critical to understand the intent of use for the DMS in order to determine the applicable service package(s). A DMS could fall within the TM06 Traffic Information Dissemination if the intent is to provide drivers with information. If a DMS is being installed as part of a tunnel, then it could fall under TM24 Tunnel Management. The key is focusing on what application the DMS is being used in. It is possible for a project to fall within multiple service packages. Please reach out to the ITS & Network Services Branch with any questions.

3.1 Which architecture plan will be used?

☐ National ITS Architecture ☐ CDOT ITS Architecture

☒ COG

3.2 If using a COG/MPO/TPR Architecture Plan, what COG? N/A for using the National or CDOT Architecture Plan.

DRCOG ITS Architecture

3.3 List service packages that will be implemented on this project:

1. TM01: 023 Local Jurisdiction Travel Time Monitoring

2. DM01: 02 Local Jurisdiction Data Warehouse

To add additional service packages click in the line item 2 box and hit enter.

Section 4 - Procurement

Federal Requirement: 23 CFR 940.11(c)(5) Procurement options

4.1 State the procurement method for the project.

☐ Competitively Bid ☒ Sole Source

4.2 If 4.1 is competitively bid, then what kind is the project delivery method?

☐ Design, Bid, Build ☐ Design Build

☐ Construction Manager/General Contractor ☐ Other (Please specify)_____

Section 5 - Alternative Analysis

Federal Requirement: 23 CFR 940.11(c)(4) - Analysis of alternative system configurations and technology options to meet requirements

Instructions: Document alternatives considered. When thinking of alternatives it is important to consider maintenance resources and costs into the selected alternative. An alternative can also include not implementing the project. More rows can be added as needed.

Alternative Title	Alternative Description	Selected (Yes/No)	Reason

Not implementing	Not expanding the existing travel time monitoring network	No	The travel time monitoring expansion directly supports Thornton's strategic planning goal of reducing congestion and improving corridor mobility throughout the city.
Implementing CV technology	In addition to travel time monitoring, implementing connected vehicle technology at the same locations	No	Cost and readiness of the current vehicle fleet

To add additional rows, right click on a row, select "insert", select "row below"

Section 6 - Roles & Responsibilities

Federal Requirement: 23 CFR 940.11(c)(2) - Identification of participating agencies roles and responsibilities

Instructions: Determine roles and responsibilities of the proposed technology system throughout the entire life cycle. More rows can be added as needed.

Agency	Role/Position	Contact Info	Phase*	Responsibility
Marta Junyent	Senior Civil Engineer – Traffic	970 9776486 Marta.junyent@thorntonco.gov	Procurement	Project Manager

*Phase: Design, Construction, Operations

To add additional rows, right click on a row, select "insert", select "row below"

Section 7 - Requirements & Corresponding Standards

Federal Requirement: 23 CFR 940.11(c)(3) Requirements definitions and 23 CFR 940.11(c)(6) Identification of applicable ITS standards and testing procedures

Instructions: Determine the functional requirements of the system and how these requirements will be implemented. Implementation could be specifications or included in the general design of the system. More rows can be added as needed.

Functional Requirement	How is the requirement included in the project? Spec, plan set, etc
Bluetooth readers shall be compatible with existing system and existing devices deployed in the field	A FIPI is anticipated
Bluetooth readers shall be compatible with Westminster's system	A FIPI is anticipated

To add additional rows, right click on a row, select "insert", select "row below"

Section 8 - Devices & System

Federal Requirement: 23 CFR 940.11(c)(6) Identification of applicable ITS standards and testing procedures and 23 CFR 940.11(c)(7) Procedures and resources necessary for operations and management of the system

8.1 Is a list or a map with all of the proposed devices attached?

☐ Yes ☐ No

8.2 Determine how each device type installed or modified on the project will be specified, tested, and operation of the devices documented. If the project is a whole system, then there may need to be a system wide test as well to ensure all devices are working together properly. More rows can be added as needed.

Device and system type included in project	Is there a supporting specification(s)? If yes, give specification title.	Is there a supporting test document? If yes, give testing procedure title.	Is this device documented in a Standard Operating Procedure (SOP) Document? If yes, give SOP title.	Is this device documented in a Maintenance Plan document? If Yes, give maintenance plan title.

To add additional rows, right click on a row, select “insert”, select “row below”

Section 9 - FHWA Involvement
9.1 Has FHWA classified this project as a Project of Division Involvement (PODI) and requires involvement in the review of SEA documents? ☐ Yes ☐ No

Section 10 - Schedule	
10.1 Design Start Date:	10.2 AD date:
10.3 Construction Start:	10.4 Construction completion:
10.5 Relationship to other Federal, State, and local projects and phases. Tip: Does this project depend on another project to operate successfully? Is this project one of a series or projects for a phased approach?	