

Grant Application: Climate Pollution Reduction Grant | April 1, 2024

Active Transportation Improvements in Southern Utah: Trail Projects to Reduce Vehicle Miles Traveled

Technical Appendix

Submitted to:



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Contents

1. Introduction 1

2. Methodology..... 1

3. Assumptions 1

Tables

Table 1. Calculation for GHG and Criteria Pollutant Emissions Reduction 1

Table 2. Assumptions for Mode Shift Potential for the Project by Trail..... 2

Table 3. National Average Vehicles Emissions Data Provided by BTS 2

Appendices

- Appendix A:** [Letters of Support](#)
- Appendix B:** [Project Cost Estimate](#)
- Appendix C:** [UDOT Mode Shift Tool Documentation](#)
- Appendix D:** [Emissions Reduction Calculation](#)

Abbreviations

| | |
|-------------------|--|
| BTS | Bureau of Transportation Statistics |
| CO ₂ e | carbon dioxide equivalent |
| DAQ | Division of Air Quality |
| GHG | greenhouse gas |
| MOVES | Motor Vehicle Emission Simulator |
| NEPA | National Environmental Policy Act |
| NH ₃ | ammonia |
| NO _x | oxides of nitrogen |
| PM _{2.5} | fine particulate matter less than 2.5 micrometers in diameter |
| Project | Active Transportation Improvements in Southern Utah: Trail Projects to Reduce Vehicle Miles Traveled Project |
| SR-7 | State Route 7 |
| SR-9 | State Route 9 |
| SO ₂ | sulfur dioxide |
| UDOT | Utah Department of Transportation |
| UDEQ | Utah Department of Environmental Quality |
| US-89 | U.S. Highway 89 |
| VOCs | volatile organic compounds |

Technical Appendix—Emissions Reduction Calculation

1. Introduction

The Active Transportation Improvements in Southern Utah: Trail Projects to Reduce Vehicle Miles Traveled Project (the Project) seeks to reduce greenhouse gas (GHG) and criteria pollutant emissions through a mode shift from vehicles to bicycles or other modes of active transportation. This technical appendix provides the background methodology and assumptions that were used to calculate the GHG and criteria pollutant emission reduction presented in the Utah Department of Environmental Quality (UDEQ) Division of Air Quality (DAQ) [Beehive Emissions Reduction Plan: Priority Plan](#) (Table 1).

Table 1. Calculation for GHG and Criteria Pollutant Emissions Reduction

| Year | NO _x | SO ₂ | PM _{2.5} | VOCs | NH ₃ | CO ₂ e |
|---------|-----------------|-----------------|-------------------|------|-----------------|-------------------|
| By 2030 | 0.5 | — | 0.0 | 0.7 | — | 940.9 |
| By 2050 | 5.0 | — | 0.1 | 7.8 | — | 10,349.4 |

Source: UDEQ [Beehive Emissions Reduction Plan: Priority Plan](#)

Note: NO_x = nitrogen oxides; SO₂ = sulfur dioxide; PM_{2.5} = particulate matter less than 2.5 micrometers in diameter; VOC = volatile organic compounds; NH₃ = ammonia; and CO₂e = carbon dioxide equivalent

2. Methodology

To calculate the emissions reduction of the Project, DAQ used the Bureau of Transportation Statistics’ (BTS) Motor Vehicle Emission Simulator (MOVES) model and assumptions of mode shift for the Project provided by the Utah Department of Transportation (UDOT). UDOT has developed a tool to evaluate mode shift potential based on data describing short vehicle trips and the proximity and distance to proposed active transportation facilities. The documentation for this mode shift tool is provided in [Appendix C, UDOT Mode Shift Tool Documentation](#).

3. Assumptions

The following assumptions were used in the Project’s emissions reduction calculation. The emission reduction calculation for the first period (2025 through 2030) assumes that both trails are open for use in 2029 and captures 2 years of mode shift (Table 1). Table 2 lists the assumptions for mode shift and the percentage of bicyclists assumed to be commuter traffic. These assumptions for mode shift were identified using UDOT’s tool summarized in Appendix C. The area around State Route 7 (SR-7) has more residential development than State Route 9 (SR-9) and United States Route 89 (US-89), and, therefore, a great share of bicyclist trips are assumed

to be for commuting purposes. The percentage of bicyclists assumed to be commuters and their annual miles traveled was used to calculate the emissions reduction shown in Table 1. The full calculation is presented in [Appendix D, Emissions Reduction Calculation](#), and the Excel file (GHGcalcs_UDOT.xlsx) attached to this application.

Table 2. Assumptions for Mode Shift Potential for the Project by Trail

| Trail Corridor | SR-7 | SR-9 and US-89 | Combined |
|--|---------|----------------|-----------|
| Trips converted from vehicles per day | 788 | 900 | 1,688 |
| Percentage of trips that are for commuting | 15.0% | 5.0% | 10% |
| Commuting trips per day | 118.2 | 45 | 163.2 |
| Commuting days per year | 365 | 365 | 365 |
| Commuting trips per year | 43,143 | 16,425 | 59,568 |
| Miles per trip | 20 | 20 | 20 |
| Miles per year | 862,860 | 328,500 | 1,191,360 |

Table 3 shows the national average vehicles emissions data provided by BTS that was used to calculate the metric tons of emissions saved per year ([source](#)).

Table 3. National Average Vehicles Emissions Data Provided by BTS

| Source | SO ₂ ^a | NO _x ^a | CO ₂ ^a | PM _{2.5} ^a | VOC ^a | NH ₃ ^a |
|------------------------------|------------------------------|------------------------------|------------------------------|--------------------------------|------------------|------------------------------|
| Light-duty gasoline vehicles | — | 0.18942624 | 413.3971546 | 0.00238272 | 0.36574752 | — |
| Light-duty trucks | — | 0.2620992 | 527.4531955 | 0.00357408 | 0.34787712 | — |
| Average | — | 0.22576272 | 470.425175 | 0.0029784 | 0.35681232 | — |

^a Measure in metric tons

The full calculation is presented in [Appendix D](#) and the Excel file (GHGcalcs_UDOT.xlsx) attached to this application.