

Sustainability Calculations

The calculations below detail the carbon emissions calculations within CyRide's TIGER grant application (pages 23-24) for an Intermodal Transportation Facility.

Hybrid Buses Carbon Emissions equivalent calculations

Assumptions

CyRide annual shuttle miles = 30,056

CyRide current average miles per gallon = 3.8

Hybrids expected miles per gallon = 6.2 (per Gillig manufacturer)

Other 5% Greenhouse gases carbon dioxide equivalent (CO₂e) = CO₂ * 100/95

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05004.htm) or <http://www.epa.gov/OMS/climate/420f05004.htm>)

CO₂ burned per 1 gallon diesel fuel = 9.17 kg

(Source: [TIGER federal register guidance](http://edocket.access.gpo.gov/2009/pdf/E9-9469.pdf) or <http://edocket.access.gpo.gov/2009/pdf/E9-9469.pdf>)

Calculations

Diesel Fuel = ((30,056 miles/3.8 mpg) - (30,056/6.2 mpg)) = 3,062 gallons diesel

Tons Carbon Dioxide Emissions = 3,062 gal. fuel * 9.17 kg CO₂ = 28,078.5 CO₂

Carbon Equivalent = 28,078.5 * 100/95/1,000 = **29.6 tons CO₂e**

Bicycle/Pedestrian Connections

Assumptions

60 space bike locker facility = 60 bikes or 60 cars off the road (CyRide assumes that bikes will turnover so this is a conservative estimate in that lockers will only be occupied once a day)

Average round trip miles driven in Ames = 8 miles

Days utilized = 255

Average vehicle miles per gallon = 27.5 mpg

(Source: [NHTSA](http://www.nhtsa.gov/cars/rules/cape/NewPassengerCarFleet.htm) or <http://www.nhtsa.gov/cars/rules/cape/NewPassengerCarFleet.htm>)

Other 5% Greenhouse gases carbon dioxide equivalent (CO₂e) = CO₂ * 100/95

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05004.htm) or <http://www.epa.gov/OMS/climate/420f05004.htm>)

CO₂ burned per 1 gallon gasoline fuel = 8.8 kg

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05001.htm) or <http://www.epa.gov/OMS/climate/420f05001.htm>)

Calculations

Vehicle miles traveled = 60 cars * 8 miles * 255 days = 122,400 VMT

Fuel = ((122,400 miles/27.5 mpg) = 4,450.9 gallons gasoline

Tons Carbon Dioxide Emissions = 4,450.9 gal. fuel * 8.8 kg CO₂ = 39,168 CO₂

Carbon Equivalent = 39,168 * 100/95/1,000 = **41.2 tons CO₂e**

Circling for A Parking Space

Assumptions

200 Existing Campustown parking spaces

85% utilization before Circulation

120% maximum demand

35% of cars circle (120%-85%) during peak periods

3 peak periods daily

180 peak days/year

6 average block lengths circulated (before parking or going elsewhere)

425 feet = typical block length

5,280 ft = 1 mile

Average vehicle miles per gallon = 27.5 mpg

(Source: [NHTSA](http://www.nhtsa.gov/cars/rules/cape/NewPassengerCarFleet.htm) or <http://www.nhtsa.gov/cars/rules/cape/NewPassengerCarFleet.htm>)

Other 5% Greenhouse gases carbon dioxide equivalent (CO₂e) = CO₂ * 100/95

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CO₂ burned per 1 gallon gasoline fuel = 8.8 kg

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05001.htm) or <http://www.epa.gov/OMS/climate/420f05001.htm>)

Calculations

Vehicle miles traveled (VMT) = 200 spaces * 35% circling * 3 peak times daily * 180 peak days * 6 block lengths * 425 ft)/5,280 feet = 18,256

Fuel = ((18,256 miles/27.5 mpg) = 663.9 gallons gasoline

Tons Carbon Dioxide Emissions = 663.9 gal. fuel *8.8 kg CO₂ = 5,841.9 CO₂

Carbon Equivalent = 6,504.2 * 100/95/1,000 = **6.1 tons CO₂e**

Connected Transportation Modes

Airport Shuttle (Executive Express connects individuals to DSM Airport)

Assumptions

Average vehicle miles per gallon = 27.5 mpg

(Source: [NHTSA](http://www.nhtsa.gov/cars/rules/cafe/NewPassengerCarFleet.htm) or <http://www.nhtsa.gov/cars/rules/cafe/NewPassengerCarFleet.htm>)

Other 5% Greenhouse gases carbon dioxide equivalent (CO₂e) = CO₂ * 100/95

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05004.htm) or <http://www.epa.gov/OMS/climate/420f05004.htm>)

CO₂ burned per 1 gallon gasoline fuel = 8.8 kg

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05001.htm) or <http://www.epa.gov/OMS/climate/420f05001.htm>)

8.4 persons/trip (60% full on average; 14 seat van)

1.5 persons/private auto (carpooling or taking CyRide to facility to catch shuttle)

5.6 autos removed/shuttle trip (8.4/1.5 persons)

9 trips/day (current Executive Express schedule)

365 days/year

Calculations

Airport Express private vehicle annual trips removed= (5.6 autos/trip * 9 trips * 365)= 18,396

Vehicle miles traveled (VMT) = 18,396 * 65 miles to Airport = 1,195,740

Subtract Executive Express added miles = 65 * 365 days *9 trips= 213,525

Saved Vehicle miles traveled (VMT) = (1,195,740-213,525) = 982,215

Fuel Saved = (982,215/27.5mpg) = 35,716.9 gallons gasoline

Tons Carbon Dioxide Emissions = 35,716.9 gal. fuel *8.8 kg CO₂ = 314,308.8 CO₂

Carbon Equivalent = 314,308.8 * 100/95/1,000 = **330.9 tons CO₂e**

Intercity Buses (Jefferson/Greyhound)

Assumptions

Average vehicle miles per gallon = 27.5 mpg

(Source: [NHTSA](http://www.nhtsa.gov/cars/rules/cafe/NewPassengerCarFleet.htm) or <http://www.nhtsa.gov/cars/rules/cafe/NewPassengerCarFleet.htm>)

Other 5% Greenhouse gases carbon dioxide equivalent (CO₂e) = CO₂ * 100/95

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05004.htm) or <http://www.epa.gov/OMS/climate/420f05004.htm>)

CO₂ burned per 1 gallon gasoline fuel = 8.8 kg

(Source: [EPA](http://www.epa.gov/OMS/climate/420f05001.htm) or <http://www.epa.gov/OMS/climate/420f05001.htm>)

15 person added trips/day estimated (assume no vehicle is available for all travelers)

365 days/year

120 miles average trip

Calculations

15 person added trips/day * 365 days/year = 5,500 trips annually

Vehicle miles traveled (VMT) = 5,500 trips * 120 miles/trip = 660,000 VMT

Fuel Saved = (660,000/27.5mpg) = 24,000 gallons gasoline

Tons Carbon Dioxide Emissions = 24,000 gal. fuel *8.8 kg CO₂ = 211,200.0 CO₂

Carbon Equivalent = 211,200.0 * 100/95/1,000 = **222.3 tons CO₂e**

TOTAL = 29.6+41.2+6.1+330.9 + 222.3 = 624 tons CO₂e * \$33/metric ton = \$20,592 saved annually