

Midwest Research Institute



# **Field Study of Emissions from Haul Roads**

## **Final Test Report**

**For  
Iron Mining Association of Minnesota**

**MRI Project No. 310700**

**October 30, 2008**



# **Field Study of Emissions from Haul Roads**

Loaded & Unloaded Truck Weights, Other Vehicle Weights

Truck passes by class during Profile Testing.

United Taconite Plume Profiling Test Calculations & Results

Mintac Taconite Plume Profiling Test Calculations & Results

Road Surface Characteristics (Silt & Moisture)

DustTrack Concentrations to Plume Profiling Emissions Factors

Minntac Watering Truck Data

United Taconite Summer Emissions Factors Data from Mobile Monitoring

Minntac Summer Emissions Factor Data from Mobile Monitoring

Winter Emissions Factor Data

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Iron Mining Association of Minnesota  
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**MRI Project No. 310700**

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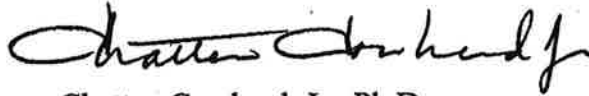
## Preface

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This test report describes a field study performed by Midwest Research Institute (MRI). The primary objective of the study was to develop improved particulate matter (PM) emission factors for dust from taconite haul roads. The report presents the study design, the methods used in implementing the various phases of the study, and the results of the field testing.

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MIDWEST RESEARCH INSTITUTE



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## Acronyms and Abbreviations

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acfm	Actual cubic feet per minute
alt	Alternate
APS	Aerodynamic Particle Sizer
BP	Barometric Pressure
cfm	Cubic feet per minute
D50	50% cutpoint diameter
DW	Down wind
EPA	Environmental Protection Agency
ETV	Environmental Technology Verification
APCTVC	Air Pollution Control Technology Verification Center
ft	Foot
g	Gram
gal	Gallon
GPS	Global Positioning System
in	Inches
in Hg	Inches of Mercury
IS	Instrument Services
ISC	Industrial Source Complex
kW	Kilowatts
lb	Pound
Lpm	Liter per minute
m	Meter
mbar	Millibar
mg/m <sup>3</sup>	Milligrams per cubic meter
mg/cm <sup>2</sup>	Milligrams per centimeter squared (area)
m <sup>3</sup> /h	Cubic meters per hour
min	Minute
mph	Miles per hour
MRI	Midwest Research Institute
$\Delta P$	Pressure drop
PM	Particulate Matter
PM-x	Size specific particulate matter (where "x" denotes particles no greater than x microns in [aerodynamic] diameter)
QA/QC	Quality Assurance/Quality Control
RH	Relative Humidity
scfm	Standard cubic feet per minute (77°F, 29.92 in Hg)
sec	Second
SOP	Standard Operating Procedure
STD	Standard Deviation
Temp	Temperature
TPM	Total Particulate Matter
$\mu m$	micrometers
USS	United States Steel
VFC	Volumetric Flow Controller
VMT	Vehicle mile traveled



## Summary

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A two-phase winter and summer testing program was conducted at two taconite mines in January and July 2007, for the purpose of developing updated PM-10 emission factors and watering control efficiencies for taconite mine haul roads. The test mines were U.S. Steel Minntac and United Taconite, both located on the Mesabi Iron Range in northern Minnesota. These two mines featured the two haul road surface materials found in the Iron Range: tailings and crushed low-grade ore. A preliminary test program was performed at both mines in August 2006 to study haul truck traffic patterns and to verify the performance of a new mobile monitoring method with an on-board monitoring system.

The on-board continuous dust particle monitor and GPS unit were operated on a test vehicle (pick-up truck) at each mine, for the purpose of generating maps of relative PM-10 emissions during a test periods of approximately 1 hour. In traveling the active haul road network at a fixed speed of 25 mph, the mobile monitor measured a series of 1-sec plume concentrations, each representing the average emission rate over a 36-ft length of haul road. This mapping process assured that the entire active haul road system at each mine was evaluated in this study, as opposed to past studies that have relied on only very limited sampling locations.

During the July 2007 testing program, the standard plume profiling method and the mobile monitoring methods were implemented simultaneously at selected reference uncontrolled haul road sites within each mine, so that ratios of haul road emission factor to monitoring vehicle plume concentration could be determined. These ratios were used to develop calibration factors for each test vehicle. Use of these calibration factors provided for conversion of maps of relative haul road emissions to emission factor maps. This enabled the derivation of summer and winter average test mine haul road emission factors weighted by traffic levels on each active haul road segment. Comparison of emissions from the uncontrolled reference sites with the rest of the haul road system also provided for evaluation of the effectiveness of haul road watering as a dust control measure.

During the mobile monitoring at each mine, the repeatability of relative emission measurements was evaluated by traveling back and forth on specified road segments. The repeatability of the measurements was expressed as a relative standard deviation. During the winter testing, the relative standard deviation was very tight (in the range of 5% to 10%), but larger variability was observed during summer testing when emission potential was greater.

Road surface samples were also collected and analyzed for moisture and silt content (particles smaller than 75  $\mu\text{m}$  in diameter). The average winter silt content values for both mines were approximately half the summer values, and the values for United Taconite tended to be higher than the values for U.S. Steel Minntac. The summer silt content values for United Taconite were in the same range as the values obtained in the original June 1978 study performed at Erie Mining Company.



During the winter testing, measured relative emissions were abnormally high due to unusually light precipitation and freeze-thaw conditions. These conditions typically occur during a few days in the wintertime and are not typical of that season. Emissions were observed to increase significantly during the test week as the temperature rose above the freezing point and the road surfaces dried. The effects of freeze-thaw conditions were most evident during the testing at United Taconite. No measurable snowfall was recorded in the area during test month of January 2007, for which the normal monthly snowfall is 11 inches.

During the summer testing, an average uncontrolled daytime PM-10 emission factor of 21.7 lb/VMT was found for active haul roads at U.S. Steel Minntac, and the average watering control efficiency was 81%. At United Taconite, the average uncontrolled daytime PM-10 emission factor was 9.5 lb/VMT with an average watering efficiency of 58%. The lower emission factor at United Taconite reflected the intermittent wet weather encountered during the test week and the effect of overnight watering on the reference test location. Nighttime uncontrolled emissions in the summer testing were found to be 10% of daytime emissions at U.S. Steel Minntac but were about 50% of daytime emissions at United Taconite, mostly because of occasional rainfall during the test week.

When equal weight is given to uncontrolled nighttime and daytime emissions for the summer and winter periods, overall emission factors for U.S. Steel Minntac and United Taconite are found to be 8.4 lb/VMT and 6.0 lb/VMT, respectively. The overall average PM-10 emission factor for taconite mine haul roads is 7.2 lb/VMT. The average ratio of PM-2.5/PM-10 was found to be 10%, so that the corresponding PM-2.5 emission factor is 0.72 lb/VMT.



## Section 1.

# Background and Objectives

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It is likely that AP-42 emission factors published by EPA [1] overestimate the “uncontrolled” PM emissions from dust generating operations such as open pit mining for a variety of reasons. In most cases, the factors were developed under worst-case emission conditions so that high-end emissions could be bracketed with the limited funds available for emission factor development. Although the resulting emission factor equations have correction terms that allow for adjustment of emission estimates to a range of source conditions, it is suspected that emission reduction phenomena such as natural mitigation cannot be adequately treated with these adjustments. MRI has performed recent field studies demonstrating that actual emissions from specific fugitive dust sources are significantly over-predicted using AP-42 emission factors.

There is also a need for measurement of the PM-2.5 component of haul road emissions. No such prior work has been performed at taconite mines. It is appropriate to compare these measurements to test results recently obtained by MRI [2] in a controlled dust tunnel study to determine the PM-2.5 to PM-10 ratios from aerosolized soils.

The subject study is directed to the development of Particulate Matter (PM) emission factors for dust from haul trucks at taconite mines. In more detail, the objectives of the study may be stated as follows:

1. Develop specific PM-10 emission factors for the dominant PM source (haul trucks) in the taconite mining industry under a range of source/ambient conditions:
  - Predominant roadbed materials (rock and coarse tailings)
  - Predominant haul truck sizes and weights.
  - Diurnal/seasonal conditions (showing effects of natural mitigation at the source)
  - Various types and levels of anthropogenic control application (e.g., watering)
2. Develop ratios of PM-2.5/PM-10 for taconite mine haul road dust.
3. Develop watering control efficiencies for taconite mine haul road dust.

This study was designed to provide industry-specific information on taconite haul road emission factors and on the actual control effectiveness of natural mitigation and anthropogenic controls that are applied at the test facilities. It is intended to provide the basis for potential justification of a single-valued emission factor that can be used to characterize haul road emissions at taconite mines. This would reduce or eliminate the need for periodic gathering of site specific data (such as road surface silt and moisture content values) to make adjustments to emission factor equations.



This report describes the methodology and results of testing that was performed in both January and July 2007 at the U.S. Steel Minntac and United Taconite mine facilities in the area of Eveleth, Minnesota. Excluding days required for set-up and redeployment of sampling and analysis equipment at the mine sites, the winter testing at U.S. Steel Minntac was performed on January 9 and 10, and the testing at United Taconite was performed on January 11. Similarly, the summer testing at United Taconite was performed from July 12 to 14, and testing at U.S. Steel Minntac was performed from July 16 to 19.

The primary work products of the summer testing consist of:

- Maps of relative emissions over the full extent of active haul roads at the two mines, showing the effects of watering as a dust control
- Uncontrolled emission factors at reference test sites, and their relationships to relative emissions at the same sites
- Ratios of PM-2.5/PM-10 in the dust plumes at the reference test sites

The extensive maps of relative haul truck emissions for the summer and winter test periods are included on a compact disk. The extensive spreadsheets of haul truck activity during each test period are available electronically in the project files. The test method description is provided as Appendix A. An example calculation that converts plume profiling data to an uncontrolled emission factor is presented in Appendix B.

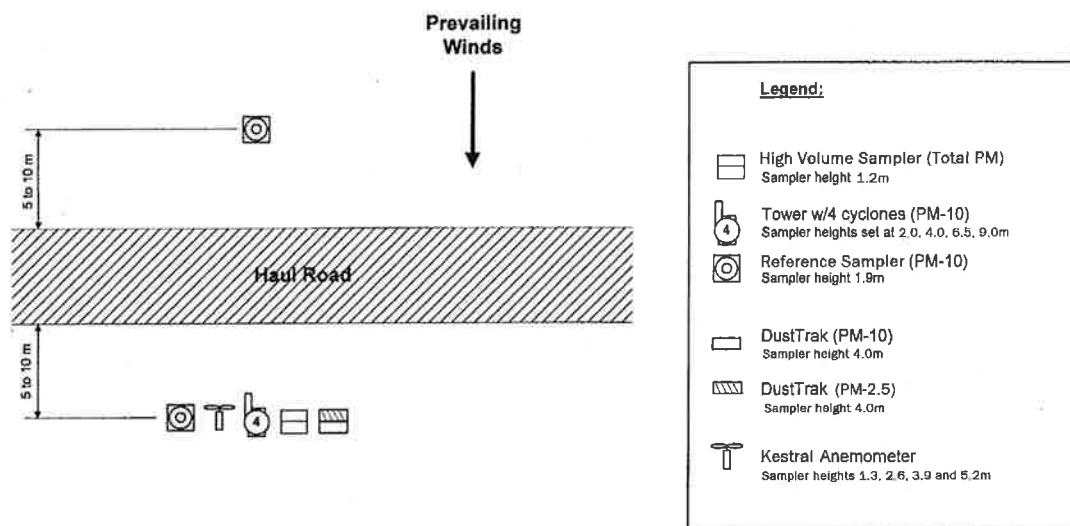


## Section 2. Test Methods

MRI used a blend of test methods for this study, so that the most favorable cost-effectiveness could be achieved in accomplishing the objectives. These test methods include a well-recognized reference method (roadside plume profiling) and a new method (on-board plume monitoring) that can be used to provide spatial and temporal detail in emission factor variation across a roadway system. The mobile monitoring method provides a much better assurance of roadway representation in the emission assessment process, but requires calibration against a reference emission factor test method.

### 2.1 Plume Profiling

For the measurement of **PM-10 emission factors** from haul roads, the plume (exposure) profiling method developed by MRI [5] constituted the primary reference method. The plume profiling method utilizes a sampling tower for measuring concentration and wind speed profiles at roadside locations under crosswind conditions, as shown in Figure 1. MRI has used the profiling method for many years in the determination of unpaved road emission factors for EPA and for industry sponsors.



**Figure 1. Deployment of Profiling Tower and Ancillary Samplers**

The PM-10 plume profiling tower was deployed at each reference test site. The tower was located at a distance of approximately 5 m downwind from the near edge of the haul road. An upwind sampler was operated to determine background PM-10 concentration. A typical sampling period ranged from 1 to 2 hours.



Table 1 lists the field equipment items that were used for the plume profiling at the emission factor reference test sites within the United Taconite and U.S. Steel Minntac mines. The table also includes items for the mobile monitoring system and the road surface characterization, as discussed further below. A picture of the reference test site at the U.S. Steel Minntac facility is contained in Figure 2.

**Table 1. Field Equipment Used for Summer Testing**

Units	Sampler	Location	Flow rate	Intake height	Purpose
2	Wedding Hi-Vol/VFC	Upwind/downwind	40 cfm	1.9 m	Monitor background PM-10 concentration
4	Cyclone Hi-Vol/VFC	Profiling tower	40 cfm	2.0, 4.0, 6.5, 9.0 m	Measure roadside PM-10 concentration profile
2	DustTRAK	Profiling tower	1.7 Lpm	4m (alt.)	Measure PM-2.5/PM-10 ratio in plume core (roadside)
4	Kestral Anemometers (battery operated)	Profiling tower	NA	1.3, 2.6, 3.9, 5.2 m	Measure roadside wind speed profile (20-min averages)
2	Crepe paper streamer	Profiling tower	NA	3, 6 m	Monitor wind direction
2	Manometers	Profiling tower & Mobile monitor	NA	NA	Monitor Hi-Vol flow rates via pressure drop readings
1	Cyclone Hi-Vol with back plate	Mobile monitor	40 cfm	Per field notes	Remove >10 micron particles from sample stream and feed PM-10 stream to DustTRAK
1	DustTRAK	Mobile monitor	1.7 Lpm	Cyclone effluent	Provide 1-sec PM-10 concentration values for test truck plume
1	Garmin GPS Unit	Mobile monitor	NA	NA	Provide 1-sec test truck position data
1	Laptop	Mobile monitor	NA	NA	Record GPS and DustTRAK signals
2	Wisk broom, dust pan & 5-gal bucket	Road test site	NA	Surface	Collect road surface samples for moisture and silt analysis
1	Road sample splitter	Road test site	NA	NA	Split surface samples to about 200 g
1	Portable oven	Field lab	NA	NA	Dry sample splits for moisture analysis
1	Top loading balance	Field lab	NA	NA	Weigh surface samples for moisture determinations
3	Generator	Profiling tower & Mobile monitor	NA	NA	Supply power to instruments
1	Variac	Mobile monitor	NA	NA	Adjust monitor flow rate via pressure drop reading for Cyclone flow rates
1	Air compressor	Mobile monitor	NA	NA	Clean cyclones





Figure 2. U.S. Steel Minntac Reference Test Site (looking from the side)

## 2.2 Mobile Monitoring

The mobile monitoring method developed by MRI [5] was used as a “transfer standard” for determining the **spatial variability of haul road emission factors** at a given mine, season, and time of day. The mobile monitoring method is calibrated against traditional plume profiling as a recognized reference method.

The mobile monitoring method utilizes a continuously recording “on-board” PM-10 concentration monitor suspended in the plume on the side of a special light-duty test vehicle (see Figure 3). The continuous monitor samples the effluent of a high-volume PM-10 cyclone of the same design as used on the plume profiling tower. A continuous GPS unit on the test vehicle references each 1-sec PM-10 concentration reading to its location.

MRI’s mobile monitoring method has been used as part of EPA’s Environmental Technology Verification Program in the testing of the effectiveness of road dust suppressants [5]. While the mobile monitoring method does not measure the absolute emission factor for any given road segment, it does measure the relative emission factor, so that location-dependent emission factors can be mapped across a network of primary haul roads at a particular mine site over a period of about 1 hour. As stated above, conversion to absolute emission factors requires on-site calibration of the mobile monitor



PM-10 concentration level to the equivalent PM-10 emission factor determined by conventional roadside plume emission characterization.



**Figure 3. Mobile Monitor Intake Line on Side of Test Vehicle**

The calibration of the mobile monitoring system provides for conversion of contemporaneous plume concentration and GPS data files for each test run into a map that depicts the emission factor variation over a specified network of haul roads at the respective mine. This map gives an emission characterization of an entire system of active haul roads for the hour during which the mobile monitoring data set was obtained.

In this way, the mobile monitoring system is used to look at spatial variations in the haul truck PM-10 emission factor as a result of differences in road surface aggregate materials, differences in road surface moisture content caused by natural effects and by periodic watering programs, and differences in surface integrity caused by degrees of compaction or by application of chemical road dust suppressants. It is important to note that the test vehicle with the mobile monitoring system is restricted to a specified speed range (while the monitoring system is in operation) so that unrestricted speed changes are not interpreted as changes in road surface conditions.

## **2.3 Truck Activity/Road Characterization**

During the emission factor testing, the haul road traffic and surface conditions at the mine site needed to be thoroughly documented. This included (a) traffic counts by vehicle type and weight, (b) watering system parameters for road dust control, and (c) road surface silt and moisture content, determined using EPA-approved methods. Representatives of the two test mines provided hourly traffic counts for specified road segments during the days when testing was performed. These traffic counts came from each mine's computerized mine management systems. Watering information was



provided for the summer testing only, because watering is not used in the winter months to avoid road skid hazards.

During the winter and summer testing, samples of loose road surface material were collected from lateral strips that extended across the active (traveled) portion of the road. (see Figure 4). These samples were analyzed for silt content according to the recommended AP-42 method [1]. Silt is defined as the fraction of particles passing a 200 mesh screen upon dry sieving, consisting of particles smaller than 75  $\mu\text{m}$  in diameter. Silt has traditionally been used as a surrogate for the dustiness (dust emission potential) of a source material such as the surface of an unpaved road.



**Figure 4. Road Surface Sampling During Winter Testing**

Road surface sampling is normally performed only on roads with dry surface conditions (to the extent that dry surface conditions are available). It is not possible to perform representative road surface sampling on wet roads or roads with consolidated surface material that does not contain loose fines. During the winter season, road watering for dust control at taconite mines is normally suspended because of freezing conditions.

Traffic activity on mine haul roads is not limited to haul trucks. Other vehicles travel the road network, including light-duty trucks, maintenance vehicles, graders, loaders,



water trucks. Because of the importance of traffic activity at the emission factor test sites, each vehicle pass was recorded on a run sheet and placed in one of four categories: haul truck/loaded, haul truck/unloaded, light-duty vehicle, or maintenance vehicle. In order to account for the emission contribution of vehicles other than haul trucks, an emission ratio was formed from the AP-42 industrial unpaved road emission factor equation so that nonhaul truck passes could be converted into equivalent haul passes.

The AP-42 PM-10 emission factor equation for industrial unpaved roads is as follows:

$$E = 1.5(s/12)^{0.9}(W/3)^{0.45}$$

where: E = size-specific emission factor (lb/VMT)  
s = surface material silt content (%) with a range of 1.8% to 25.2%  
W = mean vehicle weight (tons) with a range 2 to 290 tons

For determining PM-2.5 emission factors, the coefficient 0.15 is used in place of 1.5 in the above equation.

The following data were used to convert the emission potential of maintenance and light-duty vehicles to equivalent haul trucks (average of loaded and unloaded values):

- Approximate weight of an unloaded haul truck is 180 tons.
- Approximate weight of a loaded haul truck is 440 tons.
- Average weight of a haul truck is 310 tons.
- Average weight of a light-duty vehicle is 4.5 tons.
- Average weight of a maintenance vehicle is 17 tons.

The above values of vehicle weights were provided by mine personnel at U.S. Steel Minntac.

By combining the above weights with the AP-42 weight adjustment term, the following PM-10 emission ratios were obtained:

- Ratio of emissions from an unloaded to a loaded haul truck is 0.67.
- Ratio of emissions from a light-duty vehicle to an average haul truck is 0.15.
- Ratio of emissions from a maintenance vehicle to an average haul truck is 0.27.

These ratios were applied to the number of vehicles in each category during a testing run to get an overall equivalent number of haul truck passes.

## 2.4 Environmental Characterization

During each test with the plume profiling or the mobile monitoring system, a number of environmental parameters were measured. Periodically during the testing, hand-held



monitors were used to record ambient wind speed as well as temperature and relative humidity. The environmental parameters and the devices or methods used to determine them are summarized in the Table 2.

**Table 2. Environmental Monitoring Instruments**

Variable	Device	Frequency
Temperature	Testo Model 625	Once per run
Relative Humidity	Testo Model 652	Once per run
Cloud Cover	Visual	Once per run
Wind Speed	Kestral Model K1000	Average every 20 min
Wind Direction	Visual/Streamer	Every truck pass
Precipitation	Eveleth Airport	Recorded hourly
Barometric Pressure	Eveleth Airport	Recorded hourly
Background PM-10	Wedding reference high volume PM-10 sampler	Time-integrated measurement

## 2.5 Quality Assurance

Quality assurance items used in the testing are summarized in Table 3.

**Table 3. Quality Assurance Items**

Item	Property	Method 1	Method 2	Comments
Filters	Identification	Stamped with unique number	—	Per SOP
	Deployment	Data form entry	Label tape on cassette	Specify run, location & date
	Weight (tare, final)	Gravimetric lab entries	—	Per SOP (audits & blanks)
	Weight (tare, field gain)	Field lab entries	—	Blank corrections only
Hi-Vol/ VFCs	Flow rate	Calibrate against high volume sampler orifice in field	Monitor $\Delta P$ across filter during test	High volume sampler orifice calibrated using Roots meter at MRI
Hi-Vol/ Back Plate	Flow rate	Calibrate against high volume sampler orifice in field	Monitor $\Delta P$ across back plate during test	High volume sampler orifice calibrated using Roots meter at MRI
Field Balance	Accuracy	Twice yearly IS Calibration	Standard weights	
DustTRAKs	Concentration	APS in Dust Tunnel	Return to TSI	
	Flow rate	Rotameter	—	
	Zero Check	HEPA Filter	—	
Kestrals	Wind speed	Factory	Collocated on horizontal bar	Outdoor setting



## Section 3.

### Special Issues

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During the summer testing program, specific criteria were used for site selection and sampler deployment at the emission factor reference sites within each mine where plume profiling towers were erected. The criteria for site acceptability were as listed below:

1. Quarter-mile straight section of haul road with temporary termination of road watering.
2. High level of haul truck traffic with a mixture of unloaded and loaded trucks moving at normal speeds.
3. Good exposure to unobstructed wind flow, with an expected wind direction normal to the road orientation.
4. Access area on downwind edge of road for placement of equipment and crew.
5. Negligible interference from any upwind sources.
6. The grade of the reference test road is small so that diesel exhaust emissions are negligible in relation to road dust emissions.

During the first week of testing (performed at United Taconite), wind direction shifts were encountered, which hampered the selection of a profiling test site. Finally, a site was selected on a north-south section of a main haul road to the crusher, where a roadside pocket was available for profiling equipment deployment along the east side. The 6-ft high berm of crushed rock, which bordered all haul roads, was recessed to the back of the pocket. In effect, this notch in the berm offered a safe zone for crew and equipment.

Initially, a 7-m profiling tower was set up, which duplicated the tower height used in the original testing of haul truck emissions at taconite mines. However, it quickly became evident that a 7-m tower height would not be sufficient to capture plumes from the larger haul trucks. Thus, the decision was made to use a 10-m mast, so that the uppermost sampler could be at a height of 9 m. This necessitated rerigging the tie-down cables that ran from the top of the mast to three anchor points in a triangular array on the ground, each at a distance of 5 m from the base of the mast. There was only one suitable site at United Taconite that fit the criteria for this uncontrolled emission factor testing.

During the testing at United Taconite, the uncontrolled reference test site was watered during the night, based on the operating procedures at the mine. It was believed by mine personnel that this watering would not affect the suitability of the site for the uncontrolled emission factor tests. Also because of shovel problems, it was necessary to reroute haul truck traffic from the normal pattern, in order to provide adequate activity at the profiling test site.

Wind direction was also a problem at United Taconite. Even though the forecasts continued to show strong wind components from the west, winds shifted more to the



south during some tests. In those cases, the section of road impacting the profiling tower was lengthened, and in some cases the angle between the wind direction and the road was less than 45 degrees, which introduced uncertainties into the data analysis process. This is addressed further in the results section.

At U.S. Steel Minntac, the profiling site offered large and accessible profiling equipment deployment areas on three sides of an intersection between an east-west section of haul road and a north-south section of haul road. A 1-ft berm bordered the edge of these roads in the testing area. This arrangement offered flexibility to accommodate changes in primary wind direction during the test week. In addition, watering of the roads in this area was terminated completely unless approval from MRI was given to restart the watering activity.

At both mines, the pick-up truck that was used for mobile monitoring during the January 2007 testing was made available again for the summer testing. In addition, good working maps of daily haul truck routes were provided. Finally, MRI was given access to indoor laboratory space at each mine for use in loading collection media and recovering and analyzing collected samples.

In order to account for emissions from all of the active haul road traffic at the particular mine, the mobile monitoring system traveled over every active haul route during the hour of testing. The mobile monitoring route was determined by looking at all of the active shovel locations within the mine and the haul destination for each shovel. The mobile monitor traveled over each load-to-unload route, in succession, just as the trucks would use them. Routes were also separated into unloaded versus loaded routes, in order to determine the difference in emission factors from loaded and unloaded trucks. Some road segments were monitored more than once, to represent shared traffic with separated destinations.

During the winter testing, measured relative emissions using the mobile monitoring method were abnormally high due to unusually light precipitation and freeze dry conditions. These conditions typically occur during a few days in the wintertime and are not typical of that season. Emissions were observed to increase significantly during the test week as the temperature rose above freezing and the road surfaces dried.



## Section 4.

### Results of Winter Mobile Monitoring

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The study design for the winter testing of relative haul road PM-10 emissions encompassed three maps of the active haul roads at each of the two test mines. In addition, it included emission repeatability testing over fixed road segments. As stated previously, no road watering occurs in the winter, due to freezing conditions and associated safety hazards. Normally, because of higher moisture levels in the winter, uncontrolled emissions are expected to be lower than in the summer season.

Table 4 summarizes the characteristics of the mobile monitoring platforms (light-duty trucks) that were used for the winter testing. The test vehicle for United Taconite is shown in Figure 5.

**Table 4. Mobile Test Platforms for Winter Testing**

	U.S. Steel Minntac	United Taconite
<b>Truck</b>		
Make	Ford	Chevy
Model	F-250 XL Superduty	Silverado Half Ton Extended Cab
Year	2005	1999
<b>Tire</b>		
Make	Continental	Michelin
Model	Contitrac (LT245/75R17)	XZY Radial (7.50R16)
Diameter	17 inches	16 inches



**Figure 5. Test Vehicle for United Taconite**



## 4.1 Mapping of Relative Emissions

Table 5 lists the individual test runs that were performed during the winter testing program at the U.S. Steel Minntac and United Taconite mines. Also listed are sampling periods for each test, the purpose of the test, and the ambient weather conditions. As stated above, tests were performed either for PM-10 emission mapping or for emission measurement repeatability determination.

**Table 5. Test Log and Site Conditions**

Mine	Run	Date	Purpose	Start time	Stop time	Temp. (°F)	Relative humidity (%)
U.S. Steel Minntac	8	1/9/2007	Emission Map	11:07	12:19	16	55
U.S. Steel Minntac	9	1/9/2007	Emission Map	14:39	15:44	20	55
U.S. Steel Minntac	10	1/10/2007	Emission Map	8:58	9:48	21	65
U.S. Steel Minntac	11	1/10/2007	Emission Map	9:56	10:47	21	65
U.S. Steel Minntac	12	1/10/2007	Emission Map	12:10	13:02	23	60
U.S. Steel Minntac	13	1/10/2007	Repeatability	13:16	13:22	23 <sup>a</sup>	60 <sup>a</sup>
United Taconite	14	1/11/2007	Emission Map	9:12	9:48	32	66
United Taconite	15	1/11/2007	Repeatability	10:06	10:20	39	55
United Taconite	16	1/11/2007	Emission Map	10:27	10:55	39 <sup>a</sup>	55 <sup>a</sup>
United Taconite	17	1/11/2007	Emission Map	13:17	13:47	32	64
United Taconite	18	1/11/2007	Repeatability	14:00	14:07	32 <sup>a</sup>	64 <sup>a</sup>

<sup>a</sup> Value applied from immediately prior period.

Eight relative emission maps were generated for the winter testing as presented in Compact Disk A. These maps were generated by overlaying the DustTRAK concentration measurements and associated GPS coordinate readings with Google maps of the mine sites. Color coding of data points was used to provide a broad classification of the relative emission (plume concentration) measurements. The PM-10 concentration (in the dust plume from the test vehicle) is indicated in the maps using the following color codes:

- Blue— < 2 mg/m<sup>3</sup>
- Green—2 to 10 mg/m<sup>3</sup>
- Orange—10 to 50 mg/m<sup>3</sup>
- Red— > 50 mg/m<sup>3</sup>

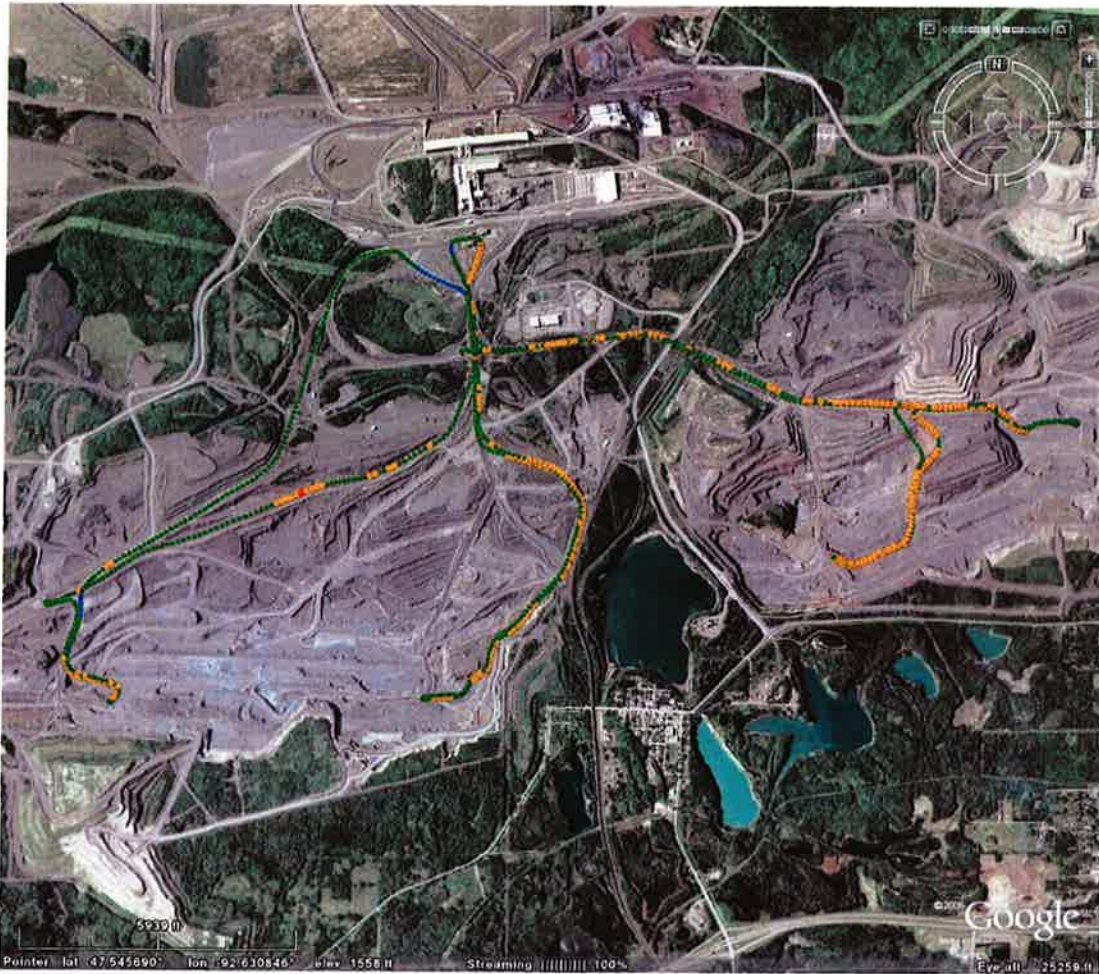
Example maps for each mine from the winter testing are presented in Figures 6 and 7.





**Figure 6. Example Relative Emissions Map of the United Taconite Haul Road System**





**Figure 7. Example Relative Emissions Map of the U.S. Steel Minntac Haul Road System**

Calibration of these test vehicles during the July 2007 summer testing provides for conversion of the relative emission maps for each mine (for both the winter and summer testing) to haul truck emission factor maps for each mine. It was presumed unlikely that the test vehicles used at each mine would have the same calibration factor, because of differences in the body design of the test vehicles for the two mines.

In gathering plume concentration and location measurements, each test vehicle traveled at 25 mph. The travel speed was held constant to the extent possible, so that speed differences would not be interpreted as differences in emission potential. It is known that road dust emissions from any vehicle increase with vehicle speed.

The 1-sec data points from the test vehicle represented 36-ft distance intervals along the travel route. To provide time smoothing of concentration data over short haul road distances, running 5-sec concentration averages were obtained, and 3-sec averages of



these points were used for emission mapping. Thus, each point on an emission map represents a running average plume concentration over a 108-ft length of haul road.

## **4.2 Repeatability of Relative Emissions**

A second basic type of emission monitoring test was performed to establish the repeatability of relative emission measurements by traveling back and forth over a given haul road segment. Three circuits of each repeatability test road segment were performed. Due to natural differences in road surface conditions between lanes traveled by loaded and by empty haul trucks, each travel direction was analyzed separately. In addition, any slope of a haul road segment will result in differences in tire/road energy transfer as a haul truck travels in one direction versus the other over the road segment.

Table 6 summarizes the results of the winter emission repeatability testing. For this purpose the average PM-10 plume concentration for each pass along the test road segment was determined. For purposes of analysis, the concentration average for each pass in a given direction was determined. Then average concentration and the relative standard deviation of the average concentration in each direction are also presented in Table 6.

As shown in Table 6, the average concentration in each direction was very stable with a relative standard deviation in the range of approximately 5% to 10%. This indicates a high degree of repeatability of the relative emission measurements. Note that Run 13 was performed at U.S. Steel Minntac, and Runs 15 and 18 were performed at United Taconite. Other repeatability data sets are available by grouping multiple passes over the same road segments from the emission mapping test runs.

It is also evident in Table 6 (Runs 13 and 18) that for a given road segment with two-way haul truck traffic, the side of the road traveled by loaded haul trucks has higher emissions than the side of the road traveled by empty haul trucks. This difference was accentuated by the slope of the haul road for both of these tests. In contrast, the test road segment for Run 15 was nearly flat and showed little difference in each direction, reflecting the fact that both sides of the road were traveled by a combination of loaded and empty haul trucks.



**Table 6. PM-10 Measurement Repeatability Analysis**

Mobile monitor run	Loaded, unloaded, combined	Pass average concentration (mg/m <sup>3</sup> )	3-Pass average concentration (mg/m <sup>3</sup> )	Relative Standard Deviation <sup>a</sup>
13	Unloaded	13.8	13.7	4.0%
		14.2		
		13.1		
	Loaded	20.2	21.4	10.3%
		20.2		
		24.0		
15	Combined	4.36	4.06	11.0%
		4.29		
		3.55		
	Combined	5.06	4.78	5.6%
		4.73		
		4.53		
18	Unloaded	11.0	11.7	6.1%
		11.7		
		12.5		
	Loaded	32.0	30.0	6.1%
		28.4		
		29.5		

<sup>a</sup> Relative Standard Deviation = Standard Deviation/Average.

### 4.3 Haul Road Surface Characteristics

Table 7 shows the results of the silt analysis of the collected road surface samples. Also shown for comparison are the results from the original testing of taconite mine haul roads performed in June 1978 [MRI, 6]. It is evident that the silt content values measured during the winter testing program are below the values measured in the original summertime emission factor study for taconite haul roads.

**Table 7. Haul Road Silt Contents**

Sample identification	Mine	Surface	% Silt
<b>Winter Testing (Jan 2007)</b>			
IMA-13 Unloaded	U.S. Steel Minntac	Tailings	0.8
IMA-13 Loaded	U.S. Steel Minntac	Tailings	0.6
IMA-18 Unloaded	United Taconite	Crushed ore	0.7
IMA-18 Loaded	United Taconite	Crushed ore	2.3
<b>Previous Testing (June 1978)</b>			
Average (I-2 to I-4)	Erie Mining Co.	Sand/gravel	4.7
I-6	Erie Mining Co.	Sand/gravel	2.4
Average (I-7 to I-8)	Erie Mining Co.	Crushed rock	6.1

### 4.4 Summary of Test Results

During the winter testing program, a total of eight maps of relative emissions were successfully generated. Although these maps are color coded to indicate the spatial



distribution of relative emissions as reflected by broad PM-10 dust plume concentration levels, complete sets of 1-sec concentration readings were generated by the testing. Each concentration point represents a moving 108-ft average emission value applied to a 36-ft segment of haul road. No watering of haul roads took place during the winter because of safety issues associated with icy road surfaces. A summary of the results are presented in Table 8.

It should be noted that weather conditions during winter emission mapping were uncharacteristic of normal conditions, and road emissions were abnormally high during the latter part of the test week. Up to and including the winter test week in mid-January, no monthly measurable snowfall was recorded. In addition, the ambient temperature approached the freezing point on several days during the month, even though the average high temperature for the month is 18°F. These temperature conditions created a freeze-thaw effect on the haul road surface material, resulting in much higher than normal wintertime emissions.

When the MRI test crew arrived to begin testing, some residual moisture in the haul road surfaces was evident, but no snow accumulations on road edges were observed and little snowcover was present on the surround terrain. Visible emissions increased noticeably as the temperature continued to rise during the test week.

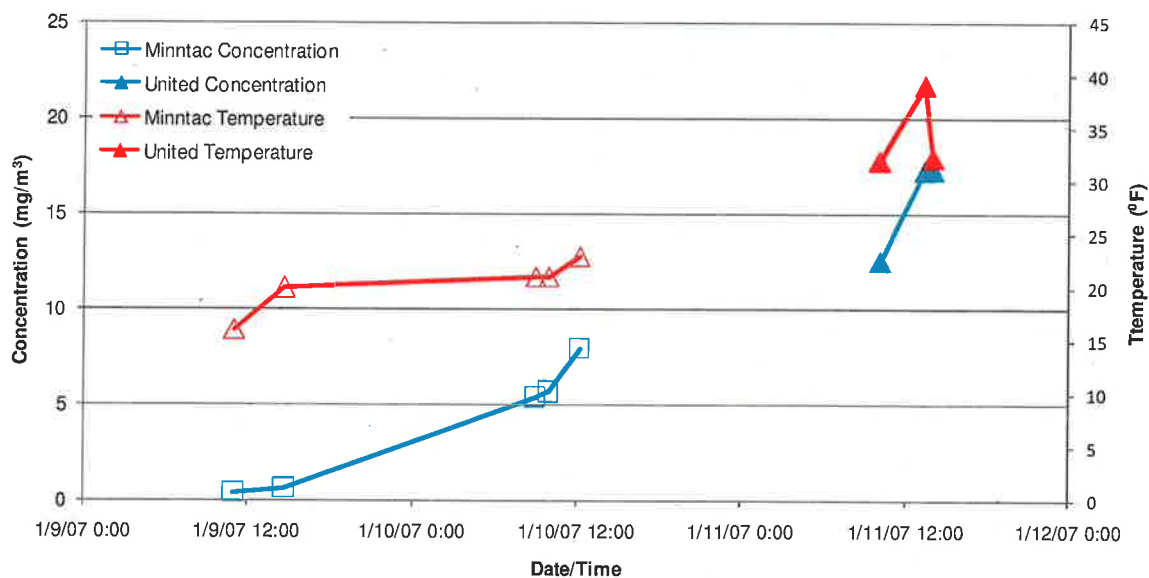
The trend of increasing relative emissions under these conditions can be seen in Figure 8. Notice that the daytime emissions increased by a factor of 100 during the test week. The emissions observed early in the week are believed to be more closely representative of normal winter conditions. Further analysis of winter emissions is presented later in this report.

**Table 8. Summary of Relative Daytime PM-10 Emissions During Winter Testing**

Mobile monitor run	Location	Weighted concentration (mg/m <sup>3</sup> )	Mine average (mg/m <sup>3</sup> )	Emission factor (lb/VMT) <sup>a</sup>
8	U.S. Steel Minntac	0.372	3.99	7.78
9	U.S. Steel Minntac	0.624		
10	U.S. Steel Minntac	5.38		
11	U.S. Steel Minntac	5.63		
12	U.S. Steel Minntac	7.93		
14	United Taconite	12.4	15.6	40.1
16	United Taconite	17.2		
17	United Taconite	17.3		

<sup>a</sup> Based on calibration factors given in Section 6.4.





**Figure 8. Response of Winter Relative PM-10 Emissions to Increasing Temperature and Road Drying**

Based on the calibration data collected during the July 2007 testing program, the mobile monitoring maps of relative PM-10 emissions can be converted into haul truck emission factor maps for the winter testing. In turn, these maps were used to obtain representative uncontrolled emission factors for haul trucks during the winter season.

Also during the winter testing program, tests of the repeatability of relative emission measurements were performed. These were accomplished by driving back and forth on a given road segment. The repeatability of the measurements was found to be very good, as indicated by a relative standard deviation in the range of approximately 5% to 10%.

Finally, the winter tests of road surface silt content indicated values in the range of 0.6% to 2.3%. These values are similar to those found during the August 2006 summer pre-testing, but lower than the values obtained in the original work at Erie Mining Company in 1978, which were in the range of 2.4% to 6.1%.

Besides collecting data on emission and road surface characteristics, traffic data from the winter testing were obtained from the respective mining company personnel. For each test, all of the active haul roads were identified along with the routes of travel between shovels and the crusher(s) or various waste rock dump locations. This enabled converting hourly truck trips to truck passes (loaded and empty) on each road segment. These road activity results formed the basis for the development of representative PM-10 emission factors that can be associated with segment-average dust plume PM-10 concentrations.



## Section 5.

### Results of Summer Mobile Monitoring

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The study design for this field testing program specified that the summer testing of relative haul road PM-10 emissions would result in six maps of the active haul roads at each of the two test mines. In addition, it included emission repeatability testing over fixed-road segments. Because road watering occurs in the summer, most active haul roads were passing through a moisture cycle that reduces dust emissions to near zero when the water is applied to a specific section of the road.

Table 9 summarizes the characteristics of the mobile platforms (light-duty trucks) that were used for the summer testing. There was no change in test vehicles at United Taconite or U.S. Steel Minntac between the January 2007 and July 2007 test programs. The test vehicle for U.S. Steel Minntac is shown in Figure 9.

**Table 9. Mobile Test Platforms for Summer Testing**

	U.S. Steel Minntac	United Taconite
<b>Truck</b>		
Make	Ford	Chevrolet
Model	F-250 XL Superduty	Silverado Half Ton Extended Cab
Year	2005	1999
<b>Tire</b>		
Make	Continental	Firestone
Model	Contitrac (LT245/75R17)	Transforce AT (LT265/75R16)
Diameter	17 inches	16 inches



**Figure 9. Test Vehicle for U.S. Steel Minntac**



## 5.1 Mapping of Relative Emissions

Tables 10 and 11 list the individual test runs that were performed during the summer testing program at the U.S. Steel Minntac and United Taconite mines, respectively. As indicated, tests were performed either for PM-10 emission mapping or for emission measurement repeatability determination. Also listed in Table 10 are sampling periods for each test and the associated diurnal period.

A total of 19 emission maps of the active haul roads were generated by the mobile monitoring system, nine maps at United Taconite and ten at U.S. Steel Minntac. Because of the much larger size of the U.S. Steel Minntac mine and its 2-pit configuration, a given haul road emission map applied to the active haul roads related to one pit at a time.

**Table 10. Summer Mobile Monitoring Test Log—United Taconite**

Mobile monitor run	Date	Start time	Stop time	Purpose	Diurnal period
IMA-019	7/12/2007	12:10	12:40	Emission Mapping	Day
IMA-020	7/12/2007	14:19	14:50	Emission Mapping	Day
IMA-021	7/12/2007	16:23	16:51	Emission Mapping	Day
IMA-022	7/12/2007	17:21	17:50	Emission Mapping	Day
IMA-023	7/13/2007	5:11	5:48	Emission Mapping	Night
IMA-024	7/13/2007	9:55	10:18	Emission Mapping	Dawn/Dusk
IMA-025	7/13/2007	10:52	11:17	Emission Mapping	Day
IMA-026	7/13/2007	11:27	11:51	Emission Mapping	Day
IMA-027	7/13/2007	14:05	14:29	Emission Mapping	Day
IMA-028	7/13/2007	14:47	15:10	Emission Mapping	Day
IMA-029	7/14/2007	11:10	11:15	Repeatability	Day
IMA-030	7/14/2007	11:43	11:49	Repeatability	Day
IMA-031	7/14/2007	12:12	12:18	Repeatability	Day
IMA-032	7/14/2007	12:43	12:49	Repeatability	Day



**Table 11. Summer Mobile Monitoring Test Log—U.S. Steel Minntac**

Mobile monitor run	Date	Start time	Stop time	Purpose	Diurnal period
IMA-033	7/16/2007	15:10	15:42	Emission Mapping	Day
IMA-034	7/16/2007	16:31	17:08	Emission Mapping	Day
IMA-035	7/16/2007	17:30	18:04	Emission Mapping	Day
IMA-036	7/17/2007	9:35	10:18	Emission Mapping	Dawn/dusk
IMA-037	7/17/2007	14:29	16:04	Emission Mapping	Day
IMA-038	7/18/2007	9:28	10:15	Emission Mapping	Dawn/dusk
IMA-039	7/18/2007	13:22	13:27	Repeatability	Day
IMA-040	7/18/2007	13:41	14:29	Emission Mapping	Day
IMA-041	7/18/2007	14:37	14:42	Repeatability	Day
IMA-042	7/18/2007	15:34	15:38	Repeatability	Day
IMA-043	7/18/2007	16:05	17:01	Emission Mapping	Day
IMA-044	7/18/2007	17:28	17:33	Repeatability	Day
IMA-045	7/19/2007	5:19	6:02	Emission Mapping	Night
IMA-046	7/19/2007	9:22	9:27	Repeatability	Dawn/dusk
IMA-047	7/19/2007	9:36	10:36	Emission Mapping	Dawn/dusk
IMA-048	7/19/2007	11:08	11:14	Repeatability	Day
IMA-049	7/19/2007	14:27	14:32	Repeatability	Day
IMA-050	7/19/2007	14:42	15:00	Emission Mapping	Day
IMA-051	7/19/2007	15:10	15:14	Repeatability	Day
IMA-052	7/19/2007	16:00	16:05	Repeatability	Day

The 19 relative emission maps that resulted the summer testing are presented in Compact Disk A. These maps were generated by overlaying the DustTRAK concentration measurements and associated GPS coordinate readings on maps of the mine sites. Color coding of data points was used to provide a broad classification of the relative emission (plume concentration) measurements. The PM-10 concentration (in the dust plume from the test vehicle) is indicated in the maps using the following color codes:

- Blue—< 2 mg/m<sup>3</sup>
- Green—2 to 10 mg/m<sup>3</sup>
- Orange—10 to 50 mg/m<sup>3</sup>
- Red—> 50 mg/m<sup>3</sup>

Example maps for the U.S. Steel Minntac and United Taconite mines are shown in Figures 10 and 11, respectively.





**Figure 10. Example Map for the United Taconite Mine—Summer Testing**



**Figure 11. Example Map for the U.S. Steel Minntac Mine—Summer Testing**



It should be noted that direct comparison of the relative emission maps for the two test mines may not be meaningful because different models of extended-cab pickup trucks were used to generate the data at each mine. It is unlikely that the two test vehicles used would have exactly the same calibration factor because of the effect of the different body designs on dispersion of the dust plume from the front wheel/road surface point of origin. Calibration of the test vehicles during the July 2007 summer testing (see Section 6.4) provides for conversion of the relative emission maps for each mine (for both the winter and summer testing) to haul truck emission factor maps for each mine.

As in the winter testing, each test vehicle traveled at 25 mph for the summer mapping of relative emissions. The travel speed was held constant to the extent possible so that speed differences would not be interpreted as differences in emission potential. It is known that road dust emissions from any vehicle increase with vehicle speed.

The 1-sec data points from the test vehicle represented 36-ft distance intervals along the travel route. To provide time smoothing of concentration data over short haul road distances, running 5-sec concentration averages were obtained, and 3-sec averages of these points were used for emission mapping. Thus, each point on an emission map represents a running average plume concentration over a 108-ft length of haul road.

## **5.2 Repeatability of Relative Emissions**

A second basic type of emission test was performed to establish the repeatability of relative emission measurements by traveling back and forth over a given haul road segment. Three circuits of each repeatability test road segment were performed. Each travel direction was analyzed separately because of natural differences in road conditions between lanes traveled by loaded and empty haul trucks. In addition, any slope of a haul road segment will result in differences in tire/road shear force as a haul truck travels in one direction versus the other over the road segment.

As indicated in Tables 10 and 11 above, a total of 13 repeatability tests were performed at the two mines, four at United Taconite, and nine at U.S. Steel Minntac. For this purpose, the average PM-10 plume concentration for each pass along the test road segment was determined. Passes in each direction were evaluated separately, because one direction usually represented loaded trucks while the other direction represented empty trucks. Then average concentration and the relative standard deviation of the average concentration in each direction were determined and are provided in Tables 12 and 13 for the United Taconite and U.S. Steel Minntac mines, respectively.

As shown in Table 12, the average concentration in each direction at United Taconite was very stable with a relative standard deviation in the range of 5% to 25%. Table 13 shows that similar repeatability occurred on the loaded side of the reference test roads at U.S. Steel Minntac, but higher relative standard deviations occurred on the unloaded side of the test roads, up to 76%.



Overall, the test results indicate a high degree of repeatability of the relative emission measurements. Other repeatability data sets are available by grouping multiple passes over the same road segments from the emission mapping test runs.

It is also evident in Tables 12 and 13 that for a given road segment with 2-way haul truck traffic, the side of the road traveled by loaded haul trucks has higher emissions than the side of the road traveled by empty haul trucks.

**Table 12. PM-10 Measurement Repeatability Analysis: United Taconite**

Mobile monitor run	Loaded, unloaded, combined	Pass average concentration (mg/m <sup>3</sup> )	3-Pass average concentration (mg/m <sup>3</sup> )	Relative standard deviation
Run 29	Unloaded	6.38	6.85	10%
		6.56		
		7.63		
	Loaded	8.40	8.20	20%
		6.45		
		9.76		
Run 30	Unloaded	6.20	7.16	12%
		7.95		
		7.33		
	Loaded	11.2	9.75	26%
		6.81		
		11.2		
Run 31	Unloaded	13.3	12.0	10%
		10.9		
		11.7		
	Loaded	23.3	21.5	8%
		21.3		
		19.9		
Run 32	Unloaded	13.6	13.1	5%
		13.2		
		12.4		
	Loaded	25.0	21.3	24%
		15.3		
		23.6		



**Table 13. PM-10 Measurement Repeatability Analysis: U.S. Steel Minntac**

Mobile monitor run	Loaded, unloaded, combined	Pass average concentration (mg/m <sup>3</sup> )	3-Pass average concentration (mg/m <sup>3</sup> )	Relative standard deviation
Run 39	Unloaded	8.77	19.5	51%
		28.4		
		21.2		
	Loaded	23.4	21.2	31%
		13.7		
		26.5		
Run 41	Unloaded	2.39	1.83	27%
		1.42		
		1.68		
	Loaded	13.8	19.0	24%
		22.1		
		21.1		
Run 42	Unloaded	7.66	5.80	28%
		4.90		
		4.85		
	Loaded	20.6	20.8	25%
		26.2		
		15.7		
Run 44	Unloaded	2.05	2.87	35%
		4.00		
		2.58		
	Loaded	20.0	22.3	19%
		27.2		
		19.7		
Run 46	Unloaded	1.86	3.28	73%
		6.04		
		1.945		
	Loaded	8.87	8.14	10%
		7.25		
		8.30		
Run 48	Unloaded	7.14	7.37	20%
		8.97		
		6.01		
	Loaded	11.8	12.6	36%
		8.51		
		17.6		
Run 49	Unloaded	2.70	2.74	7%
		2.58		
		2.94		
	Loaded	27.3	18.4	42%
		14.8		
		12.9		
Run 51	Unloaded	1.77	3.26	76%
		6.11		
		1.90		
	Loaded	17.5	14.7	20%
		14.9		
		11.7		



**Table 13. Measurement Repeatability Analysis: U.S. Steel Minntac (Continued)**

Mobile monitor run	Loaded, unloaded, combined	Pass average concentration (mg/m <sup>3</sup> )	3-Pass average concentration (mg/m <sup>3</sup> )	Relative standard deviation
Run 52	Unloaded	3.67	5.08	69%
		2.52		
		9.05		
	Loaded	24.1	29.9	47%
		19.6		
		45.8		

## 5.3 Haul Road Surface Characteristics

Table 14 shows the results of the analysis of the collected road surface samples from United Taconite (low-grade ore) and U.S. Steel Minntac (tailings). In addition to the samples collected during the summer testing, the table shows the test results from the summer pre-testing in August 2006. Also shown for comparison are the results from the original testing of taconite mine haul roads performed in June 1978 [MRI, 6]. The summer silt values measured at United Taconite are similar to the values obtained in the original June 1978 study at Erie Mining Company, but the summer values measured at U.S. Steel Minntac tend to be lower.

**Table 14. Haul Road Silt Contents**

Sample Identification	Mine	Surface	Silt (%)
<b>Summer Testing (July 2007)</b>			
IMAP-1	United Taconite	Crushed ore	1.7
IMAP-2	United Taconite	Crushed ore	2.6
IMAP-3	United Taconite	Crushed ore	4.7
IMAP-4	United Taconite	Crushed ore	5.1
IMAP-5	United Taconite	Crushed ore	5.4
IMAP-6	United Taconite	Crushed ore	3.0
IMAP-7	U.S. Steel Minntac	Tailings	2.8
IMAP-10	U.S. Steel Minntac	Tailings	2.0
IMAP-14	U.S. Steel Minntac	Tailings	2.2
<b>Previous Testing (June 1978)</b>			
Average (I-2 to I-4)	Erie Mining Co.	Sand/gravel	4.7
I-6	Erie Mining Co.	Sand/gravel	2.4
Average (I-7 to I-8)	Erie Mining Co.	Crushed rock	6.1



## 5.4 Summary of Test Results

During the summer testing program, a total of nineteen maps of relative emissions were successfully generated. Although these maps are color coded to indicate the spatial distribution of relative emissions as reflected by broad PM-10 dust plume concentration levels, a complete set of 1-sec concentration readings was generated by the testing. Each concentration point represents a 36-ft segment of haul road.

Based on the calibration data collected during the July 2007 testing program (see Section 6.4), the relative emission maps can be converted into haul truck emission factor maps for both the summer and winter testing. In turn, these maps can be used to obtain representative uncontrolled emission factors for haul trucks during the winter season and uncontrolled emission factors for haul trucks during the summer season.

Also during the summer testing program, tests of the repeatability of relative emission measurements were performed. These were accomplished by driving back and forth on a given road segment. The repeatability of the measurements was found to be less precise than in the winter, because of greater differences in road conditions from side to side.

Finally, the summer tests of road surface silt content indicated values in the range of 1.7% to 5.4%. These values are similar to those found during the August 2006 summer pre-testing, and to the values obtained in the original work at Erie Mining Company in 1978, which were in the range of 2.4% to 6.1%.

Besides collecting data on emission and road surface characteristics, traffic data from the summer testing were obtained from the respective mining company personnel. For each test, all of the active haul roads were identified along with the routes of travel between shovels and the crusher(s) or various waste rock dump locations. This enabled converting hourly truck trips to truck passes (loaded and empty) on each road segment. These road activity results formed the basis for the development of representative PM-10 emission factors that can be associated with segment-average dust plume PM-10 concentrations from the mobile monitor.



## Section 6.

### Haul Truck Emission Factors

During the July 2007 summer testing program, at least one reference test road segment was identified at each test mine for direct measurement of uncontrolled haul road emission factors and for calibration of the mobile monitoring method. Test road segments were located where there were no interferences from other sources and where there was unobstructed wind flow across the road. The grade of the reference test road segments was small so that diesel exhaust emissions would be negligible in relation to road dust emissions.

At these locations, the plume profiling method was used to measure reference PM-10 emission factors for a specified set of haul trucks and associated weights, which were chosen to represent a typical mix of haul truck characteristics. The haul truck passes during a test were typically interspersed with a number of passes of maintenance vehicles and light-duty vehicles. These other vehicles were converted into equivalent haul trucks using the weight correction discussed in Section 2.3 of this report. In most cases, the passes of other vehicles generated dust emissions that were equivalent to less than 10 percent of the haul truck passes.

#### 6.1 Uncontrolled Emission Factors

Table 15 lists the individual emission factor test runs that were performed during the summer testing program at the U.S. Steel Minntac and United Taconite mines. Also listed are sampling periods for each test and the reference test site number. Table 16 gives the ambient weather conditions for each test. IMAP was used as the test run designator for the emission factor tests.

**Table 15. Emission Factor Test Log**

Test run No.	Date	Location	Site ID	Start time	Stop Time
IMAP-01	7/12/2007	United Taconite	Site 1	12:08	14:39
IMAP-02	7/12/2007	United Taconite	Site 1	16:14	18:14
IMAP-03	7/13/2007	United Taconite	Site 1	9:57	11:58
IMAP-04	7/13/2007	United Taconite	Site 1	12:33	13:51
IMAP-05	7/13/2007	United Taconite	Site 1	14:16	15:27
IMAP-06	7/14/2007	United Taconite	Site 1	10:33	12:51
IMAP-07	7/17/2007	U.S. Steel Minntac	Site 1	13:49	15:00
IMAP-08	7/17/2007	U.S. Steel Minntac	Site 1	15:11	16:02
IMAP-09	7/18/2007	U.S. Steel Minntac	Site 2	13:08	14:32
IMAP-10	7/18/2007	U.S. Steel Minntac	Site 2	14:57	16:02
IMAP-11	7/18/2007	U.S. Steel Minntac	Site 2	16:29	17:29
IMAP-12	7/19/2007	U.S. Steel Minntac	Site 2	9:48	10:49
IMAP-13	7/19/2007	U.S. Steel Minntac	Site 2	14:18	14:47
IMAP-14	7/19/2007	U.S. Steel Minntac	Site 2	15:15	15:56



A total of 12 plume profiling tests were performed for emission factor determination: six tests at United Taconite (N-S road orientation) and six tests at U.S. Steel Minntac (E-W road orientation). Two additional profiling tests were performed at U.S. Steel Minntac using three stacked PM-10 DustTRAK monitors rather than four high-volume cyclone/filter samplers. These supplementary tests were conducted during periods of unstable wind direction, in case stable periods would not be sufficient to meet the specifications of the study design. During each of the 12 primary profiling tests, PM-2.5 samplers were also operated at plume core heights to provide PM-2.5/PM-10 ratios for the haul road dust emissions.

**Table 16. Test Site Conditions**

Test run No.	Date	Location	Time	Temp. (°F)	R.H. (%)	Prevailing wind direction
IMAP-01	7/12/2007	United Taconite	13:08	66	55	WNW
IMAP-02	7/12/2007	United Taconite	16:27	65	43	NW
IMAP-03	7/13/2007	United Taconite	10:02	60	69	SSW
IMAP-04	7/13/2007	United Taconite	12:51	69	56	SSW
IMAP-05	7/13/2007	United Taconite	14:38	69	57	S-SSW
IMAP-06	7/14/2007	United Taconite	11:27	75	51	NW
IMAP-09	7/18/2007	U.S. Steel Minntac	13:18	82	35	NW
IMAP-10	7/18/2007	U.S. Steel Minntac	15:50	85	34	NW
IMAP-11	7/18/2007	U.S. Steel Minntac	17:32	83	35	N
IMAP-12	7/19/2007	U.S. Steel Minntac	10:28	68	44	NE
IMAP-13 <sup>a</sup>	7/19/2007	U.S. Steel Minntac	14:33	74	36	NE
IMAP-14	7/19/2007	U.S. Steel Minntac	17:00	76	32	N

<sup>a</sup> The time, temperature, and relative humidity for IMAP 13 were taken from the Eveleth Airport meteorological data.

In order to accommodate for the effects of intermittent wind direction variability, the observed wind direction was recorded during each vehicle pass, beginning with IMAP-3 when wind direction variability became particularly more pronounced. This practice was continued for the remainder of the profiling tests.

Tables 17 and 18 show the results of the emission factor tests. The emission factors measured at United Taconite were generally lower than the factors measured at U.S. Steel Minntac. In part, this reflected differences in weather conditions. During the week of testing at United Taconite, intermittent rainy conditions were encountered. In addition, the reference test road segment at United Taconite was usually watered during the nighttime hours. Even though time was allowed for the test road segment to dry prior to testing, some residual effects of moisture were present. Run IMAP-2 is believed to best represent dry conditions at the United Taconite test road section.



**Table 17. United Taconite Plume Profiling Results**

Run	Sampler height (m)	Duration (min)	Blank corrected PM-10 (mg)	Flow rate VFC or URG (acfm)	Net PM-10 conc. (mg/m <sup>3</sup> )	Wind speed (mph)	PM-10 exposure (mg/cm <sup>2</sup> )	Extrapolated plume height (m)	Integrated PM-10 exposure (m-mg/cm <sup>2</sup> )	Integrated PM-10 exposure (lb/mile)	Equivalent haul truck passes	PM-10 emission factor (lb/VMT)
<b>IMAP-01</b>	9.0	151	29.0	42.2	0.151	11.8	0.721		0.688			
	6.5	151	63.6	41.5	0.348	11.4	1.61		2.91			
	4.0	151	62.9	42.2	0.339	10.7	1.47		3.84			
	2.0	152	52.1	41.5	0.282	9.8	1.12	10.9	<u>2.59</u> 2.25	435	45.3	<b>9.61</b>
<b>IMAP-02</b>	9.0	120	25.5	42.1	0.168	9.8 <sup>a</sup>	0.531		1.59			
	6.5	120	26.3	41.5	0.177	9.4	0.532		1.33			
	4.0	120	31.1	42.1	0.207	8.7	0.578		1.39			
	2.0	120	38.3	41.5	0.262	7.7	0.648	15.0	<u>1.23</u> 1.30	242	16.4	<b>14.8</b>
<b>IMAP-03</b>	9.0	121	39.8	41.7	0.269	2.3 <sup>b</sup>	0.198		5.11			
	6.5	121	32.5	41.0	0.221	2.2	0.160		0.447			
	4.0	121	38.9	41.7	0.262	2.2	0.183		0.429			
	2.0	121	36.2	41.0	0.248	2.0	0.165	60.6	<u>0.348</u> 0.329	236	29.8	<b>7.93</b>
<b>IMAP-04</b>	8.25	78	77.0	42.4	0.813	1.9 <sup>c</sup>	0.316		6.50			
	5.75	78	80.3	41.7	0.862	1.8	0.325		0.801			
	3.25	78	53.3	42.4	0.559	1.7	0.201		0.657			
	1.25	78	60.2	41.7	0.644	1.6	0.211	49.4	<u>0.411</u> 0.264	306	25.1	<b>12.2</b>
<b>IMAP-05</b>	9.0	71	20.3	42.5	0.228	1.9 <sup>c</sup>	0.083		1.02			
	6.5	71	21.9	41.8	0.251	1.8	0.088		0.214			
	4.0	71	25.5	42.5	0.289	1.8	0.097		0.232			
	2.0	71	23.2	41.8	0.266	1.6	0.084	33.8	<u>0.181</u> 0.167	64.4	15.3	<b>4.21</b>
<b>IMAP-06</b>	9.0	34.5	3.7	42.6	0.078	6.1 <sup>a</sup>	0.044		0.014			
	6.5	34.5	16.6	42.0	0.396	5.9	0.216		0.324			
	4.0	34.5	16.8	42.6	0.393	5.6	0.203		0.524			
	2.0	34.5	14.9	42.0	0.354	5.2	0.170	9.5	<u>0.373</u> 0.339	55.8	6.8	<b>8.2</b>

<sup>a</sup> Denotes a 0.71 Wind Direction Correction Multiplier for winds 45° incident to sampling tower.

<sup>b</sup> Denotes a 0.38 Wind Direction Correction Multiplier for winds 22.5° incident to sampling tower.

<sup>c</sup> Denotes a 0.20 Wind Direction Correction Multiplier for winds 0-22° incident to sampling tower.



**Table 18. U.S. Steel Minntac Plume Profiling Results**

Run	Sampler height (m)	Duration (min)	Blank corrected PM-10 (mg)	Flow rate VFC or URG (acfm)	Net PM-10 conc. (mg/m <sup>3</sup> )	Wind speed (mph)	PM-10 exposure (mg/cm <sup>2</sup> )	Extrapolated plume height (m)	Integrated PM-10 exposure (m-mg/cm <sup>2</sup> )	Integrated PM-10 exposure (lb/mile)	Equivalent haul truck Passes	PM-10 emission factor (lb/VMT)
<b>IMAP-09</b>	9.0	84	39.3	43.4	0.370	6.8	0.564		1.17			
	6.5	84	61.4	42.7	0.594	6.6	0.880		1.81			
	4.0	84	104.2	43.4	0.998	6.3	1.41		2.87			
	2.0	64 <sup>a</sup>	92.1	42.7	1.179	5.9	1.19	13.1	<u>2.60</u> 2.38	383	18.8	<b>20.4</b>
<b>IMAP-10</b>	9.0	65	22.8	43.9	0.272	8.1	0.383		1.09			
	6.5	65	31.9	43.2	0.391	7.7	0.525		1.14			
	4.0	65	68.5	43.9	0.838	7.2	1.05		1.96			
	2.0	65	97.0	43.2	1.211	6.4	1.35	14.7	<u>2.39</u> 2.69	329	11.8	<b>27.8</b>
<b>IMAP-11</b>	9.0	60	43.5	43.7	0.576	6.7	0.620		1.53			
	6.5	60	64.1	43.0	0.867	6.4	0.896		1.89			
	4.0	60	117.3	43.7	1.569	6.0	1.52		3.02			
	2.0	60	162.4	43.0	2.212	5.5	1.94	13.9	<u>3.46</u> 3.88	489	15.5	<b>31.4</b>
<b>IMAP-12</b>	9.0	61	3.3	41.9	0.0356	9.0	0.0523		0.045			
	6.5	61	6.9	41.2	0.0870	8.8	0.125		0.221			
	4.0	61	16.5	41.9	0.218	8.4	0.301		0.532			
	2.0	61	24.9	41.2	0.340	8.0	0.444	10.7	<u>0.746</u> 0.889	86.2	28.0	<b>3.08</b>
<b>IMAP-13</b>	9.0	29	32.3	42.8	0.909	4.9 <sup>b</sup>	0.350		0.638			
	6.5	29	53.3	42.1	1.532	4.9	0.582		1.16			
	4.0	29	95.8	42.8	2.717	4.8	1.014		2.00			
	2.0	29	125.3	42.1	3.615	4.7	1.315	12.7	<u>2.33</u> 2.63	310.3	18.0	<b>17.3</b>
<b>IMAP-14</b>	9.0	41	33.8	42.8	0.670	4.2 <sup>b</sup>	0.309		2.56			
	6.5	41	38.2	42.1	0.772	4.1	0.349		0.823			
	4.0	41	75.4	42.8	1.508	4.0	0.662		1.26			
	2.0	41	76.9	42.1	1.564	3.8	0.658	25.6	<u>1.32</u> 1.32	258.	8.42	<b>30.6</b>

<sup>a</sup> Generator failure caused a 20-minute sampling loss.

<sup>b</sup> Denotes a 0.71 Wind Direction Correction Multiplier for winds 45° incident to sampling tower.



During Runs IMAP 3, 4, and 5, the wind direction had an increasingly strong southerly component parallel to the road direction. For many vehicle passes during these runs, the wind direction did not meet the acceptance criterion of being within 45 degrees of the line perpendicular to the test road segment. This necessitated a larger than desirable emission factor correction to account for the component of the wind at right angles to the road. West-to-southwest winds were forecast, which would have met the criteria. It was decided to continue with the testing, because of forecast rain events that would have caused testing to be terminated.

During IMAP-6 at United Taconite, wind conditions were particularly good, but the road had been watered immediately prior to testing. At the beginning of the test, no emissions were visually observed, but during the course of the 2-hr test, the road gradually dried out, as reflected by the increasing intensity of emissions. Based on plume tracking data from the DustTRAK monitor, it was possible to decouple the test into two parts: one for the 90-min period before the driver lunch break, and one for the much drier road condition following the time delay for the lunch break.

During the testing at U.S. Steel Minntac, weather conditions were much drier than observed at United Taconite, and the test road segments were never watered during the test week. This is reflected in the road surface moisture content values, which were generally less than 0.5%. During the final three tests (IMAP-12 through IMAP-14), a special experiment was performed by requesting that the road be watered just before the first test. This provided for a tracking of the emission factor as the road dried out during a 6-hr period. The increase in the emission factor during these three tests is evident.

Additional results for total particulate high-volume (Hi-Vol) samplers and Wedding reference samplers are presented in Tables 19 and 20. For testing at United Taconite an upwind Wedding Sampler was run to establish background concentrations. However, due to wind conditions during runs IMAP 3, 4, and 5, the upwind sampler was impacted by vehicle generated plumes and did not represent a true ambient background concentration. However, the DustTRAK continuous monitoring record at the downwind profiling location could be used to determine the background during periods between vehicle passes on the test road. An upwind reference sampler was not set up at U.S. Steel Minntac due to potential impacts from crossing traffic patterns relative to the test site, but background values were minimal as observed from continuous DustTRAK traces at downwind locations.



**Table 19. United Taconite Additional Sampler Results**

Run	Sampler location	Cutpoint	Height (m)	Duration (min)	Blank corrected (mg)	Flow rate (cfm)	PM-10 Concentration (mg/m <sup>3</sup> )
<b>IMAP-01</b>	Wedding U <sup>a</sup>	10 µm	1.9	264	2.4	43.5	0.007
	Wedding D	10 µm	1.9	152	16.4	44.2	0.086
	Hi Vol	TP	1.2	152	<sup>b</sup>	41.0	–
<b>IMAP-02</b>	Wedding U <sup>a</sup>	10 µm	1.9	264	2.4	43.5	0.007
	Wedding D	10 µm	1.9	120	18.7	44.1	0.125
	Hi Vol	TP	1.2	120	152	40.9	1.10
<b>IMAP-03</b>	Wedding U <sup>a</sup>	10 µm	1.9	220	32.0	43.0	0.119
	Wedding D	10 µm	1.9	121	13.8	43.7	0.092
	Hi Vol	TP	1.2	121	157	40.5	1.132
<b>IMAP-04</b>	Wedding U <sup>a</sup>	10 µm	1.9	220	32.0	43.7	0.117
	Wedding D	10 µm	1.9	78	22.4	44.4	0.229
	Hi Vol	TP	1.2	78	284	41.1	3.121
<b>IMAP-05</b>	Wedding U <sup>a</sup>	10 µm	1.9	220	32.0	43.2	0.119
	Wedding D	10 µm	1.9	69	13.2	44.5	0.152
	Hi Vol	TP	1.2	71	<sup>b</sup>	41.2	–
<b>IMAP-06</b>	Wedding U <sup>a</sup>	10 µm	1.9	168	1.1	44.0	0.005
	Wedding D	10 µm	1.9	138	7.9	44.7	0.045
	Hi Vol	TP	1.2	138	182	41.4	1.13

<sup>a</sup> All upwind sampling periods extended over multiple test runs.

<sup>b</sup> Filter failed QC check.



**Table 20. U.S. Steel Minntac Additional Sampler Results**

Run	Sampler location	Cutpoint	Height (m)	Duration (min)	Blank corrected (mg)	Flow rate (cfm)	PM-10 Concentration (mg/m <sup>3</sup> )
<b>IMAP-09</b>	Wedding D	10 µm	1.9	64	45.4	45.5	0.551
	Hi Vol	TP	1.2	64	212	42.2	2.77
<b>IMAP-10</b>	Wedding D	10 µm	1.9	65	37.7	46.0	0.446
	Hi Vol	TP	1.2	65	293	42.6	3.74
<b>IMAP-11</b>	Wedding D	10 µm	1.9	60	69	45.8	0.887
	Hi Vol	TP	1.2	60	525	42.4	7.29
<b>IMAP-12</b>	Wedding D	10 µm	1.9	61	6.7	43.8	0.088
	Hi Vol	TP	1.2	61	150	40.6	2.14
<b>IMAP-13</b>	Wedding D	10 µm	1.9	29	46.8	44.8	1.27
	Hi Vol	TP	1.2	29	364	41.5	10.7
<b>IMAP-14</b>	Wedding D	10 µm	1.9	41	35.2	44.8	0.677
	Hi Vol	TP	1.2	41	259	41.5	5.36

## 6.2 PM-2.5 Results

Tables 21 and 22 show the measured PM-2.5 and PM-10 concentrations for the profiling tests conducted at United Taconite and at U.S. Steel Minntac, respectively. These concentrations were measured by collocated DustTRAK continuous monitors on the profiling tower at a representative plume core height of 4 m above ground level. A 6-sec monitoring interval was used for each DustTRAK so that the recorded values were 6-sec averages.

Two approaches were used to calculate PM-2.5/PM-10 ratios for each test run. In the first case, the overall average PM-2.5 concentration was divided by the overall average PM-10 concentration. In the second case, the maximum recorded PM-2.5 concentration was divided by the maximum recorder PM-10 concentration for the run.

As indicated in the tables, the ratio of the average PM-2.5 concentration to the average PM-10 concentration was in the range of 20%, and the ratio was consistent between the two test mines. Moreover, the ratio was essentially independent of the dustiness (PM-10 dust emission potential) of the road, as reflected by the average PM-10 concentration in the plume generated by the test vehicle. However, the ratio based on average concentrations was influenced by the high background ratio that occurred during periods when no dust plumes were passing the tower location.



The PM-2.5/PM-10 ratios developed from the maximum DustTRAK readings were slightly lower. These values should be more representative of the periods when a dust plume was passing the sampler locations. However, because the DustTRAKs were measuring 6-sec concentration values, the maximum readings were more sensitive to the synchronization between plume passage and the sampling interval. In any case, the resultant ratio by either method is close to 20%.

**Table 21. United Taconite PM-2.5 and PM-10 Results**

Run	DustTRAK 1 PM-10 conc. mg/m <sup>3</sup>		DustTRAK 2 PM-2.5 conc. mg/m <sup>3</sup>		Ratios of PM-2.5/PM-10	
	Average	Max	Average	Max	Average	Max
IMAP-01	0.028	1.58	0.007	0.31	25%	20%
IMAP-02	0.044	5.03	0.009	0.804	20%	16%
IMAP-03	0.059	2.77	0.011	1.31	19%	47%
IMAP-04	0.105	17.5	0.017	2.36	16%	14%
IMAP-05	0.100	5.68	0.012	0.175	12%	3%
IMAP-06	0.033	3.41	0.011	0.202	33%	6%
Average					21%	18%
STD					7%	16%

**Table 22. U.S. Steel Minntac PM-2.5 and PM-10 Results**

Run	DustTRAK 1 PM-10 conc. mg/m <sup>3</sup>		DustTRAK 2 PM-2.5 conc. mg/m <sup>3</sup>		Ratios of PM2.5/PM-10	
	Average	Max	Average	Max	Average	Max
IMAP-09	0.316	20.9	0.071	4.09	22%	20%
IMAP-10	0.260	15.8	0.081	4.36	31%	28%
IMAP-11	0.425	15.5	0.107	3.43	25%	22%
IMAP-12	0.108	6.56	0.021	1.13	19%	17%
IMAP-13	0.991	25.0	0.142	3.46	14%	14%
IMAP-14	0.494	22.5	0.087	4.64	18%	21%
Average					22%	20%
STD					6%	5%

It is important to note that the PM-2.5/PM-10 ratio of 20% must be corrected to account for the recognized bias in the PM-2.5 measurements by the DustTRAK monitor in a high dust environment. This correction factor can be derived from previous data collected in the MRI Dust Tunnel, where PM-2.5 and PM-10 DustTRAKs were collocated with Federal Reference Method (FRM) samplers [8]. That study was performed for the Western Regional Air Partnership (WRAP) for the purpose of developing more reliable PM-2.5/PM-10 ratios for fugitive dust sources.

In the WRAP study, a number of western soils associated with dust control problems were suspended in the MRI Dust Tunnel for these determinations. During each test, a stable dust environment was maintained for a period of about 20 min. Whereas the DustTRAK PM-10 samplers agreed closely with the FRM (R&P Partisol) PM-10



samplers, the DustTRAK PM-2.5 samplers measured significantly higher concentrations than the FRM (R&P Partisol) PM-2.5 samplers.

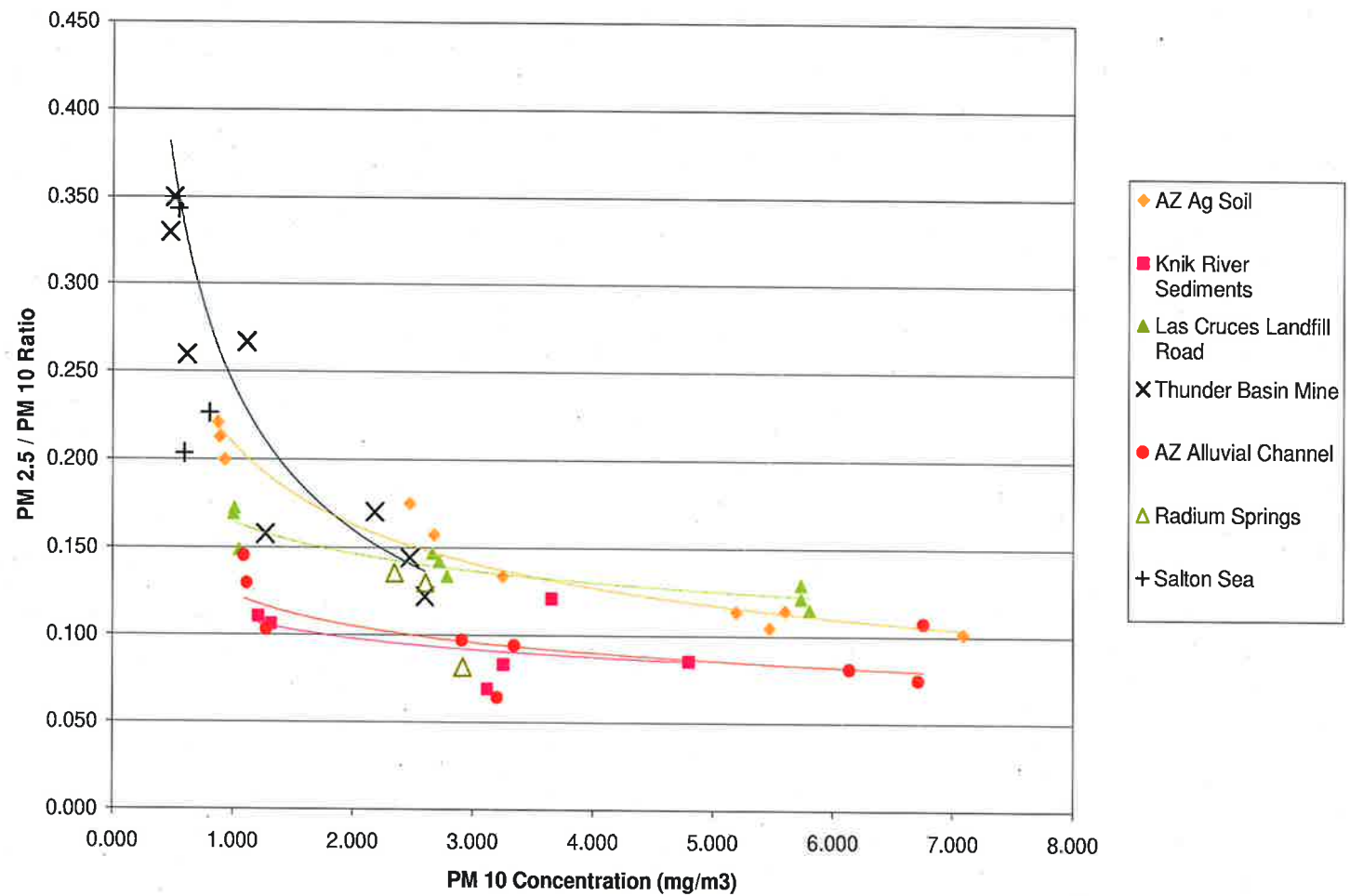
The comparisons of PM-2.5/PM-10 ratios measured by DustTRAKs and Partisols are shown in Table 23. Ratios are presented as a function of the PM-10 concentration measured by the FRM Partisol sampler. The net conclusion is the PM-2.5/PM-10 ratio measured by the DustTRAKs needs to be divided by 2 to obtain the correct value. When this correction is applied to the data from taconite mine haul roads, the resulting PM-2.5/PM-10 ratio is 10%, which is the value included in the 2006 update to AP-42 Section 13.2, Fugitive Dust Sources.

**Table 23. Comparison of DustTRAK and Partisol PM-2.5 Concentrations**

PM10 Range (mg/m3)	Avg PM2.5/PM10		Ratio D/P
	DustTraks	Partisols	
< 0.5	0.84	0.56	1.51
0.5 - 0.99	0.56	0.29	1.93
1.0 - 1.99	0.38	0.15	2.54
2.0 - 2.99	0.34	0.14	2.49
3 - 3.99	0.23	0.09	2.47
4 - 4.99	0.29	0.17	1.69
5 - 5.99	0.22	0.12	1.87
6 - 6.99	0.19	0.09	2.17
> 7	0.19	0.10	1.91
Geometric Mean	0.32	0.16	2.03

The test results from the WRAP study are shown in Figure 12 for the range of surface materials tested. As indicated, the PM-2.5/PM-10 ratio tended to drop as PM-10 concentration increased, becoming more representative of dust plume conditions at the point of generation. Figure 12 shows that the PM-2.5/PM-10 ratio is in the range of 10% for uncontrolled dust plume concentrations generated by taconite mine haul roads, based on the maximum 6-sec PM-10 concentrations shown in Tables 21 and 22.





**Figure 12. PM-2.5/PM-10 Ratios Developed by MRI [8]**



## 6.3 Comparison With Prior Emission Factors

In recent years, a Taconite Industry Working Group was convened to develop an interim PM-10 emission factor (uncontrolled) and a series of control efficiencies for haul roads in taconite mines [9]. Represented on the working group were the MPCA and the taconite industry. The working group reviewed existing literature, AP-42 guidance, and other state agencies and mining industries.

The working group reached consensus that, in the absence of actual field testing, a value of 6.2 lb PM-10/VMT would be used for haul roads with a crushed rock (overburden) road bed, and a value of 5.2 lb PM-10/VMT would be used for road beds constructed of crushed taconite and waste rock.

It should be noted that emission factors that are based on typical daytime emission testing are inappropriate for application to mining operations that have a 24-hr continuous schedule. During the period dusk to dawn, calm winds are typical and atmospheric condensation replaces daytime evaporation, so that emissions are reduced accordingly, irrespective of the separate issue of watering effectiveness. This aspect of 24-hr emission factor determination is addressed further below.

## 6.4 Mobile Monitor Calibrations

Concurrently with each emission factor measurement at each reference haul road test site, the mobile monitoring vehicle traveled back and forth across the uncontrolled road segment where plume profiling was taking place. The resulting data comparisons are used to calibrate the mobile monitoring system for each mine. Once the mobile monitoring system is calibrated, it can be used to convert maps of relative emissions to maps of emission factor variation over a specified network of haul roads at each mine.

In this way, the mobile monitoring system tracks variations in the haul truck emission factor as a result of differences in road surface aggregate materials, differences in road surface moisture content caused by natural effects or by watering programs, and differences in surface integrity caused by degrees of compaction or by application of chemical road dust suppressants. It is important to note that the test vehicle with the mobile monitoring system was restricted to a specified speed of 25 mph (while the monitoring system is in operation) so that unrestricted speed changes were not interpreted as changes in road surface conditions.

Because the mobile monitor measures the emission potential of a road surface, it is reasonable to expect a consistent ratio between the PM-10 emission factor (lb/VMT) for a road segment and its emission potential ( $\text{mg}/\text{m}^3$ ). However, certain conditions might have an influence on the consistency of this ratio. For example, strong cross-winds at the reference site might tend to dilute the plume from the mobile monitor point of origin, i.e., the right front tire surface in contact with the road. For this reason, it is most meaningful



to determine an average ratio and a relative standard deviation of that ratio, for calibration purposes.

Tables 24 and 25 show the individual ratios obtained for each calibration test at the United Taconite and U.S. Steel Minntac reference sites. As indicated in the tables, the average conversion ratio between mobile monitor plume concentration and reference emission factor is relatively consistent between the two mines. It was previously thought that the differences between the mobile monitoring test vehicles used in the summer testing at the two mines might result in significantly different calibration factors.

**Table 24. United Taconite Mobile Monitor PM-10 Calibration**

Profiling run	Mobile monitor runs	Tower emission factor (lb/VMT)	DustTrak average (mg/m <sup>3</sup> )	Ratio
IMAP-01	19,20	9.61	3.76	2.56
IMAP-02	21	14.8	3.38	4.37
IMAP-03	24,25	7.93	3.08	2.58
IMAP-04	26	12.2	4.40	2.77
IMAP-05 <sup>a</sup>	27,28	4.21	12.9	0.33
IMAP-06	29,30,31,32	8.19	12.5	0.66
	<b>Average</b>	<b>9.48</b>	<b>6.67</b>	<b>2.57</b>

<sup>a</sup> Omitted from average due to prevalence of wind directions outside the prescribed tolerance for the plume profiling method.

**Table 25. U.S. Steel Minntac Mobile Monitor PM-10 Calibration**

Profiling run	Mobile monitor runs	Tower emission factor (lb/VMT)	DustTrak average (mg/m <sup>3</sup> )	Ratio
IMAP-09	39	20.4	20.3	1.00
IMAP-10	41,42	27.8	12.0	2.32
IMAP-11	43,44	31.4	12.8	2.46
IMAP-12 <sup>a</sup>	46,47,48	3.08	6.74	0.46
IMAP-13	49	17.3	10.5	1.64
IMAP-14	51,52	30.7	13.2	2.32
	<b>Average</b>	<b>21.8</b>	<b>12.6</b>	<b>1.95</b>

<sup>a</sup> Omitted from average due to damp road conditions.



## Section 7. Mitigative Effects

### 7.1 Assessing the Effectiveness of Watering

To assess the effectiveness of watering, average haul road plume concentrations from the mobile monitors were determined for each mine, with watering in place as a dust control. These emission factors were derived from the vehicle-weighted average plume concentrations from the mobile monitoring tests. This required compilation and analysis of detailed haul truck activity data corresponding to the mine reporting hourly period that most closely matched the period of the mobile monitoring test. Note that the uncontrolled reference haul road test sections used for profiling were not included in these derivations of controlled plume concentrations.

As a final step, the average emission factor for each test was compared to the uncontrolled (dry road) emission factor for the particular mine, so that a control efficiency of watering could be determined. Because the haul road emission factor is linearly related to the plume concentration, the result would be the same if weighted emission factors were used for the determination of watering effectiveness.

The results of the control efficiency analyses are shown in Tables 26 and 27 for each mobile monitoring test. Once again, the control efficiency is determined by comparing the average controlled concentration (with normal watering in place) with the highest uncontrolled concentration for the given mobile test run. These uncontrolled values may be greater than the reference test area concentrations due to road slope and road surface composition variations. Note that the emission reductions from watering cannot be separated from the emission reductions due to natural mitigation from precipitation.

The concentration presented in the Mobile monitoring detail calculation is not 4.82 but 3.998.

**Table 26. United Taconite Watering Control Efficiency**

Mobile monitor run	Run concentration	Relative uncontrolled PM-10 concentration <sup>a</sup> (mg/m <sup>3</sup> )	PM-10 control efficiency
19	3.57	8.40	58%
20	4.82	10.9	56%
21	7.01	9.86	29%
24	2.16	7.04	69%
25	2.87	5.79	50%
26	3.61	7.79	54%
27	5.96	23.7	75%
28	6.87	24.0	71%
Average	4.61	12.2	58%

<sup>a</sup> Represents the highest segment from each test run.



**Table 27. U.S. Steel Minntac Watering Control Efficiency**

Mobile monitor run	Run concentration	Relative uncontrolled PM-10 concentration (mg/m <sup>3</sup> )	PM-10 control efficiency
33	3.53	61.2	94%
34	8.86	25.1	65%
37	24.0	88.8	73%
38	4.76	45.3	89%
40	16.9	68.0	75%
43	6.77	52.5	87%
45 <sup>b</sup>	0.941	4.17	77%
47	4.27	22.7	81%
50	3.71	37.2	90%
Average	8.20	45.0	81%

<sup>a</sup> Represents the highest segment concentration from each test run.

<sup>b</sup> Predawn Test Run.

Watering truck data provided by U.S. Steel Minntac are shown in Table 28. Typically two watering trucks at U.S. Steel Minntac were responsible for dust control on approximately 44 miles of active haul roads (both travel directions). Each truck has a capacity of 55,000 gallons and runs on a continuous basis. During the test week at U.S. Steel Minntac, the second watering truck had maintenance problems that may have affected the watering control efficiency.

Due to the smaller size of United Taconite operations with typically 12 miles of active haul roads (both travel directions), one watering truck is used. However, no specific information on the number of truckloads of water deposited was available from United Taconite.

Overall emissions at United Taconite were generally lower than at U.S. Steel Minntac during summer testing, in part reflecting increased watering capacity per mile of haul road at United Taconite. However, this effect was partially offset by apparent nighttime watering of the reference test section at United Taconite, which resulted in reducing the calculated control efficiency of watering.



**Table 28. U.S. Steel Minntac Watering Data**

Location	Date	Shift	No. of loads	Total loads per shift
U.S. Steel Minntac	7/16/2007	2	7	
U.S. Steel Minntac	7/16/2007	2	7	14
U.S. Steel Minntac	7/16/2007	3	6	
U.S. Steel Minntac	7/16/2007	3	7	13
U.S. Steel Minntac	7/17/2007	1	7	7
U.S. Steel Minntac	7/17/2007	2	8	
U.S. Steel Minntac	7/17/2007	2	7	15
U.S. Steel Minntac	7/17/2007	3	6	
U.S. Steel Minntac	7/17/2007	3	6	12
U.S. Steel Minntac	7/18/2007	1	5	
U.S. Steel Minntac	7/18/2007	1	8	13
U.S. Steel Minntac	7/18/2007	2	6	
U.S. Steel Minntac	7/18/2007	2	6	12
U.S. Steel Minntac	7/18/2007	3	7	
U.S. Steel Minntac	7/18/2007	3	3	10
U.S. Steel Minntac	7/19/2007	1	7	
U.S. Steel Minntac	7/19/2007	1	8	15
U.S. Steel Minntac	7/19/2007	2	3	
U.S. Steel Minntac	7/19/2007	2	7	10

## 7.2 Early Morning Emission Characterization

In order to quantify the effects of nighttime condensation and resulting moisture additions to the road surface, separate summer mobile monitoring tests of the active haul road system were performed during early morning hours. Because some nighttime watering occurred at both mines, this analysis focused on the uncontrolled reference test sites used for emission factor determination. However, there was evidence that the uncontrolled reference test site at United Taconite was watered during the night, so that the U.S. Steel Minntac data are considered more reliable for this purpose. The results are shown in Table 29.

**Table 29. Nighttime Mitigation Due to Condensation**

Location	Mobile monitor run ID	Date	Start time	Stop time	Overall PM-10 emission factor (lb/VMT)	Uncontrolled PM-10 emission factor (lb/VMT)
United Taconite	23	7/13/2007	5:11	5:48	3.26	4.99 <sup>a</sup>
U.S. Steel Minntac	45	7/19/2007	5:19	6:02	1.84	2.41

<sup>a</sup> Test section watered prior to testing.



### 7.3 Effect of Rainfall

Summer emission testing at United Taconite was hampered by rainfall on several days. The major rain events as recorded at the Eveleth Airport are presented in Table 30. Zero precipitation was recorded during the week of testing at U.S. Steel Minntac.

**Table 30. United Taconite Precipitation Log**

Date	Time	Temperature (F)	Humidity %	Sea level barometric pressure (in Hg)	Precipitation (in)
7/11/2007	0000-0600	53.6	85.7	29.9	—
	0600-1200	59.8	73.2	29.9	—
	1200-1800	62.6	60.6	29.9	2.25
	1800-2400	55.2	80.2	29.9	—
7/12/2007	0000-0600	53.6	78.8	29.9	—
	0600-1200	60.1	63.3	29.9	—
	1200-1800	64.1	49.8	29.9	—
	1800-2400	57.2	63.2	30.0	—
7/13/2007	0000-0600	42.4	88.7	30.1	—
	0600-1200	56.5	72.1	30.0	—
	1200-1800	63.0	67.9	29.9	1.26
	1800-2400	61.7	88.0	29.7	6.94
7/14/2007	0000-0600	59.6	80.4	29.7	—
	0600-1200	59.7	68.0	29.8	—
	1200-1800	71.8	46.7	29.8	—
	1800-2400	63.6	65.6	29.9	—

### 7.4 Annualizing Mine-Integrated Emission Factors

A summary analysis of average uncontrolled emission factors is presented in Table 31. These were developed by combining the maps of relative emissions with the calibration factors determined at the reference test sites where plume profiling was implemented as a standard method. As indicated, nighttime emissions are much lower than daytime emissions, and wintertime emissions are much lower than summer time emissions, on an uncontrolled basis.

**Table 31. Breakout of Uncontrolled PM-10 Emission Factors**

Period		Emission factors (lb/VMT)	
Summer		United Taconite	U.S. Steel Minntac
	Day	9.5	21.7
	Night	5.0	2.4
	Average	7.2	12.1
Winter			
	Day	7.8 [40.1] <sup>a</sup>	7.8
	Night	1.9 <sup>b</sup>	1.9 <sup>b</sup>
	Average	4.8	4.8
Annual		6.0	8.4

<sup>a</sup> Freeze-thaw conditions produced an atypical value, so winter daytime emissions were assumed to equal summer daytime emissions as a worst case.

<sup>b</sup> Estimated as 25% of daytime emissions.



As shown in Table 31, uncontrolled daytime summer emissions measured at United Taconite were about half the value measured at U.S. Steel Minntac, reflecting the wetter conditions at United Taconite. There was occasional rainfall during the test week at United Taconite, but no uncontrolled emission testing was conducted when precipitation was occurring or had occurred within several hours. The uncontrolled emissions measured at dawn in the summer testing were found to be 10% of daytime emissions at U.S. Steel Minntac, but were about 50% of daytime emissions at United Taconite, also reflecting the wetter conditions at United Taconite.

As expected, the difference in precipitation between the two mines during the summer testing was also reflected in the control efficiencies that were determined for watering of the haul roads. At U.S. Steel Minntac the average watering control efficiency was determined to be 81%, but at United Taconite, the average watering control efficiency was 58%. When used with the respective emission factors for each mine, these control efficiencies produce nearly identical values for the controlled emission factor. In addition, it should be noted that the control efficiency value for U.S. Steel Minntac may have adversely been affected by the downtime of the second water truck during part of the testing week.

Table 30 also shows that the winter daytime emission factor for United Taconite was higher than the summer value. This reflected the abnormally dusty conditions that occurred during the winter testing at United Taconite. This outcome resulted from the absence of normal precipitation and occurrence of freeze-thaw conditions as the ambient temperature rose to the freezing point. No measurable snowfall was recorded in the area during test month of January 2007, for which the normal monthly snowfall is 11 inches.

These conditions typically occur during a few days in the wintertime and are not typical of that season. This effect was not seen in the winter daytime emission factor for U.S. Steel Minntac, which was 36% of the summer daytime emission factor for U.S. Steel Minntac. In this analysis, it is assumed that winter daytime emissions at United Taconite do not exceed winter daytime emissions at U.S. Steel Minntac. Furthermore, for both mines it is assumed that winter nighttime emissions are 25% of daytime emissions, under normal weather conditions.

The annual uncontrolled emission factor for each mine is determined as an average of summer and winter conditions with an equal weighting to daytime and nighttime hours. The average values of 6.0 lb/VMT for United Taconite and 8.4 lb/VMT for U.S. Steel Minntac are very close to the interim value estimated by the Taconite Industry Working Group. However, the emission factors from this study apply to larger haul trucks currently used in the industry. The overall average PM-10 emission factor for taconite mine haul roads is 7.2 lb/VMT. The average PM-2.5 emission factor for taconite mine haul roads is 0.72 lb/VMT.

Road surface samples were also collected and analyzed for moisture and silt content (particles smaller than 75  $\mu\text{m}$  in diameter). The silt content values obtained in the July 2007 testing at United Taconite were in the same range as the values found in the original study performed in June 1978 at the Erie Mining Company mine site, but the values obtained at U.S. Steel Minntac were lower.



## Section 8.

### Conclusions

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This report presents the methodology and results of a winter and summer testing program that was conducted at two taconite mines in January 2007 and July 2007. The objectives of the program were to develop updated PM-10 emission factors for taconite mine haul roads and to develop watering control efficiencies for taconite mine haul roads. The test mines were U.S. Steel Minntac and United Taconite, both located on the Mesabi Iron Range in northern Minnesota. A preliminary test program was performed at both mines in August 2006 to verify the effectiveness of the proposed test methods and to assess the haul road traffic patterns and the suitability of sampling locations.

The primary sampling method utilized an on-board continuous dust particle monitor and GPS unit that were operated on a test vehicle (pick-up truck) at each mine. This mobile monitoring method successfully generated maps of relative PM-10 emissions during a test periods of approximately 1 hour. In traveling the active haul road network at a fixed speed of 25 mph, the mobile monitor measured a series of 1-sec plume concentrations, each representing the average emission rate over a 36-ft length of haul road.

During the mobile monitoring at each mine, the repeatability of relative emission measurements was evaluated by traveling back and forth on specified road segments. The repeatability of the measurements was expressed as a relative standard deviation. During the winter testing, the relative standard deviation was very tight (not exceeding about 10%), but larger variability was observed during summer testing at U.S. Steel Minntac in the traffic direction traveled by unloaded trucks.

During the July 2007 testing program, the standard plume profiling method was used to calibrate the mobile monitor at each mine. This was accomplished by implementing the mobile monitoring method and the plume profiling method simultaneously at selected reference uncontrolled haul road sites within each mine. This calibration work produced ratios of haul road emission factor to monitoring vehicle plume concentration for each mine mobile monitor.

Use of the on-site calibration factors provided for conversion of maps of relative haul road emissions to emission factor maps. This enabled the derivation of summer and winter average test mine haul road emission factors weighted by traffic levels on each active haul road segment. It also provided for evaluation of the effectiveness of haul road watering as a dust control measure.

A summary analysis of average uncontrolled emission factors is presented in Table 32. These were developed by combining the maps of relative emissions with the calibration factors determined at the reference test sites where plume profiling was implemented as a standard method. As indicated, nighttime emissions are much lower



than daytime emissions, and wintertime emissions are lower than summertime emissions, on an uncontrolled basis.

**Table 32. Breakout of Uncontrolled PM-10 Emission Factors**

Period		Emission factors (lb/VMT)	
<b>Summer</b>		United Taconite	U.S. Steel Minntac
	Day	9.5	21.7
	Night	5.0	2.4
	Average	7.2	12.1
<b>Winter</b>			
	Day	7.8 [40.1] <sup>a</sup>	7.8
	Night	1.9 <sup>b</sup>	1.9 <sup>b</sup>
	Average	4.8	4.8
<b>Annual</b>		6.0	8.4

<sup>a</sup> Freeze-thaw conditions produced an atypical value, so winter daytime emissions were assumed to equal summer daytime emissions as a worst case.

<sup>b</sup> Estimated as 25% of daytime emissions.

As shown in Table 32, uncontrolled daytime summer emissions measured at United Taconite were about half the value measured at U.S. Steel Minntac, reflecting the wetter conditions at United Taconite. There was occasional rainfall during the test week at United Taconite, but no uncontrolled emission testing was conducted when precipitation was occurring or had occurred within several hours. The uncontrolled emissions measured at dawn in the summer testing were found to be 10% of daytime emissions at U.S. Steel Minntac, but were about 50% of daytime emissions at United Taconite, also reflecting the wetter conditions at United Taconite.

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These conditions typically occur during a few days in the wintertime and are not typical of that season. This effect was not seen in the winter daytime emission factor for



U.S. Steel Minntac, which was 36% of the summer daytime emission factor for U.S. Steel Minntac. In this analysis, it is assumed that winter daytime emissions at United Taconite do not exceed winter daytime emissions at U.S. Steel Minntac. Furthermore, for both mines it is assumed that winter nighttime emissions are 25% of daytime emissions, under normal weather conditions.

The annual uncontrolled emission factor for each mine is determined as an average of summer and winter conditions with an equal weighting to daytime and nighttime hours. The average values of 6.0 lb/VMT for United Taconite and 8.4 lb/VMT for U.S. Steel Minntac are very close to the interim value estimated by the Taconite Industry Working Group. However, the emission factors from this study apply to larger haul trucks currently used in the industry. The overall average PM-10 emission factor for taconite mine haul roads is 7.2 lb/VMT. The average PM-2.5 emission factor is 0.72 lb/VMT.

Road surface samples were also collected and analyzed for moisture and silt content (particles smaller than 75  $\mu\text{m}$  in diameter). The silt content values obtained in the July 2007 testing at United Taconite were in the same range as the values found in the original study performed in June 1978 at the Erie Mining Company mine site, but the values obtained at U.S. Steel Minntac were lower.



## Section 9.

### References

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1. U.S. EPA. *Compilation of Air Pollutant Emission Factors*, AP-42, Fifth Edition, Research Triangle Park, NC, September 1995.
2. <http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0202.pdf>
3. Midwest Research Institute. *Validation and Preliminary Modeling of Dust/PM Capture by Vegetative Groundcover Bordering Emission Sources*. Prepared for U.S. Army Construction Engineering Research Laboratory, June 2004.
4. C. Cowherd, Jr. Presentation to U.S. EPA Modeling Group, Research Triangle Park, NC, August 2005.
5. C. Cowherd, Jr. *Guidance for Open Source Test Method*, Midwest Research Institute Report to U.S. EPA, Research Triangle Park, NC, September 2000.
6. Midwest Research Institute. *Evaluation of a Mobile Sampler to Characterize Unpaved Road Dust Palliatives*. Final Report prepared for the U.S. Army Construction Engineering Research Laboratory, CERL Order No. DACA42-01-F-0062, August 5, 2002.
7. T. Cuscino, Jr. *Taconite Mining Fugitive Emissions Study*, Midwest Research Institute Report to the Minnesota Pollution Control Agency, Roseville MN, June 1979.
8. C. Cowherd, Jr. *Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust*, Midwest Research Institute Report to the Western Regional Air Partnership, Denver CO, October 2005.
9. Taconite Industry Work Group, Taconite Industry Haul Truck Unpaved Haul Road Fugitive Particulate Emission Factor and Control Efficiency, January 1999.



## **Compact Disk A**

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## **Maps of Relative Emissions**



## **Appendix A**

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# **Sampling and Analytical Procedures**



## **Sampling and Analytical Procedures**

This section describes the sampling and analysis procedures that will be used in the emission testing phases of the program.

### **Plume Profiling Method**

Plume profiling (also referred to as exposure profiling) was used to determine the depletion of dust particle mass as the plume passes through the trees. The exposure profiling test method has been recognized by EPA as the characterization technique most appropriate for collecting PM emissions from a broad class of open anthropogenic dust sources, such as material transfer and moving point sources. Because the method isolates a single emission source while not artificially shielding the source from ambient conditions (e.g., wind), the open source emission factors with the highest quality ratings in EPA's emission factor handbook AP-42 (USEPA, 1995) are typically based on this approach.

The exposure profiling technique for source testing of open particulate matter sources is based on the passage of airborne pollutant across a vertical plane normal to the wind direction immediately downwind of the source. The dust flux is measured directly by means of simultaneous multipoint sampling over the cross section of the open dust source plume. This technique uses a mass flux measurement scheme rather than requiring indirect emission rate calculation through the application of a generalized atmospheric dispersion model. Mass flux is calculated by multiplying the pollutant mass concentration times the wind speed.

The exposure profiling technique relies on simultaneous multipoint measurement of both concentration and airflow (advection) over the effective area of the emission plume. The technique uses a mass flux measurement scheme. However, both the emission rate and the airflow are nonsteady. This requires simultaneous multipoint sampling of mass concentration and airflow over the effective area of the emission plume. As noted in the body of this test plan, the emission source—an unpaved road—can be represented as a line source.

As applied to line sources, the exposure profiling test method requires a vertically oriented array of sampling points. Vertical networks of samplers are positioned just downwind from the edge of the source (see Figure A-1). The downwind distance of approximately 5 m is far enough that interference with sampling due to vehicle-generated turbulence is minimal but close enough to the source that the vertical plume extent can be adequately characterized with a maximum sampling height of 5 to 7 m. At a downwind distance of 25 m from the source, the vertical plume extent can be adequately characterized with a maximum sampling height of 10 m.





**Figure A-1. Deployment of Co-Located Profiling Towers for Replicability Testing**

In a similar manner, the approximate 15-m distance upwind from the source's edge (for location of the background monitor) is far enough from the source that (a) source turbulence does not affect sampling, and (b) a brief wind reversal would not substantially impact the upwind samplers. The 15-m distance is, however, close enough to the line of the moving point source to provide the representative background concentration values needed to determine the net mass flux (i.e., due to the source).

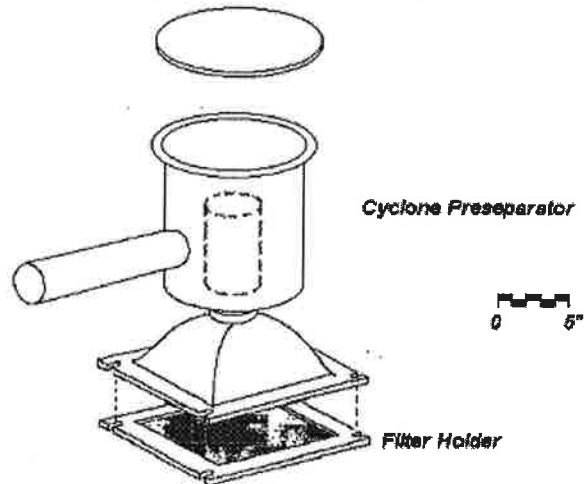
The primary air sampling device in the exposure profiling portion of the field program consists of a tower with four standard high-volume PM-10 air samplers, each fitted with a Sierra Instruments Model 230CP cyclone preseparator (Figure A-2). PM-10 denotes particles equal to or smaller than  $10\ \mu\text{m}$ , where A refers to aerodynamic diameter. The cyclone exhibits an effective 50% cutoff diameter ( $D_{50}$ ) of approximately  $10\ \mu\text{m}$  when operated at a flow rate of 40 cfm ( $68\ \text{m}^3/\text{h}$ ) (Baxter et al., 1986). Thus, mass collected on the 8- by 10-in backup filter represents a PM-10 sample. Normally at least 50 pickup truck or automobile passes are necessary to obtain adequate sample mass on all sample collection media, but fewer haul truck passes are required because of larger vehicle size.

Throughout each test, wind conditions are monitored at a downwind distance of 5 m. Wind speed is monitored at two heights (2.1 m and 5.4 m) using R. M. Young Gill-type (model 27106) anemometers. Furthermore, an R. M. Young portable wind station (model 05305) is used to record wind speed and direction at a 3.1-m height downwind. All wind data are accumulated into 5- to 15-min averages logged with a 26700 series R. M. Young "programmable translator."

The sampling deployment described above is fundamentally identical to that used to develop the emission factor test database for paved and unpaved road emission factor equations in AP-42, EPA's emission factor handbook. As such, the emission test data are



being reduced and analyzed in a manner analogous to tests in the AP-42 database. That is to say, the emission factor is expressed in terms of mass emitted per unit of source activity (e.g., lb/vehicle mile traveled).



**Figure A-2. Cyclone Preseparator/PM-10 Sampler**

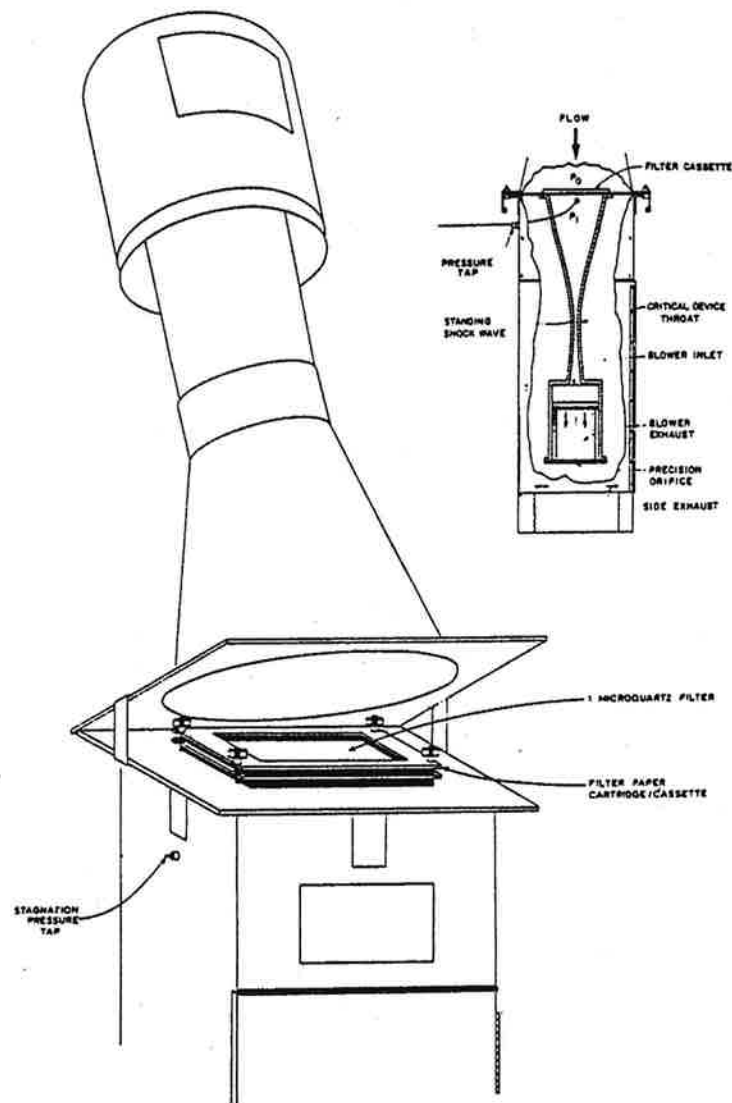
During each emission test, ambient PM-10 reference-method samplers (see Figure A-3) are collocated with the downwind profiling towers and at the upwind (background) sampling station. Wedding and Associates high-volume samplers with a sampling rate of 40 acfm (68 m<sup>3</sup>/h) are used for this purpose. The Wedding PM-10 samplers also use 8- by 10-in glass fiber back-up filters (rather than quartz fiber filters) to take advantage of lower pressure drop and lower probability of filter fiber loss in collecting nonreactive fugitive dust.

One battery-operated TSI DustTRAK continuous particle monitor is collocated (at a height of 1.8 m) with the two downwind roadside plume profilers during each test to record any changes in plume intensity as each haul truck passes the test road segment. Although the DustTRAK monitor utilizes light-scattering of particles as a surrogate for dust concentration, it gives a reliable relative measurement of PM-10 concentration. Data from the DustTRAK monitor is used to track any changes in plume dynamics resulting from wind variations.

Sampling activities are subject to the quality assurance/quality control (QA/QC) guidelines discussed in detail in the test plan that was prepared after the study design was finalized.

To calculate emission factors/rates by the exposure profiling technique, a conservation of mass approach is used. The passage of airborne particulate (i.e., the quantity of emissions per unit of source activity) is obtained by spatial integration of distributed measurements of exposure (mass/area) over the effective cross section of the plume. Exposure is the point value of the flux (mass/area-time) of airborne particulate integrated over the time of measurement, or equivalently, the net particulate mass passing





**Figure A-3. Schematic of the Wedding High Sampler PM-10 Sampler**



through a unit area normal to the mean wind direction during the test. The steps in the calculation procedure are described below.

The concentration of particulate matter measured by a sampler is given by:

$$C = m / QT$$

where: C = particulate concentration (mass/volume)  
m = net mass collected on the filter or substrate (mass)  
Q = volumetric flow rate of the sampler (volume/time)  
T = duration of sampling (time)

The isokinetic flow ratio (IFR) is the ratio of a directional sampler's intake air speed to the mean wind speed approaching the sampler. It is given by:

$$IFR = Q / aU$$

where: Q = volumetric flow rate of the sampler (volume/time)  
a = sampler intake area (area)  
U = approach wind speed (length/time)

This ratio is of interest in the sampling of total particulate, since isokinetic sampling ensures that particles of all sizes are sampled without bias. As such, the ratio is of greatest interest in the particle size profiling tests. Specially designed cyclone intake nozzles are available to maintain  $\pm 20\%$  isokinetic sampling for wind speeds in the range of approximately 5 to 20 mph. Because the primary interest in this program is directed to PM-10 and PM-2.5 emissions, sampling under moderately nonisokinetic conditions should pose little difficulty. It is readily recognized that 10- $\mu\text{m}$  (aerodynamic diameter) and smaller particles have weak inertial characteristics at normal wind speeds and therefore are relatively unaffected by anisokinesis (Davies, 1968).

Exposure represents the net passage of mass through a unit area normal to the direction of plume transport (wind direction) and is calculated by:

$$E = (C - C_b) U T$$

where: E = net particulate exposure (mass/area)  
C = downwind particulate concentration (mass/volume)  
C<sub>b</sub> = background particulate concentration (mass/volume)  
U = approach wind speed (length/time)  
T = duration of sampling (time)

The wind speed at each PM sampling height will be interpolated or extrapolated from the 2.1 m and 5.4 m measurements. The interpolation or extrapolation assumes a logarithmic wind profile of the form:



$$u(Z) = K \ln (z/z_0)$$

where: K = proportionality constant (length/time)  
 u = wind speed (length/time)  
 z = height above ground (length)  
 z<sub>0</sub> = roughness height (length)

Exposure values vary over the vertical extent of the plume. If exposure is integrated over the plume effective cross section, then the quantity obtained represents the total passage of airborne particulate matter due to the source. For a line source, a one-dimensional integration is used:

$$A1 = \int_0^H E \, dh$$

where A1 = integrated exposure for a line source (mass/length)  
 E = net particulate exposure (mass/area)  
 h = height above ground (length)  
 H = vertical extent of the plume (length)

Because exposures are measured at discrete points within the plume, a numerical integration is necessary to determine the integrated exposure. For moving point (line) sources, exposure must equal zero at the vertical extremes of the profile (i.e., at the ground where the wind velocity equals zero and at the effective height of the plume where the net concentration equals zero). However, the maximum exposure usually occurs below a height of 1 m for conventional roadway vehicles, so that there is a sharp decay in exposure near the ground. To account for this sharp decay, the value of exposure at the ground level is set equal to the value at a height of 1 m. The 1 m value of exposure is obtained by extrapolating the values from the lowest two samplers. The effective height H is found by vertically extrapolating the net (i.e., downwind minus upwind) concentrations to a value of zero. Finally, the integration is performed using the trapezoidal rule. Even though for haul trucks the maximum exposure occurs at a height greater than 1 m the effect of this difference is small, as shown in Appendix B.

The emission factor for particulate matter in the specific particle size range is determined from the integrated exposure by normalizing the emissions against some measure of source activity. For the tests of near-source plume depletion, the integrated exposures at the two profiler positions are divided by the number of vehicle passes to obtain emission factors in terms of mass emitted per unit distance of vehicle travel. The plume deficiency is determined from the reduction of plume mass (expressed in terms of the emission factor) as the plume passes from the roadside profiler to the second profiler.

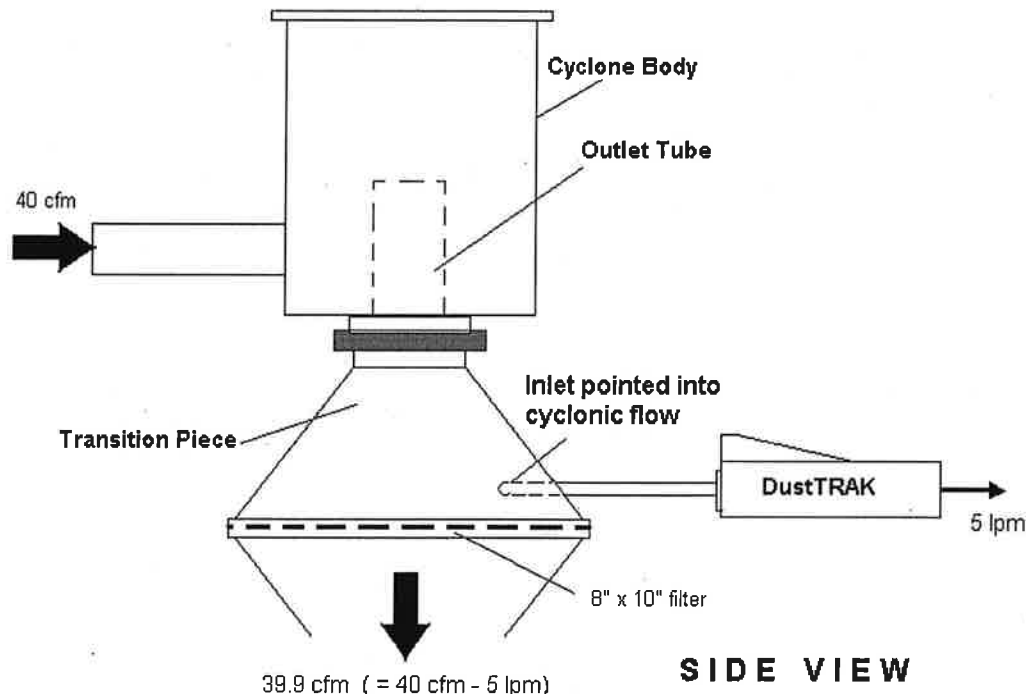
For each test series, operational features, such as number of vehicle passes and vehicle speeds are recorded. Wind direction, wind speed, and other environmental data are also collected. Photographs of test locations and equipment are made to provide additional documentation of the source activity and vegetative configurations.



## Mobile Monitoring Method

For quantifying emission factor variation over a network of haul roads, there is a simpler test procedure that provides information on **relative** rather than **absolute** emission rates. This procedure is also suitable for determining road dust control efficiencies by testing controlled and uncontrolled roadway segments and determining emission reductions attributable to dust control. MRI developed this procedure for use in a long-term program for testing of road dust controls at Fort Leonard Wood, Missouri. The program was coordinated by the U.S. Environmental Protection Agency under the Environmental Technology Verification Program.

Figure A-4 shows a schematic representation of the device in which a DustTRAK PM-10 concentration monitor is coupled with the high-volume cyclone preseparator. The high-volume cyclone preseparator exhibits a  $D_{50}$  cut point of approximately 10 micrometers in aerodynamic diameter ( $\mu\text{mA}$ ) at a flow rate of 40 actual cubic feet per minute (acfm) and thus collects a PM-10 sample on an 8-in by 10-in glass fiber back-up filter. By positioning the DustTRAK monitor intake below the outlet tube of the high-volume cyclone, the high-volume cyclone removes large particles that might otherwise overwhelm the DustTRAK unit. In this arrangement, DustTRAK samples a portion (approximately 1 to 2 %) of the total flow that enters the cyclone.



**Figure A-4. Hybrid PM-10 Sampler/DustTRAK Monitor**



Adaptation of the hybrid sampler to mobile use required modifications regarding physical placement of the sampler and adjustment of operating procedures.

The physical placement of the sampler relative to the vehicle is one of the most important differences between the mobile monitoring system and devices used in the past. The focus is on PM that is truly airborne and thus capable of contributing to PM fence line concentrations. As a practical matter, the sampler inlet needs to be positioned (a) directly downstream from a component dust source (tire/road surface interface) and (b) high enough above the road surface to collect truly airborne material but (c) close enough to the surface to collect adequate sample mass.

Figures A-5 and A-6 show views of the sampling and support systems, respectively, used during recent demonstration tests of the mobile sampler. The sampling intake location produced 1-sec PM-10 concentrations in a very reliable operating range of the DustTRAK monitor. The monitor, which was located in the cab of the vehicle, drew a slipstream from the cyclone effluent through a recommended length of Tygon tubing.



**Figures A-5 and A-6. Views of the Mobile Monitor Intake Tube and Cyclone Pre-collector (left view) for Removal of Particles Larger than PM-10**

In the original development of the mobile monitoring method, a set of operating procedures was established to avoid confounding influences from wind. These included the following:

- The truck travel speed should be well above ambient wind speeds so that plume flow dynamics at the sampling point are dominated by the vehicle wake rather than ambient winds.
- The sampling intake velocity should approximate the truck travel speed.



The field test comparison between the mobile monitoring method and the plume profiling method (MRI, 2002) showed that:

- The mobile dust monitor may be used to develop relative emission rate information for PM-10.
- Mobile monitor results are highly correlated with results derived from exposure profiling measurements. There is approximately a linear relationship between the two methods.
- Control effectiveness values based on mobile monitoring are highly correlated with control efficiency values developed with exposure profiling test data. The correlation is significant at the 1% level.
- The mobile monitoring method includes measurements of uncontrolled emissions during each test period. Control efficiency values are based on the uncontrolled emission levels measured during individual field campaigns.

Based on the success from the field comparison, the mobile sampler was subsequently been used in a yearlong field study of dust suppressant performance not only on unpaved roads at Fort Leonard Wood but also on a public unpaved road in Maricopa County, Arizona. These field investigations were conducted as part of EPA's Environmental Technology Verification (ETV) program and the Air Pollution Control Technology Verification Center (APCTVC).



## References for Appendix A

1. Baxter, T. E., D. D. Lane, C. Cowherd, Jr., and F. Pendleton. "Calibration of a Cyclone for Monitoring Inhalable Particulates," *Journal of Environmental Engineering*, 112(3), 468 (1986).
2. Midwest Research Institute. *Evaluation of a Mobile Sampler to Characterize Unpaved Road Dust Palliatives*, Final report prepared for the US Army Construction Engineering Research Laboratory, CERL Order No. DACA42-01-F-0062, August 5, 2002.
3. U.S. EPA. *Compilation of Air Pollutant Emission Factors*, AP-42, Fifth Edition, Research Triangle Park, NC, September 1995.
4. Davies, C. N. "The Entry of Aerosols in Sampling Heads and Tubes," *British Journal of Applied Physics* 2:921 (1968).



## **Appendix B**

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### **Example Plume Profiling Calculation**



### Example Calculation—Run IMAF-6

This example calculation is based on run IMAF-6. The test was conducted on July 14, 2007. It began at 10:33 and ended at 12:51. Thus, the test duration was 138 minutes. The average temperature during the test was 70.5° F and the barometric pressure was 29.85 in Hg. During the test, there were 25.55 haul truck passes. The downwind sampler operated for the duration of the test, and the upwind sampler operated for 168 minutes, from 10:14 to 13:02.

Table B-1 shows the net filter weights calculated for the samplers:

**Table B-1. Filter Weights**

Sampler location	(Note 1) Filter No.	Tare weight (mg)	Final weight (mg)	Net weight (mg)	(Note 2) Blank- corrected net weight (mg)
Cyclone 9.0 m DW	0631110	4303.2	4311.6	8.4	4.9
Cyclone 6.5 m DW	0631108	4292.1	4317.8	25.7	22.2
Cyclone 4.0 m DW	0631100	4300.7	4326.6	25.9	22.4
Cyclone 2.0 m DW	0631101	4319.6	4343.0	23.4	19.9

Notes:

1. Information taken from Data Run Sheets.
2. The blank-corrected net weights are based on an average blank value of 3.5 mg.

The following table illustrates how the sampling flow rates and concentrations were determined:



**Table B-2. Sampler Flow Rates and Concentration Values**

Sampler location	VFC ID	(Note 1) BGI pressure drop (in H <sub>2</sub> O)	(Note 2) Flow rate (scfm)	(Note 3) Flow rate (acfm)	(Note 4) PM-10 concentration (mg/m <sup>3</sup> )
Cyclone 9.0 m DW	011928	3.3	40.9	40.5	0.031
Cyclone 6.5 m DW	011931	3.2	40.3	39.9	0.142
Cyclone 4.0 m DW	011920	3.3	40.9	40.5	0.142
Cyclone 2.0 m DW	011929	3.2	40.3	39.9	0.128

**Notes:**

- Recorded BGI change in pressure on the calibration sheet.
- Flow rates for the VFC samplers were developed after calibration with a BGI orifice. The VFC calibrations are of the form

$$Q = a (\Delta P)^b$$

where Q = flow rate (scfm)  
 $\Delta P$  = filter pressure drop (in water)

In this case, a=21.734 and b=0.53 for all units.

- This flow rate is converted from scfm to acfm, using the ideal gas law:

$$\text{scfm} \times (530^\circ \text{ R (actual temp)} / 537^\circ \text{ R (standard temp)}) \times (29.92 \text{ in Hg (standard BP)} / 29.85 \text{ in Hg (actual BP)}) = \text{acfm}$$

- For example, over the 138 minute run, a volume of 40.5 f<sup>3</sup>/min x 138 min = 5589 cubic feet (=158.3 m<sup>3</sup>) of air was sampled. The concentration for the 9.0 m sampler is thus found as

$$4.9 \text{ mg} / 158.3 \text{ m}^3 = 0.031 \text{ mg/m}^3$$

The next table illustrates how net concentrations and exposure values were determined:

**Table B-3. Exposure Values**

Sampler location	PM-10 concentration (mg/m <sup>3</sup> )	(Note 1) Net PM-10 concentration (mg/m <sup>3</sup> )	(Note 2) Mean wind speed (mph)	(Note 3) Net PM-10 exposure (mg/cm <sup>2</sup> )
Cyclone 9.0 m DW	0.031	0.021	6.1	0.0471
Cyclone 6.5 m DW	0.142	0.132	5.9	0.2881
Cyclone 4.0 m DW	0.142	0.132	5.6	0.2722
Cyclone 2.0 m DW	0.128	0.118	5.2	0.2255

**Notes:**

- Determined by subtracting the upwind value of the corresponding sampler. For all runs in this data, a representative value of 0.010 mg/m<sup>3</sup> was subtracted for the upwind concentration.
- Average of 25-min average wind speeds recorded during test. Measured values fitted to a logarithmic profile. Then speeds were corrected based on sampler direction. In this case, the sampler was at a 45-degree angle to the road, so measured wind speed was multiplied by sin(45°) to represent the component of the wind that was normal to the road.
- Exposure represents the product of wind speed, concentration, and test duration.



A numerical integration scheme is used to determine the integrated exposure and emission factor. Because the concentration at the 9.0 m level was non-zero, the concentrations of the 6.5 m and 9.0 m levels were linearly extrapolated to find the plume height of 9.5 m. Next, recall that the exposure at ground level is set equal to that found for the lowest sampler.

Figure 1 plots the exposure values and shows how the trapezoidal rule is applied to obtain the integrated exposure value:

$$\begin{aligned} A &= 0.0111 + 0.4191 + 0.7005 + 0.4978 + 0.4511 \text{ m-mg/cm}^2 \\ &= 2.0795 \text{ m-mg/cm}^2 \times (100 \text{ cm/1 m})^2 \times (1609 \text{ m/1 mile}) \times (1 \text{ lb/454,000 mg}) \\ &= 73.70 \text{ lb/mile} \end{aligned}$$

Next, the number of vehicle passes to include needs to be determined. In this case we are only looking at the impact of haul trucks. Thus to account for all of the smaller vehicles that impacted the samplers, a ratio of smaller vehicles to haul trucks was found based on the AP-42 industrial unpaved road emission factor equation:

$$E = 1.5 \left( \frac{s}{12} \right)^{0.9} \left( \frac{W}{3} \right)^{0.45}, \text{ where } W \text{ is the weight of the vehicle.}$$

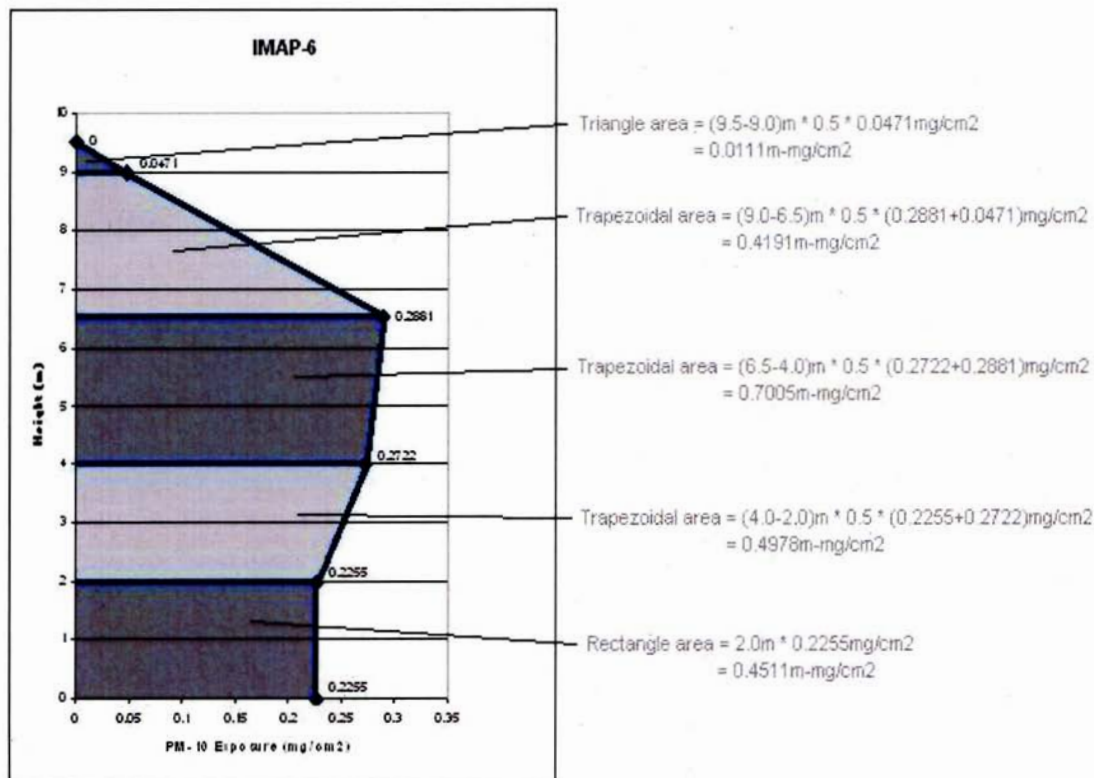
On average, haul trucks weighed 310 tons, light duty vehicles weighed 4.5 tons, and maintenance vehicles weighed 17 tons. Thus a ratio of 0.15 was multiplied to the number of light-duty vehicles that passed by the tower, and a ratio of 0.27 was multiplied to the number of maintenance vehicles that passed by the tower. Doing this found that there was 26.73 equivalent haul truck passes during the test period.

The emission factor  $e$  is found by dividing the integrated exposure by the number of equivalent haul truck passes:

$$\begin{aligned} e &= 73.70 \text{ lb/mile} / 26.73 \text{ vehicles} \\ &= 2.757 \text{ lb/VMT} \end{aligned}$$

where VMT denotes vehicle-mile traveled.





**Figure B-1. Integration of the Exposure Values Over Height**

The effect of modifications to the method for extrapolating the exposure from the lowest sampling point to the ground is illustrated below. Three variations are shown:

- Set exposure at ground level equal to that found for the lowest sampler.  
– Emission Factor: **2.757 lb/VMT**
- Extrapolate exposure from the 2.0 m and 4.0 m samplers to a height of 1.0 m and set exposure at ground level equal to that found for the 1.0 m height.  
– Emission Factor: **2.711 lb/VMT**
- Extrapolate exposure from the 2.0 m and 4.0 m samplers to a height of 0.5 m, and then make a linear fit from the 0.5 m height to zero exposure at ground level.  
– Emission Factor: **2.636 lb/VMT**

It is clear that the resulting emission factor is relatively insensitive to the method used.







# Calculations for Developing Composite Emission Factor for Taconite Mine Haul Roads

## Supplemental Materials for “Field Study of Emissions from Haul Roads: Final Test Report (October 30, 2008)”

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May 18, 2009

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# Calculations for Developing Composite Emission Factor for Taconite Haul Roads

## 1.0 Background

As requested by EPA, this document provides detailed calculation procedures and spreadsheets of data that were used to calculate the emission factors presented in MRI's test report "Field Study of Emissions from Haul Roads." The purpose is to assist in streamlining the technical reviewer's job by showing how the plume profiling and mobile monitoring calculations were carried out and provide explanations for why these methodologies were used.

As in past studies, the baseline (uncontrolled) emission factors were determined by conventional plume profile during the summer testing at the two test mines. However, for the first time, mobile monitoring provided for calculation of wintertime emission factors at both mines as well as nighttime emission factors for summer conditions. In addition mobile monitoring provided for much more reliable calculation of summer watering control efficiencies than attainable in the past.

## 2.0 File List

The following is a list and description of the spreadsheets of original test data. These workbooks were originally submitted to Hongming Chiang of the Minnesota Pollution Control Agency and are now being provided to EPA for review.

File Name:	Description:
Iron Mining Association of Minnesota <b>Mintac Calibration.xls</b>	Contains a summary of the repeatability runs that were used to derive the calibration factor for the mobile monitor at the Mintac site.
Iron Mining Association of Minnesota <b>Mintac Summer Segment Data.xls</b>	Contains a breakdown of each Mintac mobile monitor run by road segment.
Iron Mining Association of Minnesota <b>Plume Profile Data.xls</b>	Contains calculation of the plume profiling emission factors as well as all the supporting data needed for plume profiling.
Iron Mining Association of Minnesota <b>Silt and Moisture Analysis.xls</b>	Contains silt and moisture data from both sites during summer testing.
Iron Mining Association of Minnesota <b>Truck Activity and Road Segment Data.xls</b>	Summarizes summer mobile monitoring data from both sites and contains the calculation of control efficiencies derived through mobile monitoring.
Iron Mining Association of Minnesota <b>United Taconite Calibration.xls</b>	Contains a summary of the repeatability runs that were used to derive the calibration factor for the mobile monitor at the United Taconite site.



Iron Mining Association of Minnesota <b>United Taconite Summer Segment Data.xls</b>	Contains a breakdown of each United Taconite mobile monitor run by road segment.
Iron Mining Association of Minnesota <b>Winter Emission Factor.xls</b>	Summarizes winter mobile monitoring data from both sites and contains the calculations of winter emission factors.
Iron Mining Association of Minnesota <b>Winter Silt Data.xls</b>	Contains silt and moisture data from both sites during winter testing.

### 3.0 Calculation of Mobile Monitoring Calibration Factors

The calibration factor calculations are performed using the following method:

- 1) Find the emission factor calculated from plume profiling results (found in Column P of “United Tower Breakout”, and in column AA of “Mintac Tower Breakout” in the file: Iron Mining Association of Minnesota Plume Profile Data.xls)
- 2) Find the traffic-weighted average concentration measured by the mobile monitor, with equal weight given to loaded and unloaded sides of roads. These calculations are in the “Summary” worksheets of the calibration files (Iron Mining Association of Minnesota United Taconite Calibration.xls, & Iron Mining Association of Minnesota Mintac Calibration.xls)
- 3) Take the arithmetic average of the ratios of values in (1) to the values in (2) with IMAP-05 excluded for high winds and IMAP-12 excluded for damp road conditions (shown in “Sheet1” of the calibration files). This results in two mobile monitor calibration factors (2.57 and 1.95 for United and Minntac, respectively) which are used to convert from a mobile monitor concentration to an equivalent emission factor.


Note: The mobile monitoring calibration factors are based on a test road segment which is approximately 700 feet long, with the plume profiling towers in the middle of the segment. This can be seen in the timestamps (of the format “000000”) of each repeatability run which show 18-21 seconds per pass (at 36.6ft/s). These are found in the run worksheets of: Iron Mining Association of Minnesota United Taconite Calibration.xls, & Iron Mining Association of Minnesota Mintac Calibration.xls.

### 4.0 Calculation of Emission Factors from Mobile Monitoring

The mobile monitoring emission factor calculations are performed using the following method:


- 1) Take the number of loaded/unloaded vehicle passes for a road segment (Columns B & C of “Overall Analysis” worksheets in the file: Iron Mining Association of Minnesota Truck Activity and Road Segment Data.xls) and multiply by the length of the segment (Column E) to obtain vehicle miles travelled (VMT) per segment (Columns F & G).



- 
- 2) Total the unloaded and the loaded vehicle VMTs to calculate the total distance travelled by the trucks in each direction.
  - 3) Give equal weight to both sides of road by reporting concentration as an average of loaded and unloaded concentration averages (Column Q).
  - 4) Multiply the average concentration by the calibration factor (Cell X7) to obtain the emission factor for the run (Tan colored, Column S).

## 5.0 Calculation of Control Efficiencies from Mobile Monitoring

The control efficiency calculations are all found in the file “Iron Mining Association of Minnesota Truck Activity and Road Segment Data.xls” and use the following method:

- 
- 1) Find the segment in each run which resulted in the highest average loaded and unloaded emissions (shown in blue in column K of the “Overall Analysis” sheets) .This segment is considered uncontrolled for that run.
  - 2) Take the average concentration from the loaded and unloaded sides of the road for the uncontrolled segment (shown in blue in columns I and J of the “Overall Analysis” sheets). The result is the uncontrolled concentration shown in light orange, column R.
  - 3) Multiply the uncontrolled concentration by the calibration factor to obtain the uncontrolled emission factor for the run (Column T).
  - 4) Calculate control efficiency by calculating:  $1 - (\text{ratio of controlled/uncontrolled emission factors})$ . This result is found in Column U.

## 6.0 Calculation of Nighttime Emission Factors

The nighttime emission factor calculations are all found in the file “Iron Mining Association of Minnesota Truck Activity and Road Segment Data.xls”. The early morning runs were #23 at United Taconite and #45 at U.S. Steel Minntac. In order to correlate the results of mobile monitoring directly with the segments where plume profiling was done, the nighttime emission factors were derived exclusively from the segments where the plume profiling was done—Segment 6 at United Taconite and Segment 21 at U.S. Steel Minntac. The data for these results are found in the “Overall Analysis” sheets and the method is as follows:

- 1) The average of the loaded and unloaded concentrations for the segment adjacent to the plume profiling is multiplied by the calibration factor to obtain values of 4.99 and 2.41 lb/VMT (In sheet “Overall” see Cell T81 for United and P241 for Minntac) for summer nighttime emission factors. Note that because the profiling test segment at United was inadvertently watered by mine personnel prior to testing, the uncontrolled emission factor was based on the highest reading road segment. Because no nighttime winter testing was feasible, winter nighttime emission factors are assumed to be 25% of the daytime winter emissions. This was considered an accurate estimate because during summer testing, the nighttime emissions were approximately 10% of the



daytime emissions at Minntac, and about 50% at United (with wet conditions causing a higher factor), so 25% was selected as a good overall predictor.

## **7.0 Calculation of Winter Emission Factors**

The winter emission factors were obtained using the same pass-weighted technique described in section 4. Go to worksheet titled “Summary” in the file: Iron Mining Association of Minnesota Winter Emission Factor.xls to see the calculations for obtaining the value of 7.8 lb/VMT for summer daytime emissions. Note also that due to freeze-thaw conditions at United Taconite, which produced an atypical value, winter daytime emissions were assumed to equal those at Minntac as a worst case.

## **8.0 Calculation of Composite Emission Factors**

In order to properly account for day and night variations in emissions, which were quantified in this study, it was necessary to equalize the weight placed on summer vs. winter and day vs. night operating periods. This was done in Table 31 of the test report. The day and night summer emissions at United Taconite were found to be 9.5 lb/VMT and 5.0 lb/VMT, respectively, giving a summer average of 7.2 lb/VMT. For the winter, a value of 7.8 lb/VMT during the day was used as a worst-case estimate, along with 1.9 lb/VMT for nighttime. This gave a winter average of 4.8 lb/VMT and an overall average of 6.0 lb/VMT.

At U.S. Steel Minntac, the day and night summer emissions were found to be 21.7 lb/VMT and 2.4 lb/VMT, respectively, giving a summer average of 12.1 lb/VMT. For the winter, a value of 7.8 lb/VMT during the day was measured, along with 1.9 lb/VMT for nighttime. This gave a winter average of 4.8 lb/VMT and an overall average of 8.4 lb/VMT.

To obtain an annualized emission factor for taconite mine haul roads, an average between the two mines (representing the two major types of road surface material used in constructing haul roads) was taken  $(6.0+8.4)/2 = 7.2$  lb/VMT.



Summary of the repeatability runs that were used to derive the calibration factor for the mobile monitor at the Mintac site.

Run	Unloaded	Loaded	Ratio U-L	Average
34	4.141	14.157	0.293	9.149
37	14.996	65.341	0.230	40.169
39	19.463	21.203	0.918	20.333
41	2.388	18.998	0.126	10.693
42	5.801	20.816	0.279	13.309
43	5.845	20.171	0.290	13.008
44	2.873	22.306	0.129	12.589
45	0.299	2.176	0.138	1.237
46	3.280	8.141	0.403	5.710
47	4.375	4.639	0.943	4.507
48	7.372	12.640	0.583	10.006
49	2.739	18.353	0.149	10.546
51	3.261	14.668	0.222	8.965
52	5.081	29.870	0.170	17.476
Average			0.348	12.693

\*Runs that were not repeatability runs

Profiling Run	Mobile Monitor Runs	Tower Emission Factor	DustTrak Average	
IMAP-09	39	20.42	20.333	1.004265
IMAP-10	41,42	27.78	12.001	2.314833
IMAP-11	43,44	31.44	12.799	2.456503
IMAP-12	46,47,48	3.08	6.741	0.456894
IMAP-13	49	17.25	10.546	1.635657
IMAP-14	51,52	30.65	13.220	2.318406

USS Minntac Repeatability Analysis

Run #	Unloaded Concentration (mg/m <sup>3</sup> )			Loaded Concentration (mg/m <sup>3</sup> )			Unloaded Average	Loaded Average
	Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3		
39	8.765	28.392	21.233	23.378	13.726	26.505	19.463	21.203
41	2.388	1.419	1.684	13.837	22.093	21.063	1.830	18.998
42	7.662	4.895	4.847	20.607	26.162	15.679	5.801	20.816
44	2.048	3.992	2.579	20.032	27.202	19.683	2.873	22.306
46	1.857	6.039	1.945	8.870	7.250	8.302	3.280	8.141
48	7.136	8.971	6.008	11.791	8.513	17.616	7.372	12.640
49	2.707	2.576	2.935	27.283	14.845	12.931	2.739	18.353
51	1.774	6.112	1.897	17.484	14.871	11.650	3.261	14.668
52	3.671	2.522	9.051	24.131	19.641	45.839	5.081	29.870


Run	Loaded, Unloaded, Combined	Pass Average Concentration (mg/m3)	3- Pass Average Concentration (mg/m3)	Relative Standard Deviation
Run 39	Unloaded	8.770	19.465	51%
		28.392		
		21.233		
	Loaded	23.378	21.203	31%
		13.726		
		26.505		
Run 41	Unloaded	2.388	1.830	27%
		1.419		
		1.684		
	Loaded	13.837	18.998	24%
		22.093		
		21.063		
Run 42	Unloaded	7.662	5.801	28%
		4.895		
		4.847		
	Loaded	20.607	20.816	25%
		26.162		
		15.679		
Run 44	Unloaded	2.048	2.873	35%
		3.992		
		2.579		
	Loaded	20.032	22.306	19%
		27.202		
		19.683		
Run 46	Unloaded	1.857	3.280	73%
		6.039		
		1.945		
	Loaded	8.870	8.141	10%
		7.250		
		8.302		
Run 48	Unloaded	7.136	7.372	20%
		8.971		
		6.008		
	Loaded	11.791	12.640	36%
		8.513		
		17.616		
Run 49	Unloaded	2.707	2.739	7%
		2.576		
		2.935		
	Loaded	27.283	18.353	42%
		14.845		
		12.931		
Run 51	Unloaded	1.774	3.261	76%
		6.112		
		1.897		
	Loaded	17.484	14.668	20%
		14.871		
		11.650		
Run 52	Unloaded	3.671	5.081	69%
		2.522		
		9.051		
	Loaded	24.131	29.870	47%
		19.641		
		45.839		

Run	Mobile Monitor Test ID	Loaded, Unloaded, Combined	Average Concentration (mg/m3)	Relative Standard Deviation
IMAP-09	39	Unloaded	19.47	51.0%
		Loaded	21.20	31.4%
IMAP-10	41,42	Unloaded	3.82	63.5%
		Loaded	19.91	22.5%
IMAP-11	43,44	Unloaded	2.87	35.0%
		Loaded	22.31	19.0%
IMAP-12	46,47,48	Unloaded	5.33	53.8%
		Loaded	10.39	37.1%
IMAP-13	49	Unloaded	2.74	7.0%
		Loaded	18.35	42.0%
IMAP-14	51,52	Unloaded	4.17	69.0%
		Loaded	22.27	55.2%



## DustTrak Calibration Ratio

Profiling Run	Mobile Monitor Runs	Tower Emission Factor	DustTrak Average	Ratio
IMAP-09	39	20.42	20.333	1.00
IMAP-10	41,42	27.78	12.001	2.31
IMAP-11	43,44	31.44	12.799	2.46
IMAP-12	46,47,48	3.08	6.741	0.46
IMAP-13	49	17.25	10.546	1.64
IMAP-14	51,52	30.65	13.220	2.32
	Average	21.77	12.61	1.95



Relative Std Deviation

42%



## Run 39

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
7.354	182321	16.628	182439	10.788	182557	41.260	182633	14.965	182400	24.241	182518
10.324	182324	36.050	182442	16.314	182600	39.354	182636	13.827	182403	24.478	182521
9.865	182327	38.916	182445	28.867	182603	22.939	182639	10.485	182406	24.219	182524
8.400	182330	30.820	182448	26.738	182606	19.299	182642	11.519	182409	32.130	182527
6.142	182333	25.052	182451	22.378	182609	16.404	182645	14.859	182412	38.830	182530
7.938	182336	29.654	182454	26.964	182612	13.091	182648	15.072	182415	28.302	182533
11.332	182339	21.624	182457	16.585	182615	14.772	182651	15.354	182418	13.334	182536
						19.908	182654				
8.765						23.378					
28.392						13.726					
21.233						26.505					
Unloaded Average						Loaded Average					
19.463						21.203					

Average of Averages      20.333  
Std Dev of Averages      7.623671



## Run 41

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
28.38233	193810	2.008733	194055	2.759467	193931	13.3572	194010	12.36187	193846	21.6708	194137
22.21953	193813	2.695467	194058	1.878267	193934	20.36087	194013	9.9592	193849	28.2266	194140
6.246	193816	2.3158	194101	1.571667	193937	19.6464	194016	16.88507	193852	30.853	194143
2.726867	193819	1.4324	194104	1.160667	193940	17.89147	194019	40.29473	193855	20.2464	194146
3.094	193822	1.099933	194107	1.274	193943	10.6516	194022	40.343	193858	13.3378	194149
4.199	193825	0.848733	194110	1.413133	193946	7.733467	194025	21.9236	193901	16.2022	194152
4.609933	193828	0.533733	194113	1.585267	193949	7.218733	194028	12.88573	193904	16.90207	194155
3.499667	193831	0.414	194116	1.8292	193952						
4.063						13.837					
1.419						22.093					
1.684						21.063					
Unloaded Average						Loaded Average					
2.388						18.998					

Average of Averages 10.693

Std Dev of Averages 9.576252



## Run 42

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
19.40053	193810	8.263333	194055	3.406867	193931	21.33513	194010	15.95013	193846	13.78633	194137
11.05447	193813	4.275667	194058	3.208867	193934	15.84927	194013	16.04687	193849	12.36813	194140
7.897933	193816	4.002667	194101	2.753933	193937	15.22	194016	20.42793	193852	14.50973	194143
5.057933	193819	3.7526	194104	2.281533	193940	13.14933	194019	26.41693	193855	12.55687	194146
3.858667	193822	4.448333	194107	5.636267	193943	16.37847	194022	36.389	193858	10.341	194149
4.4686	193825	4.559667	194110	9.9662	193946	24.4468	194025	36.21087	193901	16.7266	194152
4.1066	193828	3.633467	194113	7.361867	193949	37.87173	194028	31.69267	193904	29.4616	194155
5.454	193831	6.224933	194116	4.1588	193952						
7.662						20.607					
4.895						26.162					
4.847						15.679					
Unloaded Average						Loaded Average					
5.801						20.816					

Average of Averages 13.309

Std Dev of Averages 8.92601



## Run 44

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
3.8488	223150	11.34787	222847	3.255733	223020	13.72773	223102	20.63933	223235	9.769733	222932
2.5562	223153	5.6106	222850	3.9582	223023	14.27373	223105	17.3448	223238	7.978	222935
2.154267	223156	4.192467	222853	4.507	223026	17.87927	223108	28.9066	223241	13.4982	222938
1.845267	223159	4.308	222856	2.434667	223029	22.25687	223111	39.98827	223244	29.2108	222941
1.655667	223202	1.996733	222859	1.894467	223032	31.23327	223114	33.86253	223247	35.16573	222944
1.557733	223205	1.486	222902	1.690867	223035	23.56733	223117	26.527	223250	28.7936	222947
1.4306	223208	1.2592	222905	1.494667	223038	20.8596	223120	27.9628	223253	20.03933	222950
1.338	223211	1.7382	222908	1.3952	223041	16.45787	223123	22.3854	223256	13.005	222953
2.048		3.992		2.579		20.032		27.202		19.683	
Unloaded Average		2.873				Loaded Average		22.306			

Average of Averages 12.589

Std Dev of Averages 10.99518



## Run 46

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
2.5804	142439	3.096533	142615	0.345733	142303	4.387267	142527	5.213	142703	6.602267	142351
2.326467	142442	6.5038	142618	1.032933	142306	6.05	142530	4.567533	142706	8.004	142354
2.1312	142445	5.9738	142621	1.290333	142309	10.14493	142533	6.048733	142709	8.480667	142357
1.823	142448	5.258133	142624	1.7944	142312	10.5668	142536	8.2834	142712	7.203267	142400
1.652133	142451	9.386733	142627	2.161067	142315	6.9948	142539	8.238333	142715	6.837	142403
1.500733	142454	10.10567	142630	1.286867	142318	8.265	142542	9.178733	142718	10.73793	142406
1.440933	142457	5.012067	142633	3.466133	142321	15.68293	142545	9.218267	142721	10.25147	142409
1.399467	142500	2.9718	142636	4.179867	142324						
1.857						8.870					
6.039						7.250					
1.945						8.302					
Unloaded Average						Loaded Average					
3.280						8.141					

Average of Averages 5.710

Std Dev of Averages 3.105195



## Run 48

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
6.327133	161227	8.6986	160915	5.3712	161057	6.083733	161006	9.547133	161318	6.486067	161142
7.6842	161230	13.05947	160918	7.131067	161100	7.133333	161009	7.290867	161321	7.5936	161145
7.216133	161233	14.06473	160921	7.0484	161103	13.11853	161012	6.573867	161324	13.13173	161148
6.5902	161236	9.972667	160924	7.134133	161106	17.44447	161015	6.708733	161327	18.93727	161151
7.222467	161239	8.128933	160927	6.7422	161109	14.3962	161018	7.634467	161330	19.92187	161154
7.247	161242	6.896067	160930	4.9228	161112	12.15553	161021	9.079733	161333	24.02187	161157
6.992267	161245	5.6424	160933	4.5806	161115	12.76573	161024	11.1154	161336	26.50253	161200
7.8116	161248	5.307733	160936	5.136533	161118	11.23293	161027	10.15707	161339	24.3328	161203
7.136						11.791					
8.971						8.513					
6.008						17.616					
Unloaded Average						Loaded Average					
7.372						12.640					

Average of Averages 10.006

Std Dev of Averages 4.209825



## Run 49

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
2.281133	192943	3.958267	193107	4.341067	192758	14.57267	192852	10.76613	193019	9.153533	193143
2.787733	192946	2.984133	193110	3.5484	192801	13.81833	192855	9.968133	193022	7.2048	193146
3.077067	192949	3.0698	193113	3.421933	192804	21.1626	192858	13.97767	193025	8.847467	193149
3.031067	192952	2.7224	193116	3.112867	192807	27.6082	192901	20.72527	193028	13.467	193152
3.067333	192955	2.424133	193119	2.489067	192810	21.44747	192904	18.79253	193031	18.1664	193155
2.797133	192958	1.696933	193122	2.149267	192813	35.22893	192907	14.7736	193034	16.066	193158
1.905533	193001	1.175867	193125	1.4858	192816	45.48793	192910	14.9112	193037	17.6112	193201
						38.94053	192913				
2.707		2.576		2.935		27.283		14.845		12.931	
Unloaded Average		2.739				Loaded Average		18.353			

Average of Averages 10.546

Std Dev of Averages 9.871203



## Run 51

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
1.9952	201213	12.13413	201049	0.149933	201340	16.65867	201416	7.697733	201252	6.8334	201128
2.536067	201216	6.3162	201052	1.0306	201343	12.81753	201419	6.285133	201255	8.505133	201131
2.484267	201219	6.810733	201055	1.9764	201346	12.898	201422	6.723667	201258	7.993533	201134
1.588267	201222	6.252867	201058	2.062	201349	20.14633	201425	8.043667	201301	8.1636	201137
1.2718	201225	5.4116	201101	2.376867	201352	18.5716	201428	14.7662	201304	16.24147	201140
1.714733	201228	6.315333	201104	3.300533	201355	19.74387	201431	26.7698	201307	17.63533	201143
1.621467	201231	3.337933	201107	2.384	201358	20.5678	201434	28.9942	201310	16.17413	201146
0.981267	201234	2.316067	201110			18.4716	201437	19.69073	201313		
1.774						17.484					
6.112						14.871					
1.897						11.650					
Unloaded Average						Loaded Average					
3.261						14.668					

Average of Averages 8.965

Std Dev of Averages 6.700382



## Run 52

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
6.420267	210104	3.3168	210237	2.3948	210407	17.42613	210443	17.1192	210316	18.06193	210146
4.020667	210107	4.502133	210240	8.293467	210410	23.4178	210446	15.19993	210319	16.3364	210149
4.026533	210110	4.4992	210243	11.17447	210413	28.042	210449	17.71593	210322	13.60227	210152
3.203533	210113	2.483	210246	10.42453	210416	26.14107	210452	19.94907	210325	13.76813	210155
2.456733	210116	1.747667	210249	13.65413	210419	15.99867	210455	30.8086	210328	44.2658	210158
4.076667	210119	1.563733	210252	12.0478	210422	14.8744	210458	23.87633	210331	104.0405	210201
3.728867	210122	1.2598	210255	5.368933	210425	31.77587	210501	18.8196	210334	105.6775	210204
1.437267	210125	0.802667	210258			35.373	210504	13.6386	210337	50.95607	210207
3.671		2.522		9.051		24.131		19.641		45.839	
Unloaded Average		5.081				Loaded Average		29.870			

Average of Averages    17.476  
Std Dev of Averages    16.36207



Blank			
Segment 1	Unloaded	Average #DIV/0!	Concentration Time
Segment 1	Loaded	#DIV/0!	Concentration Time
Segment 2	Unloaded	#DIV/0!	Concentration Time
Segment 2	Loaded	#DIV/0!	Concentration Time
Segment 3	Unloaded	#DIV/0!	Concentration Time
Segment 3	Loaded	#DIV/0!	Concentration Time
Segment 4	Unloaded	#DIV/0!	Concentration Time
Segment 4	Loaded	#DIV/0!	Concentration Time
Segment 5	Unloaded	#DIV/0!	Concentration Time
Segment 5	Loaded	#DIV/0!	Concentration Time
Segment 6	Unloaded	#DIV/0!	Concentration Time
Segment 6	Loaded	#DIV/0!	Concentration Time
Segment 7	Unloaded	#DIV/0!	Concentration Time
Segment 7	Loaded	#DIV/0!	Concentration Time
Segment 8	Unloaded	#DIV/0!	Concentration Time
Segment 8	Loaded	#DIV/0!	Concentration Time
Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	Loaded	#DIV/0!	Concentration Time
Segment 10	Unloaded	#DIV/0!	Concentration Time
Segment 10	Loaded	#DIV/0!	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	Loaded	#DIV/0!	Concentration Time



Segment 12	Unloaded	#DIV/0!	Concentration Time
Segment 12	Loaded	#DIV/0!	Concentration Time
Segment 13	Unloaded	#DIV/0!	Concentration Time
Segment 13	Loaded	#DIV/0!	Concentration Time
Segment 14	Unloaded	#DIV/0!	Concentration Time
Segment 14	Loaded	#DIV/0!	Concentration Time
Segment 15	Unloaded	#DIV/0!	Concentration Time
Segment 15	Loaded	#DIV/0!	Concentration Time
Segment 16	Unloaded	#DIV/0!	Concentration Time
Segment 16	Loaded	#DIV/0!	Concentration Time
Segment 17	Unloaded	#DIV/0!	Concentration Time
Segment 17	Loaded	#DIV/0!	Concentration Time
Segment 18	Unloaded	#DIV/0!	Concentration Time
Segment 18	Loaded	#DIV/0!	Concentration Time
Segment 19	Unloaded	#DIV/0!	Concentration Time
Segment 19	Loaded	#DIV/0!	Concentration Time
Segment 20	Unloaded	#DIV/0!	Concentration Time
Segment 20	Loaded	#DIV/0!	Concentration Time
Segment 21	Unloaded	#DIV/0!	Concentration Time
Segment 21	Loaded	#DIV/0!	Concentration Time
Segment 22	Unloaded	#DIV/0!	Concentration Time
Segment 22	Loaded	#DIV/0!	Concentration Time



## Run 33

Segment 1	Unloaded	Average #DIV/0!	Concentration Time																											
Segment 1	Loaded	10.41834	Concentration Time	9.748333 200226	12.08353 200229	21.1618 200232	17.57927 200235	10.01607 200238	9.731867 200241	7.529933 200244	5.7506 200247	5.698133 200250	4.883867 200253																	
Segment 14	Unloaded	3.523244	Concentration Time	4.978667 204123	4.605333 204126	4.704333 204129	3.751533 204132	2.7868 204135	2.512333 204138	2.2066 204141	2.8306 204144	3.333 204147																		
Segment 14	Loaded	3.474388	Concentration Time	2.542933 200314	2.684 200317	2.822733 200320	3.0148 200323	3.2492 200326	3.252267 200329	2.994733 200332	2.602867 200335	2.4936 200338	2.5024 200341	2.8218 200344	2.701267 200347	2.389533 200350	2.114333 200353	1.728133 200356	1.879 200359	2.274467 200402	2.7084 200405	2.91 200408	3.315733 200411	3.1128 200414	3.129267 200417	4.012533 200420	4.406333 200423			
Segment 15	Unloaded	4.238025	Concentration Time	10.19793 203802	9.347533 203805	7.4422 203808	6.802933 203811	6.247267 203814	6.076933 203817	6.184333 203820	6.071 203823	5.594333 203826	6.242667 203829	5.896333 203832	4.629333 203835	4.841067 203838	4.7358 203841	4.232133 203844	4.762467 203847	3.9386 203850	3.113267 203853	3.045267 203856	3.373067 203859	4.056933 203902	4.059333 203905	4.4288 203908	5.8686 203911			
Segment 15	Loaded	#DIV/0!	Concentration Time																											
Segment 16	Unloaded	#DIV/0!	Concentration Time																											
Segment 16	Loaded	#DIV/0!	Concentration Time																											
Segment 17	Unloaded	#DIV/0!	Concentration Time																											
Segment 17	Loaded	#DIV/0!	Concentration Time																											
Segment 18	Unloaded	#DIV/0!	Concentration Time																											
Segment 18	Loaded	44.47242	Concentration Time	26.61713 203335	35.65013 203338	45.10013 203341	60.02627 203344	41.13673 203347	40.25753 203350	41.92407 203353	36.42353 203356	59.8788 203359	57.01613 203402	38.01687 203405	30.8294 203408	21.90507 203411	25.56187 203414	37.36033 203417	38.94073 203420	33.97767 203423	45.11627 203426	60.9148 203429	57.2544 203432	44.51307 203435	36.82793 203438	32.51167 203441	34.37973 203444			
Segment 19	Unloaded	77.91134	Concentration Time	53.50927 203208	83.08893 203211	97.77833 203214	105.0555 203217	82.0434 203220	60.7166 203223	49.18667 203226	69.59687 203229	99.4446 203232	107.4741 203235	108.8616 203238	109.1727 203241	94.09073 203244	111.5434 203247	179.38 203250	168.9909 203253	87.39807 203256	44.879 203259	33.8788 203302	28.40113 203305	53.19967 203308	116.5451 203311	100.8039 203314	63.77647 203317			
Segment 19	Loaded	4.084459	Concentration Time	17.21227 200935	10.30587 200938	8.3228 200941	7.927333 200944	8.4538 200947	7.517533 200950	6.381 200953	5.0914 200956	4.891733 200959	5.1702 201002	4.9376 201005	4.741867 201008	4.654 201011	4.971867 201014	5.253467 201017	6.051933 201020	5.478333 201023	5.155733 201026	5.4396 201029	5.696133 201032	6.515667 201035	6.111 201038	5.177133 201041	6.272133 201044			
Segment 20	Unloaded	4.374887	Concentration Time	1.897667 201129	2.481867 201132	4.142067 201135	5.478733 201138	4.642067 201141	4.0388 201144	4.723467 201147	5.179 201150	4.9106 201153	5.830867 201156	7.5698 201159	7.312733 201202	5.7418 201205	4.240533 201208	3.288133 201211	2.792867 201214	2.918867 201217	3.928533 201220	4.319667 201223	3.900533 201226	4.511067 201229	9.825867 201232	13.61153 201235	13.69793 201238			
Segment 20	Loaded	16.64946	Concentration Time	8.9452 200629	12.90993 200632	18.76513 200635	20.2966 200638	18.39393 200641	14.55573 200644	11.92007 200647	10.7244 200650	8.535067 200653	8.338 200656	7.812933 200659	10.71247 200702	10.60607 200705	7.621267 200708	8.2146 200711	10.2658 200714	16.3046 200717	20.43787 200720	18.97287 200723	19.71167 200726	17.68973 200729	12.09913 200732	6.547267 200735	4.9584 200738			
Segment 21	Unloaded	5.170317	Concentration Time	5.140933 202029	4.864133 202032	4.878533 202035	4.8514 202038	5.823667 202041	7.757533 202044	8.45 202047	7.994467 202050	6.040467 202053	4.772 202056	4.7558 202059	5.3148 202102	5.606333 202105	4.250933 202108	3.642267 202111	3.7544 202114	3.3316 202117	3.519667 202120	4.3622 202123	4.622333 202126	4.245533 202129	4.576533 202132	3.4818 202135	2.649333 202138			
Segment 21	Loaded	#DIV/0!	Concentration Time																											
Segment 22	Unloaded	#DIV/0!	Concentration Time																											
Segment 22	Loaded	#DIV/0!	Concentration Time																											



## Run 33

Segment 1	Unloaded	Average #DIV/0!	Concentration Time																									
Segment 1	Loaded	10.41834	Concentration Time																									
Segment 14	Unloaded	3.523244	Concentration Time																									
Segment 14	Loaded	3.474388	Concentration Time	4.076467 200426	3.144867 200429	2.336933 200432	2.3994 200435	2.844267 200438	2.874733 200441	2.567267 200444	2.4658 200447	2.870533 200450	2.380067 200453	1.724867 200456	1.869267 200459	1.950467 200502	2.070733 200505	1.8376 200508	2.352133 200511	2.949533 200514	2.8874 200517	3.390533 200520	3.875 200523	3.2782 200526	3.272267 200529	4.4044 200532	5.6664 200535	
Segment 15	Unloaded	4.238025	Concentration Time	5.668133 203914	4.083733 203917	4.4724 203920	4.5576 203923	4.1014 203926	3.935667 203929	4.0628 203932	3.897333 203935	4.0644 203938	4.400467 203941	4.346533 203944	4.284267 203947	4.241267 203950	3.990333 203953	3.992 203956	4.6146 203959	5.090867 204002	5.561533 204005	4.941133 204008	3.965467 204011	4.427733 204014	4.651 204017	3.232067 204020	2.589467 204023	
Segment 15	Loaded	#DIV/0!	Concentration Time																									
Segment 16	Unloaded	#DIV/0!	Concentration Time																									
Segment 16	Loaded	#DIV/0!	Concentration Time																									
Segment 17	Unloaded	#DIV/0!	Concentration Time																									
Segment 17	Loaded	#DIV/0!	Concentration Time																									
Segment 18	Unloaded	#DIV/0!	Concentration Time																									
Segment 18	Loaded	44.47242	Concentration Time	47.21413 203447	53.43307 203450	84.6136 203453	77.8266 203456																					
Segment 19	Unloaded	77.91134	Concentration Time	49.75707 203320	35.95147 203323	21.5772 203326	18.7394 203329	24.5882 203332																				
Segment 19	Loaded	4.084459	Concentration Time	7.160533 201047	6.778133 201050	5.239933 201053	4.7716 201056	5.510533 201059	5.2738 201102	5.530133 201105	7.807067 201108	5.979933 201111	4.6716 201114	3.645067 201117	2.360333 201120	1.596133 201123			2.199067 201708	2.7224 201711	3.608667 201714	7.172733 201717	8.054067 201720	4.971133 201723	2.929867 201726	2.158333 201729	1.689333 201732	1.342067 201735
Segment 20	Unloaded	4.374887	Concentration Time	11.11187 201241	6.651333 201244	7.721733 201247	8.532867 201250	8.248867 201253	7.276133 201256	6.856667 201259	6.9024 201302	5.718467 201305	4.905733 201308	5.723067 201311	5.308267 201314			4.995933 201317	4.206267 201320	3.6266 201323	3.376067 201326	2.773267 201329	2.295467 201332	2.021933 201335	2.794333 201338	3.254333 201341	3.649133 201344	4.333867 201347
Segment 20	Loaded	16.64946	Concentration Time	7.5882 200741	14.72573 200744	14.87893 200747	9.4708 200750	12.40167 200753	17.64927 200756	13.6042 200759	17.97473 200802	25.9956 200805	33.55773 200808	24.90413 200811	18.3936 200814	12.5654 200817	12.92767 200820	16.95933 200823	21.6484 200826	33.24087 200829	32.20593 200832	19.5866 200835	9.433667 200838	6.7894 200841	6.064067 200844	6.310733 200847	11.69707 200850	
Segment 21	Unloaded	5.170317	Concentration Time	2.4292 202141	2.698533 202144	3.702267 202147	4.4172 202150	4.929 202153	5.205267 202156	5.299133 202159	4.599 202202	4.2506 202205	3.8662 202208	3.519733 202211	4.210067 202214	4.637467 202217	4.179133 202220	2.715333 202223	2.266933 202226	2.416867 202229	2.278733 202232	2.011 202235	1.986 202238	3.034933 202241	3.566267 202244	4.070933 202247	4.3264 202250	
Segment 21	Loaded	#DIV/0!	Concentration Time																									
Segment 22	Unloaded	#DIV/0!	Concentration Time																									
Segment 22	Loaded	#DIV/0!	Concentration Time																									



## Run 33

Segment 1	Unloaded	Average #DIV/0!	Concentration Time																															
Segment 1	Loaded	10.41834	Concentration Time																															
Segment 14	Unloaded	3.523244	Concentration Time																															
Segment 14	Loaded	3.474388	Concentration Time	5.445467 200538	6.139067 200541	7.4908 200544	7.183267 200547	5.8202 200550	6.000667 200553	7.0258 200556	5.923133 200559	4.5478 200602	3.9726 200605	4.699133 200608	5.7522 200611	4.1852 200614	4.074467 200617																	
Segment 15	Unloaded	4.238025	Concentration Time	3.098333 204026	3.865733 204029	2.163733 204032	1.520667 204035	1.777067 204038	1.458533 204041	2.481867 204044	2.716533 204047	1.324067 204050	1.283867 204053	1.6122 204056	1.808333 204059	1.6974 204102	1.588867 204105																	
Segment 15	Loaded	#DIV/0!	Concentration Time																															
Segment 16	Unloaded	#DIV/0!	Concentration Time																															
Segment 16	Loaded	#DIV/0!	Concentration Time																															
Segment 17	Unloaded	#DIV/0!	Concentration Time																															
Segment 17	Loaded	#DIV/0!	Concentration Time																															
Segment 18	Unloaded	#DIV/0!	Concentration Time																															
Segment 18	Loaded	44.47242	Concentration Time																															
Segment 19	Unloaded	77.91134	Concentration Time																															
Segment 19	Loaded	4.084459	Concentration Time	1.2462 201738	1.815133 201741	2.182867 201744	1.546267 201747	1.187067 201750	1.862667 201753	2.408467 201756	1.784933 201759	1.578733 201802	1.2624 201805	1.112067 201808	6.425333 201811	10.075 201814	5.370267 201817	3.929667 201820	2.972733 201823	2.571467 201826	2.3832 201829	2.1196 201832	2.078867 201835	2.1466 201838	2.480867 201841	3.330267 201844	3.928667 201847							
Segment 20	Unloaded	4.374887	Concentration Time	4.058867 201350	3.134333 201353	2.5066 201356	2.140467 201359	1.794667 201402	1.547533 201405	1.489133 201408	1.976733 201411	2.210533 201414	2.093533 201417	2.985533 201420	4.930133 201423	7.456467 201426	11.01507 201429	11.137 201432	8.898867 201435	5.9206 201438	4.647733 201441	4.704933 201444	5.143 201447	5.388733 201450	4.1746 201453	3.272533 201456	2.9104 201459							
Segment 20	Loaded	16.64946	Concentration Time	17.44973 200853	32.28673 200856	38.9284 200859	33.0736 200902	40.5496 200905	31.43713 200908	18.4518 200911	20.6266 200914	22.3806 200917	15.50653 200920	9.421 200923	9.1788 200926	13.17793 200929	23.8856 200932																	
Segment 21	Unloaded	5.170317	Concentration Time	4.006133 202253	4.0036 202256	3.4372 202259	2.601667 202302	2.721333 202305	2.841667 202308	2.5918 202311	2.459 202314	2.244133 202317	2.631 202320	3.407333 202323	12.73873 202326	38.8544 202329	30.7188 202332																	
Segment 21	Loaded	#DIV/0!	Concentration Time																															
Segment 22	Unloaded	#DIV/0!	Concentration Time																															
Segment 22	Loaded	#DIV/0!	Concentration Time																															



## Run 33

Segment 1	Unloaded	Average #DIV/0!	Concentration Time																								
Segment 1	Loaded	10.41834	Concentration Time																								
Segment 14	Unloaded	3.523244	Concentration Time																								
Segment 14	Loaded	3.474388	Concentration Time																								
Segment 15	Unloaded	4.238025	Concentration Time																								
Segment 15	Loaded	#DIV/0!	Concentration Time																								
Segment 16	Unloaded	#DIV/0!	Concentration Time																								
Segment 16	Loaded	#DIV/0!	Concentration Time																								
Segment 17	Unloaded	#DIV/0!	Concentration Time																								
Segment 17	Loaded	#DIV/0!	Concentration Time																								
Segment 18	Unloaded	#DIV/0!	Concentration Time																								
Segment 18	Loaded	44.47242	Concentration Time																								
Segment 19	Unloaded	77.91134	Concentration Time																								
Segment 19	Loaded	4.084459	Concentration Time	3.706467 201850	3.1578 201853	2.675 201856	2.669867 201859	2.3994 201902	1.888867 201905	1.548 201908	1.690333 201911	1.5416 201914	1.2882 201917	1.6458 201920	2.3678 201923	2.356 201926	1.7444 201929	1.635867 201932	1.606067 201935	0.808933 201938	0.4226 201941	0.5766 201944	0.771667 201947	0.798467 201950	0.381667 201953	0.871267 201956	1.780667 201959
Segment 20	Unloaded	4.374887	Concentration Time	2.3124 201502	1.8926 201505	1.946733 201508	2.004733 201511	2.604867 201514	2.483133 201517	1.898 201520	3.0508 201523	6.290933 201526	3.9198 201529	1.823667 201532	2.391267 201535	2.856067 201538	2.946067 201541	2.920133 201544	2.8528 201547	2.504933 201550	2.255467 201553	2.393533 201556	3.207933 201559	3.8354 201602	3.649333 201605	3.359 201608	3.634067 201611
Segment 20	Loaded	16.64946	Concentration Time																								
Segment 21	Unloaded	5.170317	Concentration Time																								
Segment 21	Loaded	#DIV/0!	Concentration Time																								
Segment 22	Unloaded	#DIV/0!	Concentration Time																								
Segment 22	Loaded	#DIV/0!	Concentration Time																								



## Run 34

Segment 1	Unloaded	Average 10.733	Concentration Time	11.4406 213213	13.27133 213216	17.46833 213219	19.44467 213222	13.09013 213225	10.44073 213228	9.743933 213231	8.8958 213234	6.986867 213237	6.017267 213240	5.333133 213243	6.662467 213246								
Segment 1	Loaded	#DIV/0!	Concentration Time																				
Segment 2	Unloaded	6.870	Concentration Time	10.4994 213249	12.87553 213252	17.4886 213255	24.499 213258	20.887 213301	17.9438 213304	17.71207 213307	16.8572 213310	15.3154 213313	14.471 213316	14.7798 213319	17.1176 213322	19.90887 213325	20.94733 213328	18.5176 213331	15.3462 213334	12.86727 213337	12.80193 213340	11.37707 213343	11.00193 213346
Segment 2	Loaded	#DIV/0!	Concentration Time																				
Segment 3	Unloaded	#DIV/0!	Concentration Time																				
Segment 3	Loaded	6.262	Concentration Time	9.285267 220228	8.549467 220231	6.983533 220234	6.670333 220237	6.182133 220240	5.685533 220243	5.6484 220246	6.584067 220249	7.640667 220252	9.399667 220255	9.837267 220258	9.100467 220301	7.6278 220304	8.0782 220307	9.285667 220310	9.136533 220313	9.434267 220316	10.23473 220319	9.5004 220322	7.4714 220325
Segment 4	Unloaded	2.501	Concentration Time	13.2392 213749	12.004 213752	8.7478 213755	5.305533 213758	2.272933 213801	1.273267 213804	1.223067 213807	1.304867 213810	1.159067 213813	1.135267 213816	1.570867 213819	1.885733 213822	1.918533 213825	2.359467 213828	2.172133 213831	1.4012 213834	0.783 213837	0.595733 213840	0.673933 213843	0.528733 213846
Segment 4	Loaded	14.118	Concentration Time	25.529 220031	22.46113 220034	18.1032 220037	14.94647 220040	15.20747 220043	11.15613 220046	10.455 220049	13.18253 220052	14.5532 220055	12.48427 220058	12.98233 220101	15.48547 220104	15.65027 220107	15.25287 220110	13.49527 220113	10.3476 220116	9.9668 220119	13.9142 220122	17.14393 220125	16.3544 220128
Segment 5	Unloaded	22.487	Concentration Time	18.4278 215534	20.455 215537	21.4644 215540	19.21713 215543	27.48573 215546	21.78667 215549	15.49713 215552	12.98553 215555	10.03267 215558	8.724933 215601	9.1504 215604	7.4758 215607	4.779267 215840	10.66627 215843	14.3514 215846	6.840933 215849	5.590733 215852	5.449067 215855	5.824867 215858	4.915933 215901
Segment 5	Loaded	27.667	Concentration Time	12.83353 215719	11.92487 215722	12.2472 215725	13.04887 215728	12.56653 215731	11.2432 215734	17.98847 215737	29.51467 215740	33.4524 215743	25.06913 215746	24.44993 215749	20.75607 215752	17.27213 215755	12.62153 215758	11.47527 215801	17.38107 215804	19.0396 215807	20.80133 215810	27.3592 215813	22.73033 215816
Segment 6	Unloaded	6.234	Concentration Time	12.17827 214022	5.6452 214025	3.980133 214028	3.972667 214031	3.1374 214034	3.535333 214037	4.3742 214040	4.550933 214043	4.870933 214046	3.877933 214049	3.978667 214052	3.8592 214055	3.636667 214058	3.423533 214101	3.0058 214104	2.2236 214107	1.069667 214110	1.271133 214113	1.176733 214116	1.263933 214119
Segment 6	Loaded	9.028	Concentration Time	8.4982 214313	6.447267 214316	7.0834 214319	10.8864 214322	12.3576 214325	7.9694 214328	6.3004 214331	12.77967 214334	15.37613 214337	12.6714 214340	9.078267 214343	9.201867 214346	13.66067 214349	23.87493 214352	31.79473 214355	23.0976 214358	9.512533 214401	6.135133 214404	8.9518 214407	22.04493 214410
Segment 7	Unloaded	14.441	Concentration Time	20.59293 215001	31.70353 215004	31.91387 215007	24.60993 215010	21.57453 215013	23.91907 215016	28.8576 215019	28.3982 215022	25.54307 215025	30.49253 215028	27.85193 215031	20.55053 215034	22.89153 215037	24.8398 215040	24.59353 215043	24.2058 215046	20.65213 215049	14.1656 215052	20.09173 215055	31.5658 215058
Segment 7	Loaded	15.475	Concentration Time	3.986667 214713	5.840733 214716	4.9474 214719	3.882667 214722	2.573333 214725	2.980533 214728	6.8062 214731	25.19533 214734	25.9904 214737	13.47353 214740	12.4446 214743	9.9508 214746	6.552667 214749	8.065 214752	12.3302 214755	12.606 214758	8.3114 214801	8.611667 214804	12.44573 214807	10.36287 214810
Segment 21	Unloaded	4.141	Concentration Time	2.6634 213940	2.413333 213943	3.2868 213946	2.8438 213949	2.0268 213952	1.9032 213955	2.155667 213958	2.683267 214001	4.6328 214004	5.984533 214007	5.5702 214010	4.667467 214013	2.750333 214016	6.350133 214019	12.17827 214022					
Segment 21	Loaded	14.157	Concentration Time	5.2412 215458	5.248 215501	5.490667 215504	5.629533 215507	5.437133 215510	6.095267 215513	7.9916 215516	11.1392 215519	7.956133 220010		10.73907 220013	20.29887 220016	35.96167 220019	34.26553 220022	25.9914 220025	24.8694 220028				
Segment 22	Unloaded	31.075	Concentration Time	77.32733 215952	61.36173 215955	24.63607 215958	11.1232 220001	8.4754 220004	15.33833 215522		31.05853 215525	30.60873 215528	19.74273 215531										
Segment 22	Loaded	15.596	Concentration Time	15.1146 215652	12.02987 215655	10.859 215658	16.06593 215701	22.0398 215704	14.85993 215707	13.60067 215710	17.2272 215713	18.57033 215716											



## Run 34

Segment 1	Unloaded	Average 10.733	Concentration Time																					
Segment 1	Loaded	#DIV/0!	Concentration Time																					
Segment 2	Unloaded	6.870	Concentration Time	10.89927 213349	8.3694 213352	7.4118 213355	8.896133 213358	9.78 213401	8.766333 213404	8.383867 213407	7.330067 213410	8.0498 213413	8.104933 213416	6.9336 213419	5.903667 213422	4.868533 213425	4.2902 213428	3.9004 213431	3.466133 213434	3.1694 213437	3.343 213440	3.5082 213443	3.367733 213446	
Segment 2	Loaded	#DIV/0!	Concentration Time																					
Segment 3	Unloaded	#DIV/0!	Concentration Time																					
Segment 3	Loaded	6.262	Concentration Time	6.5772 220328	6.591867 220331	6.872733 220334	7.450667 220337	6.0856 220340	5.750867 220343	5.8374 220346	5.547267 220349	5.098133 220352	5.002667 220355	4.371467 220358	3.927867 220401	4.280867 220404	3.5848 220407	2.605333 220410	2.8944 220413	4.3954 220416	6.241733 220419	8.974133 220422	9.297467 220425	
Segment 4	Unloaded	2.501	Concentration Time	0.4782 213849	0.653733 213852	1.253267 213855	1.2824 213858	0.5434 213901	0.420133 213904	0.385733 213907	0.188733 213910	0.6646 213913	2.815333 213916	2.895 213919	2.586933 213922	2.865667 213925	2.828733 213928	3.7082 213931	4.004533 213934	3.415333 213937				
Segment 4	Loaded	14.118	Concentration Time	15.63873 220131	13.2532 220134	7.643533 220137	8.251733 220140	7.778933 220143	6.273333 220146	5.704067 220149	7.632067 220152	13.76407 220155	15.56453 220158	18.21533 220201	34.3252 220204	26.35227 220207	11.9204 220210	11.23013 220213	11.00847 220216	11.89947 220219	11.34947 220222			
Segment 5	Unloaded	22.487	Concentration Time	3.974067 215904	5.354467 215907	14.63073 215910	22.16387 215913	33.82947 215916	33.39847 215919	24.2268 215922	29.33747 215925	47.92647 215928	77.62633 215931	64.3486 215934	47.42813 215937	32.4358 215940	28.3486 215943	38.501 215946	54.89307 215949					
Segment 5	Loaded	27.667	Concentration Time	20.57993 215819	30.8958 215822	29.94047 215825	18.334 215828	9.401867 215831	8.668467 215834	6.053 215837			9.3006 215613	60.71713 215616	83.54173 215619	50.77273 215622	41.31653 215625	36.88807 215628	34.78713 215631	31.8448 215634	55.37873 215637	78.36 215640	69.8022 215643	35.84807 215646
Segment 6	Unloaded	6.234	Concentration Time	2.047667 214122	2.250733 214125	2.377867 214128	2.476867 214131	2.123867 214134	2.128733 214137	3.221533 214140	5.525333 214143	5.433 214146	3.7412 214149	2.7538 214152	3.986667 214155	9.5984 214158	16.89653 214201	16.0556 214204	11.73573 214207	11.6604 214210	18.1362 214213	13.85713 214216	7.8176 214219	
Segment 6	Loaded	9.028	Concentration Time	29.01767 214413	17.25913 214416	8.6548 214419	6.662733 214422	7.139467 214425	6.727067 214428	4.2056 214431	3.715933 214434	3.521067 214437			6.173267 215331	9.161133 215334	10.42347 215337	8.685067 215340	8.144933 215343	7.854333 215346	6.239067 215349	6.032467 215352	5.808267 215355	5.7776 215358
Segment 7	Unloaded	14.441	Concentration Time	22.6986 215101	11.21267 215104	8.8516 215107	10.32087 215110	10.6326 215113	7.990467 215116	8.9484 215119	8.676 215122	6.437933 215125	4.5336 215128	6.810733 215131	12.96827 215134	18.4454 215137	16.07013 215140	10.81033 215143	15.06247 215146	18.50047 215149			4.5966 214625	3.688333 214628
Segment 7	Loaded	15.475	Concentration Time	10.27113 214813	8.949133 214816	6.8576 214819	18.58433 214822	36.9544 214825	41.50247 214828	49.30833 214831	50.37807 214834	38.2866 214837	28.22187 214840	30.73967 214843	35.97993 214846	27.26067 214849	16.555 214852	22.301 214855	28.0452 214858	26.49 214901	20.54193 214904	11.63447 214907	9.887267 214910	
Segment 21	Unloaded	4.141	Concentration Time																					
Segment 21	Loaded	14.157	Concentration Time																					
Segment 22	Unloaded	31.075	Concentration Time																					
Segment 22	Loaded	15.596	Concentration Time																					



## Run 34

Segment 1	Unloaded	Average 10.733	Concentration Time																				
Segment 1	Loaded	#DIV/0!	Concentration Time																				
Segment 2	Unloaded	6.870	Concentration Time	3.409933 213449	4.249 213452	4.9954 213455	4.5556 213458	4.624867 213501	6.836 213504	6.675733 213507	4.702067 213510	4.5966 213513	4.7668 213516	4.678133 213519	4.326933 213522	3.509267 213525	2.7718 213528	2.499667 213531	3.311667 213534	4.620933 213537	4.974667 213540	4.273333 213543	4.3538 213546
Segment 2	Loaded	#DIV/0!	Concentration Time																				
Segment 3	Unloaded	#DIV/0!	Concentration Time																				
Segment 3	Loaded	6.262	Concentration Time	8.377867 220428	8.522067 220431	7.9522 220434	7.340667 220437	11.02753 220440	21.9172 220443	33.4458 220446	25.60187 220449	11.46067 220452	6.721 220455	5.3116 220458	5.779667 220501	6.528733 220504	6.064467 220507	4.8794 220510	4.046333 220513	3.8324 220516	3.895533 220519	3.425333 220522	2.994667 220525
Segment 4	Unloaded	2.501	Concentration Time																				
Segment 4	Loaded	14.118	Concentration Time																				
Segment 5	Unloaded	22.487	Concentration Time																				
Segment 5	Loaded	27.667	Concentration Time	20.4726 215649																			
Segment 6	Unloaded	6.234	Concentration Time	9.287467 214222	12.8888 214225	17.153 214228	13.04113 214231	11.41227 214234	9.1852 214237	9.361533 214240	8.8446 214243	8.2116 214246	7.3644 214249	4.6518 214252	3.140133 214255	4.363067 214258	4.866733 214301	3.0992 214304	2.747467 214307	6.835067 214310			
Segment 6	Loaded	9.028	Concentration Time	6.647333 215401	6.291333 215404	5.679133 215407	5.323533 215410	4.613467 215413	3.804867 215416	4.017533 215419	4.015533 215422	4.1512 215425	4.8644 215428	5.470933 215431	7.133 215434	5.417333 215437	4.354067 215440	5.335733 215443	8.861733 215446	9.115333 215449	6.892467 215452	6.476867 215455	5.2412 215458
Segment 7	Unloaded	14.441	Concentration Time	5.997067 214631	9.937133 214634	11.9324 214637	8.324933 214640	4.212467 214643	2.222 214646	1.813133 214649	1.9768 214652	1.9778 214655	2.566067 214658	2.816933 214701	2.074867 214704	1.518067 214707	1.736933 214710						
Segment 7	Loaded	15.475	Concentration Time	8.553 214913	8.7504 214916	10.8678 214919	11.7294 214922	12.5882 214925	10.367 214928	9.413067 214931	9.0646 214934	7.3524 214937	6.578933 214940	8.076933 214943	8.680533 214946	8.6836 214949	8.655533 214952	8.275067 214955	12.86287 214958				
Segment 21	Unloaded	4.141	Concentration Time																				
Segment 21	Loaded	14.157	Concentration Time																				
Segment 22	Unloaded	31.075	Concentration Time																				
Segment 22	Loaded	15.596	Concentration Time																				



## Run 34

Segment 1	Unloaded	Average 10.733	Concentration Time																				
Segment 1	Loaded	#DIV/0!	Concentration Time																				
Segment 2	Unloaded	6.870	Concentration Time	3.5698 213549	2.941867 213552	4.197933 213555	6.225667 213558	6.037867 213601	5.628933 213604	5.186467 213607	4.103333 213610	2.973733 213613	2.556 213616	2.2598 213619	1.9794 213622	2.352933 213625	2.6594 213628	2.779 213631	2.649 213634	2.612067 213637	2.571067 213640	2.480267 213643	2.136267 213646
Segment 2	Loaded	#DIV/0!	Concentration Time																				
Segment 3	Unloaded	#DIV/0!	Concentration Time																				
Segment 3	Loaded	6.262	Concentration Time	2.936 220528	2.715733 220531	2.954 220534	3.427 220537	3.078467 220540	3.013 220543	2.309133 220546	2.133933 220549	2.014467 220552	2.024 220555	2.7062 220558	3.084667 220601	3.7302 220604	3.560133 220607	3.889533 220610	4.042333 220613	3.8582 220616	5.048933 220619	3.939133 220622	2.293933 220625
Segment 4	Unloaded	2.501	Concentration Time																				
Segment 4	Loaded	14.118	Concentration Time																				
Segment 5	Unloaded	22.487	Concentration Time																				
Segment 5	Loaded	27.667	Concentration Time																				
Segment 6	Unloaded	6.234	Concentration Time																				
Segment 6	Loaded	9.028	Concentration Time																				
Segment 7	Unloaded	14.441	Concentration Time																				
Segment 7	Loaded	15.475	Concentration Time																				
Segment 21	Unloaded	4.141	Concentration Time																				
Segment 21	Loaded	14.157	Concentration Time																				
Segment 22	Unloaded	31.075	Concentration Time																				
Segment 22	Loaded	15.596	Concentration Time																				



Run 36

Segment 1	Unloaded	Average	Concentration Time	0.7742	0.118867	0.112267	0.1564	0.179733	0.153733	0.1424	0.155667	0.2118	0.1764								
		0.218		143535	143538	143541	143544	143547	143550	143553	143556	143559	143602								
Segment 1	Loaded	0.253	Concentration Time	0.1988	0.251133	0.286733	0.2418	0.307267	0.277667	0.218267	0.203867	0.256533	0.287333								
				151802	151805	151808	151811	151814	151817	151820	151823	151826	151829								
Segment 14	Unloaded	0.775	Concentration Time	0.384733	0.340067	0.185	0.174267	0.173933	0.181533	0.159	0.166533	0.174667	0.161933	0.243267	0.3138	0.338333	0.392467	0.347533	0.3088	0.999267	2.303933
				143626	143629	143632	143635	143638	143641	143644	143647	143650	143653	143656	143659	143702	143705	143708	143711	143714	143717
Segment 14	Loaded	0.577	Concentration Time	0.724	0.835267	1.043333	1.187267	1.085667	0.8958	0.894533	0.8624	0.7924	0.779867	0.7936	0.749333	0.7648	0.831067	0.712	0.643733	0.755267	0.968933
				151444	151447	151450	151453	151456	151459	151502	151505	151508	151511	151514	151517	151520	151523	151526	151529	151532	151535
Segment 15	Unloaded	0.958	Concentration Time	0.315667	0.2952	0.3048	0.3384	0.3466	0.342	0.3024	0.273267	0.309	1.955667	5.2806	2.669	0.829667	0.425067	0.3866			
				145626	145629	145632	145635	145638	145641	145644	145647	145650	145653	145656	145659	145702	145705	145708			
Segment 15	Loaded	0.222	Concentration Time	0.284067	0.262467	0.2462	0.222667	0.237	0.2406	0.236533	0.23	0.240533	0.2358	0.2002	0.154333	0.160533	0.236533	0.204	0.160533		
				150105	150108	150111	150114	150117	150120	150123	150126	150129	150132	150135	150138	150141	150144	150147	150150		
Segment 16	Unloaded	0.428	Concentration Time	0.430467	0.5496	0.421067	0.339267	0.331867	0.278467	0.2738	0.301867	0.311067	0.302533	0.370933	0.7796	0.8568	0.597533	0.438	0.364733	0.411467	0.3986
				145711	145714	145717	145720	145723	145726	145729	145732	145735	145738	145741	145744	145747	145750	145753	145756	145759	145802
Segment 16	Loaded	0.836	Concentration Time	0.2892	0.247267	0.298867	0.2868	0.279133	0.293667	0.325	0.480933	0.571333	0.541067	0.484	0.407667	0.3882	0.458333	0.5228	0.646333	0.798867	0.787667
				145908	145911	145914	145917	145920	145923	145926	145929	145932	145935	145938	145941	145944	145947	145950	145953	145956	145959
Segment 17	Unloaded	0.117	Concentration Time	0.142267	0.159667	0.164067	0.1434	0.125467	0.134667	0.123467	0.1264	0.134267	0.122333	0.112533	0.106067	0.099	0.1028	0.1064	0.095067	0.089067	0.093067
				150202	150205	150208	150211	150214	150217	150220	150223	150226	150229	150232	150235	150238	150241	150244	150247	150250	150253
Segment 17	Loaded	0.395	Concentration Time	0.047467	0.086267	0.149333	0.2468	0.222467	0.219	0.164733	0.1658	0.173733	0.134933	0.102533	0.121533	0.136667	0.2252	0.2502	0.308533	0.357067	0.4496
				150935	150938	150941	150944	150947	150950	150953	150956	150959	151002	151005	151008	151011	151014	151017	151020	151023	151026
Segment 18	Unloaded	0.165	Concentration Time	0.062733	0.045333	0.046867	0.049467	0.074733	0.0596	0.055533	0.078867	0.0654	0.0664	0.055533	0.045533	0.060867	0.074733	0.049	0.062267	0.249467	0.495133
				150635	150638	150641	150644	150647	150650	150653	150656	150659	150702	150705	150708	150711	150714	150717	150720	150723	150726
Segment 18	Loaded	0.206	Concentration Time	0.1262	0.105667	0.127333	0.8234	1.2166	0.2892	0.1566	0.427133	0.4094	0.1982	0.1288	0.147	0.125733	0.112467	0.150267	0.150133	0.1182	0.111333
				150459	150502	150505	150508	150511	150514	150517	150520	150523	150526	150529	150532	150535	150538	150541	150544	150547	150550
Segment 19	Unloaded	0.516	Concentration Time	0.463267	0.474867	0.6548	0.815667	0.739	0.5736	1.2056	1.537267	0.434	0.396933	0.506	0.740867	0.579933	0.5846	0.603267	0.700267	0.740067	0.635733
				144959	145002	145005	145008	145011	145014	145017	145020	145023	145026	145029	145032	145035	145038	145041	145044	145047	145050
Segment 19	Loaded	0.556	Concentration Time	0.424933	0.3468	0.397133	0.484933	0.6062	0.871533	0.756733	0.612	0.564867	0.552867	1.368467	1.2406	0.7322	0.814	0.591733	0.5248	0.4808	0.3948
				144435	144438	144441	144444	144447	144450	144453	144456	144459	144502	144505	144508	144511	144514	144517	144520	144523	144526
Segment 20	Unloaded	0.212	Concentration Time	0.179933	0.282	0.3956	0.266	0.312933	0.345667	0.135933	0.133733	0.148533	0.159867	0.1522	0.2506	0.296867	0.145533	0.135533	0.140067	0.165733	0.1928
				143941	143944	143947	143950	143953	143956	143959	144002	144005	144008	144011	144014	144017	144020	144023	144026	144029	144032
Segment 20	Loaded	0.619	Concentration Time	0.767333	0.5414	0.509933	0.7358	0.928533	0.872267	0.6988	0.631133	0.5828	0.6624	0.934	0.934933	0.6366	0.4122	0.456333	0.616133	0.858667	0.9702
				145314	145317	145320	145323	145326	145329	145332	145335	145338	145341	145344	145347	145350	145353	145356	145359	145402	145405



Run 36

Segment 1	Unloaded	Average 0.218	Concentration Time																		
Segment 1	Loaded	0.253	Concentration Time																		
Segment 14	Unloaded	0.775	Concentration Time	1.031 143720	0.823 143723	1.534133 143726	1.506533 143729	0.502467 143732	0.3364 143735	3.910467 143738	6.288933 143741	1.368133 143744	0.593067 143747	0.1738 143750	0.165867 143753	0.174533 143756	0.169933 143759	0.194867 143802	0.206 143805	0.217867 143808	0.167133 143811
Segment 14	Loaded	0.577	Concentration Time	0.978133 151538	0.8054 151541	0.608267 151544	0.5456 151547	0.516467 151550	0.5056 151553	0.5082 151556	0.554333 151559	0.641733 151602	0.738467 151605	0.719133 151608	0.679933 151611	0.637667 151614	0.6116 151617	0.7072 151620	0.7788 151623	0.525 151626	0.468467 151629
Segment 15	Unloaded	0.958	Concentration Time																		
Segment 15	Loaded	0.222	Concentration Time																		
Segment 16	Unloaded	0.428	Concentration Time	0.366267 145805	0.424867 145808	0.469867 145811	0.4764 145814	0.4266 145817	0.3992 145820	0.469867 145823	0.538 145826	0.625067 145829	0.6904 145832	0.504133 145835	0.346267 145838	0.3168 145841	0.3394 145844	0.382933 145847	0.408267 145850	0.382133 145853	0.337067 145856
Segment 16	Loaded	0.836	Concentration Time	0.778267 150002	0.831333 150005	0.861467 150008	1.2994 150011	1.968333 150014	1.272067 150017	0.761067 150020	0.728133 150023	1.019133 150026	0.893867 150029	0.619133 150032	0.517267 150035	0.529867 150038	0.3322 150041	0.3052 150044	0.257933 150047	0.2572 150050	0.246267 150053
Segment 17	Unloaded	0.117	Concentration Time	0.094467 150256	0.084867 150259	0.077 150302	0.093333 150305	0.118933 150308	0.135267 150311	0.107267 150314	0.0876 150317	0.096467 150320	0.104467 150323	0.109933 150326	0.099333 150329	0.101933 150332	0.124267 150335	0.149533 150338	0.199267 150341	0.1482 150344	
Segment 17	Loaded	0.395	Concentration Time	0.584867 151029	0.575867 151032	0.474733 151035	0.316533 151038	0.378667 151041	0.294667 151044		0.789867 151350	0.722733 151353	0.636133 151356	0.602067 151359	0.5484 151402	0.577133 151405	0.6424 151408	0.501467 151411	0.562 151414	0.650133 151417	0.6348 151420
Segment 18	Unloaded	0.165	Concentration Time	0.536333 150729	0.403867 150732	0.538733 150735	0.7386 150738	0.347 150741	0.189667 150744	0.120867 150747	0.057 150750	0.056 150753	0.039933 150756	0.050267 150759	0.120333 150802	0.213133 150805					
Segment 18	Loaded	0.206	Concentration Time	0.114933 150553	0.1092 150556	0.067333 150559	0.066533 150602	0.099467 150605	0.084533 150608	0.084533 150611	0.104867 150614	0.050267 150617	0.056667 150620	0.173667 150623	0.329533 150626	0.227467 150629	0.0936 150632				
Segment 19	Unloaded	0.516	Concentration Time	0.530933 145053	0.425933 145056	0.572133 145059	1.007267 145102	1.089533 145105	0.865467 145108	0.7284 145111	0.592933 145114	0.508267 145117	0.525867 145120	0.627 145123	0.550067 145126	0.499467 145129	0.4864 145132	0.4048 145135	0.399 145138	0.440133 145141	0.4288 145144
Segment 19	Loaded	0.556	Concentration Time	0.435267 144529	0.463933 144532	0.461467 144535	0.4654 144538	0.454867 144541	0.382333 144544	0.332933 144547	0.343267 144550	0.372 144553	0.458533 144556	0.439933 144559	0.391533 144602	0.4074 144605	2.106467 144608	2.904733 144611	0.4202 144614	0.419 144617	0.4346 144620
Segment 20	Unloaded	0.212	Concentration Time	0.189067 144035	0.1554 144038	0.142267 144041	0.146067 144044	0.1652 144047	0.144533 144050	0.147 144053	0.168133 144056	0.1782 144059	0.175667 144102	0.181667 144105	0.209733 144108	0.215467 144111	0.195133 144114	0.196667 144117	0.2174 144120	0.256933 144123	0.262133 144126
Segment 20	Loaded	0.619	Concentration Time	0.8042 145408	0.6638 145411	0.6686 145414	0.786667 145417	0.585067 145420	0.427467 145423	0.374333 145426	0.2888 145429	0.335533 145432	0.3666 145435	0.3736 145438	0.4986 145441	0.992867 145444	1.664 145447	1.235467 145450	0.694933 145453	0.401267 145456	0.3488 145459



Run 36

Segment 1	Unloaded	Average 0.218	Concentration Time																		
Segment 1	Loaded	0.253	Concentration Time																		
Segment 14	Unloaded	0.775	Concentration Time	0.1348 143814	0.149467 143817	0.2152 143820	0.269933 143823	0.5088 143826	0.664667 143829	0.3512 143832	0.250133 143835	0.2448 143838	0.7772 143841	0.878533 143844	0.203933 143847	0.342 143850	0.331867 143853	0.262467 143856	0.257867 143859	0.1962 143902	0.185933 143905
Segment 14	Loaded	0.577	Concentration Time	0.4338 151632	0.431933 151635	0.382133 151638	0.392133 151641	0.397133 151644	0.420533 151647	0.4876 151650	0.423333 151653	0.362733 151656	0.379733 151659	0.3568 151702	0.378133 151705	0.390667 151708	0.330267 151711	0.250267 151714	0.235333 151717	0.242867 151720	0.23 151723
Segment 15	Unloaded	0.958	Concentration Time																		
Segment 15	Loaded	0.222	Concentration Time																		
Segment 16	Unloaded	0.428	Concentration Time	0.352467 145859	0.347267 145902	0.333933 145905															
Segment 16	Loaded	0.836	Concentration Time	4.244467 150056	6.343933 150059	0.4198 150102															
Segment 17	Unloaded	0.117	Concentration Time																		
Segment 17	Loaded	0.395	Concentration Time	0.525667 151423	0.503267 151426	0.565 151429	0.741333 151432														
Segment 18	Unloaded	0.165	Concentration Time																		
Segment 18	Loaded	0.206	Concentration Time																		
Segment 19	Unloaded	0.516	Concentration Time	0.368467 145147	0.363 145150	0.396067 145153	0.425867 145156	0.435867 145159	0.4174 145202	0.3254 145205	0.303667 145208	0.3194 145211	0.308 145214	0.291333 145217	0.276533 145220	0.286933 145223	0.277933 145226	0.272733 145229	0.271533 145232	0.298533 145235	0.275933 145238
Segment 19	Loaded	0.556	Concentration Time	0.4074 144623	0.390667 144626	0.465 144629	0.5296 144632	0.403067 144635	0.358533 144638	0.3808 144641	0.430333 144644	0.431667 144647	0.396533 144650	0.394867 144653	0.378733 144656	0.4304 144659	0.501267 144702	0.441533 144705	0.426133 144708	0.426133 144711	0.367933 144714
Segment 20	Unloaded	0.212	Concentration Time	0.217133 144129	0.266733 144132	0.276467 144135	0.1768 144138	0.197267 144141	0.276333 144144	0.258867 144147	0.2042 144150	0.2224 144153	0.2946 144156	0.296067 144159	0.336333 144202	0.312533 144205	0.230467 144208	0.214333 144211	0.203267 144214	0.173267 144217	0.2354 144220
Segment 20	Loaded	0.619	Concentration Time	0.3242 145502	0.312733 145505	0.294667 145508	0.3278 145511	0.314733 145514	0.277267 145517	0.3098 145520	0.3508 145523	0.3816 145526	0.403 145529	0.512067 145532	0.651133 145535	0.770533 145538	0.821333 145541	0.7578 145544	1.066 145547	1.4504 145550	0.788067 145553



## Run 36

Segment 1	Unloaded	Average 0.218	Concentration Time																			
Segment 1	Loaded	0.253	Concentration Time																			
Segment 14	Unloaded	0.775	Concentration Time	0.534133 143908	0.733267 143911	7.7956 143914	5.238333 143917	0.174 143920	0.167133 143923	0.194733 143926	0.255733 143929											
Segment 14	Loaded	0.577	Concentration Time	0.2474 151726	0.263 151729	0.228867 151732	0.293533 151735	0.293067 151738	0.243333 151741	0.247933 151744												
Segment 15	Unloaded	0.958	Concentration Time																			
Segment 15	Loaded	0.222	Concentration Time																			
Segment 16	Unloaded	0.428	Concentration Time																			
Segment 16	Loaded	0.836	Concentration Time																			
Segment 17	Unloaded	0.117	Concentration Time																			
Segment 17	Loaded	0.395	Concentration Time																			
Segment 18	Unloaded	0.165	Concentration Time																			
Segment 18	Loaded	0.206	Concentration Time																			
Segment 19	Unloaded	0.516	Concentration Time	0.2736 145241	0.2912 145244	0.2868 145247	0.291267 145250	0.294933 145253	0.282533 145256	0.298667 145259	1.3384 145302	2.678867 145305	1.604267 145308			0.4506 144250	0.435267 144253	0.385067 144256	0.3456 144259	0.326133 144302	0.338267 144305	0.337067 144308
Segment 19	Loaded	0.556	Concentration Time	0.494867 144717	0.574 144720	0.498267 144723	0.4634 144726	0.4124 144729	0.351067 144732	0.4946 144735	0.614733 144738	0.5108 144741	0.5728 144744	0.5292 144747	0.469533 144750	0.468533 144753	0.380667 144756	0.451067 144759	0.461533 144802	0.3568 144805	0.370867 144808	
Segment 20	Unloaded	0.212	Concentration Time	0.287067 144223	0.206533 144226	0.1696 144229	0.1686 144232	0.172333 144235	0.173933 144238	0.204133 144241												
Segment 20	Loaded	0.619	Concentration Time	0.4948 145556	0.4574 145559	0.410333 145602	0.430067 145605	0.4458 145608	0.499 145611													



## Run 36

Segment 1	Unloaded	Average 0.218	Concentration Time																		
Segment 1	Loaded	0.253	Concentration Time																		
Segment 14	Unloaded	0.775	Concentration Time																		
Segment 14	Loaded	0.577	Concentration Time																		
Segment 15	Unloaded	0.958	Concentration Time																		
Segment 15	Loaded	0.222	Concentration Time																		
Segment 16	Unloaded	0.428	Concentration Time																		
Segment 16	Loaded	0.836	Concentration Time																		
Segment 17	Unloaded	0.117	Concentration Time																		
Segment 17	Loaded	0.395	Concentration Time																		
Segment 18	Unloaded	0.165	Concentration Time																		
Segment 18	Loaded	0.206	Concentration Time																		
Segment 19	Unloaded	0.516	Concentration Time	0.2954 144311	0.221267 144314	0.198933 144317	0.197267 144320	0.202733 144323	0.181 144326	0.152133 144329	0.192933 144332	0.231867 144335	0.409667 144338	0.585733 144341	0.5 144344	0.701733 144347	0.7074 144350	0.534467 144353	0.472467 144356	0.589267 144359	0.6628 144402
Segment 19	Loaded	0.556	Concentration Time	0.430267 144811	0.540133 144814	0.6106 144817	0.528667 144820	0.4972 144823	0.6272 144826	0.608467 144829	0.481467 144832	0.4598 144835	0.462667 144838	0.473467 144841	0.645733 144844	0.710933 144847	0.585267 144850	0.436867 144853	0.4824 144856	0.634067 144859	0.528 144902
Segment 20	Unloaded	0.212	Concentration Time																		
Segment 20	Loaded	0.619	Concentration Time																		



## Run 37

Segment 1	Unloaded	Average 6.014	Concentration Time	2.3632 193038	2.8282 193041	2.950867 193044	3.187533 193047	3.247867 193050	3.109733 193053	3.254 193056	3.909067 193059	3.725 193102	10.65293 204958	9.246133 205001	8.012333 205004	7.269067 205007	7.8902 205010	8.480467 205013	8.135067 205016	8.7316 205019	8.8594 205022	8.420933 205025												
Segment 1	Loaded	#DIV/0!	Concentration Time																															
Segment 2	Unloaded	2.496	Concentration Time	4.043 193123	3.364133 193126	3.099533 193129	2.6108 193132	2.658 193135	2.758867 193138	2.9902 193141	2.986667 193144	3.4524 193147	3.953067 193150	4.357667 193153	4.370467 193156	3.409267 193159	2.800733 193202	2.9704 193205	3.3206 193208	2.890933 193211	2.4204 193214	2.390467 193217	2.2102 193220	2.3286 193223	2.630667 193226	2.731467 193229	2.684333 193232	2.753933 193235	2.760933 193238	2.732867 193241	2.730133 193244	2.377533 193247	2.202133 193250	2.066333 193253
Segment 2	Loaded	#DIV/0!	Concentration Time																															
Segment 3	Unloaded	#DIV/0!	Concentration Time																															
Segment 3	Loaded	40.593	Concentration Time	61.95387 204410	144.6038 204413	117.2101 204416	36.6584 204419	20.61827 204422	21.1876 204425	27.10493 204428	25.67393 204431	37.95873 204434	34.32947 204437	16.9774 204440	14.63013 204443	12.98953 204446	9.9142 204449	8.523867 204452	8.8396 204455	10.41907 204458	12.79147 204501	16.11327 204504	14.59493 204507	15.4884 204510	18.31493 204513	14.73393 204516	13.15213 204519	16.23727 204522	15.28807 204525	17.15307 204528	24.1334 204531	28.2386 204534	28.45353 204537	44.14587 204540
Segment 4	Unloaded	3.317	Concentration Time	1.470267 193617	1.501133 193620	1.3682 193623	1.288067 193626	1.3402 193629	1.5898 193632	1.633733 193635	1.696467 193638	1.720267 193641	1.733067 193644	2.575333 193647	4.282933 193650	5.897467 193653	6.7614 193656	6.720067 193659	4.866267 193702	3.688333 193705	3.791933 193708	3.5586 193711	3.039933 193714	2.662667 193717	2.1984 193720	2.1436 193723	2.192267 193726	2.388867 193729	2.754733 193732	3.4406 193735	4.754267 193738	5.189 193741	4.939933 193744	4.289067 193747
Segment 4	Loaded	27.458	Concentration Time	68.5438 201910	60.9942 201913	40.667 201916	26.2748 201919	19.05427 201922	15.0512 201925	12.86467 201928	14.2772 201931	16.62613 201934	15.6168 201937	14.5918 201940	14.33887 201943	13.605 201946	12.80467 201949	12.35567 201952	12.12927 201955	12.12387 201958	12.4194 202001	12.81793 202004	12.55427 202007	11.33913 202010	10.03593 202013	9.4732 202016	10.3306 202019	11.34433 202022	10.15553 202025	8.6184 202028	7.876 202031	8.9646 202034	11.59853 202037	13.52413 202040
Segment 5	Unloaded	45.481	Concentration Time	8.315867 201719	8.160933 201722	7.932467 201725	7.525533 201728	6.9388 201731	7.007733 201734	8.264067 201737	8.999933 201740	9.965733 201743	9.258467 201746	8.142733 201749	7.244533 201752	9.1756 201755	17.68307 201758	28.8124 201801	35.84413 201804	40.58073 201807	44.846 201810	67.61913 201813	129.5566 201816	122.5715 201819	52.4782 201822	25.48187 201825	25.01947 201828	17.26507 201831		79.66147 194817	90.146 194820	122.1441 194823	160.5241 194826	162.7569 194829
Segment 5	Loaded	75.136	Concentration Time	190.0818 201601	180.0261 201604	146.5324 201607	81.13093 201610	58.95873 201613	61.15827 201616	84.93713 201619	79.177 201622	59.2402 201625	50.4708 201628	61.9976 201631	56.98253 201634	61.29013 201637	71.14527 201640	63.25473 201643	36.4292 201646	20.5876 201649	16.21533 201652	12.56667 201655	12.45193 201658	18.27733 201701	15.77067 201704	12.49007 201707	19.6586 201710	15.46907 201713	9.163333 201716		38.2978 194717	61.28967 194720	130.5927 194723	193.8379 194726
Segment 6	Unloaded	53.494	Concentration Time	7.519133 193847	6.7656 193850	6.266667 193853	5.37 193856	5.2846 193859	5.376533 193902	5.859733 193905	6.182333 193908	5.602 193911	4.928 193914	5.3118 193917	5.874133 193920	5.931667 193923	5.208733 193926	5.506867 193929	7.125133 193932	10.8602 193935	11.43593 193938	9.633 193941	7.7268 193944	5.430067 193947	4.6188 193950	5.337933 193953	6.045333 193956	5.6572 193959	9.2162 194002	11.12367 194005	16.06873 194008	26.6922 194011	28.2538 194014	17.9946 194017
Segment 6	Loaded	101.235	Concentration Time	113.4471 194135	169.9484 194138	172.7985 194141	143.5398 194144	159.2205 194147	215.4371 194150	164.46 194153	169.6103 194156	217.6609 194159	181.5369 194202	235.393 194205	259.9999 194208	216.2101 194211	188.6969 194214	266.3795 194217	316.1997 194220	258.3655 194223	208.6304 194226	265.1887 194229	245.2092 194232	160.4064 194235	108.7378 194238	89.33313 194241	57.2496 194244	39.60047 194247	36.94113 194250	38.44313 194253	35.72387 194256	33.62813 194259	32.6204 194302	33.1242 194305
Segment 7	Unloaded	#DIV/0!	Concentration Time																															
Segment 7	Loaded	#DIV/0!	Concentration Time																															
Segment 8	Unloaded	8.325	Concentration Time	5.995467 203804	7.269 203807	7.729667 203810	6.756067 203813	6.1616 203816	5.580133 203819	5.969 203822	6.2214 203825	6.200467 203828	5.655 203831	6.119467 203834	7.367667 203837	7.305133 203840	6.043 203843	5.493467 203846	6.0278 203849	6.002867 203852	5.858933 203855	5.700867 203858	5.102067 203901	5.664533 203904	7.6746 203907	10.6364 203910	10.47193 203913	10.4102 203916	12.38833 203919	11.514 203922	9.187133 203925	9.1158 203928	10.42553 203931	10.9392 203934
Segment 8	Loaded	22.309	Concentration Time	20.01267 202319	24.11447 202322	21.04853 202325	18.37713 202328	17.35273 202331	14.58847 202334	14.56533 202337	14.2196 202340	14.47333 202343	15.64893 202346	16.96227 202349	18.2364 202352	27.08107 202355	32.556 202358	29.00753 202401	26.2364 202404	21.1578 202407	25.30507 202410	26.98627 202413	17.80227 202416	14.51873 202419	11.08227 202422	11.31813 202425	12.63647 202428	12.9692 202431	12.85607 202434	12.47607 202437	13.8152 202440	15.61027 202443	14.93287 202446	11.65527 202449
Segment 9	Unloaded	9.243	Concentration Time	11.95893 204125	10.98427 204128	6.937933 204131	6.2692 204134	6.584733 204137	7.017933 204140	15.22567 204143	22.43073 204146	16.15613 204149	11.8866 204152	8.801267 204155	6.775267 204158	6.428467 204201	6.461667 204204	6.779667 204207	7.036467 204210	8.427533 204213	7.587667 204216	6.003733 204219	5.107533 204222											
Segment 9	Loaded	45.318	Concentration Time	13.65853 202219	19.67027 202222	15.44413 202225	26.05747 202228	51.30487 202231	73.1452 202234	50.7184 202237	20.48893 202240	20.59273 202243	26.60273 202246	40.77167 202249	46.48447 202252	31.60393 202255	49.96867 202258	105.4283 202301	122.6953 202304	77.71687 202307	61.5852 202310	33.08 202313	19.344 202316											
Segment 10	Unloaded	#DIV/0!	Concentration Time																															
Segment 10	Loaded	7.017	Concentration Time	6.426533 204252	6.087533 204255	8.545267 204258	10.26587 204301	7.290067 204304	6.7212 204307	6.471667 204310	8.1972 204313	10.16593 204316	9.549933 204319	9.217 204322	8.535133 204325	8.261667 204328	7.939333 204331	6.862067 204334	6.478333 204337	5.665267 204340	5.418733 204343	4.934533 204346	4.492533 204349	4.690267 204352	5.125867 204355	5.411533 204358	5.664467 204401							
Segment 11	Unloaded	19.812	Concentration Time	11.51093 202713	11.64673 202716	13.65767 202719	14.76547 202722	13.0288 202725	12.16273 202728	14.79807 202731	17.31 202734	16.63793 202737	15.6936 202740	12.9876 202743	13.25453 202746	12.70527 202749	11.6352 202752	10.50487 202755	9.7706 202758	10.25873 202801	9.929467 202804	9.782667 202807	9.844867 202810	9.0762 202813	9.906333 202816	8.881267 202819	9.7472 202822	10.84947 202825	9.5934 202828	10.7536 202831	17.04933 202834	17.14113 202837	12.7902 202840	10.23207 202843
Segment 11	Loaded	24.840	Concentration Time	47.57307 203122	36.63313 203125	49.4546 203128	102.7333 203131	111.1929 203134	88.6648 203137	54.47073 203140	51.5804 203143	41.71613 203146	31.77973 203149	34.6906 203152	39.96453 203155	28.97707 203158	18.92933 203201	19.4614 203204	25.77447 203207	41.03153 203210	88.03793 203213	116.1711 203216	70.1398 203219	41.26673 203222	29.0866 203225	25.814 203228	26.18073 203231	27.27233 203234	25.23527 203237	20.15033 203240	16.3466 203243	15.6602 203246	17.629 203249	24.63153 203252
Segment 12	Unloaded	36.554	Concentration Time	12.2166 205225	9.314533 205228	8.604667 205231	17.64933 205234	23.92427 205237	16.84473 205240	12.6982 205243	9.431133 205246	8.4762 205249	8.860667 205252	9.4166 205255	8.352067 205258	9.730667 205301	9.9388 205304	7.595867 205307	7.858133 205310	8.921467 205313	8.619667 205316	8.096867 205319	8.234133 205322	10.51187 205325	11.6454 205328	13.96887 205331	15.73153 205334	11.427 205337	10.6112 205340	9.136067 205343	8.623467 205346	9.401667 205349	9.844 205352	10.5178 205355
Segment 12	Loaded	#DIV/0!	Concentration Time																															
Segment 13	Unloaded	45.319	Concentration Time	271.628 205710	167.7845 205713	73.90253 205716	44.76713 205719	32.991 205722	30.08053 205725	30.96173 205728	38.5636 205731	38.01127 205734	28.68667 205737	28.57667 205740	26.5692 205743	22.85193 205746	23.59693 205749	25.23807 205752	24.79547 205755	25.98387 205758	26.3288 205801	31.67647 205804	38.46747 205807	38.583 205810	57.98567 205813	80.6994 205816	58.549 205819	36.67267 205822	34.85033 205825	39.39293 205828	42.84247 205831	40.00327 205834	34.4092 205837	31.59507 205840
Segment 13	Loaded	40.835	Concentration Time	24.933 210004	22.4038 210007	15.7212 210010	13.8746 210013	15.6358 210016	15.15853 210019	14.0174 210022	15.0474 210025	16.07547 210028	15.4374 210031	19.12127 210034	26.1016 210037	26.69067 210040	27.86087 210043	30.34913 210046	32.04133 210049	38.7184 210052	46.17833 210055	78.60973 210058	114.4288 210101	128.0277 210104	137.819 210107	106.3781 21								







## Run 37

Segment 1	Unloaded	Average 6.014	Concentration Time																																	
Segment 1	Loaded	#DIV/0!	Concentration Time																																	
Segment 2	Unloaded	2.496	Concentration Time	2.484 193429	2.31 193432	2.040467 193435	1.905733 193438	2.017933 193441	1.952467 193444	1.801667 193447	1.936933 193450	2.151067 193453	2.262333 193456	2.039133 193459	1.920533 193502	1.9258 193505	1.875667 193508	1.998533 193511	1.9164 193514	1.585133 193517	1.412267 193520	1.502933 193523	1.854 193526	1.875267 193529	1.726333 193532	1.819933 193535	1.821267 193538	1.755533 193541	1.7094 193544	1.688867 193547	2.0624 193550	1.990333 193553	1.598267 193556	1.573533 193559		
Segment 2	Loaded	#DIV/0!	Concentration Time																																	
Segment 3	Unloaded	#DIV/0!	Concentration Time																																	
Segment 3	Loaded	40.593	Concentration Time	44.8522 204716	40.10033 204719	30.0974 204722	22.8864 204725	15.59013 204728	12.55433 204731	12.2964 204734	12.79107 204737	13.2784 204740	14.21693 204743	17.74973 204746	28.58607 204749	35.9866 204752	47.89133 204755	48.067 204758	39.255 204801	30.68287 204804	21.9558 204807	18.7472 204810	19.7114 204813	20.04113 204816	20.34173 204819	23.75687 204822	20.58567 204825	15.73327 204828	14.17307 204831	13.74067 204834	12.83467 204837	13.32993 204840	12.18433 204843	10.34487 204846		
Segment 4	Unloaded	3.317	Concentration Time																																	
Segment 4	Loaded	27.458	Concentration Time																																	
Segment 5	Unloaded	45.481	Concentration Time																																	
Segment 5	Loaded	75.136	Concentration Time																																	
Segment 6	Unloaded	53.494	Concentration Time																																	
Segment 6	Loaded	101.235	Concentration Time																																	
Segment 7	Unloaded	#DIV/0!	Concentration Time																																	
Segment 7	Loaded	#DIV/0!	Concentration Time																																	
Segment 8	Unloaded	8.325	Concentration Time	5.578133 204110	5.452133 204113	5.6796 204116	8.078267 204119	9.8466 204122																												
Segment 8	Loaded	22.309	Concentration Time	22.16453 202625	14.96947 202628	15.94047 202631	16.64973 202634	14.46307 202637	13.2406 202640	24.44293 202643	31.38833 202646																									
Segment 9	Unloaded	9.243	Concentration Time																																	
Segment 9	Loaded	45.318	Concentration Time																																	
Segment 10	Unloaded	#DIV/0!	Concentration Time																																	
Segment 10	Loaded	7.017	Concentration Time																																	
Segment 11	Unloaded	19.812	Concentration Time	15.6174 203019	13.63393 203022	12.39907 203025	11.22967 203028	12.71687 203031	17.43613 203034	22.10707 203037	23.06813 203040	21.64993 203043	29.19347 203046	30.36313 203049	24.65113 203052	16.9918 203055	17.29433 203058	36.34753 203101	79.3148 203104	105.6437 203107	66.51853 203110	38.30273 203113	33.09167 203116	35.37093 203119												
Segment 11	Loaded	24.840	Concentration Time	10.02467 203428	12.2158 203431	12.8046 203434	11.15047 203437	12.03047 203440	12.71467 203443	11.46133 203446	12.32307 203449	13.688 203452	10.24587 203455	9.5692 203458	11.29853 203501	14.0832 203504	13.61893 203507	9.721133 203510	7.041133 203513	6.721733 203516	8.1262 203519	8.3994 203522	11.5038 203525	14.343 203528												
Segment 12	Unloaded	36.554	Concentration Time	47.63193 205531	40.06133 205534	34.95713 205537	31.28953 205540	34.9436 205543	37.99113 205546	43.74347 205549	44.44073 205552	34.63813 205555	35.59253 205558	31.134 205601	27.777 205604	36.51147 205607	41.21807 205610	38.48893 205613	33.31533 205616	35.57713 205619	37.77127 205622	35.92 205625	31.5212 205628	24.79967 205631	37.3864 205634	79.55147 205637	81.27327 205640	55.372 205643	45.85967 205646	40.98647 205649	39.7436 205652	35.72047 205655	40.82633 205658	50.7542 205701		
Segment 12	Loaded	#DIV/0!	Concentration Time																																	
Segment 13	Unloaded	45.319	Concentration Time																																	
Segment 13	Loaded	40.835	Concentration Time																																	
Segment 21	Unloaded	14.996	Concentration Time																																	
Segment 21	Loaded	65.341	Concentration Time																																	
Segment 22	Unloaded	74.666	Concentration Time																																	
Segment 22	Loaded	102.905	Concentration Time																																	



## Run 38

Segment 1	Unloaded	Average 1.326	Concentration Time	0.379333 142901	0.505533 142904	0.721733 142907	0.816733 142910	0.827267 142913	1.669267 142916	1.8624 142919	2.1212 142922	2.106 142925	1.812267 142928	2.0558 142931	1.240333 142934	1.1146 142937										
Segment 1	Loaded	#DIV/0!	Concentration Time																							
Segment 2	Unloaded	1.291	Concentration Time	3.344 142946	2.365533 142949	2.105133 142952	1.816733 142955	1.885133 142958	1.9578 143001	1.601 143004	1.793467 143007	1.490867 143010	1.156333 143013	1.088867 143016	0.974867 143019	0.895 143022	0.9078 143025	1.224533 143028	1.2496 143031	1.058933 143034	0.855467 143037	0.7706 143040	0.813667 143043	0.828733 143046	0.850667 143049	
Segment 2	Loaded	#DIV/0!	Concentration Time																							
Segment 3	Unloaded	#DIV/0!	Concentration Time																							
Segment 3	Loaded	6.747	Concentration Time	24.49907 151200	14.11327 151203	14.53393 151206	10.18827 151209	7.805267 151212	7.462733 151215	8.274533 151218	8.578 151221	7.461933 151224	6.487333 151227	6.2722 151230	5.771 151233	5.0314 151236	4.794467 151239	4.889667 151242	4.809133 151245	4.663533 151248	5.096867 151251	5.8128 151254	6.231467 151257	6.338933 151300	6.916267 151303	
Segment 4	Unloaded	1.170	Concentration Time	1.083733 143440	1.203533 143443	1.404733 143446	1.992067 143449	3.010867 143452	2.205 143455	1.628333 143458	1.6736 143501	1.599933 143504	1.347133 143507	1.154867 143510	1.142733 143513	1.295 143516	1.971733 143519	1.766467 143522	1.3624 143525	1.150133 143528	1.0122 143531	1.001933 143534	1.0972 143537	1.159667 143540	1.051067 143543	
Segment 4	Loaded	6.013	Concentration Time	4.573933 145733	4.217533 145736	4.799333 145739	4.6366 145742	4.021467 145745	3.743 145748	3.7364 145751	3.6474 145754	4.197933 145757	5.6828 145800	6.240267 145803	5.063667 145806	4.398267 145809	4.3034 145812	4.3878 145815	4.086533 145818	4.010333 145821	4.196867 145824	4.883133 145827	5.4554 145830	6.132533 145833	10.17787 145836	
Segment 5	Unloaded	18.787	Concentration Time	6.3316 145539	6.4346 145542	7.513267 145545	7.159467 145548	4.940267 145551	4.996067 145554	4.965533 145557	4.6312 145600	4.6134 145603	4.660733 145606	5.021733 145609	4.6732 145612	5.522 145615	11.2314 145618	22.01307 145621	23.6452 145624	10.6362 145627	5.826933 145630	4.848733 145633	6.0296 145636	19.81587 145639	64.69313 145642	
Segment 5	Loaded	71.803	Concentration Time	212.3376 145418	177.5606 145421	148.2917 145424	87.93253 145427	32.52907 145430	22.03827 145433	28.72093 145436	2.804333 145315		4.6368 145318	26.4794 145321	62.84127 145324	76.52813 145327	52.32927 145330	49.819 145333	60.19887 145336	84.90427 145339	83.6924 145342	72.94613 145345	77.66053 145348			
Segment 6	Unloaded	0.835	Concentration Time	1.1596 143707	1.1056 143710	1.229533 143713	1.124467 143716	0.935733 143719	0.9014 143722	0.9606 143725	0.902133 143728	0.818667 143731	0.758467 143734	0.718667 143737	0.6466 143740	0.664733 143743	0.757667 143746	0.809733 143749	0.812867 143752	0.791267 143755	0.740733 143758	0.723133 143801	0.775333 143804	0.784 143807	0.7258 143810	
Segment 6	Loaded	3.989	Concentration Time	5.3592 144001	8.133133 144004	5.8632 144007	4.626133 144010	4.9942 144013	5.0424 144016	5.056933 144019	4.965533 144022	3.120133 144025	2.116933 144028	1.7282 144031	1.629 144034	1.6698 144037	1.756067 144040	1.744533 144043	1.832467 144046	1.8852 144049	1.956867 144052	2.142333 144055	1.874067 144058	1.701333 144101	1.764733 144104	
Segment 7	Unloaded	#DIV/0!	Concentration Time																							
Segment 7	Loaded	#DIV/0!	Concentration Time																							
Segment 8	Unloaded	4.917	Concentration Time	4.403267 150557	5.232467 150600	5.879267 150603	5.9528 150606	6.288533 150609	5.871333 150612	4.401467 150615	4.0206 150618	4.171 150621	4.681533 150624	4.9848 150627	4.7966 150630	4.909 150633	4.644067 150636	3.789933 150639	3.773467 150642	4.182933 150645	4.208 150648	3.920267 150651	3.653133 150654	3.4874 150657	3.3794 150700	
Segment 8	Loaded	5.890	Concentration Time	5.7422 150212	7.226733 150215	6.441267 150218	4.965933 150221	4.504733 150224	4.233667 150227	4.653333 150230	5.247733 150233	5.187867 150236	5.389867 150239	5.850467 150242	5.603733 150245	5.4044 150248	7.388333 150251	8.153267 150254	6.449267 150257	5.7508 150300	5.4708 150303	4.697533 150306	4.111 150309	3.605 150312	3.262867 150315	
Segment 9	Unloaded	8.351	Concentration Time	5.542667 150933	6.127467 150936	9.494867 150939	10.39527 150942	6.914133 150945	6.872067 150948	8.3092 150951	8.654933 150954	11.68533 150957	10.88433 151000	6.9766 151003												
Segment 9	Loaded	6.934	Concentration Time	2.304267 150048	2.004267 150051	2.155133 150054	2.919733 150057	3.0966 150100	2.325267 150103	2.103067 150106	2.741667 150109	4.9836 150112	7.052067 150115	6.8968 150118	5.558067 150121	4.694667 150124	5.860733 150127	7.590867 150130	9.6948 150133	10.64167 150136	7.837467 150139	5.731133 150142	5.293867 150145	7.5346 150148	7.699267 150151	
Segment 10	Unloaded	#DIV/0!	Concentration Time																							
Segment 10	Loaded	6.097	Concentration Time	8.411867 151036	7.646333 151039	6.226133 151042	4.9632 151045	5.860333 151048	5.8136 151051	5.312667 151054	5.420533 151057	6.003067 151100	7.093467 151103	8.127867 151106	9.4452 151109	8.596933 151112	6.5458 151115	4.990533 151118	4.426133 151121	4.728 151124	4.842 151127	4.610867 151130	6.675133 151133	7.306733 151136	4.82 151139	
Segment 11	Unloaded	#DIV/0!	Concentration Time																							
Segment 11	Loaded	#DIV/0!	Concentration Time																							



## Run 38

Segment 1	Unloaded	Average 1.326	Concentration Time																								
Segment 1	Loaded	#DIV/0!	Concentration Time																								
Segment 2	Unloaded	1.291	Concentration Time	0.858867 143052	0.9474 143055	1.384333 143058	1.5022 143101	1.2152 143104	1.092667 143107	0.995933 143110	0.988867 143113	1.124733 143116	1.099333 143119	1.075533 143122	1.103733 143125	1.166067 143128	1.100933 143131	1.135 143134	1.305733 143137	1.3112 143140	1.3408 143143	1.808467 143146	1.803533 143149	1.299067 143152	1.1862 143155		
Segment 2	Loaded	#DIV/0!	Concentration Time																								
Segment 3	Unloaded	#DIV/0!	Concentration Time																								
Segment 3	Loaded	6.747	Concentration Time	7.104933 151306	6.3606 151309	5.2932 151312	5.316533 151315	5.4782 151318	4.988667 151321	4.7802 151324	6.582267 151327	8.3246 151330	8.109867 151333	7.211867 151336	7.411267 151339	6.478667 151342	5.850467 151345	4.999067 151348	4.365067 151351	4.773133 151354	6.1214 151357	6.0094 151400	5.974933 151403	6.884667 151406	9.581733 151409		
Segment 4	Unloaded	1.170	Concentration Time	0.950133 143546	0.877133 143549	0.779733 143552	0.742467 143555	0.709667 143558	0.732 143601	0.742267 143604	0.6756 143607	0.616667 143610	0.6378 143613	0.630267 143616	0.5552 143619	0.5806 143622	0.5694 143625										
Segment 4	Loaded	6.013	Concentration Time	10.8694 145839	7.163533 145842	5.0468 145845	4.980733 145848	4.780333 145851	4.813733 145854	3.908467 145857	3.3426 145900	3.172867 145903	4.541533 145906	4.2776 145909	5.584 145912	17.76733 145915	29.61633 145918										
Segment 5	Unloaded	18.787	Concentration Time	79.29873 145645	37.88673 145648	32.22607 145651	47.3196 145654	14.0932 145239		33.56647 145242	43.836 145245	42.42707 145248	38.77733 145251	36.87507 145254	28.06047 145257	14.24147 145300	9.923467 145303	7.022733 145306	4.763933 145309	3.368533 145312							
Segment 5	Loaded	71.803	Concentration Time																								
Segment 6	Unloaded	0.835	Concentration Time	0.678133 143813	0.797 143816	0.858733 143819	0.7416 143822	0.910733 143825	0.850533 143828	0.6398 143831	0.635933 143834	0.694733 143837	0.6816 143840	0.6476 143843	0.578933 143846	0.535267 143849	0.5306 143852	0.512867 143855	0.553733 143858	0.6636 143901	0.680067 143904	0.662 143907	0.6596 143910	0.6934 143913	0.7766 143916		
Segment 6	Loaded	3.989	Concentration Time	1.8288 144107	2.065667 144110	2.2602 144113	2.0352 144116	1.863867 144119	1.882533 144122	2.279467 144125	2.4328 144128	2.7966 144131	3.425667 144134	3.675733 144137	3.993267 144140	4.081867 144143	4.065333 144146	4.2968 144149	4.602333 144152	5.322133 144155	7.585 144158	7.773067 144201	5.214933 144204	4.778667 144207	7.528867 144210		
Segment 7	Unloaded	#DIV/0!	Concentration Time																								
Segment 7	Loaded	#DIV/0!	Concentration Time																								
Segment 8	Unloaded	4.917	Concentration Time	3.235867 150703	3.225733 150706	2.756 150709	2.696667 150712	3.503467 150715	4.284867 150718	5.427533 150721	5.229933 150724	4.914133 150727	7.941133 150730	8.723067 150733	7.2518 150736	6.802333 150739	4.873133 150742	4.2012 150745	5.964933 150748	5.6822 150751	4.979267 150754	6.822933 150757	6.416267 150800	4.795933 150803	4.5282 150806		
Segment 8	Loaded	5.890	Concentration Time	3.269067 150318	4.1324 150321	4.298467 150324	3.46 150327	4.568733 150330	7.0348 150333	6.391533 150336	5.587867 150339	5.488933 150342	5.175333 150345	5.203667 150348	5.564133 150351	5.654267 150354	6.251333 150357	6.113933 150400	6.4826 150403	6.5504 150406	5.582933 150409	4.951 150412	5.023333 150415	4.4956 150418	4.748533 150421		
Segment 9	Unloaded	8.351	Concentration Time																								
Segment 9	Loaded	6.934	Concentration Time																								
Segment 10	Unloaded	#DIV/0!	Concentration Time																								
Segment 10	Loaded	6.097	Concentration Time	4.507733 151142	4.448467 151145	5.051133 151148	6.647533 151151																				
Segment 11	Unloaded	#DIV/0!	Concentration Time																								
Segment 11	Loaded	#DIV/0!	Concentration Time																								



## Run 38

Segment 1	Unloaded	Average 1.326	Concentration Time																						
Segment 1	Loaded	#DIV/0!	Concentration Time																						
Segment 2	Unloaded	1.291	Concentration Time	1.099867 143158	1.162467 143201	1.2644 143204	1.228867 143207	1.1882 143210	1.351067 143213	1.340333 143216	1.098 143219	1.0636 143222	1.1116 143225	1.1756 143228	1.214533 143231	1.311133 143234	1.326133 143237	1.244867 143240	1.422867 143243	1.610467 143246	1.52 143249	1.384267 143252	1.378333 143255	1.3638 143258	1.236 143301
Segment 2	Loaded	#DIV/0!	Concentration Time																						
Segment 3	Unloaded	#DIV/0!	Concentration Time																						
Segment 3	Loaded	6.747	Concentration Time	16.86233 151412	16.87767 151415	11.237 151418	8.438533 151421	7.198867 151424	5.945733 151427	4.907533 151430	5.102867 151433	5.0978 151436	5.254533 151439	5.358867 151442	5.124067 151445	4.767 151448	4.338867 151451	3.931933 151454	4.033533 151457	4.472067 151500	4.384867 151503	6.926133 151506	8.3584 151509	6.902467 151512	4.9186 151515
Segment 4	Unloaded	1.170	Concentration Time																						
Segment 4	Loaded	6.013	Concentration Time																						
Segment 5	Unloaded	18.787	Concentration Time																						
Segment 5	Loaded	71.803	Concentration Time																						
Segment 6	Unloaded	0.835	Concentration Time	0.824733 143919	0.780533 143922	0.695467 143925	0.6506 143928	0.6354 143931	0.699667 143934	0.927333 143937	0.884667 143940	0.715 143943	1.1996 143946	2.397867 143949	1.6226 143952	0.971 143955	1.611133 143958								
Segment 6	Loaded	3.989	Concentration Time	9.5516 144213	8.2878 144216	6.983133 144219	7.841933 144222	6.934667 144225	5.964 144228	5.547 144231	4.315133 144234	3.719533 144237	2.869133 144240	2.3602 144243	2.233133 144246										
Segment 7	Unloaded	#DIV/0!	Concentration Time																						
Segment 7	Loaded	#DIV/0!	Concentration Time																						
Segment 8	Unloaded	4.917	Concentration Time	3.9464 150809	4.212933 150812	5.747733 150815	6.595133 150818	5.263133 150821	5.5374 150824	7.275467 150827	8.923867 150830	8.843067 150833	6.513 150836	5.682467 150839	5.389333 150842	4.165133 150845	4.2016 150848	4.236467 150851	4.000333 150854	4.276733 150857	4.164067 150900	4.261067 150903	3.8742 150906	3.252867 150909	3.236467 150912
Segment 8	Loaded	5.890	Concentration Time	5.4086 150424	15.5128 150427	12.19653 150430	7.197933 150433	8.143533 150436	7.349733 150439	5.972867 150442	4.951133 150445	4.779933 150448	4.9238 150451	5.463733 150454	5.779067 150457	5.308133 150500	5.130533 150503	5.938333 150506	6.738067 150509	6.2542 150512	5.4494 150515	5.346933 150518	5.737533 150521	6.437067 150524	6.2496 150527
Segment 9	Unloaded	8.351	Concentration Time																						
Segment 9	Loaded	6.934	Concentration Time																						
Segment 10	Unloaded	#DIV/0!	Concentration Time																						
Segment 10	Loaded	6.097	Concentration Time																						
Segment 11	Unloaded	#DIV/0!	Concentration Time																						
Segment 11	Loaded	#DIV/0!	Concentration Time																						



## Run 38

Segment 1	Unloaded	Average 1.326	Concentration Time																						
Segment 1	Loaded	#DIV/0!	Concentration Time																						
Segment 2	Unloaded	1.291	Concentration Time	1.236333 143304	1.308533 143307	1.3526 143310	1.2448 143313	1.291 143316	1.322 143319	1.274867 143322	1.148333 143325	1.023733 143328	1.578333 143331	2.741333 143334	1.5874 143337	1.024067 143340	1.201933 143343	1.319733 143346	1.174133 143349	1.0768 143352	1.074333 143355	1.0842 143358	1.029867 143401	0.981933 143404	1.007933 143407
Segment 2	Loaded	#DIV/0!	Concentration Time																						
Segment 3	Unloaded	#DIV/0!	Concentration Time																						
Segment 3	Loaded	6.747	Concentration Time	3.661333 151518	3.489133 151521	3.505467 151524	3.784267 151527	4.447533 151530	4.665333 151533	4.490833 151536															
Segment 4	Unloaded	1.170	Concentration Time																						
Segment 4	Loaded	6.013	Concentration Time																						
Segment 5	Unloaded	18.787	Concentration Time																						
Segment 5	Loaded	71.803	Concentration Time																						
Segment 6	Unloaded	0.835	Concentration Time																						
Segment 6	Loaded	3.989	Concentration Time																						
Segment 7	Unloaded	#DIV/0!	Concentration Time																						
Segment 7	Loaded	#DIV/0!	Concentration Time																						
Segment 8	Unloaded	4.917	Concentration Time	3.147133 150915	3.1614 150918	3.670067 150921	4.107667 150924	5.318133 150927	6.125267 150930																
Segment 8	Loaded	5.890	Concentration Time	5.527533 150530	4.6008 150533	7.329533 150536	11.3156 150539	8.565467 150542	5.130933 150545																
Segment 9	Unloaded	8.351	Concentration Time																						
Segment 9	Loaded	6.934	Concentration Time																						
Segment 10	Unloaded	#DIV/0!	Concentration Time																						
Segment 10	Loaded	6.097	Concentration Time																						
Segment 11	Unloaded	#DIV/0!	Concentration Time																						
Segment 11	Loaded	#DIV/0!	Concentration Time																						



## Run 38

Segment 1	Unloaded	Average 1.326	Concentration Time							
Segment 1	Loaded	#DIV/0!	Concentration Time							
Segment 2	Unloaded	1.291	Concentration Time	1.025333 143410	0.953267 143413	0.856133 143416	0.7976 143419	1.127933 143422	1.911333 143425	1.8956 143428
Segment 2	Loaded	#DIV/0!	Concentration Time							
Segment 3	Unloaded	#DIV/0!	Concentration Time							
Segment 3	Loaded	6.747	Concentration Time							
Segment 4	Unloaded	1.170	Concentration Time							
Segment 4	Loaded	6.013	Concentration Time							
Segment 5	Unloaded	18.787	Concentration Time							
Segment 5	Loaded	71.803	Concentration Time							
Segment 6	Unloaded	0.835	Concentration Time							
Segment 6	Loaded	3.989	Concentration Time							
Segment 7	Unloaded	#DIV/0!	Concentration Time							
Segment 7	Loaded	#DIV/0!	Concentration Time							
Segment 8	Unloaded	4.917	Concentration Time							
Segment 8	Loaded	5.890	Concentration Time							
Segment 9	Unloaded	8.351	Concentration Time							
Segment 9	Loaded	6.934	Concentration Time							
Segment 10	Unloaded	#DIV/0!	Concentration Time							
Segment 10	Loaded	6.097	Concentration Time							
Segment 11	Unloaded	#DIV/0!	Concentration Time							
Segment 11	Loaded	#DIV/0!	Concentration Time							



Run 38

Segment 12	Unloaded	#DIV/0!	Concentration Time
Segment 12	Loaded	#DIV/0!	Concentration Time
Segment 13	Unloaded	#DIV/0!	Concentration Time
Segment 13	Loaded	#DIV/0!	Concentration Time
Segment 14	Unloaded	#DIV/0!	Concentration Time
Segment 14	Loaded	#DIV/0!	Concentration Time
Segment 15	Unloaded	#DIV/0!	Concentration Time
Segment 15	Loaded	#DIV/0!	Concentration Time
Segment 16	Unloaded	#DIV/0!	Concentration Time
Segment 16	Loaded	#DIV/0!	Concentration Time
Segment 17	Unloaded	#DIV/0!	Concentration Time
Segment 17	Loaded	#DIV/0!	Concentration Time
Segment 18	Unloaded	#DIV/0!	Concentration Time
Segment 18	Loaded	#DIV/0!	Concentration Time
Segment 19	Unloaded	#DIV/0!	Concentration Time
Segment 19	Loaded	#DIV/0!	Concentration Time
Segment 20	Unloaded	#DIV/0!	Concentration Time
Segment 20	Loaded	#DIV/0!	Concentration Time
Segment 21	Unloaded	#DIV/0!	Concentration Time
Segment 21	Loaded	#DIV/0!	Concentration Time
Segment 22	Unloaded	#DIV/0!	Concentration Time
Segment 22	Loaded	#DIV/0!	Concentration Time



Run 38

Segment 12	Unloaded	#DIV/0!	Concentration Time
Segment 12	Loaded	#DIV/0!	Concentration Time
Segment 13	Unloaded	#DIV/0!	Concentration Time
Segment 13	Loaded	#DIV/0!	Concentration Time
Segment 14	Unloaded	#DIV/0!	Concentration Time
Segment 14	Loaded	#DIV/0!	Concentration Time
Segment 15	Unloaded	#DIV/0!	Concentration Time
Segment 15	Loaded	#DIV/0!	Concentration Time
Segment 16	Unloaded	#DIV/0!	Concentration Time
Segment 16	Loaded	#DIV/0!	Concentration Time
Segment 17	Unloaded	#DIV/0!	Concentration Time
Segment 17	Loaded	#DIV/0!	Concentration Time
Segment 18	Unloaded	#DIV/0!	Concentration Time
Segment 18	Loaded	#DIV/0!	Concentration Time
Segment 19	Unloaded	#DIV/0!	Concentration Time
Segment 19	Loaded	#DIV/0!	Concentration Time
Segment 20	Unloaded	#DIV/0!	Concentration Time
Segment 20	Loaded	#DIV/0!	Concentration Time
Segment 21	Unloaded	#DIV/0!	Concentration Time
Segment 21	Loaded	#DIV/0!	Concentration Time
Segment 22	Unloaded	#DIV/0!	Concentration Time
Segment 22	Loaded	#DIV/0!	Concentration Time



Run 38

Segment 12	Unloaded	#DIV/0!	Concentration Time
Segment 12	Loaded	#DIV/0!	Concentration Time
Segment 13	Unloaded	#DIV/0!	Concentration Time
Segment 13	Loaded	#DIV/0!	Concentration Time
Segment 14	Unloaded	#DIV/0!	Concentration Time
Segment 14	Loaded	#DIV/0!	Concentration Time
Segment 15	Unloaded	#DIV/0!	Concentration Time
Segment 15	Loaded	#DIV/0!	Concentration Time
Segment 16	Unloaded	#DIV/0!	Concentration Time
Segment 16	Loaded	#DIV/0!	Concentration Time
Segment 17	Unloaded	#DIV/0!	Concentration Time
Segment 17	Loaded	#DIV/0!	Concentration Time
Segment 18	Unloaded	#DIV/0!	Concentration Time
Segment 18	Loaded	#DIV/0!	Concentration Time
Segment 19	Unloaded	#DIV/0!	Concentration Time
Segment 19	Loaded	#DIV/0!	Concentration Time
Segment 20	Unloaded	#DIV/0!	Concentration Time
Segment 20	Loaded	#DIV/0!	Concentration Time
Segment 21	Unloaded	#DIV/0!	Concentration Time
Segment 21	Loaded	#DIV/0!	Concentration Time
Segment 22	Unloaded	#DIV/0!	Concentration Time
Segment 22	Loaded	#DIV/0!	Concentration Time



Run 40

Segment 1	Unloaded	Average 10.269	Concentration Time	12.52227 184413	13.70667 184416	13.95673 184419	8.857933 184422	8.241267 184425	8.3012 184428	6.296733 184431											
Segment 1	Loaded	4.561	Concentration Time	7.145933 192908	7.640333 192911	4.802133 192914	3.149 192917	2.374933 192920	3.049 192923	4.720867 192926	3.605333 192929										
Segment 14	Unloaded	3.395	Concentration Time	5.369 184458	5.325733 184501	5.845067 184504	5.2702 184507	4.339867 184510	4.0414 184513	3.6576 184516	3.106 184519	2.873067 184522	2.9558 184525	3.160333 184528	3.331667 184531	2.5324 184534	2.1906 184537	2.082133 184540	1.990733 184543		
Segment 14	Loaded	4.451	Concentration Time	6.568467 192541	8.030067 192544	6.465867 192547	3.757 192550	3.1588 192553	3.604267 192556	4.318067 192559	5.452667 192602	6.8996 192605	6.749867 192608	6.421333 192611	5.702133 192614	4.405267 192617	3.2864 192620	3.400333 192623	2.978333 192626		
Segment 15	Unloaded	70.847	Concentration Time	39.80993 190504	60.023 190507	70.33527 190510	60.32027 190513	45.0524 190516	55.17087 190519	81.1272 190522	84.99347 190525	79.2844 190528	73.34433 190531	87.04153 190534	123.6147 190537	133.5028 190540	98.9542 190543	59.02093 190546	50.25233 190549		
Segment 15	Loaded	65.220	Concentration Time	65.4276 190955	84.74493 190958	89.15693 191001	60.91213 191004	65.20607 191007	86.1118 191010	93.3708 191013	84.89687 191016	66.21613 191019	58.18413 191022	64.22053 191025	66.74913 191028	80.15453 191031	80.82767 191034	53.72633 191037	35.085 191040		
Segment 16	Unloaded	22.403	Concentration Time	16.35207 190558	14.88247 190601	15.53393 190604	13.50947 190607	12.6914 190610	13.1112 190613	12.3548 190616	11.9852 190619	11.94147 190622	11.90827 190625	11.59287 190628	9.936067 190631	7.094267 190634	5.887933 190637	6.8412 190640	28.90433 190643		
Segment 16	Loaded	19.518	Concentration Time	23.24807 190816	16.39767 190819	24.11107 190822	19.92673 190825	11.997 190828	12.53213 190831	13.94933 190834	13.0038 190837	10.19573 190840	9.165933 190843	12.3154 190846	25.32413 190849	29.29973 190852	19.13373 190855	19.17007 190858	26.98973 190901		
Segment 17	Unloaded	6.408	Concentration Time	10.975 192141	11.15433 192144	5.727267 192147	4.351333 192150	2.537 192153	1.5754 192156	1.333267 192159	1.175133 192202	1.562 192205	1.960067 192208	2.7542 192211	4.871467 192214	4.1684 192217	2.6074 192220	3.263133 192223	3.219333 192226		
Segment 17	Loaded	28.458	Concentration Time	15.06887 192335	21.88193 192338	35.3622 192341	57.19287 192344	55.30993 192347	49.18847 192350	47.6874 192353	37.20393 192356	26.20193 192359	30.791 192402	37.74253 192405	96.8006 192408	146.8431 192411	79.70067 192414	29.7568 192417	19.1912 192420		
Segment 18	Unloaded	#DIV/0!	Concentration Time																		
Segment 18	Loaded	#DIV/0!	Concentration Time																		
Segment 19	Unloaded	27.884	Concentration Time	15.16333 185834	14.82927 185837	12.89873 185840	12.3028 185843	11.434 185846	14.7422 185849	19.2254 185852	17.96033 185855	26.50173 185858	31.71687 185901	26.94027 185904	35.6256 185907	45.84353 185910	45.12247 185913	62.55013 185916	60.36307 185919		
Segment 19	Loaded	32.981	Concentration Time	5.518267 185307	9.006133 185310	8.4982 185313	5.551267 185316	4.891333 185319	4.8268 185322	5.5272 185325	7.411733 185328	10.30273 185331	8.771867 185334	7.8576 185337	7.837933 185340	9.015 185343	10.50367 185346	9.687333 185349	10.17713 185352		
Segment 20	Unloaded	6.182	Concentration Time	3.478733 184813	3.060533 184816	3 184819	3.164933 184822	3.344933 184825	3.6808 184828	3.1996 184831	3.733667 184834	3.009867 184837	2.109467 184840	1.796733 184843	1.4158 184846	1.717267 184849	2.392267 184852	2.026667 184855	1.6534 184858		
Segment 20	Loaded	13.021	Concentration Time	19.6196 190149	16.11313 190152	16.1974 190155	15.341 190158	17.08447 190201	18.80313 190204	22.53813 190207	21.91867 190210	19.95613 190213	17.01367 190216	16.84093 190219	17.30747 190222	15.09093 190225	13.668 190228	12.9668 190231	14.4316 190234		



Run 40

Segment 1	Unloaded	Average 10.269	Concentration Time																
Segment 1	Loaded	4.561	Concentration Time																
Segment 14	Unloaded	3.395	Concentration Time	2.063333 184546	2.072133 184549	2.085733 184552	2.121133 184555	2.389 184558	2.68 184601	3.339867 184604	4.251867 184607	5.008467 184610	3.972333 184613	4.057933 184616	3.366333 184619	2.420733 184622	2.975467 184625	3.987267 184628	4.872667 184631
Segment 14	Loaded	4.451	Concentration Time	1.8494 192629	2.088533 192632	3.9962 192635	4.9636 192638	4.586333 192641	4.997133 192644	5.600733 192647	4.2734 192650	4.588267 192653	5.6788 192656	6.2708 192659	7.019333 192702	7.2556 192705	5.949867 192708	5.9024 192711	5.612467 192714
Segment 15	Unloaded	70.847	Concentration Time	46.59187 190552	26.79907 190555														
Segment 15	Loaded	65.220	Concentration Time	24.4096 191043	14.5652 191046														
Segment 16	Unloaded	22.403	Concentration Time	150.1454 190646	170.1671 190649	104.7967 190652	44.562 190655	22.55127 190658	13.22227 190701	10.18713 190704	8.964 190707	6.821733 190710	5.8874 190713	5.723933 190716	6.907933 190719	11.2286 190722	16.5668 190725	15.22547 190728	13.67473 190731
Segment 16	Loaded	19.518	Concentration Time	24.28207 190904	14.35807 190907	11.70033 190910	10.58007 190913	11.6168 190916	39.2502 190919	71.45247 190922	40.21827 190925	15.243 190928	13.83533 190931	14.04833 190934	9.754933 190937	8.111733 190940	8.1772 190943	8.841333 190946	14.95847 190949
Segment 17	Unloaded	6.408	Concentration Time	3.805467 192229	3.135733 192232	4.592333 192235	6.4664 192238	10.78453 192241	11.02673 192244	10.4204 192247	10.52713 192250	7.164533 192253	6.621267 192256	7.098533 192259	13.4344 192302	20.2898 192305	14.2216 192308	10.84447 192311	7.434067 192314
Segment 17	Loaded	28.458	Concentration Time	22.12253 192423	32.70273 192426	32.80853 192429	18.9404 192432	8.8534 192435	6.116733 192438	5.5214 192441	5.003 192444	6.063867 192447	7.6844 192450	8.1852 192453	10.909 192456	9.280067 192459	7.765333 192502	8.353533 192505	10.6752 192508
Segment 18	Unloaded	#DIV/0!	Concentration Time																
Segment 18	Loaded	#DIV/0!	Concentration Time																
Segment 19	Unloaded	27.884	Concentration Time	52.18327 185922	80.17633 185925	105.4965 185928	106.9293 185931	112.5839 185934	92.85253 185937	81.43587 185940	82.33907 185943	67.3452 185946	41.82193 185949	44.91347 185952	47.0656 185955	47.7188 185958	48.197 190001	45.5782 190004	57.0606 190007
Segment 19	Loaded	32.981	Concentration Time	12.45553 185355	14.16993 185358	10.99847 185401	10.10207 185404	10.32693 185407	8.734067 185410	7.629533 185413	7.240667 185416	11.7736 185419	12.80467 185422	13.81087 185425	16.55867 185428	11.64593 185431	17.6662 185434	20.2088 185437	16.208 185440
Segment 20	Unloaded	6.182	Concentration Time	2.670133 184901	5.1334 184904	7.200333 184907	6.482933 184910	6.6248 184913	8.721267 184916	7.970867 184919	5.879 184922	5.560133 184925	6.045333 184928	6.856 184931	6.0064 184934	5.8298 184937	6.063067 184940	6.491 184943	6.680667 184946
Segment 20	Loaded	13.021	Concentration Time	15.55953 190237	17.2742 190240	22.5428 190243	26.7552 190246	26.16227 190249	23.02127 190252	18.0444 190255	18.28853 190258	15.4326 190301	10.386 190304	10.46627 190307	11.9498 190310	14.61193 190313	16.15073 190316	14.68987 190319	10.6586 190322



## Run 40

Segment 1	Unloaded	Average 10.269	Concentration Time																
Segment 1	Loaded	4.561	Concentration Time																
Segment 14	Unloaded	3.395	Concentration Time	5.6352 184634	4.2926 184637	3.2372 184640	2.587667 184643	2.3106 184646	2.026 184649	1.951667 184652	2.436933 184655	2.563667 184658	2.294 184701	2.875467 184704	3.262333 184707	3.427733 184710	4.083333 184713	5.1502 184716	5.567133 184719
Segment 14	Loaded	4.451	Concentration Time	4.2422 192717	3.6612 192720	3.5748 192723	3.924933 192726	3.4208 192729	3.103133 192732	3.035933 192735	2.816733 192738	2.380067 192741	2.358333 192744	2.147733 192747	2.836 192750	3.129867 192753	2.535733 192756	3.179267 192759	3.224733 192802
Segment 15	Unloaded	70.847	Concentration Time																
Segment 15	Loaded	65.220	Concentration Time																
Segment 16	Unloaded	22.403	Concentration Time	15.3206 190734	16.1008 190737	16.6278 190740	16.96153 190743	13.6438 190746	11.73193 190749	10.636 190752	8.9114 190755	9.383467 190758	22.11747 190801	23.89827 190804	14.6968 190807	15.88787 190810	23.47573 190813		
Segment 16	Loaded	19.518	Concentration Time	40.90567 190952															
Segment 17	Unloaded	6.408	Concentration Time	5.567133 192317	5.327133 192320	4.682067 192323	5.118267 192326	5.192333 192329	6.508067 192332										
Segment 17	Loaded	28.458	Concentration Time	17.55113 192511	19.68573 192514	12.8332 192517	8.417867 192520	7.564933 192523											
Segment 18	Unloaded	#DIV/0!	Concentration Time																
Segment 18	Loaded	#DIV/0!	Concentration Time																
Segment 19	Unloaded	27.884	Concentration Time	76.33453 190010	68.84753 190013	37.9074 190016	22.24193 190019	18.79033 190022	15.4508 190025	13.876 190028	14.42207 190031	16.70907 190034	20.5354 190037	30.91067 190040	39.0806 190043	35.70307 190046	33.43947 190049	32.1622 190052	27.16333 190055
Segment 19	Loaded	32.981	Concentration Time	25.6578 185443	23.39553 185446	17.31967 185449	15.7342 185452	9.5776 185455	7.042067 185458	6.9972 185501	6.1934 185504	5.6502 185507	6.741933 185510	8.2056 185513	12.88933 185516	19.18613 185519	25.80267 185522	31.17947 185525	29.41693 185528
Segment 20	Unloaded	6.182	Concentration Time	4.326 184949	4.998533 184952	3.817 184955	2.8268 184958	3.208 185001	3.28 185004	3.505667 185007	3.214133 185010	2.568733 185013	5.552733 185016	12.09207 185019	12.3724 185022	10.35813 185025	9.736 185028	9.5078 185031	8.995467 185034
Segment 20	Loaded	13.021	Concentration Time	8.708933 190325	8.417133 190328	7.800267 190331	7.5238 190334	8.631267 190337	10.35327 190340	9.997 190343	8.7942 190346	8.121 190349	7.286133 190352	7.970933 190355	9.455067 190358	9.3376 190401	9.085067 190404	9.312867 190407	10.3932 190410



Run 40

Segment 1	Unloaded	Average 10.269	Concentration Time																
Segment 1	Loaded	4.561	Concentration Time																
Segment 14	Unloaded	3.395	Concentration Time	5.387 184722	5.5828 184725	4.241867 184728	2.752133 184731	2.4786 184734	2.9434 184737	2.904467 184740	2.461 184743	2.3496 184746	2.365533 184749						
Segment 14	Loaded	4.451	Concentration Time	2.631667 192805	2.431667 192808	1.902067 192811	1.562533 192814	1.917133 192817	2.4192 192820	3.606533 192823	3.461867 192826	2.7476 192829	2.85 192832	4.174533 192835	5.6734 192838	7.875867 192841	21.32387 192844		
Segment 15	Unloaded	70.847	Concentration Time																
Segment 15	Loaded	65.220	Concentration Time																
Segment 16	Unloaded	22.403	Concentration Time																
Segment 16	Loaded	19.518	Concentration Time																
Segment 17	Unloaded	6.408	Concentration Time																
Segment 17	Loaded	28.458	Concentration Time																
Segment 18	Unloaded	#DIV/0!	Concentration Time																
Segment 18	Loaded	#DIV/0!	Concentration Time																
Segment 19	Unloaded	27.884	Concentration Time	22.00647 190058	27.53213 190101	33.098 190104	28.22353 190107	20.17653 190110	13.90487 190113	12.22073 190116	12.10953 190119	11.87727 190122	9.661533 190125	12.45607 190128	18.6648 190131	25.42813 190134	48.1392 190137	71.0388 190140	73.8272 190143
Segment 19	Loaded	32.981	Concentration Time	27.98913 185531	23.64193 185534	21.87113 185537	18.7924 185540	15.7682 185543	11.91627 185546	13.10053 185549	18.83213 185552	21.85033 185555	24.1184 185558	19.00787 185601	23.1602 185604	28.59747 185607	24.06947 185610	22.05927 185613	39.227 185616
Segment 20	Unloaded	6.182	Concentration Time	9.8692 185037	13.25047 185040	14.8218 185043	13.93753 185046	10.70127 185049	7.793533 185052	6.071267 185055	4.365133 185058	5.783133 185101	9.9376 185104	10.63247 185107	9.9812 185110	16.61327 185113			
Segment 20	Loaded	13.021	Concentration Time	12.72793 190413	13.4238 190416	11.88787 190419	8.785 190422	6.999067 190425	6.373333 190428	6.722067 190431	7.3518 190434	7.454533 190437	6.383467 190440	4.9988 190443	6.428733 190446	6.654 190449			



## Run 40

Segment 1	Unloaded	Average 10.269	Concentration Time																
Segment 1	Loaded	4.561	Concentration Time																
Segment 14	Unloaded	3.395	Concentration Time																
Segment 14	Loaded	4.451	Concentration Time																
Segment 15	Unloaded	70.847	Concentration Time																
Segment 15	Loaded	65.220	Concentration Time																
Segment 16	Unloaded	22.403	Concentration Time																
Segment 16	Loaded	19.518	Concentration Time																
Segment 17	Unloaded	6.408	Concentration Time																
Segment 17	Loaded	28.458	Concentration Time																
Segment 18	Unloaded	#DIV/0!	Concentration Time																
Segment 18	Loaded	#DIV/0!	Concentration Time																
Segment 19	Unloaded	27.884	Concentration Time	44.20527 190146	19.12573 185116	15.971 185119	15.16827 185122	11.12187 185125	7.6272 185128	7.682067 185131	7.673667 185134	6.416667 185137	6.766667 185140	6.692867 185143	6.441 185146	6.538267 185149	6.4428 185152	6.172067 185155	
Segment 19	Loaded	32.981	Concentration Time	78.85267 185619	91.19367 185622	79.162 185625	70.22147 185628	69.74153 185631	72.44493 185634	98.6576 185637	103.5707 185640	51.61227 185643	36.81927 185646	65.87893 185649	71.30113 185652	56.2864 185655	56.1016 185658	54.2768 185701	69.96793 185704
Segment 20	Unloaded	6.182	Concentration Time																
Segment 20	Loaded	13.021	Concentration Time																



## Run 40

Segment 1	Unloaded	Average 10.269	Concentration Time																	
Segment 1	Loaded	4.561	Concentration Time																	
Segment 14	Unloaded	3.395	Concentration Time																	
Segment 14	Loaded	4.451	Concentration Time																	
Segment 15	Unloaded	70.847	Concentration Time																	
Segment 15	Loaded	65.220	Concentration Time																	
Segment 16	Unloaded	22.403	Concentration Time																	
Segment 16	Loaded	19.518	Concentration Time																	
Segment 17	Unloaded	6.408	Concentration Time																	
Segment 17	Loaded	28.458	Concentration Time																	
Segment 18	Unloaded	#DIV/0!	Concentration Time																	
Segment 18	Loaded	#DIV/0!	Concentration Time																	
Segment 19	Unloaded	27.884	Concentration Time	5.402867 185158	5.681267 185201	7.2608 185204	6.571067 185207	5.655133 185210	5.209467 185213	4.932733 185216	5.3286 185219	6.778467 185222	8.735933 185225	10.58487 185228	9.508467 185231	7.277333 185234	6.119733 185237	5.181533 185240	4.262867 185243	
Segment 19	Loaded	32.981	Concentration Time	65.58847 185707	89.41933 185710	133.9753 185713	96.82173 185716	50.764 185719	49.72933 185722	83.12907 185725	82.59893 185728	53.80627 185731	55.938 185734	45.26967 185737	46.6824 185740	65.25887 185743	53.16007 185746	45.18067 185749	37.7684 185752	
Segment 20	Unloaded	6.182	Concentration Time																	
Segment 20	Loaded	13.021	Concentration Time																	



Run 43

Segment 1	Unloaded	Average #DIV/0!	Concentration Time														
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	1.788	Concentration Time	1.430067 214028	1.5436 214031	1.645933 214034	1.9312 214037	1.802267 214040	1.317467 214043	1.233667 214046	1.0644 214049	0.362733 214052	0.562067 214055	0.990067 214058	1.5742 214101	1.424533 214104	0.961467 214107
Segment 2	Loaded	#DIV/0!	Concentration Time														
Segment 3	Unloaded	#DIV/0!	Concentration Time														
Segment 3	Loaded	17.648	Concentration Time	11.79533 215555	9.999533 215558	9.502867 215601	8.800933 215604	5.886 215607	4.946733 215610	4.7898 215613	6.179867 215616	7.1078 215619	6.8758 215622	7.0106 215625	6.6084 215628	4.943933 215631	4.354333 215634
Segment 4	Unloaded	3.300	Concentration Time	1.330933 214501	1.331 214504	1.321133 214507	1.837867 214510	2.183667 214513	2.154067 214516	2.5606 214519	4.306933 214522	4.430867 214525	4.157267 214528	4.741933 214531	3.9386 214534	3.097267 214537	3.109533 214540
Segment 4	Loaded	6.681	Concentration Time	9.220333 215401	6.425467 215404	3.825267 215407	3.602467 215410	3.373933 215413	3.585467 215416	3.8104 215419	4.909333 215422	5.1188 215425	5.835067 215428	5.366067 215431	6.061667 215434	7.707333 215437	7.052333 215440
Segment 5	Unloaded	#DIV/0!	Concentration Time														
Segment 5	Loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	9.651	Concentration Time	4.658533 214734	3.938733 214737	4.671533 214740	4.8554 214743	5.166067 214746	5.646267 214749	5.4772 214752	5.515067 214755	4.4436 214758	4.771 214801	4.7412 214804	3.549733 214807	3.7858 214810	5.426333 214813
Segment 6	Loaded	15.036	Concentration Time	3.477467 215022	5.3186 215025	7.5586 215028	14.47927 215031	15.71713 215034	12.99493 215037	20.6646 215040	32.73547 215043	28.6604 215046	15.91573 215049	16.77647 215052	16.65893 215055	9.007467 215058	9.226267 215101
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	3.071	Concentration Time	3.277733 212337	3.037867 212340	3.046733 212343	2.706733 212346	2.202267 212349	2.4684 212352	2.960067 212355	4.038067 212358	6.5202 212401	5.4076 212404	3.289733 212407	2.65 212410	2.645933 212413	2.9968 212416



Run 43

Segment 1	Unloaded	Average #DIV/0!	Concentration Time														
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	1.788	Concentration Time	0.725733 214110	0.677 214113	0.641 214116	0.591867 214119	0.737733 214122	1.962733 214125	2.550467 214128	1.903733 214131	1.794333 214134	2.032267 214137	1.762533 214140	1.846 214143	2.414667 214146	1.734667 214149
Segment 2	Loaded	#DIV/0!	Concentration Time														
Segment 3	Unloaded	#DIV/0!	Concentration Time														
Segment 3	Loaded	17.648	Concentration Time	5.251067 215637	4.277533 215640	3.508 215643	4.587867 215646	4.2618 215649	3.6446 215652	4.440067 215655	4.096733 215658	3.606 215701	5.240667 215704	6.076333 215707	5.700133 215710	8.4726 215713	13.5216 215716
Segment 4	Unloaded	3.300	Concentration Time	2.218933 214543	1.443267 214546	1.104933 214549	1.355067 214552	2.587533 214555	3.1054 214558	4.586467 214601	5.159733 214604	2.397867 214607	1.1688 214610	1.3232 214613	1.872067 214616	1.354933 214619	2.136467 214622
Segment 4	Loaded	6.681	Concentration Time	5.169667 215443	5.278867 215446	6.415467 215449	5.389733 215452	3.844933 215455	5.4268 215458	8.482133 215501	8.975267 215504	7.033533 215507	7.5394 215510	7.4656 215513	5.3108 215516	8.704333 215519	12.1066 215522
Segment 5	Unloaded	#DIV/0!	Concentration Time														
Segment 5	Loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	9.651	Concentration Time	6.674933 214816	4.135333 214819	3.026267 214822	2.571533 214825	2.4854 214828	2.6318 214831	2.512867 214834	2.784 214837	2.6378 214840	2.524533 214843	7.223467 214846	19.24407 214849	53.92193 214852	54.13167 214855
Segment 6	Loaded	15.036	Concentration Time	11.95813 215104	11.94207 215107	11.4938 215110	17.9174 215113	34.78767 215116	50.68827 215119	57.85113 215122	49.97907 215125	26.66033 215128	14.2936 215131	9.983133 215134	7.321333 215137	6.767467 215140	5.315933 215143
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	3.071	Concentration Time	3.006133 212419	2.687133 212422	2.059867 212425	1.888867 212428	1.606267 212431	1.317 212434	0.827267 212437	0.768 212440	1.1958 212443	1.881733 212446	2.227333 212449	2.453467 212452	2.264333 212455	1.869 212458



Run 43

Segment 1	Unloaded	Average #DIV/0!	Concentration Time														
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	1.788	Concentration Time	1.215 214152	1.359933 214155	1.721533 214158	2.574533 214201	1.6256 214204	0.833733 214207	1.1782 214210	1.542933 214213	1.5414 214216	1.7414 214219	1.487 214222	1.3796 214225	1.531333 214228	1.817267 214231
Segment 2	Loaded	#DIV/0!	Concentration Time														
Segment 3	Unloaded	#DIV/0!	Concentration Time														
Segment 3	Loaded	17.648	Concentration Time	23.7026 215719	38.69993 215722	42.171 215725	38.26433 215728	38.23453 215731	36.1762 215734	25.55647 215737	16.60107 215740	24.08407 215743	26.3452 215746	32.09787 215749	31.89173 215752	19.474 215755	24.3246 215758
Segment 4	Unloaded	3.300	Concentration Time	3.9646 214625	4.352133 214628	3.4338 214631	2.976467 214634	3.445933 214637	4.770667 214640	5.978 214643	8.936267 214646	11.91407 214649					
Segment 4	Loaded	6.681	Concentration Time	10.8112 215525	9.0984 215528	10.39233 215531	12.484 215534	8.659667 215537	5.927067 215540	5.859667 215543	5.700333 215546	5.222467 215549					
Segment 5	Unloaded	#DIV/0!	Concentration Time														
Segment 5	Loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	9.651	Concentration Time	15.2268 214858	7.742733 214901	5.9706 214904	5.385333 214907	5.414 214910	7.647933 214913	8.123933 214916	9.0516 214919	15.14967 214922	17.08327 214925	15.18087 214928	13.53567 214931	9.391 214934	7.716 214937
Segment 6	Loaded	15.036	Concentration Time	5.3626 215146	6.393467 215149	7.281333 215152	15.32953 215155	21.88133 215158	15.08813 215201	10.19293 215204	9.0682 215207	8.344867 215210	6.6452 215213	6.032867 215216	7.27 215219	8.435733 215222	9.923133 215225
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	3.071	Concentration Time	1.604933 212501	1.384533 212504	1.463467 212507	1.491533 212510	1.507 212513	2.478333 212516	2.989533 212519	2.938867 212522	2.6268 212525	1.874533 212528	2.153267 212531	3.2938 212534	5.302933 212537	5.474667 212540



Run 43

Segment 1	Unloaded	Average #DIV/0!	Concentration Time														
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	1.788	Concentration Time	1.421733 214234	1.2584 214237	1.610133 214240	1.8784 214243	2.039533 214246	1.820667 214249	1.9724 214252	2.136733 214255	2.578267 214258	2.8186 214301	2.646667 214304	2.124133 214307	1.8304 214310	2.070267 214313
Segment 2	Loaded	#DIV/0!	Concentration Time														
Segment 3	Unloaded	#DIV/0!	Concentration Time														
Segment 3	Loaded	17.648	Concentration Time	34.4858 215801	39.46707 215804	41.49987 215807	41.9002 215810	36.05233 215813	33.67707 215816	36.82547 215819	34.571 215822	24.61327 215825	11.62673 215828	7.102467 215831	11.6496 215834	24.60747 215837	21.734 215840
Segment 4	Unloaded	3.300	Concentration Time														
Segment 4	Loaded	6.681	Concentration Time														
Segment 5	Unloaded	#DIV/0!	Concentration Time														
Segment 5	Loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	9.651	Concentration Time	7.642467 214940	8.532467 214943	10.19253 214946	7.7582 214949	7.327533 214952	8.608133 214955	9.7812 214958	9.964333 215001	14.46687 215004	26.70287 215007	29.8094 215010	14.86993 215013	5.472133 215016	3.533933 215019
Segment 6	Loaded	15.036	Concentration Time	10.4028 215228	13.0422 215231	15.6866 215234	14.92367 215237	11.14553 215240	6.168467 215243	6.1858 215246	17.46327 215249	24.42567 215252	18.435 215255	17.6354 215258	12.0694 215301	9.3352 215304	11.87587 215307
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	3.071	Concentration Time	4.737733 212543	4.9306 212546	3.6974 212549	2.708267 212552	2.453733 212555	2.899333 212558	8.601333 212601	7.899733 212604	3.504333 212607	3.148 212610	3.371067 212613	3.355467 212616	2.674867 212619	2.554867 212622



Run 43

Segment 1	Unloaded	Average #DIV/0!	Concentration Time															
Segment 1	Loaded	#DIV/0!	Concentration Time															
Segment 2	Unloaded	1.788	Concentration Time	2.468733 214316	2.4624 214319	2.464667 214322	3.009533 214325	3.046267 214328	2.109 214331	1.8432 214334	1.8074 214337	1.8484 214340	1.955333 214343	1.682667 214346	1.936267 214349	2.182467 214352	2.145533 214355	
Segment 2	Loaded	#DIV/0!	Concentration Time															
Segment 3	Unloaded	#DIV/0!	Concentration Time															
Segment 3	Loaded	17.648	Concentration Time	15.46353 215843	10.63933 215846	11.39407 215849	12.82733 215852	12.73627 215855	13.4346 215858	25.28947 215901	23.78287 215904	14.155 215907	19.98293 215910	17.74573 215913	8.957733 215916	7.623133 215919	8.6194 215922	
Segment 4	Unloaded	3.300	Concentration Time															
Segment 4	Loaded	6.681	Concentration Time															
Segment 5	Unloaded	#DIV/0!	Concentration Time															
Segment 5	Loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	9.651	Concentration Time															
Segment 6	Loaded	15.036	Concentration Time	12.87753 215310	11.72653 215313	10.31367 215316												
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	Loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	3.071	Concentration Time	2.353333 212625	2.516933 212628	2.634267 212631	2.487133 212634	2.839267 212637	2.749067 212640	2.849467 212643	3.8432 212646	4.1022 212649	3.399667 212652	3.1322 212655	3.481533 212658	3.547867 212701	2.7754 212704	



Run 43

Segment 1	Unloaded	Average #DIV/0!	Concentration Time															
Segment 1	Loaded	#DIV/0!	Concentration Time															
Segment 2	Unloaded	1.788	Concentration Time	2.1524 214358	2.046533 214401	2.422533 214404	2.4616 214407	2.104933 214410	2.4202 214413	2.448467 214416	1.592733 214419	1.496467 214422	2.029133 214425	2.5016 214428	2.4554 214431	2.2064 214434	1.980267 214437	
Segment 2	Loaded	#DIV/0!	Concentration Time															
Segment 3	Unloaded	#DIV/0!	Concentration Time															
Segment 3	Loaded	17.648	Concentration Time	16.50493 215925	20.4532 215928	26.7644 215931	44.29533 215934	37.57127 215937	31.05927 215940	40.1672 215943	38.6856 215946	36.84627 215949	35.28227 215952	29.77473 215955	25.9862 215958	21.9266 220001	20.03553 220004	
Segment 4	Unloaded	3.300	Concentration Time															
Segment 4	Loaded	6.681	Concentration Time															
Segment 5	Unloaded	#DIV/0!	Concentration Time															
Segment 5	Loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	9.651	Concentration Time															
Segment 6	Loaded	15.036	Concentration Time															
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	Loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	3.071	Concentration Time	3.415133 212707	4.269467 212710	3.448 212713	2.921267 212716	2.747333 212719	3.0286 212722	3.1754 212725	3.314467 212728	3.0348 212731	2.622933 212734	2.3366 212737	1.953667 212740	2.004333 212743	1.821467 212746	



# Run 43

[illegible]



## Run 43

[illegible]



## Run 43

[illegible]



## Run 43

[illegible]



## Run 43

[illegible]



## Run 43

[illegible]



# Run 45

[illegible]



# Run 45

[illegible]



# Run 45

[illegible]



# Run 45

Segment 1	Unloaded	Average 1.079	Concentration Time	1.116 104258	1.04 104259	1.031 104300	1.36 104301										
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	0.377	Concentration Time	0.415 102301	0.372533 102304	0.3272 102307	0.340467 102310	0.455 102313	0.391267 102316	0.229667 102319	0.2364 102322	0.2686 102325	0.360333 102328	0.423267 102331	0.422267 102334	0.465 102337	0.3838 102340
Segment 2	Loaded	#DIV/0!	Concentration Time														
Segment 3	Unloaded	#DIV/0!	Concentration Time														
Segment 3	Loaded	1.471	Concentration Time	1.288333 103846	1.535667 103849	1.597467 103852	1.6662 103855	1.6668 103858	1.678133 103901	1.6786 103904	1.6622 103907	1.606467 103910	2.0474 103913	2.631133 103916	2.102667 103919	1.395 103922	1.164533 103925
Segment 4	Unloaded	0.480	Concentration Time														
Segment 4	Loaded	1.855	Concentration Time														
Segment 5	Unloaded	#DIV/0!	Concentration Time														
Segment 5	Loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	0.267	Concentration Time	0.149733 103019	0.176133 103022	0.226933 103025	0.238533 103028	0.2396 103031	0.191 103034	0.205333 103037	0.317133 103040	0.367067 103043	0.415133 103046	0.444867 103049	0.425133 103052	0.454867 103055	0.5064 103058
Segment 6	Loaded	0.689	Concentration Time	0.750067 103313	0.775667 103316	0.720333 103319	0.6718 103322	0.678667 103325	0.655267 103328	0.730067 103331	0.644 103334	0.607267 103337	0.7034 103340	0.767667 103343	0.945933 103346	1.091067 103349	0.958867 103352
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														



## Run 45

Segment 1	Unloaded	Average 1.079	Concentration Time														
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	0.377	Concentration Time	0.3554 102343	0.410867 102346	0.483333 102349	0.4534 102352	0.367733 102355	0.326133 102358	0.440133 102401	0.6302 102404	0.592 102407	0.450667 102410	0.448867 102413	0.446267 102416	0.5878 102419	0.545 102422
Segment 2	Loaded	#DIV/0!	Concentration Time														
Segment 3	Unloaded	#DIV/0!	Concentration Time														
Segment 3	Loaded	1.471	Concentration Time	1.1958 103928	1.48 103931	1.537867 103934	1.688267 103937	1.9142 103940	1.747667 103943	1.32 103946	1.193 103949	1.2116 103952	1.4528 103955	1.5482 103958	1.241533 104001	1.117667 104004	1.018933 104007
Segment 4	Unloaded	0.480	Concentration Time														
Segment 4	Loaded	1.855	Concentration Time														
Segment 5	Unloaded	#DIV/0!	Concentration Time														
Segment 5	Loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	0.267	Concentration Time	0.444467 103101	0.4206 103104												
Segment 6	Loaded	0.689	Concentration Time	0.985333 103355	1.154067 103358												
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														



# Run 45

Segment 1	Unloaded	Average 1.079	Concentration Time															
Segment 1	Loaded	#DIV/0!	Concentration Time															
Segment 2	Unloaded	0.377	Concentration Time	0.350467 102425	0.4058 102428	0.449867 102431	0.433733 102434	0.524933 102437	0.540333 102440	0.486 102443	0.346467 102446	0.325133 102449	0.3956 102452	0.4166 102455	0.399467 102458	0.297933 102501	0.3206 102504	
Segment 2	Loaded	#DIV/0!	Concentration Time															
Segment 3	Unloaded	#DIV/0!	Concentration Time															
Segment 3	Loaded	1.471	Concentration Time	0.909867 104010	1.0626 104013	1.442333 104016	1.490867 104019	1.571467 104022	1.5218 104025	1.469 104028	1.264333 104031	1.277133 104034	1.406267 104037	1.311667 104040	1.2062 104043	1.4832 104046	1.723733 104049	
Segment 4	Unloaded	0.480	Concentration Time															
Segment 4	Loaded	1.855	Concentration Time															
Segment 5	Unloaded	#DIV/0!	Concentration Time															
Segment 5	Loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	0.267	Concentration Time															
Segment 6	Loaded	0.689	Concentration Time															
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	Loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	#DIV/0!	Concentration Time															



## Run 45

Segment 1	Unloaded	Average 1.079	Concentration Time															
Segment 1	Loaded	#DIV/0!	Concentration Time															
Segment 2	Unloaded	0.377	Concentration Time	0.3704 102507	0.325667 102510	0.388133 102513	0.467867 102516	0.345067 102519	0.2842 102522	0.2872 102525	0.304533 102528	0.3452 102531						
Segment 2	Loaded	#DIV/0!	Concentration Time															
Segment 3	Unloaded	#DIV/0!	Concentration Time															
Segment 3	Loaded	1.471	Concentration Time	1.602067 104052	1.6336 104055	1.586733 104058	1.617667 104101	1.520733 104104	1.212667 104107	1.0374 104110	0.913067 104113	0.9844 104116	1.2238 104119	1.246867 104122	1.319067 104125	1.3994 104128	1.405533 104131	
Segment 4	Unloaded	0.480	Concentration Time															
Segment 4	Loaded	1.855	Concentration Time															
Segment 5	Unloaded	#DIV/0!	Concentration Time															
Segment 5	Loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	0.267	Concentration Time															
Segment 6	Loaded	0.689	Concentration Time															
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	Loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	#DIV/0!	Concentration Time															



Run 45

Segment 1	Unloaded	Average 1.079	Concentration Time
Segment 1	Loaded	#DIV/0!	Concentration Time
Segment 2	Unloaded	0.377	Concentration Time
Segment 2	Loaded	#DIV/0!	Concentration Time
Segment 3	Unloaded	#DIV/0!	Concentration Time
Segment 3	Loaded	1.471	Concentration Time
Segment 4	Unloaded	0.480	Concentration Time
Segment 4	Loaded	1.855	Concentration Time
Segment 5	Unloaded	#DIV/0!	Concentration Time
Segment 5	Loaded	#DIV/0!	Concentration Time
Segment 6	Unloaded	0.267	Concentration Time
Segment 6	Loaded	0.689	Concentration Time
Segment 7	Unloaded	#DIV/0!	Concentration Time
Segment 7	Loaded	#DIV/0!	Concentration Time
Segment 8	Unloaded	#DIV/0!	Concentration Time



# Run 45

Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	#DIV/0!	Concentration Time														
Segment 10	Loaded	#DIV/0!	Concentration Time														
Segment 11	Unloaded	#DIV/0!	Concentration Time														
Segment 11	Loaded	#DIV/0!	Concentration Time														
Segment 12	Unloaded	2.127	Concentration Time	0.702867 104501	0.7498 104504	0.842933 104507	0.8572 104510	0.9444 104513	0.929733 104516	0.768933 104519	0.715467 104522	0.699933 104525	0.634533 104528	0.549333 104531	0.497667 104534	0.4726 104537	0.596667 104540
Segment 12	Loaded	6.206	Concentration Time	1.7976 105537	1.763133 105540	1.779267 105543	1.777 105546	1.7078 105549	1.695733 105552	1.7624 105555	2.0296 105558	1.989667 105601	2.266533 105604	4.791533 105607	4.924867 105610	4.164933 105613	3.698067 105616
Segment 13	Unloaded	1.270	Concentration Time	2.1384 105007	1.9908 105010	1.927667 105013	1.738667 105016	1.629333 105019	1.587867 105022	1.429467 105025	1.420867 105028	1.361733 105031	1.304133 105034	1.313333 105037	1.364667 105040	1.3232 105043	1.306667 105046
Segment 13	Loaded	1.712	Concentration Time	1.089733 105231	1.2078 105234	1.391733 105237	1.6674 105240	1.576933 105243	1.704133 105246	1.707933 105249	1.467267 105252	1.5502 105255	1.9396 105258	1.8684 105301	1.556667 105304	1.605667 105307	1.645667 105310
Segment 21	Unloaded	0.299	Concentration Time	0.46 102731	0.375733 102734	0.324667 102737	0.3002 102740	0.2932 102743	0.296267 102746	0.2716 102749	0.223867 102752	0.2406 102755	0.303933 102758	0.2728 102801	0.325333 102804	0.291333 102807	0.209533 102810
Segment 21	Loaded	2.175	Concentration Time	1.262 103401	1.295933 103404	1.539867 103407	2.283333 103410	2.750267 103413	2.0224 103416	1.7784 103419	2.411 103422	2.964467 103425	2.6304 103428	2.823 103431	2.1158 103434	2.1312 103437	2.448467 103440
Segment 22	Unloaded	#DIV/0!	Concentration Time														
Segment 22	Loaded	#DIV/0!	Concentration Time														



# Run 45

Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	#DIV/0!	Concentration Time														
Segment 10	Loaded	#DIV/0!	Concentration Time														
Segment 11	Unloaded	#DIV/0!	Concentration Time														
Segment 11	Loaded	#DIV/0!	Concentration Time														
Segment 12	Unloaded	2.127	Concentration Time	0.721133 104543	0.737467 104546	0.750133 104549	0.693067 104552	0.8518 104555	0.7502 104558	0.622867 104601	0.628667 104604	0.768933 104607	0.9322 104610	0.969867 104613	0.798 104616	0.710533 104619	0.589267 104622
Segment 12	Loaded	6.206	Concentration Time	3.5974 105619	5.0574 105622	3.2448 105625	3.758333 105628	4.3188 105631	3.291 105634	3.385933 105637	4.4578 105640	9.230133 105643	10.43287 105646	7.117267 105649	5.814133 105652	5.6732 105655	5.978667 105658
Segment 13	Unloaded	1.270	Concentration Time	1.207 105049	1.181267 105052	1.170133 105055	1.285733 105058	1.278933 105101	1.185733 105104	1.095733 105107	1.071733 105110	1.171733 105113	1.1344 105116	1.2256 105119	1.28 105122	1.262333 105125	1.121533 105128
Segment 13	Loaded	1.712	Concentration Time	1.6682 105313	1.718733 105316	1.711333 105319	1.802 105322	1.9116 105325	1.858533 105328	1.679 105331	1.594067 105334	1.729467 105337	1.733867 105340	1.7806 105343	1.940733 105346	1.726333 105349	1.560933 105352
Segment 21	Unloaded	0.299	Concentration Time														
Segment 21	Loaded	2.175	Concentration Time														
Segment 22	Unloaded	#DIV/0!	Concentration Time														
Segment 22	Loaded	#DIV/0!	Concentration Time														



# Run 45

Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	#DIV/0!	Concentration Time														
Segment 10	Loaded	#DIV/0!	Concentration Time														
Segment 11	Unloaded	#DIV/0!	Concentration Time														
Segment 11	Loaded	#DIV/0!	Concentration Time														
Segment 12	Unloaded	2.127	Concentration Time	0.494067 104625	0.4552 104628	0.532333 104631	0.688533 104634	0.5462 104637	0.4816 104640	0.779267 104643	1.2896 104646	1.003133 104649	0.828067 104652	0.787467 104655	0.748067 104658	0.7766 104701	0.797733 104704
Segment 12	Loaded	6.206	Concentration Time	8.375 105701	6.736533 105704	4.235533 105707	3.622133 105710	3.059867 105713	3.8498 105716	5.0316 105719	7.242933 105722	18.98793 105725	16.71713 105728	10.60967 105731	13.1308 105734	18.68267 105737	23.48167 105740
Segment 13	Unloaded	1.270	Concentration Time	0.9904 105131	0.980333 105134	0.984067 105137	1.021467 105140	0.955267 105143	0.875067 105146	0.907467 105149	1.027467 105152	1.222133 105155	1.3778 105158	1.3838 105201	1.360933 105204	1.2506 105207	1.123867 105210
Segment 13	Loaded	1.712	Concentration Time	1.518867 105355	1.4166 105358	1.406533 105401	1.597267 105404	1.979533 105407	1.6984 105410	1.899 105413	2.778533 105416	3.3312 105419	4.170067 105422	3.392133 105425	1.9082 105428	1.301533 105431	1.139667 105434
Segment 21	Unloaded	0.299	Concentration Time														
Segment 21	Loaded	2.175	Concentration Time														
Segment 22	Unloaded	#DIV/0!	Concentration Time														
Segment 22	Loaded	#DIV/0!	Concentration Time														



## Run 45

Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	#DIV/0!	Concentration Time														
Segment 10	Loaded	#DIV/0!	Concentration Time														
Segment 11	Unloaded	#DIV/0!	Concentration Time														
Segment 11	Loaded	#DIV/0!	Concentration Time														
Segment 12	Unloaded	2.127	Concentration Time	1.059467 104707	1.0232 104710	0.842067 104713	1.463733 104716	2.6402 104719	1.947333 104722	1.5492 104725	2.938133 104728	4.8028 104731	4.199467 104734	3.114067 104737	2.643533 104740	1.836267 104743	3.9716 104746
Segment 12	Loaded	6.206	Concentration Time	25.3696 105743	27.13933 105746	29.35907 105749	28.02047 105752	29.07707 105755	20.55347 105758	13.32467 105801	9.4604 105804	6.5656 105807	6.0032 105810	5.590667 105813	4.612733 105816	4.0226 105819	4.575933 105822
Segment 13	Unloaded	1.270	Concentration Time	1.121867 105213	1.102667 105216	1.2324 105219	1.3516 105222	1.1508 105225	1.034333 105228								
Segment 13	Loaded	1.712	Concentration Time	1.166333 105437	1.1778 105440	0.9762 105443	1.000667 105446	1.033067 105449	0.871133 105452								
Segment 21	Unloaded	0.299	Concentration Time														
Segment 21	Loaded	2.175	Concentration Time														
Segment 22	Unloaded	#DIV/0!	Concentration Time														
Segment 22	Loaded	#DIV/0!	Concentration Time														



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time	2.8942 143724	3.5192 143727	3.885133 143730	4.216667 143733	4.463133 143736	4.001067 143739	2.845733 143742	2.661067 143745	2.761067 143748	2.713067 143751	2.257667 143754	
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.102	Concentration Time	7.495933 152630	7.005133 152633	7.0624 152636	6.889533 152639	6.1296 152642	6.081533 152645	6.144 152648	6.3968 152651	6.644733 152654	6.22 152657	5.834667 152700	5.502133 152703
Segment 2	Loaded	#DIV/0!	Concentration Time												
Segment 3	Unloaded	#DIV/0!	Concentration Time												
Segment 3	Loaded	3.632	Concentration Time	4.955133 153100	4.8542 153103	3.6518 153106	3.242933 153109	3.1494 153112	3.203067 153115	3.205867 153118	3.395133 153121	3.1862 153124	3.042933 153127	3.347467 153130	3.8858 153133
Segment 4	Unloaded	2.863	Concentration Time	3.914267 145924	3.7662 145927	3.579533 145930	3.570667 145933	3.4156 145936	3.1326 145939	3.100733 145942	3.001067 145945	2.9512 145948	3.005933 145951	2.9824 145954	3.3054 145957
Segment 4	Loaded	6.014	Concentration Time	4.800267 151812	3.9944 151815	3.842867 151818	3.659267 151821	3.460667 151824	3.730933 151827	3.7298 151830	2.959533 151833	2.508533 151836	2.7158 151839	3.129067 151842	3.3328 151845
Segment 5	Unloaded	#DIV/0!	Concentration Time												
Segment 5	Loaded	#DIV/0!	Concentration Time												
Segment 6	Unloaded	1.165	Concentration Time	1.551067 150327	1.414333 150330	1.353933 150333	1.354 150336	1.402733 150339	1.261333 150342	1.1824 150345	1.237667 150348	1.081467 150351	1.0264 150354	1.112133 150357	1.002133 150400
Segment 6	Loaded	11.914	Concentration Time	8.386067 151333	12.55667 151336	14.10627 151339	15.0502 151342	15.63127 151345	12.55333 151348	12.20647 151351	14.7042 151354	16.82287 151357	16.5414 151400	16.5008 151403	18.214 151406
Segment 7	Unloaded	11.419	Concentration Time	11.25073 151003	10.53767 151006	10.04133 151009	10.21673 151012	9.739133 151015	10.98787 151018	20.6892 151021	28.06427 151024	26.888 151027	18.9308 151030	18.39967 151033	17.9374 151036
Segment 7	Loaded	34.069	Concentration Time	5.019733 150721	8.387067 150724	12.2984 150727	26.68187 150730	45.47353 150733	36.4062 150736	30.73 150739	42.3188 150742	44.1158 150745	41.06707 150748	44.997 150751	50.03533 150754
Segment 8	Unloaded	1.638	Concentration Time	1.521133 143851	1.489 143854	1.3262 143857	1.102533 143900	0.959467 143903	1.0258 143906	1.183733 143909	1.205867 143912	1.255467 143915	1.1498 143918	1.0094 143921	0.9704 143924
Segment 8	Loaded	6.032	Concentration Time	2.123867 152227	1.905133 152230	1.879333 152233	2.3446 152236	2.498133 152239	2.6622 152242	2.881267 152245	3.313733 152248	3.629867 152251	3.5758 152254	4.136333 152257	4.055267 152300
Segment 9	Unloaded	2.440	Concentration Time	2.0918 144248	2.048 144251	1.950267 144254	1.842133 144257	1.7898 144300	2.3774 144303	3.3942 144306	3.5104 144309	3.5158 144312	3.612533 144315	3.118533 144318	2.5346 144321
Segment 9	Loaded	1.881	Concentration Time	1.061067 152124	1.159933 152127	0.978533 152130	0.795267 152133	0.779867 152136	0.850533 152139	1.217667 152142	2.392267 152145	2.782267 152148	1.508667 152151	1.251667 152154	1.645 152157



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time												
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.102	Concentration Time	5.496 152706	5.443733 152709	5.445133 152712	5.849133 152715	5.784667 152718	5.534667 152721	5.715533 152724	5.897533 152727	6.6624 152730	6.311533 152733	7.137733 152736	9.166267 152739
Segment 2	Loaded	#DIV/0!	Concentration Time												
Segment 3	Unloaded	#DIV/0!	Concentration Time												
Segment 3	Loaded	3.632	Concentration Time	3.464267 153136	3.143 153139	2.997 153142	3.287867 153145	3.455933 153148	2.946267 153151	2.793733 153154	3.0584 153157	3.064 153200	3.076533 153203	2.953 153206	2.8032 153209
Segment 4	Unloaded	2.863	Concentration Time	3.217733 150000	3.008533 150003	3.2232 150006	3.380667 150009	3.353267 150012	3.337667 150015	3.1658 150018	2.903533 150021	2.623467 150024	2.4664 150027	2.4924 150030	2.5898 150033
Segment 4	Loaded	6.014	Concentration Time	3.653333 151848	3.352667 151851	2.714067 151854	2.515533 151857	2.586067 151900	2.562533 151903	2.448667 151906	2.66 151909	2.9128 151912	3.147533 151915	3.6612 151918	3.8588 151921
Segment 5	Unloaded	#DIV/0!	Concentration Time												
Segment 5	Loaded	#DIV/0!	Concentration Time												
Segment 6	Unloaded	1.165	Concentration Time	0.9088 150403	1.1362 150406	1.4614 150409	1.3776 150412	1.1462 150415	1.148 150418	1.025067 150421	0.906733 150424	0.9736 150427	1.005933 150430	1.021133 150433	0.9484 150436
Segment 6	Loaded	11.914	Concentration Time	13.7776 151409	8.873467 151412	9.8248 151415	10.63193 151418	10.04113 151421	8.945467 151424	9.038267 151427	10.8568 151430	10.75533 151433	9.054067 151436	8.316267 151439	9.100467 151442
Segment 7	Unloaded	11.419	Concentration Time	15.69593 151039	19.48827 151042	16.27 151045	14.24547 151048	18.37493 151051	15.909 151054	13.42847 151057	10.36167 151100	9.6746 151103	10.3858 151106	9.1304 151109	8.690933 151112
Segment 7	Loaded	34.069	Concentration Time	52.51573 150757	69.38513 150800	67.9178 150803	34.6586 150806	27.61107 150809	35.4392 150812	34.85593 150815	29.14047 150818	30.15387 150821	23.40833 150824	21.789 150827	16.22747 150830
Segment 8	Unloaded	1.638	Concentration Time	1.118133 143927	1.228933 143930	1.158133 143933	1.205667 143936	1.299267 143939	1.335133 143942	1.323067 143945	1.123267 143948	0.814 143951	0.6482 143954	0.703267 143957	0.769333 144000
Segment 8	Loaded	6.032	Concentration Time	3.8054 152303	3.951933 152306	4.739333 152309	4.642267 152312	4.289067 152315	4.521533 152318	3.728333 152321	3.3204 152324	3.665067 152327	3.926467 152330	4.109133 152333	3.5786 152336
Segment 9	Unloaded	2.440	Concentration Time	2.281333 144324	2.030467 144327	2.0014 144330	1.9336 144333	1.7496 144336	2.1428 144339	2.4412 144342					
Segment 9	Loaded	1.881	Concentration Time	1.727867 152200	4.119533 152203	5.061133 152206	2.322667 152209	1.6672 152212	2.097 152215	2.316133 152218					



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time												
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.102	Concentration Time	9.354867 152742	7.854533 152745	6.9544 152748	6.385333 152751	6.067333 152754	5.438267 152757	5.235333 152800	5.320267 152803	5.2338 152806	5.229467 152809	5.194133 152812	5.1038 152815
Segment 2	Loaded	#DIV/0!	Concentration Time												
Segment 3	Unloaded	#DIV/0!	Concentration Time												
Segment 3	Loaded	3.632	Concentration Time	2.7928 153212	2.6314 153215	3.1194 153218	3.146067 153221	2.324667 153224	2.1646 153227	2.255067 153230	2.571467 153233	2.8276 153236	3.348667 153239	3.142733 153242	2.980467 153245
Segment 4	Unloaded	2.863	Concentration Time	2.656933 150036	2.758 150039	2.402133 150042	2.1572 150045	1.976867 150048	1.9322 150051	2.145533 150054	1.953933 150057	1.9272 150100	1.9582 150103		
Segment 4	Loaded	6.014	Concentration Time	3.775667 151924	3.515733 151927	3.415733 151930	3.795267 151933	3.456467 151936	2.628933 151939	2.428867 151942	2.150333 151945	2.4384 151948	10.22653 151951	37.49507 151954	63.22687 151957
Segment 5	Unloaded	#DIV/0!	Concentration Time												
Segment 5	Loaded	#DIV/0!	Concentration Time												
Segment 6	Unloaded	1.165	Concentration Time	0.889333 150439	1.1898 150442	1.333267 150445									
Segment 6	Loaded	11.914	Concentration Time	12.79267 151445	10.18933 151448	6.206667 151451									
Segment 7	Unloaded	11.419	Concentration Time	8.616667 151115	7.4848 151118	7.3054 151121	8.302267 151124	8.935133 151127	11.90427 151130	11.34553 151133	8.108333 151136	7.4644 151139	6.3276 151142	8.126133 151145	8.787067 151148
Segment 7	Loaded	34.069	Concentration Time	25.733 150833	36.7046 150836	37.4262 150839	38.128 150842	34.01307 150845	23.0206 150848	15.61293 150851	27.6886 150854	49.29773 150857	58.20073 150900	37.42333 150903	24.6908 150906
Segment 8	Unloaded	1.638	Concentration Time	0.506067 144003	0.348667 144006	0.415867 144009	0.430933 144012	0.408667 144015	0.3236 144018	0.21 144021	0.090933 144024	0.181133 144027	0.313067 144030	0.3526 144033	0.288267 144036
Segment 8	Loaded	6.032	Concentration Time	3.938267 152339	4.7138 152342	6.212333 152345	5.898333 152348	4.5736 152351	4.5284 152354	4.5388 152357	4.642933 152400	6.096933 152403	6.0358 152406	4.8714 152409	5.160333 152412
Segment 9	Unloaded	2.440	Concentration Time												
Segment 9	Loaded	1.881	Concentration Time												



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time												
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.102	Concentration Time	5.413267 152818	5.181333 152821	4.890267 152824	4.494467 152827	4.3618 152830	4.228933 152833	4.1356 152836	4.248667 152839	4.382867 152842	4.456133 152845	4.734067 152848	4.7474 152851
Segment 2	Loaded	#DIV/0!	Concentration Time												
Segment 3	Unloaded	#DIV/0!	Concentration Time												
Segment 3	Loaded	3.632	Concentration Time	3.507933 153248	3.403467 153251	2.9562 153254	3.5896 153257	3.906333 153300	3.586467 153303	3.712733 153306	4.372733 153309	5.209133 153312	4.407733 153315	3.620333 153318	3.094067 153321
Segment 4	Unloaded	2.863	Concentration Time												
Segment 4	Loaded	6.014	Concentration Time												
Segment 5	Unloaded	#DIV/0!	Concentration Time												
Segment 5	Loaded	#DIV/0!	Concentration Time												
Segment 6	Unloaded	1.165	Concentration Time												
Segment 6	Loaded	11.914	Concentration Time												
Segment 7	Unloaded	11.419	Concentration Time	8.049267 151151	18.1516 150633		18.42993 150636	16.829 150639	15.927 150642	11.24967 150645	10.16287 150648	9.140933 150651	7.119133 150654	5.9516 150657	5.182733 150700
Segment 7	Loaded	34.069	Concentration Time	33.51773 150909	61.78507 150912	71.68687 150915	60.88807 150918	46.85953 150921	38.8288 150924	40.73913 150927	43.23053 150930	35.26127 150933	34.7026 150936	34.45807 150939	26.96607 150942
Segment 8	Unloaded	1.638	Concentration Time	0.173933 144039	0.206467 144042	0.314533 144045	0.400733 144048	0.502133 144051	0.732867 144054	0.9186 144057	1.0256 144100	1.214267 144103	0.999467 144106	0.889467 144109	1.0078 144112
Segment 8	Loaded	6.032	Concentration Time	5.106533 152415	5.071667 152418	4.775133 152421	4.5866 152424	5.496067 152427	7.2956 152430	7.848733 152433	6.872133 152436	8.141667 152439	11.42887 152442	10.16493 152445	9.125667 152448
Segment 9	Unloaded	2.440	Concentration Time												
Segment 9	Loaded	1.881	Concentration Time												



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time												
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.102	Concentration Time	5.04 152854	5.323533 152857	5.165933 152900	5.4882 152903	5.6576 152906	4.9874 152909	4.538467 152912	4.372267 152915	4.531067 152918	4.9616 152921	5.166667 152924	4.600667 152927
Segment 2	Loaded	#DIV/0!	Concentration Time												
Segment 3	Unloaded	#DIV/0!	Concentration Time												
Segment 3	Loaded	3.632	Concentration Time	2.526133 153324	2.727533 153327	3.418 153330	3.602667 153333	3.268933 153336	2.896467 153339	3.0442 153342	3.279867 153345	3.249267 153348	3.003067 153351	3.588733 153354	3.9986 153357
Segment 4	Unloaded	2.863	Concentration Time												
Segment 4	Loaded	6.014	Concentration Time												
Segment 5	Unloaded	#DIV/0!	Concentration Time												
Segment 5	Loaded	#DIV/0!	Concentration Time												
Segment 6	Unloaded	1.165	Concentration Time												
Segment 6	Loaded	11.914	Concentration Time												
Segment 7	Unloaded	11.419	Concentration Time	4.749533 150703	4.178533 150706	3.474667 150709	2.851933 150712	2.646133 150715	3.056867 150718						
Segment 7	Loaded	34.069	Concentration Time	18.2752 150945	12.18953 150948	10.80013 150951	10.3742 150954	9.793467 150957	10.78287 151000						
Segment 8	Unloaded	1.638	Concentration Time	1.335533 144115	2.116267 144118	2.8128 144121	3.1704 144124	5.693067 144127	7.868933 144130	7.664 144133	8.336067 144136	7.3226 144139	5.082 144142	3.802467 144145	2.652267 144148
Segment 8	Loaded	6.032	Concentration Time	7.9206 152451	6.909 152454	7.057067 152457	7.605867 152500	7.778667 152503	7.531 152506	7.677 152509	8.348533 152512	8.360667 152515	8.210733 152518	7.009467 152521	6.308933 152524
Segment 9	Unloaded	2.440	Concentration Time												
Segment 9	Loaded	1.881	Concentration Time												



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time													
Segment 1	Loaded	#DIV/0!	Concentration Time													
Segment 2	Unloaded	5.102	Concentration Time	4.1182 152930	4.340467 152933	4.869667 152936	4.782867 152939	4.2912 152942	3.9998 152945	3.916533 152948	3.830467 152951	3.914467 152954	3.451733 152957	3.491333 153000	3.769933 153003	
Segment 2	Loaded	#DIV/0!	Concentration Time													
Segment 3	Unloaded	#DIV/0!	Concentration Time													
Segment 3	Loaded	3.632	Concentration Time	4.284333 153400	4.911467 153403	4.469933 153406	3.722933 153409	3.868733 153412	3.7586 153415	3.375133 153418	3.235733 153421	3.0664 153424	3.2292 153427	3.709867 153430	4.021867 153433	
Segment 4	Unloaded	2.863	Concentration Time													
Segment 4	Loaded	6.014	Concentration Time													
Segment 5	Unloaded	#DIV/0!	Concentration Time													
Segment 5	Loaded	#DIV/0!	Concentration Time													
Segment 6	Unloaded	1.165	Concentration Time													
Segment 6	Loaded	11.914	Concentration Time													
Segment 7	Unloaded	11.419	Concentration Time													
Segment 7	Loaded	34.069	Concentration Time													
Segment 8	Unloaded	1.638	Concentration Time	2.232667 144151	2.076933 144154	2.11 144157	2.034467 144200	1.929333 144203	1.811267 144206	1.750133 144209	1.495667 144212	1.244733 144215	1.2326 144218	1.3352 144221		
Segment 8	Loaded	6.032	Concentration Time	6.233467 152527	6.2976 152530	6.019667 152533	6.162467 152536	5.819267 152539	6.229133 152542	15.5362 152545	26.60487 152548	16.20227 152551				
Segment 9	Unloaded	2.440	Concentration Time													
Segment 9	Loaded	1.881	Concentration Time													



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time													
Segment 1	Loaded	#DIV/0!	Concentration Time													
Segment 2	Unloaded	5.102	Concentration Time	3.5634 153006	3.420733 153009	3.360933 153012	3.1948 153015	3.263533 153018	3.3712 153021	3.572333 153024	4.005533 153027	4.025133 153030	4.159667 153033	4.636133 153036	4.390667 153039	
Segment 2	Loaded	#DIV/0!	Concentration Time													
Segment 3	Unloaded	#DIV/0!	Concentration Time													
Segment 3	Loaded	3.632	Concentration Time	4.505267 153436	4.5458 153439	5.1238 153442	6.194533 153445	5.926667 153448	4.6698 153451	4.410667 153454	4.353667 153457	4.037133 153500	3.832333 153503	4.565067 153506	5.831867 153509	
Segment 4	Unloaded	2.863	Concentration Time													
Segment 4	Loaded	6.014	Concentration Time													
Segment 5	Unloaded	#DIV/0!	Concentration Time													
Segment 5	Loaded	#DIV/0!	Concentration Time													
Segment 6	Unloaded	1.165	Concentration Time													
Segment 6	Loaded	11.914	Concentration Time													
Segment 7	Unloaded	11.419	Concentration Time													
Segment 7	Loaded	34.069	Concentration Time													
Segment 8	Unloaded	1.638	Concentration Time													
Segment 8	Loaded	6.032	Concentration Time													
Segment 9	Unloaded	2.440	Concentration Time													
Segment 9	Loaded	1.881	Concentration Time													



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time												
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.102	Concentration Time	3.793067 153042	4.634333 153045	4.331067 153048	3.5448 153051	4.248533 153054	4.5552 153057						
Segment 2	Loaded	#DIV/0!	Concentration Time												
Segment 3	Unloaded	#DIV/0!	Concentration Time												
Segment 3	Loaded	3.632	Concentration Time	6.148733 153512	5.3 153515	5.453 153518	5.3898 153521	4.442267 153524	3.591333 153527	3.383133 153530	3.415067 153533	2.961133 153536	2.449133 153539	2.1416 153542	2.145733 153545
Segment 4	Unloaded	2.863	Concentration Time												
Segment 4	Loaded	6.014	Concentration Time												
Segment 5	Unloaded	#DIV/0!	Concentration Time												
Segment 5	Loaded	#DIV/0!	Concentration Time												
Segment 6	Unloaded	1.165	Concentration Time												
Segment 6	Loaded	11.914	Concentration Time												
Segment 7	Unloaded	11.419	Concentration Time												
Segment 7	Loaded	34.069	Concentration Time												
Segment 8	Unloaded	1.638	Concentration Time												
Segment 8	Loaded	6.032	Concentration Time												
Segment 9	Unloaded	2.440	Concentration Time												
Segment 9	Loaded	1.881	Concentration Time												



## Run 47

Segment 1	Unloaded	Average 3.293	Concentration Time		
Segment 1	Loaded	#DIV/0!	Concentration Time		
Segment 2	Unloaded	5.102	Concentration Time		
Segment 2	Loaded	#DIV/0!	Concentration Time		
Segment 3	Unloaded	#DIV/0!	Concentration Time		
Segment 3	Loaded	3.632	Concentration Time	3.222467 153548	4.828933 153551
Segment 4	Unloaded	2.863	Concentration Time		
Segment 4	Loaded	6.014	Concentration Time		
Segment 5	Unloaded	#DIV/0!	Concentration Time		
Segment 5	Loaded	#DIV/0!	Concentration Time		
Segment 6	Unloaded	1.165	Concentration Time		
Segment 6	Loaded	11.914	Concentration Time		
Segment 7	Unloaded	11.419	Concentration Time		
Segment 7	Loaded	34.069	Concentration Time		
Segment 8	Unloaded	1.638	Concentration Time		
Segment 8	Loaded	6.032	Concentration Time		
Segment 9	Unloaded	2.440	Concentration Time		
Segment 9	Loaded	1.881	Concentration Time		



## Run 47

[illegible]



## Run 47

Segment 10	Unloaded	1.165	Concentration Time	0.731467 144445	0.397933 144448	0.2152 144451	0.219333 144454	0.3076 144457	0.439333 144500	0.487067 144503					
Segment 10	Loaded	1.618	Concentration Time												
Segment 11	Unloaded	#DIV/0!	Concentration Time												
Segment 11	Loaded	#DIV/0!	Concentration Time												
Segment 12	Unloaded	#DIV/0!	Concentration Time												
Segment 12	Loaded	#DIV/0!	Concentration Time												
Segment 13	Unloaded	6.517	Concentration Time	2.925467 145430	3.138533 145433	2.998867 145436	3.097333 145439	3.101867 145442	3.396133 145445	5.646333 145448	10.3244 145451	10.076 145454	5.747 145457	3.9104 145500	3.7322 145503
Segment 13	Loaded	4.013	Concentration Time	3.858467 145224	5.253533 145227	5.251267 145230	5.930533 145233	5.626867 145236	3.6492 145239	3.201267 145242	4.1168 145245	4.6326 145248	3.732333 145251	2.8506 145254	2.522667 145257
Segment 21	Unloaded	4.375	Concentration Time	3.551667 151618	3.137 151621	2.827533 151624									
Segment 21	Loaded	4.639	Concentration Time	4.000867 151530	3.622867 151533	3.503667 151536									
Segment 22	Unloaded	#DIV/0!	Concentration Time												
Segment 22	Loaded	#DIV/0!	Concentration Time												



## Run 47

Segment 10	Unloaded	1.165	Concentration Time													
Segment 10	Loaded	1.618	Concentration Time													
Segment 11	Unloaded	#DIV/0!	Concentration Time													
Segment 11	Loaded	#DIV/0!	Concentration Time													
Segment 12	Unloaded	#DIV/0!	Concentration Time													
Segment 12	Loaded	#DIV/0!	Concentration Time													
Segment 13	Unloaded	6.517	Concentration Time	3.773933 145506	3.710733 145509	3.7404 145512	4.417733 145515	5.894867 145518	5.972667 145521	4.676733 145524	4.43 145527	4.022 145530	3.5198 145533	3.692467 145536	3.8462 145539	
Segment 13	Loaded	4.013	Concentration Time	2.732267 145300	2.720867 145303	2.4828 145306	2.192133 145309	2.0652 145312	1.973267 145315	1.960933 145318	2.528533 145321	2.677467 145324	2.4412 145327	2.656733 145330	3.272067 145333	
Segment 21	Unloaded	4.375	Concentration Time													
Segment 21	Loaded	4.639	Concentration Time													
Segment 22	Unloaded	#DIV/0!	Concentration Time													
Segment 22	Loaded	#DIV/0!	Concentration Time													



Run 50

Segment 1	Unloaded	Average 6.607	Concentration Time	4.763867 194326	5.408867 194329	5.033267 194332	9.564067 194335	13.5086 194338	7.446867 194341	4.479733 194344	4.048867 194347	5.208667 194350							
Segment 1	Loaded	0.655	Concentration Time	1.3496 200005	0.8224 200008	0.5796 200011	0.424533 200014	0.331133 200017	0.4476 200020	0.576267 200023	0.707067 200026								
Segment 14	Unloaded	1.938	Concentration Time	2.7068 194411	2.489267 194414	2.001467 194417	1.598933 194420	1.620733 194423	1.3516 194426	1.001933 194429	0.9854 194432	1.011467 194435	0.9534 194438	0.702467 194441	0.597733 194444	0.687267 194447	0.945467 194450	0.773267 194453	0.438533 194456
Segment 14	Loaded	3.692	Concentration Time	9.612267 195644	9.289467 195647	7.762533 195650	6.768933 195653	6.8048 195656	6.485333 195659	7.0204 195702	7.087067 195705	6.916 195708	6.329067 195711	5.2824 195714	5.128933 195717	5.509667 195720	5.788533 195723	5.406867 195726	4.728333 195729
Segment 15	Unloaded	9.875	Concentration Time	11.8388 194723	7.929733 194726	7.1252 194729	7.263733 194732	10.098 194735	15.30887 194738	16.23073 194741	13.11927 194744	13.74667 194747	14.80773 194750	11.1156 194753	10.9676 194756	10.8556 194759	7.918933 194802	6.6544 194805	5.943533 194808
Segment 15	Loaded	13.634	Concentration Time	16.81093 195138	13.98533 195141	9.2586 195144	7.894933 195147	9.4804 195150	11.37567 195153	10.0824 195156	11.72953 195159	15.2308 195202	23.43767 195205	32.09627 195208	26.06313 195211	23.44567 195214	20.20153 195217	12.6806 195220	9.2414 195223
Segment 16	Unloaded	10.346	Concentration Time	4.765933 194823	4.720867 194826	4.727467 194829	4.3142 194832	4.440067 194835	5.128067 194838	5.081133 194841	4.9562 194844	4.3052 194847	3.5766 194850	3.352467 194853	2.983267 194856	2.7202 194859	3.046133 194902	3.635933 194905	3.4396 194908
Segment 16	Loaded	15.794	Concentration Time	5.364333 195002	17.67133 195005	27.66033 195008	21.05993 195011	16.94493 195014	19.63687 195017	24.2844 195020	25.06607 195023	22.8622 195026	18.42593 195029	18.1356 195032	15.72607 195035	15.72233 195038	19.25487 195041	20.4646 195044	15.9266 195047
Segment 17	Unloaded	21.117	Concentration Time	10.63287 195244	11.23727 195247	7.773733 195250	12.99613 195253	13.583 195256	9.808667 195259	7.764733 195302	6.476067 195305	5.501467 195308	5.333667 195311	5.317133 195314	7.079867 195317	8.517667 195320	5.724267 195323	8.654533 195326	15.42273 195329
Segment 17	Loaded	53.209	Concentration Time	53.25013 195441	64.423 195444	66.65133 195447	60.08427 195450	80.0244 195453	101.0478 195456	96.187 195459	87.5398 195502	80.8008 195505	54.938 195508	66.5768 195511	95.12747 195514	83.4192 195517	63.3562 195520	52.14187 195523	52.27227 195526



Run 50

Segment 1	Unloaded	Average 6.607	Concentration Time																
Segment 1	Loaded	0.655	Concentration Time																
Segment 14	Unloaded	1.938	Concentration Time	0.410533 194459	0.270667 194502	0.305067 194505	0.4164 194508	0.569733 194511	1.123 194514	1.286733 194517	1.2058 194520	1.240933 194523	1.178867 194526	1.115867 194529	1.1224 194532	1.225467 194535	1.3172 194538	1.3546 194541	1.245533 194544
Segment 14	Loaded	3.692	Concentration Time	3.9884 195732	3.665 195735	3.708067 195738	3.7596 195741	3.978933 195744	5.043867 195747	5.297133 195750	5.152333 195753	5.326667 195756	4.543467 195759	3.822733 195802	4.100667 195805	4.207067 195808	4.378733 195811	4.332667 195814	3.911533 195817
Segment 15	Unloaded	9.875	Concentration Time	6.726267 194811	7.489 194814	6.5982 194817	5.7674 194820												
Segment 15	Loaded	13.634	Concentration Time	6.4192 195226	4.823733 195229	4.291467 195232	4.125933 195235												
Segment 16	Unloaded	10.346	Concentration Time	5.1766 194911	10.9872 194914	12.732 194917	11.48747 194920	11.30733 194923	9.647533 194926	10.08393 194929	17.83827 194932	20.34153 194935	11.43887 194938	8.3772 194941	11.48013 194944	13.25833 194947	20.3864 194950	58.82913 194953	36.254 194956
Segment 16	Loaded	15.794	Concentration Time	18.33673 195050	19.3596 195053	21.00727 195056	22.73747 195059	21.21567 195102	20.108 195105	15.08313 195108	8.382267 195111	6.8822 195114	6.0278 195117	5.179933 195120	5.620533 195123	5.438467 195126	5.185133 195129	7.700467 195132	12.9396 195135
Segment 17	Unloaded	21.117	Concentration Time	26.2758 195332	31.17907 195335	17.2822 195338	10.89693 195341	11.68327 195344	10.9458 195347	9.042667 195350	12.98 195353	12.83833 195356	16.10727 195359	23.26627 195402	37.23073 195405	107.5069 195408	119.9247 195411	61.36407 195414	43.37367 195417
Segment 17	Loaded	53.209	Concentration Time	63.17973 195529	56.07293 195532	38.59207 195535	33.59593 195538	34.20427 195541	28.9522 195544	24.48613 195547	26.0552 195550	31.58607 195553	40.47967 195556	51.74153 195559	54.553 195602	51.3746 195605	52.3602 195608	49.37987 195611	48.9046 195614



## Run 50

Segment 1	Unloaded	Average 6.607	Concentration Time																
Segment 1	Loaded	0.655	Concentration Time																
Segment 14	Unloaded	1.938	Concentration Time	2.239333 194547	2.617733 194550	2.137467 194553	1.650133 194556	1.549 194559	2.005667 194602	2.0186 194605	2.039533 194608	2.1654 194611	2.0526 194614	2.198733 194617	2.2054 194620	2.263467 194623	2.421667 194626	2.466133 194629	2.026933 194632
Segment 14	Loaded	3.692	Concentration Time	3.556067 195820	3.337133 195823	2.987267 195826	2.8722 195829	3.187533 195832	3.168 195835	3.322467 195838	3.7768 195841	4.197933 195844	3.6702 195847	2.952733 195850	2.362267 195853	1.689933 195856	1.1786 195859	0.702333 195902	0.576267 195905
Segment 15	Unloaded	9.875	Concentration Time																
Segment 15	Loaded	13.634	Concentration Time																
Segment 16	Unloaded	10.346	Concentration Time	6.601333 194959															
Segment 16	Loaded	15.794	Concentration Time																
Segment 17	Unloaded	21.117	Concentration Time	27.96473 195420	12.16793 195423	11.26827 195426	13.51593 195429	12.76927 195432	21.3406 195435	30.81767 195438									
Segment 17	Loaded	53.209	Concentration Time	38.53527 195617	32.00707 195620	29.98507 195623	29.55893 195626	27.23 195629	35.8462 195632	38.63673 195635									



## Run 50

Segment 1	Unloaded	Average 6.607	Concentration Time														
Segment 1	Loaded	0.655	Concentration Time														
Segment 14	Unloaded	1.938	Concentration Time	1.9064 194635	1.952333 194638	1.580533 194641	1.2272 194644	0.918467 194647	1.044667 194650	1.492333 194653	1.916333 194656	1.808933 194659	2.208933 194702	4.2822 194705	7.848533 194708	9.698133 194711	12.98133 194714
Segment 14	Loaded	3.692	Concentration Time	0.9026 195908	1.1006 195911	0.9234 195914	0.864067 195917	1.314267 195920	1.005533 195923	0.6488 195926	0.706867 195929	0.3164 195932	0.1678 195935	0.306867 195938	0.465867 195941	0.750067 195944	0.771133 195947
Segment 15	Unloaded	9.875	Concentration Time														
Segment 15	Loaded	13.634	Concentration Time														
Segment 16	Unloaded	10.346	Concentration Time														
Segment 16	Loaded	15.794	Concentration Time														
Segment 17	Unloaded	21.117	Concentration Time														
Segment 17	Loaded	53.209	Concentration Time														



Plume Profiling - all runs

Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Total Integrated Exposure	Equivalent Haul Truck	Emission Factor	Run No
																								(lb/mile)	Passes	(lb/veh-mile)	
IMAP-01	7/12/2007	United Taconite Site 1																									
		1	9.0	12:08	14:39	151	66.0	28.4	631063	4377.0	4409.5	32.5	29.0	3.3	40.9	42.2	42.2	0.1607	0.1507	11.8	0.7212		0.6877				
		2	6.5	12:08	14:39	151	66.0	28.4	631064	4393.8	4460.9	67.1	63.6	3.2	40.3	41.5	41.5	0.3582	0.3482	11.4	1.6046		2.9073				
		3	4.0	12:08	14:39	151	66.0	28.4	631065	4361.2	4427.6	66.4	62.9	3.3	40.9	42.2	42.2	0.3485	0.3385	10.7	1.4705		3.8439				
		4	2.0	12:07	14:39	152	66.0	28.4	631066	4369.9	4425.5	55.6	52.1	3.2	40.3	41.5	41.5	0.2915	0.2815	9.8	1.1238	10.9	2.5942 2.2476	435.23	45.31	9.61	IMAP-1
		Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)							
		Wedding U	10	1.9	11:58/16:14	?/18:30	264	66	28.4	--	631059	4384.6	4388.5	3.9	2.4	3.5	42.2	43.5	43.5	0.0074							
		Wedding D	10	1.9	12:07	14:39	152	66	28.4	17.5	631058	4372.5	4390.4	17.9	16.4	3.6	42.9	44.2	44.2	0.0862							
		Hi Vol	10	1.2	12:07	14:39	152	66	28.4	2.275	631067	4373.9	did not pass audit			3.12	39.7	41.0	41.0								
		Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	Average Concentration Reading (mg/m3)																
		DustTrak 1	10	4.0	12:27/13:39	13:34/14:39	File 1 / 2				127	0.028 / 0.042						14:39									
		DustTrak 2	2.5	4.0	12:27/13:39	13:34/14:39	File 1 / 2				127	0.007 / 0.013						12:08 2:31									

When a generator ran out of gas, assume it ran half the time from when it was started initially to when it was re-started after the problem was realized and fixed, then add that time to the remaining time it was run to find the duration

Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Total Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)	
IMAP-02	7/12/2007	United Taconite Site 1																									
		1	9.0	16:14	18:14	120	66.0	28.5	631068	4378.8	4407.8	29.0	25.5	3.3	40.9	42.1	42.1	0.1781	0.1681	9.8	0.5313		1.5938				
		2	6.5	16:14	18:14	120	66.0	28.5	631054	4377.2	4407.0	29.8	26.3	3.2	40.3	41.5	41.5	0.1867	0.1767	9.4	0.5322		1.3293				
		3	4.0	16:14	18:14	120	66.0	28.5	631053	4381.7	4416.3	34.6	31.1	3.3	40.9	42.1	42.1	0.2172	0.2072	8.7	0.5781		1.3879				
		4	2.0	16:14	18:14	120	66.0	28.5	631052	4368.9	4410.7	41.8	38.3	3.2	40.3	41.5	41.5	0.2719	0.2619	7.7	0.6477	15.0	1.2258 1.2954	242.14	16.42	14.75	IMAP-2
		Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)							
		Wedding U	10	1.9	11:58/16:14	?/18:30	264	66	28.5	--	631059	4384.6	4388.5	3.9	2.4	3.5	42.2	43.5	43.5	0.0074							
		Wedding D	10	1.9	16:14	18:14	120	66	28.5	17.1	631060	4379.0	4399.2	20.2	18.7	3.6	42.9	44.1	44.1	0.1247							
		Hi Vol	10	1.2	16:14	18:14	120	66	28.5	2.2	631051	4390.8	4544.5	153.7	152.2	3.12	39.7	40.9	40.9	1.0950							
		Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	Average Concentration Reading (mg/m3)																
		DustTrak 1	10	4.0	16:16	18:16				120	0.043																
DustTrak 2	2.5	4.0	16:16	18:15				119	0.009																		

Plume height not extrapolated - see Chat for explanation

Corrected Wind Speed

When a generator ran out of gas, assume it ran half the time from when it was started initially to when it was re-started after the problem was realized and fixed, then add that time to the remaining time it was run to find the duration

\*\*Wedding U continued from IMAP-1



Plume Profiling - all runs

Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Total Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)	
IMAP-03	7/13/2007	United Taconite Site 1																									
		1	9.0	9:57	11:58	121	61.5	28.5	631086	4397.5	4440.8	43.3	39.8	3.3	40.9	41.7	41.7	0.2785	0.2685	2.27	0.1982		5.1119				
		2	6.5	9:57	11:58	121	61.5	28.5	631085	4368.9	4404.9	36.0	32.5	3.2	40.3	41.0	41.0	0.2312	0.2212	2.22	0.1597		0.4473				
		3	4.0	9:57	11:58	121	61.5	28.5	631084	4382.6	4425.0	42.4	38.9	3.3	40.9	41.7	41.7	0.2722	0.2622	2.15	0.1832		0.4286				
		4	2.0	9:57	11:58	121	61.5	28.5	631083	4369.0	4408.7	39.7	36.2	3.2	40.3	41.0	41.0	0.2575	0.2475	2.05	0.1645	60.6	0.3477	236.19	29.79	7.93	IMAP-3
			7.8																								0.2449

	Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)
	Wedding U	10	1.9	10:27/13:43	7/15:45	220	61.5	28.5	--	631081	4374.8	4408.3	33.5	32.0	3.5	42.2	43.0	43.0	0.1194
	Wedding D	10	1.9	9:57	11:58	121	61.5	28.5	17.2	631082	4373.6	4388.9	15.3	13.8	3.6	42.9	43.7	43.7	0.0922
	Hi Vol	10	1.2	9:57	11:58	121	61.5	28.5	2.4	631087	4391.3	4549.8	158.5	157.0	3.12	39.7	40.5	40.5	1.1319
	Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	Average Concentration Reading (mg/m3)									
	DustTrak 1	10	4.0	9:55	11:57	File 2			122	0.064									
	DustTrak 2	2.5	4.0	9:55	11:56	File 2			121	0.011									

- Averages of top 2 samplers (samplers 1 and 2) used for calculation of extrapolated plume height - to get the extrapolated plume height, because sampler 1 had a higher concentration than sampler 2, averaged 1 and 2, then used that average and the concentration of sampler 3
- Corrected Wind Speed
- When a generator ran out of gas, assume it ran half the time from when it was started initially to when it was re-started after the problem was realized and fixed, then add that time to the remaining time it was run to find the duration

Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Total Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)	
IMAP-04	7/13/2007	United Taconite Site 1																									
		1	8.25	12:33	13:51	78	69.0	28.5	631090	4315.7	4396.2	80.5	77.0	3.3	40.9	42.4	42.4	0.8226	0.8126	1.9	0.3159		6.5001				
		2	5.75	12:33	13:51	78	69.0	28.5	631072	4377.6	4461.4	83.8	80.3	3.2	40.3	41.7	41.7	0.8720	0.8620	1.8	0.3250		0.8011				
		3	3.25	12:33	13:51	78	69.0	28.5	631073	4367.7	4424.5	56.8	53.3	3.3	40.9	42.4	42.4	0.5694	0.5594	1.7	0.2006		0.6570				
		4	1.25	12:33	13:51	78	69.0	28.5	631074	4380.8	4444.5	63.7	60.2	3.2	40.3	41.7	41.7	0.6537	0.6437	1.6	0.2109	49.4	0.4115 0.2636	305.97	25.05	12.21	IMAP-4
		Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)							
		Wedding U	10	1.9	10:27/13:43	?/15:45	220	69	28.5	--	631081	4374.8	4408.3	33.5	32.0	3.5	42.2	43.7	43.7	0.1175							
		Wedding D	10	1.9	12:33	13:51	78	69	28.5	17.4	631061	4395.1	4419.0	23.9	22.4	3.6	42.9	44.4	44.4	0.2285							
		Hi Vol	10	1.2	12:33	13:51	78	69	28.5	2.266667	631078	4378.3	4663.4	285.1	283.6	3.12	39.7	41.1	41.1	3.1213							
		Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	Average Concentration Reading (mg/m3)																
		DustTrak 1	10	4.0	12:31	13:52	File 3			81	0.105																
		DustTrak 2	2.5	4.0	12:31	13:52	File 3			81	0.017																

- Corrected Wind Speed
- When a generator ran out of gas, assume it ran half the time from when it was started initially to when it was re-started after the problem was realized and fixed, then add that time to the remaining time it was run to find the duration

\*\*Wedding U continued from IMAP-3



Plume Profiling - all runs

Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Total Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)	
IMAP-05	7/13/2007	United Taconite Site 1																									
		1	9.0	14:16	15:27	71	69.0	28.4	631094	4304.1	4327.9	23.8	20.3	3.3	40.9	42.5	42.5	0.2378	0.2278	1.9	0.0826		1.0240				
		2	6.5	14:16	15:27	71	69.0	28.4	631093	4297.0	4322.4	25.4	21.9	3.2	40.3	41.8	41.8	0.2608	0.2508	1.8	0.0883		0.2135				
		3	4.0	14:16	15:27	71	69.0	28.4	631092	4289.0	4318.0	29.0	25.5	3.3	40.9	42.5	42.5	0.2988	0.2888	1.8	0.0971		0.2317				
		4	2.0	14:16	15:27	71	69.0	28.4	631091	4301.5	4328.2	26.7	23.2	3.2	40.3	41.8	41.8	0.2763	0.2663	1.6	0.0836	33.8	0.1807 0.1672	64.40	15.31	4.21	IMAP-5
		Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)							
		Wedding U	10	1.9	10:27/13:43	?/15:45	220	61.5	28.4	--	631081	4374.8	4408.3	33.5	32.0	3.5	42.2	43.2	43.2	0.1190							
		Wedding D	10	1.9	14:16	15:25	69	69	28.4	17.3	631062	4388.1	4402.8	14.7	13.2	3.6	42.9	44.5	44.5	0.1520							
		Hi Vol	10	1.2	14:16	15:27	71	69	28.4	2.2	631097	4292.7	did not pass audit				3.12	39.7	41.2	41.2							
		Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	Average Concentration Reading (mg/m3)																
		DustTrak 1	10	4.0	14:17	15:25	File 4				68	0.100															
DustTrak 2	2.5	4.0	14:17	15:25	File 4				68	0.013																	

Corrected Wind Speed

When a generator ran out of gas, assume it ran half the time from when it was started initially to when it was re-started after the problem was realized and fixed, then add that time to the remaining time it was run to find the duration

\*\*Wedding U continued from IMAP-3

Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Total Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)	
IMAP-06	7/14/2007	United Taconite Site 1																									
		1	9.0	10:33	12:51	138	70.5	28.4	631110	4303.2	4311.6	8.4	4.9	3.3	40.9	42.6	42.6	0.0294	0.0194	6.1	0.0436		0.0100				
		2	6.5	10:33	12:51	138	70.5	28.4	631108	4292.1	4317.8	25.7	22.2	3.2	40.3	42.0	42.0	0.1354	0.1254	5.9	0.2729		0.3957				
		3	4.0	10:33	12:51	138	70.5	28.4	631100	4300.7	4326.6	25.9	22.4	3.3	40.9	42.6	42.6	0.1344	0.1244	5.6	0.2575		0.6630				
		4	2.0	10:33	12:51	138	70.5	28.4	631101	4319.6	4343.0	23.4	19.9	3.2	40.3	42.0	42.0	0.1214	0.1114	5.2	0.2135	9.5	0.4710 0.4271	69.70	26.73	2.61	IMAP-6
		Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)							
		Wedding U	10	1.9	10:14	13:02	168	70.5	28.4	--	631080	4359.1	4361.7	2.6	1.1	3.5	42.2	44.0	44.0	0.0053							
		Wedding D	10	1.9	10:33	12:51	138	70.5	28.4	17.2	631079	4367.6	4377.0	9.4	7.9	3.6	42.9	44.7	44.7	0.0453							
		Hi Vol	10	1.2	10:33	12:51	138	70.5	28.4	2.3	631109	4295.4	4479.0	183.6	182.1	3.12	39.7	41.4	41.4	1.1256							
		Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	Average Concentration Reading (mg/m3)																
		DustTrak 1	10	4.0	10:33	12:54	File 5				141	0.033															
DustTrak 2	2.5	4.0	10:33	12:53	File 5				140	0.011																	

Corrected Wind Speed







Plume Profiling - all runs

Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)
IMAP-11	7/18/2007	Minntac Site 2																								
		1	9.0	16:29	17:29	60	83.0	28.3	631137	4361.6	4408.6	47.0	43.5	3.3	40.9	43.7	43.7	0.5855	0.5755	6.7	0.6195		1.5291			
		2	6.5	16:29	17:29	60	83.0	28.3	631138	4357.8	4425.4	67.6	64.1	3.2	40.3	43.0	43.0	0.8770	0.8670	6.4	0.8959		1.8943			
		3	4.0	16:29	17:29	60	83.0	28.3	631139	4330.0	4450.8	120.8	117.3	3.3	40.9	43.7	43.7	1.5789	1.5689	6.0	1.5203		3.0202			
		4	2.0	16:29	17:29	60	83.0	28.3	631140	4324.4	4490.3	165.9	162.4	3.2	40.3	43.0	43.0	2.2219	2.2119	5.5	1.9402	13.9	3.4605	488.53	15.54	31.44
		Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)						
		Wedding U	10	1.9	--	--	--	83.0	28.3	--	--	--	--	--	--	--	--	--	--	--	--					
		Wedding D	10	1.9	16:29	17:29	60	83.0	28.3	17.0	631136	4294.3	4364.8	70.5	69	3.6	42.9	45.8	45.8	0.8869						
		Hi Vol	10	1.2	16:29	17:29	60	83.0	28.3	2.1	631183	4350.7	4877.6	526.9	525.4	3.12	39.7	42.4	42.4	7.2854						
		Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	Average Concentration Reading (mg/m3)															
		DustTrak 1	10	4.0	16:28	17:29	File 3					61	0.425													
		DustTrak 2	2.5	4.0	16:28	17:31	File 3					63	0.107													

																								Total				
Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)		
IMAP-12	7/19/2007	Minntac Site 2																										
		1	9.0	9:48	10:49	61	64.5	28.6	631184	4366.7	4373.5	6.8	3.3	3.3	40.9	41.9	41.9	0.0456	0.0356	9.0	0.0523		0.0453					
		2	6.5	9:48	10:49	61	64.5	28.6	631185	4367.5	4377.9	10.4	6.9	3.2	40.3	41.2	41.2	0.0970	0.0870	8.8	0.1246		0.2211					
		3	4.0	9:48	10:49	61	64.5	28.6	631186	4376.4	4396.4	20.0	16.5	3.3	40.9	41.9	41.9	0.2282	0.2182	8.4	0.3012		0.5322					
		4	2.0	9:48	10:49	61	64.5	28.6	631187	4378.2	4406.6	28.4	24.9	3.2	40.3	41.2	41.2	0.3500	0.3400	8.0	0.4444	10.7	0.7456	86.23	28.04	3.08		

\*\*DustTrak R is the rented DT, it was located 35 m downwind, 30 m downwind of the other DTs



Plume Profiling - all runs

																								Total	Emission Factor (lb/veh-mile)		
Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)		Equivalent Haul Truck Passes	
IMAP-13	7/19/2007	Minttac Site 2																									
		1	9.0	14:18	14:47	29	76.0	28.6	631192	4384.8	4420.6	35.8	32.3	3.3	40.9	42.8	42.8	0.9193	0.9093	4.9	0.3495		0.6380				
		2	6.5	14:18	14:47	29	76.0	28.6	631193	4382.9	4439.7	56.8	53.3	3.2	40.3	42.1	42.1	1.5420	1.5320	4.9	0.5819		1.1643				
		3	4.0	14:18	14:47	29	76.0	28.6	631194	4390.5	4489.8	99.3	95.8	3.3	40.9	42.8	42.8	2.7266	2.7166	4.8	1.0138		1.9947				
		4	2.0	14:18	14:47	29	76.0	28.6	631195	4375.4	4504.2	128.8	125.3	3.2	40.3	42.1	42.1	3.6249	3.6149	4.7	1.3145	12.7	2.3283	310.25	17.99	17.25	
																								2.6290			

Corrected Wind Speed

\*\*DustTrak R is the rented DT, it was located 35 m downwind, 30 m downwind of the other DTs

																							Total			
Run	Date	Sampler Location	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)	Net Conc.** (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)
IMAP-14	7/19/2007	Minttac Site 2																								
		1	9.0	15:15	15:56	41	76.0	28.6	631196	4336.7	4374.0	37.3	33.8	3.3	40.9	42.8	42.8	0.6804	0.6704	4.2	0.3091		2.5594			
		2	6.5	15:15	15:56	41	76.0	28.6	631197	4335.4	4377.1	41.7	38.2	3.2	40.3	42.1	42.1	0.7817	0.7717	4.1	0.3491		0.8227			
		3	4.0	15:15	15:56	41	76.0	28.6	631198	4342.5	4421.4	78.9	75.4	3.3	40.9	42.8	42.8	1.5179	1.5079	4.0	0.6624		1.2643			
	4	2.0	15:15	15:56	41	76.0	28.6	631199	4351.7	4432.1	80.4	76.9	3.2	40.3	42.1	42.1	1.5736	1.5636	3.8	0.6577	25.6	1.3201	258.07	8.42	30.65	
																							1.3154			

Corrected Wind Speed

\*\*DustTrak R is the rented DT, it was located 65 m downwind, 60 m downwind of the other DTs



IMAP 7 8

IMAP 78																										
Run	Date	Sampler Location	Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	File Name	Flow Rate (Lpm)	Average Concentration Reading (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Total Exposure (m-mg/cm2)	Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)						
IMAP-07	7/17/2007	Minntac Site 1																								
			DustTrak R	10	6.3	13:49	15:00	13:49	15:02	73	Log 1 File 1	1.7	0.511	2.6	0.1141		2.4921									
			DustTrak 2	10	4.3	13:49	15:00	13:50	14:00	73	Log 1 File 6	1.7	0.227	2.6	0.1141		0.2281									
			DustTrak 1	10	2.3	13:49	15:00	13:50	15:00	70	Log 1 File 6	1.7	0.244	2.5	0.1164	50.0	0.2305	114.06	11.14	10.24						
																	0.2677									

Run	Date	Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (afcm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)
IMAP-07	7/17/2007	Minntac Wedding D	10	1.9	13:54	15:00	66	84.7	28.3	16.2	631123	4338.4	4365.1	26.7	25.2	3.5	42.2	45.3	45.3	0.2980

Original DT R concentration: 0.2583  
New DT R concentration (based on DT 2): 0.1141  
Ratio of new conc to old: 0.44

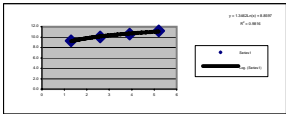
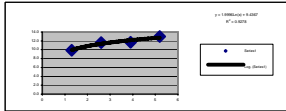
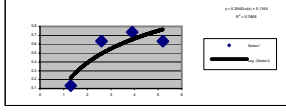
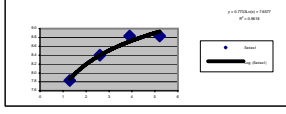
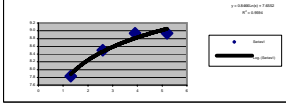
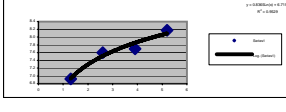
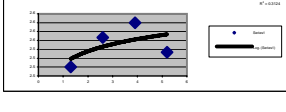
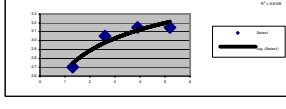
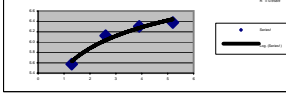
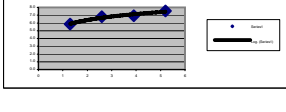
Run	Date	Sampler Location	Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Adjusted Sampler Start Time	Adjusted Sampler Stop Time	Duration (min)	File Name	Flow Rate (Lpm)	Average Concentration Reading (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Total Exposure (m-mg/cm2)	Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)						
IMAP-08	7/17/2007	Minntac Site 1																								
		DustTrak R	10	6.3	15:11	16:02	15:11	16:03	52	Log 1 File 2	1.7	0.699	3.3	0.1650		3.6046										
		DustTrak 2	10	4.3	15:11	16:02	15:23	16:03	51	Log 3 File 8	1.7	0.383	3.1	0.1650		0.3299										
		DustTrak 1	10	2.3	15:11	16:02	15:12	16:02	50	Log 1 File 7	1.7	0.393	2.9	0.1548	50.0	0.3197	163.39	10.69	15.28							
																	0.3560									

Run	Date	Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (afcm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)
IMAP-08	7/17/2007	Minntac Wedding D	10	1.9	15:13	16:02	49	86.0	28.3	16.15	631096	4309	4341.4	32.4	30.9	3.5	42.2	45.4	45.4	0.4909

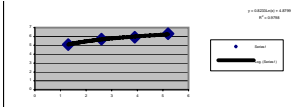
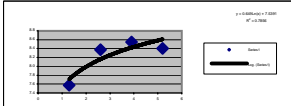
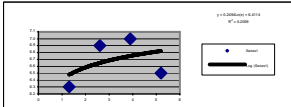
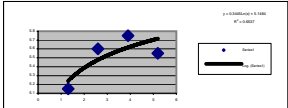
Original DT R concentration: 0.3196  
New DT R concentration (based on DT 2): 0.165  
Ratio of new conc to old: 0.52

Numbers that were changed from the original data - see the data analysis notes document for explanations



Kestrels															
Run	Sampler Location	Height	Kestral ID	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Avg. Wind Speed(mph)	Logarithmic Equation		Sampler Height	Wind Speed		
IMAP-01	1	5.2	430568	8.6	12.5	11.5	9.7	13.7	11.2	y = 1.3462Ln(x) + 8.8597 R2 = 0.9816		9.0	11.8	No change to wind speeds, samplers were parallel to road	
	2	3.9	430569	8.6	11.7		9.4	12.7	10.6			6.5	11.4		
	3	2.6	430571	8.2	11.2		8.6	12.2	10.1			4.0	10.7		
	4	1.3	430572	7.6	10.2	9.6	7.9	11.1	9.3			2.0	9.8		
IMAP-02	1	5.2	430568	13.2	13.9	13.3	12.3	12.1	13.0	y = 1.9996Ln(x) + 9.4367 R2 = 0.9278		9.0	13.8	9.8	Multiplied by 0.71 to account for the samplers being oriented for winds at a 45 degree angle from the road
	2	3.9	430569	12.4	12.6	11.6	10.8	11.1	11.7			6.5	13.2	9.4	
	3	2.6	430571	11.9	12.4	11.8	11.2	10.8	11.6			4.0	12.2	8.7	
	4	1.3	430572	10.2	10.5	10.1	9.5	9.3	9.9			2.0	10.8	7.7	
IMAP-03	1	5.2	430568	5.1	5.9	5.9			5.6	y = 0.3945Ln(x) + 5.1164 R2 = 0.7668		9.0	6.0	2.3	Multiplied by 0.38 to account for the samplers being oriented for winds at a 22.5 degree angle from the road
	2	3.9	430569	5.2	6.0	6.0			5.7			6.5	5.9	2.2	
	3	2.6	430571	5.1	6.0	5.8			5.6			4.0	5.7	2.2	
	4	1.3	430572	4.6	5.7	5.1			5.1			2.0	5.4	2.0	
IMAP-04	1	5.2	430568	8.4	8.4	9.7			8.8	y = 0.7733Ln(x) + 7.6577 R2 = 0.9618		8.25	9.3	1.9	Multiplied by 0.2 to account for the samplers being oriented for winds between a 22.5 degree angle from the road and a zero
	2	3.9	430569	8.2	8.6	9.7			8.8			5.75	9.0	1.8	
	3	2.6	430571	7.5	8.5	9.2			8.4			3.25	8.6	1.7	
	4	1.3	430572	7.3	7.9	8.3			7.8			1.25	7.8	1.6	
IMAP-05	1	5.2	430568	8.6	9.1	9.1			8.9	y = 0.8466Ln(x) + 7.6552 R2 = 0.9594		9.0	9.5	1.9	Multiplied by 0.2 to account for the samplers being oriented for winds between a 22.5 degree angle from the road and a zero
	2	3.9	430569	8.4	9.1	9.3			8.9			6.5	9.2	1.8	
	3	2.6	430571	7.8	8.6	9.1			8.5			4.0	8.8	1.8	
	4	1.3	430572	7.0	8.2	8.3			7.8			2.0	8.2	1.6	
IMAP-06	1	5.2	430568	9.3	8.5		7.6	7.3	8.2	y = 0.8365Ln(x) + 6.7159 R2 = 0.9529		9.0	8.6	6.1	Multiplied by 0.71 to account for the samplers being oriented for winds at a 45 degree angle from the road
	2	3.9	430569	8.7	8.1		7.1	6.9	7.7			6.5	8.3	5.9	
	3	2.6	430571	8.7	8.0		7.0	6.7	7.6			4.0	7.9	5.6	
	4	1.3	430572	7.9	7.4		6.3	6.1	6.9			2.0	7.3	5.2	
IMAP-07	1	5.2	430568	2.3	2.9	2.4			2.5	y = 0.04Ln(x) + 2.5077 R2 = 0.3124		6.3	2.6	No change to wind speeds, samplers were parallel to road	
	2	3.9	430569	2.2	3.2	2.4			2.6			4.3	2.6		
	3	2.6	430571	2.2	3.1	2.4			2.6			2.3	2.5		
	4	1.3	430572	2.6	2.8	2.1			2.5						
IMAP-08	1	5.2	430568	2.9	3.4				3.2	y = 0.3391Ln(x) + 2.6541 R2 = 0.9109		6.3	3.3	No change to wind speeds, samplers were parallel to road	
	2	3.9	430569	2.9	3.4				3.2			4.3	3.1		
	3	2.6	430571	2.8	3.3				3.1			2.3	2.9		
	4	1.3	430572	2.5	2.9				2.7						
IMAP-09	1	5.2	430568	4.9	5.9	8.1	6.6		6.4	y = 0.5886Ln(x) + 5.4717 R2 = 0.9589		9.0	6.8	No change to wind speeds, samplers were parallel to road	
	2	3.9	430569	4.5	5.9	7.7	7.1		6.3			6.5	6.6		
	3	2.6	430571	4.4	5.7	7.5	6.9		6.1			4.0	6.3		
	4	1.3	430572	3.7	5.4	6.5	6.7		5.6			2.0	5.9		
IMAP-10	1	5.2	430568	7.5	7.9	7.2			7.5	y = 1.1216Ln(x) + 5.5979 R2 = 0.9568		9.0	8.1	No change to wind speeds, samplers were parallel to road	
	2	3.9	430569	7.2	7.2	6.4			6.9			6.5	7.7		
	3	2.6	430571	6.9	7.1	6.4			6.8			4.0	7.2		
	4	1.3	430572	6.1	6.1	5.4			5.9			2.0	6.4		



Kestrels															
Run	Sampler Location	Height	Kestral ID	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Avg. Wind Speed(mph)	Logarithmic Equation		Sampler Height	Wind Speed		
IMAP-11		1	5.2	430568	6.3				6.3	$y = 0.8233\text{Ln}(x) + 4.8799$ R2 = 0.9798		9.0	6.7	No change to wind speeds, samplers were parallel to road	
		2	3.9	430569	5.9				5.9			6.5	6.4		
		3	2.6	430571	5.7				5.7			4.0	6.0		
		4	1.3	430572	5.1				5.1			2.0	5.5		
IMAP-12		1	5.2	430568	8.4	8.1	8.5	8.6	8.4	$y = 0.649\text{Ln}(x) + 7.5391$ R2 = 0.7856		9.0	9.0	No change to wind speeds, samplers were parallel to road	
		2	3.9	430569	8.7	8.3	8.8	8.4	8.6			6.5	8.8		
		3	2.6	430571	8.6	8.2	8.6	8.1	8.4			4.0	8.4		
		4	1.3	430572	7.7	7.3	7.8	7.5	7.6			2.0	8.0		
IMAP-13		1	5.2	430568	6.5				6.5	$y = 0.2494\text{Ln}(x) + 6.4114$ R2 = 0.2059		9.0	7.0	4.9	Multiplied by 0.71 to account for the samplers being oriented for winds at a 45 degree angle from the road
		2	3.9	430569	7.0				7.0			6.5	6.9	4.9	
		3	2.6	430571	6.9				6.9			4.0	6.8	4.8	
		4	1.3	430572	6.3				6.3			2.0	6.6	4.7	
IMAP-14		1	5.2	430568	5.3	5.8			5.6	$y = 0.3445\text{Ln}(x) + 5.1484$ R2 = 0.6537		9.0	5.9	4.2	Multiplied by 0.71 to account for the samplers being oriented for winds at a 45 degree angle from the road
		2	3.9	430569	5.6	5.9			5.8			6.5	5.8	4.1	
		3	2.6	430571	5.4	5.8			5.6			4.0	5.6	4.0	
		4	1.3	430572	5.0	5.3			5.2			2.0	5.4	3.8	

\*Averages not time-weighted  
\*\*0mph at 0m was not included in the graph/equation



Truck Passes														
Truck Type	IMAP-1	IMAP-2	IMAP-3	IMAP-4	IMAP-5	IMAP-6	IMAP-7	IMAP-8	IMAP-9	IMAP-10	IMAP-11	IMAP-12*	IMAP-13	IMAP-14
Haul Truck - Loaded	29	15	13	10	6	11	3	5	4	6	7	8	4	4
Haul Truck - Unloaded	12		14	11	6	11	7	5	9	2	8	13	13	4
Mobile Monitoring Vehicle	2	8	9	1	6	18	6	1	4	6	3	5	2	
Light-Duty Vehicle	10	1	6	9	1	2	4	1	6	5		10	3	1
Maintenance Vehicle	3	1	6	10	8	9	2	2	7	4	2	2	1	1
Front-end Loader	2					2				1				
Water Truck (not op.)		1			1				3	1	1	3		
Grader (slow, not op.)			1										1	
Wrecker												2		
Total passes	58	26	49	41	28	53	22	14	33	25	21	43	24	10
Total haul truck passes: (including water truck)	41	16	27	21	13	22	10	10	16	9	16	24	17	8

\*IMAP-12 data started at 9:48 when the test started, everything in the DT pre-test not counted here

Truck Type	IMAP-1	IMAP-2	IMAP-3	IMAP-4	IMAP-5	IMAP-6	IMAP-7	IMAP-8	IMAP-9	IMAP-10	IMAP-11	IMAP-12*	IMAP-13	IMAP-14
Haul Truck	43	16	27	21	13	24	10	10	16	10	15	26	17	8
Light-Duty Vehicle	10	1	6	9	1	2	4	1	6	5		10	3	1
Maintenance Vehicle	3	1	7	10	8	9	2	2	7	4	2	2	2	1
Equivalent Haul Trucks:	45.31	16.42	29.79	25.05	15.31	26.73	11.14	10.69	18.79	11.83	15.54	28.04	17.99	8.42

\*\*water truck counts as unloaded haul truck  
\*\*\*eliminate mm, we were going so slow that the plume did not affect the tower  
\*\*\*\*wrecker counts as unloaded haul truck  
\*\*\*\*\*grader counts as a maintenance vehicle  
\*\*\*\*\*Front end loader counts as unloaded haul truck  
\*\*\*\*\*light duty and maintenance count as 2 sep categories  
\*\*\*\*\*find the weight correction term for the light duty and maintenance vehicles

Vehicle Type	Weight (tons)	Emission formula variable
Haul Truck	310	8.06
Light Duty Vehicle	4.5	1.20
Maintenance Vehicle	17	2.18

ratio light duty to haul truck: 0.15  
ratio maintenance to haul truck: 0.27

~used the unpaved road equation for an industrial site in the AP-42



## Blanks

Filter Size	Sampler	Filter #	Tare Weight (mg)	Final Weight (mg)	Net Weight (mg)	Average Net (wt)	Standard Deviation
8 x 10 GF	Cyclone	631070	4386.0	4390.7	4.7		
	Cyclone	631071	4389.8	4392.7	2.9		
	Cyclone	631106	4331.0	4332.3	1.3		
	Cyclone	631107	4302.5	4303.3	0.8		
	Cyclone	631118	4285.6	4286.9	1.3		
	Cyclone	631119	4316.3	4321.2	4.9		
	Cyclone	631120	4311.6	4319.2	7.6		
	Cyclone	631121	4313.0	4318	5.0		
	Cyclone	631202	4376.1	4379.5	3.4		
	Cyclone	631203	4360.2	4363.1	2.9	3.5	2.003896
	Wedding	631076	4383.9	4384.2	0.3		
	Wedding	631077	4379.7	4381.6	1.9		
	Wedding	631105	4319.8	4321.8	2.0		
	Wedding	631111	4297.7	4298.5	0.8		
	Wedding	631117	4283.1	4285.5	2.4	1.5	0.793473
	Hi Vol	631122	4303.8	4354.5	50.7	50.7	0

\*separated each blank by sampler to provide more accurate corrections

\*\*used STDEVPA function for standard deviation

\*\*\*Hi Vol blank was left in unit for appx 3 hrs, does not represent a true blank run - eliminated from data - Wedding blank correction used for hi-vols



## Filter Pressure

Run	Date	Sampler Location	Sampler Height (m)	Filter Pressure (in H2O)		Calibration Coefficient "a" (scfm)	Calibration Coefficient "b" (dimensionless)	Flow rate VFC (acfm) or URG
IMAP-01	7/12/2007	United Taconite						
		Site 1						
		1	9.0	N/A				
		2	6.5	16.6				
		3	4.0	16.9				
		4	2.0	16.6				
		Wedding U	1.9					
		Wedding D	1.9	17.5				
		Hi Vol	1.2	2.3				
		IMAP-02	7/12/2007	United Taconite				
Site 1								
1	9.0			16.5				
2	6.5			16.4				
3	4.0			17.2				
4	2.0			16.6				
Wedding U	1.9							
Wedding D	1.9			17.1				
Hi Vol	1.2			2.2				
IMAP-03	7/13/2007			United Taconite				
		Site 1						
		1	9.0	16.8				
		2	6.5	16.7				
		3	4.0	17.4				
		4	2.0	17.0				
		Wedding U	1.9					
		Wedding D	1.9	17.2				
		Hi Vol	1.2	2.4				
		IMAP-04	7/13/2007	United Taconite				
Site 1								
1	8.25			16.1				
2	5.75			16.7				
3	3.25			17.3				
4	1.25			17.2				
Wedding U	1.9							
Wedding D	1.9			17.4				
Hi Vol	1.2			2.3				
IMAP-05	7/13/2007			United Taconite				
		Site 1						
		1	9.0	16.9				
		2	6.5	16.8				
		3	4.0	17.0				
		4	2.0	16.8				
		Wedding U	1.9					
		Wedding D	1.9	17.3				
		Hi Vol	1.2	2.2				
		IMAP-06	7/14/2007	United Taconite				
Site 1								
1	9.0			16.6				
2	6.5			15.9				
3	4.0			16.7				
4	2.0			17.0				
Wedding U	1.9							
Wedding D	1.9			17.2				
Hi Vol	1.2			2.3				
IMAP-07	7/17/2007			Minntac Site 1				
		Wedding U	1.9					
		Wedding D	1.9	16.2				
		Hi Vol	1.2					
IMAP-08	7/17/2007	Minntac Site 1						

### IMAP-1 Example Calculation

Flow Rates:

$$\text{Flow Rate (scfm)} = 21.734(dP)^{0.53}$$

VFC ID	Cyclone Position	dP	Flow Rate (scfm)
11928	1	3.3	40.9
11931	2	3.2	40.3
11920	3	3.3	40.9
11929	4	3.2	40.3



## Filter Pressure

Run	Date	Sampler Location	Sampler Height (m)	Filter Pressure (in H2O)		Calibration Coefficient "a" (scfm)	Calibration Coefficient "b" (dimensionless)	Flow rate VFC (acfm) or URG						
IMAP-09	7/18/2007	Wedding U	1.9	16.15										
		Wedding D	1.9											
		Hi Vol	1.2											
		Minntac Site 2												
		1	9.0	16.2										
		2	6.5	16.9										
		3	4.0	17.5										
		4	2.0	16.9										
		Wedding U	1.9	17.6										
		Wedding D	1.9											
		Hi Vol	1.2						2.1					
		Minntac Site 2												
IMAP-10	7/18/2007	1	9.0	17.1										
		2	6.5	16.9										
		3	4.0	17.6										
		4	2.0	16.7										
		Wedding U	1.9	17.5										
		Wedding D	1.9											
		Hi Vol	1.2						2.1					
		Minntac Site 2												
		1	9.0	16.6										
		2	6.5	16.7										
		3	4.0	17.1										
		4	2.0	16.8										
Wedding U	1.9	17.0												
Wedding D	1.9													
Hi Vol	1.2		2.1											
IMAP-11	7/18/2007	Minntac Site 2												
		1	9.0	16.6										
		2	6.5	16.7										
		3	4.0	17.1										
		4	2.0	16.8										
		Wedding U	1.9	17.6										
		Wedding D	1.9											
		Hi Vol	1.2						2.4					
		Minntac Site 2												
		IMAP-12	7/19/2007	1					9.0	16.5				
				2					6.5	16.5				
				3					4.0	17.1				
4	2.0			16.6										
Wedding U	1.9			17.6										
Wedding D	1.9													
Hi Vol	1.2				2.2									
Minntac Site 2														
IMAP-13	7/19/2007			1	9.0	16.8								
				2	6.5	16.7								
				3	4.0	17.3								
				4	2.0	16.8								
		Wedding U	1.9	17.6										
		Wedding D	1.9											
		Hi Vol	1.2		2.2									
		Minntac Site 2												
		IMAP-14	7/19/2007	1	9.0	16.3								
				2	6.5	16.2								
				3	4.0	17.0								
				4	2.0	16.4								
Wedding U	1.9			17.2										
Wedding D	1.9													
Hi Vol	1.2				2.2									
Minntac Site 2														

\*For now, assumed flow rate of 40 cfm for all samplers



# Elevation Calculation

Run No.	Mine	Sampler Location	Elevation (ft)	B.P. (in Hg)
IMAP-1	United	Sea-Level	0	29.9
		Tower Site	1459	28.41
IMAP-2	United	Sea-Level	0	29.95
		Tower Site	1459	28.46
IMAP-3	United	Sea-Level	0	30
		Tower Site	1459	28.51
IMAP-4	United	Sea-Level	0	29.95
		Tower Site	1459	28.46
IMAP-5	United	Sea-Level	0	29.9
		Tower Site	1459	28.41
IMAP-6	United	Sea-Level	0	29.85
		Tower Site	1459	28.36
IMAP-7	Minntac	Sea-Level	0	29.9
		Tower Site	1554.5	28.31
IMAP-8	Minntac	Sea-Level	0	29.9
		Tower Site	1554.5	28.31
IMAP-9	Minntac	Sea-Level	0	29.9
		Tower Site	1554.5	28.31
IMAP-10	Minntac	Sea-Level	0	29.9
		Tower Site	1554.5	28.31
IMAP-11	Minntac	Sea-Level	0	29.9
		Tower Site	1554.5	28.31
IMAP-12	Minntac	Sea-Level	0	30.15
		Tower Site	1554.5	28.56
IMAP-13	Minntac	Sea-Level	0	30.15
		Tower Site	1554.5	28.56
IMAP-14	Minntac	Sea-Level	0	30.15
		Tower Site	1554.5	28.56



# United Tower Breakout

Run	Date	Sampler Location	Sampler Height (m)	Duration (min)	Filter Number	Blank Corrected (mg)	Flow rate VFC (acfm) or URG	Net Conc. (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)
IMAP-01	7/12/2007	1	9.0	151	631063	29.0	42.2	0.1507	11.8	0.721		0.688			
		2	6.5	151	631064	63.6	41.5	0.3482	11.4	1.605		2.907			
		3	4.0	151	631065	62.9	42.2	0.3385	10.7	1.470		3.844			
		4	2.0	152	631066	52.1	41.5	0.2815	9.8	1.124	10.9	2.594 2.248	435.23	45.31	9.61
IMAP-02	7/12/2007	1	9.0	120	631068	25.5	42.1	0.1681	9.8 <sup>a</sup>	0.531		1.594			
		2	6.5	120	631054	26.3	41.5	0.1767	9.4	0.532		1.329			
		3	4.0	120	631053	31.1	42.1	0.2072	8.7	0.578		1.388			
		4	2.0	120	631052	38.3	41.5	0.2619	7.7	0.648	15.0	1.226 1.295	242.14	16.42	14.75
IMAP-03	7/13/2007	1	9.0	121	631086	39.8	41.7	0.2685	2.3 <sup>b</sup>	0.198		5.112			
		2	6.5	121	631085	32.5	41.0	0.2212	2.2	0.160		0.447			
		3	4.0	121	631084	38.9	41.7	0.2622	2.2	0.183		0.429			
		4	2.0	121	631083	36.2	41.0	0.2475	2.0	0.165	60.6	0.348 0.329	236.19	29.79	7.93
IMAP-04	7/13/2007	1	8.25	78	631090	77.0	42.4	0.8126	1.9 <sup>c</sup>	0.316		6.500			
		2	5.75	78	631072	80.3	41.7	0.8620	1.8	0.325		0.801			
		3	3.25	78	631073	53.3	42.4	0.5594	1.7	0.201		0.657			
		4	1.25	78	631074	60.2	41.7	0.6437	1.6	0.211	49.4	0.411 0.264	305.97	25.05	12.21
IMAP-05	7/13/2007	1	9.0	71	631094	20.3	42.5	0.2278	1.9 <sup>c</sup>	0.083		1.024			
		2	6.5	71	631093	21.9	41.8	0.2508	1.8	0.088		0.214			
		3	4.0	71	631092	25.5	42.5	0.2888	1.8	0.097		0.232			
		4	2.0	71	631091	23.2	41.8	0.2663	1.6	0.084	33.8	0.181 0.167	64.40	15.31	4.21
IMAP-06	7/14/2007	1	9.0	34.5	631110	3.7	42.6	0.078	6.1 <sup>a</sup>	0.044		0.014			
		2	6.5	34.5	631108	16.6	42.0	0.396	5.9	0.216		0.324			
		3	4.0	34.5	631100	16.8	42.6	0.393	5.6	0.203		0.524			
		4	2.0	34.5	631101	14.9	42.0	0.354	5.2	0.170	9.5	0.373 0.339	55.80	6.8	8.2

<sup>a</sup> Denotes a 0.71 Wind Direction Correction Multiplier for winds 45° incident to sampling tower



United Wedding Breakout

Run	Date	Sampler Location	Cutpoint	Height	Duration (min)	Filter Number	Blank Corrected (mg)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)
IMAP-01	7/12/2007	Wedding U	10	1.9	264	631059	2.4	43.5	0.007
		Wedding D	10	1.9	152	631058	16.4	44.2	0.086
		Hi Vol	TP	1.2	152	631067	<sup>a</sup>	41.0	-
IMAP-02	7/12/2007	Wedding U	10	1.9	264	631059	2.4	43.5	0.007
		Wedding D	10	1.9	120	631060	18.7	44.1	0.125
		Hi Vol	TP	1.2	120	631051	152.2	40.9	1.095
IMAP-03	7/13/2007	Wedding U	10	1.9	220	631081	32.0	43.0	0.119
		Wedding D	10	1.9	121	631082	13.8	43.7	0.092
		Hi Vol	TP	1.2	121	631087	157.0	40.5	1.132
IMAP-04	7/13/2007	Wedding U	10	1.9	220	631081	32.0	43.7	0.117
		Wedding D	10	1.9	78	631061	22.4	44.4	0.229
		Hi Vol	TP	1.2	78	631078	283.6	41.1	3.121
IMAP-05	7/13/2007	Wedding U	10	1.9	220	631081	32.0	43.2	0.119
		Wedding D	10	1.9	69	631062	13.2	44.5	0.152
		Hi Vol	TP	1.2	71	631097		41.2	
IMAP-06	7/14/2007	Wedding U	10	1.9	168	631080	1.1	44.0	0.005
		Wedding D	10	1.9	138	631079	7.9	44.7	0.045
		Hi Vol	TP	1.2	138	631109	182.1	41.4	1.126

<sup>a</sup> Filter failed QC check  
All upwind sampling periods extended over multiple test runs

Sampler Identification						Average Concentration	
DustTrak 1	Sampler Identification	Cutpoint	Sampler Height (m)	File Name	Reading (mg/m3)		
DustTrak 2	DustTrak 1	10	4.0	File 1 / 2	0.028 / 0.042		
	DustTrak 2	2.5	4.0	File 1 / 2	0.007 / 0.013		
DustTrak 1	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Adjusted Sampler Stop Time			
DustTrak 2							
Sampler Identification	4.0	16:16	18:16				
	4.0	16:16	18:15				
DustTrak 1	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Adjusted Sampler Stop Time			
DustTrak 2							
Sampler Identification	4.0	9:55	11:57				
	4.0	9:55	11:56				
DustTrak 1	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Adjusted Sampler Stop Time			
DustTrak 2							
	4.0	12:31	13:52				
	4.0	12:31	13:52				
	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	Adjusted Sampler Stop Time			
	4.0	14:17	15:25				
	4.0	14:17	15:25				



Mintac Tower Breakout															
Run	Date	Sampler Location	Sampler Height (m)	Duration (min)	Filter Number	Blank Corrected (mg)	Flow rate VFC (acfm) or URG	Net Conc. (mg/m3)	Wind Speed (mph)	PM-10 Exposure (mg/cm2)	Extrapolated Plume Height (m)	Integrated Exposures (m-mg/cm2)	Integrated Exposure (lb/mile)	Equivalent Haul Truck Passes	Emission Factor (lb/veh-mile)
IMAP-09	7/18/2007	1	9.0	84	631130	39.3	43.4	0.3703	6.8	0.8644		1.168			
		2	6.5	84	631131	61.4	42.7	0.5939	6.6	0.8796		1.805			
		3	4.0	84	631129	104.2	43.4	0.9983	6.3	1.4143		2.867			
		4	2.0	64 <sup>a</sup>	631128	92.1	42.7	1.1790	5.9	1.1900	13.1	2.604 2.380	383.64	18.79	20.42
IMAP-10	7/18/2007	1	9.0	65	631098	22.8	43.9	0.2722	8.1	0.3827		1.093			
		2	6.5	65	631099	31.9	43.2	0.3914	7.7	0.5252		1.135			
		3	4.0	65	631114	68.5	43.9	0.8380	7.2	1.0450		1.963			
		4	2.0	65	631115	97.0	43.2	1.2105	6.4	1.3455	14.7	2.391 2.691	328.61	11.83	27.78
IMAP-11	7/18/2007	1	9.0	60	631137	43.5	43.7	0.5755	6.7	0.6195		1.529			
		2	6.5	60	631138	64.1	43.0	0.8670	6.4	0.8959		1.894			
		3	4.0	60	631139	117.3	43.7	1.5689	6.0	1.5203		3.020			
		4	2.0	60	631140	162.4	43.0	2.2119	5.5	1.9402	13.9	3.461 3.880	488.53	15.54	31.44
IMAP-12	7/19/2007	1	9.0	61	631184	3.3	41.9	0.0356	9.0	0.0523		0.045			
		2	6.5	61	631185	6.9	41.2	0.0870	8.8	0.1246		0.221			
		3	4.0	61	631186	16.5	41.9	0.2182	8.4	0.3012		0.532			
		4	2.0	61	631187	24.9	41.2	0.3400	8.0	0.4444	10.7	0.746 0.889	86.23	28.04	3.08
IMAP-13	7/19/2007	1	9.0	29	631192	32.3	42.8	0.9093	4.9 <sup>b</sup>	0.3495		0.638			
		2	6.5	29	631193	53.3	42.1	1.5320	4.9	0.5819		1.164			
		3	4.0	29	631194	95.8	42.8	2.7166	4.8	1.0138		1.995			
		4	2.0	29	631195	125.3	42.1	3.6149	4.7	1.3145	12.7	2.328 2.629	310.25	17.99	17.25
IMAP-14	7/19/2007	1	9.0	41	631196	33.8	42.8	0.6704	4.2 <sup>b</sup>	0.3091		2.559			
		2	6.5	41	631197	38.2	42.1	0.7717	4.1	0.3491		0.823			
		3	4.0	41	631198	75.4	42.8	1.5079	4.0	0.6624		1.264			
		4	2.0	41	631199	76.9	42.1	1.5636	3.8	0.6577	25.6	1.320 1.315	258.07	8.42	30.65

<sup>a</sup> Generator Failure caused a 20 minute sampling loss

<sup>b</sup> Denotes a 0.71 Wind Direction Correction Multiplier for winds 45° incident to sampling tower



Mintac Wedding Breakout

Run	Date	Sampler Location	Cutpoint	Height	Sampler Start Time	Sampler Stop Time	Duration (min)	Avg. Temp. (deg. F)	Avg. B.P. (in. Hg)	Avg. Filter Pressure (in. H2O)	Filter Number	Tare Wt. (mg)	Final Wt. (mg)	Non-blank Corrected (mg)	Blank Corrected* (mg)	Change in Pressure of BGI (in H2O)	Flow Rate (scfm)	Flow Rate Calculation (acfm)	Flow rate VFC (acfm) or URG	Raw (Measured) PM-10 Conc. (mg/m3)
IMAP-09	7/18/2007	Wedding D Hi Vol	10 TP	1.9	13:08	14:32	64	79.5	28.3	17.6	631126	4331.1	4378.0	46.9	45.4	3.6	42.9	45.5	45.5	0.551
				1.2	13:08	14:32	64	79.5	28.3	2.1	631127	4337.3	4550.5	213.2	211.7	3.12	39.7	42.2	42.2	2.770
IMAP-10	7/18/2007	Wedding D Hi Vol	10 TP	1.9	14:57	16:02	65	85.0	28.3	17.5	631133	4329.0	4368.2	39.2	37.7	3.6	42.9	46.0	46.0	0.446
				1.2	14:57	16:02	65	85.0	28.3	2.1	631135	4299.1	4593.5	294.4	292.9	3.12	39.7	42.6	42.6	3.735
IMAP-11	7/18/2007	Wedding D Hi Vol	10 Tp	1.9	16:29	17:29	60	83.0	28.3	17.0	631136	4294.3	4364.8	70.5	69	3.6	42.9	45.8	45.8	0.887
				1.2	16:29	17:29	60	83.0	28.3	2.1	631183	4350.7	4877.6	526.9	525.4	3.12	39.7	42.4	42.4	7.285
IMAP-12	7/19/2007	Wedding D Hi Vol	10 TP	1.9	9:48	10:49	61	64.5	28.6	17.6	631188	4383.5	4391.7	8.2	6.7	3.6	42.9	43.8	43.8	0.088
				1.2	9:48	10:49	61	64.5	28.6	2.4	631189	4395.0	4546.8	151.8	150.3	3.12	39.7	40.6	40.6	2.141
IMAP-13	7/19/2007	Wedding D Hi Vol	10 TP	1.9	14:18	14:47	29	76.0	28.6	17.6	631191	4391.4	4439.7	48.3	46.8	3.6	42.9	44.8	44.8	1.272
				1.2	14:18	14:47	29	76.0	28.6	2.2	631190	4384.0	4749.7	365.7	364.2	3.12	39.7	41.5	41.5	10.679
IMAP-14	7/19/2007	Wedding D Hi Vol	10 TP	1.9	15:15	15:56	41	76.0	28.6	17.2	631200	4350.6	4387.3	36.7	35.2	3.6	42.9	44.8	44.8	0.677
				1.2	15:15	15:56	41	76.0	28.6	2.2	631201	4371.6	4631.6	260	258.5	3.12	39.7	41.5	41.5	5.361



# Mintac Wedding Breakout

Run	Date
IMAP-01	7/12/2007
IMAP-02	7/12/2007
IMAP-03	7/13/2007
IMAP-04	7/13/2007
IMAP-05	7/13/2007
IMAP-06	7/14/2007

Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time
DustTrak 1	10	4.0	13:08	14:31	File 1	
DustTrak 2	2.5	4.0	13:08	14:31	File 1	
Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time
DustTrak 1	10	4.0	14:56	16:00	File 2	
DustTrak 2	2.5	4.0	14:56	16:00	File 3	
Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time
DustTrak 1	10	4.0	16:28	17:29	File 3	
DustTrak 2	2.5	4.0	16:28	17:31	File 3	
Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time
DustTrak 1	10	4.0	9:11/10:05	10:03/10:49	File 4 / 5	
DustTrak 2	2.5	4.0	9:11	10:50	File 4	
DustTrak R*	10	4.0	9:09	10:52	File 1	
Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time
DustTrak 1	10	4.05	14:17	14:49	File 6	
DustTrak 2	2.5	4.05	14:17	14:49	File 5	
DustTrak R*	10	4.05	14:20	14:49	File 2	
Sampler Identification	Cutpoint	Sampler Height (m)	Sampler Start Time	Sampler Stop Time	File Name	Adjusted Sampler Start Time
DustTrak 1	10	4.0	15:14	15:56	File 7	
DustTrak 2	2.5	4.0	15:14	15:55	File 6	
DustTrak R*	10	4.0	15:17	15:58	File 3	



**Table \_\_\_\_\_. Moisture and Silt Analysis Results for Road Samples**

Run Number Sample Number	UTEC										MINNTEC		
	IMAP-1 1	IMAP-1 2	IMAP-2 1	IMAP-2 2	IMAP-3 1	IMAP-4 1	IMAP-5 1	IMAP-6 1	IMAP-6 2	IMAP-6 3	IMAP-7 1	IMAP-10 1	IMAP-12 1
Moisture Determination													
Wet Sample Weight	760.1	834.8	1031.0	967.5	1076.7	745.5	708.3	929.3	1062.5	1286.1	1082.4	740.8	939.9
Dry Sample Weight	<u>756.0</u>	<u>830.8</u>	<u>1026.1</u>	<u>962.2</u>	<u>1065.4</u>	<u>739.2</u>	<u>701.6</u>	<u>919.1</u>	<u>1050.4</u>	<u>1278.2</u>	<u>1077.2</u>	<u>738.9</u>	<u>934.3</u>
Moisture Weight	4.1	4.0	4.9	5.3	11.3	6.3	6.7	10.2	12.1	7.9	5.2	1.9	5.6
Size Distribution													
3/8 inch	481.3	449.6	590.6	378.9	460.7	317.4	256.3	407.9	563.6	577.4	125.3	43.8	135.4
4 mesh	110.3	135.8	139.4	180.1	186.4	115.8	135.0	158.1	151.5	199.3	108.0	110.3	188.2
10 mesh	76.4	93.7	118.9	148.8	149.0	92.5	102.4	117.5	114.8	172.4	317.9	218.0	231.2
20 mesh	42.4	61.5	71.7	96.5	95.0	66.5	69.8	90.9	76.2	131.4	317.6	207.6	217.0
40 mesh	14.4	27.8	31.2	48.2	42.4	36.0	34.8	48.6	38.2	64.0	101.9	79.0	79.1
100 mesh	13.1	31.6	37.0	55.7	56.4	48.3	45.2	51.7	49.4	68.4	64.9	52.8	54.7
140 mesh	2.2	6.1	7.0	11.5	12.1	11.6	9.5	9.3	9.8	13.9	6.0	6.5	5.8
200 mesh	2.0	5.9	7.6	12.0	14.3	13.7	11.1	9.1	12.1	16.1	7.0	6.2	2.1
Silt	<u>9.7</u>	<u>17.7</u>	<u>22.7</u>	<u>28.3</u>	<u>49.6</u>	<u>37.3</u>	<u>38.1</u>	<u>25.8</u>	<u>35.6</u>	<u>37.4</u>	<u>29.6</u>	<u>14.6</u>	<u>20.3</u>
	751.8	829.7	1026.1	960.0	1065.9	739.1	702.2	918.9	1051.2	1280.3	1078.2	738.8	933.8
% Moisture based on Entire Sample	0.54%	0.48%	0.48%	0.55%	1.05%	0.85%	0.95%	1.10%	1.14%	0.61%	0.48%	0.26%	0.60%
% Moisture based on Sample < 3/8 in	1.47%	1.04%	1.11%	0.90%	1.83%	1.47%	1.48%	1.96%	2.43%	1.11%	0.54%	0.27%	0.70%
% Silt based on Entire Sample	1.29%	2.13%	2.21%	2.95%	4.65%	5.05%	5.43%	2.81%	3.39%	2.92%	2.75%	1.98%	2.17%
% Silt based on Sample < 3/8 in	3.59%	4.66%	5.21%	4.87%	8.20%	8.85%	8.54%	5.05%	7.30%	5.32%	3.11%	2.10%	2.54%



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 19

Run 19 7/12/2007

United Taconite 12:14 - 12:40

Haul Truck Data 12:00-13:00

Shovel No. Destination Loads

16	Crusher	3
17	Idaho	2 normally goes to lower hammer, not sure where these locations indicate...
	DQ surface	2
29	Crusher	2

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	3	16	3
	29	2	29	2
2	16	3	--	
	29	2	--	
3	--		16	3
	--		29	2
4	--		16	3
	--		29	2
5	16	3	16	3
	29	2	29	2
6	16	3	16	3
7	29	2	29	2
8	17		17	
9	--		--	
10	--		--	
11	--		--	

could change depending on truck route taken by 17 routes  
(could also change other segments)

Segment	Unloaded	Loaded
1	5	5
2	5	
3		5
4		5
5	5	5
6	3	3
7	2	2
8		
9		
10		
11		



## Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 19

Total

10  
5  
5  
5  
10  
6  
4



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 20

Run 20 7/12/2007

United Taconite 14:19-14:50

Haul Truck Data 14:00-15:00

Shovel No.	Destination	Loads
16	Crusher	4
17	Lower Hammer	2
	Idaho	2 not accounted for yet
22	Crusher	2
29	Crusher	3

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	4	16	4
	29	3	29	3
2	16	4	--	
	29	3	--	
3	--		16	4
	--		29	3
4	--		16	
	--		29	3
5	16	4	16	4
	29	3	29	3
6	16	4	16	4
7	29	3	29	3
8	17	2	17	2
9	--		--	
10	22	2	22	2
11	22	2	22	2

Segment	Unloaded	Loaded	Total
1	7		7
2	7		
3			7
4			3
5	7		7
6	4		4
7	3		3
8	2		2
9			
10	2		2
11	2		2



Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 21

Run 21 7/12/2007

United Taconite 16:23-16:51

Haul Truck Data 16:00-17:00

Shovel No.	Destination	Loads
16	Crusher	4
17	Lower Hammer	6
22	Crusher	2
29	Crusher	2

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	4	16	4
	29	2	29	2
2	16	4	--	
	29	2	--	
3	--		16	4
	--		29	2
4	--		16	4
	--		29	2
5	16	4	16	4
	29	2	29	2
6	16	4	16	4
7	29	2	29	2
8	17	6	17	6
9	--		--	
10	22	2	22	2
11	22	2	22	2

Segment	Unloaded	Loaded	Total
1	6	6	12
2	6	0	6
3	0	6	6
4	0	6	6
5	6	6	12
6	4	4	8
7	2	2	4
8	6	6	12
9	0	0	0
10	2	2	4
11	2	2	4



## Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 22

Run 22                7/12/2007

United Taconite        17:21-17:50

Haul Truck Data        17:00-18:00

Shovel No. Destination    Loads

16 Crusher	2
17 Lower Hammer	8
22 Crusher	5
29 Crusher	5

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	2	16	2
	29	5	29	5
2	16	2	--	
	29	5	--	
3	--		16	2
	--		29	5
4	--		16	2
	--		29	5
5	16	2	16	2
	29	5	29	5
6	16	2	16	2
7	29	5	29	5
8	17	8	17	8
9	--		--	
10	22	5	22	5
11	22	5	22	5

Segment	Unloaded	Loaded	Total
1	7	7	14
2	7	0	7
3	0	7	7
4	0	7	7
5	7	7	14
6	2	2	4
7	5	5	10
8	8	8	16
9	0	0	0
10	5	5	10
11	5	5	10



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 23

Run 23                      7/13/2007  
 United Taconite                      5:11-5:48

Haul Truck Data                      5:00-6:00

Shovel No.	Destination	Loads
16	Crusher	8
17	Lower Hammer	5
18	Crusher	3
22	Crusher	2

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	8	16	8
	18	3	18	3
2	16	8	16	8
3	18	3	18	3
4	--	--	--	--
5	16	8	16	8
6	16	8	16	8
7	--	--	--	--
8	17	5	17	5
9	18	3	18	3
10	22	2	22	2
11	22	2	22	2

Segment	Unloaded	Loaded	Total
1	11	11	22
2	8	8	16
3	3	3	6
4	0	0	0
5	8	8	16
6	8	8	16
7	0	0	0
8	5	5	10
9	3	3	6
10	2	2	4
11	2	2	4



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 24

Run 24                      7/13/2007  
 United Taconite              9:55-10:18

Haul Truck Data              10:00-11:00  
 Shovel No. Destination      Loads  
     16 Crusher                      7  
     18 Crusher                      4  
     22 Idaho                          6

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	7	16	7
	18	4	18	4
2	16	7	16	7
3	18	4	18	4
4	--		--	
5	16	7	16	7
6	16	7	16	7
7	--		--	
8	--		--	
9	18	4	18	4
10	--		--	
11	22	6	22	6

Segment	Unloaded	Loaded	Total
1	11	11	22
2	7	7	14
3	4	4	8
4	0	0	0
5	7	7	14
6	7	7	14
7	0	0	0
8	0	0	0
9	4	4	8
10	0	0	0
11	6	6	12



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 25

Run 25 7/13/2007

United Taconite 10:52-11:17

Haul Truck Data 11:00-12:00

Shovel No. Destination Loads

16	Crusher	4
18	Crusher	8
22	Idaho	3

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	4	16	4
	18	8	18	8
2	16	4	16	4
3	18	8	18	8
4	--		--	
5	16	4	16	4
6	16	4	16	4
7	--		--	
8	--		--	
9	18	8	18	8
10	--		--	
11	22	3	22	3

Segment	Unloaded	Loaded	Total
1	12	12	24
2	4	4	8
3	8	8	16
4	0	0	0
5	4	4	8
6	4	4	8
7	0	0	0
8	0	0	0
9	8	8	16
10	0	0	0
11	3	3	6



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 26

Run 26 7/13/2007

United Taconite 11:27-11:51

Haul Truck Data 11:00-12:00

Shovel No. Destination Loads

16	Crusher	4
18	Crusher	8
22	Idaho	3

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	4	16	4
	18	8	18	8
2	16	4	16	4
3	18	8	18	8
4	--		--	
5	16	4	16	4
6	16	4	16	4
7	--		--	
8	--		--	
9	18	8	18	8
10	--		--	
11	22	3	22	3

Segment	Unloaded	Loaded	Total
1	12	12	24
2	4	4	8
3	8	8	16
4	0	0	0
5	4	4	8
6	4	4	8
7	0	0	0
8	0	0	0
9	8	8	16
10	0	0	0
11	3	3	6



## Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 27

Run 27      7/13/2007

United Taconite      14:05-14:29

Haul Truck Data      14:00-15:00

Shovel No. Destination      Loads

16 Crusher      3

18 Crusher      5

22 Idaho      4

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	3	16	3
	18	5	18	5
2	16	3	16	3
3	18	5	18	5
4	--		--	
5	16	3	16	3
6	16	3	16	3
7	--		--	
8	--		--	
9	18	5	18	5
10	--		--	
11	22	4	22	4

Segment	Unloaded	Loaded	Total
1	8	8	16
2	3	3	6
3	5	5	10
4	0	0	0
5	3	3	6
6	3	3	6
7	0	0	0
8	0	0	0
9	5	5	10
10	0	0	0
11	4	4	8



## Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 28

Run 28      7/13/2007

United Taconite      14:47-15:10

Haul Truck Data      14:00-15:00

Shovel No. Destination      Loads

16 Crusher      3

18 Crusher      5

22 Idaho      4

Road Seg	Unloaded	Passes	Loaded	Passes
1	16	3	16	3
	18	5	18	5
2	16	3	16	3
3	18	5	18	5
4	--		--	
5	16	3	16	3
6	16	3	16	3
7	--		--	
8	--		--	
9	18	5	18	5
10	--		--	
11	22	4	22	4

Segment	Unloaded	Loaded	Total
1	8	8	16
2	3	3	6
3	5	5	10
4	0	0	0
5	3	3	6
6	3	3	6
7	0	0	0
8	0	0	0
9	5	5	10
10	0	0	0
11	4	4	8



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 33

Run 33 7/16/2007  
Minntac East Pit 15:01-15:42

Haul Truck Data 14:30-15:30

Shovel No.	Destination	Loads
2	Crusher	3
6	Crusher	4
8	Crusher	9
9	Crusher	6
41	Crusher	4
4	AA Dump	1
5	55 Dump	7
7	CDW	4
37	40 Dump	6
39	N Dump	3
268	61 Dump	4

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	3 --		
	41	4	41	4
	8	9 --		
	6	4	6	4
	9	6	9	6
2 --		--		
3 --		--		
4 --		--		
5 --		--		
6 --		--		
7 --		--		
8 --		--		
9 --		--		
10 --		--		
11 --		--		
12 --		--		
13 --		--		
14	6	4	6	4
	9	6	9	6
15	9	6	9	6
16	9	6	9	6
17	6	4	6	4
18	37	6	37	6
19	5	7	5	7

Segment	Unloaded	Loaded	Total
1	26	14	40
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	10	10	20
15	6	6	12
16	6	6	12
17	4	4	8
18	6	6	12
19	7	7	14



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 34

Run 34 7/16/2007  
Minntac West Pit 16:31-17:08

Haul Truck Data 16:30-17:30

Shovel No. Destination Loads

2	Crusher	3
6	Crusher	7
8	Crusher	6
9	Crusher	6
41	Crusher	5
5	55 Dump	7
7	CDW	5
37	40 Dump	7
39	N Dump	7
268	61 Dump	5

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	3 --		
	41	5	41	5
	8	6 --		
	6	7	6	7
	9	6	9	6
2	2	3 --		
3 --			2	3
--			8	6
4	2	3	2	3
5	268	5	268	5
6	2	3	2	3
7	39	7	39	7
8 --		--		
9 --		--		
10 --		--		
11 --		--		
12 --		--		
13 --		--		
14 --		--		
15 --		--		
16 --		--		
17 --		--		
18 --		--		
19 --		--		

Segment	Unloaded	Loaded	Total
1	27	18	45
2	3	0	3
3	0	9	9
4	3	3	6
5	5	5	10
6	3	3	6
7	7	7	14
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run35

Run 35 7/16/2007  
Minntac West Pit 17:30-18:04

Haul Truck Data 17:30-18:30

Shovel No. Destination Loads

2 Crusher	3
6 Crusher	7
8 Crusher	4
9 Crusher	9
41 Crusher	7
5 55 Dump	7
7 CDW	4
37 40 Dump	8
39 N Dump	7
268 61 Dump	6

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	3 --		
	41	7	41	7
	8	4 --		
	6	7	6	7
	9	9	9	9
2 --		--		
3 --			2	3
--			8	4
4 --		--		
5 --		--		
6 --		--		
7 --		--		
8	8	4 --		
	41	7	41	7
9	8	4 --		
10 --			8	4
11 --		--		
12	7	4	7	4
13 --		--		
14 --		--		
15 --		--		
16 --		--		
17 --		--		
18 --		--		
19 --		--		

Segment	Unloaded	Loaded	Total
1	30	23	53
2	0	0	0
3	0	7	7
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	11	7	18
9	4	0	4
10	0	4	4
11	0	0	0
12	4	4	8
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 36

Run 36 7/17/2007  
Minntac East Pit 9:35-10:18

Haul Truck Data 9:30-10:30

Shovel No. Destination Loads

6 Crusher	4
8 Crusher	2
41 Crusher	5
4 AA Dump	6
5 40 Dump	6
7 CDW	4
9 63 Dump	8
37 40 Dump	9
268 61 Dump	7

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	0 --		
	41	5	41	5
	8	2 --		
	6	4	6	4
2 --		--		
3 --		--		
4 --		--		
5 --		--		
6 --		--		
7 --		--		
8 --		--		
9 --		--		
10 --		--		
11 --		--		
12 --		--		
13 --		--		
14	6	4	6	4
15 --		--		
16	9	8	9	8
17	6	4	6	4
	5	6	5	6
18	37	9	37	9
	5	6	5	6
19	5	6	5	6
20	5	6	5	6

Segment	Unloaded	Loaded	Total
1	11	9	20
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	4	4	8
15	0	0	0
16	8	8	16
17	10	10	20
18	15	15	30
19	6	6	12
20	6	6	12



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 37

Run 37 7/17/2007  
Minntac West Pit 14:29-16:04

Haul Truck Data 14:30-16:30

Shovel No. Destination Loads

2	Crusher	4	
6	Crusher	12	
8	Crusher	12	8C - route from 8 to crusher (12 passes)
41	Crusher	16	
5	55 Dump	17	
7	CDW	9	
8	49 Dump	1	8D - route from 8 to 49 dump (1 pass)
9	63 Dump	16	
268	61 Dump	10	

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	4 --		
	41	16	41	16
	8C	12		
	6	12	6	12
2	2	4 --		
3 --			2	4
			8C	12
4	2	4	2	4
5	268	10	268	10
6	2	4	2	4
7 --		--		
8	41	16	41	16
	8C	12	8D	1
	8D	1		
9	8C	12	8D	1
	8D	1		
10	--		8C	12
11	7	9	7	9
12 --		--		
13	4	0	4	0
14 --		--		
15 --		--		
16 --		--		
17 --		--		
18 --		--		
19 --		--		

Segment	Unloaded	Loaded	Total
1	44	28	72
2	4	0	4
3	0	16	16
4	4	4	8
5	10	10	10
6	4	4	8
7	0	0	0
8	29	17	46
9	13	1	14
10	0	12	12
11	9	9	18
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 38

Run 38 7/18/2007

Minntac West Pit 9:28-10:15

Haul Truck Data 9:30-10:30

Shovel No. Destination Loads

2	Crusher	3
8	Crusher	6
37	Crusher	1
41	Crusher	5
4	AA Dump	5
5	55 Dump	9
7	CDW	5
9	63 Dump	9
268	61 Dump	6

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	3 --		
	41		41	5
	8	6 --		
	37	1	37	1
2	2	3 --		
3 --			2	3
--			8	6
4	2	3	2	3
5	268	6	268	6
6	2	3	2	3
7 --		--		
8	8	6 --		
	41	5	41	5
9	8	6 --		
10 --			8	6
11 --		--		
12 --		--		
13 --		--		
14 --		--		
15 --		--		
16 --		--		
17 --		--		
18 --		--		
19 --		--		

Segment	Unloaded	Loaded	Total
1	15	6	21
2	3	0	3
3	0	9	9
4	3	3	6
5	6	6	12
6	3	3	6
7	0	0	0
8	11	5	16
9	6	0	6
10	0	6	6
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 40

Run 40 7/18/2007  
Minntac East Pit 13:41-14:21

Haul Truck Data 13:30-14:30

Shovel No. Destination Loads

2 Crusher	2
8 Crusher	3
37 Crusher	4
41 Crusher	5
4 AA Dump	3
5 40 Dump	6
6 63 Dump	3
9 63 Dump	6
268 61 Dump	3

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	2 --		
	41	5	41	5
	8	3 --		
	37	4	37	4
2 --		--		
3 --		--		
4 --		--		
5 --		--		
6 --		--		
7 --		--		
8 --		--		
9 --		--		
10 --		--		
11 --		--		
12 --		--		
13 --		--		
14	37	4	37	4
15 --		--		
16	6	3	6	3
	9	6	9	6
17	37	4	37	4
	5	6	5	6
18	5	6	5	6
19	5	6	5	6
20	5	6	5	6

Segment	Unloaded	Loaded	Total
1	14	9	23
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	4	4	8
15	0	0	0
16	9	9	18
17	10	10	20
18	6	6	12
19	6	6	12
20	6	6	12



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 43

Run 43 7/18/2007  
Minntac West Pit 16:05-17:01

Haul Truck Data 15:30-17:30

Shovel No.	Destination	Loads	
2	Crusher	14	
8	Crusher	3	
37	Crusher	12	
41	Crusher	10	
268	Crusher	4	268C
4	AA Dump	10	
5	55 Dump	14	
6	63 Dump	5	
7	CDW	6	
9	63 Dump	14	
268	61 Dump	2	268D

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	14	--	
	41	10	41	10
	37	12	37	12
	8	3		
	268C	4		
2	2	14	--	
	268C	4		
3	--		2	14
			8	3
			268C	4
4	2	14	2	14
	268C	4	268C	4
5	268D	2	268D	2
6	2	14	2	14
7	--		--	
8	41	10	41	10
	8	3	8	3
9	--		--	
10	--		--	
11	7	6	7	6
12	--		--	
13	4	10	4	10
14	--		--	
15	--		--	
16	--		--	
17	--		--	
18	--		--	
19	--		--	

Segment	Unloaded	Loaded	Total
1	43	22	65
2	18	0	18
3	0	21	21
4	18	18	36
5	2	2	4
6	14	14	28
7	0	0	0
8	13	13	26
9	0	0	0
10	0	0	0
11	6	6	12
12	0	0	0
13	10	10	20
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 45

Run 45 7/19/2007  
Minntac West Pit 5:19-6:02

Haul Truck Data 5:30-6:30

Shovel No. Destination Loads

2 Crusher	3
6 Crusher	2
37 Crusher	8
41 Crusher	6
4 AA Dump	4
7 CDW	4
9 63 Dump	6
39 N Dump	6

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	3	--	
	41	6	41	6
	37	8	37	8
	6	2	6	2
2	2	3		
3			2	3
4	2	3	2	3
5 --			--	
6	2	3	2	3
7 --			--	
8 --			--	
9 --			--	
10 --			--	
11 --			--	
12 --			--	
13	4	4	4	4
14 --			--	
15 --			--	
16 --			--	
17 --			--	
18 --			--	
19 --			--	

Segment	Unloaded	Loaded	Total
1	19	16	35
2	3	0	3
3	0	3	3
4	3	3	6
5	0	0	0
6	3	3	6
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	4	4	8
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 47

Run 47 7/19/2007  
Minntac West Pit 9:36-10:36

Haul Truck Data 9:30-10:30

Shovel No.	Destination	Loads
2	Crusher	6
6	Crusher	2
37	Crusher	8
41	Crusher	7
4	AA Dump	5
8	14 dump	6
39	N Dump	4

Road Seg	Unloaded	Passes	Loaded	Passes
1	2	6		
	6	2	6	2
	37	8	37	8
	41	7	41	7
2	2	6		
3			2	6
4	2	6	2	6
5 --		--		
6	2	6	2	6
7	39	4	39	4
8	41	7	41	7
9 --		--		
10	8	6	8	6
11 --		--		
12 --		--		
13	4	5	4	5
14 --		--		
15 --		--		
16 --		--		
17 --		--		
18 --		--		
19 --		--		

Segment	Unloaded	Loaded	Total
1	23	17	40
2	6	0	6
3	0	6	6
4	6	6	12
5	0	0	0
6	6	6	12
7	4	4	8
8	7	7	14
9	0	0	0
10	6	6	12
11	0	0	0
12	0	0	0
13	5	5	10
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0



# Iron Mining Association of Minnesota Truck Activity and Road Segment Data - Run 50

Run 50 7/19/2007  
Minntac East Pit 14:42-15:00

Haul Truck Data 14:30-15:30

Shovel No.	Destination	Loads
2	Crusher	8
6	Crusher	1
37	Crusher	8
41	Crusher	7
4	AA Dump	7
8	14 Dump	9
39	N Dump	9

\*\*got these numbers on the phone with Mike Sterk at Minntac - do not have hard copy of this data

Road Seg	Unloaded	Passes	Loaded	Passes
1	2		8	--
	41		7	41
	37		8	37
	6		1	6
2	--		--	
3	--		--	
4	--		--	
5	--		--	
6	--		--	
7	--		--	
8	--		--	
9	--		--	
10	--		--	
11	--		--	
12	--		--	
13	--		--	
14	37		8	37
	6		1	6
15	6		1	6
16	6		1	6
17	37		8	37
18	--		--	
19	--		--	

Segment	Unloaded	Loaded	Total
1	24	16	40
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	9	9	18
15	1	1	2
16	1	1	2
17	8	8	16
18	0	0	0
19	0	0	0



## Segment Lengths

### United Taconite

Segment	Length (mi)
1	0.15
2	0.2
3	0.56
4	0.28
5	0.39
6	0.2
7	0.78
8	0.81
9	1.25
10	0.99
11	0.69

### Minntac

Segment	Length (mi)
1	0.19
2	1.96
3	1.94
4	0.75
5	0.66
6	1.07
7	0.97
8	1.43
9	0.42
10	0.50
11	1.59
12	1.96
13	1.00
14	1.31
15	0.35
16	0.61
17	0.76
18	0.51
19	2.02
20	1.20
21	0.27
22	0.18





\*lost DT data



Overall Analysis - UTac

													*Early Morning Run							
Run 23	7/13/2007	5:11-5:48		United Taconite		Haul Truck Data			5:00-6:00			VTMT*Conc	VTMT*Conc	Weighted Concentration		Emission Factor	Uncontrolled Emmision			
Segment	Unloaded	Loaded	Total	Length (mi)	VTMT - UnL	VTMT- L	VTMT- Total	Conc- UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded	Unloaded	Loaded						
1	11	11	22	0.15	1.65	1.65	3.30	0.879	1.112	0.995	1.450	1.834								
2	8	8	16	0.2	1.60	1.60	3.20	0.987	1.311	1.149	1.580	2.098								
3	3	3	6	0.56	1.68	1.68	3.36	0.890	1.645	1.267	1.495	2.764								
4	0	0	0	0.28	0.00	0.00	0.00				0.000	0.000								
5	8	8	16	0.39	3.12	3.12	6.24	0.897	1.489	1.193	2.799	4.645								
6	8	8	16	0.2	1.60	1.60	3.20	1.142	1.604	1.373	1.827	2.566								
7	0	0	0	0.78	0.00	0.00	0.00				0.000	0.000								
8	5	5	10	0.81	4.05	4.05	8.10	1.552	1.682	1.617	6.286	6.814								
9	3	3	6	1.25	3.75	3.75	7.50	0.067	1.997	1.032	0.250	7.490								
10	2	2	4	0.99	1.98	1.98	3.96	1.035	1.675	1.355	2.050	3.317								
11	2	2	4	0.69	1.38	1.38	2.76	1.703	2.176	1.940	2.351	3.003								
Sum:										Average:		Sum:								
					19.430	19.430					17.736		31.527	0.913	1.623	1.268	1.940	3.258	4.99	35%
Run 24	7/13/2007	9:55-10:18		United Taconite		Haul Truck Data			10:00-11:00			VTMT*Conc	VTMT*Conc	Weighted Concentration		Emission Factor	Uncontrolled Emmision			
Segment	Unloaded	Loaded	Total	Length (mi)	VTMT - UnL	VTMT- L	VTMT- Total	Conc- UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded	Unloaded	Loaded						
1	11	11	22	0.15	1.65	1.65	3.30	0.956	3.132	2.044	1.578	5.167								
2	7	7	14	0.2	1.40	1.40	2.80	0.566	1.682	1.124	0.793	2.355								
3	4	4	8	0.56	2.24	2.24	4.48	2.125	3.439	2.782	4.760	7.704								
4	0	0	0	0.28	0.00	0.00	0.00				0.000	0.000								
5	7	7	14	0.39	2.73	2.73	5.46	1.798	1.376	1.587	4.910	3.757								
6	7	7	14	0.2	1.40	1.40	2.80	2.170			3.038	0.000								
7	0	0	0	0.78	0.00	0.00	0.00				0.000	0.000								
8	0	0	0	0.81	0.00	0.00	0.00				0.000	0.000								
9	4	4	8	1.25	5.00	5.00	10.00	5.151	8.939	7.045	25.754	44.694								
10	0	0	0	0.99	0.00	0.00	0.00	1.868	1.908	1.888	0.000	0.000								
11	6	6	12	0.69	4.14	4.14	8.28	3.208	3.406	3.307	13.281	14.100								
Sum:										Average:		Sum:								
					11.320	11.320					23.599		25.379	2.085	2.242	2.163	7.045	5.560	18.10	69%
Run 25	7/13/2007	10:52-11:17		United Taconite		Haul Truck Data			11:00-12:00			VTMT*Conc	VTMT*Conc	Weighted Concentration		Emission Factor	Uncontrolled Emmision			
Segment	Unloaded	Loaded	Total	Length (mi)	VTMT - UnL	VTMT- L	VTMT- Total	Conc- UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded	Unloaded	Loaded						
1	12	12	24	0.15	1.80	1.80	3.60	3.019	3.337	3.178	5.435	6.007								
2	4	4	8	0.2	0.80	0.80	1.60	1.870	3.098	2.484	1.496	2.479								
3	8	8	16	0.56	4.48	4.48	8.96	3.802	3.751	3.776	17.033	16.803								
4	0	0	0	0.28	0.00	0.00	0.00				0.000	0.000								
5	4	4	8	0.39	1.56	1.56	3.12	1.800	3.841	2.820	2.807	5.993								
6	4	4	8	0.2	0.80	0.80	1.60	3.341	4.031	3.686	2.673	3.225								
7	0	0	0	0.78	0.00	0.00	0.00				0.000	0.000								
8	0	0	0	0.81	0.00	0.00	0.00				0.000	0.000								
9	8	8	16	1.25	10.00	10.00	20.00	3.588	7.997	5.793	35.880	79.970								
10	0	0	0	0.99	0.00	0.00	0.00	1.887	2.025	1.956	0.000	0.000								
11	3	3	6	0.69	2.07	2.07	4.14	2.010	2.918	2.464	4.160	6.041								
Sum:										Average:		Sum:								
					7.030	7.030					16.570		23.744	2.357	3.378	2.867	5.793	7.369	14.89	50%



Overall Analysis - UTac

Run 26	7/13/2007	11:27-11:51		United Taconite		Haul Truck Data		11:00-12:00			VMT*Conc	VMT*Conc	Weighted Concentration		Emission	Uncontrolled			
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded	Unloaded	Loaded	Factor	Emmision			
1	12	12	24	0.15	1.80	1.80	3.60	2.957	3.316	3.136	5.322	5.969							
2	4	4	8	0.2	0.80	0.80	1.60	2.604	2.843	2.723	2.083	2.274							
3	8	8	16	0.56	4.48	4.48	8.96	4.991	4.593	4.792	22.361	20.575							
4	0	0	0	0.28	0.00	0.00	0.00				0.000	0.000							
5	4	4	8	0.39	1.56	1.56	3.12	2.227	3.929	3.078	3.474	6.130							
6	4	4	8	0.2	0.80	0.80	1.60	4.703	4.656	4.680	3.763	3.725							
7	0	0	0	0.78	0.00	0.00	0.00				0.000	0.000							
8	0	0	0	0.81	0.00	0.00	0.00				0.000	0.000							
9	8	8	16	1.25	10.00	10.00	20.00	4.594	10.982	7.788	45.937	109.824							
10	0	0	0	0.99	0.00	0.00	0.00	3.156	2.834	2.995	0.000	0.000							
11	3	3	6	0.69	2.07	2.07	4.14	3.449	5.238	4.343	7.139	10.842							
					Sum:			Average:			Sum:								
					7.030	7.030		4.337			21.780	28.940	3.098	4.117	3.607	7.788	9.271	20.02	54%

Run 27	7/13/2007	14:05-14:29		United Taconite		Haul Truck Data		14:00-15:00			VMT*Conc	VMT*Conc	Weighted Concentration		Emission	Uncontrolled			
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded	Unloaded	Loaded	Factor	Emmision			
1	8	8	16	0.15	1.20	1.20	2.40	6.550			7.860	0.000							
2	3	3	6	0.2	0.60	0.60	1.20	5.144	4.924	5.034	3.086	2.954							
3	5	5	10	0.56	2.80	2.80	5.60	10.286	12.643	11.465	28.802	35.400							
4	0	0	0	0.28	0.00	0.00	0.00				0.000	0.000							
5	3	3	6	0.39	1.17	1.17	2.34	4.164	6.691	5.428	4.872	7.828							
6	3	3	6	0.2	0.60	0.60	1.20	4.940	9.781	7.360	2.964	5.868							
7	0	0	0	0.78	0.00	0.00	0.00				0.000	0.000							
8	0	0	0	0.81	0.00	0.00	0.00				0.000	0.000							
9	5	5	10	1.25	6.25	6.25	12.50	10.519	36.863	23.691	65.744	230.393							
10	0	0	0	0.99	0.00	0.00	0.00	4.852	5.400	5.126	0.000	0.000							
11	4	4	8	0.69	2.76	2.76	5.52	7.324	7.176	7.250	20.214	19.807							
					Sum:			Average:			Sum:								
					6.330	6.330		9.771			38.997	36.458	6.161	5.760	5.960	23.691	15.318	60.89	75%

Run 28	7/13/2007	14:47-15:10		United Taconite		Haul Truck Data		14:00-15:00			VMT*Conc	VMT*Conc	Weighted Concentration		Emission	Uncontrolled			
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded	Unloaded	Loaded	Factor	Emmision			
1	8	8	16	0.15	1.20	1.20	2.40	11.846			14.216	0.000							
2	3	3	6	0.2	0.60	0.60	1.20	5.352	7.635	6.494	3.211	4.581							
3	5	5	10	0.56	2.80	2.80	5.60	10.417	14.866	12.641	29.168	41.624							
4	0	0	0	0.28	0.00	0.00	0.00	5.320	7.826	6.573	0.000	0.000							
5	3	3	6	0.39	1.17	1.17	2.34	8.960	10.682	9.821	10.483	12.498							
6	3	3	6	0.2	0.60	0.60	1.20				0.000	0.000							
7	0	0	0	0.78	0.00	0.00	0.00				0.000	0.000							
8	0	0	0	0.81	0.00	0.00	0.00				0.000	0.000							
9	5	5	10	1.25	6.25	6.25	12.50	12.919	35.126	24.023	80.745	219.540							
10	0	0	0	0.99	0.00	0.00	0.00	4.747	9.523	7.135	0.000	0.000							
11	4	4	8	0.69	2.76	2.76	5.52	6.474	8.738	7.606	17.869	24.116							
					Sum:			Average:			Sum:								
					6.330	6.330		12.146			45.779	41.195	7.232	6.508	6.870	24.023	17.656	61.74	71%



Overall Analysis - Minntac

Run 33		7/16/2007		15:01-15:42			Minntac		Haul Truck Data		14:30-15:30		East Pit		VMT*Conc VMT*Conc		Weighted Concentration			Uncontrolled		Emission	Uncontrolled	Control	Denotes Highest Concentration
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency						
1	26	14	40	0.19	4.94	2.66	7.60	10.418	3.523	2.957	51.467	9.372													
2	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000													
3	0	0	0	1.94	0.00	0.00	0.00				0.000	0.000													
4	0	0	0	0.75	0.00	0.00	0.00				0.000	0.000													
5	0	0	0	0.66	0.00	0.00	0.00				0.000	0.000													
6	0	0	0	1.07	0.00	0.00	0.00				0.000	0.000													
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000													
8	0	0	0	1.43	0.00	0.00	0.00				0.000	0.000													
9	0	0	0	0.42	0.00	0.00	0.00				0.000	0.000													
10	0	0	0	0.50	0.00	0.00	0.00				0.000	0.000													
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000													
12	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000													
13	0	0	0	1.00	0.00	0.00	0.00				0.000	0.000													
14	10	10	20	1.31	13.10	13.10	26.20	3.474	4.238	0.820	45.514	55.518													
15	6	6	12	0.35	2.10	2.10	4.20				0.000	0.000													
16	6	6	12	0.61	3.66	3.66	7.32				0.000	0.000													
17	4	4	8	0.76	3.04	3.04	6.08				0.000	0.000													
18	6	6	12	0.51	3.06	3.06	6.12	44.472	77.911	0.571	136.086	238.409													
19	7	7	14	2.02	14.14	14.14	28.28	4.084	4.375	0.934	57.754	61.861													
20	0	0	0	1.20	0.00	0.00	0.00	16.649	5.170	3.220	0.000	0.000													
21	0	0	0	0.27	0.00	0.00	0.00				0.000	0.000													
22	0	0	0	0.18	0.00	0.00	0.00				0.000	0.000													
				Sum:						Average:		Sum:						3.776	3.275	3.526	61.19	6.875	119.32	94%	
				40.980		38.700				1.700		154.735		126.751											

Run 34		7/16/2007		16:31-17:08			Minntac		Haul Truck Data		16:30-17:30		West Pit		VMT*Conc VMT*Conc		Weighted Concentration			Uncontrolled		Emission	Uncontrolled	Control	Denotes Highest Concentration
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency						
1	27	18	45	0.19	5.13	3.42	8.55	10.733			55.060	0.000													
2	3	0	3	1.96	5.88	0.00	5.88	6.870			40.394	0.000													
3	0	9	9	1.94	0.00	17.46	17.46		6.262		0.000	109.330													
4	3	3	6	0.75	2.25	2.25	4.50	2.501	14.118	0.177	5.628	31.765													
5	5	5	10	0.66	3.30	3.30	6.60	22.487	27.667	0.813	74.208	91.301													
6	3	3	6	1.07	3.21	3.21	6.42	6.234	9.028	0.690	20.010	28.979													
7	7	7	14	0.97	6.79	6.79	13.58	14.441	15.475	0.933	98.055	105.076													
8	0	0	0	1.43	0.00	0.00	0.00				0.000	0.000													
9	0	0	0	0.42	0.00	0.00	0.00				0.000	0.000													
10	0	0	0	0.50	0.00	0.00	0.00				0.000	0.000													
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000													
12	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000													
13	0	0	0	1.00	0.00	0.00	0.00				0.000	0.000													
14	0	0	0	1.31	0.00	0.00	0.00				0.000	0.000													
15	0	0	0	0.35	0.00	0.00	0.00				0.000	0.000													
16	0	0	0	0.61	0.00	0.00	0.00				0.000	0.000													
17	0	0	0	0.76	0.00	0.00	0.00				0.000	0.000													
18	0	0	0	0.51	0.00	0.00	0.00				0.000	0.000													
19	0	0	0	2.02	0.00	0.00	0.00				0.000	0.000													
20	0	0	0	1.20	0.00	0.00	0.00				0.000	0.000													
21	3	3	6	0.27	0.81	0.81	1.62	4.141	14.157	0.292	3.354	11.467													
22	5	5	10	0.18	0.90	0.90	1.80	31.075	15.596	1.992	27.967	14.037													
				Sum:						Average:		Sum:						9.422	8.305	8.863	25.08	17.284	48.90	65%	
				23.260		33.130				0.653		219.146		275.149											



Overall Analysis - Minntac

35		7/16/2007		17:30-18:04		Minntac		Haul Truck Data		17:30-18:30		West Pit		VMT*Conc		VMT*Conc		Weighted Concentration		Uncontrolled		Emission		Uncontrolled		Control	
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency						
1	30	23	53	0.19	5.70	4.37	10.07			#DIV/0!	0.000	0.000															
2	0	0	0	1.96	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
3	0	7	7	1.94	0.00	13.58	13.58			#DIV/0!	0.000	0.000															
4	0	0	0	0.75	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
5	0	0	0	0.66	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
6	0	0	0	1.07	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
7	0	0	0	0.97	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
8	11	7	18	1.43	15.73	10.01	25.74			#DIV/0!	0.000	0.000															
9	4	0	4	0.42	1.68	0.00	1.68			#DIV/0!	0.000	0.000															
10	0	4	4	0.50	0.00	2.00	2.00			#DIV/0!	0.000	0.000															
11	0	0	0	1.59	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
12	4	4	8	1.96	7.84	7.84	15.68			#DIV/0!	0.000	0.000															
13	0	0	0	1.00	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
14	0	0	0	1.31	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
15	0	0	0	0.35	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
16	0	0	0	0.61	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
17	0	0	0	0.76	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
18	0	0	0	0.51	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
19	0	0	0	2.02	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
20	0	0	0	1.20	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
21	0	0	0	0.27	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
22	0	0	0	0.18	0.00	0.00	0.00			#DIV/0!	0.000	0.000															
				Sum:	30.95	37.80		Average:		#DIV/0!	0.000	0.000															
*lost DT data																											
Run 36		7/17/2007		9:35-10:18		Minntac		Haul Truck Data		9:30-10:30		East Pit		VMT*Conc		VMT*Conc		Weighted Concentration		Uncontrolled		Emission		Uncontrolled		Control	
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency						
1	11	9	20	0.19	2.09	1.71	3.80	0.218	0.253	0.236	0.456	0.433															
2	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000															
3	0	0	0	1.94	0.00	0.00	0.00				0.000	0.000															
4	0	0	0	0.75	0.00	0.00	0.00				0.000	0.000															
5	0	0	0	0.66	0.00	0.00	0.00				0.000	0.000															
6	0	0	0	1.07	0.00	0.00	0.00				0.000	0.000															
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000															
8	0	0	0	1.43	0.00	0.00	0.00				0.000	0.000															
9	0	0	0	0.42	0.00	0.00	0.00				0.000	0.000															
10	0	0	0	0.50	0.00	0.00	0.00				0.000	0.000															
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000															
12	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000															
13	0	0	0	1.00	0.00	0.00	0.00				0.000	0.000															
14	4	4	8	1.31	5.24	5.24	10.48	0.775	0.577	0.676	4.059	3.023															
15	0	0	0	0.35	0.00	0.00	0.00	0.958	0.222	0.590	0.000	0.000															
16	8	8	16	0.61	4.88	4.88	9.76	0.428	0.836	0.632	2.089	4.078															
17	10	10	20	0.76	7.60	7.60	15.20	0.117	0.395	0.256	0.893	2.999															
18	15	15	30	0.51	7.65	7.65	15.30	0.165	0.206	0.185	1.261	1.575															
19	6	6	12	2.02	12.12	12.12	24.24	0.516	0.556	0.536	6.252	6.743															
20	6	6	12	1.20	7.20	7.20	14.40	0.212	0.619	0.415	1.530	4.453															
21	0	0	0	0.27	0.00	0.00	0.00				0.000	0.000															
22	0	0	0	0.18	0.00	0.00	0.00				0.000	0.000															
				Sum:				Average:			Sum:																
					41.540	41.160				0.441	12.481	20.281	0.300	0.493	0.397	0.68	0.773		1.32	41%							



Overall Analysis - Minntac

Run 37		7/17/2007		14:29-16:04		Minntac		Haul Truck Data		14:30-16:30		West Pit		VTM*Conc	VTM*Conc	Weighted Concentration		Uncontrolled	Emission	Uncontrolled	Control
Segment	Unloaded	Loaded	Total	Length (mi)	VTM - UnL	VTM- L	VTM- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency
1	44	28	72	0.19	8.36	5.32	13.68	6.014			50.280	0.000									
2	4	0	4	1.96	7.84	0.00	7.84	2.496			19.567	0.000									
3	0	16	16	1.94	0.00	31.04	31.04		40.593		0.000	1260.016									
4	4	4	8	0.75	3.00	3.00	6.00	3.317	27.458	15.388	9.952	82.374									
5	10	10	10	0.66	6.60	6.60	6.60	45.481	75.136	60.309	300.177	495.901									
6	4	4	8	1.07	4.28	4.28	8.56	53.494	101.235	77.365	228.956	433.287									
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000									
8	29	17	46	1.43	41.47	24.31	65.78	8.325	22.309	15.317	345.244	542.334									
9	13	1	14	0.42	5.46	0.42	5.88	9.243	45.318	27.281	50.467	19.034									
10	0	12	12	0.50	0.00	6.00	6.00		7.017		0.000	42.104									
11	9	9	18	1.59	14.31	14.31	28.62	19.812	24.840	22.326	283.504	355.454									
12	0	0	0	1.96	0.00	0.00	0.00	36.554			0.000	0.000									
13	0	0	0	1.00	0.00	0.00	0.00	45.319	40.835	43.077	0.000	0.000									
14	0	0	0	1.31	0.00	0.00	0.00				0.000	0.000									
15	0	0	0	0.35	0.00	0.00	0.00				0.000	0.000									
16	0	0	0	0.61	0.00	0.00	0.00				0.000	0.000									
17	0	0	0	0.76	0.00	0.00	0.00				0.000	0.000									
18	0	0	0	0.51	0.00	0.00	0.00				0.000	0.000									
19	0	0	0	2.02	0.00	0.00	0.00				0.000	0.000									
20	0	0	0	1.20	0.00	0.00	0.00				0.000	0.000									
21	4	4	8	0.27	1.08	1.08	2.16	14.996	65.341	40.168	16.196	70.568									
22	10	10	10	0.18	1.80	1.80	1.80	74.666	102.905	88.785	134.399	185.229									
				Sum:						Average:	Sum:										
				91.32		95.28				37.295	1288.147		3230.503		14.106	33.905	24.006	88.79	46.811	173.13	73%
Run 38		7/18/2007		9:28-10:15		Minntac		Haul Truck Data		9:30-10:30		West Pit		VTM*Conc	VTM*Conc	Weighted Concentration		Uncontrolled	Emission	Uncontrolled	Control
Segment	Unloaded	Loaded	Total	Length (mi)	VTM - UnL	VTM- L	VTM- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency
1	15	6	21	0.19	2.85	1.14	3.99	1.326			3.778	0.000									
2	3	0	3	1.96	5.88	0.00	5.88	1.291			7.590	0.000									
3	0	9	9	1.94	0.00	17.46	17.46		6.747		0.000	117.799									
4	3	3	6	0.75	2.25	2.25	4.50	1.170	6.013	3.591	2.632	13.529									
5	6	6	12	0.66	3.96	3.96	7.92	18.787	71.803	45.295	74.395	284.339									
6	3	3	6	1.07	3.21	3.21	6.42	0.835	3.989	0.209	2.681	12.803									
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000									
8	11	5	16	1.43	15.73	7.15	22.88	4.917	5.890	5.404	77.343	42.116									
9	6	0	6	0.42	2.52	0.00	2.52	8.351	6.934	7.642	21.044	0.000									
10	0	6	6	0.50	0.00	3.00	3.00		6.097		0.000	18.291									
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000									
12	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000									
13	0	0	0	1.00	0.00	0.00	0.00				0.000	0.000									
14	0	0	0	1.31	0.00	0.00	0.00				0.000	0.000									
15	0	0	0	0.35	0.00	0.00	0.00				0.000	0.000									
16	0	0	0	0.61	0.00	0.00	0.00				0.000	0.000									
17	0	0	0	0.76	0.00	0.00	0.00				0.000	0.000									
18	0	0	0	0.51	0.00	0.00	0.00				0.000	0.000									
19	0	0	0	2.02	0.00	0.00	0.00				0.000	0.000									
20	0	0	0	1.20	0.00	0.00	0.00				0.000	0.000									
21	3	3	6	0.27	0.81	0.81	1.62				0.000	0.000									
22	6	6	12	0.18	1.08	1.08	2.16				0.000	0.000									
				Sum:						Average:	Sum:										
				32.440		34.210				12.428	115.068		204.538		3.547	5.979	4.763	45.29	9.288	88.32	89%



Overall Analysis - Minntac

Run 40	7/18/2007	13:41-14:21		Minntac		Haul Truck Data			13:30-14:30		East Pit		VTM*Conc	VTM*Conc	Weighted Concentration		Uncontrolled	Emission	Uncontrolled	Control	
Segment	Unloaded	Loaded	Total	Length (mi)	VTM - UnL	VTM- L	VTM- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency
1	14	9	23	0.19	2.66	1.71	4.37	10.269	4.561	7.415	27.315	7.799									
2	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000									
3	0	0	0	1.94	0.00	0.00	0.00				0.000	0.000									
4	0	0	0	0.75	0.00	0.00	0.00				0.000	0.000									
5	0	0	0	0.66	0.00	0.00	0.00				0.000	0.000									
6	0	0	0	1.07	0.00	0.00	0.00				0.000	0.000									
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000									
8	0	0	0	1.43	0.00	0.00	0.00				0.000	0.000									
9	0	0	0	0.42	0.00	0.00	0.00				0.000	0.000									
10	0	0	0	0.50	0.00	0.00	0.00				0.000	0.000									
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000									
12	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000									
13	0	0	0	1.00	0.00	0.00	0.00				0.000	0.000									
14	4	4	8	1.31	5.24	5.24	10.48	3.395	4.451	3.923	17.789	23.325									
15	0	0	0	0.35	0.00	0.00	0.00	70.847	65.220	68.033	0.000	0.000									
16	9	9	18	0.61	5.49	5.49	10.98	22.403	19.518	20.961	122.994	107.154									
17	10	10	20	0.76	7.60	7.60	15.20	6.408	28.458	17.433	48.699	216.284									
18	6	6	12	0.51	3.06	3.06	6.12				0.000	0.000									
19	6	6	12	2.02	12.12	12.12	24.24	27.884	32.981	30.432	337.950	399.729									
20	6	6	12	1.20	7.20	7.20	14.40	6.182	13.021	9.601	44.512	93.749									
21	0	0	0	0.27	0.00	0.00	0.00				0.000	0.000									
22	0	0	0	0.18	0.00	0.00	0.00				0.000	0.000									
				Sum:						Average:	Sum:										
				43.370		42.420				22.543	599.260		848.040		13.817	19.992	16.904	68.03	32.964	132.67	75%
Run 43	7/18/2007	16:05-17:01		Minntac		Haul Truck Data			15:30-17:30		West Pit		VTM*Conc	VTM*Conc	Weighted Concentration		Uncontrolled	Emission	Uncontrolled	Control	
Segment	Unloaded	Loaded	Total	Length (mi)	VTM - UnL	VTM- L	VTM- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency
1	43	22	65	0.19	8.17	4.18	12.35				0.000	0.000									
2	18	0	18	1.96	35.28	0.00	35.28	1.788			63.072	0.000									
3	0	21	21	1.94	0.00	0.00	40.74		17.648		0.000	718.996									
4	18	18	36	0.75	13.50	13.50	27.00	3.300	6.681	4.990	44.546	90.192									
5	2	2	4	0.66	1.32	1.32	2.64				0.000	0.000									
6	14	14	28	1.07	14.98	14.98	29.96	9.651	15.036	12.343	144.566	225.236									
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000									
8	13	13	26	1.43	18.59	18.59	37.18	3.071	2.426	2.749	57.093	45.099									
9	0	0	0	0.42	0.00	0.00	0.00				0.000	0.000									
10	0	0	0	0.50	0.00	0.00	0.00				0.000	0.000									
11	6	6	12	1.59	9.54	9.54	19.08				0.000	0.000									
12	0	0	0	1.96	0.00	0.00	0.00	33.268	40.888	37.078	0.000	0.000									
13	10	10	20	1.00	10.00	10.00	20.00	53.549	51.365	52.457	535.490	513.651									
14	0	0	0	1.31	0.00	0.00	0.00				0.000	0.000									
15	0	0	0	0.35	0.00	0.00	0.00				0.000	0.000									
16	0	0	0	0.61	0.00	0.00	0.00				0.000	0.000									
17	0	0	0	0.76	0.00	0.00	0.00				0.000	0.000									
18	0	0	0	0.51	0.00	0.00	0.00				0.000	0.000									
19	0	0	0	2.02	0.00	0.00	0.00				0.000	0.000									
20	0	0	0	1.20	0.00	0.00	0.00				0.000	0.000									
21	18	18	36	0.27	4.86	4.86	9.72	5.845	20.171	13.008	28.408	98.032									
22	2	2	4	0.18	0.36	0.36	0.72				0.000	0.000									
				Sum:						Average:	Sum:										
				101.380		102.850				21.923	309.277		1079.523		3.051	10.496	6.773	52.46	13.208	102.29	87%



Overall Analysis - Minntac

Run 45	7/19/2007 5:19-6:02			Minntac		Haul Truck Data			5:30-6:30		West Pit		VMT*Conc VMT*Conc		Weighted Concentration			Uncontrolled	Emission	Uncontrolled	Control	*Early Morning Run
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency			
1	19	16	35	0.19	3.61	3.04	6.65	1.0786			3.894	0.000										
2	3	0	3	1.96	5.88	0.00	5.88	0.3771			2.217	0.000										
3	0	3	3	1.94	0.00	5.82	5.82		1.4708		0.000	8.560										
4	3	3	6	0.75	2.25	2.25	4.50	0.4804	1.8553	1.168	1.081	4.174										
5	0	0	0	0.66	0.00	0.00	0.00				0.000	0.000										
6	3	3	6	1.07	3.21	3.21	6.42	0.2673	0.6891	0.478	0.858	2.212										
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000										
8	0	0	0	1.43	0.00	0.00	0.00				0.000	0.000										
9	0	0	0	0.42	0.00	0.00	0.00				0.000	0.000										
10	0	0	0	0.50	0.00	0.00	0.00				0.000	0.000										
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000										
12	0	0	0	1.96	0.00	0.00	0.00	2.1268	6.2058	4.166	0.000	0.000										
13	4	4	8	1.00	4.00	4.00	8.00	1.2701	1.7116	1.491	5.080	6.846										
14	0	0	0	1.31	0.00	0.00	0.00				0.000	0.000										
15	0	0	0	0.35	0.00	0.00	0.00				0.000	0.000										
16	0	0	0	0.61	0.00	0.00	0.00				0.000	0.000										
17	0	0	0	0.76	0.00	0.00	0.00				0.000	0.000										
18	0	0	0	0.51	0.00	0.00	0.00				0.000	0.000										
19	0	0	0	2.02	0.00	0.00	0.00				0.000	0.000										
20	0	0	0	1.20	0.00	0.00	0.00				0.000	0.000										
21	3	3	6	0.27	0.81	0.81	1.62	0.2992	2.1755	1.237	0.242	1.762			2.41215							
22	0	0	0	0.18	0.00	0.00	0.00				0.000	0.000										
				Sum:						Average:		Sum:										
				18.950				18.320		1.826		13.131		21.793		0.693	1.190	0.941	4.17	1.835	8.12	77%
Run 47	7/19/2007 9:36-10:36			Minntac		Haul Truck Data			9:30-10:30		West Pit		VMT*Conc VMT*Conc		Weighted Concentration			Uncontrolled	Emission	Uncontrolled	Control	
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency			
1	23	17	40	0.19	4.37	3.23	7.60	3.293			14.390	0.000										
2	6	0	6	1.96	11.76	0.00	11.76	5.102			60.000	0.000										
3	0	6	6	1.94	0.00	11.64	11.64		3.632	3.632	0.000	42.276										
4	6	6	12	0.75	4.50	4.50	9.00	2.863	6.014	4.439	12.884	27.063										
5	0	0	0	0.66	0.00	0.00	0.00				0.000	0.000										
6	6	6	12	1.07	6.42	6.42	12.84	1.165	11.914	6.540	7.479	76.488										
7	4	4	8	0.97	3.88	3.88	7.76	11.419	34.069	22.744	44.306	132.188										
8	7	7	14	1.43	10.01	10.01	20.02	1.638	6.032	3.835	16.396	60.380										
9	0	0	0	0.42	0.00	0.00	0.00	2.440	1.881	2.161	0.000	0.000										
10	6	6	12	0.50	3.00	3.00	6.00	1.165	1.618	1.392	3.495	4.854										
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000										
12	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000										
13	5	5	10	1.00	5.00	5.00	10.00	6.517	4.013	5.265	32.585	20.065										
14	0	0	0	1.31	0.00	0.00	0.00				0.000	0.000										
15	0	0	0	0.35	0.00	0.00	0.00				0.000	0.000										
16	0	0	0	0.61	0.00	0.00	0.00				0.000	0.000										
17	0	0	0	0.76	0.00	0.00	0.00				0.000	0.000										
18	0	0	0	0.51	0.00	0.00	0.00				0.000	0.000										
19	0	0	0	2.02	0.00	0.00	0.00				0.000	0.000										
20	0	0	0	1.20	0.00	0.00	0.00				0.000	0.000										
21	6	6	12	0.27	1.62	1.62	3.24	4.375	4.639	4.507	7.088	7.515										
22	0	0	0	0.18	0.00	0.00	0.00				0.000	0.000										
				Sum:						Average:		Sum:										
				45.060				43.800		6.251		147.229		231.127		3.267	5.277	4.272	22.74	8.331	44.35	81%



Overall Analysis - Minntac

Run 50	7/19/2007	14:42-15:00			Minntac		Haul Truck Data			14:30-15:30		East Pit		VMT*Conc	VMT*Conc	Weighted Concentration			Uncontrolled	Emission	Uncontrolled	Control								
Segment	Unloaded	Loaded	Total	Length (mi)	VMT - UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg UnL-L	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Average	Conc.	Factor	Emmision	Efficiency									
1	24	16	40	0.19	4.56	3.04	7.60	6.607	0.655	3.631	30.128	1.991																		
2	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000																		
3	0	0	0	1.94	0.00	0.00	0.00				0.000	0.000																		
4	0	0	0	0.75	0.00	0.00	0.00				0.000	0.000																		
5	0	0	0	0.66	0.00	0.00	0.00				0.000	0.000																		
6	0	0	0	1.07	0.00	0.00	0.00				0.000	0.000																		
7	0	0	0	0.97	0.00	0.00	0.00				0.000	0.000																		
8	0	0	0	1.43	0.00	0.00	0.00				0.000	0.000																		
9	0	0	0	0.42	0.00	0.00	0.00				0.000	0.000																		
10	0	0	0	0.50	0.00	0.00	0.00				0.000	0.000																		
11	0	0	0	1.59	0.00	0.00	0.00				0.000	0.000																		
12	0	0	0	1.96	0.00	0.00	0.00				0.000	0.000																		
13	0	0	0	1.00	0.00	0.00	0.00				0.000	0.000																		
14	9	9	18	1.31	11.79	11.79	23.58	1.938	3.692	2.815	22.849	43.529																		
15	1	1	2	0.35	0.35	0.35	0.70	9.875	13.634	11.755	3.456	4.772																		
16	1	1	2	0.61	0.61	0.61	1.22	10.346	15.794	13.070	6.311	9.634																		
17	8	8	16	0.76	6.08	6.08	12.16	21.117	53.209	37.163	128.391	323.511																		
18	0	0	0	0.51	0.00	0.00	0.00				0.000	0.000																		
19	0	0	0	2.02	0.00	0.00	0.00				0.000	0.000																		
20	0	0	0	1.20	0.00	0.00	0.00				0.000	0.000																		
21	0	0	0	0.27	0.00	0.00	0.00				0.000	0.000																		
22	0	0	0	0.18	0.00	0.00	0.00				0.000	0.000																		
				Sum:						Average:	Sum:																			
				17.310		15.790				13.687	62.744		59.926		3.625			3.795			3.710		37.16		7.234		72.47		90%	



## Water Truck Data

Location	Date	Shift	No. of Loads	Loads per shift
Minntac	7/16/2007	2	7	
Minntac	7/16/2007	2	7	14
Minntac	7/16/2007	3	6	
Minntac	7/16/2007	3	7	13
Minntac	7/17/2007	1	7	7
Minntac	7/17/2007	2	8	
Minntac	7/17/2007	2	7	15
Minntac	7/17/2007	3	6	
Minntac	7/17/2007	3	6	12
Minntac	7/18/2007	1	5	
Minntac	7/18/2007	1	8	13
Minntac	7/18/2007	2	6	
Minntac	7/18/2007	2	6	12
Minntac	7/18/2007	3	7	
Minntac	7/18/2007	3	3	10
Minntac	7/19/2007	1	7	
Minntac	7/19/2007	1	8	15
Minntac	7/19/2007	2	3	
Minntac	7/19/2007	2	7	10



## Individual Run Factors

Run	Run Concentration	Relative Uncontrolled Concentration	Control Efficiency
33	3.526	61.192	94%
34	8.863	25.077	65%
35	-	-	-
36	-	-	-
37	24.006	88.785	73%
38	4.763	45.295	89%
40	16.904	68.033	75%
43	6.773	52.457	87%
45	0.941	4.166	77%
47	4.272	22.744	81%
50	3.710	37.163	90%
Average	8.195	44.990	81%

\*Represents the highest segment from each test run

Run	Run Concentration	Relative Uncontrolled Concentration	Control Efficiency
19	3.57	8.40	58%
20	4.82	10.89	56%
21	7.01	9.86	29%
22	-	-	-
23	-	-	-
24	2.16	7.04	69%
25	2.87	5.79	50%
26	3.61	7.79	54%
27	5.96	23.69	75%
28	6.87	24.02	71%
Average	4.608	12.186	58%

\*Represents the highest segment from each test run



## Watering Effects

Mine	Run	Start Time	Stop Time	Overall Emission Factor	Uncontrolled Emission Factor
United Taconite	23	5:11	5:48	1.62	-
Minntac	36	5:19	6:02	1.88	2.47



# **Iron Mining Association of Minnesota United Taconite Calibration - Compiled Profileing Run Ratio Data**

Profiling Run	Mobile Monitor Runs	Tower Emission Factor	DustTrak Average	Ratio
IMAP-01	19,20	9.61	3.761	2.555
IMAP-02	21	14.75	3.377	4.367
IMAP-03	24,25	7.93	3.076	2.578
IMAP-04	26	12.21	4.404	2.772
IMAP-05	27,28	4.21	12.911	0.326
IMAP-06	29,30,31,32	8.19	12.475	0.657
	Average	9.483	6.667	2.586



## Iron Mining Association of Minnesota United Taconite Calibration - Summary

Run	Unloaded	Loaded	Ratio U-L	Average
19	2.761	4.587	0.60	3.674
20	4.869	2.827	1.72	3.848
21	2.139	4.615	0.46	3.377
23	0.947	1.789	0.53	1.368
24	2.604	3.079	0.85	2.841
25	3.325	3.297	1.01	3.311
26	4.623	4.185	1.10	4.404
27	9.695	13.362	0.73	11.529
28	12.314	16.273	0.76	14.293
29	6.854	8.204	0.84	7.529
30	7.161	9.747	0.73	8.454
31	11.984	21.502	0.56	16.743
32	13.054	21.294	0.61	17.174
Total			0.81	7.58

Profiling Run	Mobile Monitor Runs	Tower Emission Factor	DustTrak Average	Moisture	Silt	Tower EF / DustTrak Ave
IMAP-01	19,20	9.61	3.761	1.26	4.13	2.555
IMAP-02	21	14.75	3.377	1.01	5.04	4.367
IMAP-03	24,25	7.93	3.076	1.83	8.20	2.578
IMAP-04	26	12.21	4.404	1.47	8.85	2.772
IMAP-05	27,28	4.21	12.911	1.48	8.54	0.326
IMAP-06	29,30,31,32	8.19	12.475	1.83	5.89	0.657
Average						2.586
Std Deviation						1.316

### United Repeatability Analysis

Run #	Unloaded Concentration (mg/m <sup>3</sup> )			Loaded Concentration (mg/m <sup>3</sup> )			Unloaded Average	Loaded Average
	Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3		
Run 29	6.375	6.557	7.630	8.404	6.448	9.760	6.854	8.204
Run 30	6.199	7.952	7.333	11.201	6.808	11.231	7.161	9.747
Run 31	13.343	10.947	11.662	23.348	21.268	19.890	11.984	21.502
Run 32	13.562	13.211	12.388	24.947	15.329	23.604	13.054	21.294



## Iron Mining Association of Minnesota United Taconite Calibration - Summary

Run	Loaded, Unloaded, Combined	Pass Average Concentration (mg/m3)	3- Pass Average Concentration (mg/m3)	Relative Standard Deviation
Run 29	Unloaded	6.375	6.854	10%
		6.557		
		7.630		
	Loaded	8.404	8.204	20%
		6.448		
		9.760		
Run 30	Unloaded	6.199	7.161	12%
		7.952		
		7.333		
	Loaded	11.201	9.747	26%
		6.808		
		11.231		
Run 31	Unloaded	13.343	11.984	10%
		10.947		
		11.662		
	Loaded	23.348	21.502	8%
		21.268		
		19.890		
Run 32	Unloaded	13.562	13.054	5%
		13.211		
		12.388		
	Loaded	24.947	21.294	24%
		15.329		
		23.604		



## Iron Mining Association of Minnesota United Taconite Calibration - Run 19

Unloaded			Loaded		
Pass1	Pass 2	Pass 3	Pass1	Pass 2	Pass 3
2.463	173103		8.289	173921	3.500 172033
2.369	173106		6.275	173924	3.607 172036
2.335	173109		4.590	173927	3.884 172039
2.428	173112		3.941	173930	4.561 172042
2.831	173115		3.414	173933	4.188 172045
3.226	173118		4.223	173936	2.828 172048
3.207	173121		6.882	173939	2.492 172051
2.951	173124		7.419	173942	2.426 172054
2.860	173127		8.163	173945	2.256 172057
2.936	173130		6.559	173948	2.238 172100
2.761			5.976 3.198		
Unloaded Average 2.761			Loaded Average 4.587		



## Iron Mining Association of Minnesota United Taconite Calibration - Run 20

Unloaded			Loaded		
Pass1	Pass 2	Pass 3	Pass1	Pass 2	Pass 3
7.314	194025		3.710	193001	
6.924	194028		2.517	193004	
7.038	194031		2.698	193007	
6.044	194034		4.217	193010	
4.828	194037		3.713	193013	
3.837	194040		2.128	193016	
2.517	194404		2.036	193019	
2.926	194407		2.324	193022	
3.388	194410		2.104	193025	
3.872	194413				
4.869			2.827		
Unloaded Average 4.869			Loaded Average 2.827		



## Iron Mining Association of Minnesota United Taconite Calibration - Run 21

Unloaded			Loaded		
Pass1	Pass 2	Pass 3	Pass1	Pass 2	Pass 3
2.840	214255		4.840	215004	5.831 213240
2.432	214258		5.121	215007	5.613 213243
2.326	214301		3.723	215010	4.803 213246
2.301	214304		2.885	215013	4.142 213249
2.284	214307		3.455	215016	6.592 213252
1.836	214310		3.567	215019	6.300 213255
1.496	214313		2.638	215022	4.191 213258
1.690	214316		3.099	215025	4.712 213301
2.146	214319		5.546	215028	4.436 213304
2.044	214322		7.143	215031	3.662 213307
			5.158	215034	4.423 213310
2.139			4.202 5.028		
Unloaded Average 2.139			Loaded Average 4.615		



## Iron Mining Association of Minnesota United Taconite Calibration - Run 23

Unloaded				Loaded			
Pass1		Pass 2		Pass1		Pass 2	
			Pass 3				Pass 3
2.119	103206	0.042	101254	1.897	102400	2.074	103906
2.122	103209	0.091	101257	2.000	102403	1.877	103909
1.985	103212	0.462	101300	1.949	102406	1.855	103912
1.901	103215	0.555	101303	1.828	102409	1.870	103915
1.758	103218	0.444	101306	1.775	102412	1.820	103918
1.702	103221	0.320	101309	1.628	102415	1.848	103921
1.502	103224	0.132	101312	1.595	102418	1.705	103924
1.280	103227	0.101	101315	1.659	102421	1.654	103927
1.169	103230	0.039	101318	1.667	102424	1.743	103930
1.153	103233	0.054	101321	1.605	102427	1.731	103933
				1.504	102430		
1.669		0.224		1.760		1.818	
Unloaded Average		0.947		Loaded Average		1.789	



## Iron Mining Association of Minnesota United Taconite Calibration - Run 24

Pass1		Unloaded Pass 2	Pass 3	Pass1		Loaded Pass 2	Pass 3
2.256	150948			4.049	151706		
2.556	150951			4.146	151709		
2.516	150954			3.697	151712		
2.245	150957			3.421	151715		
2.345	151000			2.822	151718		
2.800	151003			2.546	151721		
2.816	151006			2.813	151724		
3.045	151009			2.647	151727		
3.069	151012			2.332	151730		
2.392	151015			2.314	151733		
2.604				3.079			
Unloaded Average		2.604		Loaded Average		3.079	



## Iron Mining Association of Minnesota United Taconite Calibration - Run 25

Unloaded				Loaded			
Pass1		Pass 2		Pass 3		Pass1	
3.420	155853	2.259	161650			3.872	160605
3.783	155856	2.444	161653			3.645	160608
3.856	155859	2.459	161656			3.517	160611
3.736	155902	2.425	161659			3.185	160614
3.403	155905	2.491	161702			2.744	160617
4.009	155908	2.459	161705			3.135	160620
4.748	155911	2.328	161708			3.054	160623
4.937	155914	2.717	161711			2.894	160626
5.093	155917	2.862	161714			3.155	160629
4.583	155920					3.772	160632
4.157				2.494			
Unloaded Average				3.297			
3.325				3.297			
Unloaded Average				Loaded Average			
3.325				3.297			



## Iron Mining Association of Minnesota United Taconite Calibration - Run 26

Unloaded				Loaded			
Pass1		Pass 2		Pass 3		Pass1	
6.190	163301	4.548	165046			4.156	164016
6.577	163304	4.163	165049			3.934	164019
5.260	163307	4.068	165052			4.358	164022
4.861	163310	4.062	165055			5.079	164025
4.922	163313	4.349	165058			4.464	164028
5.210	163316	4.614	165101			4.346	164031
5.189	163319	4.450	165104			3.945	164034
4.720	163322	3.965	165107			3.257	164037
4.235	163325	3.543	165110			3.658	164040
4.125	163328	3.400	165113			4.658	164043
						5.077	164046
5.129				4.116			
Unloaded Average				4.623			
				4.185			
Loaded Average				4.185			



## Iron Mining Association of Minnesota United Taconite Calibration - Run 27

Unloaded				Loaded			
Pass1		Pass 2		Pass1		Pass 2	
			Pass 3				Pass 3
8.718	191555	7.899	192834	14.139	192301		
9.460	191558	7.780	192837	15.611	192304		
11.412	191601	7.429	192840	17.022	192307		
11.974	191604	7.379	192843	15.147	192310		
12.127	191607	8.376	192846	12.282	192313		
12.944	191610	9.197	192849	11.766	192316		
11.461	191613	9.560	192852	12.288	192319		
11.277	191616	9.946	192855	11.189	192322		
11.714	191619	8.294	192858	11.311	192325		
9.940	191622	7.019	192901	12.864	192328		
11.103		8.288		13.362			
Unloaded Average		9.695		Loaded Average		13.362	



## Iron Mining Association of Minnesota United Taconite Calibration Run 28

Unloaded				Loaded			
Pass1		Pass 2		Pass1		Pass 2	
			Pass 3				Pass 3
11.132	200900	9.023	195700	15.333	200412		
10.213	200903	9.882	195703	18.226	200415		
9.197	200906	11.457	195706	19.305	200418		
9.904	200909	13.159	195709	18.325	200421		
11.616	200912	11.732	195712	16.509	200424		
12.472	200915	10.800	195715	15.935	200427		
15.272	200918	13.212	195718	14.358	200430		
15.839	200921	14.807	195721	13.630	200433		
15.305	200924	14.807	195724	14.538	200436		
14.348	200927			16.567	200439		
13.765	200930			15.165	200442		
12.530		12.098		16.273			
Unloaded Average		12.314		Loaded Average		16.273	



## Iron Mining Association of Minnesota United Taconite Calibration - Run 29

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
8.040	161512	7.824	161333	10.332	161200	14.643	161245	5.684	161421	13.312	161112.000
7.276	161515	6.860	161336	7.897	161203	11.100	161248	5.709	161424	12.904	161115.000
6.672	161518	5.816	161339	6.044	161206	7.475	161251	5.381	161427	11.866	161118.000
6.238	161521	6.136	161342	6.095	161209	6.826	161254	5.278	161430	10.309	161121.000
6.942	161524	7.092	161345	7.789	161212	8.245	161257	4.807	161433	9.643	161124.000
7.397	161527	7.045	161348	10.634	161215	8.937	161300	6.672	161436	10.591	161127.000
6.099	161530	6.252	161351	8.619	161218	7.276	161303	7.377	161439	8.872	161130.000
5.395	161533	5.909	161354	6.399	161221	7.018	161306	6.889	161442	6.919	161133.000
5.310	161536	6.421	161357	6.180	161224	6.583	161309	8.240	161445	6.389	161136.000
4.380	161539	6.217	161400	6.306	161227	5.938	161312	8.446	161448	6.794	161139.000
3.713	161542	5.726	161403	7.558	161230						
6.375		6.557		7.630		8.404		6.448		9.760	
Unloaded Average		6.854				Loaded Average		8.204			

0.678

0.099

1.665

0.203

average



## Iron Mining Association of Minnesota United Taconite Calibration - Run 30

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
6.723	164822	10.413	164516	6.696	164649	11.593	164425	8.662	164731	9.848	164558.000
6.321	164825	9.612	164519	6.697	164652	11.241	164428	6.817	164734	11.150	164601.000
6.174	164828	7.568	164522	7.213	164655	10.725	164431	6.020	164737	15.306	164604.000
6.404	164831	7.428	164525	8.246	164658	12.700	164434	5.826	164740	16.407	164607.000
6.620	164834	8.108	164528	9.270	164701	15.085	164437	6.437	164743	13.701	164610.000
6.719	164837	8.007	164531	8.778	164704	13.982	164440	7.521	164746	11.175	164613.000
6.159	164840	7.307	164534	7.278	164707	10.837	164443	7.232	164749	9.035	164616.000
5.894	164843	6.994	164537	6.545	164710	9.634	164446	6.159	164752	7.489	164619.000
5.676	164846	6.911	164540	6.436	164713	8.527	164449	6.268	164755	7.856	164622.000
5.301	164849	7.168	164543	6.168	164716	7.690	164452	7.133	164758	10.339	164625.000
5.372	164852					7.705	164455	8.267	164801	13.395	164628.000
6.199		7.952		7.333		11.201		6.808		11.231	
Unloaded Average		7.161				Loaded Average		9.747			

0.889

0.124

2.545

0.261



## Iron Mining Association of Minnesota United Taconite Calibration - Run 31

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
10.551	171412	12.591	171724	16.241	171548	26.147	171457	26.897	171633	18.567	171324.000
11.845	171415	14.921	171727	17.032	171551	28.271	171500	28.411	171636	20.184	171327.000
14.334	171418	15.091	171730	16.168	171554	31.453	171503	27.295	171639	21.114	171330.000
15.772	171421	13.620	171733	14.024	171557	28.075	171506	26.175	171642	19.853	171333.000
20.873	171424	13.495	171736	11.482	171600	22.242	171509	22.306	171645	21.024	171336.000
20.789	171427	10.978	171739	9.372	171603	18.396	171512	20.214	171648	18.101	171339.000
12.851	171430	8.475	171742	8.154	171606	17.466	171515	17.867	171651	14.462	171342.000
9.616	171433	7.378	171745	7.877	171609	22.297	171518	17.105	171654	20.510	171345.000
8.639	171436	6.897	171748	8.699	171612	20.821	171521	15.102	171657	24.104	171348.000
8.157	171439	6.026	171751	7.570	171615	18.315	171524	11.305	171700	20.983	171351.000
						17.089	171527	12.893	171703	15.344	171354.000
13.343		10.947		11.662		23.348		21.268		19.890	
Unloaded Average		11.984				Loaded Average		21.502			

1.230

0.103

1.741

0.081



## Iron Mining Association of Minnesota United Taconite Calibration - Run 32

Unloaded						Loaded					
Pass1		Pass 2		Pass 3		Pass1		Pass 2		Pass 3	
16.340	174818	14.630	174509	16.018	174645	25.598	174418	19.903	174554	32.910	174730.000
20.448	174821	13.751	174512	17.042	174648	33.938	174421	21.284	174557	37.117	174733.000
17.090	174824	14.206	174515	14.720	174651	34.575	174424	21.019	174600	37.190	174736.000
13.394	174827	16.941	174518	12.810	174654	25.232	174427	16.757	174603	29.281	174739.000
12.935	174830	17.749	174521	13.806	174657	19.747	174430	13.266	174606	24.489	174742.000
11.133	174833	13.720	174524	11.901	174700	18.881	174433	12.452	174609	19.997	174745.000
9.761	174836	12.196	174527	9.953	174703	19.515	174436	14.592	174612	15.258	174748.000
10.462	174839	11.063	174530	9.351	174706	23.579	174439	13.596	174615	11.121	174751.000
12.042	174842	9.669	174533	9.554	174709	23.438	174442	10.019	174618	12.778	174754.000
12.012	174845	8.187	174536	8.725	174712	24.971	174445	10.404	174621	15.897	174757.000
						18.445	174448	12.993	174624	15.393	174800.000
13.562		13.211		12.388		24.947		15.329		23.604	
Unloaded Average		13.054				Loaded Average		21.294			



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19

Segment	Unloaded	Average 4.226	Concentration	4.923333	3.503933	1.737533	1.3438	1.562133	1.569067		14.14647	7.4828	4.972733	3.911067	3.219133	3.499933	3.524267
1			Time	171106	171109	171112	171115	171118	171121		173015	173018	173021	173024	173027	173030	173033
Segment	Loaded	5.350	Concentration	6.076133	5.557867	5.949267	5.801667	3.409867	3.2084	3.0532	2.9642		8.288733	6.274733	4.5904	3.9408	3.413867
1			Time	172133	172136	172139	172142	172145	172148	172151	172154		173921	173924	173927	173930	173933
Segment	Unloaded	1.237	Concentration	1.518133	1.5598	1.399467	1.257333	1.2932	1.0572	1.072133	1.154467	1.005533	1.053467				
2			Time	171124	171127	171130	171133	171136	171139	171142	171145	171148	171151				
Segment	Unloaded	2.956	Concentration	3.7682	3.9008	3.027467	2.6988	2.706267	2.762533	2.925867	2.845467	2.5562	2.4634	2.368867	2.334667	2.428467	2.830533
3			Time	173036	173039	173042	173045	173048	173051	173054	173057	173100	173103	173106	173109	173112	173115
Segment	Loaded	4.939	Concentration	1.7916	2.387333	2.261267	2.6518	3.4606	3.4716	3.584133	3.499867	3.607267	3.8838	4.560933	4.188333	2.828467	2.491733
3			Time	172012	172015	172018	172021	172024	172027	172030	172033	172036	172039	172042	172045	172048	172051
Segment	Unloaded	#DIV/0!	Concentration														
4			Time														
Segment	Loaded	5.735	Concentration	6.274733	4.5904	3.9408	3.413867	4.223	6.882267	7.419467	8.1634	6.559067	5.881				
4			Time	173924	173927	173930	173933	173936	173939	173942	173945	173948	173951				
Segment	Unloaded	1.303	Concentration	1.191733	1.269733	1.2886	1.5708	1.946333	1.773733	1.5802	1.363333	1.101667	1.139667	1.265867	1.208267	1.1564	0.921067
5			Time	171154	171157	171200	171203	171206	171209	171212	171215	171218	171221	171224	171227	171230	171233
Segment	Loaded	2.520	Concentration	3.328667	3.3008	2.7194	2.221933	2.1816	2.499733	2.845933	2.884133	2.865867	2.582867	2.209867	2.255	2.4194	2.378133
5			Time	171830	171833	171836	171839	171842	171845	171848	171851	171854	171857	171900	171903	171906	171909
Segment	Unloaded	4.110	Concentration	1.598133	1.913133	3.197	4.214	5.4038	6.7412	5.709667	5.133467	5.702733	5.438667	3.5172	2.3652	2.493667	
6			Time	171248	171251	171254	171257	171300	171303	171306	171309	171312	171315	171318	171321	171324	
Segment	Loaded	3.644	Concentration	2.8486	2.8526	3.137933	2.698733	3.191333	5.2832	5.425	4.847267	3.845533	3.524467	4.462133	4.901867	3.9068	2.761267
6			Time	171327	171330	171333	171336	171339	171342	171345	171348	171351	171354	171357	171400	171403	171406
Segment	Unloaded	4.308	Concentration	3.172667	3.132667	3.459	5.187867	6.537933	4.700467	3.693133	4.569867	4.755467	4.413133	4.404667	5.424133	6.250133	6.5344
7			Time	171415	171418	171421	171424	171427	171430	171433	171436	171439	171442	171445	171448	171451	171454
Segment	Loaded	5.310	Concentration	1.697867	1.472133	1.387267	1.665	1.646067	1.700333	2.3004	3.760067	3.418	3.0952	2.924333	2.075133	1.7486	2.264933
7			Time	171618	171621	171624	171627	171630	171633	171636	171639	171642	171645	171648	171651	171654	171657
Segment	Unloaded	9.368	Concentration	5.808867	6.8172	7.661067	8.254133	11.70407	11.64747	9.569	8.206933	5.8606	5.942333	7.529733	10.71327	15.5688	12.55467
8			Time	173503	173506	173509	173512	173515	173518	173521	173524	173527	173530	173533	173536	173539	173542



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19

Segment 1	Unloaded	Average 4.226	Concentration Time	3.7682 173036													
Segment 1	Loaded	5.350	Concentration Time	4.223 173936	6.882267 173939	7.419467 173942	8.1634 173945	6.559067 173948	5.881 173951								
Segment 2	Unloaded	1.237	Concentration Time														
Segment 3	Unloaded	2.956	Concentration Time	3.226133 173118	3.2068 173121	2.951333 173124	2.860133 173127	2.935867 173130	2.963533 173133	2.8624 173136	2.769667 173139	3.040133 173142	3.296067 173145	3.340533 173148	3.780667 173151		
Segment 3	Loaded	4.939	Concentration Time	2.4262 172054	2.256067 172057	2.237933 172100	2.383133 172103	2.2344 172106	1.881 172109	1.775533 172112	2.2076 172115	3.6926 172118	5.4546 172121	9.8682 172124	8.1834 172127	4.959933 172130	
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	5.735	Concentration Time														
Segment 5	Unloaded	1.303	Concentration Time	0.814133 171236	1.146067 171239	1.306267 171242	1.408733 171245										
Segment 5	Loaded	2.520	Concentration Time	2.355867 171912	2.4278 171915	2.257333 171918	2.0544 171921	2.083 171924									
Segment 6	Unloaded	4.110	Concentration Time														
Segment 6	Loaded	3.644	Concentration Time	2.2698 171409	2.349 171412												
Segment 7	Unloaded	4.308	Concentration Time	5.267 171457	3.946 171500	5.087867 171503	5.8342 171506	5.405467 171509	4.9848 171512	5.349333 171515	7.097933 171518	7.392733 171521	7.007133 171524	6.140067 171527	4.3768 171530	2.9622 171533	2.358867 171536
Segment 7	Loaded	5.310	Concentration Time	2.596267 171700	2.1728 171703	2.253333 171706	2.997133 171709	3.773867 171712	4.8874 171715	8.9668 171718	9.458867 171721	7.318333 171724	5.852133 171727	6.1576 171730	10.32427 171733	9.9842 171736	6.483667 171739
Segment 8	Unloaded	9.368	Concentration Time	8.894467 173545	7.629 173548	5.423 173551	4.865467 173554	5.6772 173557	6.313867 173600	6.535133 173603	6.1048 173606	6.626133 173609	8.077733 173612	9.1678 173615	7.579467 173618	6.740133 173621	7.060067 173624



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19

Segment 1	Unloaded	Average 4.226	Concentration Time														
Segment 1	Loaded	5.350	Concentration Time														
Segment 2	Unloaded	1.237	Concentration Time														
Segment 3	Unloaded	2.956	Concentration Time														
Segment 3	Loaded	4.939	Concentration Time	5.827533 173803	5.8474 173806	6.2906 173809	7.206333 173812	7.513667 173815	9.671733 173818	8.6286 173821	6.8726 173824	5.7154 173827	5.3114 173830	5.578867 173833	4.944 173836	4.475533 173839	4.212933 173842
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	5.735	Concentration Time														
Segment 5	Unloaded	1.303	Concentration Time														
Segment 5	Loaded	2.520	Concentration Time														
Segment 6	Unloaded	4.110	Concentration Time														
Segment 6	Loaded	3.644	Concentration Time														
Segment 7	Unloaded	4.308	Concentration Time	2.942133 171539	3.530667 171542	4.123067 171545	3.625333 171548	2.692733 171551	2.463 171554	2.339467 171557	2.319533 171600	3.234467 171603	3.433867 171606	2.587267 171609	2.102333 171612	1.793933 171615	
Segment 7	Loaded	5.310	Concentration Time	6.150533 171742	5.628133 171745	5.065067 171748	7.822867 171751	14.393 171754	17.70507 171757	11.16907 171800	5.324733 171803	5.0034 171806	5.402 171809	6.100467 171812	8.965 171815	7.14 171818	5.1062 171821
Segment 8	Unloaded	9.368	Concentration Time	7.625067 173627	8.332333 173630	8.4194 173633	6.338333 173636	5.841 173639	6.581267 173642	9.1408 173645	9.883533 173648	11.48293 173651	11.82047 173654	9.660733 173657	8.750067 173700	10.9844 173703	15.97547 173706



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19

Segment 1	Unloaded	Average 4.226	Concentration Time												
Segment 1	Loaded	5.350	Concentration Time												
Segment 2	Unloaded	1.237	Concentration Time												
Segment 3	Unloaded	2.956	Concentration Time												
Segment 3	Loaded	4.939	Concentration Time	3.889133 173845	3.624933 173848	3.591133 173851	3.805933 173854	4.173933 173857	4.0678 173900	5.105333 173903	6.33 173906	7.478133 173909	10.27433 173912	15.4848 173915	11.59233 173918
Segment 4	Unloaded	#DIV/0!	Concentration Time												
Segment 4	Loaded	5.735	Concentration Time												
Segment 5	Unloaded	1.303	Concentration Time												
Segment 5	Loaded	2.520	Concentration Time												
Segment 6	Unloaded	4.110	Concentration Time												
Segment 6	Loaded	3.644	Concentration Time												
Segment 7	Unloaded	4.308	Concentration Time												
Segment 7	Loaded	5.310	Concentration Time	4.644333 171824	3.624867 171827										
Segment 8	Unloaded	9.368	Concentration Time	17.40027 173709	18.42667 173712	19.39553 173715	20.32787 173718								



**Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19**

Segment 8	Loaded	7.424	Concentration Time	6.028267 173245	5.0828 173248	4.918533 173251	4.456133 173254	5.020667 173257	5.8042 173300	11.7968 173303	16.40247 173306	12.98113 173309	13.42073 173312	8.249133 173315	5.5806 173318	7.504267 173321	9.419867 173324
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	3.392	Concentration Time	3.582933 172157	3.662133 172200	3.5794 172203	3.4386 172206	3.0538 172209	3.040333 172212	2.7118 172215	2.3898 172218	2.456 172221	2.786733 172224	2.709 172227	2.494133 172230	2.546533 172233	2.602333 172236
Segment 10	Loaded	6.028	Concentration Time	6.2052 172806	5.659067 172809	4.107133 172812	4.7458 172815	5.067933 172818	4.1856 172821	3.670867 172824	3.981933 172827	6.297133 172830	7.744 172833	8.488067 172836	11.24527 172839	10.93213 172842	10.35107 172845
Segment 11	Unloaded	5.104	Concentration Time	2.363 172415	2.2004 172418	2.6282 172421	2.977133 172424	2.962133 172427	2.783933 172430	2.619267 172433	2.536667 172436	2.2554 172439	2.0602 172442	1.8666 172445	1.845733 172448	2.613467 172451	4.424733 172454
Segment 11	Loaded	5.880	Concentration Time	3.261933 172609	3.857933 172612	3.8482 172615	3.658067 172618	3.837333 172621	3.971 172624	3.6446 172627	5.7962 172630	8.735667 172633	8.7784 172636	6.5562 172639	5.6666 172642	6.136067 172645	5.8938 172648



**Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19**

Segment 8	Loaded	7.424	Concentration Time	7.171 173327	5.6334 173330	5.3004 173333	4.423867 173336	3.807333 173339	3.901467 173342	3.761933 173345	3.942667 173348	4.2962 173351	5.173333 173354	6.689067 173357	7.998867 173400	6.462733 173403	6.254533 173406
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	3.392	Concentration Time	2.911733 172239	2.4204 172242	2.022867 172245	2.246133 172248	4.010667 172251	8.678533 172254	10.23587 172257	5.8372 172300	4.971067 172303	4.3516 172306	3.8982 172309	3.596133 172312	3.7414 172315	3.963867 172318
Segment 10	Loaded	6.028	Concentration Time	9.419533 172848	10.6748 172851	10.27127 172854	9.4926 172857	7.6052 172900	5.983133 172903	5.846667 172906	5.855533 172909	5.591333 172912	5.926733 172915	4.909133 172918	4.323667 172921	5.561467 172924	5.5982 172927
Segment 11	Unloaded	5.104	Concentration Time	6.7714 172457	8.161533 172500	7.848067 172503	8.270533 172506	9.613333 172509	9.053 172512	6.2834 172515	6.372267 172518	8.131867 172521	8.856 172524	7.854667 172527	7.698467 172530	9.543733 172533	9.197 172536
Segment 11	Loaded	5.880	Concentration Time	5.904933 172651	8.497533 172654	11.6842 172657	10.144 172700	8.762333 172703	8.448667 172706	8.491867 172709	8.0978 172712	7.688333 172715	7.100867 172718	6.578133 172721	5.085733 172724	3.9582 172727	3.771667 172730



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19

Segment 8	Loaded	7.424	Concentration Time	7.1792 173409	7.437933 173412	8.329933 173415	8.411667 173418	6.510667 173421	8.044333 173424	10.39947 173427	9.5356 173430	14.1708 173433	12.52167 173436	6.884333 173439	7.283533 173442	7.596533 173445	7.282067 173448
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	3.392	Concentration Time	3.741 172321	3.2354 172324	2.952533 172327	2.8858 172330	3.054067 172333	3.198733 172336	2.980467 172339	2.679933 172342	2.6502 172345	2.713867 172348	2.5048 172351	2.859067 172354	3.244267 172357	2.582333 172400
Segment 10	Loaded	6.028	Concentration Time	4.501667 172930	3.965133 172933	4.1014 172936	4.216133 172939	3.9058 172942	3.892733 172945	4.202467 172948	4.065133 172951	4.234133 172954	4.356067 172957	4.152667 173000	4.4668 173003	4.7436 173006	8.6524 173009
Segment 11	Unloaded	5.104	Concentration Time	6.319333 172539	5.311533 172542	4.339467 172545	3.519733 172548	3.948733 172551	4.320733 172554	4.223667 172557	5.327133 172600	4.089267 172603	2.7622 172606				
Segment 11	Loaded	5.880	Concentration Time	4.125533 172733	3.849333 172736	3.153133 172739	2.941067 172742	2.798933 172745	2.983733 172748	6.063733 172751	9.192667 172754	7.076067 172757	4.861133 172800	4.436267 172803			



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 19

Segment 8	Loaded	7.424	Concentration Time	7.499733 173451	7.493267 173454	7.4116 173457	6.031733 173500
Segment 9	Unloaded	#DIV/0!	Concentration Time				
Segment 9	Loaded	#DIV/0!	Concentration Time				
Segment 10	Unloaded	3.392	Concentration Time	2.626133 172403	3.090933 172406	2.5878 172409	2.511667 172412
Segment 10	Loaded	6.028	Concentration Time				
Segment 11	Unloaded	5.104	Concentration Time				
Segment 11	Loaded	5.880	Concentration Time				



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment 1	Unloaded	Average 7.446	Concentration Time	11.903 192013	12.438 192016	9.918 192019	8.504 192022	5.238 192025	3.983 192028	4.001 192031		8.890 193934	10.231 193937	6.641 193940	4.939 193943	3.939 193946	6.882 193949
Segment 1	Loaded	8.192	Concentration Time	4.816 193101	3.933 193104	5.929 193107	11.107 193110	15.807 193113	10.565 193116	5.190 193119							
Segment 2	Unloaded	3.924	Concentration Time	4.426 192034	4.523 192037	3.892 192040	3.411 192043	3.798 192046	3.719 192049	3.710 192052	4.153 192055	3.684 192058					
Segment 3	Unloaded	5.694	Concentration Time	10.805 193955	12.996 193958	7.146 194001	5.396 194004	4.895 194007	4.107 194010	3.430 194013	3.928 194016	6.231 194019	7.746 194022	7.314 194025	6.924 194028	7.038 194031	6.044 194034
Segment 3	Loaded	6.381	Concentration Time	2.892 192937	7.151 192940	10.140 192943	9.931 192946	5.927 192949	3.677 192952	3.122 192955	4.550 192958	3.710 193001	2.517 193004	2.698 193007	4.217 193010	3.713 193013	2.128 193016
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	3.907	Concentration Time	1.723 192831	1.893 192834	2.310 192837	2.271 192840	2.569 192843	3.822 192846	6.481 192849	7.666 192852	5.532 192855	5.937 192858	7.805 192901	4.746 192904	2.237 192907	1.969 192910
Segment 5	Unloaded	2.641	Concentration Time	3.811 192101	3.621 192104	2.815 192107	3.011 192110	2.955 192113	2.341 192116	1.950 192119	2.531 192122	3.118 192125	2.769 192128	2.626 192131	2.265 192134	2.299 192137	2.377 192140
Segment 5	Loaded	2.770	Concentration Time	2.377 192728	1.787 192731	1.833 192734	3.102 192737	3.518 192740	3.016 192743	4.029 192746	4.659 192749	4.237 192752	3.870 192755	3.046 192758	2.398 192801	2.809 192804	3.374 192807
Segment 6	Unloaded	5.874	Concentration Time	2.622 192155	2.811 192158	3.573 192201	7.139 192204	10.035 192207	8.760 192210	7.246 192213	6.513 192216	6.847 192219	7.177 192222	5.712 192225	4.613 192228	3.313 192231	
Segment 6	Loaded	5.404	Concentration Time	2.490 192237	2.652 192240	3.248 192243	3.808 192246	3.384 192249	3.205 192252	2.953 192255	5.490 192258	8.766 192301	10.003 192304	9.873 192307	8.591 192310	7.755 192313	5.538 192316
Segment 7	Unloaded	6.559	Concentration Time	5.905 192328	6.515 192331	6.363 192334	6.531 192337	8.058 192340	7.616 192343	6.673 192346	7.546 192349	8.102 192352	7.071 192355	7.345 192358	9.118 192401	8.229 192404	7.155 192407
Segment 7	Loaded	4.532	Concentration Time	3.979 192522	4.576 192525	4.487 192528	4.185 192531	5.577 192534	8.505 192537	6.124 192540	4.422 192543	4.699 192546	5.116 192549	3.843 192552	2.428 192555	2.465 192558	3.970 192601
Segment 8	Unloaded	9.427	Concentration Time	3.984 194734	4.550 194737	4.552 194740	4.645 194743	5.442 194746	6.565 194749	8.076 194752	11.321 194755	11.208 194758	9.946 194801	10.948 194804	10.920 194807	18.230 194810	19.147 194813



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment 1	Unloaded	Average 7.446	Concentration Time	6.732 193952													
Segment 1	Loaded	8.192	Concentration Time														
Segment 2	Unloaded	3.924	Concentration Time														
Segment 3	Unloaded	5.694	Concentration Time	2.517 194404	2.926 194407	3.388 194410	3.872 194413	3.366 194416	3.068 194419	3.818 194422	4.672 194425	7.460 194428	7.960 194431	5.301 194434			
Segment 3	Loaded	6.381	Concentration Time	2.036 193019	2.324 193022	2.104 193025	5.549 193028	11.607 193031	15.273 193034	15.768 193037	9.095 193040	4.044 193043	5.589 193046	7.232 193049	9.687 193052	14.458 193055	7.539 193058
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	3.907	Concentration Time	2.283 192913	1.635 192916	0.988 192919	2.260 192922	5.195 192925	6.827 192928	5.901 192931							
Segment 5	Unloaded	2.641	Concentration Time	2.331 192143	2.297 192146	2.045 192149	2.385 192152										
Segment 5	Loaded	2.770	Concentration Time	3.221 192810	2.464 192813	1.884 192816	1.755 192819	1.634 192822	1.528 192825	1.628 192828							
Segment 6	Unloaded	5.874	Concentration Time														
Segment 6	Loaded	5.404	Concentration Time	4.584 192319	4.127 192322												
Segment 7	Unloaded	6.559	Concentration Time	6.128 192410	6.929 192413	7.714 192416	6.473 192419	6.184 192422	8.543 192425	11.178 192428	9.196 192431	8.646 192434	7.739 192437	7.814 192440	7.563 192443	5.655 192446	4.722 192449
Segment 7	Loaded	4.532	Concentration Time	3.896 192604	2.914 192607	3.694 192610	5.285 192613	5.648 192616	6.551 192619	6.159 192622	5.652 192625	6.211 192628	10.356 192631	10.230 192634	5.810 192637	4.408 192640	4.916 192643
Segment 8	Unloaded	9.427	Concentration Time	14.884 194816	12.496 194819	6.710 194822	5.247 194825	5.754 194828	7.549 194831	11.339 194834	12.634 194837	11.047 194840	12.088 194843	9.737 194846	6.440 194849	6.959 194852	7.763 194855



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment 1	Unloaded	Average 7.446	Concentration Time															
Segment 1	Loaded	8.192	Concentration Time															
Segment 2	Unloaded	3.924	Concentration Time															
Segment 3	Unloaded	5.694	Concentration Time															
Segment 3	Loaded	6.381	Concentration Time															
Segment 4	Unloaded	#DIV/0!	Concentration Time															
Segment 4	Loaded	3.907	Concentration Time															
Segment 5	Unloaded	2.641	Concentration Time															
Segment 5	Loaded	2.770	Concentration Time															
Segment 6	Unloaded	5.874	Concentration Time															
Segment 6	Loaded	5.404	Concentration Time															
Segment 7	Unloaded	6.559	Concentration Time	3.916 192452	4.719 192455	5.761 192458	5.239 192501	4.595 192504	3.818 192507	3.825 192510	3.652 192513	3.264 192516	3.731 192519					
Segment 7	Loaded	4.532	Concentration Time	5.441 192646	4.475 192649	3.180 192652	2.937 192655	3.156 192658	2.905 192701	3.401 192704	2.894 192707	3.136 192710	2.945 192713	2.152 192716	2.339 192719	2.601 192722	2.682 192725	
Segment 8	Unloaded	9.427	Concentration Time	5.928 194858	5.702 194901	6.130 194904	5.469 194907	5.352 194910	10.188 194913	16.063 194916	15.324 194919	12.200 194922	13.071 194925	12.028 194928				



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment	Unloaded	Average 7.446	Concentration
1			Time
Segment	Loaded	8.192	Concentration
1			Time
Segment	Unloaded	3.924	Concentration
2			Time
Segment	Unloaded	5.694	Concentration
3			Time
Segment	Loaded	6.381	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	3.907	Concentration
4			Time
Segment	Unloaded	2.641	Concentration
5			Time
Segment	Loaded	2.770	Concentration
5			Time
Segment	Unloaded	5.874	Concentration
6			Time
Segment	Loaded	5.404	Concentration
6			Time
Segment	Unloaded	6.559	Concentration
7			Time
Segment	Loaded	4.532	Concentration
7			Time
Segment	Unloaded	9.427	Concentration
8			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment 8	Loaded	12.361	Concentration Time	11.094 194537	9.963 194540	11.652 194543	11.403 194546	13.875 194549	14.061 194552	11.348 194555	15.161 194558	23.477 194601	20.090 194604	13.516 194607	12.262 194610	7.770 194613	6.531 194616
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	1.834	Concentration Time	3.256 193122	2.724 193125	2.312 193128	2.135 193131	2.153 193134	2.149 193137	1.900 193140	1.631 193143	1.474 193146	1.348 193149	1.539 193152	1.595 193155	1.548 193158	1.599 193201
Segment 10	Loaded	5.185	Concentration Time	7.383 193719	6.595 193722	9.011 193725	12.286 193728	11.829 193731	8.842 193734	6.197 193737	5.453 193740	7.088 193743	6.493 193746	6.986 193749	10.654 193752	11.220 193755	9.708 193758
Segment 11	Unloaded	4.858	Concentration Time	1.458 193337	1.174 193340	1.162 193343	1.132 193346	1.039 193349	2.511 193352	3.587 193355	2.681 193358	2.630 193401	4.149 193404	5.865 193407	5.836 193410	4.448 193413	3.713 193416
Segment 11	Loaded	7.084	Concentration Time	1.563 193528	1.749 193531	2.852 193534	4.287 193537	4.729 193540	4.255 193543	5.593 193546	8.136 193549	8.446 193552	8.243 193555	9.972 193558	10.373 193601	8.908 193604	8.063 193607



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment 8	Loaded	12.361	Concentration Time	5.735 194619	5.243 194622	5.153 194625	5.159 194628	4.936 194631	4.528 194634	7.414 194637	13.990 194640	14.095 194643	11.918 194646	10.387 194649	10.366 194652	12.745 194655	13.270 194658
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	1.834	Concentration Time	1.334 193204	1.052 193207	1.219 193210	1.404 193213	1.557 193216	1.248 193219	0.948 193222	1.378 193225	2.102 193228	1.683 193231	1.785 193234	1.666 193237	1.146 193240	1.335 193243
Segment 10	Loaded	5.185	Concentration Time	9.587 193801	7.133 193804	6.199 193807	6.674 193810	7.699 193813	7.662 193816	6.618 193819	6.054 193822	6.788 193825	4.606 193828	2.730 193831	2.451 193834	2.398 193837	2.036 193840
Segment 11	Unloaded	4.858	Concentration Time	7.790 193419	8.133 193422	4.473 193425	5.438 193428	6.741 193431	6.624 193434	5.642 193437	7.598 193440	9.625 193443	8.011 193446	7.199 193449	7.082 193452	7.271 193455	6.792 193458
Segment 11	Loaded	7.084	Concentration Time	8.305 193610	12.436 193613	15.656 193616	10.949 193619	7.942 193622	6.993 193625	6.314 193628	5.491 193631	4.949 193634	4.182 193637	3.400 193640	3.741 193643	3.874 193646	2.733 193649



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment 8	Loaded	12.361	Concentration Time	13.947 194701	22.268 194704	30.463 194707	21.772 194710	15.681 194713	18.667 194716	18.909 194719	13.193 194722	8.712 194725	6.851 194728	4.474 194731			
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	1.834	Concentration Time	1.653 193246	1.616 193249	1.563 193252	1.316 193255	1.180 193258	1.215 193301	1.253 193304	1.291 193307	1.816 193310	4.756 193313	5.224 193316	2.851 193319	1.971 193322	1.853 193325
Segment 10	Loaded	5.185	Concentration Time	2.934 193843	2.859 193846	1.726 193849	1.526 193852	2.744 193855	2.382 193858	1.454 193901	1.409 193904	1.479 193907	1.845 193910	2.238 193913	2.074 193916	1.598 193919	1.777 193922
Segment 11	Unloaded	4.858	Concentration Time	6.577 193501	7.438 193504	7.434 193507	5.772 193510	4.030 193513	2.989 193516	2.249 193519	1.835 193522	1.630 193525					
Segment 11	Loaded	7.084	Concentration Time	3.364 193652	7.159 193655	12.205 193658	16.696 193701	14.986 193704	8.987 193707	4.608 193710	4.309 193713	5.663 193716					



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 20

Segment 8	Loaded	12.361	Concentration Time			
Segment 9	Unloaded	#DIV/0!	Concentration Time			
Segment 9	Loaded	#DIV/0!	Concentration Time			
Segment 10	Unloaded	1.834	Concentration Time	2.043 193328	2.043 193331	1.674 193334
Segment 10	Loaded	5.185	Concentration Time	2.261 193925	1.807 193928	2.810 193931
Segment 11	Unloaded	4.858	Concentration Time			
Segment 11	Loaded	7.084	Concentration Time			



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21

Segment 1	Unloaded	Average 7.666	Concentration Time	8.777	10.486	9.578	8.143	6.437	5.140	5.059		9.262	10.267	10.647	9.606	7.755	6.210
				214210	214213	214216	214219	214222	214225	214228		212340	212343	212346	212349	212352	212355
Segment 1	Loaded	4.481	Concentration Time	13.746	8.081	4.920	3.410	2.723	2.417	2.522		9.231	3.926	3.325	3.490	2.334	1.447
				213340	213343	213346	213349	213352	213355	213358		215101	215104	215107	215110	215113	215116
Segment 2	Unloaded	3.758	Concentration Time	2.930	2.842	2.663	3.084	3.607	4.378	5.252	5.003	4.066					
				212404	212407	212410	212413	212416	212419	212422	212425	212428					
Segment 3	Unloaded	3.191	Concentration Time	5.992	8.748	6.128	3.840	3.631	4.347	4.775	3.609	2.840	2.432	2.326	2.301	2.284	1.836
				214231	214234	214237	214240	214243	214246	214249	214252	214255	214258	214301	214304	214307	214310
Segment 3	Loaded	6.812	Concentration Time	3.525	4.730	6.548	6.631	6.190	5.472	5.831	5.613	4.803	4.142	6.592	6.300	4.191	4.712
				213222	213225	213228	213231	213234	213237	213240	213243	213246	213249	213252	213255	213258	213301
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	14.022	Concentration Time	10.677	11.973	11.944	17.297	24.014	23.219	21.289	18.319	12.052	9.745	10.806	13.206	12.742	8.331
				213134	213137	213140	213143	213146	213149	213152	213155	213158	213201	213204	213207	213210	213213
Segment 5	Unloaded	3.044	Concentration Time	3.789	2.959	2.285	1.941	1.573	2.019	3.106	4.878	5.046	3.957	2.875	2.174	2.575	2.877
				212431	212434	212437	212440	212443	212446	212449	212452	212455	212458	212501	212504	212507	212510
Segment 5	Loaded	7.822	Concentration Time	8.061	6.987	6.946	8.455	10.711	10.714	8.372	6.628	6.831	9.969	12.214	10.724	7.897	6.964
				213037	213040	213043	213046	213049	213052	213055	213058	213101	213104	213107	213110	213113	213116
Segment 6	Unloaded	4.400	Concentration Time	3.425	4.523	5.646	5.077	3.873	3.217	4.047	4.449	4.858	5.654	4.685	3.346		
				212522	212525	212528	212531	212534	212537	212540	212543	212546	212549	212552	212555		
Segment 6	Loaded	4.456	Concentration Time	3.104	2.686	2.920	4.604	4.933	3.527	2.928	6.044	8.616	7.693	5.857	4.256	3.481	3.192
				212558	212601	212604	212607	212610	212613	212616	212619	212622	212625	212628	212631	212634	212637
Segment 7	Unloaded	7.593	Concentration Time	3.431	4.421	5.642	7.362	7.264	7.563	7.615	8.518	8.939	7.860	5.963	6.799	7.902	5.774
				212643	212646	212649	212652	212655	212658	212701	212704	212707	212710	212713	212716	212719	212722
Segment 7	Loaded	12.122	Concentration Time	2.534	2.992	2.889	2.702	4.527	8.790	9.620	6.038	6.737	7.602	10.512	15.133	16.499	15.914
				212834	212837	212840	212843	212846	212849	212852	212855	212858	212901	212904	212907	212910	212913
Segment 8	Unloaded	7.645	Concentration Time	1.795	2.116	3.119	4.146	5.372	8.650	18.833	23.358	13.888	9.457	7.366	5.689	4.564	4.705
				214431	214434	214437	214440	214443	214446	214449	214452	214455	214458	214501	214504	214507	214510



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21

Segment 1	Unloaded	Average 7.666	Concentration Time	4.326 212358	3.298 212401												
Segment 1	Loaded	4.481	Concentration Time	1.168 215119													
Segment 2	Unloaded	3.758	Concentration Time														
Segment 3	Unloaded	3.191	Concentration Time	1.496 214313	1.690 214316	2.146 214319	2.044 214322	1.865 214325	2.007 214328	2.171 214331	2.278 214334	2.932 214337	2.878 214340				
Segment 3	Loaded	6.812	Concentration Time	4.436 213304	3.662 213307	4.423 213310	3.853 213313	3.137 213316	3.672 213319	5.601 213322	7.282 213325	10.644 213328	12.680 213331	18.236 213334	24.183 213337		6.007 214949
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	14.022	Concentration Time	4.708 213216													
Segment 5	Unloaded	3.044	Concentration Time	2.762 212513	3.280 212516	3.654 212519											
Segment 5	Loaded	7.822	Concentration Time	5.444 213119	5.106 213122	4.687 213125	4.948 213128	6.953 213131									
Segment 6	Unloaded	4.400	Concentration Time														
Segment 6	Loaded	4.456	Concentration Time	2.996 212640													
Segment 7	Unloaded	7.593	Concentration Time	4.039 212725	3.887 212728	5.688 212731	8.388 212734	8.509 212737	7.072 212740	7.021 212743	6.655 212746	6.127 212749	7.685 212752	7.759 212755	6.765 212758	4.241 212801	4.274 212804
Segment 7	Loaded	12.122	Concentration Time	20.531 212916	28.812 212919	22.660 212922	21.085 212925	20.078 212928	14.345 212931	14.073 212934	21.465 212937	25.589 212940	20.163 212943	15.658 212946	10.738 212949	9.071 212952	7.472 212955
Segment 8	Unloaded	7.645	Concentration Time	4.361 214513	3.774 214516	3.592 214519	3.351 214522	4.433 214525	5.559 214528	4.885 214531	3.290 214534	2.487 214537	2.682 214540	3.248 214543	3.331 214546	2.992 214549	3.410 214552



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21

Segment 1	Unloaded	Average 7.666	Concentration Time															
Segment 1	Loaded	4.481	Concentration Time															
Segment 2	Unloaded	3.758	Concentration Time															
Segment 3	Unloaded	3.191	Concentration Time															
Segment 3	Loaded	6.812	Concentration Time	9.894 214952	8.171 214955	5.472 214958	4.279 215001	4.840 215004	5.121 215007	3.723 215010	2.885 215013	3.455 215016	3.567 215019	2.638 215022	3.099 215025	5.546 215028	7.143 215031	
Segment 4	Unloaded	#DIV/0!	Concentration Time															
Segment 4	Loaded	14.022	Concentration Time															
Segment 5	Unloaded	3.044	Concentration Time															
Segment 5	Loaded	7.822	Concentration Time															
Segment 6	Unloaded	4.400	Concentration Time															
Segment 6	Loaded	4.456	Concentration Time															
Segment 7	Unloaded	7.593	Concentration Time	6.911 212807	11.574 212810	23.410 212813	22.574 212816	12.940 212819	7.778 212822	5.726 212825	4.259 212828	2.600 212831						
Segment 7	Loaded	12.122	Concentration Time	8.152 212958	13.182 213001	14.684 213004	9.336 213007	5.483 213010	4.385 213013	6.246 213016	10.631 213019	12.548 213022	13.995 213025	11.707 213028	11.885 213031	10.530 213034		
Segment 8	Unloaded	7.645	Concentration Time	6.469 214555	12.734 214558	14.690 214601	13.103 214604	15.691 214607	14.895 214610	15.251 214613	17.151 214616	17.481 214619	17.502 214622	10.534 214625	5.147 214628	4.396 214631	6.239 214634	



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21

Segment 1	Unloaded	Average 7.666	Concentration Time									
Segment 1	Loaded	4.481	Concentration Time									
Segment 2	Unloaded	3.758	Concentration Time									
Segment 3	Unloaded	3.191	Concentration Time									
Segment 3	Loaded	6.812	Concentration Time	5.158 215034	4.688 215037	5.713 215040	5.306 215043	5.628 215046	8.573 215049	14.812 215052	19.701 215055	18.071 215058
Segment 4	Unloaded	#DIV/0!	Concentration Time									
Segment 4	Loaded	14.022	Concentration Time									
Segment 5	Unloaded	3.044	Concentration Time									
Segment 5	Loaded	7.822	Concentration Time									
Segment 6	Unloaded	4.400	Concentration Time									
Segment 6	Loaded	4.456	Concentration Time									
Segment 7	Unloaded	7.593	Concentration Time									
Segment 7	Loaded	12.122	Concentration Time									
Segment 8	Unloaded	7.645	Concentration Time	7.274 214637	5.577 214640	4.351 214643	3.586 214646	2.791 214649				



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21

Segment 8	Loaded	8.859	Concentration Time	2.751 214652	3.543 214655	4.710 214658	6.571 214701	11.709 214704	17.475 214707	18.753 214710	15.749 214713	14.833 214716	17.828 214719	18.298 214722	18.897 214725	19.439 214728	18.416 214731
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	2.939	Concentration Time	8.024 213407	5.785 213410	3.955 213413	3.850 213416	4.122 213419	3.177 213422	2.554 213425	2.542 213428	2.612 213431	2.088 213434	1.854 213437	1.701 213440	1.474 213443	2.506 213446
Segment 10	Loaded	9.502	Concentration Time	7.266 213955	5.028 213958	6.448 214001	17.412 214004	25.479 214007	18.846 214010	12.082 214013	7.791 214016	8.181 214019	11.511 214022	13.886 214025	16.070 214028	14.609 214031	11.367 214034
Segment 11	Unloaded	5.458	Concentration Time	6.469 213622	7.145 213625	6.318 213628	6.497 213631	6.942 213634	5.708 213637	4.711 213640	4.714 213643	5.316 213646	6.032 213649	7.489 213652	9.741 213655	12.345 213658	10.383 213701
Segment 11	Loaded	6.503	Concentration Time	3.589 213810	4.228 213813	4.142 213816	3.925 213819	4.063 213822	4.090 213825	3.884 213828	4.116 213831	4.095 213834	4.044 213837	4.924 213840	6.866 213843	8.948 213846	13.619 213849



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21																	
Segment 8	Loaded	8.859	Concentration Time	14.600 214734	9.060 214737	5.598 214740	5.926 214743	7.464 214746	8.104 214749	7.188 214752	5.839 214755	4.869 214758	4.427 214801	4.326 214804	3.908 214807	3.804 214810	3.853 214813
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	2.939	Concentration Time	2.682 213449	1.776 213452	1.472 213455	1.465 213458	1.743 213501	3.210 213504	5.728 213507	5.791 213510	4.951 213513	4.153 213516	3.189 213519	3.008 213522	2.667 213525	2.150 213528
Segment 10	Loaded	9.502	Concentration Time	13.519 214037	13.887 214040	12.083 214043	10.300 214046	9.436 214049	10.317 214052	12.072 214055	12.771 214058	20.938 214101	21.396 214104	13.256 214107	8.133 214110	6.662 214113	7.175 214116
Segment 11	Unloaded	5.458	Concentration Time	5.908 213704	3.415 213707	3.651 213710	4.829 213713	4.467 213716	4.365 213719	4.426 213722	4.338 213725	5.238 213728	5.498 213731	4.724 213734	4.987 213737	6.142 213740	7.605 213743
Segment 11	Loaded	6.503	Concentration Time	13.714 213852	8.781 213855	5.812 213858	4.926 213901	5.053 213904	7.005 213907	10.486 213910	11.491 213913	10.795 213916	11.002 213919	10.679 213922	8.026 213925	6.650 213928	5.070 213931



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21

Segment 8	Loaded	8.859	Concentration Time	3.716 214816	3.338 214819	3.362 214822	3.370 214825	3.251 214828	3.216 214831	5.288 214834	8.199 214837	11.491 214840	16.095 214843	15.391 214846	8.559 214849	4.651 214852	4.194 214855
Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	Loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	2.939	Concentration Time	1.915 213531	1.951 213534	2.101 213537	2.293 213540	2.744 213543	2.803 213546	2.449 213549	2.122 213552	1.854 213555	2.010 213558	1.853 213601	1.916 213604	2.747 213607	2.962 213610
Segment 10	Loaded	9.502	Concentration Time	9.075 214119	9.013 214122	6.366 214125	4.772 214128	3.902 214131	3.286 214134	2.822 214137	2.492 214140	2.522 214143	2.912 214146	3.354 214149	3.893 214152	3.559 214155	3.048 214158
Segment 11	Unloaded	5.458	Concentration Time	7.269 213746	5.320 213749	3.765 213752	2.594 213755	1.872 213758	1.743 213801	1.891 213804	2.631 213807						
Segment 11	Loaded	6.503	Concentration Time	3.773 213934	4.102 213937	5.288 213940	4.432 213943	4.061 213946	4.830 213949	7.091 213952							



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 21

Segment 8	Loaded	8.859	Concentration Time			
Segment 9	Unloaded	#DIV/0!	Concentration Time			
Segment 9	Loaded	#DIV/0!	Concentration Time			
Segment 10	Unloaded	2.939	Concentration Time	2.748 213613	3.216 213616	4.349 213619
Segment 10	Loaded	9.502	Concentration Time	3.691 214201	5.459 214204	
Segment 11	Unloaded	5.458	Concentration Time			
Segment 11	Loaded	6.503	Concentration Time			



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 1	Unloaded	Average 0.879	Concentration Time	0.870 102527	0.761 102530	0.803 102533	0.829 102536	0.852 102539	0.848 102542		0.024 101209	0.195 101212	1.657 101215	2.281 101218	0.806 101221	0.617 101224	
Segment 1	Loaded	1.112	Concentration Time	1.024 102506	0.949 102509	0.954 102512	1.030 102515	1.097 102518	1.053 102521	0.998 102524		1.213 104009	1.151 104012	1.033 104015	1.098 104018	1.448 104021	1.404 104024
Segment 2	Unloaded	0.987	Concentration Time	0.855 102545	0.976 102548	1.025 102551	0.986 102554	0.969 102557	0.911 102600	0.954 102603	1.008 102606	1.060 102609	1.130 102612				
Segment 2	Loaded	1.311	Concentration Time	1.304 103039	1.326 103042	1.281 103045	1.303 103048	1.335 103051	1.325 103054	1.209 103057	1.129 103100	1.195 103103	1.254 103106	1.242 103109	1.219 103112	1.259 103115	1.385 103118
Segment 3	Unloaded	0.890	Concentration Time	0.305 101230	0.242 101233	0.222 101236	0.191 101239	0.179 101242	0.188 101245	0.214 101248	0.149 101251	0.042 101254	0.091 101257	0.462 101300	0.555 101303	0.444 101306	0.320 101309
Segment 3	Loaded	1.645	Concentration Time	1.751 103845	1.870 103848	1.974 103851	1.929 103854	2.004 103857	1.888 103900	1.886 103903	2.074 103906	1.877 103909	1.855 103912	1.870 103915	1.820 103918	1.848 103921	1.705 103924
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	0.897	Concentration Time	1.082 102615	1.021 102618	1.077 102621	1.049 102624	1.022 102627	1.005 102630	0.871 102633	0.839 102636	0.896 102639	0.863 102642	0.821 102645	0.811 102648	0.776 102651	0.731 102654
Segment 5	Loaded	1.489	Concentration Time	1.543 102848	1.579 102851	1.575 102854	1.551 102857	1.597 102900	1.765 102903	1.760 102906	1.598 102909	1.568 102912	1.507 102915	1.397 102918	1.381 102921	1.482 102924	1.487 102927
Segment 6	Unloaded	1.142	Concentration Time	1.153 102712	1.211 102715	1.151 102718	1.087 102721	1.059 102724	1.102 102727	1.089 102730	1.154 102733	1.196 102736	1.168 102739	1.080 102742	1.183 102745	1.174 102748	1.136 102751
Segment 6	Loaded	1.604	Concentration Time	1.551 102803	1.545 102806	1.562 102809	1.633 102812	1.609 102815	1.602 102818	1.565 102821	1.577 102824	1.580 102827	1.658 102830	1.615 102833	1.516 102836	1.656 102839	1.749 102842
Segment 7	Unloaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 1	Unloaded	Average 0.879	Concentration Time														
Segment 1	Loaded	1.112	Concentration Time														
Segment 2	Unloaded	0.987	Concentration Time														
Segment 2	Loaded	1.311	Concentration Time	1.364 103121	1.379 103124	1.445 103127	1.507 103130	1.515 103133	1.246 103136								
Segment 3	Unloaded	0.890	Concentration Time	0.132 101312	0.101 101315	0.039 101318	0.054 101321	0.226 101324	0.203 101327	0.090 101330	0.110 101333	0.112 101336	0.092 101339	0.080 101342	1.060 103139	1.189 103142	
Segment 3	Loaded	1.645	Concentration Time	1.654 103927	1.743 103930	1.731 103933	1.635 103936	1.492 103939	1.408 103942	1.326 103945	1.175 103948	1.177 103951	1.213 103954	1.275 103957	1.852 102339	1.946 102342	
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	0.897	Concentration Time	0.678 102657	0.671 102700	0.834 102703	0.956 102706	1.045 102709									
Segment 5	Loaded	1.489	Concentration Time	1.418 102930	1.275 102933	1.310 102936	1.364 102939	1.282 102942	1.279 102945	1.331 102948	1.393 102951	1.535 102954	1.587 102957	1.568 103000	1.560 103003	1.562 103006	1.588 103009
Segment 6	Unloaded	1.142	Concentration Time	1.116 102754	1.079 102757	1.278 102800											
Segment 6	Loaded	1.604	Concentration Time	1.637 102845													
Segment 7	Unloaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 1	Unloaded	Average 0.879	Concentration Time														
Segment 1	Loaded	1.112	Concentration Time														
Segment 2	Unloaded	0.987	Concentration Time														
Segment 2	Loaded	1.311	Concentration Time														
Segment 3	Unloaded	0.890	Concentration Time	1.753 103145	2.360 103148	1.828 103151	1.805 103154	1.784 103157	1.809 103200	1.960 103203	2.119 103206	2.122 103209	1.985 103212	1.901 103215	1.758 103218	1.702 103221	1.502 103224
Segment 3	Loaded	1.645	Concentration Time	2.019 102345	2.034 102348	2.067 102351	2.081 102354	1.947 102357	1.897 102400	2.000 102403	1.949 102406	1.828 102409	1.775 102412	1.628 102415	1.595 102418	1.659 102421	1.667 102424
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	0.897	Concentration Time														
Segment 5	Loaded	1.489	Concentration Time	1.484 103012	1.469 103015	1.508 103018	1.475 103021	1.430 103024	1.423 103027	1.473 103030							
Segment 6	Unloaded	1.142	Concentration Time														
Segment 6	Loaded	1.604	Concentration Time														
Segment 7	Unloaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 1	Unloaded	Average 0.879	Concentration Time										
Segment 1	Loaded	1.112	Concentration Time										
Segment 2	Unloaded	0.987	Concentration Time										
Segment 2	Loaded	1.311	Concentration Time										
Segment 3	Unloaded	0.890	Concentration Time	1.280 103227	1.169 103230	1.153 103233	1.218 103236	1.147 103239	1.129 103242	1.270 103245	1.340 103248	1.293 103251	
Segment 3	Loaded	1.645	Concentration Time	1.605 102427	1.504 102430	1.326 102433	1.211 102436	1.061 102439	1.005 102442	1.036 102445	1.061 102448	1.027 102451	0.938 102454
Segment 4	Unloaded	#DIV/0!	Concentration Time										
Segment 4	Loaded	#DIV/0!	Concentration Time										
Segment 5	Unloaded	0.897	Concentration Time										
Segment 5	Loaded	1.489	Concentration Time										
Segment 6	Unloaded	1.142	Concentration Time										
Segment 6	Loaded	1.604	Concentration Time										
Segment 7	Unloaded	#DIV/0!	Concentration Time										



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment	Unloaded	Average 0.879	Concentration
1			Time
Segment	Loaded	1.112	Concentration
1			Time
Segment	Unloaded	0.987	Concentration
2			Time
Segment	Loaded	1.311	Concentration
2			Time
Segment	Unloaded	0.890	Concentration
3			Time
Segment	Loaded	1.645	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	0.897	Concentration
5			Time
Segment	Loaded	1.489	Concentration
5			Time
Segment	Unloaded	1.142	Concentration
6			Time
Segment	Loaded	1.604	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment	Unloaded	Average 0.879	Concentration
1			Time
Segment	Loaded	1.112	Concentration
1			Time
Segment	Unloaded	0.987	Concentration
2			Time
Segment	Loaded	1.311	Concentration
2			Time
Segment	Unloaded	0.890	Concentration
3			Time
Segment	Loaded	1.645	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	0.897	Concentration
5			Time
Segment	Loaded	1.489	Concentration
5			Time
Segment	Unloaded	1.142	Concentration
6			Time
Segment	Loaded	1.604	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time



**Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23**

Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	1.552	Concentration Time	1.313 103412	1.281 103415	1.400 103418	1.596 103421	1.511 103424	1.397 103427	1.482 103430	1.475 103433	1.504 103436	1.593 103439	1.562 103442	1.581 103445	1.795 103448	1.720 103451
Segment 8	Loaded	1.682	Concentration Time	1.633 103554	1.620 103557	1.710 103600	1.762 103603	1.606 103606	1.307 103609	1.118 103612	1.188 103615	1.312 103618	1.332 103621	1.235 103624	1.193 103627	1.263 103630	1.326 103633
Segment 9	Unloaded	0.067	Concentration Time	0.055 101345	0.045 101348	0.032 101351	0.033 101354	0.037 101357	0.036 101400	0.042 101403	0.128 101406	0.183 101409	0.135 101412	0.132 101415	0.143 101418	0.122 101421	0.103 101424
Segment 9	Loaded	1.997	Concentration Time	2.160 102000	2.051 102003	2.166 102006	2.187 102009	2.020 102012	2.099 102015	2.329 102018	2.341 102021	2.151 102024	1.788 102027	1.750 102030	1.767 102033	1.852 102036	2.158 102039
Segment 10	Unloaded	1.035	Concentration Time	1.110 104030	1.027 104033	1.031 104036	1.015 104039	1.025 104042	1.034 104045	1.030 104048	1.020 104051	1.037 104054	1.140 104057	1.132 104100	1.080 104103	1.203 104106	1.222 104109
Segment 10	Loaded	1.675	Concentration Time	2.083 104618	1.919 104621	1.988 104624	2.155 104627	2.242 104630	2.074 104633	2.071 104636	2.110 104639	2.031 104642	1.931 104645	1.963 104648	1.823 104651	1.709 104654	1.740 104657
Segment 11	Unloaded	1.703	Concentration Time	1.199 104248	1.188 104251	1.168 104254	1.147 104257	1.188 104300	1.136 104303	1.029 104306	1.136 104309	1.162 104312	1.131 104315	1.152 104318	1.138 104321	1.200 104324	1.277 104327
Segment 11	Loaded	2.176	Concentration Time	1.650 104433	1.911 104436	1.868 104439	1.710 104442	1.720 104445	1.894 104448	1.980 104451	2.090 104454	2.503 104457	2.498 104500	2.237 104503	2.036 104506	2.136 104509	2.133 104512



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	1.552	Concentration Time	1.658 103454	1.542 103457	1.494 103500	1.461 103503	1.321 103506	1.385 103509	1.491 103512	1.519 103515	1.681 103518	1.741 103521	1.660 103524	1.594 103527	1.506 103530	1.432 103533
Segment 8	Loaded	1.682	Concentration Time	1.355 103636	1.331 103639	1.472 103642	1.756 103645	1.953 103648	1.957 103651	1.978 103654	2.136 103657	2.140 103700	2.218 103703	2.105 103706	1.966 103709	1.979 103712	1.810 103715
Segment 9	Unloaded	0.067	Concentration Time	0.091 101427	0.062 101430	0.046 101433	0.076 101436	0.069 101439	0.004 101442	0.041 101445	0.159 101448	0.174 101451	0.096 101454	0.058 101457	0.044 101500	0.010 101503	0.006 101506
Segment 9	Loaded	1.997	Concentration Time	2.374 102042	2.391 102045	2.422 102048	2.624 102051	2.509 102054	2.349 102057	2.331 102100	2.271 102103	2.262 102106	2.268 102109	2.180 102112	2.163 102115	2.022 102118	1.950 102121
Segment 10	Unloaded	1.035	Concentration Time	1.056 104112	0.847 104115	0.721 104118	0.736 104121	0.772 104124	0.852 104127	0.912 104130	1.018 104133	0.952 104136	0.888 104139	0.982 104142	1.037 104145	0.971 104148	0.982 104151
Segment 10	Loaded	1.675	Concentration Time	1.559 104700	1.588 104703	1.678 104706	1.562 104709	1.555 104712	1.599 104715	1.650 104718	1.776 104721	2.084 104724	1.947 104727	1.665 104730	1.486 104733	1.368 104736	1.398 104739
Segment 11	Unloaded	1.703	Concentration Time	1.354 104330	1.418 104333	1.448 104336	1.572 104339	1.676 104342	1.596 104345	1.493 104348	1.610 104351	1.792 104354	4.276 104357	4.513 104400	2.468 104403	2.100 104406	2.059 104409
Segment 11	Loaded	2.176	Concentration Time	1.968 104515	2.167 104518	3.147 104521	2.890 104524	2.320 104527	2.127 104530	1.877 104533	1.747 104536	1.805 104539	2.009 104542	2.036 104545	2.032 104548	2.367 104551	2.634 104554



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	1.552	Concentration Time	1.454 103536	1.491 103539	1.630 103542	1.740 103545	1.853 103548	1.909 103551								
Segment 8	Loaded	1.682	Concentration Time	2.023 103718	2.040 103721	1.966 103724	2.049 103727										
Segment 9	Unloaded	0.067	Concentration Time	0.027 101509	0.020 101512	0.006 101515	0.005 101518	0.007 101521	0.062 101524	0.047 101527	0.009 101530	0.010 101533	0.017 101536	0.015 101539	0.012 101542	0.011 101545	0.017 101548
Segment 9	Loaded	1.997	Concentration Time	2.107 102124	2.513 102127	2.493 102130	2.052 102133	1.901 102136	2.202 102139	2.174 102142	1.957 102145	1.721 102148	1.626 102151	1.758 102154	1.781 102157	1.702 102200	1.718 102203
Segment 10	Unloaded	1.035	Concentration Time	1.007 104154	0.997 104157	0.968 104200	1.061 104203	1.081 104206	1.098 104209	1.064 104212	1.114 104215	1.086 104218	1.106 104221	1.141 104224	1.148 104227	1.189 104230	1.116 104233
Segment 10	Loaded	1.675	Concentration Time	1.329 104742	1.311 104745	1.333 104748	1.368 104751	1.432 104754	1.475 104757	1.508 104800	1.382 104803	1.295 104806	1.235 104809	1.281 104812	1.313 104815	1.317 104818	1.393 104821
Segment 11	Unloaded	1.703	Concentration Time	2.195 104412	2.334 104415	2.307 104418	2.056 104421	1.783 104424	1.709 104427	1.616 104430							
Segment 11	Loaded	2.176	Concentration Time	2.408 104557	2.197 104600	2.156 104603	2.281 104606	2.597 104609	2.651 104612	2.380 104615							



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	1.552	Concentration Time														
Segment 8	Loaded	1.682	Concentration Time														
Segment 9	Unloaded	0.067	Concentration Time	0.028 101551	0.025 101554	0.031 101557	0.024 101600	0.029 101603	0.056 101606	0.078 101609	0.028 101612	0.033 101615	0.084 101618	0.046 101621	0.016 101624	0.019 101627	0.035 101630
Segment 9	Loaded	1.997	Concentration Time	1.735 102206	1.633 102209	2.168 102212	2.439 102215	1.936 102218	1.830 102221	1.801 102224	1.801 102227	1.935 102230	1.860 102233	1.751 102236	1.627 102239	1.590 102242	1.554 102245
Segment 10	Unloaded	1.035	Concentration Time	1.104 104236	1.151 104239	1.188 104242	1.175 104245										
Segment 10	Loaded	1.675	Concentration Time	1.629 104824	1.686 104827	1.870 104830	1.931 104833	1.893 104836									
Segment 11	Unloaded	1.703	Concentration Time														
Segment 11	Loaded	2.176	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 7	Loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	1.552	Concentration Time														
Segment 8	Loaded	1.682	Concentration Time														
Segment 9	Unloaded	0.067	Concentration Time	0.042 101633	0.026 101636	0.016 101639	0.257 101642	0.679 101645	0.259 101648	0.032 101651	0.024 101654	0.044 101657					
Segment 9	Loaded	1.997	Concentration Time	1.543 102248	1.811 102251	2.107 102254	1.968 102257	1.700 102300	1.600 102303	1.651 102306	1.856 102309	2.153 102312	2.122 102315	1.925 102318	1.866 102321	1.902 102324	1.873 102327
Segment 10	Unloaded	1.035	Concentration Time														
Segment 10	Loaded	1.675	Concentration Time														
Segment 11	Unloaded	1.703	Concentration Time														
Segment 11	Loaded	2.176	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 23

Segment 7	Loaded	#DIV/0!	Concentration Time			
Segment 8	Unloaded	1.552	Concentration Time			
Segment 8	Loaded	1.682	Concentration Time			
Segment 9	Unloaded	0.067	Concentration Time			
Segment 9	Loaded	1.997	Concentration Time	1.852 102330	1.794 102333	1.781 102336
Segment 10	Unloaded	1.035	Concentration Time			
Segment 10	Loaded	1.675	Concentration Time			
Segment 11	Unloaded	1.703	Concentration Time			
Segment 11	Loaded	2.176	Concentration Time			



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment 1	Unloaded	Average 0.956	Concentration Time	1.1754 150427	1.216267 150430	1.1878 150433	0.819733 150436	0.6916 150439	0.646067 150442								
Segment 1	Loaded	3.132	Concentration Time	1.5334 151812	2.447067 151815	2.9376 151818	2.426733 151821	2.8808 151824	4.231 151827	5.465467 151830							
Segment 2	Unloaded	0.566	Concentration Time	0.661533 150445	0.5152 150448	0.273533 150451	0.3112 150454	0.3864 150457	0.4598 150500	0.614667 150503	0.7792 150506	0.699133 150509	0.734267 150512	0.7932 150515			
Segment 2	Loaded	1.682	Concentration Time	0.684733 150848	0.618867 150851	0.465867 150854	0.379667 150857	0.876467 150900	1.4864 150903	2.208267 150906	2.702067 150909	3.713533 150912	3.686067 150915				
Segment 3	Unloaded	2.125	Concentration Time	2.1568 150927	2.1636 150930	1.862733 150933	1.9076 150936	2.0158 150939	2.0858 150942	2.178333 150945	2.2562 150948	2.556333 150951	2.5156 150954	2.244533 150957	2.345333 151000	2.8004 151003	2.8164 151006
Segment 3	Loaded	3.439	Concentration Time	3.198933 151642	3.440533 151645	4.091333 151648	4.504333 151651	4.195267 151654	4.2914 151657	4.3362 151700	3.8324 151703	4.048933 151706	4.1458 151709	3.696733 151712	3.421 151715	2.821933 151718	2.545667 151721
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	1.798	Concentration Time	1.4312 150527	2.0792 150530	2.219 150533	2.398067 150536	2.082867 150539	1.962667 150542	2.040533 150545	1.593533 150548	1.536867 150551	1.517867 150554	1.6114 150557	2.0134 150600	1.954733 150603	1.326467 150606
Segment 5	Loaded	1.376	Concentration Time	1.648 150738	1.682667 150741	1.4252 150744	1.415533 150747	1.541267 150750	1.500067 150753	1.3504 150756	1.366133 150759	1.4338 150803	1.3064 150806	1.521667 150809	1.892933 150812	2.235667 150815	1.975333 150818
Segment 6	Unloaded	2.170	Concentration Time	1.490467 150612	1.486333 150615	1.858067 150618	2.102733 150621	1.934533 150624	1.916533 150627	1.9348 150630	2.245267 150633	2.394867 150636	2.853533 150639	3.1942 150642	2.821533 150645	1.976733 150648	
Segment 6	Loaded	#DIV/0!	Concentration Time														
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment 1	Unloaded	Average 0.956	Concentration Time													
Segment 1	Loaded	3.132	Concentration Time													
Segment 2	Unloaded	0.566	Concentration Time													
Segment 2	Loaded	1.682	Concentration Time													
Segment 3	Unloaded	2.125	Concentration Time	3.044733 151009	3.068933 151012	2.391667 151015	1.993067 151018	1.556067 151021	1.3186 151024	1.104467 151027	1.042533 151030	1.5792 151033	1.9922 151036			
Segment 3	Loaded	3.439	Concentration Time	2.813 151724	2.6468 151727	2.332267 151730	2.3138 151733	2.3962 151736	2.489867 151739	2.585533 151742	3.3156 151745	4.8368 151748	5.733 151751	3.886467 151754	2.450733 151757	2.4846 151800
Segment 4	Unloaded	#DIV/0!	Concentration Time													
Segment 4	Loaded	#DIV/0!	Concentration Time													
Segment 5	Unloaded	1.798	Concentration Time	1.209333 150609												
Segment 5	Loaded	1.376	Concentration Time	1.524133 150821	1.2086 150824	0.909533 150827	0.647467 150830	0.393533 150833	0.5432 150836							
Segment 6	Unloaded	2.170	Concentration Time													
Segment 6	Loaded	#DIV/0!	Concentration Time													
Segment 7	Unloaded	#DIV/0!	Concentration Time													
Segment 7	Loaded	#DIV/0!	Concentration Time													



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment	Unloaded	Average 0.956	Concentration
1			Time
Segment	Loaded	3.132	Concentration
1			Time
Segment	Unloaded	0.566	Concentration
2			Time
Segment	Loaded	1.682	Concentration
2			Time
Segment	Unloaded	2.125	Concentration
3			Time
Segment	Loaded	3.439	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	1.798	Concentration
5			Time
Segment	Loaded	1.376	Concentration
5			Time
Segment	Unloaded	2.170	Concentration
6			Time
Segment	Loaded	#DIV/0!	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment	Unloaded	Average 0.956	Concentration
1			Time
Segment	Loaded	3.132	Concentration
1			Time
Segment	Unloaded	0.566	Concentration
2			Time
Segment	Loaded	1.682	Concentration
2			Time
Segment	Unloaded	2.125	Concentration
3			Time
Segment	Loaded	3.439	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	1.798	Concentration
5			Time
Segment	Loaded	1.376	Concentration
5			Time
Segment	Unloaded	2.170	Concentration
6			Time
Segment	Loaded	#DIV/0!	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment	Unloaded	Average 0.956	Concentration
1			Time
Segment	Loaded	3.132	Concentration
1			Time
Segment	Unloaded	0.566	Concentration
2			Time
Segment	Loaded	1.682	Concentration
2			Time
Segment	Unloaded	2.125	Concentration
3			Time
Segment	Loaded	3.439	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	1.798	Concentration
5			Time
Segment	Loaded	1.376	Concentration
5			Time
Segment	Unloaded	2.170	Concentration
6			Time
Segment	Loaded	#DIV/0!	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	5.151	Concentration Time	2.1664 151039	2.548933 151042	2.811933 151045	2.5322 151048	2.500067 151051	2.717 151054	2.515667 151057	2.354467 151100	2.394067 151103	2.409533 151106	2.587533 151109	3.183667 151112	3.589133 151115	4.159333 151118
Segment 9	Loaded	8.939	Concentration Time	4.211733 151342	4.953467 151345	4.8182 151348	4.329333 151351	3.505933 151354	2.960667 151357	2.8016 151400	2.687467 151403	2.483933 151406	2.315933 151409	2.069867 151412	1.9798 151415	2.543933 151418	3.953067 151421
Segment 10	Unloaded	1.868	Concentration Time	2.8488 145606	2.847533 145609	2.783933 145612	2.794067 145615	2.845533 145618	2.7186 145621	2.6066 145624	2.092133 145627	1.78 145630	1.750867 145633	1.838267 145636	2.408067 145639	2.358133 145642	1.777667 145645
Segment 10	Loaded	1.908	Concentration Time	1.982533 150215	1.9546 150218	1.953067 150221	2.7054 150224	3.0852 150227	3.267867 150230	3.7504 150233	3.4506 150236	3.1332 150239	2.9258 150242	2.582267 150245	2.371333 150248	2.039533 150251	1.9804 150254
Segment 11	Unloaded	3.208	Concentration Time	1.457733 145821	1.6046 145824	1.681733 145827	2.2504 145830	2.858067 145833	3.4888 145836	4.281267 145839	4.187533 145842	4.025333 145845	3.295933 145848	2.712933 145851	2.981667 145854	3.3946 145857	3.398333 145900
Segment 11	Loaded	3.406	Concentration Time	4.9428 150015	5.697867 150018	9.034333 150021	9.7656 150024	7.130867 150027	5.130467 150030	5.234733 150033	6.477933 150036	5.8292 150039	4.335667 150042	3.545667 150045	3.113467 150048	2.936667 150051	2.695867 150054



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	5.151	Concentration Time	6.775533 151121	6.716533 151124	6.527733 151127	6.9212 151130	6.738933 151133	5.1986 151136	3.152133 151139	2.5738 151142	2.671533 151145	3.000667 151148	3.149533 151151	4.694067 151154	18.27293 151157	31.40893 151200
Segment 9	Loaded	8.939	Concentration Time	5.486267 151424	4.9488 151427	4.793333 151430	7.139467 151433	9.518267 151436	7.4232 151439	8.228467 151442	10.06947 151445	7.720267 151448	9.1918 151451	12.75807 151454	10.364 151457	6.948467 151500	6.774467 151503
Segment 10	Unloaded	1.868	Concentration Time	1.980467 145648	2.399467 145651	2.3476 145654	2.0538 145657	1.8642 145700	1.915867 145703	1.755133 145706	1.702067 145709	1.781467 145712	1.5398 145715	1.168667 145718	1.215867 145721	1.3854 145724	1.810933 145727
Segment 10	Loaded	1.908	Concentration Time	2.129733 150257	1.951333 150300	1.823733 150303	1.385533 150306	1.073467 150309	0.881533 150312	0.875 150315	0.935467 150318	0.921933 150321	1.0942 150324	1.0982 150327	0.7806 150330	0.771333 150333	1.064933 150336
Segment 11	Unloaded	3.208	Concentration Time	3.847067 145903	3.921333 145906	3.509333 145909	3.331667 145912	3.004333 145915	2.920867 145918	2.6892 145921	2.2118 145924	2.2052 145927	2.4712 145930	2.962067 145933	3.492067 145936	3.053867 145939	2.7028 145942
Segment 11	Loaded	3.406	Concentration Time	2.753667 150057	3.264333 150100	3.06 150103	2.894667 150106	3.6148 150109	3.865933 150112	3.403333 150115	2.805733 150118	3.0412 150121	2.605533 150124	1.99 150127	2.150333 150130	2.319267 150133	2.0018 150136



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	5.151	Concentration Time	29.09293 151203	24.63687 151206	16.99267 151209	7.057267 151212	5.772067 151215	6.723333 151218	5.261467 151221	3.6438 151224	3.7692 151227	3.252133 151230	2.600267 151233	2.634733 151236	2.679267 151239	2.568867 151242
Segment 9	Loaded	8.939	Concentration Time	11.61013 151506	10.6526 151509	9.408067 151512	18.76613 151515	27.7586 151518	33.89353 151521	41.33833 151524	43.0886 151527	33.7414 151530	23.84827 151533	17.2434 151536	11.36453 151539	6.952133 151542	6.0856 151545
Segment 10	Unloaded	1.868	Concentration Time	1.914267 145730	1.891267 145733	1.832533 145736	1.689333 145739	1.5966 145742	1.6706 145745	1.3878 145748	1.304333 145751	1.734467 145754	1.776 145757	1.7442 145800	1.9048 145803	1.549667 145806	1.129733 145809
Segment 10	Loaded	1.908	Concentration Time	1.5232 150339	1.844533 150342	1.784067 150345	1.643733 150348	3.026 150351	3.568733 150354	2.746467 150357	2.679733 150400	2.448933 150403	1.982533 150406	1.382267 150409	0.9808 150412	1.062333 150415	1.016867 150418
Segment 11	Unloaded	3.208	Concentration Time	2.6 145945	2.2438 145948	2.1296 145951	2.505 145954	3.054667 145957	4.1834 150000	5.533533 150003	5.9372 150006	4.989267 150009	4.7844 150012				
Segment 11	Loaded	3.406	Concentration Time	1.772533 150139	1.606133 150142	1.552533 150145	1.775 150148	1.845 150151	1.882 150154	1.779867 150157	1.8086 150200	1.8308 150203	1.735467 150206	1.414667 150209	1.589867 150212		



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	5.151	Concentration Time	2.7606 151245	2.491533 151248	2.239067 151251	2.223133 151254	2.307667 151257	2.236533 151300	2.363067 151303	2.673267 151306	3.4574 151309	3.7032 151312	2.976267 151315	2.876733 151318	2.688733 151321	2.348133 151324
Segment 9	Loaded	8.939	Concentration Time	6.837067 151548	8.180267 151551	8.359 151554	7.129933 151557	5.520467 151600	4.090133 151603	3.854133 151606	3.628333 151609	4.0604 151612	4.4282 151615	3.664133 151618	3.221 151621	3.2302 151624	3.362133 151627
Segment 10	Unloaded	1.868	Concentration Time	0.8804 145812	0.684933 145815	1.0116 145818											
Segment 10	Loaded	1.908	Concentration Time	1.088267 150421	1.2074 150424												
Segment 11	Unloaded	3.208	Concentration Time														
Segment 11	Loaded	3.406	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 24

Segment 8	Unloaded	#DIV/0!	Concentration Time					
Segment 8	Loaded	#DIV/0!	Concentration Time					
Segment 9	Unloaded	5.151	Concentration Time	2.0762 151327	2.249133 151330	2.602533 151333	3.277733 151336	3.687733 151339
Segment 9	Loaded	8.939	Concentration Time	3.807267 151630	3.918267 151633	3.2366 151636	3.064533 151639	
Segment 10	Unloaded	1.868	Concentration Time					
Segment 10	Loaded	1.908	Concentration Time					
Segment 11	Unloaded	3.208	Concentration Time					
Segment 11	Loaded	3.406	Concentration Time					



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment 1	Unloaded	Average	Concentration Time	5.064	5.086	5.242	5.051	4.177	3.441	3.368	3.367	3.202		0.758	1.096	1.306	1.706
		155350		155353	155356	155359	155402	155405	155408	155411	155414	161602		161605	161608	161611	
Segment 1	Loaded	3.337	Concentration Time	3.452	3.413	3.611	3.445	3.270	3.272	2.898							
				160702	160705	160708	160711	160714	160717	160720							
Segment 2	Unloaded	1.870	Concentration Time	3.371	3.301	2.569	1.595	1.529	1.414	0.968	1.092	1.415	1.446				
				155417	155420	155423	155426	155429	155432	155435	155438	155441	155444				
Segment 2	Loaded	3.098	Concentration Time	3.037	2.942	2.981	3.568	3.579	2.932	2.832	3.129	3.038	2.943				
				155756	155759	155802	155805	155808	155811	155814	155817	155820	155823				
Segment 3	Unloaded	3.802	Concentration Time	2.891	2.822	2.703	2.603	2.284	2.442	2.933	3.420	3.783	3.856	3.736	3.403	4.009	4.748
				155832	155835	155838	155841	155844	155847	155850	155853	155856	155859	155902	155905	155908	155911
Segment 3	Loaded	3.751	Concentration Time	3.514	3.545	4.462	5.340	5.292	4.133	3.872	3.645	3.517	3.185	2.744	3.135	3.054	2.894
				160547	160550	160553	160556	160559	160602	160605	160608	160611	160614	160617	160620	160623	160626
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	1.800	Concentration Time	1.427	1.535	1.786	1.863	1.799	1.294	1.165	1.359	1.604	1.882	1.952	1.714	1.833	1.991
				155447	155450	155453	155456	155459	155502	155505	155508	155511	155514	155517	155520	155523	155526
Segment 5	Loaded	3.841	Concentration Time	2.651	2.698	2.669	3.457	4.594	5.302	5.624	4.369	4.121	4.288	3.806	3.746	3.634	3.311
				155702	155705	155708	155711	155714	155717	155720	155723	155726	155729	155732	155735	155738	155741
Segment 6	Unloaded	3.341	Concentration Time	3.098	4.013	5.098	4.604	3.468	3.221	3.240	3.285	3.395	3.135	2.699	2.076	2.099	
				155538	155541	155544	155547	155550	155553	155556	155559	155602	155605	155608	155611	155614	
Segment 6	Loaded	4.031	Concentration Time	2.704	3.008	3.122	3.232	3.294	3.270	4.083	5.235	6.380	6.847	5.525	3.981	3.584	3.321
				155617	155620	155623	155626	155629	155632	155635	155638	155641	155644	155647	155650	155653	155656
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment 1	Unloaded	Average 3.019	Concentration Time	1.678 161614	1.773 161617	1.990 161620								
Segment 1	Loaded	3.337	Concentration Time											
Segment 2	Unloaded	1.870	Concentration Time											
Segment 2	Loaded	3.098	Concentration Time											
Segment 3	Unloaded	3.802	Concentration Time	4.937 155914	5.093 155917	4.583 155920	4.652 155923	6.354 155926	6.175 155929	4.576 155932	3.771 155935	3.059 155938	2.415 155941	
Segment 3	Loaded	3.751	Concentration Time	3.155 160629	3.772 160632	4.085 160635	3.296 160638	3.303 160641	3.996 160644	4.143 160647	3.728 160650	4.143 160653	4.066 160656	
Segment 4	Unloaded	#DIV/0!	Concentration Time											
Segment 4	Loaded	#DIV/0!	Concentration Time											
Segment 5	Unloaded	1.800	Concentration Time	2.179 155529	2.492 155532	2.717 155535								
Segment 5	Loaded	3.841	Concentration Time	3.713 155744	3.929 155747	3.900 155750	3.334 155753							
Segment 6	Unloaded	3.341	Concentration Time											
Segment 6	Loaded	4.031	Concentration Time	2.879 155659										
Segment 7	Unloaded	#DIV/0!	Concentration Time											
Segment 7	Loaded	#DIV/0!	Concentration Time											



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment	Unloaded	Average 3.019	Concentration
1			Time
Segment	Loaded	3.337	Concentration
1			Time
Segment	Unloaded	1.870	Concentration
2			Time
Segment	Loaded	3.098	Concentration
2			Time
Segment	Unloaded	3.802	Concentration
3			Time
Segment	Loaded	3.751	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	1.800	Concentration
5			Time
Segment	Loaded	3.841	Concentration
5			Time
Segment	Unloaded	3.341	Concentration
6			Time
Segment	Loaded	4.031	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment	Unloaded	Average 3.019	Concentration
1			Time
Segment	Loaded	3.337	Concentration
1			Time
Segment	Unloaded	1.870	Concentration
2			Time
Segment	Loaded	3.098	Concentration
2			Time
Segment	Unloaded	3.802	Concentration
3			Time
Segment	Loaded	3.751	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	1.800	Concentration
5			Time
Segment	Loaded	3.841	Concentration
5			Time
Segment	Unloaded	3.341	Concentration
6			Time
Segment	Loaded	4.031	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment	Unloaded	Average 3.019	Concentration
1			Time
Segment	Loaded	3.337	Concentration
1			Time
Segment	Unloaded	1.870	Concentration
2			Time
Segment	Loaded	3.098	Concentration
2			Time
Segment	Unloaded	3.802	Concentration
3			Time
Segment	Loaded	3.751	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	1.800	Concentration
5			Time
Segment	Loaded	3.841	Concentration
5			Time
Segment	Unloaded	3.341	Concentration
6			Time
Segment	Loaded	4.031	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	3.588	Concentration Time	2.578 155944	2.985 155947	3.751 155950	3.667 155953	3.609 155956	4.014 155959	3.677 160002	2.953 160005	2.795 160008	2.670 160011	2.420 160014	2.404 160017	2.656 160020	2.963 160023
Segment 9	Loaded	7.997	Concentration Time	2.421 160247	2.439 160250	2.908 160253	3.815 160256	3.989 160259	4.419 160302	4.306 160305	3.194 160308	3.097 160311	3.160 160314	3.106 160317	3.232 160320	2.625 160323	1.904 160326
Segment 10	Unloaded	1.887	Concentration Time	2.337 160723	1.993 160726	1.832 160729	1.905 160732	1.873 160735	2.202 160738	2.834 160741	2.578 160744	2.143 160747	1.831 160750	1.696 160753	1.442 160756	1.195 160759	1.237 160802
Segment 10	Loaded	2.025	Concentration Time	1.915 161350	1.829 161353	1.928 161356	1.870 161359	1.859 161402	2.091 161405	2.448 161408	2.276 161411	1.681 161414	1.661 161417	2.070 161420	2.629 161423	2.501 161426	2.118 161429
Segment 11	Unloaded	2.010	Concentration Time	1.769 161005	1.239 161008	1.000 161011	1.182 161014	1.125 161017	1.070 161020	1.123 161023	1.045 161026	0.686 161029	0.501 161032	0.453 161035	0.298 161038	0.234 161041	0.385 161044
Segment 11	Loaded	2.918	Concentration Time	3.629 161156	3.261 161159	2.419 161202	2.004 161205	2.310 161208	3.315 161211	3.288 161214	2.751 161217	3.712 161220	3.989 161223	3.489 161226	3.334 161229	3.401 161232	4.370 161235



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	3.588	Concentration Time	3.319 160026	3.930 160029	5.322 160032	9.267 160035	15.019 160038	20.147 160041	19.070 160044	8.386 160047	3.970 160050	2.902 160053	2.219 160056	2.108 160059	2.531 160102	3.010 160105
Segment 9	Loaded	7.997	Concentration Time	2.067 160329	2.151 160332	2.135 160335	2.071 160338	1.527 160341	1.670 160344	2.185 160347	2.532 160350	2.069 160353	2.279 160356	1.926 160359	1.480 160402	1.619 160405	1.842 160408
Segment 10	Unloaded	1.887	Concentration Time	1.493 160805	1.594 160808	1.384 160811	1.332 160814	1.552 160817	1.661 160820	1.790 160823	1.672 160826	1.981 160829	2.278 160832	2.041 160835	2.124 160838	2.324 160841	2.250 160844
Segment 10	Loaded	2.025	Concentration Time	2.022 161432	3.719 161435	4.745 161438	4.481 161441	4.347 161444	3.503 161447	2.782 161450	2.977 161453	3.126 161456	2.664 161459	2.450 161502	2.273 161505	2.136 161508	2.090 161511
Segment 11	Unloaded	2.010	Concentration Time	1.495 161047	2.735 161050	2.785 161053	3.003 161056	2.978 161059	2.699 161102	2.547 161105	2.637 161108	2.417 161111	2.548 161114	2.887 161117	3.575 161120	4.493 161123	4.186 161126
Segment 11	Loaded	2.918	Concentration Time	5.619 161238	5.048 161241	3.695 161244	2.929 161247	2.275 161250	2.289 161253	2.256 161256	1.982 161259	1.432 161302	1.605 161305	1.988 161308	1.726 161311	1.486 161314	1.766 161317



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	3.588	Concentration Time	3.088 160108	2.668 160111	2.780 160114	2.646 160117	2.373 160120	2.234 160123	1.793 160126	1.561 160129	1.710 160132	1.646 160135	1.432 160138	1.837 160141	2.034 160144	1.638 160147
Segment 9	Loaded	7.997	Concentration Time	1.860 160411	1.912 160414	1.930 160417	2.072 160420	2.186 160423	2.608 160426	11.999 160429	36.170 160432	45.123 160435	52.832 160438	52.079 160441	42.942 160444	31.524 160447	19.528 160450
Segment 10	Unloaded	1.887	Concentration Time	2.453 160847	2.493 160850	1.914 160853	1.691 160856	1.908 160859	2.626 160902	2.723 160905	2.300 160908	1.749 160911	1.520 160914	1.440 160917	1.488 160920	1.963 160923	2.031 160926
Segment 10	Loaded	2.025	Concentration Time	1.628 161514	1.375 161517	1.218 161520	1.288 161523	0.967 161526	0.658 161529	0.897 161532	1.279 161535	1.084 161538	0.744 161541	0.868 161544	0.937 161547	1.015 161550	1.051 161553
Segment 11	Unloaded	2.010	Concentration Time	2.628 161129	2.263 161132	2.183 161135	2.195 161138	2.245 161141	2.255 161144	2.317 161147	2.371 161150	2.798 161153					
Segment 11	Loaded	2.918	Concentration Time	2.317 161320	2.239 161323	2.412 161326	3.691 161329	4.060 161332	3.433 161335	3.397 161338	3.156 161341	2.687 161344	2.141 161347				



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	3.588	Concentration Time	1.982 160150	2.531 160153	2.552 160156	2.244 160159	2.060 160202	2.283 160205	2.789 160208	2.678 160211	2.342 160214	2.534 160217	2.699 160220	2.621 160223	2.510 160226	2.322 160229
Segment 9	Loaded	7.997	Concentration Time	10.625 160453	9.003 160456	7.705 160459	7.904 160502	7.614 160505	6.774 160508	6.423 160511	5.355 160514	4.853 160517	4.553 160520	4.474 160523	4.594 160526	4.395 160529	4.673 160532
Segment 10	Unloaded	1.887	Concentration Time	1.633 160929	1.950 160932	2.069 160935	1.919 160938	1.751 160941	1.555 160944	1.562 160947	1.814 160950	1.852 160953	1.759 160956	1.520 160959	1.646 161002		
Segment 10	Loaded	2.025	Concentration Time	1.064 161556	0.839 161559												
Segment 11	Unloaded	2.010	Concentration Time														
Segment 11	Loaded	2.918	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 25

Segment 8	Unloaded	#DIV/0!	Concentration Time					
Segment 8	Loaded	#DIV/0!	Concentration Time					
Segment 9	Unloaded	3.588	Concentration Time	2.254 160232	2.593 160235	2.287 160238	1.805 160241	2.000 160244
Segment 9	Loaded	7.997	Concentration Time	4.026 160535	3.376 160538	3.142 160541	3.399 160544	
Segment 10	Unloaded	1.887	Concentration Time					
Segment 10	Loaded	2.025	Concentration Time					
Segment 11	Unloaded	2.010	Concentration Time					
Segment 11	Loaded	2.918	Concentration Time					



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment 1	Unloaded	Average	Concentration Time	2.601667	2.613933	2.915133	2.758467	3.171267	3.539	3.5256	3.296733	3.177333		2.499333	2.541867	1.936467	1.708
		2.957		162807	162810	162813	162816	162819	162822	162825	162828	162831		164955	164958	165001	165004
Segment 1	Loaded	3.316	Concentration Time	3.256733	3.239133	3.2508	3.656533	3.861133	3.3396	3.114467	2.810467						
Segment 2	Unloaded	2.604	Concentration Time	3.1588	3.333133	3.217867	3.183667	3.316733	2.694267	2.0522	1.841933	1.726333	1.510733				
				162837	162840	162843	162846	162849	162852	162855	162858	162901	162904				
Segment 2	Loaded	2.843	Concentration Time	2.083533	2.504933	2.779667	2.688467	2.844133	2.987	3.139733	3.1198	3.153467	2.810467	3.159667			
Segment 3	Unloaded	4.991	Concentration Time	3.258133	3.583067	4.467067	4.753333	4.2262	3.426	3.3324	4.333467	6.1904	6.577067	5.2598	4.8608	4.922333	5.21
				163237	163240	163243	163246	163249	163252	163255	163258	163301	163304	163307	163310	163313	163316
Segment 3	Loaded	4.593	Concentration Time	5.749067	5.161467	5.4462	5.994733	5.896	6.311067	6.000333	5.0542	4.155667	3.934	4.357933	5.078733	4.4636	4.346067
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	2.227	Concentration Time	1.528	1.981267	2.1904	2.0606	2.067867	1.8478	1.555733	2.125933	2.4608	2.321	2.286467	2.296733	2.244133	2.060133
				162907	162910	162913	162916	162919	162922	162925	162928	162931	162934	162937	162940	162943	162946
Segment 5	Loaded	3.929	Concentration Time	2.593667	2.479467	2.530467	2.688867	4.399667	6.183733	5.770467	4.833	4.4232	3.854	3.7382	4.7604	5.1106	4.5572
				163110	163113	163116	163119	163122	163125	163128	163131	163134	163137	163140	163143	163146	163149
Segment 6	Unloaded	4.703	Concentration Time	4.734267	6.231067	6.276267	6.016267	6.0288	5.618533	4.7964	4.176267	4.057	3.010533	2.576467	2.915867		
				162958	163001	163004	163007	163010	163013	163016	163019	163022	163025	163028	163031		
Segment 6	Loaded	4.656	Concentration Time	3.7158	3.530067	3.370467	4.790267	5.1096	5.351133	5.749067	5.992	5.6278	5.065933	4.367867	3.202067		
				163034	163037	163040	163043	163046	163049	163052	163055	163058	163101	163104	163107		
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment 1	Unloaded	Average 2.957	Concentration Time	1.459333 165007	1.943733 165010	3.291933 165013	7.280867 165016									
Segment 1	Loaded	3.316	Concentration Time													
Segment 2	Unloaded	2.604	Concentration Time													
Segment 2	Loaded	2.843	Concentration Time													
Segment 3	Unloaded	4.991	Concentration Time	5.1886 163319	4.7204 163322	4.234533 163325	4.125333 163328	5.7122 163331	8.391 163334	9.4572 163337	7.201867 163340	4.482933 163343	3.4412 163346	3.428067 163349		
Segment 3	Loaded	4.593	Concentration Time	3.945267 164034	3.256533 164037	3.657933 164040	4.6584 164043	5.076733 164046	5.097267 164049	4.042533 164052	3.810333 164055	4.240867 164058	4.143133 164101	3.498933 164104	3.3732 164107	3.249533 164110
Segment 4	Unloaded	#DIV/0!	Concentration Time													
Segment 4	Loaded	#DIV/0!	Concentration Time													
Segment 5	Unloaded	2.227	Concentration Time	2.727067 162949	3.067467 162952	3.0358 162955										
Segment 5	Loaded	3.929	Concentration Time	4.053733 163152	3.516667 163155	3.099533 163158	2.1338 163201									
Segment 6	Unloaded	4.703	Concentration Time													
Segment 6	Loaded	4.656	Concentration Time													
Segment 7	Unloaded	#DIV/0!	Concentration Time													
Segment 7	Loaded	#DIV/0!	Concentration Time													



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment	Unloaded	Average 2.957	Concentration
1			Time
Segment	Loaded	3.316	Concentration
1			Time
Segment	Unloaded	2.604	Concentration
2			Time
Segment	Loaded	2.843	Concentration
2			Time
Segment	Unloaded	4.991	Concentration
3			Time
Segment	Loaded	4.593	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	2.227	Concentration
5			Time
Segment	Loaded	3.929	Concentration
5			Time
Segment	Unloaded	4.703	Concentration
6			Time
Segment	Loaded	4.656	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment	Unloaded	Average	Concentration
1		2.957	Time
Segment	Loaded	3.316	Concentration
1			Time
Segment	Unloaded	2.604	Concentration
2			Time
Segment	Loaded	2.843	Concentration
2			Time
Segment	Unloaded	4.991	Concentration
3			Time
Segment	Loaded	4.593	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	2.227	Concentration
5			Time
Segment	Loaded	3.929	Concentration
5			Time
Segment	Unloaded	4.703	Concentration
6			Time
Segment	Loaded	4.656	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment	Unloaded	Average 2.957	Concentration
1			Time
Segment	Loaded	3.316	Concentration
1			Time
Segment	Unloaded	2.604	Concentration
2			Time
Segment	Loaded	2.843	Concentration
2			Time
Segment	Unloaded	4.991	Concentration
3			Time
Segment	Loaded	4.593	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	2.227	Concentration
5			Time
Segment	Loaded	3.929	Concentration
5			Time
Segment	Unloaded	4.703	Concentration
6			Time
Segment	Loaded	4.656	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	4.594	Concentration Time	4.091133 163352	6.294067 163355	6.9592 163358	4.781333 163401	4.080533 163404	4.121067 163407	4.082 163410	4.5922 163413	4.889867 163416	4.525533 163419	4.052 163422	3.909067 163425	4.066267 163428	4.797733 163431
Segment 9	Loaded	10.982	Concentration Time	5.307267 163652	6.680667 163655	7.602467 163658	7.913667 163701	7.730933 163704	6.658933 163707	8.165333 163710	8.0232 163713	5.664333 163716	4.873667 163719	5.035133 163722	5.0186 163725	4.1528 163728	3.3888 163731
Segment 10	Unloaded	3.156	Concentration Time	2.081333 164140	2.679467 164143	3.3592 164146	3.851667 164149	5.476667 164152	4.6838 164155	3.0908 164158	2.884667 164201	3.203333 164204	3.7054 164207	3.313133 164210	2.677133 164213	2.412533 164216	2.342333 164219
Segment 10	Loaded	2.834	Concentration Time	2.4268 164737	2.442067 164740	2.230733 164743	1.9556 164746	1.538333 164749	1.405867 164752	2.078133 164755	2.6802 164758	2.527667 164801	1.984467 164804	2.248333 164807	2.479667 164810	2.922733 164813	3.573933 164816
Segment 11	Unloaded	3.449	Concentration Time	2.7736 164355	2.364 164358	1.8696 164401	2.587733 164404	2.9134 164407	1.885667 164410	1.3698 164413	1.34 164416	1.386067 164419	1.3016 164422	1.139 164425	1.2426 164428	1.566067 164431	2.151333 164434
Segment 11	Loaded	5.238	Concentration Time	5.1372 164543	5.284133 164546	4.6904 164549	4.000867 164552	3.3648 164555	4.1524 164558	6.248067 164601	6.182667 164604	6.274333 164607	6.5516 164610	6.460667 164613	6.919133 164616	8.977067 164619	10.6538 164622



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	4.594	Concentration Time	5.748333 163434	7.969867 163437	13.51387 163440	19.2396 163443	19.69107 163446	15.8 163449	8.479867 163452	4.5424 163455	3.381933 163458	2.952733 163501	2.818667 163504	3.017267 163507	3.4352 163510	2.954867 163513
Segment 9	Loaded	10.982	Concentration Time	3.223067 163734	3.148867 163737	2.863467 163740	4.078333 163743	5.2766 163746	4.265533 163749	4.983267 163752	6.481267 163755	6.8384 163758	4.954933 163801	6.356467 163804	8.4956 163807	8.023133 163810	8.093267 163813
Segment 10	Unloaded	3.156	Concentration Time	2.1628 164222	2.010933 164225	1.9348 164228	2.651467 164231	4.1448 164234	4.1376 164237	3.491667 164240	3.393467 164243	3.639267 164246	5.022933 164249	5.756867 164252	3.6662 164255	3.3788 164258	4.2178 164301
Segment 10	Loaded	2.834	Concentration Time	2.996667 164819	2.569267 164822	3.985733 164825	5.5072 164828	7.013 164831	7.250733 164834	6.371 164837	6.335667 164840	6.095267 164843	5.0212 164846	3.527667 164849	2.5434 164852	2.119067 164855	2.5596 164858
Segment 11	Unloaded	3.449	Concentration Time	2.736467 164437	3.3688 164440	4.0464 164443	3.9584 164446	3.959267 164449	3.987333 164452	4.714133 164455	4.6952 164458	4.620733 164501	5.673467 164504	7.1644 164507	6.738867 164510	5.3798 164513	5.3302 164516
Segment 11	Loaded	5.238	Concentration Time	12.3218 164625	13.242 164628	10.21453 164631	7.754333 164634	5.4044 164637	4.593467 164640	4.7306 164643	4.040667 164646	3.841667 164649	4.2622 164652	3.222733 164655	2.676667 164658	2.569733 164701	2.8282 164704



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	4.594	Concentration Time	3.476 163516	5.2106 163519	4.742533 163522	5.375467 163525	5.2224 163528	3.8658 163531	3.0126 163534	2.1002 163537	2.001933 163540	1.728733 163543	1.2004 163546	1.380467 163549	1.4458 163552	1.207467 163555
Segment 9	Loaded	10.982	Concentration Time	8.391333 163816	7.789267 163819	6.5984 163822	5.4926 163825	5.723 163828	5.7136 163831	6.4956 163834	8.464667 163837	17.90807 163840	37.83887 163843	45.0142 163846	48.92813 163849	56.87813 163852	48.02187 163855
Segment 10	Unloaded	3.156	Concentration Time	3.899067 164304	3.0732 164307	3.049933 164310	2.921533 164313	2.6876 164316	2.8692 164319	2.982 164322	2.9254 164325	2.8018 164328	2.6554 164331	2.891933 164334	3.086867 164337	2.725133 164340	2.151267 164343
Segment 10	Loaded	2.834	Concentration Time	3.0384 164901	2.4844 164904	1.788933 164907	1.923667 164910	1.855333 164913	1.681467 164916	1.846667 164919	1.542467 164922	1.1928 164925	1.0726 164928	1.399933 164931	2.030533 164934	1.826467 164937	1.638333 164940
Segment 11	Unloaded	3.449	Concentration Time	6.048067 164519	5.0512 164522	3.7778 164525	3.6104 164528	3.7224 164531	3.012667 164534	2.7936 164537	3.868267 164540						
Segment 11	Loaded	5.238	Concentration Time	3.117467 164707	3.162067 164710	3.047333 164713	3.468067 164716	3.818667 164719	3.929067 164722	3.341267 164725	2.9358 164728	3.015333 164731	2.6058 164734				



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	4.594	Concentration Time	1.336867 163558	1.497867 163601	1.486733 163604	1.631533 163607	1.596067 163610	3.000267 163613	3.775933 163616	3.0426 163619	3.502333 163622	3.855867 163625	3.436467 163628	3.1912 163631	3.702667 163634	4.3322 163637
Segment 9	Loaded	10.982	Concentration Time	31.60247 163858	19.43727 163901	11.8656 163904	11.97673 163907	12.89953 163910	11.89767 163913	11.35587 163916	11.04727 163919	9.465467 163922	7.483733 163925	6.503467 163928	6.163067 163931	6.9628 163934	6.264733 163937
Segment 10	Unloaded	3.156	Concentration Time	1.7312 164346	1.864267 164349	2.3418 164352											
Segment 10	Loaded	2.834	Concentration Time	1.9608 164943	2.080467 164946	1.773867 164949											
Segment 11	Unloaded	3.449	Concentration Time														
Segment 11	Loaded	5.238	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 26

Segment 8	Unloaded	#DIV/0!	Concentration Time				
Segment 8	Loaded	#DIV/0!	Concentration Time				
Segment 9	Unloaded	4.594	Concentration Time	4.399467 163640	3.995667 163643	3.2334 163646	3.8472 163649
Segment 9	Loaded	10.982	Concentration Time	5.227467 163940	5.165467 163943	5.282133 163946	5.7888 163949
Segment 10	Unloaded	3.156	Concentration Time				
Segment 10	Loaded	2.834	Concentration Time				
Segment 11	Unloaded	3.449	Concentration Time				
Segment 11	Loaded	5.238	Concentration Time				



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 1	Unloaded	Average 6.550	Concentration Time	6.691 191513	6.995 191516	6.337 191519	5.669 191522	4.523 191525	4.163 191528	7.653 191531	10.370 191534						
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	5.144	Concentration Time	6.092 192401	5.487 192404	5.082 192407	5.442 192410	5.437 192413	4.777 192416	4.967 192419	4.919 192422	4.094 192425					
Segment 2	Loaded	4.924	Concentration Time	4.759 192743	4.354 192746	4.792 192749	5.620 192752	5.798 192755	5.235 192758	4.529 192801	3.804 192804	4.184 192807	6.162 192810				
Segment 3	Unloaded	10.286	Concentration Time	10.075 191537	12.346 191540	12.718 191543	10.373 191546	8.488 191549	8.226 191552	8.718 191555	9.460 191558	11.412 191601	11.974 191604	12.127 191607	12.944 191610	11.461 191613	11.277 191616
Segment 3	Loaded	12.643	Concentration Time	12.453 192237	12.659 192240	13.666 192243	12.594 192246	11.291 192249	13.080 192252	15.824 192255	15.348 192258	14.139 192301	15.611 192304	17.022 192307	15.147 192310	12.282 192313	11.766 192316
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	4.164	Concentration Time	4.084 192428	4.309 192431	4.149 192434	4.600 192437	5.069 192440	4.709 192443	4.571 192446	4.774 192449	5.283 192452	5.494 192455	5.278 192458	5.044 192501	4.738 192504	4.132 192507
Segment 5	Loaded	6.691	Concentration Time	7.314 192649	7.422 192652	6.922 192655	6.031 192658	6.419 192701	6.909 192704	7.358 192707	6.756 192710	5.857 192713	4.930 192716	5.043 192719	7.480 192722	9.365 192725	8.341 192728
Segment 6	Unloaded	4.940	Concentration Time	3.056 192531	3.017 192534	3.295 192537	3.619 192540	3.448 192543	3.815 192546	4.641 192549	5.644 192552	6.265 192555	6.578 192558	6.956 192601	6.507 192604	5.630 192607	4.821 192610
Segment 6	Loaded	9.781	Concentration Time	8.114 192625	11.495 192628	13.170 192631	12.541 192634	8.901 192637	7.725 192640	7.971 192643	8.330 192646						
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 1	Unloaded	Average 6.550	Concentration Time												
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.144	Concentration Time												
Segment 2	Loaded	4.924	Concentration Time												
Segment 3	Unloaded	10.286	Concentration Time	11.714 191619	9.940 191622	10.360 191625	12.858 191628	11.130 191631	7.228 191634	5.683 191637	5.788 191640				
Segment 3	Loaded	12.643	Concentration Time	12.288 192319	11.189 192322	11.311 192325	12.864 192328	13.804 192331	12.527 192334	11.295 192337	10.920 192340	11.209 192343	10.269 192346	9.188 192349	8.971 192352
Segment 4	Unloaded	#DIV/0!	Concentration Time												
Segment 4	Loaded	#DIV/0!	Concentration Time												
Segment 5	Unloaded	4.164	Concentration Time	3.535 192510	3.202 192513	2.805 192516	2.765 192519	3.078 192522	2.974 192525	2.860 192528					
Segment 5	Loaded	6.691	Concentration Time	6.864 192731	6.618 192734	5.738 192737	5.069 192740								
Segment 6	Unloaded	4.940	Concentration Time	4.885 192613	5.671 192616	5.578 192619	5.489 192622								
Segment 6	Loaded	9.781	Concentration Time												
Segment 7	Unloaded	#DIV/0!	Concentration Time												
Segment 7	Loaded	#DIV/0!	Concentration Time												



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment	Unloaded	Average	Concentration
1		6.550	Time
Segment	Loaded	#DIV/0!	Concentration
1			Time
Segment	Unloaded	5.144	Concentration
2			Time
Segment	Loaded	4.924	Concentration
2			Time
Segment	Unloaded	10.286	Concentration
3			Time
Segment	Loaded	12.643	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	4.164	Concentration
5			Time
Segment	Loaded	6.691	Concentration
5			Time
Segment	Unloaded	4.940	Concentration
6			Time
Segment	Loaded	9.781	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 1	Unloaded	Average 6.550	Concentration Time
Segment 1	Loaded	#DIV/0!	Concentration Time
Segment 2	Unloaded	5.144	Concentration Time
Segment 2	Loaded	4.924	Concentration Time
Segment 3	Unloaded	10.286	Concentration Time
Segment 3	Loaded	12.643	Concentration Time
Segment 4	Unloaded	#DIV/0!	Concentration Time
Segment 4	Loaded	#DIV/0!	Concentration Time
Segment 5	Unloaded	4.164	Concentration Time
Segment 5	Loaded	6.691	Concentration Time
Segment 6	Unloaded	4.940	Concentration Time
Segment 6	Loaded	9.781	Concentration Time
Segment 7	Unloaded	#DIV/0!	Concentration Time
Segment 7	Loaded	#DIV/0!	Concentration Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 1	Unloaded	Average 6.550	Concentration Time
Segment 1	Loaded	#DIV/0!	Concentration Time
Segment 2	Unloaded	5.144	Concentration Time
Segment 2	Loaded	4.924	Concentration Time
Segment 3	Unloaded	10.286	Concentration Time
Segment 3	Loaded	12.643	Concentration Time
Segment 4	Unloaded	#DIV/0!	Concentration Time
Segment 4	Loaded	#DIV/0!	Concentration Time
Segment 5	Unloaded	4.164	Concentration Time
Segment 5	Loaded	6.691	Concentration Time
Segment 6	Unloaded	4.940	Concentration Time
Segment 6	Loaded	9.781	Concentration Time
Segment 7	Unloaded	#DIV/0!	Concentration Time
Segment 7	Loaded	#DIV/0!	Concentration Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	10.519	Concentration Time	7.198 191643	11.980 191646	10.182 191649	7.110 191652	7.204 191655	7.453 191658	6.484 191701	6.067 191704	6.130 191707	5.984 191710	5.631 191713	4.931 191716	4.989 191719	5.501 191722
Segment 9	Loaded	36.863	Concentration Time	18.668 191943	29.756 191946	40.377 191949	54.123 191952	48.532 191955	28.970 191958	20.375 192001	11.794 192004	9.461 192007	10.649 192010	11.400 192013	14.360 192016	14.717 192019	12.408 192022
Segment 10	Unloaded	4.852	Concentration Time	5.430 190552	4.664 190555	5.537 190558	5.536 190601	4.885 190604	4.583 190607	4.554 190610	4.465 190613	4.027 190616	3.813 190619	4.821 190622	5.302 190625	5.257 190628	5.542 190631
Segment 10	Loaded	5.400	Concentration Time	6.640 191301	6.033 191304	5.047 191307	4.534 191310	4.106 191313	3.780 191316	3.600 191319	3.992 191322	4.399 191325	4.218 191328	4.577 191331	5.368 191334	5.389 191337	4.764 191340
Segment 11	Unloaded	7.324	Concentration Time	4.058 190804	5.523 190807	6.561 190810	9.671 190813	9.979 190816	7.336 190819	6.490 190822	5.579 190825	4.533 190828	4.186 190831	3.866 190834	3.716 190837	4.280 190840	5.221 190843
Segment 11	Loaded	7.176	Concentration Time	6.289 190952	6.224 190955	6.456 190958	6.943 191001	7.225 191004	7.964 191007	7.557 191010	6.666 191013	6.144 191016	5.375 191019	6.012 191022	7.022 191025	7.144 191028	9.141 191031



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	10.519	Concentration Time	8.434 191725	14.307 191728	24.121 191731	33.062 191734	27.349 191737	17.273 191740	15.080 191743	11.307 191746	7.735 191749	6.929 191752	9.753 191755	9.773 191758	8.257 191801	12.253 191804
Segment 9	Loaded	36.863	Concentration Time	14.057 192025	21.285 192028	23.871 192031	22.660 192034	23.148 192037	27.521 192040	29.568 192043	25.082 192046	27.051 192049	34.997 192052	36.650 192055	51.416 192058	106.817 192101	127.903 192104
Segment 10	Unloaded	4.852	Concentration Time	5.619 190634	5.678 190637	5.683 190640	5.690 190643	5.109 190646	4.193 190649	3.747 190652	3.422 190655	3.954 190658	4.559 190701	4.762 190704	4.716 190707	4.989 190710	5.335 190713
Segment 10	Loaded	5.400	Concentration Time	4.204 191343	4.129 191346	5.450 191349	6.086 191352	6.993 191355	7.616 191358	7.699 191401	8.305 191404	9.335 191407	8.631 191410	6.893 191413	6.134 191416	6.053 191419	6.523 191422
Segment 11	Unloaded	7.324	Concentration Time	6.022 190846	6.526 190849	6.984 190852	6.883 190855	7.127 190858	7.695 190901	7.255 190904	7.552 190907	8.405 190910	10.021 190913	13.738 190916	13.083 190919	10.251 190922	8.432 190925
Segment 11	Loaded	7.176	Concentration Time	11.250 191034	12.362 191037	12.651 191040	11.376 191043	10.960 191046	11.344 191049	10.328 191052	9.626 191055	10.409 191058	12.140 191101	12.004 191104	11.017 191107	10.892 191110	10.919 191113



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	10.519	Concentration Time	24.005 191807	17.233 191810	16.866 191813	21.982 191816	18.038 191819	9.935 191822	8.036 191825	10.985 191828	9.744 191831	6.250 191834	5.809 191837	6.669 191840	8.027 191843	9.510 191846
Segment 9	Loaded	36.863	Concentration Time	86.763 192107	60.826 192110	50.791 192113	46.469 192116	57.157 192119	59.614 192122	65.823 192125	113.194 192128	106.281 192131	100.820 192134	122.087 192137	85.621 192140	45.813 192143	28.133 192146
Segment 10	Unloaded	4.852	Concentration Time	5.088 190716	4.895 190719	5.179 190722	5.607 190725	5.425 190728	5.040 190731	5.413 190734	5.012 190737	4.775 190740	5.127 190743	5.310 190746	5.037 190749	4.347 190752	3.808 190755
Segment 10	Loaded	5.400	Concentration Time	6.661 191425	6.039 191428	5.457 191431	4.861 191434	4.353 191437	4.670 191440	4.493 191443	3.942 191446	3.855 191449	3.938 191452	4.155 191455	4.199 191458	4.377 191501	4.936 191504
Segment 11	Unloaded	7.324	Concentration Time	6.713 190928	7.374 190931	8.738 190934	9.591 190937	8.843 190940	7.898 190943	7.014 190946	6.520 190949						
Segment 11	Loaded	7.176	Concentration Time	9.173 191116	6.836 191119	5.680 191122	5.085 191125	4.855 191128	4.857 191131	4.557 191134	4.341 191137	4.406 191140	4.250 191143	4.527 191146	4.483 191149	4.193 191152	4.889 191155



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	10.519	Concentration Time	8.708 191849	7.003 191852	6.402 191855	6.018 191858	5.757 191901	5.982 191904	5.107 191907	5.141 191910	6.421 191913	10.193 191916	13.583 191919	11.163 191922	8.268 191925	10.965 191928
Segment 9	Loaded	36.863	Concentration Time	22.246 192149	22.837 192152	22.667 192155	20.162 192158	15.600 192201	12.357 192204	10.799 192207	10.329 192210	10.102 192213	9.378 192216	8.912 192219	8.921 192222	9.145 192225	8.768 192228
Segment 10	Unloaded	4.852	Concentration Time	3.791 190758	3.763 190801												
Segment 10	Loaded	5.400	Concentration Time	5.747 191507													
Segment 11	Unloaded	7.324	Concentration Time														
Segment 11	Loaded	7.176	Concentration Time	4.651 191158	3.876 191201	3.615 191204	3.578 191207	3.636 191210	3.450 191213	3.657 191216	5.034 191219	5.652 191222	5.905 191225	5.820 191228	5.669 191231	6.751 191234	7.570 191237



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 27

Segment 8	Unloaded	#DIV/0!	Concentration Time				
Segment 8	Loaded	#DIV/0!	Concentration Time				
Segment 9	Unloaded	10.519	Concentration Time	12.072 191931	10.022 191934	10.432 191937	12.342 191940
Segment 9	Loaded	36.863	Concentration Time	8.736 192231	10.074 192234		
Segment 10	Unloaded	4.852	Concentration Time				
Segment 10	Loaded	5.400	Concentration Time				
Segment 11	Unloaded	7.324	Concentration Time				
Segment 11	Loaded	7.176	Concentration Time	6.819 191240	5.523 191243	5.944 191246	8.700 191249



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment 1	Unloaded	Average 11.846	Concentration Time	8.915 195618	8.829 195621	6.603 195624	4.877 195627	6.743 195630	17.684 195633	22.699 195636	18.420 195639						
Segment 1	Loaded	#DIV/0!	Concentration Time														
Segment 2	Unloaded	5.352	Concentration Time	6.697 200512	5.646 200515	4.850 200518	4.706 200521	4.627 200524	4.998 200527	5.434 200530	5.453 200533	5.754 200536					
Segment 2	Loaded	7.635	Concentration Time	6.171 200806	6.679 200809	8.146 200812	10.582 200815	10.021 200818	7.046 200821	5.917 200824	5.926 200827	7.494 200830	8.913 200833	7.090 200836			
Segment 3	Unloaded	10.417	Concentration Time	14.496 195642	9.918 195645	6.988 195648	7.774 195651	8.097 195654	7.713 195657	9.023 195700	9.882 195703	11.457 195706	13.159 195709	11.732 195712	10.800 195715	13.212 195718	14.807 195721
Segment 3	Loaded	14.866	Concentration Time	16.616 200351	21.269 200354	20.414 200357	19.429 200400	21.814 200403	19.309 200406	15.392 200409	15.333 200412	18.226 200415	19.305 200418	18.325 200421	16.509 200424	15.935 200427	14.358 200430
Segment 4	Unloaded	#DIV/0!	Concentration Time														
Segment 4	Loaded	#DIV/0!	Concentration Time														
Segment 5	Unloaded	5.320	Concentration Time	5.704 200539	5.252 200542	4.710 200545	4.472 200548	4.297 200551	3.842 200554	4.272 200557	5.310 200600	6.326 200603	7.101 200606	6.575 200609	5.887 200612	5.372 200615	4.935 200618
Segment 5	Loaded	7.826	Concentration Time	7.843 200715	7.063 200718	7.935 200721	8.410 200724	8.996 200727	9.570 200730	8.553 200733	7.048 200736	5.940 200739	6.470 200742	9.153 200745	10.247 200748	9.239 200751	7.374 200754
Segment 6	Unloaded	8.960	Concentration Time	7.428 200627	10.124 200630	11.340 200633	10.663 200636	9.696 200639	8.054 200642	6.699 200645	7.673 200648						
Segment 6	Loaded	10.682	Concentration Time	12.193 200651	14.474 200654	13.056 200657	9.731 200700	8.369 200703	8.718 200706	9.727 200709	9.188 200712						
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	Loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment 1	Unloaded	Average 11.846	Concentration Time												
Segment 1	Loaded	#DIV/0!	Concentration Time												
Segment 2	Unloaded	5.352	Concentration Time												
Segment 2	Loaded	7.635	Concentration Time												
Segment 3	Unloaded	10.417	Concentration Time	14.807 195724	13.964 195727	12.687 195730	8.231 195733	5.871 195736	5.901 195739	8.240 195742					
Segment 3	Loaded	14.866	Concentration Time	13.630 200433	14.538 200436	16.567 200439	15.165 200442	12.255 200445	11.254 200448	10.315 200451	9.929 200454	8.800 200457	7.420 200500	7.276 200503	7.121 200506
Segment 4	Unloaded	#DIV/0!	Concentration Time												
Segment 4	Loaded	#DIV/0!	Concentration Time												
Segment 5	Unloaded	5.320	Concentration Time	5.221 200621	5.846 200624										
Segment 5	Loaded	7.826	Concentration Time	6.775 200757	6.574 200800	5.858 200803									
Segment 6	Unloaded	8.960	Concentration Time												
Segment 6	Loaded	10.682	Concentration Time												
Segment 7	Unloaded	#DIV/0!	Concentration Time												
Segment 7	Loaded	#DIV/0!	Concentration Time												



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment	Unloaded	Average 11.846	Concentration
1			Time
Segment	Loaded	#DIV/0!	Concentration
1			Time
Segment	Unloaded	5.352	Concentration
2			Time
Segment	Loaded	7.635	Concentration
2			Time
Segment	Unloaded	10.417	Concentration
3			Time
Segment	Loaded	14.866	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	5.320	Concentration
5			Time
Segment	Loaded	7.826	Concentration
5			Time
Segment	Unloaded	8.960	Concentration
6			Time
Segment	Loaded	10.682	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment	Unloaded	Average 11.846	Concentration
1			Time
Segment	Loaded	#DIV/0!	Concentration
1			Time
Segment	Unloaded	5.352	Concentration
2			Time
Segment	Loaded	7.635	Concentration
2			Time
Segment	Unloaded	10.417	Concentration
3			Time
Segment	Loaded	14.866	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	5.320	Concentration
5			Time
Segment	Loaded	7.826	Concentration
5			Time
Segment	Unloaded	8.960	Concentration
6			Time
Segment	Loaded	10.682	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment	Unloaded	Average 11.846	Concentration
1			Time
Segment	Loaded	#DIV/0!	Concentration
1			Time
Segment	Unloaded	5.352	Concentration
2			Time
Segment	Loaded	7.635	Concentration
2			Time
Segment	Unloaded	10.417	Concentration
3			Time
Segment	Loaded	14.866	Concentration
3			Time
Segment	Unloaded	#DIV/0!	Concentration
4			Time
Segment	Loaded	#DIV/0!	Concentration
4			Time
Segment	Unloaded	5.320	Concentration
5			Time
Segment	Loaded	7.826	Concentration
5			Time
Segment	Unloaded	8.960	Concentration
6			Time
Segment	Loaded	10.682	Concentration
6			Time
Segment	Unloaded	#DIV/0!	Concentration
7			Time
Segment	Loaded	#DIV/0!	Concentration
7			Time



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	12.919	Concentration Time	12.829 195745	11.931 195748	8.518 195751	8.509 195754	8.192 195757	7.585 195800	8.246 195803	8.607 195806	8.144 195809	8.304 195812	7.413 195815	7.117 195818	7.801 195821	9.578 195824
Segment 9	Loaded	35.126	Concentration Time	12.104 200045	16.784 200048	24.430 200051	32.185 200054	30.034 200057	33.332 200100	39.208 200103	36.915 200106	26.296 200109	12.864 200112	9.758 200115	9.200 200118	9.097 200121	17.495 200124
Segment 10	Unloaded	4.747	Concentration Time	4.064 194824	4.652 194827	4.889 194830	4.444 194833	4.450 194836	4.126 194839	3.765 194842	3.591 194845	4.075 194848	4.292 194851	4.401 194854	5.115 194857	5.056 194900	5.762 194903
Segment 10	Loaded	9.523	Concentration Time	7.302 195415	8.156 195418	7.927 195421	7.233 195424	8.884 195427	10.660 195430	10.969 195433	9.983 195436	9.260 195439	9.406 195442	8.260 195445	8.323 195448	8.947 195451	12.838 195454
Segment 11	Unloaded	6.474	Concentration Time	4.393 195036	4.761 195039	4.987 195042	5.654 195045	6.117 195048	5.585 195051	4.779 195054	4.238 195057	3.106 195100	2.597 195103	2.683 195106	2.702 195109	3.082 195112	4.207 195115
Segment 11	Loaded	8.738	Concentration Time	9.516 195224	10.080 195227	8.247 195230	6.449 195233	6.529 195236	7.373 195239	8.426 195242	9.619 195245	9.132 195248	8.879 195251	8.836 195254	9.648 195257	9.657 195300	9.379 195303



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	12.919	Concentration Time	11.263 195827	13.246 195830	17.565 195833	30.587 195836	35.992 195839	23.875 195842	16.918 195845	11.630 195848	9.211 195851	6.861 195854	7.342 195857	9.041 195900	10.115 195903	12.070 195906
Segment 9	Loaded	35.126	Concentration Time	24.304 200127	14.923 200130	11.525 200133	15.298 200136	20.839 200139	24.060 200142	27.600 200145	27.755 200148	30.655 200151	25.481 200154	21.446 200157	35.968 200200	58.526 200203	63.827 200206
Segment 10	Unloaded	4.747	Concentration Time	5.938 194906	5.411 194909	5.539 194912	5.227 194915	5.052 194918	4.817 194921	4.304 194924	4.537 194927	5.125 194930	5.358 194933	4.828 194936	4.394 194939	4.451 194942	4.578 194945
Segment 10	Loaded	9.523	Concentration Time	16.490 195457	18.808 195500	17.172 195503	13.438 195506	10.650 195509	13.432 195512	14.608 195515	13.102 195518	11.627 195521	10.422 195524	12.366 195527	12.588 195530	9.788 195533	7.213 195536
Segment 11	Unloaded	6.474	Concentration Time	5.647 195118	6.304 195121	6.632 195124	6.752 195127	8.583 195130	9.965 195133	8.895 195136	8.895 195139	10.041 195142	9.527 195145	9.282 195148	8.486 195151	7.896 195154	7.396 195157
Segment 11	Loaded	8.738	Concentration Time	9.550 195306	8.528 195309	7.646 195312	9.359 195315	11.055 195318	10.638 195321	8.472 195324	7.002 195327	6.751 195330	7.489 195333	9.463 195336	10.018 195339	8.453 195342	7.889 195345



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	12.919	Concentration Time	23.779 195909	37.850 195912	35.298 195915	39.464 195918	33.440 195921	12.820 195924	8.402 195927	13.665 195930	15.980 195933	9.522 195936	7.234 195939	7.070 195942	7.031 195945	7.112 195948
Segment 9	Loaded	35.126	Concentration Time	77.940 200209	115.387 200212	102.960 200215	63.170 200218	44.629 200221	35.336 200224	38.868 200227	43.775 200230	52.401 200233	75.743 200236	162.457 200239	153.586 200242	99.241 200245	73.541 200248
Segment 10	Unloaded	4.747	Concentration Time	4.946 194948	6.036 194951	5.638 194954	4.831 194957	4.616 195000	4.728 195003	4.796 195006	4.784 195009	5.308 195012	4.969 195015	4.635 195018	4.544 195021	4.476 195024	4.322 195027
Segment 10	Loaded	9.523	Concentration Time	6.565 195539	6.224 195542	6.165 195545	5.838 195548	5.808 195551	5.858 195554	5.515 195557	5.513 195600	5.053 195603	4.947 195606	6.193 195609	7.369 195612		
Segment 11	Unloaded	6.474	Concentration Time	6.292 195200	6.193 195203	6.421 195206	6.390 195209	6.402 195212	8.659 195215	10.523 195218	9.006 195221						
Segment 11	Loaded	8.738	Concentration Time	7.467 195348	8.147 195351	9.324 195354	8.876 195357	9.851 195400	11.304 195403	9.660 195406	7.688 195409	6.902 195412					



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	Loaded	#DIV/0!	Concentration Time														
Segment 9	Unloaded	12.919	Concentration Time	9.455 195951	11.387 195954	8.969 195957	7.559 200000	7.076 200003	6.522 200006	6.507 200009	8.312 200012	13.128 200015	13.623 200018	12.112 200021	11.395 200024	10.670 200027	11.410 200030
Segment 9	Loaded	35.126	Concentration Time	51.341 200251	35.576 200254	23.007 200257	19.214 200300	16.057 200303	15.226 200306	15.708 200309	13.664 200312	11.238 200315	10.744 200318	10.886 200321	10.662 200324	9.489 200327	10.521 200330
Segment 10	Unloaded	4.747	Concentration Time	3.946 195030	4.052 195033												
Segment 10	Loaded	9.523	Concentration Time														
Segment 11	Unloaded	6.474	Concentration Time														
Segment 11	Loaded	8.738	Concentration Time														



Iron Mining Association of Minnesota United Taconite Summer Segment Data - Run 28

Segment 8	Unloaded	#DIV/0!	Concentration Time						
Segment 8	Loaded	#DIV/0!	Concentration Time						
Segment 9	Unloaded	12.919	Concentration Time	12.399 200033	10.130 200036	8.285 200039	9.063 200042		
Segment 9	Loaded	35.126	Concentration Time	10.796 200333	10.200 200336	10.824 200339	10.705 200342	15.141 200345	15.896 200348
Segment 10	Unloaded	4.747	Concentration Time						
Segment 10	Loaded	9.523	Concentration Time						
Segment 11	Unloaded	6.474	Concentration Time						
Segment 11	Loaded	8.738	Concentration Time						



## Iron Mining Association of Minnesota Winter Emission Factor - Summary

Run	Location	Weighted Run Conc. (mg/m3)	Average (mg/m3)	Emission factor (lb/VMT)
8	USS Minntac	0.372	3.99	7.77
9	USS Minntac	0.624		
10	USS Minntac	5.384		
11	USS Minntac	5.627		
12	USS Minntac	7.926		
14	United Taconite	12.426	15.64	40.2
16	United Taconite	17.227		
17	United Taconite	17.253		



Iron Mining Association of Minnesota Winter Emission Factor - Overall Analysis

Run 8	1/9/2007	11:07-12:19	Minntac	Truck Data taken from a 2-hr time period							VMT*Conc	VMT*Conc	Weighted Conc.	Weighted Conc.	Average Traffic			
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT- L	VMT- Total	Conc- UnL	Conc- L	Avg. UnL-L	Unloaded	Loaded	Unloaded	Loaded				
1	34	14	48	0.15	5.10	2.10	7.20	0.023		0.023	0.117	0.000						
2	26	6	32	0.11	2.86	0.66	3.52	0.024		0.024	0.069	0.000						
3	20	0	20	1.91	38.20	0.00	38.20	0.147	0.000	0.074	5.615	0.000						
4	18	18	36	0.86	15.48	15.48	30.96	0.315	0.393	0.354	4.876	6.084						
5	9	9	18	1.40	12.60	12.60	25.20	0.427	0.482	0.455	5.380	6.073						
6	9	9	18	0.41	3.69	3.69	7.38	0.206	0.438	0.322	0.760	1.616						
7	1	1	2	0.49	0.49	0.49	0.98	0.034	1.077	0.556	0.017	0.528						
8	0	1	1	0.50	0.00	0.50	0.50		1.482	1.482	0.000	0.741						
9	1	1	2	0.63	0.63	0.63	1.26	0.162	0.912	0.537	0.102	0.575						
10	1	0	1	0.68	0.68	0.00	0.68	0.027	0.000	0.014	0.018	0.000						
11	9	9	18	0.32	2.88	2.88	5.76	0.022		0.022	0.063	0.000						
12	9	9	18	0.48	4.32	4.32	8.64	--	--		--	--						
14	0	20	20	2.13	0.00	42.60	42.60	0.000	0.741	0.371	0.000	31.567						
					Sum:			Average:			Sum:							
					86.930			85.950			0.353			17.018	47.183	0.196	0.549	0.372
Run 9	1/9/2007	14:39-15:44	Minntac	Truck Data taken from a 2-hr time period							VMT*Conc	VMT*Conc						
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded						
1	62	26	88	0.15	9.30	3.90	13.20	0.577	0.453	0.515	5.366	1.767						
2	49	13	62	0.11	5.39	1.43	6.82	1.189	1.158	1.174	6.409	1.656						
4	25	25	50	0.86	21.50	21.50	43.00		0.638	0.638	0.000	13.717						
11	0	0	0	0.32	0.00	0.00	0.00		0.023	0.023	0.000	0.000						
13	11	11	22	0.62	6.82	6.82	13.64	0.783	2.425	1.604	5.340	16.539						
14	0	36	36	2.13	0.00	76.68	76.68	0.000	0.561	0.281	0.000	43.017						
18	13	13	26	1.98	25.74	25.74	51.48	1.142	1.943	1.543	29.395	50.013						
19	13	13	26	1.87	24.31	24.31	48.62	0.051		0.051	1.240	0.000						
20	35	35	70	0.49	17.15	17.15	34.30		1.351	1.351	0.000	23.170						
21	13	13	26	0.56	7.28	7.28	14.56	0.030	0.722	0.376	0.218	5.256						
					Sum:			Average:			Sum:							
					117.490			184.810			0.755			47.968	155.134	0.408	0.839	0.624
Run 10	1/10/2007	8:58-9:48	Minntac	Truck Data taken from a 2-hr time period							VMT*Conc	VMT*Conc						
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded						
1	44	27	71	0.15	6.60	4.05	10.65	4.233	9.447	6.840	27.938	38.260						
19	13	13	26	1.87	24.31	24.31	48.62	3.717	7.616	5.667	90.360	185.145						
20	12	12	24	0.49	5.88	5.88	11.76	--	--		--	--						
21	4	4	8	0.56	2.24	2.24	4.48	12.070	14.206	13.138	27.037	31.821						
22	8	8	16	0.45	3.60	3.60	7.20	5.106	9.744	7.425	18.382	35.078						
23	9	9	18	0.71	6.39	6.39	12.78		8.595	8.595	0.000	54.922						
					Sum:			Average:			Sum:							
					49.020			46.470			5.518			163.717	345.227	3.340	7.429	5.384



Iron Mining Association of Minnesota Winter Emission Factor - Overall Analysis

Run 11	1/10/2007	9:56-10:47	Minntac		Truck Data taken from a 2-hr time period						VMT*Conc	
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded
1	35	13	48	0.15	5.25	1.95	7.20	3.457	30.893	17.175	18.149	60.241
2	27	11	38	0.11	2.97	1.21	4.18	3.600	10.221	6.911	10.692	12.367
3	16	0	16	1.91	30.56	0.00	30.56	4.687		4.687	143.235	0.000
4	6	6	12	0.86	5.16	5.16	10.32	3.279	4.705	3.992	16.920	24.278
5	5	5	10	1.40	7.00	7.00	14.00	3.643	6.153	4.898	25.501	43.071
6	5	5	10	0.41	2.05	2.05	4.10	4.076	8.573	6.325	8.356	17.575
7	8	8	16	0.49	3.92	3.92	7.84	4.236	3.775	4.006	16.605	14.798
8	0	8	8	0.50	0.00	4.00	4.00		5.927	5.927	0.000	23.708
9	8	8	16	0.63	5.04	5.04	10.08	4.821	3.439	4.130	24.298	17.333
10	8	0	8	0.68	5.44	0.00	5.44	4.573		4.573	24.877	0.000
13	11	11	22	0.62	6.82	6.82	13.64	6.608	9.158	7.883	45.067	62.458
14	0	16	16	2.13	0.00	34.08	34.08		4.085	4.085	0.000	139.217
18	11	11	22	1.98	21.78	21.78	43.56		14.155	14.155	0.000	308.296
Sum:										Average:	Sum:	
					95.990	93.010				6.827	333.699	723.341
										3.476	7.777	5.627

Run 12	1/10/2007	12:10-13:02	Minntac		Truck Data taken from a 2-hr time period						VMT*Conc	
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded
1	53	19	72	0.15	7.95	2.85	10.80	9.797	7.677	8.737	77.886	21.879
2	40	16	56	0.11	4.40	1.76	6.16	2.639	6.103	4.371	11.612	10.741
3	24	0	24	1.91	45.84	0.00	45.84	9.806	0.000	4.903	449.507	0.000
13	16	16	32	0.62	9.92	9.92	19.84	12.575	5.294	8.935	124.744	52.516
14	0	24	24	2.13	0.00	51.12	51.12	0.000	4.028	2.014	0.000	205.911
18	16	16	32	1.98	31.68	31.68	63.36	6.922	13.936	10.429	219.289	441.492
19	13	13	26	1.87	24.31	24.31	48.62	3.357	11.163	7.260	81.609	271.373
20	3	3	6	0.49	1.47	1.47	2.94	--	--		--	--
22	0	0	0	0.45	0.00	0.00	0.00	16.402	23.328	19.865	0.000	0.000
23	10	10	20	0.71	7.10	7.10	14.20	7.755	8.351	8.053	55.061	59.292
Sum:										Average:	Sum:	
					132.670	130.210				8.285	1019.707	1063.206
										7.686	8.165	7.926

Run 13	1/10/2007	13:16-13:22	Minntac		Truck Data taken from a 1-hr time period						VMT*Conc	
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded
23	7	7	14	0.71	4.97	4.97	9.94	--	--		--	--



Iron Mining Association of Minnesota Winter Emission Factor - Overall Analysis

Run 14	1/11/2007	9:12-9:48	United Taconite		Truck Data taken from a 1-hr time period						VMT*Conc	VMT*Conc				
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded				
1	9	7	16	0.12	1.08	0.84	1.92	crusher area			--	--				
2	9	4	13	0.16	1.44	0.64	2.08	13.660	21.212	0.644	19.670	13.576				
3	6	4	10	0.54	3.24	2.16	5.40	26.178	50.525	0.518	84.817	109.134				
4	4	4	8	0.54	2.16	2.16	4.32	24.887	29.767	0.836	53.756	64.297				
5	2	0	2	0.48	0.96	0.00	0.96	33.480	0.000		32.141	0.000				
678	0	2	2	1.58	0.00	3.16	3.16	0.000	29.121		0.000	92.022				
9	0	3	4	0.52	0.00	1.56	2.08	12.090	5.185	2.332	0.000	8.089				
10	10	10	20	0.44	4.40	4.40	8.80				0.000	0.000				
11	3	3	6	0.72	2.16	2.16	4.32	5.717	6.565	0.871	12.349	14.180				
12	7	7	14	0.33	2.31	2.31	4.62	8.750	10.206	0.857	20.213	23.576				
13	10	7	17	0.14	1.40	0.98	2.38				0.000	0.000				
14	7	7	14	0.72	5.04	5.04	10.08	7.271	6.736	1.079	36.646	33.949				
					Sum:						Average:		Sum:			
					24.190			25.410			1.020		259.591		358.823	
												10.731	14.121	12.426		

Run 15	1/11/2007	10:06-10:20	United Taconite		Truck Data taken from a 2-hr time period											
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded				
10	19	19	38	0.44	8.36	8.36	16.72									

Run 16	1/11/2007	10:27-10:55	United Taconite		Truck Data taken from a 1-hr time period						VMT*Conc	VMT*Conc				
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded				
1	9	5	14	0.12	1.08	0.60	1.68	crusher area			--	--				
2	9	5	14	0.16	1.44	0.80	2.24	15.398	13.963	1.103	22.173	11.170				
3	9	5	14	0.54	4.86	2.70	7.56	26.208	42.362	0.619	127.371	114.377				
4	5	5	10	0.54	2.70	2.70	5.40	25.866	27.545	0.939	69.838	74.372				
5	4	0	4	0.48	1.92	0.00	1.92	32.425	0.000		62.256	0.000				
678	0	4	4	1.58	0.00	6.32	6.32	0.000	26.836		0.000	169.604				
9	0	0	0	0.52	0.00	0.00	0.00	no activity			0.000	0.000				
10	9	9	18	0.44	3.96	3.96	7.92				0.000	0.000				
11	0	0	0	0.72	0.00	0.00	0.00	no activity			0.000	0.000				
12	9	9	18	0.33	2.97	2.97	5.94	10.173	11.973	0.850	30.214	35.560				
13	9	9	18	0.14	1.26	1.26	2.52				0.000	0.000				
14	9	9	18	0.72	6.48	6.48	12.96	7.078	7.799	0.908	45.865	50.538				
					20.190			21.310			0.878		311.852		405.083	
												15.446	19.009	17.227		



Iron Mining Association of Minnesota Winter Emission Factor - Overall Analysis

Run 17	1/11/2007	13:16-13:47	United Taconite	Truck Data taken from a 1-hr time period							VMT*Conc	VMT*Conc			
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded			
1	10	6	16	0.12	1.20	0.72	1.92	crusher area			--	--			
2	10	6	16	0.16	1.60	0.96	2.56	10.112	16.304	0.620	16.179	15.652			
3	10	6	16	0.54	5.40	3.24	8.64	20.713	58.096	0.357	111.850	188.231			
4	6	6	12	0.54	3.24	3.24	6.48	16.684	26.567	0.628	54.056	86.077			
5	4	0	4	0.48	1.92	0.00	1.92	26.920	0.000		51.686	0.000			
678	0	4	4	1.58	0.00	6.32	6.32	0.000	21.195		0.000	133.952			
9	0	0	0	0.52	0.00	0.00	0.00	no activity			0.000	0.000			
10	6	6	12	0.44	2.64	2.64	5.28				0.000	0.000			
11	0	0	0	0.72	0.00	0.00	0.00	no activity			0.000	0.000			
12	8	8	12	0.33	2.64	2.64	3.96	7.620	6.983	1.091	20.117	18.435			
13	6	6	12	0.14	0.84	0.84	1.68				0.000	0.000			
14	6	6	12	0.72	4.32	4.32	8.64	5.390	4.304	1.252	23.285	18.593			
					19.480	20.600				0.674	253.889	442.347	13.033	21.473	17.253

Run 18	1/11/2007	14:00-14:07	United Taconite		Truck Data taken from a 1-hr time period						VMT*Conc	VMT*Conc
Segment	Unloaded	Loaded	Total	Length (mi)	VMT- UnL	VMT-L	VMT-Total	Conc-UnL	Conc- L	Ratio UnL-L	Unloaded	Loaded
3	10	6	16	0.54	5.4	3.24	8.64					



# Iron Mining Association of Minnesota Winter Emission Factor

## Segment Lengths

Minntac Segment No.	Length (mi)	United Taconite Segment No.	Length (mi)
1	0.15	1	0.12
2	0.11	2	0.16
3	1.91	3	0.54
4	0.86	4	0.54
5	1.4	5	0.48
6	0.41	6+7+8	1.58
7	0.49	9	0.52
8	0.5	10	0.44
9	0.63	11	0.72
10	0.68	12	0.33
11	0.32	13	0.14
12	0.48	14	0.72
13	0.62	15	0.2
14	2.13	16	0.06
15	crusher		
16	crusher		
17	crusher		
18	1.98		
19	1.87		
20	0.49		
21	0.56		
22	0.45		
23	0.71		



**Iron Mining Association of Minnesota Winter Emission Factor - Run 13 Repeatability**

name	time	name	time	name	time
5.877	191658	12.950	191855	29.549	192055
6.136	191701	12.324	191858	38.433	192058
7.152	191704	8.478	191901	35.378	192101
8.501	191707	11.580	191904	17.322	192104
8.536	191710	9.554	191907	8.048	192107
8.154	191713	5.444	191910	9.436	192110
9.580	191716	7.363	191913	8.356	192113
9.603	191719	8.920	191916	9.121	192116
10.134	191722	14.600	191919	13.855	192119
10.918	191725	19.553	191922	15.742	192122
10.229	191728	16.160	191925	21.859	192125
10.278	191731	19.988	191928	20.208	192128
9.226	191734	33.575	191931	12.208	192131
7.927	191737	33.357	191934	12.185	192134
5.534	191740	29.020	191937	10.599	192137
4.253	191743	20.163	191940	7.567	192140
4.568	191746	18.009	191943	9.409	192143
6.922	191749	9.174	191946	11.590	192146
8.213	191752	8.236	191949	8.880	192149
10.820	191755	9.167	191952	5.010	192152
7.806	191758	8.065	191955	5.610	192155
6.274	191801	9.653	191958	9.757	192158
9.105	191804	13.405	192001	11.960	192201
15.511	191807	15.048	192004	18.961	192204
16.804	191810	12.002	192007	29.523	192207
32.581	191813	12.742	192010	40.335	192210
11.812	191816	12.589	192013	44.026	192213
5.754	191819	16.159	192016	42.026	192216
5.402	191822	18.133	192019	21.368	192219
12.163	191825	17.646	192022	16.311	192222
14.089	191828	16.319	192025	16.815	192225
11.658	191831	13.978	192028	15.211	192228
10.693	191834	8.086	192031	7.232	192231
14.161	191837	6.097	192034	5.042	192234
14.830	191840	6.516	192037	4.369	192237
15.762	191843	8.603	192040		
16.959	191846	13.269	192043		
19.501	191849	18.788	192046		
14.767	191852	21.359	192049		
		21.446	192052		



Iron Mining Association of Minnesota Winter Emission Factor - Run 13 Repeatability

Pass 1-a			Pass 2-a		Pass 3-a		Average	Pass 1-b		Pass 2-b		Pass 3-b		Average	Times		
time	name		time	name	time	name		time	name	time	name	time	name				
	191834	10.693	192001	13.405	192119	13.855	10.693	191949	8.236	192110	9.436	192231	7.232	8.236	Pass1	191834	191904
	191837	14.161	192004	15.048	192122	15.742	14.161	191946	9.174	192107	8.048	192228	15.211	9.174	Pass 2	192001	192031
	191840	14.830	192007	12.002	192125	21.859	14.830	191943	18.009	192104	17.322	192225	16.815	18.009	Pass 3	192119	192149
	191843	15.762	192010	12.742	192128	20.208	15.762	191940	20.163	192101	35.378	192222	16.311	20.163			
	191846	16.959	192013	12.589	192131	12.208	16.959	191937	29.020	192058	38.433	192219	21.368	29.020	Pass 4	191919	191949
	191849	19.501	192016	16.159	192134	12.185	19.501	191934	33.357	192055	29.549	192216	42.026	33.357	Pass 5	192040	192110
	191852	14.767	192019	18.133	192137	10.599	14.767	191931	33.575	192052	21.446	192213	44.026	33.575	Pass 6	192201	192231
	191855	12.950	192022	17.646	192140	7.567	12.950	191928	19.988	192049	21.359	192210	40.335	19.988			
	191858	12.324	192025	16.319	192143	9.409	12.324	191925	16.160	192046	18.788	192207	29.523	16.160			
	191901	8.478	192028	13.978	192146	11.590	8.478	191922	19.553	192043	13.269	192204	18.961	19.553			
	191904	11.580	192031	8.086	192149	8.880	11.580	191919	14.600	192040	8.603	192201	11.960	14.600			

Pass Max	19.501	18.133	21.859
Pass Min	8.478	8.086	7.567
Pass Average	13.819	14.192	13.100
Pass STD	2.927	2.764	4.338
Pass 1a-3a Average	13.703		
Pass 1a-3a STD	0.555		

Relative STD	4.0%	3.9%	4.2%
Average RSTD	4%		

	By time segment	By Pass Average
Run 13 Average	17.567	17.567
Run 13 STD	8.713546	4.081046
Run 13 RSTD	50%	23%
Run 13 Average STD	1.072563	1.66608
Run 13 Average RSTD	6%	9%

	33.575	38.433	44.026
	8.236	8.048	7.232
	20.167	20.148	23.979
	8.243	10.043	12.321
	21.4		
STD	2.206		
	10.9%	10.9%	9.2%
	10%		



## Iron Mining Association of Minnesota Winter Emission Factor - Run 15 Repeatability

	Run 1	Run 2	Run 3	Average	Pass 4	Pass 5	Pass 6	Average	Times		
	4.829	4.157	3.080	4.022	3.624	3.209	2.435	3.089	Pass1	161400	161454
	4.909	4.851	3.634	4.464	3.900	3.308	2.469	3.226	Pass 2	161609	161703
	4.634	5.230	3.840	4.568	4.683	3.523	2.584	3.597	Pass 3	161809	161903
	4.629	5.235	4.083	4.649	4.258	3.291	2.990	3.513			
	4.622	4.744	3.951	4.439	4.386	3.436	3.156	3.659	Pass 4	161509	161557
	4.662	4.574	3.763	4.333	4.588	3.634	3.437	3.886	Pass 5	161715	161803
	4.542	4.890	3.770	4.401	5.426	3.651	3.325	4.134	Pass 6	161915	162003
	4.575	4.899	3.622	4.366	5.838	3.792	3.276	4.302			
	3.975	4.145	3.437	3.852	5.500	4.443	4.170	4.704			
	4.138	4.142	3.273	3.851	6.465	5.154	4.561	5.393			
	4.448	3.899	3.610	3.985	8.349	5.849	5.955	6.718			
	4.706	3.694	3.668	4.022	6.952	6.451	8.332	7.245			
	5.198	3.711	3.375	4.095	5.683	7.335	9.300	7.439			
	4.163	3.720	3.477	3.787	5.147	7.051	6.899	6.366			
	4.103	4.168	3.314	3.862	4.482	6.544	5.694	5.573			
	3.761	4.183	3.258	3.734	3.527	5.716	4.537	4.593			
	3.684	4.254	3.331	3.757	3.243	4.041	3.941	3.742			
	3.498	3.908	3.482	3.630							
	3.699	3.074	3.478	3.417							
Max	5.198	5.235	4.083	4.839	8.349	7.335	9.300	8.328			
Min	3.498	3.074	3.080	3.217	3.243	3.209	2.435	2.962			
Average	4.357	4.288	3.550		5.062	4.731	4.533				
STD	0.403	0.464	0.210		1.043	1.292	1.594				
Total Average	4.065				4.8						
Average STD	0.447			STD	0.267						
Relative STD	10.3%	10.4%	12.6%		5.3%	5.6%	5.9%				
Average STD	11%				5.6%						
	By time segment		By Pass	Average							
Run 15 Average	4.400		4.420								
Run 15 STD	1.237		0.465								
Run 15 RSTD	28%		11%								
Run 15 Average STD	0.119		0.190								
Run 15 Average RSTD	3%		4%								



## Iron Mining Association of Minnesota Winter Emission Factor - Run 18 Repeatability

	Pass 1-a	Pass 2-a	Pass 3-a	Average		Pass 1-b	Pass 2-b	Pass 3-b	Average	Times		
	8.465	8.905	12.450	9.940		9.735	10.791	11.112	10.546	Pass1	200244	200314
	10.403	10.921	13.058	11.461		15.233	17.099	18.019	16.784	Pass 2	200402	200432
	9.891	13.136	15.328	12.785		24.008	29.792	31.348	28.383	Pass 3	200523	200553
	10.466	14.309	20.333	15.036		34.299	29.558	32.841	32.232			
	10.947	16.517	16.774	14.746		32.912	28.837	24.544	28.764	Pass 4	200320	200353
	12.362	14.780	12.525	13.222		29.573	28.855	20.543	26.324	Pass 5	200438	200511
	20.123	14.634	11.501	15.419		43.201	47.404	25.436	38.680	Pass 6	200559	200632
	17.221	11.968	10.428	13.206		43.696	44.739	39.320	42.585			
	8.499	9.155	8.919	8.858		55.097	35.406	43.588	44.697			
	6.560	7.719	8.334	7.537		44.736	25.447	51.350	40.511			
	6.517	6.603	7.629	6.917		19.400	14.537	26.700	20.212			
Max	20.123	16.517	20.333			55.097	47.404	51.350				
Min	6.517	6.603	7.629			9.735	10.791	11.112				
Average	11.041	11.695	12.480			31.990	28.406	29.527				
Total Average	11.7					30.0						
STD	0.720			STD		1.833						
Relative STD	6.5%	6.2%	5.8%			5.7%	6.5%	6.2%				
Average STD	6.2%					6.1%						
	By time segment			By Pass Average								
Run 15 Average	20.857			20.857								
Run 15 STD	12.720			9.188								
Run 15 RSTD	61%			44%								
Run 15 Average	1.566			3.751								
Run 15 Average	8%			18%								



Iron Mining Association of Minnesota Winter Emission Factor - Run 8

Segment 1	Unloaded	0.023	Concentration Time	0.042 173757	0.032 173800	0.030 173803	0.014 173806	0.017 173809	0.014 173812	0.028 173815	0.033 173818	0.013 173821	0.012 173824	0.014 173827								
Segment 2	Unloaded	0.024	Concentration Time	0.013 173830	0.013 173833	0.016 173836	0.028 173839	0.048 173842														
Segment 3	Unloaded	0.147	Concentration Time	0.048 173842	0.062 173845	0.080 173848	0.074 173851	0.059 173854	0.034 173857	0.049 173900	0.033 173903	0.031 173906	0.044 173909	0.062 173912	0.053 173915	0.039 173918	0.053 173921	0.050 173924	0.048 173927	0.067 173930	0.052 173933	0.069 173936
Segment 4	Unloaded	0.315	Concentration Time	0.014 174424	0.073 174427	0.073 174430	0.004 174433	0.006 174436	0.201 174706	0.182 174709	0.200 174712	0.141 174715	0.115 174718	0.157 174721	0.226 174724	0.248 174727	0.224 174730	0.228 174733	0.190 174736	0.208 174739	0.209 174742	0.124 174745
Segment 4	Loaded	0.393	Concentration Time	0.717 172621	0.734 172624	0.754 172627	0.830 172630	0.753 172633	0.764 172636	0.712 172639	0.700 172642	0.602 172645	0.663 172648	0.704 172651	0.754 172654	0.695 172657	0.690 172700	0.716 172703	0.787 172706	0.822 172709	0.795 172712	0.734 172715
Segment 5	Unloaded	0.427	Concentration Time	0.124 174745	0.126 174748	0.132 174751	0.143 174754	0.118 174757	0.112 174800	0.191 174803	0.207 174806	0.219 174809	0.258 174812	0.251 174815	0.438 174818	0.392 174821	0.391 174824	0.328 174827	0.461 174830	0.427 174833	0.411 174836	0.398 174839
Segment 5	Loaded	0.482	Concentration Time	1.106 172300	0.911 172303	0.925 172306	0.916 172309	0.936 172312	0.968 172315	0.918 172318	1.041 172321	0.929 172324	0.988 172327	0.977 172330	1.018 172333	0.967 172336	1.002 172339	1.123 172342	1.297 172345	1.344 172348	1.183 172351	1.184 172354
Segment 6	Unloaded	0.206	Concentration Time	0.177 171936	0.324 171939	0.423 171942	0.366 171945	0.315 171948	0.455 171951	0.443 171954	0.385 171957	0.546 172000	0.281 172003	0.236 172006	0.205 172009	0.187 172012	0.199 172015	0.237 172018	0.227 172021	0.201 172024	0.133 172027	0.126 172030
Segment 6	Loaded	0.438	Concentration Time	0.374 172127	0.509 172130	0.520 172133	0.460 172136	0.488 172139	0.463 172142	0.337 172145	0.351 172148	0.466 172151	0.764 172154	1.163 172157	1.083 172200	0.936 172203	0.843 172206	0.712 172209	0.768 172212	0.944 172215	1.126 172218	1.134 172221
Segment 7	Unloaded	0.034	Concentration Time	0.026 175424	0.017 175427	0.020 175430	0.019 175433	0.018 175436	0.020 175439	0.020 175442	0.024 175445	0.020 175448	0.016 175451	0.029 175454	0.031 175457	0.016 175500	0.012 175503	0.010 175506	0.012 175509	0.023 175512	0.016 175515	0.021 175518
Segment 7	Loaded	1.077	Concentration Time	0.160 175842	0.365 175845	0.424 175848	0.657 175851	0.617 175854	0.581 175857	0.716 175900	0.921 175903	1.135 175906	1.207 175909	1.224 175912	1.110 175915	0.972 175918	0.647 175921	0.861 175924	1.077 175927	1.276 175930	1.880 175933	2.003 175936
Segment 8	Loaded	1.482	Concentration Time	2.773 180045	3.998 180048	3.473 180051	2.657 180054	2.501 180057	1.919 180100	1.569 180103	1.705 180106	1.614 180109	1.470 180112	1.048 180115	0.674 180118	0.372 180121	0.538 180124	0.571 180127	0.748 180130	0.682 180133	0.650 180136	0.679 180139
Segment 9	Loaded	0.912	Concentration Time	2.468 180218	2.400 180221	2.976 180224	2.475 180227	2.723 180230	2.607 180233	1.579 180236	1.034 180239	0.779 180242	0.661 180245	0.746 180248	0.990 180251	1.249 180254	1.417 180257	1.240 180300	1.007 180303	0.927 180306	1.106 180309	1.013 180312
Segment 9	Unloaded	0.162	Concentration Time	0.033 180424	0.046 180427	0.044 180430	0.056 180433	0.069 180436	0.084 180439	0.106 180442	0.108 180445	0.082 180448	0.069 180451	0.098 180454	0.120 180457	0.170 180500	0.172 180503	0.158 180506	0.141 180509	0.141 180512	0.121 180515	0.153 180518
Segment 10	Unloaded	0.027	Concentration Time	0.054 180615	0.058 180618	0.130 180621	0.137 180624	0.044 180627	0.033 180630	0.031 180633	0.026 180636	0.028 180639	0.048 180642	0.023 180645	0.013 180648	0.016 180651	0.013 180654	0.015 180657	0.022 180700	0.016 180703	0.015 180706	0.016 180709
Segment 14	Loaded	0.741	Concentration Time	0.887 172815	0.828 172818	0.843 172821	0.928 172824	1.033 172827	0.832 172830	0.874 172833	0.966 172836	0.904 172839	0.767 172842	0.744 172845	0.673 172848	0.695 172851	0.842 172854	0.813 172857	0.916 172900	0.844 172903	0.812 172906	0.719 172909
Segment 11	Unloaded	0.022	Concentration Time	0.037 181700	0.024 181703	0.025 181706	0.019 181709	0.031 181712	0.033 181715	0.043 181718	0.033 181721	0.049 181724	0.040 181727	0.050 181730	0.016 181733	0.007 181736	0.006 181739	0.006 181742	0.010 181745	0.007 181748	0.007 181751	0.010 181754



Iron Mining Association of Minnesota Winter Emission Factor - Run 8

Segment 1	Unloaded	0.023	Concentration Time																			
Segment 2	Unloaded	0.024	Concentration Time																			
Segment 3	Unloaded	0.147	Concentration Time	0.065 173939	0.141 173942	0.106 173945	0.142 173948	0.223 173951	0.111 173954	0.144 173957	0.127 174000	0.169 174003	0.118 174006	0.298 174009	0.490 174012	0.476 174015	0.512 174018	0.589 174021	0.564 174024	0.610 174027	0.499 174030	0.323 174033
Segment 4	Unloaded	0.315	Concentration Time				0.425 181515	0.619 181518	0.665 181521	0.653 181524	0.687 181527	0.653 181530	0.583 181533	0.890 181536	0.786 181539	0.662 181542	0.565 181545	0.353 181548	0.396 181551	0.288 181554	0.288 181557	0.523 181600
Segment 4	Loaded	0.393	Concentration Time	0.740 172718	0.605 172721	0.615 172724	0.688 172727	0.684 172730	0.698 172733	0.659 172736	0.658 172739	0.754 172742	0.637 172745	0.717 172748	0.711 172751	0.793 172754	0.880 172757	0.885 172800	0.866 172803	0.815 172806	0.821 172809	0.016 181124
Segment 5	Unloaded	0.427	Concentration Time	0.440 174842	0.473 174845	0.639 174848	0.943 174851	0.983 174854	0.538 174857	0.241 174900	0.314 174903	0.449 174906	0.973 174909	1.547 174912	0.933 174915	0.573 174918	0.441 174921	0.427 174924	0.494 174927	0.551 174930	0.468 174933	0.417 174936
Segment 5	Loaded	0.482	Concentration Time	1.285 172357	1.222 172400	1.037 172403	1.074 172406	1.215 172409	1.264 172412	1.076 172415	1.089 172418	1.088 172421	0.967 172424	0.910 172427	0.943 172430	1.012 172433	1.002 172436	0.898 172439	0.883 172442	0.962 172445	0.942 172448	0.935 172451
Segment 6	Unloaded	0.206	Concentration Time	0.135 172033	0.134 172036	0.173 172039	0.168 172042	0.113 172045	0.138 172048	0.164 172051	0.272 172054	0.567 172057	0.460 172100	0.371 172103	0.251 172106	0.369 172109	0.256 172112	0.141 175118	0.115 175121	0.237 175124	0.283 175127	0.237 175130
Segment 6	Loaded	0.438	Concentration Time	1.387 172224	1.531 172227	1.144 172230	1.205 172233	1.039 172236	0.960 172239	0.839 172242	0.818 172245	0.934 172248	0.965 172251	0.017 175254	0.015 175257	0.018 175300	0.021 175303	0.021 175306	0.031 175309	0.042 175312	0.076 175315	0.027 175318
Segment 7	Unloaded	0.034	Concentration Time	0.017 175521	0.017 175524	0.024 175527	0.064 175530	0.092 175533	0.099 175536	0.108 175539	0.105 175542	0.079 175545	0.063 175548	0.060 175551	0.044 175554	0.040 175557	0.019 175600	0.010 175603	0.007 175606	0.014 175609	0.029 175612	
Segment 7	Loaded	1.077	Concentration Time	1.879 175939	2.147 175942	2.312 175945	2.001 175948	1.391 175951	1.034 175954	0.839 175957	0.669 180000	0.717 180003	0.669 180006	0.913 180009	1.301 180012	1.037 180015	1.018 180018	1.270 180021	1.323 180024	0.850 180027	0.656 180030	
Segment 8	Loaded	1.482	Concentration Time	0.719 180142	0.923 180145	1.132 180148	1.484 180151	1.994 180154	1.733 180157	1.073 180200	0.851 180203	0.746 180206	1.195 180209	2.043 180212	2.420 180215							
Segment 9	Loaded	0.912	Concentration Time	0.871 180315	0.966 180318	1.141 180321	0.836 180324	0.557 180327	0.291 180330	0.226 180333	0.182 180336	0.248 180339	0.107 180342	0.052 180345	0.076 180348	0.170 180351	0.216 180354	0.277 180357	0.287 180400	0.284 180403	0.196 180406	0.084 180409
Segment 9	Unloaded	0.162	Concentration Time	0.227 180521	0.209 180524	0.259 180527	0.307 180530	0.345 180533	0.393 180536	0.457 180539	0.342 180542	0.295 180545	0.247 180548	0.106 180551	0.093 180554	0.104 180557	0.115 180600	0.106 180603	0.093 180606			
Segment 10	Unloaded	0.027	Concentration Time	0.013 180712	0.011 180715	0.009 180718	0.009 180721	0.012 180724	0.013 180727	0.016 180730	0.023 180733	0.021 180736	0.013 180739	0.009 180742	0.014 180745	0.017 180748	0.014 180751	0.015 180754	0.015 180757	0.023 180800	0.025 180803	0.023 180806
Segment 14	Loaded	0.741	Concentration Time	0.766 172912	0.721 172915	0.715 172918	0.683 172921	0.668 172924	0.643 172927	0.680 172930	0.634 172933	0.753 172936	0.686 172939	0.717 172942	0.730 172945	0.642 172948	0.756 172951	0.751 172954	0.699 172957	0.753 173000	0.993 173003	1.031 173006
Segment 11	Unloaded	0.022	Concentration Time	0.013 181757	0.007 181800	0.011 181803	0.016 181806	0.021 181809	0.023 181812													



Iron Mining Association of Minnesota Winter Emission Factor - Run 8

Segment 1	Unloaded	0.023	Concentration Time																			
Segment 2	Unloaded	0.024	Concentration Time																			
Segment 3	Unloaded	0.147	Concentration Time	0.216 174036	0.169 174039	0.217 174042	0.283 174045	0.287 174048	0.261 174051	0.216 174054	0.127 174057	0.112 174100	0.103 174103	0.116 174106	0.152 174109	0.148 174112	0.175 174115	0.260 174118	0.285 174121	0.394 174124	0.379 174127	0.246 174130
Segment 4	Unloaded	0.315	Concentration Time	0.568 181603	0.436 181606	0.306 181609	0.258 181612	0.272 181615	0.212 181618	0.335 181621	0.357 181624	0.421 181627	0.618 181630	0.408 181633	0.235 181636	0.141 181639	0.110 181642	0.059 181645	0.043 181648	0.040 181651	0.026 181654	
Segment 4	Loaded	0.393	Concentration Time	0.015 181127	0.015 181130	0.022 181133	0.033 181136	0.011 181139	0.019 181142	0.020 181145	0.028 181148	0.030 181151	0.028 181154	0.022 181157	0.024 181200	0.015 181203	0.023 181206	0.046 181209	0.031 181212	0.021 181215	0.016 181218	0.026 181221
Segment 5	Unloaded	0.427	Concentration Time	0.578 174939	0.524 174942	0.667 174945	0.971 174948	0.964 174951	0.828 174954	1.034 174957	1.369 175000	1.198 175003	0.659 175006	0.248 175009	0.078 175012	0.039 175015	0.030 175018	0.028 175021	0.060 175024	0.072 175027	0.130 175030	0.191 175033
Segment 5	Loaded	0.482	Concentration Time	0.856 172454	0.999 172457	0.949 172500	0.943 172503	0.838 172506	0.828 172509	0.770 172512	0.786 172515	0.851 172518	0.805 172521	0.773 172524	0.810 172527	0.743 172530	0.750 172533	0.856 172536	0.766 172539	0.738 172542	0.678 172545	0.753 172548
Segment 6	Unloaded	0.206	Concentration Time	0.304 175133	0.280 175136	0.321 175139	0.362 175142	0.228 175145	0.195 175148	0.195 175151	0.149 175154	0.119 175157	0.071 175200	0.050 175203	0.028 175206	0.023 175209	0.023 175212	0.033 175215	0.030 175218	0.032 175221	0.016 175224	0.021 175227
Segment 6	Loaded	0.438	Concentration Time	0.022 175321	0.020 175324	0.021 175327	0.021 175330	0.021 175333	0.021 175336	0.024 175339	0.018 175342	0.024 175345	0.026 175348	0.016 175351	0.021 175354	0.031 175357	0.033 175400	0.026 175403	0.026 175406	0.012 175409	0.015 175412	0.021 175415
Segment 7	Unloaded	0.034	Concentration Time																			
Segment 7	Loaded	1.077	Concentration Time																			
Segment 8	Loaded	1.482	Concentration Time																			
Segment 9	Loaded	0.912	Concentration Time	0.014 180412	0.008 180415																	
Segment 9	Unloaded	0.162	Concentration Time																			
Segment 10	Unloaded	0.027	Concentration Time																			
Segment 14	Loaded	0.741	Concentration Time	1.076 173009	1.097 173012	1.183 173015	1.256 173018	1.136 173021	0.996 173024	0.843 173027	0.841 173030	0.886 173033	1.005 173036	0.859 173039	0.864 173042	0.877 173045	0.826 173048	0.851 173051	0.706 173054	0.752 173057	0.721 173100	0.687 173103
Segment 11	Unloaded	0.022	Concentration Time																			



Iron Mining Association of Minnesota Winter Emission Factor - Run 8

Segment 1	Unloaded	0.023	Concentration Time																			
Segment 2	Unloaded	0.024	Concentration Time																			
Segment 3	Unloaded	0.147	Concentration Time	0.260 174133	0.248 174136	0.195 174139	0.210 174142	0.128 174145	0.126 174148	0.113 174151	0.114 174154	0.218 174157	0.257 174200	0.311 174203	0.212 174206	0.044 174209	0.010 174212	0.005 174215	0.010 174218	0.011 174221	0.008 174224	0.008 174227
Segment 4	Unloaded	0.315	Concentration Time																			
Segment 4	Loaded	0.393	Concentration Time	0.059 181224	0.022 181227	0.018 181230	0.016 181233	0.025 181236	0.020 181239	0.016 181242	0.023 181245	0.016 181248	0.018 181251	0.012 181254	0.013 181257	0.021 181300	0.018 181303					
Segment 5	Unloaded	0.427	Concentration Time	0.215 175036	0.162 175039	0.168 175042	0.219 175045	0.316 175048	0.533 175051	0.355 175054	0.235 175057	0.170 175100	0.164 175103	0.159 175106	0.112 175109							
Segment 5	Loaded	0.482	Concentration Time	0.721 172551	0.753 172554	0.680 172557	0.649 172600	0.738 172603	0.675 172606	0.720 172609	0.628 172612	0.034 180812	0.026 180815	0.024 180818	0.020 180821	0.020 180824	0.028 180827	0.039 180830	0.021 180833	0.022 180836	0.020 180839	0.020 180842
Segment 6	Unloaded	0.206	Concentration Time	0.015 175230	0.011 175233	0.014 175236	0.024 175239															
Segment 6	Loaded	0.438	Concentration Time																			
Segment 7	Unloaded	0.034	Concentration Time																			
Segment 7	Loaded	1.077	Concentration Time																			
Segment 8	Loaded	1.482	Concentration Time																			
Segment 9	Loaded	0.912	Concentration Time																			
Segment 9	Unloaded	0.162	Concentration Time																			
Segment 10	Unloaded	0.027	Concentration Time																			
Segment 14	Loaded	0.741	Concentration Time	0.653 173106	0.701 173109	0.681 173112	0.622 173115	0.640 173118	0.831 173121	0.809 173124	0.669 173127	0.670 173130	0.801 173133	0.819 173136	0.814 173139	0.846 173142	0.861 173145	0.798 173148	0.756 173151	0.768 173154	0.659 173157	0.663 173200
Segment 11	Unloaded	0.022	Concentration Time																			



Iron Mining Association of Minnesota Winter Emission Factor - Run 8

Segment 1	Unloaded	0.023	Concentration Time																			
Segment 2	Unloaded	0.024	Concentration Time																			
Segment 3	Unloaded	0.147	Concentration Time	0.009 174230	0.013 174233	0.014 174236	0.017 174239	0.017 174242	0.020 174245	0.016 174248	0.011 174251	0.008 174254	0.007 174257	0.009 174300	0.009 174303	0.007 174306	0.008 174309	0.010 174312	0.015 174315			
Segment 4	Unloaded	0.315	Concentration Time																			
Segment 4	Loaded	0.393	Concentration Time																			
Segment 5	Unloaded	0.427	Concentration Time																			
Segment 5	Loaded	0.482	Concentration Time	0.009 180845	0.023 180848	0.010 180851	0.016 180854	0.019 180857	0.021 180900	0.019 180903	0.014 180906	0.013 180909	0.018 180912	0.016 180915	0.018 180918	0.017 180921	0.011 180924	0.015 180927	0.014 180930	0.017 180933	0.014 180936	0.019 180939
Segment 6	Unloaded	0.206	Concentration Time																			
Segment 6	Loaded	0.438	Concentration Time																			
Segment 7	Unloaded	0.034	Concentration Time																			
Segment 7	Loaded	1.077	Concentration Time																			
Segment 8	Loaded	1.482	Concentration Time																			
Segment 9	Loaded	0.912	Concentration Time																			
Segment 9	Unloaded	0.162	Concentration Time																			
Segment 10	Unloaded	0.027	Concentration Time																			
Segment 14	Loaded	0.741	Concentration Time	0.705 173203	0.767 173206	0.624 173209	0.686 173212	0.507 173215	0.492 173218	0.508 173221	0.514 173224	0.519 173227	0.506 173230	0.517 173233	0.595 173236	0.519 173239	0.536 173242	0.575 173245	0.546 173248	0.488 173251	0.493 173254	0.559 173257
Segment 11	Unloaded	0.022	Concentration Time																			



Iron Mining Association of Minnesota Winter Emission Factor - Run 8

Segment 1	Unloaded	0.023	Concentration Time																			
Segment 2	Unloaded	0.024	Concentration Time																			
Segment 3	Unloaded	0.147	Concentration Time																			
Segment 4	Unloaded	0.315	Concentration Time																			
Segment 4	Loaded	0.393	Concentration Time																			
Segment 5	Unloaded	0.427	Concentration Time																			
Segment 5	Loaded	0.482	Concentration Time	0.017 180942	0.017 180945	0.014 180948	0.014 180951	0.019 180954	0.030 180957	0.022 181000	0.018 181003	0.016 181006	0.024 181009	0.015 181012	0.014 181015	0.018 181018	0.013 181021	0.016 181024	0.018 181027	0.013 181030	0.013 181033	0.010 181036
Segment 6	Unloaded	0.206	Concentration Time																			
Segment 6	Loaded	0.438	Concentration Time																			
Segment 7	Unloaded	0.034	Concentration Time																			
Segment 7	Loaded	1.077	Concentration Time																			
Segment 8	Loaded	1.482	Concentration Time																			
Segment 9	Loaded	0.912	Concentration Time																			
Segment 9	Unloaded	0.162	Concentration Time																			
Segment 10	Unloaded	0.027	Concentration Time																			
Segment 14	Loaded	0.741	Concentration Time	0.506 173300	0.523 173303	0.499 173306	0.543 173309	0.668 173312	0.518 173315	0.451 173318	0.522 173321											
Segment 11	Unloaded	0.022	Concentration Time																			



Iron Mining Association of Minnesota Winter Emission Factor - Run 8

Segment 1	Unloaded	0.023	Concentration Time														
Segment 2	Unloaded	0.024	Concentration Time														
Segment 3	Unloaded	0.147	Concentration Time														
Segment 4	Unloaded	0.315	Concentration Time														
Segment 4	Loaded	0.393	Concentration Time														
Segment 5	Unloaded	0.427	Concentration Time														
Segment 5	Loaded	0.482	Concentration Time	0.012 181039	0.012 181042	0.014 181045	0.017 181048	0.010 181051	0.011 181054	0.012 181057	0.015 181100	0.020 181103	0.017 181106	0.013 181109	0.014 181112	0.023 181115	0.017 181118
Segment 6	Unloaded	0.206	Concentration Time														
Segment 6	Loaded	0.438	Concentration Time														
Segment 7	Unloaded	0.034	Concentration Time														
Segment 7	Loaded	1.077	Concentration Time														
Segment 8	Loaded	1.482	Concentration Time														
Segment 9	Loaded	0.912	Concentration Time														
Segment 9	Unloaded	0.162	Concentration Time														
Segment 10	Unloaded	0.027	Concentration Time														
Segment 14	Loaded	0.741	Concentration Time														
Segment 11	Unloaded	0.022	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 9

		Average																				
Segment 19	Unloaded	0.051	Concentration Time	0.010 211355	0.012 211358	0.015 211401	0.019 211404	0.017 211407	0.042 211410	0.067 211413	0.088 211416	0.126 211419	0.108 211422	0.157 211425	0.231 211428	0.182 211431	0.036 211434	0.015 211437	0.021 211440	0.017 211443	0.026 211446	0.037 211449
Segment 18	Unloaded	1.142	Concentration Time	1.366 205525	0.886 205528	0.860 205531	1.568 205534	1.763 205537	0.963 205540	0.808 205543	0.713 205546	1.083 205549	1.320 205552	1.885 205555	2.126 205558	1.813 205601	1.551 205604	1.277 205607	0.941 205610	0.654 205613	0.684 205616	0.617 205619
Segment 18	loaded	1.943	Concentration Time	0.311 210049	0.491 210052	0.624 210055	0.644 210058	0.602 210101	0.703 210104	0.877 210107	1.192 210110	2.031 210113	3.192 210116	3.595 210119	2.451 210122	2.199 210125	3.737 210128	6.200 210131	8.257 210134	8.007 210137	4.796 210140	3.596 210143
Segment 13	Unloaded	0.783	Concentration Time	0.809 204416	0.725 204419	0.768 204422	0.841 204425	1.054 204428	1.148 204431	1.297 204434	1.288 204437	0.824 204440	0.593 204443	0.430 204446	0.436 204449	0.502 204452	0.818 204455	0.806 204458	1.179 204501	1.448 204504	1.041 204507	0.661 204510
Segment 13	loaded	2.425	Concentration Time	0.238 204610	0.217 204613	0.298 204616	0.749 204619	1.599 204622	1.697 204625	2.374 204628	3.685 204631	3.389 204634	2.961 204637	3.780 204640	6.337 204643	9.289 204646	8.248 204649	4.352 204652	3.317 204655	2.837 204658	3.284 204701	2.536 204704
Segment 4	loaded	0.638	Concentration Time	0.096 204213	0.262 204216	0.527 204219	0.803 204222	0.859 204225	0.832 204228	0.795 204231	0.638 204234	0.584 204237	0.556 204240	0.569 204243	0.535 204246	0.519 204249	0.367 204252	0.517 204255	0.694 204258	0.841 204301	0.973 204304	1.045 204307
Segment 14	loaded	0.561	Concentration Time	1.884 204810	1.462 204813	1.201 204816	1.099 204819	1.200 204822	1.425 204825	1.386 204828	1.259 204831	1.215 204834	1.055 204837	0.473 204840	0.120 204843	0.074 204846	0.062 204849	0.067 204852	0.052 204855	0.064 204858	0.057 204901	0.053 204904
Segment 1	Unloaded	0.577	Concentration Time	0.018 211319	0.052 211322	0.095 211325	0.104 211328	0.149 211331	0.119 211334	0.114 211337	0.058 211340	0.013 211343	0.010 211346	2.126 205558	1.813 205601	1.551 205604	1.277 205607	0.941 205610	0.654 205613	0.684 205616	0.617 205619	
Segment 1	loaded	0.453	Concentration Time	0.477 210558	0.451 210601	0.370 210604	0.518 210607	0.238 210610	0.301 210613	0.722 210616	0.480 210619	0.523 210622										
Segment 2	Unloaded	1.189	Concentration Time	1.266 205522	1.366 205525	0.886 205528	0.860 205531	1.568 205534														
Segment 2	loaded	1.158	Concentration Time	1.339 210543	1.231 210546	1.243 210549	1.092 210552	0.885 210555														
Segment 11	Unloaded	#DIV/0!	Concentration Time	-																		
Segment 11	loaded	0.023	Concentration Time	0.013 204046	0.026 204049	0.014 204052	0.016 204055	0.014 204058	0.015 204101	0.010 204104	0.011 204107	0.018 204110	0.023 204113	0.020 204116	0.018 204119	0.012 204122	0.011 204125	0.016 204128	0.018 204131	0.015 204134	0.010 204137	0.011 204140
Segment 20	Unloaded	#DIV/0!	Concentration Time	--																		
Segment 20	loaded	1.351	Concentration Time	2.535 212731	2.377 212734	3.059 212737	3.180 212740	4.069 212743	2.775 212746	1.116 212749	0.928 212752	0.769 212755	0.824 212758	0.679 212801	0.316 212804	0.134 212807	0.215 212810	0.234 212813	0.365 212816	0.624 212819	0.702 212822	0.906 212825
Segment 21	Unloaded	0.030	Concentration Time	0.039 211943	0.038 211946	0.037 211949	0.040 211952	0.041 211955	0.045 211958	0.054 212001	0.064 212004	0.069 212007	0.081 212010	0.069 212013	0.067 212016	0.058 212019	0.050 212022	0.053 212025	0.023 212407	0.019 212410	0.018 212413	0.018 212416
Segment 21	loaded	0.722	Concentration Time	0.151 212534	0.220 212537	0.345 212540	0.456 212543	0.512 212546	0.479 212549	0.468 212552	0.602 212555	0.692 212558	0.635 212601	0.548 212604	0.306 212607	0.240 212610	0.234 212613	0.156 212616	0.240 212619	0.234 212622	0.089 212625	0.062 212628



Iron Mining Association of Minnesota Winter Emission Factor - Run 9

		Average																				
Segment 19	Unloaded	0.051	Concentration Time	0.025 211452	0.015 211455	0.016 211458	0.015 211501	0.018 211504	0.021 211507	0.028 211510	0.016 211513	0.062 211516	0.022 211519	0.021 211522	0.020 211525	0.025 211528	0.034 211531	0.037 211534	0.041 211537	0.051 211540	0.045 211543	0.046 211546
Segment 18	Unloaded	1.142	Concentration Time	0.690 205622	0.776 205625	0.694 205628	0.770 205631	0.701 205634	0.726 205637	0.864 205640	0.902 205643	1.050 205646	1.810 205649	1.993 205652	1.705 205655	1.560 205658	1.211 205701	1.432 205704	1.220 205707	0.778 205710	0.692 205713	0.752 205716
Segment 18	loaded	1.943	Concentration Time	2.895 210146	2.129 210149	2.102 210152	2.286 210155	2.478 210158	1.968 210201	2.124 210204	3.011 210207	3.232 210210	4.325 210213	3.611 210216	4.121 210219	2.607 210222	1.713 210225	0.389 210228	0.085 210231	0.065 210234	0.050 210237	0.050 210240
Segment 13	Unloaded	0.783	Concentration Time	0.783 204513	0.790 204516	0.616 204519	0.769 204522	0.669 204525	0.725 204528	0.820 204531	1.085 204534	0.805 204537	0.581 204540	0.600 204543	0.561 204546	0.475 204549	0.385 204552	0.301 204555				
Segment 13	loaded	2.425	Concentration Time	2.116 204707	1.764 204710	1.423 204713	1.620 204716	1.629 204719	1.374 204722	1.397 204725	1.410 204728	1.911 204731	1.812 204734	1.888 204737	1.569 204740	1.526 204743	1.306 204746	1.217 204749	1.131 204752	1.031 204755		
Segment 4	loaded	0.638	Concentration Time	0.861 204310	0.807 204313	0.793 204316	0.790 204319	0.646 204322	0.626 204325	0.640 204328	0.757 204331	0.702 204334	0.795 204337	0.707 204340	0.725 204343	0.688 204346	0.590 204349	0.435 204352	0.292 204355	0.331 204358	0.446 204401	0.610 204404
Segment 14	loaded	0.561	Concentration Time	0.043 204907	0.208 204910	0.366 204913	0.274 204916	0.245 204919	0.315 204922	0.286 204925	0.368 204928	0.452 204931	0.559 204934	0.573 204937	0.563 204940	0.437 204943	0.375 204946	0.497 204949	0.571 204952	0.621 204955	0.635 204958	0.587 205001
Segment 1	Unloaded	0.577	Concentration Time																			
Segment 1	loaded	0.453	Concentration Time																			
Segment 2	Unloaded	1.189	Concentration Time																			
Segment 2	loaded	1.158	Concentration Time																			
Segment 11	Unloaded	#DIV/0!	Concentration Time																			
Segment 11	loaded	0.023	Concentration Time	0.018 204143	0.012 204146	0.014 204149	0.020 204152	0.025 204155	0.028 204158	0.036 204201	0.060 204204	0.064 204207	0.103 204210									
Segment 20	Unloaded	#DIV/0!	Concentration Time																			
Segment 20	loaded	1.351	Concentration Time	1.437 212828	2.487 212831	2.262 212834	2.106 212837	1.551 212840	0.513 212843	0.207 212846	0.734 212849	0.710 212852										
Segment 21	Unloaded	0.030	Concentration Time	0.024 212419	0.020 212422	0.012 212425	0.014 212428	0.013 212431	0.014 212434	0.020 212437	0.014 212440	0.013 212443	0.011 212446	0.014 212449	0.015 212452	0.019 212455	0.017 212458	0.017 212501	0.018 212504	0.023 212507	0.019 212510	0.015 212513
Segment 21	loaded	0.722	Concentration Time	0.272 212631	0.331 212634	0.489 212637	0.986 212640	0.537 212643	0.422 212646	0.693 212649	0.802 212652	0.821 212655	1.081 212658	1.681 212701	2.814 212704	2.158 212707	2.004 212710	1.434 212713	0.802 212716	0.608 212719	0.625 212722	0.994 212725



Iron Mining Association of Minnesota Winter Emission Factor - Run 9

Average																						
Segment 19	Unloaded	0.051	Concentration Time	0.042 211549	0.047 211552	0.042 211555	0.047 211558	0.048 211601	0.046 211604	0.050 211607	0.054 211610	0.046 211613	0.061 211616	0.058 211619	0.052 211622	0.041 211625	0.043 211628	0.034 211631	0.038 211634	0.057 211637	0.109 211640	0.125 211643
Segment 18	Unloaded	1.142	Concentration Time	1.230 205719	1.483 205722	1.619 205725	1.854 205728	1.987 205731	1.607 205734	1.348 205737	1.106 205740	1.089 205743	0.937 205746	0.942 205749	0.838 205752	1.527 205755	1.559 205758	1.389 205801	0.905 205804	0.791 205807	0.848 205810	1.433 205813
Segment 18	loaded	1.943	Concentration Time	0.048 210243	0.063 210246	0.048 210249	0.048 210252	0.048 210255	0.041 210258	0.058 210301	0.063 210304	0.071 210307	0.111 210310	0.558 210313	0.864 210316	0.903 210319	1.237 210322	1.059 210325	1.017 210328	0.828 210331	0.778 210334	0.705 210337
Segment 13	Unloaded	0.783	Concentration Time																			
Segment 13	loaded	2.425	Concentration Time																			
Segment 4	loaded	0.638	Concentration Time																			
Segment 14	loaded	0.561	Concentration Time	0.538 205004	0.720 205007	0.657 205010	0.636 205013	0.817 205016	0.997 205019	1.518 205022	1.340 205025	1.210 205028	1.007 205031	0.809 205034	0.732 205037	0.764 205040	0.602 205043	0.589 205046	0.612 205049	0.722 205052	0.731 205055	0.644 205058
Segment 1	Unloaded	0.577	Concentration Time																			
Segment 1	loaded	0.453	Concentration Time																			
Segment 2	Unloaded	1.189	Concentration Time																			
Segment 2	loaded	1.158	Concentration Time																			
Segment 11	Unloaded	#DIV/0!	Concentration Time																			
Segment 11	loaded	0.023	Concentration Time																			
Segment 20	Unloaded	#DIV/0!	Concentration Time																			
Segment 20	loaded	1.351	Concentration Time																			
Segment 21	Unloaded	0.030	Concentration Time	0.014 212516	0.020 212519	0.022 212522	0.026 212525															
Segment 21	loaded	0.722	Concentration Time	1.926 212728																		



Iron Mining Association of Minnesota Winter Emission Factor - Run 9

		Average																				
Segment 19	Unloaded	0.051	Concentration Time	0.125 211646	0.112 211649	0.147 211652	0.119 211655	0.097 211658	0.079 211701	0.052 211704	0.033 211707	0.024 211710	0.025 211713	0.023 211716	0.023 211719	0.020 211722	0.018 211725	0.017 211728	0.022 211731	0.019 211734	0.026 211737	0.022 211740
Segment 18	Unloaded	1.142	Concentration Time	1.664 205816	1.320 205819	0.741 205822	0.553 205825	0.458 205828	0.374 205831	0.366 205834	0.502 205837	0.431 205840	0.610 205843	0.508 205846	0.651 205849	0.876 205852	1.078 205855	0.848 205858	1.065 205901	1.062 205904	1.031 205907	0.779 205910
Segment 18	loaded	1.943	Concentration Time	0.719 210340	0.603 210343	0.622 210346	0.688 210349	0.809 210352	0.959 210355	1.351 210358	2.718 210401	4.138 210404	4.618 210407	5.110 210410	5.884 210413	5.630 210416	5.479 210419	3.289 210422	2.077 210425	1.518 210428	1.993 210431	2.383 210434
Segment 13	Unloaded	0.783	Concentration Time																			
Segment 13	loaded	2.425	Concentration Time																			
Segment 4	loaded	0.638	Concentration Time																			
Segment 14	loaded	0.561	Concentration Time	0.640 205101	0.563 205104	0.537 205107	0.473 205110	0.502 205113	0.341 205116	0.261 205119	0.284 205122	0.366 205125	0.346 205128	0.352 205131	0.359 205134	0.337 205137	0.395 205140	0.530 205143	0.620 205146	0.765 205149	1.045 205152	1.232 205155
Segment 1	Unloaded	0.577	Concentration Time																			
Segment 1	loaded	0.453	Concentration Time																			
Segment 2	Unloaded	1.189	Concentration Time																			
Segment 2	loaded	1.158	Concentration Time																			
Segment 11	Unloaded	#DIV/0!	Concentration Time																			
Segment 11	loaded	0.023	Concentration Time																			
Segment 20	Unloaded	#DIV/0!	Concentration Time																			
Segment 20	loaded	1.351	Concentration Time																			
Segment 21	Unloaded	0.030	Concentration Time																			
Segment 21	loaded	0.722	Concentration Time																			



Iron Mining Association of Minnesota Winter Emission Factor - Run 9

Segment 19	Unloaded	Average	Concentration Time	0.033	0.027	0.046	0.033	0.033	0.038	0.050	0.063	0.102	0.158									
		0.051		211743	211746	211749	211752	211755	211758	211801	211804	211807	211810									
Segment 18	Unloaded	1.142	Concentration Time	0.513	0.380	0.406	0.551	0.800	0.897	1.408	1.535	2.049	2.612	2.197	2.316	2.258	1.887	2.988	3.012	2.100	0.966	0.743
				205913	205916	205919	205922	205925	205928	205931	205934	205937	205940	205943	205946	205949	205952	205955	205958	210001	210004	210007
Segment 18	loaded	1.943	Concentration Time	2.434	1.778	1.135	0.956	0.658	0.446	0.547	0.894	1.654	2.101	2.763	3.154	2.641	2.435	2.634	3.381	2.628	2.519	1.921
				210437	210440	210443	210446	210449	210452	210455	210458	210501	210504	210507	210510	210513	210516	210519	210522	210525	210528	210531
Segment 13	Unloaded	0.783	Concentration Time																			
Segment 13	loaded	2.425	Concentration Time																			
Segment 4	loaded	0.638	Concentration Time																			
Segment 14	loaded	0.561	Concentration Time	1.609	1.329	1.108	1.175	1.112	0.848	0.902	1.010	0.866	0.680	0.455	0.250	0.183	0.153	0.100	0.075	0.086	0.066	0.036
				205158	205201	205204	205207	205210	205213	205216	205219	205222	205225	205228	205231	205234	205237	205240	205243	205246	205249	205252
Segment 1	Unloaded	0.577	Concentration Time																			
Segment 1	loaded	0.453	Concentration Time																			
Segment 2	Unloaded	1.189	Concentration Time																			
Segment 2	loaded	1.158	Concentration Time																			
Segment 11	Unloaded	#DIV/0!	Concentration Time																			
Segment 11	loaded	0.023	Concentration Time																			
Segment 20	Unloaded	#DIV/0!	Concentration Time																			
Segment 20	loaded	1.351	Concentration Time																			
Segment 21	Unloaded	0.030	Concentration Time																			
Segment 21	loaded	0.722	Concentration Time																			



Iron Mining Association of Minnesota Winter Emission Factor - Run 9

Segment 19	Unloaded	Average 0.051	Concentration Time																
Segment 18	Unloaded	1.142	Concentration Time	0.935 210010	0.993 210013	0.889 210016	0.635 210019	0.496 210022	0.520 210025	0.531 210028	0.424 210031								
Segment 18	loaded	1.943	Concentration Time	1.742 210534	1.668 210537	1.341 210540	1.339 210543	1.231 210546	1.243 210549	1.092 210552									
Segment 13	Unloaded	0.783	Concentration Time																
Segment 13	loaded	2.425	Concentration Time																
Segment 4	loaded	0.638	Concentration Time																
Segment 14	loaded	0.561	Concentration Time	0.041 205255	0.068 205258	0.062 205301	0.095 205304	0.095 205307	0.100 205310	0.124 205313	0.163 205316	0.190 205319	0.161 205322	0.155 205325	0.154 205328	0.219 205331	0.259 205334	0.243 205337	0.278 205340
Segment 1	Unloaded	0.577	Concentration Time																
Segment 1	loaded	0.453	Concentration Time																
Segment 2	Unloaded	1.189	Concentration Time																
Segment 2	loaded	1.158	Concentration Time																
Segment 11	Unloaded	#DIV/0!	Concentration Time																
Segment 11	loaded	0.023	Concentration Time																
Segment 20	Unloaded	#DIV/0!	Concentration Time																
Segment 20	loaded	1.351	Concentration Time																
Segment 21	Unloaded	0.030	Concentration Time																
Segment 21	loaded	0.722	Concentration Time																



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded	Average															
19	3.717	Concentration	3.759	3.933	4.823	4.272	4.024	3.995	4.630	4.339	3.923	3.796	3.893	3.794	4.136	4.121
		Time	152121	152124	152131	152134	152137	152140	152143	152146	152149	152152	152155	152158	152201	152204
Segment loaded	7.612	Concentration	12.637	12.488	10.789	10.935	11.065	11.628	12.927	11.651	10.043	10.533	11.846	9.745	8.515	8.775
19		Time	151415	151418	151421	151424	151427	151430	151433	151436	151439	151442	151445	151448	151451	151454
Segment Unloaded	4.233	Concentration	3.263	3.119	3.663	3.704	3.994	4.024	4.434	4.416	5.827	5.882				
1		Time	152030	152033	152036	152039	152042	152045	152048	152051	152054	152057				
Segment loaded	9.447	Concentration	5.977	8.601	11.738	12.436	9.205	8.871	10.123	8.628						
1		Time	154209	154212	154215	154218	154221	154224	154227	154230						
Segment Unloaded	12.702	Concentration	18.625	19.518	16.961	14.669	17.235	18.471	16.332	13.547	13.578	13.924	12.703	12.617	15.139	17.034
20		Time	153246	153249	153252	153255	153258	153301	153304	153307	153310	153313	153316	153319	153322	153325
Segment loaded	14.206	Concentration	5.053	5.863	6.312	6.404	5.549	6.114	7.864	9.224	10.083	9.791	11.734	13.086	10.572	11.996
20		Time	153426	153429	153437	153440	153443	153446	153449	153452	153455	153458	153501	153504	153507	153510
Segment Unloaded	5.106	Concentration	5.308	5.382	6.330	4.937	4.805	5.218	5.833	6.980	6.873	5.877	5.218	3.855	3.366	3.088
22		Time	152743	152746	152749	152752	152755	152758	152801	152804	152807	152810	152813	152816	152819	152822
Segment loaded	9.744	Concentration	3.978	6.360	8.278	9.014	10.104	10.448	10.684	10.150	9.716	9.175	9.230	8.714	8.624	9.311
22		Time	152946	152949	152952	152955	152958	153001	153004	153007	153010	153013	153016	153019	153022	153025
Segment Unloaded	#DIV/0!	Concentration	--													
23		Time														
Segment loaded	8.595	Concentration	3.539	2.829	2.632	2.788	4.279	5.041	4.548	4.441	5.269	4.755	4.646	4.701	4.729	5.270
23		Time	151120	151123	151126	151129	151132	151135	151138	151141	151144	151147	151150	151153	151156	151200



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded	Average															
19	3.717	Concentration	3.464	3.232	3.233	3.110	3.178	3.085	2.751	3.017	2.766	2.808	2.730	2.632	2.856	2.887
		Time	152207	152210	152213	152216	152219	152222	152225	152228	152231	152234	152237	152240	152243	152246
Segment loaded	7.612	Concentration	7.968	9.487	9.009	8.341	7.990	7.178	6.532	6.939	6.940	6.716	6.644	6.535	7.596	7.163
19		Time	151457	151500	151503	151506	151509	151512	151515	151518	151521	151524	151527	151530	151533	151536
Segment Unloaded	4.233	Concentration														
1		Time														
Segment loaded	9.447	Concentration														
1		Time														
Segment Unloaded	12.702	Concentration	15.715	16.214	14.258	15.929	15.271	15.349	13.895	11.518	9.054	8.492	7.946	6.654	5.823	5.777
20		Time	153328	153331	153334	153337	153340	153343	153346	153349	153352	153355	153358	153401	153404	153407
Segment loaded	14.206	Concentration	15.289	14.416	17.531	19.693	20.493	21.957	23.240	22.641	27.488	26.432	22.632	20.164	17.088	13.547
20		Time	153513	153516	153519	153522	153525	153528	153531	153534	153537	153540	153543	153546	153549	153552
Segment Unloaded	5.106	Concentration	3.206	3.891	4.003	6.078	5.383	4.015	4.166	3.961	4.690	4.872	4.424	5.193	5.329	5.158
22		Time	152825	152828	152831	152834	152837	152840	152843	152847	152850	152853	152901	152904	152907	152910
Segment loaded	9.744	Concentration	9.766	10.109	12.768	18.726	21.486	12.620	9.805	10.437	8.072	7.133	6.286	5.127	6.954	
22		Time	153028	153031	153034	153037	153041	153044	153052	153055	153058	153101	153104	153107	153110	
Segment Unloaded	#DIV/0!	Concentration														
23		Time														
Segment loaded	8.595	Concentration	5.223	5.401	5.624	6.371	5.882	3.243	2.073	1.771	2.092	3.426	6.403	7.749	8.204	8.882
23		Time	151203	151206	151213	151216	151219	151222	151225	151228	151231	151234	151237	151240	151243	151246



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded 19	Average 3.717	Concentration Time	2.428 152249	2.070 152252	2.512 152255	3.004 152258	2.756 152301	2.491 152304	2.552 152307	2.626 152311	2.768 152314	2.871 152317	2.939 152325	3.162 152328	3.804 152331	4.165 152334
Segment loaded 19	7.612	Concentration Time	5.922 151539	5.632 151542	5.733 151545	5.059 151548	4.781 151556	4.324 151559	3.825 151602	3.859 151605	3.828 151608	3.855 151611	4.451 151614	5.024 151617	5.187 151620	5.069 151623
Segment Unloaded 1	4.233	Concentration Time														
Segment loaded 1	9.447	Concentration Time														
Segment Unloaded 20	12.702	Concentration Time	6.147 153410	6.770 153413	5.883 153416	5.416 153419										
Segment loaded 20	14.206	Concentration Time	12.174 153555	14.302 153558	11.644 153601											
Segment Unloaded 22	5.106	Concentration Time	5.702 152913	5.799 152916	6.753 152919	6.722 152922	6.163 152925	5.834 152928	5.520 152931	4.722 152934	4.274 152937					
Segment loaded 22	9.744	Concentration Time														
Segment Unloaded 23	#DIV/0!	Concentration Time														
Segment loaded 23	8.595	Concentration Time	8.973 151249	9.107 151252	9.856 151255	8.507 151258	8.119 151301	9.352 151304	8.658 151307	9.425 151310	13.005 151313	12.832 151316	12.861 151319	13.989 151322	16.774 151325	17.040 151328



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded 19	Average 3.717	Concentration Time	4.234 152337	4.287 152340	4.078 152343	3.819 152346	3.560 152349	3.324 152352	3.046 152355	3.481 152358	3.756 152401	4.041 152404	4.014 152407	4.180 152410	3.954 152413	3.958 152416
Segment loaded 19	7.612	Concentration Time	5.033 151626	5.270 151629	4.965 151632	6.874 151635	8.034 151638	7.721 151641	6.958 151644	5.401 151647	5.458 151650	5.373 151653	5.252 151656	5.097 151659	4.921 151702	5.040 151705
Segment Unloaded 1	4.233	Concentration Time														
Segment loaded 1	9.447	Concentration Time														
Segment Unloaded 20	12.702	Concentration Time														
Segment loaded 20	14.206	Concentration Time														
Segment Unloaded 22	5.106	Concentration Time														
Segment loaded 22	9.744	Concentration Time														
Segment Unloaded 23	#DIV/0!	Concentration Time														
Segment loaded 23	8.595	Concentration Time	19.727 151331	19.100 151334	15.903 151337	16.702 151340	14.511 151343	13.218 151346	15.091 151349	16.960 151352	16.834 151355					



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded	Average															
19	3.717	Concentration	4.111	4.144	4.491	3.857	3.612	3.533	3.678	3.587	4.253	4.837	5.504	6.504	6.770	6.025
		Time	152419	152422	152425	152428	152431	152434	152437	152440	152443	152446	152449	152452	152455	152458
Segment loaded	7.612	Concentration	5.135	5.389	6.374	8.761	8.453	6.965	7.744	8.921	9.639	6.795	4.958	4.447	3.885	4.010
19		Time	151708	151711	151714	151717	151720	151723	151726	151729	151732	151735	151738	151741	151748	151751
Segment Unloaded	4.233	Concentration														
1		Time														
Segment loaded	9.447	Concentration														
1		Time														
Segment Unloaded	12.702	Concentration														
20		Time														
Segment loaded	14.206	Concentration														
20		Time														
Segment Unloaded	5.106	Concentration														
22		Time														
Segment loaded	9.744	Concentration														
22		Time														
Segment Unloaded	#DIV/0!	Concentration														
23		Time														
Segment loaded	8.595	Concentration														
23		Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded 19	Average 3.717	Concentration Time	5.939 152501													
Segment loaded 19	7.612	Concentration Time	12.280 153822	11.631 153825	12.848 153828	12.296 153831	12.888 153834	14.342 153837	14.479 153840	14.916 153843	12.376 153846	12.763 153849	12.638 153852	12.453 153855	12.405 153858	12.832 153901
Segment Unloaded 1	4.233	Concentration Time														
Segment loaded 1	9.447	Concentration Time														
Segment Unloaded 20	12.702	Concentration Time														
Segment loaded 20	14.206	Concentration Time														
Segment Unloaded 22	5.106	Concentration Time														
Segment loaded 22	9.744	Concentration Time														
Segment Unloaded 23	#DIV/0!	Concentration Time														
Segment loaded 23	8.595	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded 19	Average 3.717	Concentration Time														
Segment loaded 19	7.612	Concentration Time	11.165 153904	8.889 153907	8.251 153910	9.830 153913	10.454 153916	9.653 153919	9.966 153922	9.230 153925	8.808 153928	7.577 153931	6.661 153934	6.256 153937	5.897 153940	5.972 153943
Segment Unloaded 1	4.233	Concentration Time														
Segment loaded 1	9.447	Concentration Time														
Segment Unloaded 20	12.702	Concentration Time														
Segment loaded 20	14.206	Concentration Time														
Segment Unloaded 22	5.106	Concentration Time														
Segment loaded 22	9.744	Concentration Time														
Segment Unloaded 23	#DIV/0!	Concentration Time														
Segment loaded 23	8.595	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded 19	Average 3.717	Concentration Time														
Segment loaded 19	7.612	Concentration Time	5.330 153946	5.300 153949	4.903 153952	4.271 153955	3.819 153959	3.696 154002	3.845 154005	6.220 154012	7.264 154015	6.553 154018	5.415 154021	4.898 154024	5.414 154027	5.520 154030
Segment Unloaded 1	4.233	Concentration Time														
Segment loaded 1	9.447	Concentration Time														
Segment Unloaded 20	12.702	Concentration Time														
Segment loaded 20	14.206	Concentration Time														
Segment Unloaded 22	5.106	Concentration Time														
Segment loaded 22	9.744	Concentration Time														
Segment Unloaded 23	#DIV/0!	Concentration Time														
Segment loaded 23	8.595	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded 19	Average 3.717	Concentration Time														
Segment loaded 19	7.612	Concentration Time	5.239 154033	6.253 154036	7.599 154039	8.876 154042	8.925 154045	8.622 154048	7.271 154051	6.810 154054	6.496 154057	6.391 154100	5.859 154103	6.324 154106	7.911 154109	8.615 154112
Segment Unloaded 1	4.233	Concentration Time														
Segment loaded 1	9.447	Concentration Time														
Segment Unloaded 20	12.702	Concentration Time														
Segment loaded 20	14.206	Concentration Time														
Segment Unloaded 22	5.106	Concentration Time														
Segment loaded 22	9.744	Concentration Time														
Segment Unloaded 23	#DIV/0!	Concentration Time														
Segment loaded 23	8.595	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 10

Segment Unloaded 19	Average 3.717	Concentration Time													
Segment loaded 19	7.612	Concentration Time	9.371 154115	10.282 154118	8.748 154121	8.013 154124	6.792 154127	7.868 154130	6.351 154133	5.764 154136	4.983 154139	5.019 154142	5.097 154145	4.583 154148	3.783 154152
Segment Unloaded 1	4.233	Concentration Time													
Segment loaded 1	9.447	Concentration Time													
Segment Unloaded 20	12.702	Concentration Time													
Segment loaded 20	14.206	Concentration Time													
Segment Unloaded 22	5.106	Concentration Time													
Segment loaded 22	9.744	Concentration Time													
Segment Unloaded 23	#DIV/0!	Concentration Time													
Segment loaded 23	8.595	Concentration Time													



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment Unloaded 3	Average 4.693	Concentration Time	4.132	3.710	4.179	5.767	5.278	4.535	4.062	4.442	3.926	3.688	3.717	3.077	2.818	3.147
	161016		161019	161022	161025	161028	161031	161034	161037	161040	161043	161046	161049	161052	161055	
Segment Loaded 14	4.105	Concentration Time	2.341	2.066	1.932	1.920	2.066	3.309	4.778	4.759	4.532	4.428	4.612	5.293	6.261	7.352
	164201		164204	164207	164210	164213	164216	164219	164222	164225	164228	164231	164234	164237	164240	
Segment Unloaded 10	4.530	Concentration Time	6.118	4.314	3.946	4.045	4.497	4.121	3.942	4.302	4.912	4.429	4.333	3.765	3.770	4.010
	162513		162516	162519	162522	162525	162528	162531	162534	162537	162540	162543	162546	162549	162552	
Segment loaded 8	6.023	Concentration Time	3.266	3.674	4.130	4.722	5.218	5.093	5.124	4.463	3.871	4.038	4.256	4.620	4.734	5.663
	162919		162922	162925	162928	162931	162934	162937	162940	162943	162946	162949	162952	162955	162958	
Segment Unloaded 5	3.623	Concentration Time	4.897	5.385	4.550	4.045	3.813	3.074	3.030	2.741	2.599	3.237	3.229	2.784	2.701	3.262
	161634		161637	161640	161643	161646	161649	161652	161655	161658	161701	161704	161707	161710	161713	
Segment loaded 5	6.000	Concentration Time	15.898	28.025	26.351	16.293	13.058	10.411	7.347	6.378	6.058	5.626	6.151	8.170	8.093	8.507
	163052		163055	163058	163101	163104	163107	163110	163113	163116	163119	163122	163125	163128	163131	
Segment Unloaded 4	3.266	Concentration Time	3.771	2.835	2.740	2.928	2.930	3.457	3.091	3.132	2.966	2.678	2.508	2.614	2.898	3.503
	161443		161446	161449	161452	161455	161458	161501	161504	161507	161510	161513	161516	161519	161522	
Segment loaded 4	4.716	Concentration Time	4.263	4.699	6.159	5.219	4.548	5.134	5.263	4.924	5.925	7.080	6.917	6.142	7.041	7.426
	163407		163410	163413	163416	163419	163422	163425	163428	163431	163434	163437	163440	163443	163446	
Segment unloaded 13	6.708	Concentration Time	3.193	3.639	2.611	2.487	3.496	2.49	2.3	2.496	1.882	1.862	2.5	2.468	2.355	3.209
	163613		163616	163619	163622	163625	163628	163631	163634	163637	163640	163643	163646	163649	163652	
Segment loaded 13	9.185	Concentration Time	8.2	15.383	16.537	5.833	3.868	3.384	4.919	8.855	14.574	16.749	17.612	14.429	12.257	17.567
	163958		164001	164004	164007	164010	164013	164016	164019	164022	164025	164028	164031	164034	164037	
Segment unloaded 18	#DIV/0!	Concentration Time	--													
Segment loaded 18	14.268	Concentration Time	3.802	6.023	7.858	10.236	13.127	15.752	20.18	18.129	10.785	5.394	6.662	8.053	13.516	19.626
	160331		160334	160337	160340	160343	160346	160349	160352	160355	160358	160401	160404	160407	160410	
Segment unloaded 1	3.457	Concentration Time	2.111	2.106	2.422	3.271	4.356	4.312	3.593	3.813	3.944	3.888	3.244	3.077		
	160922		160925	160928	160931	160934	160937	160940	160943	160946	160949	160952	160955			
Segment loaded 1	3.893	Concentration Time	7.747	5.502	4.727	4.189	3.482	3.891	4.813	3.248	2.804	2.673	3.597			
	160819		160822	160825	160828	160831	160834	160837	160840	160843	160846	160849				



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Segment Unloaded 3	Average 4.693	Concentration Time	3.674 161058	5.980 161101	4.915 161104	3.874 161107	3.945 161110	4.870 161113	4.409 161116	4.397 161119	5.564 161122	4.972 161125	5.580 161128	5.422 161131	5.984 161134	5.506 161137
Segment Loaded 14	4.105	Concentration Time	6.428 164243	5.865 164246	5.785 164249	5.347 164252	6.009 164255	5.138 164258	4.936 164301	4.144 164304	4.100 164307	4.562 164310	4.389 164313	3.227 164316	3.147 164319	4.061 164322
Segment Unloaded 10	4.530	Concentration Time	4.635 162555	4.707 162558	4.398 162601	4.552 162604	5.058 162607	4.715 162610	4.075 162613	4.861 162616	6.959 162619	9.298 162622	8.915 162625	6.407 162628	4.527 162631	4.004 162634
Segment loaded 8	6.023	Concentration Time	6.800 163001	7.894 163004	9.155 163007	8.630 163010	9.156 163013	7.101 163016	5.133 163019	5.021 163022	8.493 163025	11.555 163028	8.483 163031	5.939 163034	5.249 163037	4.671 163040
Segment Unloaded 5	3.623	Concentration Time	4.057 161716	3.036 161719	4.049 161722	3.862 161725	3.520 161728	3.743 161731	2.868 161734	2.474 161737	3.029 161740	2.990 161743	2.972 161746	3.366 161749	3.417 161752	4.309 161755
Segment loaded 5	6.000	Concentration Time	7.291 163134	6.432 163137	6.134 163140	6.081 163143	6.385 163146	8.457 163149	10.655 163152	8.917 163155	8.706 163158	8.650 163201	8.245 163204	7.141 163207	5.371 163210	4.402 163213
Segment Unloaded 4	3.266	Concentration Time	3.357 161525	2.477 161528	3.416 161531	4.489 161534	3.975 161537	3.980 161540	3.449 161543	3.694 161546	3.171 161549	2.691 161552	2.973 161555	2.912 161558	3.467 161601	3.262 161604
Segment loaded 4	4.716	Concentration Time	8.719 163449	9.057 163452	8.256 163455	6.918 163458	5.915 163501	3.934 163504	3.346 163507	3.230 163510	3.380 163513	3.494 163516	3.978 163519	4.279 163522	4.179 163525	3.577 163528
Segment unloaded 13	6.708	Concentration Time	3.238 163655	5.657 163849	4.333 163852	5.409 163855	9.583 163858	16.025 163901	19.4 163904	13.815 163907	9.35 163910	10.33 163913	11.423 163916	8.819 163919	7.002 163922	9.64 163925
Segment loaded 13	9.185	Concentration Time	16.943 164040	17.318 164043	11.189 164046	10.858 164049	11.269 164052	6.374 164055	5.9 164058	4.973 164101	5.004 164104	7.147 164107	8.52 164110	11.116 164113	11.543 164116	6.784 164119
Segment unloaded 18	#DIV/0!	Concentration Time														
Segment loaded 18	14.268	Concentration Time	23.323 160413	27.496 160416	31.99 160419	29.807 160422	21.109 160425	20.406 160428	22.449 160431	18.913 160434	14.413 160437	17.117 160440	17.913 160443	16.915 160446	17.624 160449	12.913 160452
Segment unloaded 1	3.457	Concentration Time														
Segment loaded 1	3.893	Concentration Time														



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Segment Unloaded 3	Average 4.693	Concentration Time	5.403 161140	4.577 161143	4.063 161146	4.399 161149	4.365 161152	5.214 161155	5.000 161158	5.544 161201	6.534 161204	5.888 161207	5.137 161210	4.796 161213	4.322 161216	4.456 161219
Segment Loaded 14	4.105	Concentration Time	4.126 164325	3.332 164328	2.648 164331	2.640 164334	2.953 164337	3.238 164340	3.787 164343	4.379 164346	4.567 164349	3.581 164352	3.844 164355	4.436 164358	4.394 164401	4.880 164404
Segment Unloaded 10	4.530	Concentration Time	3.886 162637	3.521 162640	3.526 162643	5.004 162646	3.848 162649	3.142 162652	2.882 162655	2.966 162658	2.791 162701					
Segment loaded 8	6.023	Concentration Time	5.744 163043													
Segment Unloaded 5	3.623	Concentration Time	3.878 161758	3.936 161801	3.760 161804	2.550 161807	2.560 161810	3.124 161813	4.506 161816	3.780 161819	4.888 161822	3.897 161825	3.059 161828	4.142 161831	4.428 161834	4.926 161837
Segment loaded 5	6.000	Concentration Time	4.707 163216	4.563 163219	4.548 163222	4.169 163225	3.955 163228	3.473 163231	3.290 163234	3.157 163237	3.038 163240	2.848 163243	3.003 163246	3.215 163249	3.188 163252	2.982 163255
Segment Unloaded 4	3.266	Concentration Time	2.959 161607	3.148 161610	4.135 161613	3.369 161616	3.474 161619	3.304 161622	2.988 161625	3.559 161628	5.036 161631					
Segment loaded 4	4.716	Concentration Time	3.640 163531	3.806 163534	3.352 163537	2.911 163540	2.818 163543	2.947 163546	2.547 163549	2.166 163552	2.153 163555	2.156 163558	1.987 163601			
Segment unloaded 13	6.708	Concentration Time	9.656 163928	10.243 163931	10.466 163934	9.305 163937	7.981 163940	6.864 163943	5.74 163946							
Segment loaded 13	9.185	Concentration Time	4.537 164122	3.912 164125	4.436 164128	7.628 164131	5.415 164134	3.392 164137	2.764 164140	2.491 164143						
Segment unloaded 18	#DIV/0!	Concentration Time														
Segment loaded 18	14.268	Concentration Time	14.191 160455	13.98 160458	12.141 160501	11.164 160504	15.02 160507	15.359 160510	15.055 160513	16.537 160516	18.336 160519	16.847 160522	10.567 160525	8.025 160528	12.91 160531	15.768 160534
Segment unloaded 1	3.457	Concentration Time														
Segment loaded 1	3.893	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment Unloaded 3	Average 4.693	Concentration Time	5.597 161222	7.523 161225	6.881 161228	4.938 161231	4.791 161234	5.060 161237	5.404 161240	5.384 161243	5.657 161246	5.150 161249	4.044 161252	3.879 161255	4.410 161258	4.321 161301
Segment Loaded 14	4.105	Concentration Time	5.251 164407	4.963 164410	4.344 164413	2.936 164416	3.389 164419	3.754 164422	4.024 164425	6.687 164428	5.916 164431	5.652 164434	4.944 164437	5.805 164440	4.588 164443	5.191 164446
Segment Unloaded 10	4.530	Concentration Time														
Segment loaded 8	6.023	Concentration Time														
Segment Unloaded 5	3.623	Concentration Time	4.937 161840	4.222 161843	3.539 161846	4.738 161849	5.522 161852	6.416 161855	5.018 161858	3.986 161901	3.751 161904	3.456 161907	2.793 161910	2.392 161913	2.433 161916	2.077 161919
Segment loaded 5	6.000	Concentration Time	2.902 163258	2.706 163301	2.916 163304	2.901 163307	2.813 163310	2.828 163313	3.461 163316	3.316 163319	3.052 163322	2.980 163325	3.131 163328	3.328 163331	2.756 163334	2.240 163337
Segment Unloaded 4	3.266	Concentration Time														
Segment loaded 4	4.716	Concentration Time														
Segment unloaded 13	6.708	Concentration Time														
Segment loaded 13	9.185	Concentration Time														
Segment unloaded 18	#DIV/0!	Concentration Time														
Segment loaded 18	14.268	Concentration Time	17.374 160537	19.199 160540	19.721 160543	20.574 160546	23.872 160549	25.592 160552	26.462 160555	19.833 160558	15.469 160601	15.32 160604	17.149 160607	16.292 160610	15.739 160613	16.709 160616
Segment unloaded 1	3.457	Concentration Time														
Segment loaded 1	3.893	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment Unloaded 3	Average 4.693	Concentration Time	4.139 161304	4.588 161307	4.460 161310	6.319 161313	5.807 161316	4.112 161319	3.679 161322	3.357 161325	3.646 161328	4.185 161331	4.342 161334	4.532 161337	3.693 161340	3.889 161343
Segment Loaded 14	4.105	Concentration Time	5.046 164449	4.885 164452	4.166 164455	2.984 164458	4.055 164501	3.735 164504	4.328 164507	3.922 164510	3.711 164513	3.140 164516	2.714 164519	2.940 164522	3.134 164525	3.170 164528
Segment Unloaded 10	4.530	Concentration Time														
Segment loaded 8	6.023	Concentration Time														
Segment Unloaded 5	3.623	Concentration Time	2.572 161922	3.452 161925	4.340 161928	3.371 161931	2.910 161934	3.354 161937	3.787 161940							
Segment loaded 5	6.000	Concentration Time	2.787 163340	3.558 163343	5.077 163346	4.695 163349	4.032 163352	4.313 163355	4.103 163358	6.144 163401	4.519 163404					
Segment Unloaded 4	3.266	Concentration Time														
Segment loaded 4	4.716	Concentration Time														
Segment unloaded 13	6.708	Concentration Time														
Segment loaded 13	9.185	Concentration Time														
Segment unloaded 18	#DIV/0!	Concentration Time														
Segment loaded 18	14.268	Concentration Time	14.271 160619	14.813 160622	13.405 160625	13.955 160628	14.15 160631	11.045 160634	9.303 160637	8.447 160640	8.197 160643	10.886 160646	10.145 160649	7.682 160652	6.381 160655	5.844 160658
Segment unloaded 1	3.457	Concentration Time														
Segment loaded 1	3.893	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment Unloaded 3	Average 4.693	Concentration Time	5.080 161346	5.072 161349	5.825 161352	5.427 161355	4.287 161358	5.472 161401	5.460 161404	4.353 161407	4.983 161410	3.730 161413	3.359 161416	3.155 161419	3.712 161422	
Segment Loaded 14	4.105	Concentration Time	3.284 164531	3.972 164534	4.175 164537	3.956 164540	3.653 164543	3.607 164546	3.685 164549	3.326 164552	4.409 164555	3.613 164558	3.022 164601	3.184 164604	3.341 164607	3.170 164610
Segment Unloaded 10	4.530	Concentration Time														
Segment loaded 8	6.023	Concentration Time														
Segment Unloaded 5	3.623	Concentration Time														
Segment loaded 5	6.000	Concentration Time														
Segment Unloaded 4	3.266	Concentration Time														
Segment loaded 4	4.716	Concentration Time														
Segment unloaded 13	6.708	Concentration Time														
Segment loaded 13	9.185	Concentration Time														
Segment unloaded 18	#DIV/0!	Concentration Time														
Segment loaded 18	14.268	Concentration Time	5.312 160701	4.53 160704	4.825 160707	5.262 160710	4.519 160713	4.166 160716	4.289 160719	5.864 160722	7.604 160725	10.642 160728	10.378 160731	14.298 160734	19.244 160737	18.813 160740
Segment unloaded 1	3.457	Concentration Time														
Segment loaded 1	3.893	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment Unloaded 3	Average 4.693	Concentration Time										
Segment Loaded 14	4.105	Concentration Time	3.476 164613	3.202 164616	4.290 164619	3.149 164622						
Segment Unloaded 10	4.530	Concentration Time										
Segment loaded 8	6.023	Concentration Time										
Segment Unloaded 5	3.623	Concentration Time										
Segment loaded 5	6.000	Concentration Time										
Segment Unloaded 4	3.266	Concentration Time										
Segment loaded 4	4.716	Concentration Time										
Segment unloaded 13	6.708	Concentration Time										
Segment loaded 13	9.185	Concentration Time										
Segment unloaded 18	#DIV/0!	Concentration Time										
Segment loaded 18	14.268	Concentration Time	19.791 160743	20.998 160746	19.33 160749	20.72 160752	16.828 160755	9.399 160758	9.334 160801	8.15 160804	6.901 160807	
Segment unloaded 1	3.457	Concentration Time										
Segment loaded 1	3.893	Concentration Time										



Iron Mining Association of Minnesota Winter Emission Factor - Run 11																
Segment unloaded 2	3.600	Concentration Time	3.244 160952	3.077 160955	2.884 160958	3.359 161001	4.712 161004	3.997 161007	3.569 161010							
Segment loaded 2	10.221	Concentration Time	6.901 160807	12.855 160810	13.888 160813	11.111 160816	7.747 160819	5.502 160822								
Segment unloaded 6	4.076	Concentration Time	4.059 161952	3.222 161955	4.844 161958	4.159 162001	3.722 162004	4.037 162007	4.677 162010	5.919 162013	5.034 162016	5.266 162019	5.513 162022	5.970 162025	5.312 162028	3.775 162031
Segment loaded 6	8.753	Concentration Time	3.115 162104	2.119 162107	2.938 162110	10.780 162113	17.103 162116	13.267 162119	13.175 162122	13.838 162125	10.146 162128	12.078 162131	9.835 162134	6.597 162137	6.446 162140	8.128 162143
Segment unloaded 7	4.236	Concentration Time	4.909 162213	5.589 162216	5.008 162219	5.048 162222	6.276 162225	4.777 162228	4.434 162231	5.016 162234	4.505 162237	3.759 162240	3.107 162243	3.151 162246	3.398 162249	3.859 162252
Segment loaded 7	3.775	Concentration Time	2.422 162340	1.783 162343	1.597 162346	1.604 162349	1.567 162352	1.245 162355	1.264 162358	1.608 162401	1.893 162404	2.003 162407	2.889 162410	2.991 162413	3.861 162416	4.405 162419
Segment unloaded 9	4.821	Concentration Time	3.429 162819	4.078 162822	3.975 162825	4.075 162828	4.013 162831	3.851 162834	3.481 162837	3.672 162840	3.588 162843	4.381 162846	5.572 162849	7.018 162852	7.001 162855	6.119 162858
Segment loaded 9	3.439	Concentration Time	3.618 162707	5.092 162710	5.425 162713	5.062 162716	4.923 162719	4.356 162722	3.080 162725	2.373 162728	2.497 162731	2.510 162734	2.594 162737	2.597 162740	2.649 162743	2.739 162746



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment unloaded 2	3.600	Concentration Time														
Segment loaded 2	10.221	Concentration Time														
Segment unloaded 6	4.076	Concentration Time	3.255 162034	3.527 162037	3.652 162040	3.545 162043	3.533 162046	3.306 162049	2.815 162052	2.318 162055	2.278 162058					
Segment loaded 6	8.753	Concentration Time	12.922 162146	13.951 162149	9.082 162152	5.725 162155	4.793 162158	3.983 162201	3.645 162204	3.273 162207						
Segment unloaded 7	4.236	Concentration Time	4.202 162255	4.180 162258	3.581 162301	3.430 162304	3.545 162307	3.555 162310	4.060 162313	4.207 162316	4.626 162319	4.823 162322	4.637 162325	4.829 162328	3.850 162331	2.911 162334
Segment loaded 7	3.775	Concentration Time	4.313 162422	5.941 162425	6.984 162428	5.241 162431	4.136 162434	4.421 162437	5.667 162440	4.857 162443	4.319 162446	6.544 162449	8.235 162452	5.376 162455	3.401 162458	
Segment unloaded 9	4.821	Concentration Time	6.661 162901	7.244 162904	5.115 162907	4.541 162910	4.015 162913	3.206 162916								
Segment loaded 9	3.439	Concentration Time	3.146 162749	3.515 162752	2.894 162755	3.453 162758	4.037 162801	3.666 162804	2.895 162807	2.724 162810						



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment unloaded 2	3.600	Concentration Time
Segment loaded 2	10.221	Concentration Time
Segment unloaded 6	4.076	Concentration Time
Segment loaded 6	8.753	Concentration Time
Segment unloaded 7	4.236	Concentration Time
Segment loaded 7	3.775	Concentration Time
Segment unloaded 9	4.821	Concentration Time
Segment loaded 9	3.439	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment unloaded 2	3.600	Concentration Time
Segment loaded 2	10.221	Concentration Time
Segment unloaded 6	4.076	Concentration Time
Segment loaded 6	8.753	Concentration Time
Segment unloaded 7	4.236	Concentration Time
Segment loaded 7	3.775	Concentration Time
Segment unloaded 9	4.821	Concentration Time
Segment loaded 9	3.439	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment unloaded 2	3.600	Concentration Time
Segment loaded 2	10.221	Concentration Time
Segment unloaded 6	4.076	Concentration Time
Segment loaded 6	8.753	Concentration Time
Segment unloaded 7	4.236	Concentration Time
Segment loaded 7	3.775	Concentration Time
Segment unloaded 9	4.821	Concentration Time
Segment loaded 9	3.439	Concentration Time



**Iron Mining Association of Minnesota Winter Emission Factor - Run 11**

Segment unloaded 2	3.600	Concentration Time
Segment loaded 2	10.221	Concentration Time
Segment unloaded 6	4.076	Concentration Time
Segment loaded 6	8.753	Concentration Time
Segment unloaded 7	4.236	Concentration Time
Segment loaded 7	3.775	Concentration Time
Segment unloaded 9	4.821	Concentration Time
Segment loaded 9	3.439	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 11

Segment unloaded 2	3.600	Concentration Time
Segment loaded 2	10.221	Concentration Time
Segment unloaded 6	4.076	Concentration Time
Segment loaded 6	8.753	Concentration Time
Segment unloaded 7	4.236	Concentration Time
Segment loaded 7	3.775	Concentration Time
Segment unloaded 9	4.821	Concentration Time
Segment loaded 9	3.439	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 12

Segment	Unloaded	Average	Concentration Time	8.263	8.598	6.867	6.473	6.676	7.981	8.304	6.347	5.713	6.016	7.171	5.698	5.027	4.998	4.980	5.579	5.751	5.355	7.747
		9.806		181215	181218	181221	181224	181227	181230	181233	181236	181239	181242	181245	181248	181251	181254	181257	181300	181303	181306	181309
Segment	loaded	4.028	Concentration Time	2.206	2.326	2.712	2.126	2.557	8.114	17.748	14.890	7.829	5.663	4.871	4.647	6.029	6.050	5.394	5.186	5.102	5.919	6.326
14				182157	182200	182203	182206	182209	182212	182215	182218	182221	182224	182227	182230	182233	182236	182239	182242	182245	182248	182251
Segment	unloaded	6.922	Concentration Time	3.600	4.077	3.328	2.520	2.567	2.504	2.317	3.387	4.855	3.260	3.447	3.270	3.548	4.607	7.108	7.564	6.625	7.048	7.901
18				182830	182833	182836	182839	182842	182845	182848	182851	182854	182857	182900	182903	182906	182909	182912	182915	182918	182921	182924
Segment	loaded	13.671	Concentration Time	3.918	4.164	5.659	7.901	13.356	16.502	12.356	22.198	22.429	7.977	4.575	3.585	3.674	6.807	9.595	14.313	15.548	19.591	20.230
18				183336	183339	183342	183345	183348	183351	183354	183357	183400	183403	183406	183409	183412	183415	183418	183421	183424	183427	183430
Segment	loaded	11.163	Concentration Time	13.023	12.702	15.721	18.628	15.740	16.105	15.956	14.407	15.960	15.742	10.428	11.830	18.245	14.412	11.486	8.631	11.185	9.721	10.771
19				185757	185800	185803	185806	185809	185812	185815	185818	185821	185824	185827	185830	185833	185836	185839	185842	185845	185848	185851
Segment	unloaded	3.357	Concentration Time	2.938	2.948	2.546	2.332	2.571	2.495	2.585	2.109	2.248	2.065	2.158	1.898	2.001	2.119	1.794	1.910	2.234	2.213	2.333
19				184339	184342	184345	184348	184351	184354	184357	184400	184403	184406	184409	184412	184415	184418	184421	184424	184427	184430	184433
Segment	unloaded	12.575	Concentration Time	4.429	4.172	4.789	4.512	4.615	5.387	4.621	5.727	5.070	3.808	6.179	10.314	14.646	12.320	15.489	27.919	28.501	24.607	16.603
13				181754	181757	181800	181803	181806	181809	181812	181815	181818	181821	181824	181827	181830	181833	181836	181839	181842	181845	181848
Segment	loaded	5.294	Concentration Time	8.040	5.270	4.715	4.179	4.254	7.720	12.264	8.277	10.424	9.506	8.051	7.974	7.808	9.939	10.271	9.007	12.906	6.961	3.820
13				181933	181936	181939	181942	181945	181948	181951	181954	181957	182000	182003	182006	182009	182012	182015	182018	182021	182024	182027
Segment	unloaded	3.797	Concentration Time	6.130	5.836	5.163	4.522	4.332	4.576	4.177	4.563	4.956	2.034	2.443	2.568	2.926	2.704	2.846	3.070	2.773	2.722	
1				184157	184200	184203	184206	184209	184212	184215	184218	184221	182739	182742	182745	182748	182751	182754	182757	182800	182803	
Segment	loaded	7.677	Concentration Time	11.139	5.481	5.405	4.588	5.229	11.475	13.529	11.200	4.836	3.882									
1				183912	183915	183918	183921	183924	183927	183930	183933	183936	183939									
Segment	unloaded	2.639	Concentration Time	2.456	2.275	2.402	3.216	3.029	2.454													
2				182806	182809	182812	182815	182818	182821													
Segment	loaded	6.103	Concentration Time	3.871	5.371	5.185	5.244	7.128	11.139	5.481	5.405											
2				183857	183900	183903	183906	183909	183912	183915	183918											
Segment	unloaded	16.402	Concentration Time	14.406	13.011	13.861	15.677	15.682	17.352	17.860	20.559	21.734	15.590	14.546	17.137	17.146	14.106	13.940	13.471	12.792	20.717	19.532
22				185345	185348	185351	185354	185357	185400	185403	185406	185409	185412	185415	185418	185421	185424	185427	185430	185433	185436	185439
Segment	loaded	23.328	Concentration Time	13.993	18.753	16.703	24.587	36.474	42.643	41.141	34.428	29.734	29.866	24.538	24.299	32.721	41.945	47.166	38.908	31.985	18.960	9.904
22				185506	185509	185512	185515	185518	185521	185524	185527	185530	185533	185536	185539	185542	185545	185548	185551	185554	185557	185600
Segment	unloaded	7.755	Concentration Time	4.164	4.276	3.922	4.389	4.296	6.360	6.321	5.008	7.526	9.013	9.193	10.095	9.924	11.071	10.806	9.241	8.369	7.078	5.403
23				184736	184739	184742	184745	184748	184751	184754	184757	184800	184803	184806	184809	184812	184815	184818	184821	184824	184827	184830
Segment	loaded	8.351	Concentration Time	4.125	3.221	3.294	3.107	2.636	2.435	3.985	7.817	5.971	3.200	2.848	4.642	5.521	4.379	4.776	4.989	4.947	5.589	6.535
23				184939	184942	184945	184948	184951	184954	184957	185000	185003	185006	185009	185012	185015	185018	185021	185024	185027	185030	185033



Iron Mining Association of Minnesota Winter Emission Factor - Run 12

Segment	Unloaded	Average	Concentration Time	11.406	9.700	7.246	6.690	7.620	8.714	9.709	10.129	10.127	9.401	9.742	11.835	10.299	9.931	9.875	8.216	7.965	6.532	6.634
		9.806		181312	181315	181318	181321	181324	181327	181330	181333	181336	181339	181342	181345	181348	181351	181354	181357	181400	181403	181406
Segment	loaded	4.028	Concentration Time	5.390	5.473	5.249	4.591	3.559	3.419	3.577	3.789	4.133	3.826	3.422	3.360	3.446	3.729	3.454	3.222	3.165	3.123	2.770
14				182254	182257	182300	182303	182306	182309	182312	182315	182318	182321	182324	182327	182330	182333	182336	182339	182342	182345	182348
Segment	unloaded	6.922	Concentration Time	8.331	9.934	12.992	15.990	17.423	16.096	16.126	14.305	13.303	12.396	7.558	7.749	8.420	7.682	6.360	7.194	8.132	9.193	8.029
18				182927	182930	182933	182936	182939	182942	182945	182948	182951	182954	182957	183000	183003	183006	183009	183012	183015	183018	183021
Segment	loaded	13.671	Concentration Time	18.323	20.323	22.432	20.262	19.237	22.929	13.897	10.113	6.513	5.125	7.095	19.586	17.782	14.030	12.883	13.709	11.586	11.140	16.607
18				183433	183436	183439	183442	183445	183448	183451	183454	183457	183500	183503	183506	183509	183512	183515	183518	183521	183524	183527
Segment	loaded	11.163	Concentration Time	10.415	9.733	9.232	8.499	7.417	9.234	14.347	14.643	10.128	8.461	8.368	7.573	6.382	6.556	5.504	7.693	17.150	21.434	14.390
19				185854	185857	185900	185903	185906	185909	185912	185915	185918	185921	185924	185927	185930	185933	185936	185939	185942	185945	185948
Segment	unloaded	3.357	Concentration Time	2.607	2.356	2.178	2.428	2.324	2.696	2.620	2.023	2.435	4.332	4.282	3.876	3.754	3.268	2.316	2.211	2.679	3.272	3.419
19				184436	184439	184442	184445	184448	184451	184454	184457	184500	184503	184506	184509	184512	184515	184518	184521	184524	184527	184530
Segment	unloaded	12.575	Concentration Time	17.482	22.370	19.129	17.149	14.182	15.611	13.118	18.404	19.874	13.986	12.048	8.642	6.690						
13				181851	181854	181857	181900	181903	181906	181909	181912	181915	181918	181921	181924	181927						
Segment	loaded	5.294	Concentration Time	3.465	3.139	2.937	2.788	2.720	2.378	2.102	2.731	2.781	1.838	2.105	5.339	7.741	5.336	3.512	2.962	2.359	2.100	1.964
13				182030	182033	182036	182039	182042	182045	182048	182051	182054	182057	182100	182103	182106	182109	182112	182115	182118	182121	182124
Segment	unloaded	3.797	Concentration Time																			
1																						
Segment	loaded	7.677	Concentration Time																			
1																						
Segment	unloaded	2.639	Concentration Time																			
2																						
Segment	loaded	6.103	Concentration Time																			
2																						
Segment	unloaded	16.402	Concentration Time	20.673	24.517	18.325	11.225	13.015	13.189													
22				185442	185445	185448	185451	185454	185457													
Segment	loaded	23.328	Concentration Time	7.821	6.604	5.847	5.193	4.799	4.487	13.028												
22				185603	185606	185609	185612	185615	185618	185621												
Segment	unloaded	7.755	Concentration Time	7.006	9.573	10.597	14.925	20.795	18.158	11.684	7.942	4.892	4.255	3.769	3.351	4.000	5.906	6.251	6.354	6.317	8.070	8.663
23				184833	184836	184839	184842	184845	184848	184851	184854	184857	184900	184903	184906	184909	184912	184915	184918	184921	184924	184927
Segment	loaded	8.351	Concentration Time	5.682	4.980	4.333	4.710	5.712	9.237	9.133	5.870	6.844	11.079	19.006	20.357	18.053	12.898	9.617	11.516	10.955	8.201	8.822
23				185036	185039	185042	185045	185048	185051	185054	185057	185100	185103	185106	185109	185112	185115	185118	185121	185124	185127	185130



Iron Mining Association of Minnesota Winter Emission Factor - Run 12

Segment	Unloaded	Average 9.806	Concentration	6.725	7.467	7.644	8.186	10.425	10.589	10.662	43.078	174.975	23.458	10.897	13.536	12.933	10.525	7.518	8.248	9.145	7.257	6.768
3			Time	181409	181412	181415	181418	181421	181424	181427	181430	181433	181436	181439	181442	181445	181448	181451	181454	181457	181500	181503
Segment	loaded	4.028	Concentration	2.835	3.130	3.003	3.697	4.094	3.528	4.097	4.282	4.409	3.191	2.610	2.618	2.631	2.589	3.369	4.387	3.195	2.557	2.333
14			Time	182351	182354	182357	182400	182403	182406	182409	182412	182415	182418	182421	182424	182427	182430	182433	182436	182439	182442	182445
Segment	unloaded	6.922	Concentration	7.205	7.461	7.583	7.097	5.608	5.685	6.453	7.656	7.177	6.993	5.676	6.825	6.664	6.705	5.377	5.418	5.855	4.986	5.857
18			Time	183024	183027	183030	183033	183036	183039	183042	183045	183048	183051	183054	183057	183100	183103	183106	183109	183112	183115	183118
Segment	loaded	13.671	Concentration	15.653	9.674	9.342	7.469	9.113	5.980	5.022	7.485	18.371	24.438	19.394	17.090	16.651	17.573	17.641	19.933	20.621	19.593	18.975
18			Time	183530	183533	183536	183539	183542	183545	183548	183551	183554	183557	183600	183603	183606	183609	183612	183615	183618	183621	183624
Segment	loaded	11.163	Concentration	7.155	5.534	5.012	5.709	8.833	11.530	9.679	7.015	7.370	8.908	11.887	11.250	10.492	9.959	11.343	11.349	12.641	13.259	11.067
19			Time	185951	185954	185957	190000	190003	190006	190009	190012	190015	190018	190021	190024	190027	190030	190033	190036	190039	190042	190045
Segment	unloaded	3.357	Concentration	3.123	2.793	3.314	4.288	5.070	4.421	3.956	3.798	4.005	4.260	3.598	4.249	5.211	5.262	4.671	4.632	4.291	4.328	4.126
19			Time	184533	184536	184539	184542	184545	184548	184551	184554	184557	184600	184603	184606	184609	184612	184615	184618	184621	184624	184627
Segment	unloaded	12.575	Concentration	12.575																		
13			Time																			
Segment	loaded	5.294	Concentration	1.793	1.821	1.739	5.294															
13			Time	182127	182130	182133																
Segment	unloaded	3.797	Concentration																			
1			Time																			
Segment	loaded	7.677	Concentration																			
1			Time																			
Segment	unloaded	2.639	Concentration																			
2			Time																			
Segment	loaded	6.103	Concentration																			
2			Time																			
Segment	unloaded	16.402	Concentration																			
22			Time																			
Segment	loaded	23.328	Concentration																			
22			Time																			
Segment	unloaded	7.755	Concentration	8.295	5.522	5.186																
23			Time	184930	184933	184936																
Segment	loaded	8.351	Concentration	5.834	6.574	8.029	10.291	11.520	12.400	11.266	15.975	16.691	15.199	9.289	18.378	13.424						
23			Time	185133	185136	185139	185142	185145	185148	185151	185154	185157	185200	185203	185206	185209						



Iron Mining Association of Minnesota Winter Emission Factor - Run 12

Segment	Unloaded	Average	Concentration Time	6.728	6.389	6.329	7.000	6.883	8.219	8.562	7.589	8.279	8.404	6.365	7.078	9.757	9.068	7.362	5.941	5.332	5.039	4.232
		9.806		181506	181509	181512	181515	181518	181521	181524	181527	181530	181533	181536	181539	181542	181545	181548	181551	181554	181557	181600
Segment	loaded	4.028	Concentration Time	2.190	2.028	2.944	4.201	3.138	2.888	2.551	3.002	3.089	2.366	2.240	2.214	2.131	2.040	2.680	3.372	4.462	5.265	4.912
14				182448	182451	182454	182457	182500	182503	182506	182509	182512	182515	182518	182521	182524	182527	182530	182533	182536	182539	182542
Segment	unloaded	6.922	Concentration Time	6.338	5.689	6.081	6.720	6.627	5.394	5.398	5.419	5.170	4.926	5.223	5.971	5.090	5.191	6.203	6.084	5.850	5.398	5.487
18				183121	183124	183127	183130	183133	183136	183139	183142	183145	183148	183151	183154	183157	183200	183203	183206	183209	183212	183215
Segment	loaded	13.671	Concentration Time	20.614	15.980	20.724	21.610	18.827	19.319	30.750	27.752	18.773	23.857	30.368	35.517	37.111	29.460	18.217	17.284	16.869	14.241	12.038
18				183627	183630	183633	183636	183639	183642	183645	183648	183651	183654	183657	183700	183703	183706	183709	183712	183715	183718	183721
Segment	loaded	11.163	Concentration Time	9.073	8.256	12.237	15.591	17.194	13.334	9.334	10.788	10.072	12.487	12.180	9.816	12.348	9.297	7.473	7.567			
19				190048	190051	190054	190057	190100	190103	190106	190109	190112	190115	190118	190121	190124	190127	190130	190133			
Segment	unloaded	3.357	Concentration Time	4.262	4.576	5.024	5.872	4.487	3.983	3.897	3.576	3.691	3.910	4.466	4.611	4.502	3.172	3.289	2.906	2.874	3.412	3.616
19				184630	184633	184636	184639	184642	184645	184648	184651	184654	184657	184700	184703	184706	184709	184712	184715	184718	184721	184724
Segment	unloaded	12.575	Concentration Time																			
13																						
Segment	loaded	5.294	Concentration Time																			
13																						
Segment	unloaded	3.797	Concentration Time																			
1																						
Segment	loaded	7.677	Concentration Time																			
1																						
Segment	unloaded	2.639	Concentration Time																			
2																						
Segment	loaded	6.103	Concentration Time																			
2																						
Segment	unloaded	16.402	Concentration Time																			
22																						
Segment	loaded	23.328	Concentration Time																			
22																						
Segment	unloaded	7.755	Concentration Time																			
23																						
Segment	loaded	8.351	Concentration Time																			
23																						



Iron Mining Association of Minnesota Winter Emission Factor - Run 12

Segment	Unloaded	Average 9.806	Concentration Time	4.464 181603	4.368 181606	4.252 181609	4.366 181612	4.400 181615	4.881 181618	4.289 181621	4.654 181624	4.176 181627	4.798 181630	4.322 181633	3.940 181636	4.424 181639	5.330 181642		9.806			
Segment	loaded	4.028	Concentration Time	4.239 182545	3.671 182548	3.655 182551	3.594 182554	4.601 182557	4.905 182600	4.805 182603	3.983 182606	3.365 182609	2.736 182612	3.005 182615	3.268 182618	3.592 182621	3.152 182624	3.428 182627	6.046 182630	3.906 182633		4.028
Segment	unloaded	6.922	Concentration Time	6.213 183218	7.206 183221	7.454 183224	6.745 183227	4.749 183230	5.359 183233	10.298 183236	15.322 183239	13.455 183242	9.670 183245	7.999 183248	8.404 183251	6.842 183254	6.667 183257	6.321 183300	5.983 183303	4.932 183306	4.755 183309	6.330 183312
Segment	loaded	13.671	Concentration Time	10.615 183724	12.770 183727	9.562 183730	7.788 183733	7.737 183736	6.099 183739	6.160 183742	6.396 183745	7.468 183748	11.043 183751	7.664 183754	4.489 183757	4.122 183800	3.921 183803	3.902 183806	3.430 183809	3.270 183812	6.320 183815	13.178 183818
Segment	loaded	11.163	Concentration Time																			
Segment	unloaded	3.357	Concentration Time	3.840 184727	3.946 184730																	
Segment	unloaded	12.575	Concentration Time																			
Segment	loaded	5.294	Concentration Time																			
Segment	unloaded	3.797	Concentration Time																			
Segment	loaded	7.677	Concentration Time																			
Segment	unloaded	2.639	Concentration Time																			
Segment	loaded	6.103	Concentration Time																			
Segment	unloaded	16.402	Concentration Time																			
Segment	loaded	23.328	Concentration Time																			
Segment	unloaded	7.755	Concentration Time																			
Segment	loaded	8.351	Concentration Time																			



Iron Mining Association of Minnesota Winter Emission Factor - Run 12

Segment 3	Unloaded	Average 9.806	Concentration Time										
Segment 14	loaded	4.028	Concentration Time										
Segment 18	unloaded	6.922	Concentration Time	6.786 183315	6.958 183318	6.381 183321	5.368 183324	4.217 183327	3.439 183330				
Segment 18	loaded	13.671	Concentration Time	12.268 183821	13.412 183824	10.322 183827	9.579 183830	10.593 183833	8.175 183836	5.160 183839	4.758 183842	4.039 183845	
Segment 19	loaded	11.163	Concentration Time										
Segment 19	unloaded	3.357	Concentration Time										
Segment 13	unloaded	12.575	Concentration Time										
Segment 13	loaded	5.294	Concentration Time										
Segment 1	unloaded	3.797	Concentration Time										
Segment 1	loaded	7.677	Concentration Time										
Segment 2	unloaded	2.639	Concentration Time										
Segment 2	loaded	6.103	Concentration Time										
Segment 22	unloaded	16.402	Concentration Time										
Segment 22	loaded	23.328	Concentration Time										
Segment 23	unloaded	7.755	Concentration Time										
Segment 23	loaded	8.351	Concentration Time										



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 2	Unloaded	Average 13.666	Concentration Time	5.544	6.099	6.189	5.750	6.161	6.939	8.303	13.658	22.713	22.324	13.014	13.731	13.911	13.818
				151656	151659	151702	151705	151708	151711	151714	151717	151720	151723	152350	152353	152356	152359
Segment 2	loaded	21.212	Concentration Time	22.311 152941	19.280 152944	18.422 152947	18.751 152950	20.617 152953	24.682 152956	26.566 152959	25.243 153002	19.582 153005	18.816 153008	19.059 153011			
Segment 3	Unloaded	26.178	Concentration Time	18.079 151726	17.476 151729	12.052 151732	12.119 151735	18.902 151738	25.428 151741	23.230 151744	21.959 151747	18.833 151750	18.429 151753	29.229 151756	25.091 151759	22.510 151802	29.693 151805
Segment 3	loaded	50.525	Concentration Time	19.589 152829	27.004 152832	38.710 152835	52.143 152838	65.653 152841	58.264 152844	51.253 152847	56.459 152850	73.173 152853	85.592 152856	97.328 152859	103.440 152902	69.998 152905	53.328 152908
Segment 4	Unloaded	24.887	Concentration Time	19.687 152532	29.594 152535	37.834 152538	40.939 152541	34.012 152544	28.951 152547	25.732 152550	25.297 152553	24.957 152556	22.321 152559	21.182 152602	19.194 152605	19.503 152608	23.377 152611
Segment 4	loaded	29.767	Concentration Time	13.903 152711	14.308 152714	14.032 152717	12.775 152720	11.867 152723	12.749 152726	19.903 152729	38.481 152732	54.362 152735	58.860 152738	38.475 152741	24.940 152744	22.452 152747	23.916 152750
Segment 5	Unloaded	33.482	Concentration Time	37.983 151838	41.543 151841	33.046 151844	24.918 151847	20.776 151850	21.088 151853	21.628 151856	22.800 151859	30.568 151902	32.506 151905	29.219 151908	33.519 151911	31.367 151914	27.920 151917
Segment 5	loaded	#DIV/0!	Concentration Time	--													
Segment 6	Unloaded	29.121	Concentration Time	19.837 151950	26.133 151953	32.346 151956	34.128 151959	36.537 152002	41.905 152005	45.974 152008	47.434 152011	55.147 152014	59.268 152017	47.619 152020	42.402 152023	33.704 152026	26.967 152029
Segment 6	loaded	#DIV/0!	Concentration Time														
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 2	Unloaded	Average 13.666	Concentration Time	14.086 152402	13.890 152405	14.585 152408	18.927 152411	24.262 152414	29.411 152417								
Segment 2	loaded	21.212	Concentration Time														
Segment 3	Unloaded	26.178	Concentration Time	34.598 151808	32.745 151811	36.494 151814	38.238 151817	36.909 151820	29.638 151823	25.810 151826	17.490 151829	16.804 151832	22.587 151835	26.378 152420	24.432 152423	20.460 152426	20.706 152429
Segment 3	loaded	50.525	Concentration Time	46.713 152911	58.259 152914	51.009 152917	33.958 152920	29.379 152923	27.879 152926	27.749 152929	29.893 152932	28.547 152935	27.289 152938				
Segment 4	Unloaded	24.887	Concentration Time	24.223 152614	23.440 152617	27.245 152620	31.958 152623	29.193 152626	26.521 152629	24.480 152632	21.289 152635	20.490 152638	16.131 152641	14.793 152644	14.730 152647		
Segment 4	loaded	29.767	Concentration Time	19.921 152753	25.612 152756	39.833 152759	45.058 152802	51.581 152805	54.275 152808	46.780 152811	35.525 152814	26.120 152817	19.150 152820	19.291 152823			
Segment 5	Unloaded	33.482	Concentration Time	26.849 151920	35.441 151923	50.820 151926	74.853 151929	62.030 151932	44.507 151935	33.715 151938	26.243 151941	21.197 151944	19.023 151947				
Segment 5	loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	29.121	Concentration Time	25.432 152032	30.696 152035	37.025 152038	39.798 152041	50.325 152044	70.078 152047	67.625 152050	50.478 152053	44.732 152056	44.748 152059	44.316 152102	41.975 152105	35.024 152108	36.191 152111
Segment 6	loaded	#DIV/0!	Concentration Time														
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 2	Unloaded	Average 13.666	Concentration Time															
Segment 2	loaded	21.212	Concentration Time															
Segment 3	Unloaded	26.178	Concentration Time	29.961 152432	38.335 152435	31.042 152438	23.623 152441	21.939 152444	21.922 152447	30.880 152450	41.672 152453	34.181 152456	24.226 152459	20.810 152502	23.881 152505	31.790 152508	42.692 152511	
Segment 3	loaded	50.525	Concentration Time															
Segment 4	Unloaded	24.887	Concentration Time															
Segment 4	loaded	29.767	Concentration Time															
Segment 5	Unloaded	33.482	Concentration Time															
Segment 5	loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	29.121	Concentration Time	37.913 152114	27.151 152117	19.328 152120	16.749 152123	14.951 152126	14.966 152129	15.612 152132	14.854 152135	14.553 152138	13.713 152141	13.831 152144	16.721 152147	18.103 152150	18.665 152153	
Segment 6	loaded	#DIV/0!	Concentration Time															
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	#DIV/0!	Concentration Time															
Segment 8	loaded	#DIV/0!	Concentration Time															



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 2	Unloaded	Average 13.666	Concentration Time															
Segment 2	loaded	21.212	Concentration Time															
Segment 3	Unloaded	26.178	Concentration Time	47.896 152514	38.714 152517	26.543 152520	18.994 152523	15.828 152526	15.285 152529									
Segment 3	loaded	50.525	Concentration Time															
Segment 4	Unloaded	24.887	Concentration Time															
Segment 4	loaded	29.767	Concentration Time															
Segment 5	Unloaded	33.482	Concentration Time															
Segment 5	loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	29.121	Concentration Time	18.443 152156	20.328 152159	24.762 152202	23.979 152205	25.102 152208	34.876 152211	45.767 152214	46.949 152217	43.081 152220	42.678 152223	35.099 152226	30.500 152229	27.803 152232	23.393 152235	
Segment 6	loaded	#DIV/0!	Concentration Time															
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	#DIV/0!	Concentration Time															
Segment 8	loaded	#DIV/0!	Concentration Time															



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 2	Unloaded	Average 13.666	Concentration Time														
Segment 2	loaded	21.212	Concentration Time														
Segment 3	Unloaded	26.178	Concentration Time														
Segment 3	loaded	50.525	Concentration Time														
Segment 4	Unloaded	24.887	Concentration Time														
Segment 4	loaded	29.767	Concentration Time														
Segment 5	Unloaded	33.482	Concentration Time														
Segment 5	loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	29.121	Concentration Time	20.068 152238	19.099 152241	17.817 152244	17.122 152247	16.001 152250	15.950 152253	15.968 152256	17.076 152259	17.674 152302	17.948 152305	18.825 152308	19.259 152311	16.962 152314	16.416 152317
Segment 6	loaded	#DIV/0!	Concentration Time														
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 2	Unloaded	Average 13.666	Concentration Time					
Segment 2	loaded	21.212	Concentration Time					
Segment 3	Unloaded	26.178	Concentration Time					
Segment 3	loaded	50.525	Concentration Time					
Segment 4	Unloaded	24.887	Concentration Time					
Segment 4	loaded	29.767	Concentration Time					
Segment 5	Unloaded	33.482	Concentration Time					
Segment 5	loaded	#DIV/0!	Concentration Time					
Segment 6	Unloaded	29.121	Concentration Time	15.376 152320	14.636 152323	13.913 152326	13.573 152329	12.663 152332
Segment 6	loaded	#DIV/0!	Concentration Time					
Segment 7	Unloaded	#DIV/0!	Concentration Time					
Segment 7	loaded	#DIV/0!	Concentration Time					
Segment 8	Unloaded	#DIV/0!	Concentration Time					
Segment 8	loaded	#DIV/0!	Concentration Time					



Iron Mining Association of Minnesota Winter Emission Factor - Run 14																	
Segment 9	Unloaded	12.009	Concentration Time	14.613 153129	14.326 153132	13.571 153135	13.254 153138	13.986 153141	13.296 153144	12.483 153147	11.906 153150	12.381 153153	12.242 153156	11.602 153159	11.507 153202	11.633 153205	11.826 153208
Segment 9	loaded	5.185	Concentration Time	4.031 154659	5.031 154702	5.653 154705	6.457 154708	5.748 154711	7.533 154714	7.743 154717	6.149 154720	5.576 154723	4.613 154726	5.265 154729	5.181 154732	5.820 154735	4.996 154738
Segment 10	Combined	6.972	Concentration Time	10.892 153244	11.034 153247	10.855 153250	10.427 153253	10.964 153256	11.162 153259	11.189 153302	10.523 153305	10.040 153308	10.139 153311	9.885 153314	10.325 153317	10.543 153320	10.090 153323
Segment 10	Combined	6.890	Concentration Time	11.122 153529	11.518 153532	12.541 153535	13.295 153538	13.610 153541	11.149 153544	8.793 153547	8.195 153550	7.840 153553	7.503 153556	7.430 153559	7.015 153602	6.938 153605	7.365 153608
Segment 11	Unloaded	5.717	Concentration Time	3.685 154159	3.470 154202	3.513 154205	3.458 154208	3.416 154211	4.854 154214	6.391 154217	6.210 154220	7.468 154223	7.397 154226	8.043 154229	12.837 154232	11.760 154235	9.185 154238
Segment 11	loaded	6.565	Concentration Time	2.967 154402	2.936 154405	3.508 154408	4.389 154411	6.193 154414	9.264 154417	10.467 154420	8.123 154423	5.166 154426	5.788 154429	11.318 154432	12.215 154435	19.509 154438	16.593 154441
Segment 12	Unloaded	8.750	Concentration Time	6.927 153435	7.764 153438	8.455 153441	9.551 153444	9.975 153447	10.324 153450	9.930 153453	8.296 153456	8.484 153459	8.305 153502	8.638 153505	8.509 153508	9.020 153511	8.693 153514
Segment 12	loaded	10.206	Concentration Time	9.600 153341	10.130 153344	10.218 153347	10.959 153350	10.422 153353	11.282 153356	10.355 153359	11.509 153402	12.390 153405	11.892 153408	11.622 153411	10.693 153414	9.922 153417	9.456 153420
Segment 13	Combined	13.536	Concentration Time	8.237 153620	7.946 153623	9.684 153626	17.333 153629	22.009 153632	19.703 153635	15.996 153638	11.127 153641	9.790 153644					
Segment 13	Combined	3.989	Concentration Time	4.447 154041	4.594 154044	4.961 154047	4.391 154050	3.595 154053	3.499 154056	3.400 154059	3.510 154102	3.500 154105					
Segment 14	Unloaded	7.271	Concentration Time	8.137 153650	7.575 153653	7.553 153656	7.993 153659	8.644 153702	9.496 153705	8.478 153708	7.592 153711	7.351 153714	7.116 153717	6.727 153720	6.731 153723	6.642 153726	6.348 153729
Segment 14	loaded	6.736	Concentration Time	7.206 153850	7.242 153853	7.679 153856	7.104 153859	7.084 153902	7.078 153905	7.160 153908	8.608 153911	10.921 153914	10.002 153917	9.312 153920	8.552 153923	7.723 153926	7.390 153929



Iron Mining Association of Minnesota Winter Emission Factor - Run 14																	
Segment 9	Unloaded	12.009	Concentration Time	11.994 153211	11.375 153214	10.642 153217	10.092 153220	9.956 153223	10.614 153226	10.933 153229	11.485 153232	10.497 153235					
Segment 9	loaded	5.185	Concentration Time	4.308 154741	4.085 154744	3.978 154747	4.184 154750	4.025 154753	4.008 154756	4.607 154759	5.318 154802	4.821 154805	5.227 154808	5.260 154811			
Segment 10	Combined	6.972	Concentration Time	10.235 153326	10.158 153329	10.069 153332	10.290 153335	3.500 154105	3.721 154108	3.647 154111	3.526 154114	3.639 154117	3.485 154120	3.333 154123	3.298 154126	3.278 154129	3.345 154132
Segment 10	Combined	6.890	Concentration Time	8.113 153611	8.511 153614	8.755 153617	4.528 154559	5.289 154602	4.837 154605	5.735 154608	7.404 154611	6.411 154614	4.749 154617	4.076 154620	3.660 154623	3.686 154626	3.825 154629
Segment 11	Unloaded	5.717	Concentration Time	6.024 154241	4.618 154244	4.543 154247	3.844 154250	3.692 154253	3.431 154256	3.368 154259	3.261 154302	3.407 154305	4.894 154308	9.209 154311	12.000 154314	8.579 154317	6.545 154320
Segment 11	loaded	6.565	Concentration Time	7.589 154444	5.828 154447	5.124 154450	4.602 154453	4.220 154456	4.068 154459	4.114 154502	4.552 154505	4.778 154508	4.493 154511	4.356 154514	6.912 154517	11.696 154520	12.542 154523
Segment 12	Unloaded	8.750	Concentration Time	8.626 153517	8.739 153520	8.513 153523											
Segment 12	loaded	10.206	Concentration Time	8.724 153423	7.450 153426	6.879 153429											
Segment 13	Combined	13.536	Concentration Time														
Segment 13	Combined	3.989	Concentration Time														
Segment 14	Unloaded	7.271	Concentration Time	5.776 153732	5.649 153735	5.653 153738	5.558 153741	5.153 153744	5.909 153747	11.562 153750	15.747 153753	9.671 153756	7.944 153759	7.076 153802	7.038 153805	6.666 153808	6.390 153811
Segment 14	loaded	6.736	Concentration Time	10.509 153932	8.413 153935	7.310 153938	7.316 153941	6.898 153944	6.911 153947	7.190 153950	7.177 153953	7.112 153956	6.479 153959	6.033 154002	6.557 154005	6.585 154008	4.361 154011



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 9	Unloaded	12.009	Concentration Time											
Segment 9	loaded	5.185	Concentration Time											
Segment 10	Combined	6.972	Concentration Time	3.347 154135	3.634 154138	3.756 154141	3.676 154144	3.307 154147	3.202 154150	3.244 154153	3.232 154156			
Segment 10	Combined	6.890	Concentration Time	3.542 154632	3.408 154635	3.285 154638	3.215 154641	3.441 154644	3.471 154647					
Segment 11	Unloaded	5.717	Concentration Time	7.137 154323	5.593 154326	4.732 154329	4.324 154332	3.988 154335	4.275 154338	4.503 154341	4.886 154344	5.353 154347	4.951 154350	4.133 154353
Segment 11	loaded	6.565	Concentration Time	6.813 154526	5.484 154529	4.713 154532	4.530 154535	4.195 154538	4.448 154541	4.463 154544	4.256 154547	3.676 154550	3.574 154553	
Segment 12	Unloaded	8.750	Concentration Time											
Segment 12	loaded	10.206	Concentration Time											
Segment 13	Combined	13.536	Concentration Time											
Segment 13	Combined	3.989	Concentration Time											
Segment 14	Unloaded	7.271	Concentration Time	6.250 153814	6.013 153817	6.181 153820	6.635 153823	6.593 153826	6.297 153829	6.357 153832	6.483 153835	6.662 153838	6.658 153841	
Segment 14	loaded	6.736	Concentration Time	3.896 154014	3.985 154017	4.020 154020	3.917 154023	4.192 154026	4.430 154029	4.618 154032	4.174 154035	4.083 154038		



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 9	Unloaded	12.009	Concentration Time
Segment 9	loaded	5.185	Concentration Time
Segment 10	Combined	6.972	Concentration Time
Segment 10	Combined	6.890	Concentration Time
Segment 11	Unloaded	5.717	Concentration Time
Segment 11	loaded	6.565	Concentration Time
Segment 12	Unloaded	8.750	Concentration Time
Segment 12	loaded	10.206	Concentration Time
Segment 13	Combined	13.536	Concentration Time
Segment 13	Combined	3.989	Concentration Time
Segment 14	Unloaded	7.271	Concentration Time
Segment 14	loaded	6.736	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 9	Unloaded	12.009	Concentration Time
Segment 9	loaded	5.185	Concentration Time
Segment 10	Combined	6.972	Concentration Time
Segment 10	Combined	6.890	Concentration Time
Segment 11	Unloaded	5.717	Concentration Time
Segment 11	loaded	6.565	Concentration Time
Segment 12	Unloaded	8.750	Concentration Time
Segment 12	loaded	10.206	Concentration Time
Segment 13	Combined	13.536	Concentration Time
Segment 13	Combined	3.989	Concentration Time
Segment 14	Unloaded	7.271	Concentration Time
Segment 14	loaded	6.736	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 14

Segment 9	Unloaded	12.009	Concentration Time
Segment 9	loaded	5.185	Concentration Time
Segment 10	Combined	6.972	Concentration Time
Segment 10	Combined	6.890	Concentration Time
Segment 11	Unloaded	5.717	Concentration Time
Segment 11	loaded	6.565	Concentration Time
Segment 12	Unloaded	8.750	Concentration Time
Segment 12	loaded	10.206	Concentration Time
Segment 13	Combined	13.536	Concentration Time
Segment 13	Combined	3.989	Concentration Time
Segment 14	Unloaded	7.271	Concentration Time
Segment 14	loaded	6.736	Concentration Time



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment	Unloaded	Average 15.398	Concentration	8.109	8.887	10.261	8.799	8.921	10.365	10.945	11.269	14.028	17.260
2			Time	162800	162803	162806	162809	162812	162815	162818	162821	162824	162827
Segment	loaded	13.963	Concentration	20.245	15.487	15.400	17.356	21.870	32.220	28.660	20.619	21.243	21.189
2			Time	164054	164057	164100	164103	164106	164109	164112	164115	164118	164121
Segment	Unloaded	26.208	Concentration	23.901	23.096	21.706	18.042	15.090	19.317	31.838	26.424	23.162	27.165
3			Time	162830	162833	162836	162839	162842	162845	162848	162851	162854	162857
Segment	loaded	42.362	Concentration	15.692	21.431	31.903	61.421	81.677	78.289	50.037	61.373	68.180	59.880
3			Time	163939	163942	163945	163948	163951	163954	163957	164000	164003	164006
Segment	Unloaded	25.866	Concentration	26.411	33.388	35.685	31.932	28.311	32.823	33.953	38.408	47.615	48.659
4			Time	163633	163636	163639	163642	163645	163648	163651	163654	163657	163700
Segment	loaded	27.545	Concentration	10.601	15.362	20.842	21.945	25.818	25.903	30.553	26.439	22.029	26.945
4			Time	163806	163809	163812	163815	163818	163821	163824	163827	163830	163833
Segment	Unloaded	35.425	Concentration	58.844	41.570	32.632	31.113	29.736	25.037	23.789	29.513	29.237	30.053
5			Time	162948	162951	162954	162957	163000	163003	163006	163009	163012	163015
Segment	loaded	#DIV/0!	Concentration	--									
5			Time										
Segment	Unloaded	#DIV/0!	Concentration	--									
6			Time										
Segment	loaded	26.836	Concentration	18.280	26.363	28.288	24.087	24.932	34.865	44.455	38.789	32.307	38.377
6			Time	163057	163100	163103	163106	163109	163112	163115	163118	163121	163124
Segment	Unloaded	11.549	Concentration	18.993	28.384	15.368	12.344	12.129	9.743	9.025	9.481	9.555	10.147
7			Time	164939	164942	164945	164948	164951	164954	164957	165000	165003	165006
Segment	loaded	10.589	Concentration	10.857	10.408	10.167	10.706	11.320	10.842	10.240	10.559	10.111	10.306
7			Time	164306	164309	164312	164315	164318	164321	164324	164327	164330	164333
Segment	Unloaded	#DIV/0!	Concentration										
8			Time										
Segment	loaded	#DIV/0!	Concentration										
8			Time										



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment	Unloaded	Average 15.398	Concentration	23.901	13.109	13.792	17.333	19.385	16.526	15.628	20.313	22.865	22.598
2			Time	162830	163448	163451	163454	163457	163500	163503	163506	163509	163512
Segment	loaded	13.963	Concentration	18.474	8.504	7.657	7.325	7.518	6.337	7.417	6.207	4.729	6.340
2			Time	164124	165500	165503	165506	165509	165512	165515	165518	165521	165524
Segment	Unloaded	26.208	Concentration	30.104	24.039	32.724	31.879	23.434	21.861	24.697	37.058	42.127	48.727
3			Time	162900	162903	162906	162909	162912	162915	162918	162921	162924	162927
Segment	loaded	42.362	Concentration	66.355	78.795	59.112	51.930	41.507	32.062	25.164	22.761	20.428	23.074
3			Time	164009	164012	164015	164018	164021	164024	164027	164030	164033	164036
Segment	Unloaded	25.866	Concentration	33.799	23.945	26.348	28.600	23.663	20.281	24.237	27.563	27.894	24.156
4			Time	163703	163706	163709	163712	163715	163718	163721	163724	163727	163730
Segment	loaded	27.545	Concentration	40.512	45.901	44.794	36.673	32.737	33.201	25.786	25.899	25.705	30.744
4			Time	163836	163839	163842	163845	163848	163851	163854	163857	163900	163903
Segment	Unloaded	35.425	Concentration	35.755	30.078	34.584	41.635	38.031	46.152	62.546	51.957	43.219	32.311
5			Time	163018	163021	163024	163027	163030	163033	163036	163039	163042	163045
Segment	loaded	#DIV/0!	Concentration										
5			Time										
Segment	Unloaded	#DIV/0!	Concentration										
6			Time										
Segment	loaded	26.836	Concentration	37.891	34.029	27.332	23.530	30.949	47.309	53.431	55.203	72.276	74.979
6			Time	163127	163130	163133	163136	163139	163142	163145	163148	163151	163154
Segment	Unloaded	11.549	Concentration	9.464	8.263	9.027	8.718	9.197	8.629	7.869			
7			Time	165009	165012	165015	165018	165021	165024	165027			
Segment	loaded	10.589	Concentration	10.599	10.779	10.391	10.393	10.406	10.731	11.157	10.626		
7			Time	164336	164339	164342	164345	164348	164351	164354	164357		
Segment	Unloaded	#DIV/0!	Concentration										
8			Time										
Segment	loaded	#DIV/0!	Concentration										
8			Time										



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 2	Unloaded	Average 15.398	Concentration Time	29.059 163515															
Segment 2	loaded	13.963	Concentration Time	6.934 165527	5.454 165530														
Segment 3	Unloaded	26.208	Concentration Time	33.751 162930	26.811 162933	19.432 162936	16.695 162939	26.890 162942	29.059 163515	27.517 163518	31.307 163521	27.110 163524	20.576 163527						
Segment 3	loaded	42.362	Concentration Time	27.102 164039	24.582 164042	27.342 164045	24.503 164048	26.574 164051	20.245 164054										
Segment 4	Unloaded	25.866	Concentration Time	23.658 163733	19.551 163736	18.005 163739	16.931 163742	14.948 163745	16.366 163748	14.493 163751	12.491 163754	11.633 163757	10.228 163800						
Segment 4	loaded	27.545	Concentration Time	32.037 163906	29.715 163909	26.775 163912	29.676 163915	29.866 163918	26.442 163921	21.887 163924	18.055 163927	15.950 163930							
Segment 5	Unloaded	35.425	Concentration Time	28.839 163048	20.715 163051	17.419 163054													
Segment 5	loaded	#DIV/0!	Concentration Time																
Segment 6	Unloaded	#DIV/0!	Concentration Time																
Segment 6	loaded	26.836	Concentration Time	57.409 163157	44.536 163200	45.092 163203	48.868 163206	51.890 163209	42.907 163212	43.740 163215	41.657 163218	31.462 163221	20.765 163224						
Segment 7	Unloaded	11.549	Concentration Time																
Segment 7	loaded	10.589	Concentration Time																
Segment 8	Unloaded	#DIV/0!	Concentration Time																
Segment 8	loaded	#DIV/0!	Concentration Time																



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 2	Unloaded	Average 15.398	Concentration Time										
Segment 2	loaded	13.963	Concentration Time										
Segment 3	Unloaded	26.208	Concentration Time	16.608 163530	13.910 163533	16.086 163536	19.422 163539	19.254 163542	22.771 163545	34.059 163548	32.589 163551	25.749 163554	23.351 163557
Segment 3	loaded	42.362	Concentration Time										
Segment 4	Unloaded	25.866	Concentration Time										
Segment 4	loaded	27.545	Concentration Time										
Segment 5	Unloaded	35.425	Concentration Time										
Segment 5	loaded	#DIV/0!	Concentration Time										
Segment 6	Unloaded	#DIV/0!	Concentration Time										
Segment 6	loaded	26.836	Concentration Time	17.226 163227	16.833 163230	17.300 163233	15.139 163236	14.407 163239	13.324 163242	14.420 163245	14.572 163248	14.602 163251	16.003 163254
Segment 7	Unloaded	11.549	Concentration Time										
Segment 7	loaded	10.589	Concentration Time										
Segment 8	Unloaded	#DIV/0!	Concentration Time										
Segment 8	loaded	#DIV/0!	Concentration Time										



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 2	Unloaded	Average 15.398	Concentration Time										
Segment 2	loaded	13.963	Concentration Time										
Segment 3	Unloaded	26.208	Concentration Time	30.671 163600	37.501 163603	42.176 163606	42.565 163609	31.316 163612	26.960 163615	17.892 163618	13.441 163621	12.347 163624	
Segment 3	loaded	42.362	Concentration Time										
Segment 4	Unloaded	25.866	Concentration Time										
Segment 4	loaded	27.545	Concentration Time										
Segment 5	Unloaded	35.425	Concentration Time										
Segment 5	loaded	#DIV/0!	Concentration Time										
Segment 6	Unloaded	#DIV/0!	Concentration Time										
Segment 6	loaded	26.836	Concentration Time	18.601 163257	19.574 163300	23.405 163303	22.707 163306	25.305 163309	29.818 163312	38.116 163315	41.486 163318	36.507 163321	33.298 163324
Segment 7	Unloaded	11.549	Concentration Time										
Segment 7	loaded	10.589	Concentration Time										
Segment 8	Unloaded	#DIV/0!	Concentration Time										
Segment 8	loaded	#DIV/0!	Concentration Time										



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment	Unloaded	Average 15.398	Concentration										
2			Time										
Segment	loaded	13.963	Concentration										
2			Time										
Segment	Unloaded	26.208	Concentration										
3			Time										
Segment	loaded	42.362	Concentration										
3			Time										
Segment	Unloaded	25.866	Concentration										
4			Time										
Segment	loaded	27.545	Concentration										
4			Time										
Segment	Unloaded	35.425	Concentration										
5			Time										
Segment	loaded	#DIV/0!	Concentration										
5			Time										
Segment	Unloaded	#DIV/0!	Concentration										
6			Time										
Segment	loaded	26.836	Concentration	29.654	25.013	17.137	13.675	12.080	11.053	10.329	9.626	9.060	8.893
6			Time	163327	163330	163333	163336	163339	163342	163345	163348	163351	163354
Segment	Unloaded	11.549	Concentration										
7			Time										
Segment	loaded	10.589	Concentration										
7			Time										
Segment	Unloaded	#DIV/0!	Concentration										
8			Time										
Segment	loaded	#DIV/0!	Concentration										
8			Time										



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment	Unloaded	Average 15.398	Concentration										
2			Time										
Segment	loaded	13.963	Concentration										
2			Time										
Segment	Unloaded	26.208	Concentration										
3			Time										
Segment	loaded	42.362	Concentration										
3			Time										
Segment	Unloaded	25.866	Concentration										
4			Time										
Segment	loaded	27.545	Concentration										
4			Time										
Segment	Unloaded	35.425	Concentration										
5			Time										
Segment	loaded	#DIV/0!	Concentration										
5			Time										
Segment	Unloaded	#DIV/0!	Concentration										
6			Time										
Segment	loaded	26.836	Concentration	9.409	10.153	11.115	11.207	11.412	11.782	12.820	14.252	15.166	13.452
6			Time	163357	163400	163403	163406	163409	163412	163415	163418	163421	163424
Segment	Unloaded	11.549	Concentration										
7			Time										
Segment	loaded	10.589	Concentration										
7			Time										
Segment	Unloaded	#DIV/0!	Concentration										
8			Time										
Segment	loaded	#DIV/0!	Concentration										
8			Time										



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment	Unloaded	Average 15.398	Concentration		
2			Time		
Segment	loaded	13.963	Concentration		
2			Time		
Segment	Unloaded	26.208	Concentration		
3			Time		
Segment	loaded	42.362	Concentration		
3			Time		
Segment	Unloaded	25.866	Concentration		
4			Time		
Segment	loaded	27.545	Concentration		
4			Time		
Segment	Unloaded	35.425	Concentration		
5			Time		
Segment	loaded	#DIV/0!	Concentration		
5			Time		
Segment	Unloaded	#DIV/0!	Concentration		
6			Time		
Segment	loaded	26.836	Concentration	13.212	13.065
6			Time	163427	163430
Segment	Unloaded	11.549	Concentration		
7			Time		
Segment	loaded	10.589	Concentration		
7			Time		
Segment	Unloaded	#DIV/0!	Concentration		
8			Time		
Segment	loaded	#DIV/0!	Concentration		
8			Time		



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time										
Segment 9	loaded	#DIV/0!	Concentration Time										
Segment 10	Combined	#DIV/0!	Concentration Time										
Segment 10	Combined	#DIV/0!	Concentration Time										
Segment 11	Unloaded	#DIV/0!	Concentration Time										
Segment 11	loaded	#DIV/0!	Concentration Time										
Segment 12	Unloaded	10.173	Concentration Time	9.462 164454	10.468 164457	12.702 164500	12.924 164503	11.021 164506	11.607 164509	12.166 164512	11.256 164515	10.838 164518	10.339 164521
Segment 12	loaded	11.973	Concentration Time	11.122 164403	12.085 164406	13.908 164409	14.813 164412	13.414 164415	12.593 164418	12.670 164421	13.624 164424	12.862 164427	12.170 164430
Segment 13	-	#DIV/0!	Concentration Time										
Segment 13	Loaded	12.673	Concentration Time	13.109 165036	19.053 165039	16.041 165042	12.073 165045	11.019 165048	9.200 165051	8.213 165054			
Segment 14	Unloaded	7.078	Concentration Time	5.987 165103	5.899 165106	5.789 165109	5.925 165112	6.383 165115	6.533 165118	6.012 165121	5.917 165124	6.220 165127	6.267 165130
Segment 14	loaded	7.799	Concentration Time	6.611 165251	6.662 165254	6.242 165257	6.197 165300	6.079 165303	6.079 165306	5.921 165309	6.340 165312	6.661 165315	6.037 165318



# Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time										
Segment 9	loaded	#DIV/0!	Concentration Time										
Segment 10	Combined	#DIV/0!	Concentration Time										
Segment 10	Combined	#DIV/0!	Concentration Time										
Segment 11	Unloaded	#DIV/0!	Concentration Time										
Segment 11	loaded	#DIV/0!	Concentration Time										
Segment 12	Unloaded	10.173	Concentration Time	9.529 164524	9.055 164527	8.921 164530	8.437 164533	7.943 164536	7.817 164539	8.461 164542			
Segment 12	loaded	11.973	Concentration Time	11.889 164433	10.963 164436	10.714 164439	9.827 164442	9.523 164445	9.389 164448				
Segment 13	-	#DIV/0!	Concentration Time										
Segment 13	Loaded	12.673	Concentration Time										
Segment 14	Unloaded	7.078	Concentration Time	5.811 165133	5.566 165136	5.671 165139	5.581 165142	5.590 165145	5.086 165148	6.188 165151	10.781 165154	12.450 165157	11.081 165200
Segment 14	loaded	7.799	Concentration Time	8.792 165321	19.540 165324	11.121 165327	9.129 165330	10.224 165333	10.114 165336	8.788 165339	8.171 165342	8.032 165345	9.007 165348



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time										
Segment 9	loaded	#DIV/0!	Concentration Time										
Segment 10	Combined	#DIV/0!	Concentration Time										
Segment 10	Combined	#DIV/0!	Concentration Time										
Segment 11	Unloaded	#DIV/0!	Concentration Time										
Segment 11	loaded	#DIV/0!	Concentration Time										
Segment 12	Unloaded	10.173	Concentration Time										
Segment 12	loaded	11.973	Concentration Time										
Segment 13	-	#DIV/0!	Concentration Time										
Segment 13	Loaded	12.673	Concentration Time										
Segment 14	Unloaded	7.078	Concentration Time	7.948 165203	6.720 165206	6.849 165209	7.756 165212	8.776 165215	8.578 165218	7.993 165221	7.571 165224	7.411 165227	7.444 165230
Segment 14	loaded	7.799	Concentration Time	8.374 165351	10.328 165354	14.111 165357	8.618 165400	7.835 165403	8.298 165406	7.711 165409	5.433 165412	4.826 165415	4.835 165418



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time					
Segment 9	loaded	#DIV/0!	Concentration Time					
Segment 10	Combined	#DIV/0!	Concentration Time					
Segment 10	Combined	#DIV/0!	Concentration Time					
Segment 11	Unloaded	#DIV/0!	Concentration Time					
Segment 11	loaded	#DIV/0!	Concentration Time					
Segment 12	Unloaded	10.173	Concentration Time					
Segment 12	loaded	11.973	Concentration Time					
Segment 13	-	#DIV/0!	Concentration Time					
Segment 13	Loaded	12.673	Concentration Time					
Segment 14	Unloaded	7.078	Concentration Time	7.465 165233	7.298 165236	7.060 165239	7.053 165242	
Segment 14	loaded	7.799	Concentration Time	4.904 165421	5.050 165424	5.368 165427	5.488 165430	6.056 165433



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	loaded	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	loaded	#DIV/0!	Concentration Time
Segment 12	Unloaded	10.173	Concentration Time
Segment 12	loaded	11.973	Concentration Time
Segment 13	-	#DIV/0!	Concentration Time
Segment 13	Loaded	12.673	Concentration Time
Segment 14	Unloaded	7.078	Concentration Time
Segment 14	loaded	7.799	Concentration Time



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	loaded	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	loaded	#DIV/0!	Concentration Time
Segment 12	Unloaded	10.173	Concentration Time
Segment 12	loaded	11.973	Concentration Time
Segment 13	-	#DIV/0!	Concentration Time
Segment 13	Loaded	12.673	Concentration Time
Segment 14	Unloaded	7.078	Concentration Time
Segment 14	loaded	7.799	Concentration Time



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	loaded	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	loaded	#DIV/0!	Concentration Time
Segment 12	Unloaded	10.173	Concentration Time
Segment 12	loaded	11.973	Concentration Time
Segment 13	-	#DIV/0!	Concentration Time
Segment 13	Loaded	12.673	Concentration Time
Segment 14	Unloaded	7.078	Concentration Time
Segment 14	loaded	7.799	Concentration Time



## Iron Mining Association of Minnesota Winter Emission Factor - Run 16

Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	loaded	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 10	Combined	#DIV/0!	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	loaded	#DIV/0!	Concentration Time
Segment 12	Unloaded	10.173	Concentration Time
Segment 12	loaded	11.973	Concentration Time
Segment 13	-	#DIV/0!	Concentration Time
Segment 13	Loaded	12.673	Concentration Time
Segment 14	Unloaded	7.078	Concentration Time
Segment 14	loaded	7.799	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 2	Unloaded	Average	Concentration Time	7.733	6.708	6.621	6.099	6.887	6.069	5.392	5.580	11.329	18.791	11.122	11.042	13.599	12.869
		10.112		191839	191842	191845	191848	191851	191854	191857	191900	191903	191906	192542	192545	192548	192551
Segment 2	loaded	16.304	Concentration Time	18.432	22.429	28.084	32.945	38.885	32.000	19.513	15.917	17.560	14.241	10.426	14.435	11.282	9.900
				193154	193157	193200	193203	193206	193209	193212	193215	193218	193221	194627	194630	194633	194636
Segment 3	Unloaded	20.713	Concentration Time	16.027	17.982	21.249	17.567	13.522	17.333	29.366	24.239	21.618	25.760	28.717	31.696	43.178	42.469
				191909	191912	191915	191918	191921	191924	191927	191930	191933	191936	191939	191942	191945	191948
Segment 3	loaded	58.096	Concentration Time	17.182	54.031	122.157	161.247	131.299	88.629	70.863	84.960	89.912	59.870	51.393	65.613	60.707	53.484
				193039	193042	193045	193048	193051	193054	193057	193100	193103	193106	193109	193112	193115	193118
Segment 4	Unloaded	16.684	Concentration Time	15.368	22.016	19.689	20.108	18.430	16.960	14.568	15.473	13.536	12.068	11.204	10.891	10.875	13.271
				192751	192754	192757	192800	192803	192806	192809	192812	192815	192818	192821	192824	192827	192830
Segment 4	loaded	26.567	Concentration Time	7.241	8.482	12.328	15.778	16.810	12.486	23.556	41.072	47.050	53.431	40.100	29.855	23.059	18.848
				192918	192921	192924	192927	192930	192933	192936	192939	192942	192945	192948	192951	192954	192957
Segment 5	Unloaded	26.920	Concentration Time	14.902	26.951	23.567	22.303	20.173	15.458	14.202	17.468	22.054	23.230	24.153	27.529	27.098	36.516
				192024	192027	192030	192033	192036	192039	192042	192045	192048	192051	192054	192057	192100	192103
Segment 5	loaded	#DIV/0!	Concentration Time	-													
Segment 6	Unloaded	#DIV/0!	Concentration Time	-													
Segment 6	loaded	21.195	Concentration Time	24.344	21.242	28.231	25.088	29.079	25.285	24.467	44.426	46.365	43.483	41.357	40.418	39.593	26.597
				192133	192136	192139	192142	192145	192148	192151	192154	192157	192200	192203	192206	192209	192212
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 2	Unloaded	Average 10.112	Concentration Time	10.241	9.195	9.280	10.088	10.370	16.404	16.934							
		192554		192557	192600	192603	192606	192609	192612								
Segment 2	loaded	16.304	Concentration Time	9.171	10.029	10.609	6.144	5.470	6.304	8.597							
				194639	194642	194645	194648	194651	194654	194657							
Segment 3	Unloaded	20.713	Concentration Time	28.314	30.033	37.589	40.513	32.165	15.797	20.225	16.419	10.296	12.238	16.410	15.988	15.958	16.686
				191951	191954	191957	192000	192003	192006	192009	192012	192015	192615	192618	192621	192624	192627
Segment 3	loaded	58.096	Concentration Time	61.319	61.264	34.310	22.769	20.566	23.897	24.681	22.204	19.256	25.260	25.528			
				193121	193124	193127	193130	193133	193136	193139	193142	193145	193148	193151			
Segment 4	Unloaded	16.684	Concentration Time	18.518	20.222	22.828	22.897	20.553	29.197	20.629	20.217	21.740	17.515	13.779	9.928	7.525	7.151
				192833	192836	192839	192842	192845	192848	192851	192854	192857	192900	192903	192906	192909	192912
Segment 4	loaded	26.567	Concentration Time	21.792	30.471	33.131	33.010	32.395	41.948	42.613	31.925	19.694	14.626	12.483			
				193000	193003	193006	193009	193012	193015	193018	193021	193024	193027	193030			
Segment 5	Unloaded	26.920	Concentration Time	43.946	41.060	34.323	43.293	41.400	24.064	22.080	28.244	25.140					
				192106	192109	192112	192115	192118	192121	192124	192127	192130					
Segment 5	loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	#DIV/0!	Concentration Time														
Segment 6	loaded	21.195	Concentration Time	19.301	18.294	21.696	24.727	26.083	30.619	29.259	26.017	29.218	37.371	34.313	36.195	25.776	20.541
				192215	192218	192221	192224	192227	192230	192233	192236	192239	192242	192245	192248	192251	192254
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 2	Unloaded	Average 10.112	Concentration Time														
Segment 2	loaded	16.304	Concentration Time														
Segment 3	Unloaded	20.713	Concentration Time	20.230 192630	17.095 192633	17.597 192636	18.068 192639	20.692 192642	26.459 192645	24.955 192648	17.090 192651	11.082 192654	10.127 192657	11.427 192700	10.638 192703	12.465 192706	17.559 192709
Segment 3	loaded	58.096	Concentration Time														
Segment 4	Unloaded	16.684	Concentration Time														
Segment 4	loaded	26.567	Concentration Time														
Segment 5	Unloaded	26.920	Concentration Time														
Segment 5	loaded	#DIV/0!	Concentration Time														
Segment 6	Unloaded	#DIV/0!	Concentration Time														
Segment 6	loaded	21.195	Concentration Time	17.175 192257	12.396 192300	10.986 192303	9.984 192306	9.750 192309	10.699 192312	12.519 192315	11.120 192318	10.114 192321	9.253 192324	9.249 192327	9.676 192330	12.356 192333	14.947 192336
Segment 7	Unloaded	#DIV/0!	Concentration Time														
Segment 7	loaded	#DIV/0!	Concentration Time														
Segment 8	Unloaded	#DIV/0!	Concentration Time														
Segment 8	loaded	#DIV/0!	Concentration Time														



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 2	Unloaded	Average 10.112	Concentration Time															
Segment 2	loaded	16.304	Concentration Time															
Segment 3	Unloaded	20.713	Concentration Time	19.935 192712	14.129 192715	16.454 192718	15.860 192721	18.560 192724	23.934 192727	24.257 192730	19.876 192733	17.141 192736	12.069 192739					
Segment 3	loaded	58.096	Concentration Time															
Segment 4	Unloaded	16.684	Concentration Time															
Segment 4	loaded	26.567	Concentration Time															
Segment 5	Unloaded	26.920	Concentration Time															
Segment 5	loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	#DIV/0!	Concentration Time															
Segment 6	loaded	21.195	Concentration Time	12.367 192339	15.948 192342	18.972 192345	25.578 192348	19.953 192351	20.307 192354	29.188 192357	38.947 192400	37.632 192403	35.198 192406	27.758 192409	25.610 192412	21.191 192415	17.195 192418	
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	#DIV/0!	Concentration Time															
Segment 8	loaded	#DIV/0!	Concentration Time															



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 2	Unloaded	Average 10.112	Concentration Time															
Segment 2	loaded	16.304	Concentration Time															
Segment 3	Unloaded	20.713	Concentration Time															
Segment 3	loaded	58.096	Concentration Time															
Segment 4	Unloaded	16.684	Concentration Time															
Segment 4	loaded	26.567	Concentration Time															
Segment 5	Unloaded	26.920	Concentration Time															
Segment 5	loaded	#DIV/0!	Concentration Time															
Segment 6	Unloaded	#DIV/0!	Concentration Time															
Segment 6	loaded	21.195	Concentration Time	14.009 192421	12.782 192424	12.352 192427	13.655 192430	13.295 192433	12.814 192436	14.307 192439	16.151 192442	17.492 192445	15.636 192448	15.026 192451	15.738 192454	13.882 192457	12.514 192500	
Segment 7	Unloaded	#DIV/0!	Concentration Time															
Segment 7	loaded	#DIV/0!	Concentration Time															
Segment 8	Unloaded	#DIV/0!	Concentration Time															
Segment 8	loaded	#DIV/0!	Concentration Time															



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 2	Unloaded	Average 10.112	Concentration Time						
Segment 2	loaded	16.304	Concentration Time						
Segment 3	Unloaded	20.713	Concentration Time						
Segment 3	loaded	58.096	Concentration Time						
Segment 4	Unloaded	16.684	Concentration Time						
Segment 4	loaded	26.567	Concentration Time						
Segment 5	Unloaded	26.920	Concentration Time						
Segment 5	loaded	#DIV/0!	Concentration Time						
Segment 6	Unloaded	#DIV/0!	Concentration Time						
Segment 6	loaded	21.195	Concentration Time	11.492 192503	10.584 192506	10.088 192509	11.513 192512	11.445 192515	10.627 192518
Segment 7	Unloaded	#DIV/0!	Concentration Time						
Segment 7	loaded	#DIV/0!	Concentration Time						
Segment 8	Unloaded	#DIV/0!	Concentration Time						
Segment 8	loaded	#DIV/0!	Concentration Time						



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	8.484	Concentration Time	7.795 194057	9.584 194100	11.269 194103	13.643 194106	15.508 194109	15.477 194112	12.720 194115	8.107 194118	7.063 194121	6.466 194124	6.183 194127	6.179 194130	5.865 194133	5.614 194136
Segment 10	loaded	9.551	Concentration Time	14.237 193406	11.594 193409	11.097 193412	10.871 193415	10.585 193418	9.794 193421	9.804 193424	9.186 193427	9.198 193430	8.951 193433	8.741 193436	8.798 193439	8.899 193442	8.136 193445
Segment 11	Unloaded	#DIV/0!	Concentration Time														
Segment 11	loaded	#DIV/0!	Concentration Time														
Segment 12	Unloaded	7.620	Concentration Time	9.490 193506	8.922 193509	8.314 193512	9.496 193515	9.733 193518	8.691 193521	8.285 193524	7.989 193527	8.315 193530	8.293 193533	7.269 193536	6.714 193539	6.315 193542	6.235 193545
Segment 12	loaded	7.048	Concentration Time		6.629 193600	6.374 193603	7.360 193606	7.233 193609	7.151 193612	7.322 193615	7.350 193618	7.616 193621	9.071 193624	7.413 193627	6.660 193630	6.021 193633	5.522 193636
Segment 13	-	15.390	Concentration Time	8.389 194157	17.971 194200	20.985 194203	18.251 194206	16.659 194209	16.736 194212	8.739 194215							
Segment 13	Loaded	#DIV/0!	Concentration Time														
Segment 14	Unloaded	5.390	Concentration Time	7.028 194221	7.475 194224	7.358 194227	7.081 194230	7.265 194233	7.531 194236	6.589 194239	5.780 194242	5.988 194245	5.397 194248	4.949 194251	5.370 194254	5.072 194257	4.865 194300
Segment 14	loaded	4.304	Concentration Time	3.638 194412	3.873 194415	4.159 194418	4.512 194421	4.617 194424	5.025 194427	5.346 194430	5.076 194433	4.707 194436	4.719 194439	5.012 194442	5.434 194445	4.703 194448	4.624 194451



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 9	Unloaded	#DIV/0!	Concentration Time														
Segment 9	loaded	#DIV/0!	Concentration Time														
Segment 10	Unloaded	8.484	Concentration Time	5.763 194139	5.791 194142	6.046 194145	5.970 194148	6.161 194151									
Segment 10	loaded	9.551	Concentration Time	8.062 193448	8.616 193451	8.691 193454	8.429 193457	7.788 193500									
Segment 11	Unloaded	#DIV/0!	Concentration Time														
Segment 11	loaded	#DIV/0!	Concentration Time														
Segment 12	Unloaded	7.620	Concentration Time	5.481 193548	4.765 193551	5.226 193554											
Segment 12	loaded	7.048	Concentration Time	6.570 193642	6.875 193645	7.606 193648											
Segment 13	-	15.390	Concentration Time														
Segment 13	Loaded	#DIV/0!	Concentration Time														
Segment 14	Unloaded	5.390	Concentration Time	4.579 194303	4.433 194306	4.275 194309	4.106 194312	4.416 194315	5.101 194318	7.447 194321	7.567 194324	6.519 194327	5.469 194330	5.085 194333	5.146 194336	4.875 194339	4.508 194342
Segment 14	loaded	4.304	Concentration Time	4.816 194454	4.770 194457	4.883 194500	5.066 194503	5.203 194506	4.628 194509	4.529 194512	5.154 194515	5.361 194518	5.066 194521	4.830 194524	4.855 194527	4.733 194530	4.229 194533



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 9	Unloaded	#DIV/0!	Concentration Time									
Segment 9	loaded	#DIV/0!	Concentration Time									
Segment 10	Unloaded	8.484	Concentration Time									
Segment 10	loaded	9.551	Concentration Time									
Segment 11	Unloaded	#DIV/0!	Concentration Time									
Segment 11	loaded	#DIV/0!	Concentration Time									
Segment 12	Unloaded	7.620	Concentration Time									
Segment 12	loaded	7.048	Concentration Time									
Segment 13	-	15.390	Concentration Time									
Segment 13	Loaded	#DIV/0!	Concentration Time									
Segment 14	Unloaded	5.390	Concentration Time	4.319 194345	4.401 194348	4.025 194351	3.842 194354	3.892 194357	3.816 194400	4.327 194403	4.128 194406	
Segment 14	loaded	4.304	Concentration Time	2.147 194536	2.097 194539	2.436 194542	2.630 194545	2.792 194548	3.100 194551	3.004 194554	3.042 194557	4.433 194600



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	loaded	#DIV/0!	Concentration Time
Segment 10	Unloaded	8.484	Concentration Time
Segment 10	loaded	9.551	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	loaded	#DIV/0!	Concentration Time
Segment 12	Unloaded	7.620	Concentration Time
Segment 12	loaded	7.048	Concentration Time
Segment 13	-	15.390	Concentration Time
Segment 13	Loaded	#DIV/0!	Concentration Time
Segment 14	Unloaded	5.390	Concentration Time
Segment 14	loaded	4.304	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	loaded	#DIV/0!	Concentration Time
Segment 10	Unloaded	8.484	Concentration Time
Segment 10	loaded	9.551	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	loaded	#DIV/0!	Concentration Time
Segment 12	Unloaded	7.620	Concentration Time
Segment 12	loaded	7.048	Concentration Time
Segment 13	-	15.390	Concentration Time
Segment 13	Loaded	#DIV/0!	Concentration Time
Segment 14	Unloaded	5.390	Concentration Time
Segment 14	loaded	4.304	Concentration Time



Iron Mining Association of Minnesota Winter Emission Factor - Run 17

Segment 9	Unloaded	#DIV/0!	Concentration Time
Segment 9	loaded	#DIV/0!	Concentration Time
Segment 10	Unloaded	8.484	Concentration Time
Segment 10	loaded	9.551	Concentration Time
Segment 11	Unloaded	#DIV/0!	Concentration Time
Segment 11	loaded	#DIV/0!	Concentration Time
Segment 12	Unloaded	7.620	Concentration Time
Segment 12	loaded	7.048	Concentration Time
Segment 13	-	15.390	Concentration Time
Segment 13	Loaded	#DIV/0!	Concentration Time
Segment 14	Unloaded	5.390	Concentration Time
Segment 14	loaded	4.304	Concentration Time



## Iron Mining Association of Minnesota Winter Silt Data - Summer Pre-Test

Sample  
#2 Mintac

Total Wet Sample Weight (g) -  
Total Dry Sample Weight (g) 1464.6

% Moisture -

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%
3/8 in	547.7	688.8	141.1	10%
4 mes	531.9	766.2	234.3	16%
10 mesh	481.7	820.8	339.1	23%
20 mesh	433.5	841.6	408.1	28%
40 mesh	396.5	558.4	161.9	11%
100 mesh	367.9	478.9	111.0	8%
140 mesh	364.3	377.0	12.7	1%
200 mesh	351.1	364.8	13.7	1%
Pan	299.9	342.1	42.2	3%

Sample  
#3 Mintac

Total Wet Sample Weight (g) -  
Total Dry Sample Weight (g) 2154.8

% Moisture -

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%
3/8 in	547.7	1329.6	781.9	36%
4 mes	531.9	890.8	358.9	17%
10 mesh	481.7	930.7	449.0	21%
20 mesh	433.5	740.3	306.8	14%
40 mesh	396.5	506.8	110.3	5%
100 mesh	367.9	438.4	70.5	3%
140 mesh	364.3	374.3	10.0	0%
200 mesh	351.1	373.4	22.3	1%
Pan	299.9	336.3	36.4	2%

Sample  
#4 Mintac IM-005

Total Wet Sample Weight (g) -  
Total Dry Sample Weight (g) 889.4

% Moisture -

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%
3/8 in	547.7	751.8	204.1	23%
4 mes	531.9	800.3	268.4	30%
10 mesh	481.7	654.2	172.5	19%
20 mesh	433.5	528.5	95.0	11%
40 mesh	396.5	439.7	43.2	5%
100 mesh	367.9	427.6	59.7	7%
140 mesh	364.3	376.0	11.7	1%
200 mesh	351.1	372.4	21.3	2%
Pan	299.9	313.2	13.3	1%



# Iron Mining Association of Minnesota Winter Silt Data - Summer Pre-Test

Sample  
#5 Mintac IM-006

Total Wet Sample Weight (g) -  
Total Dry Sample Weight (g) 1014.2

% Moisture -

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%
3/8 in	547.9	969.3	421.4	42%
4 mes	531.7	815.0	283.3	28%
10 mesh	482.1	629.0	146.9	15%
20 mesh	434.3	506.3	72.0	7%
40 mesh	397.1	425.2	28.1	3%
100 mesh	368.0	404.3	36.3	4%
140 mesh	364.2	371.9	7.7	1%
200 mesh	351.0	365.2	14.2	1%
Pan	299.9	301.1	1.2	0%

Sample  
Mintac 2:20-2:30

Total Wet Sample Weight (g) -  
Total Dry Sample Weight (g) 1219.8

% Moisture -

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%
3/8 in	547.7	710.2	162.5	13%
4 mes	531.9	848.8	316.9	26%
10 mesh	481.7	762.7	281.0	23%
20 mesh	433.5	663.8	230.3	19%
40 mesh	396.5	502.5	106.0	9%
100 mesh	367.9	446.9	79.0	6%
140 mesh	364.3	372.5	8.2	1%
200 mesh	351.1	359.7	8.6	1%
Pan	299.9	327.3	27.4	2%

Sample  
8/16/06 United

Total Wet Sample Weight (g) -  
Total Dry Sample Weight (g) 1373

% Moisture -

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%
3/8 in	547.9	1007.5	459.6	33%
4 mes	531.7	934.0	402.3	29%
10 mesh	482.1	728.3	246.2	18%
20 mesh	434.3	599.6	165.3	12%
40 mesh	397.1	444.0	46.9	3%
100 mesh	368.0	406.8	38.8	3%
140 mesh	364.2	367.7	3.5	0%
200 mesh	351.0	357.0	6.0	0%
Pan	299.9	304.8	4.9	0%



# Iron Mining Association of Minnesota Winter Silt Data - Winter Testing

Sample

## IMA-13 Unloaded

Total Wet Sample Weight (g) 773.5

Total Dry Sample Weight (g) 759.4

% Moisture 1.82

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%	
3/8 in	547.7	550.5	2.8	0.4%	0.4%
4 mes	531.9	561.5	29.6	3.9%	3.9%
10 mesh	481.7	749.8	268.1	35.3%	35.3%
20 mesh	433.5	738.5	305.0	40.2%	40.2%
40 mesh	396.5	495.8	99.3	13.1%	13.1%
100 mesh	367.9	412.5	44.6	5.9%	5.9%
140 mesh	364.3	366.4	2.1	0.3%	0.3%
200 mesh	351.1	352.6	1.5	0.2%	0.2%
Pan	299.9	306.3	6.4	0.8%	0.8%

Sample

## IMA-13 Loaded

Total Wet Sample Weight (g) 999.4

Total Dry Sample Weight (g) 980.9

% Moisture 1.85

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%	
3/8 in	547.7	547.4	-0.3	0.0%	0.0%
4 mes	531.9	583.0	51.1	5.2%	5.2%
10 mesh	481.7	816.2	334.5	34.4%	34.1%
20 mesh	433.5	803.2	369.7	38.0%	37.7%
40 mesh	396.5	535.8	139.3	14.3%	14.2%
100 mesh	367.9	436.3	68.4	7.0%	7.0%
140 mesh	364.3	367.4	3.1	0.3%	0.3%
200 mesh	351.1	353.3	2.2	0.2%	0.2%
Pan	299.9	305.6	5.7	0.6%	0.6%



# Iron Mining Association of Minnesota Winter Silt Data - Winter Testing

Sample

## IMA-18 Unloaded

Total Wet Sample Weight (g) 385.1

Total Dry Sample Weight (g) 382.9

% Moisture 0.57

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%	
3/8 in	547.7	677.0	129.3	33.8%	33.8%
4 mes	531.9	658.3	126.4	33.1%	33.0%
10 mesh	481.7	558.6	76.9	20.1%	20.1%
20 mesh	433.5	461.4	27.9	7.3%	7.3%
40 mesh	396.5	406.6	10.1	2.6%	2.6%
100 mesh	367.9	375.4	7.5	2.0%	2.0%
140 mesh	364.3	364.9	0.6	0.2%	0.2%
200 mesh	351.1	351.7	0.6	0.2%	0.2%
Pan	299.9	302.6	2.7	0.7%	0.7%

Sample

## IMA-18 Loaded

Total Wet Sample Weight (g) 588.9

Total Dry Sample Weight (g) 584.9

% Moisture 0.68

Size Distribution microns	Screen Tare (g)	Screen Final (g)	Sample Weight (g)	%	
3/8 in	547.7	738.4	190.7	32.7%	32.6%
4 mes	531.9	703.8	171.9	29.5%	29.4%
10 mesh	481.7	574.5	92.8	15.9%	15.9%
20 mesh	433.5	486.4	52.9	9.1%	9.0%
40 mesh	396.5	422.1	25.6	4.4%	4.4%
100 mesh	367.9	395.6	27.7	4.7%	4.7%
140 mesh	364.3	368.5	4.2	0.7%	0.7%
200 mesh	351.1	355.4	4.3	0.7%	0.7%
Pan	299.9	313.3	13.4	2.3%	2.3%



# Iron Mining Association of Minnesota Winter Silt Data - Silt and Moisture Summary

## Summary of Surface Samples

	Mine	Surface Type	Silt (%)	Moisture (%)	Notes
Summer Pretest Samples					
#2 Mintac	Mintac		2.9%		Moisture was not determined for these samples
#3 Mintac	Mintac		1.7%		
#4 Mintac IM-005	Mintac		1.5%		
#5 Mintac IM-006	Mintac		0.1%		
Mintac 2:20-2:30	Mintac		2.2%		
8/16/06 United	United Taconite		0.4%		
Winter Test Samples					
IMA-13 Unloaded	Mintac		0.8%	1.82	Moisture and Silt determinations made for same sample
IMA-13 Loaded	Mintac		0.6%	1.85	
IMA-18 Unloaded	United Taconite		0.7%	0.57	
IMA-18 Loaded	United Taconite		2.3%	0.68	
Previous Testing (June 1978)					
Average (I-2 to I-4)	Erie Mining Co.	Sand Gravel	4.7	1.2	Moisture is the average of 3 samples from Haul Roads
I-6	Erie Mining Co.	Sand Gravel	2.4		
Average (I-7 to I-8)	Erie Mining Co.	Untreated crushed rock	6.1		