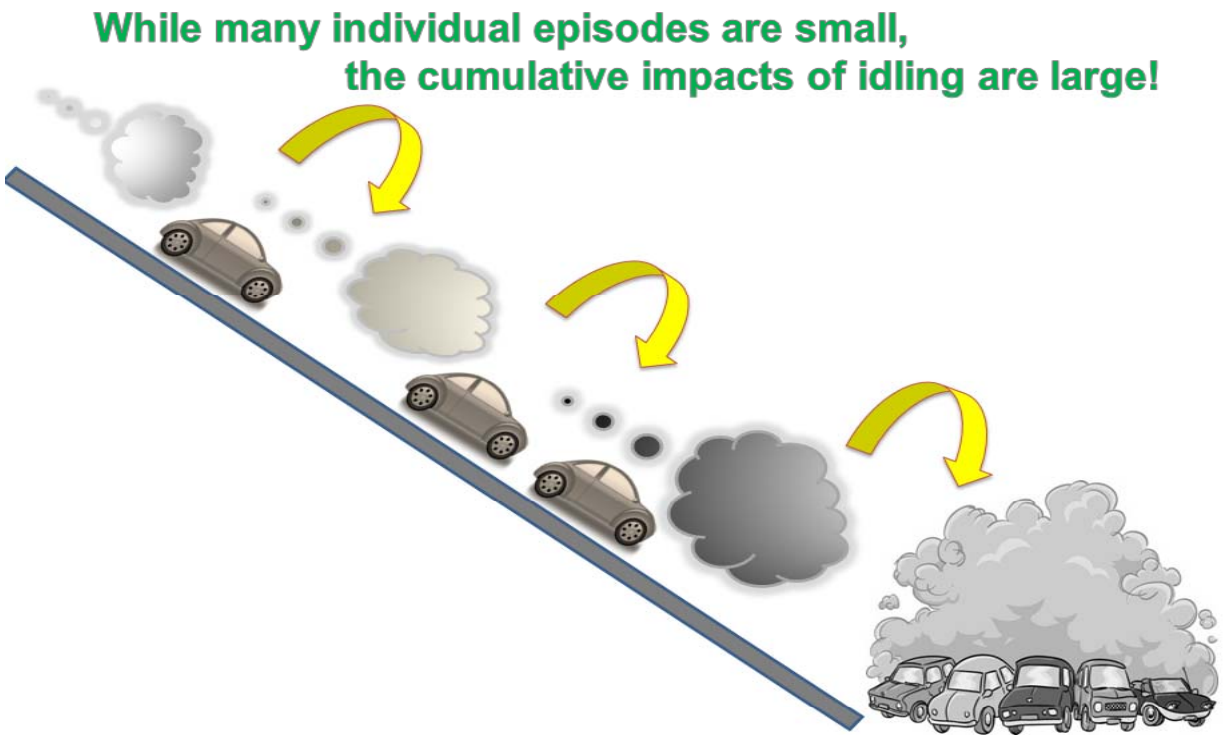
Ride Yellow Go Green



Abhi Swaroop Adil

8th Grade, Still Middle School

8th February 2016

Location : Naperville Mayor's Office

Agenda

- **Team Introduction : Adil , Swaroop and Abhi**

  - **eCybermission Initiative**
  - **Problem Statement**

  } Adil

  - **Survey Process**
  - **Data Collection Procedure**

  } Swaroop

  - **Data Analysis**
  - **Conclusion**

  } Abhi

  - **Acknowledgements** — **Adil**
  - **Q & A** — **All**

eCYBERMISSION is a STEM initiative

offered by the Army Educational Outreach Program (AEOP)

- Designed to encourage STEM education for students in grades 6 through 9
- Strives to encourage students to apply what they learn in the classroom to a real life situation
- Students work in teams to identify a problem in their community
- Promotes learning the value of teamwork and community service
- Competition at state, regional and national level

Problem

- Cars are idling while waiting in line to pick up and drop off students in IPSD 204 schools
- Idling cars contribute to carbon emissions
- Idling has direct impact on the environment, health and economy

What is the Problem?

Cause

- Students who live within 1.5 miles of the school do not have school bus service
- Some students prefer not to take the school bus in spite of having the bus who may not realize the impact of their actions

Why there are so many cars waiting along curbside ?

Reason

- Stringent rules against idling are inefficiently enforced
- Weather
- Inadequate awareness of idling impact on health , economy and climate

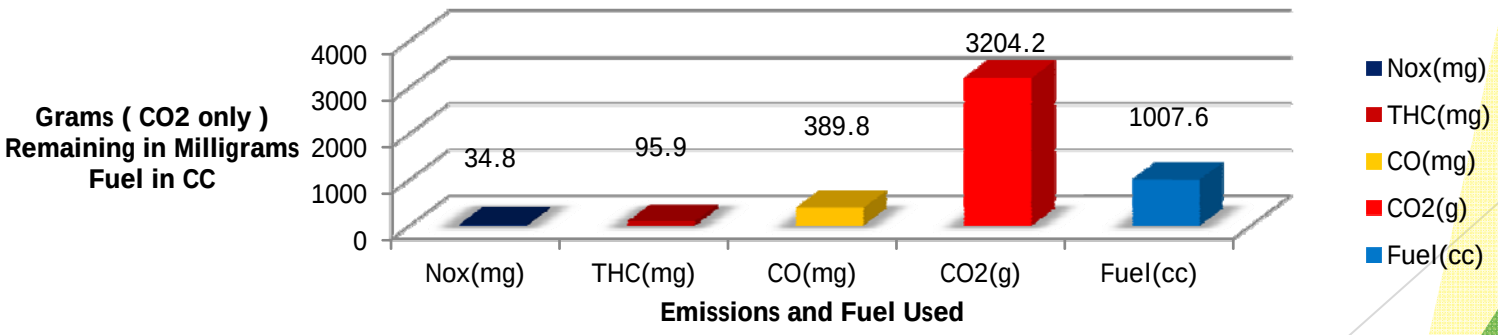
Why cars are Idling?

Environmental Impact
Air Pollution

Vehicular emissions cause air pollution

Research by Argonne Laboratories show that an idling car can add 3,204gm of CO_2 per hour

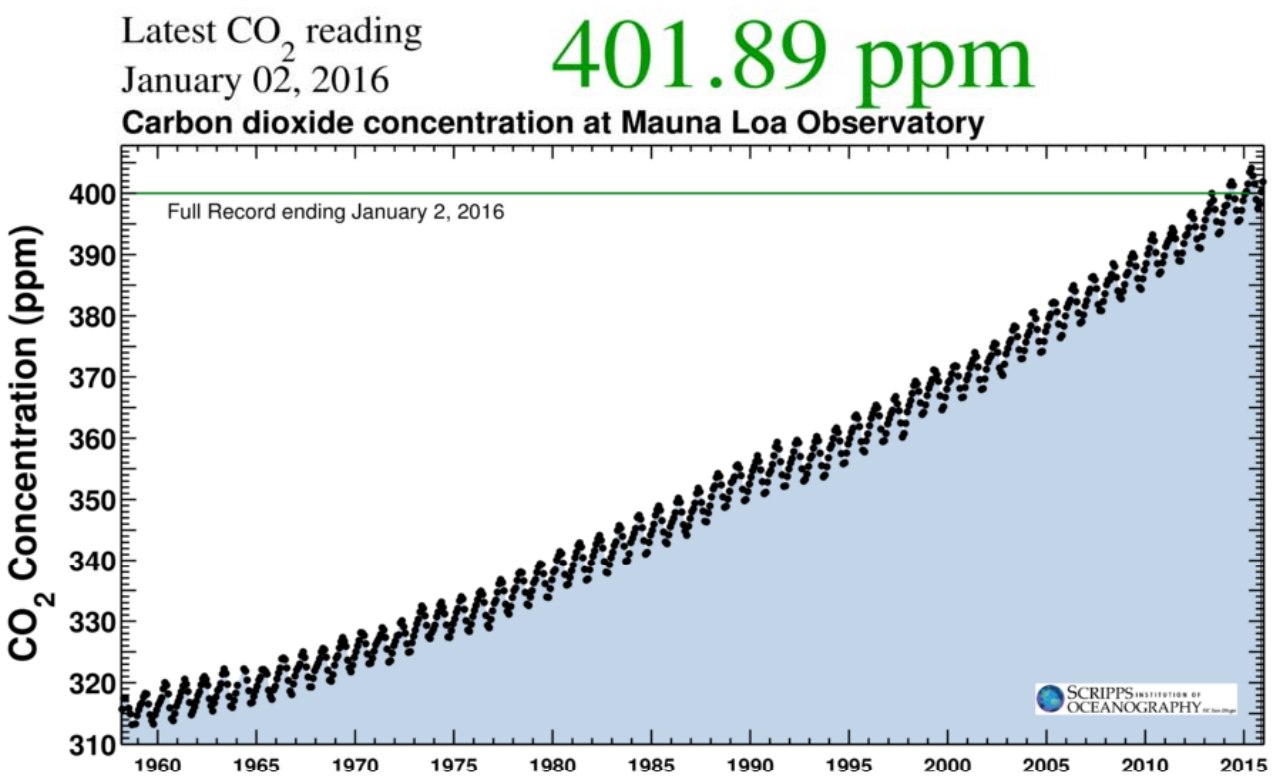
Idle Emissions Per Hour



Environmental Impact

Increasing CO2 Concentration

Recorded at Mauna Loa observatory; Data shows increasing C02 Levels

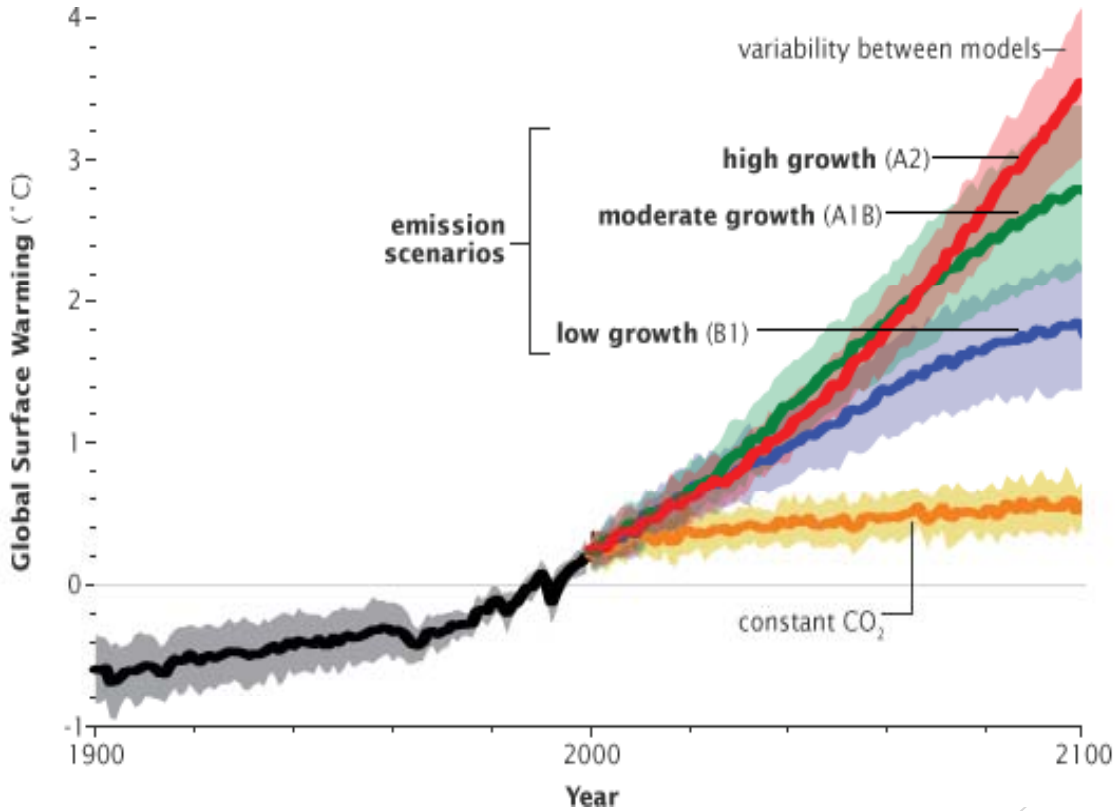


Environmental Impact

Earth Temperature

Global Surface is much more warmer than it was in 1900's

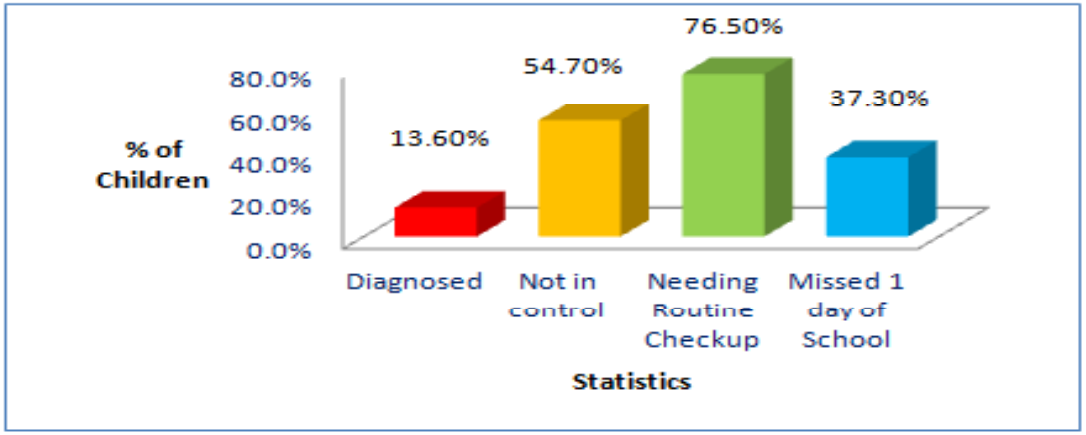
Predictions from NASA indicate an increase over the next century



Health Impact

Air Pollution

- The greatest impact is on children since they breathe more air per pound of body weight
- Vehicle emissions are more concentrated at ground level where kids are standing and breathing
- Causes respiratory and cardiovascular illnesses
- Illinois Health Statistics show that 76% of children need routine checkups due to respiratory illnesses



Economic Impact

- Idling a car wastes up to 0.5 gallons of fuel per hour
- Idling in the U.S. uses more than 6 billion gallons of fuel
- Idling costing more than $20 billion each year
- Engine idling increases vehicle maintenance costs
- Engine idling can shorten vehicle life
- Indirectly, Idling Emissions impacting health increase health care costs as well

Compendium of Idling Regulations in Illinois

Cities : Aux Sable, Goose Lake, Oswego & Counties: Cook, Du page, Kane etc

- 10 minutes within any 60-minute period
- Less than 32° F or greater than 80° F)
- Fines:$90 – 1st conviction; $150 after

Chicago : 3 minutes in any 60-minute period (No limit: 80º F) Fines: $250

City of Evanston : 5 minutes in any 60-minute period Fines: $150

What are the idling limit in other states * all states not listed here

Maine : 5 minutes in any 60-minute period (15 min if 0º - 32º F; No limit if < 0º F)

Delaware & Connecticut : 3 Minutes

Exceptions apply for emergency or law enforcement vehicles

Source: 625 Illinois Combined Statute 5/11-1429; Illinois Environmental Protection Agency

Procedure and Data Collection

- <u>Initial analysis of number of walkers and bus riders in IPSD 204</u>
- High School and Middle School are not included
  - Extra curricular activities less prevalent in elementary
  - Inconvenience of schedules
- Choose one of the top five schools with a high number of walkers
- Analyze street map around school zone
- Design Survey Observation Form for data collection
- Request survey approvals from the identified schools of interest

Procedure and Data Collection

Count	school	Walkers	Comment
1	Fry	540	Appoved for Survey
2	Welch	514	Appoved for Survey
3	Brookdale	477	Not Available
4	Patterson	453	Not Available
5	Springbrook	432	Skipped - To far from home school - cannot reach by 3:14PM
6	Scullen	380	Skipped - Middle School
7	White Eagle	375	Appoved for Survey
8	Kendall	373	Skipped in first phase
9	Steck	351	Skipped in first phase
10	Georgetown	334	Skipped in first phase
11	Young	308	Skipped in first phase
12	Watts	307	Skipped in first phase
13	Clow	301	Skipped in first phase
14	Longwood	293	Skipped in first phase
15	Builta	291	Skipped in first phase
16	Gumbert	288	Skipped in first phase
17	Still	278	Collect Drop off Data - Home School

Procedure and Data Collection

- Before Data Collection
  - Designate each recorder an observation area
  - Observe general pick-up times at each school
  - Each observer was assigned a time to reach his observation area
  - Estimate number of observers required for the amount of cars
- On the day of data collection
  - Observers arrive at pre-designated areas which is as early as 3:00 P.M.
  - Student group arrive at school by 3.14 P.M to the pre-designated area
  - All the observers carry a watch , idling observation form , pencil and a phone

Procedure and Data Collection

- Parameters & Data
  - Weather Conditions 9 Degrees Fahrenheit to 45 Degrees Fahrenheit
  - Survey Time Interval : December 2015 to January 2016
  - Total Number of Cars
  - Idling Cars and Idling Time
  - Identify Idling Vehicle
  - Number of Trials : 3 at each school

Procedure and Data Collection

Fry Elementary School Zone Pickup Areas

80% of the cars recorded on the curbside were idling

Idling Emission Calculations

FACT Sheet from Argonne Lab Research Publication on Idling Emissions

Time(s)	CO2(g)	Fuel(cc)
500.1(8.3min)	430	135.22
1200.1(20min)	1053	331.15
Per Minute	35.28	16.74

How much CO2 emission occurs during idling?		How many minutes of idling per year by 1 car?		
35.28	g/min	200 days X 16 minutes	3200	min/year

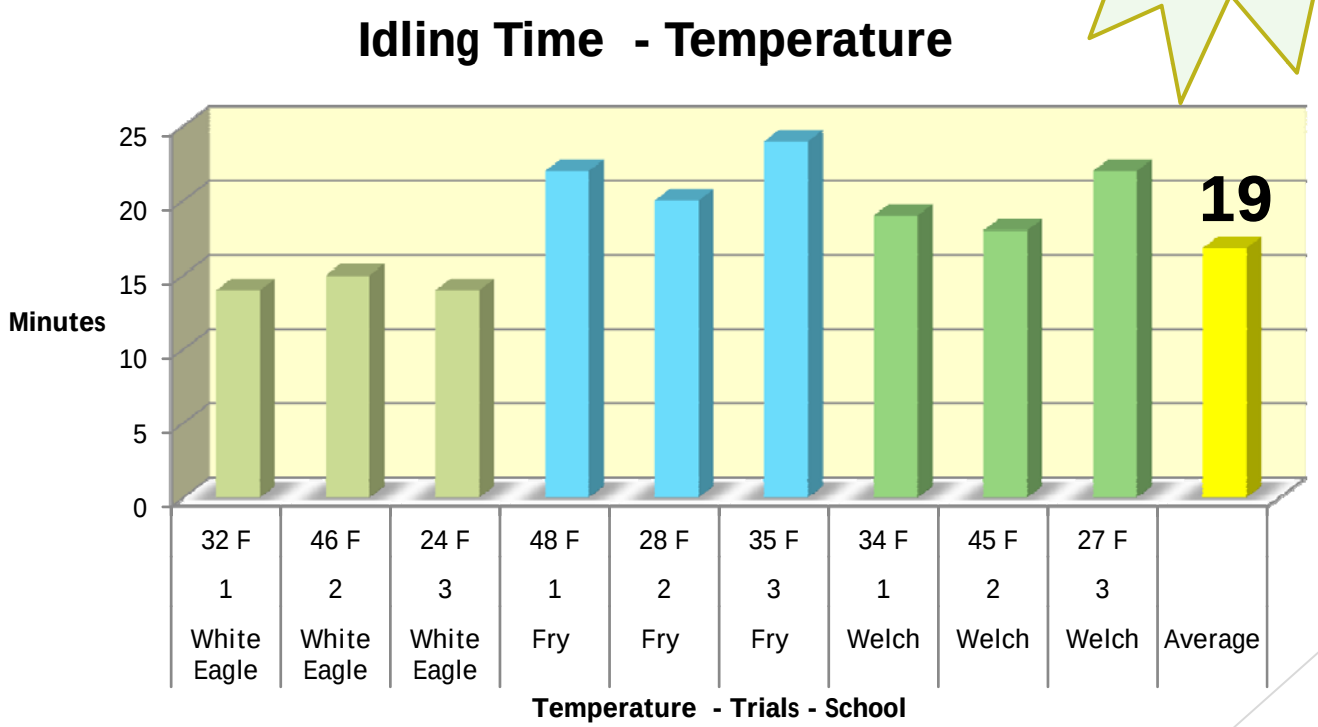
Total CO2	Total C02 emission			100 Cars near school	Avoidable CO2 Emmisions by 100 cars per year	
35.28gm CO2 X 3200 min/year =	112896	g/year	X	100	11,289,600	g/year

24,889 Pounds of CO2 emission by just one hundred cars waiting near our school!

Idling Observation Data Analysis

Location : Welch, Fry and White Eagle Elementary Schools
Event : School Dismissal
Observation Window : 3.10 PM to 3.50 PM
Recorded Temperatures : 24F to 48F
Feels Like Factor : Min 9F

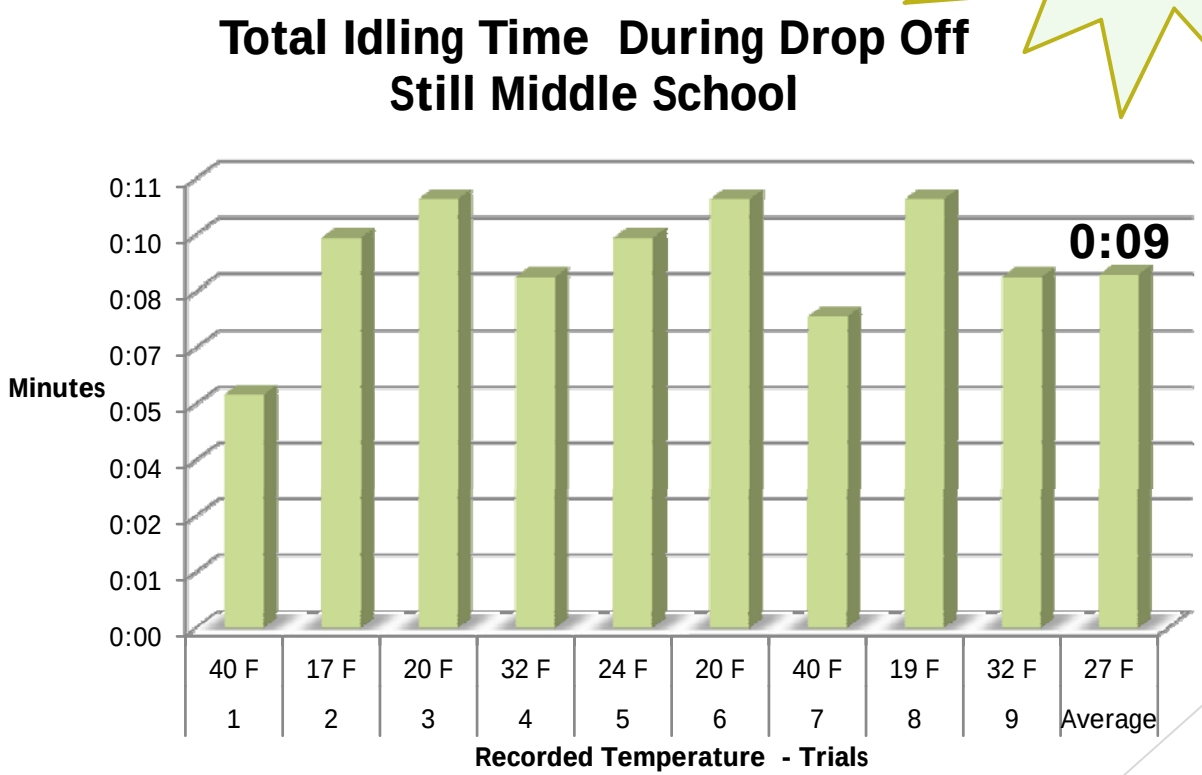
Average Idling Time 19 Minutes



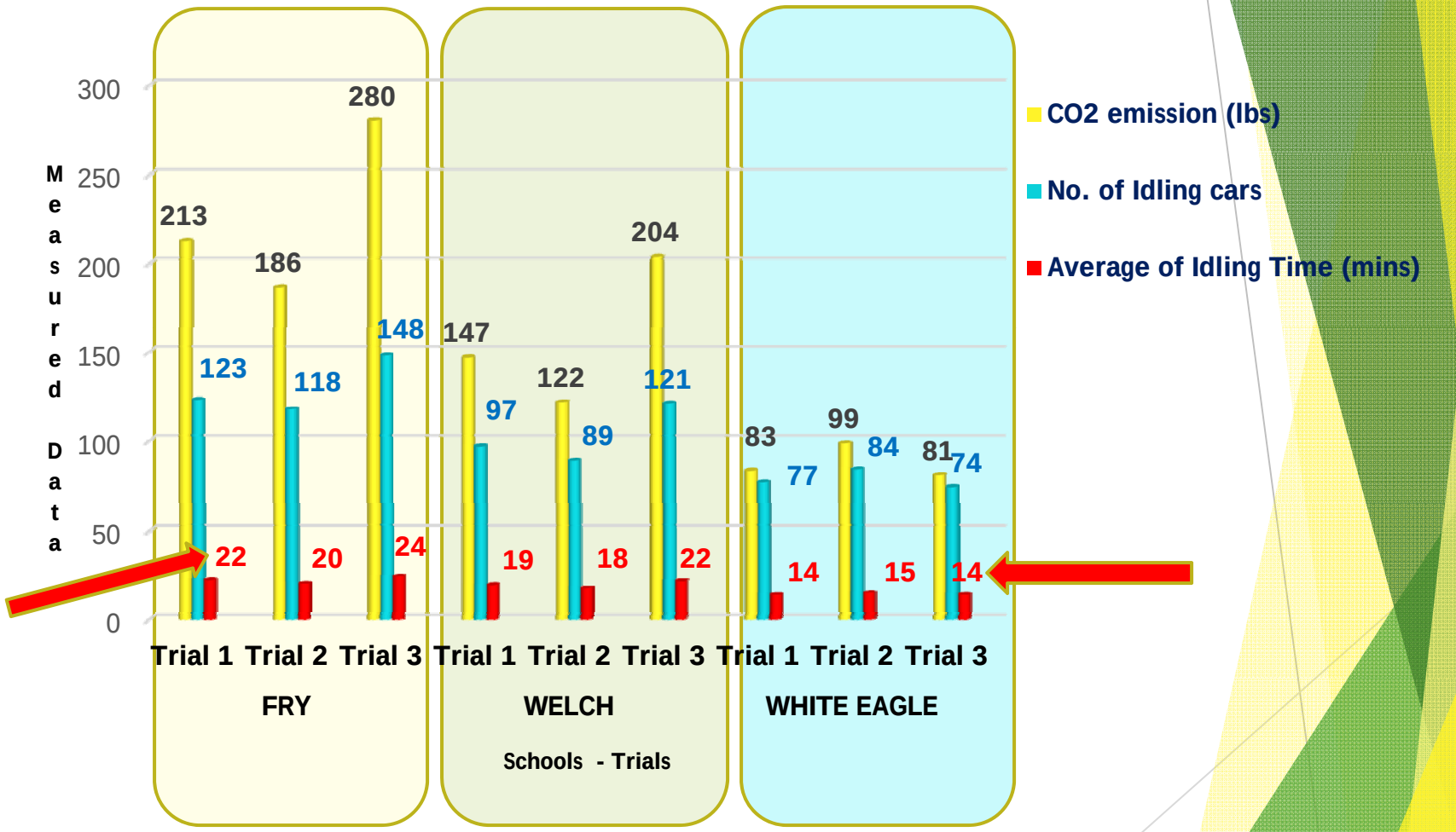
Idling Observation Data Analysis

Location : Still Middle School
Event : School Starting
Observation Window : 7.35 AM to 8.05 AM
Recorded Temperatures : 20F to 40F
Feels Like Factor : Minimum 7F

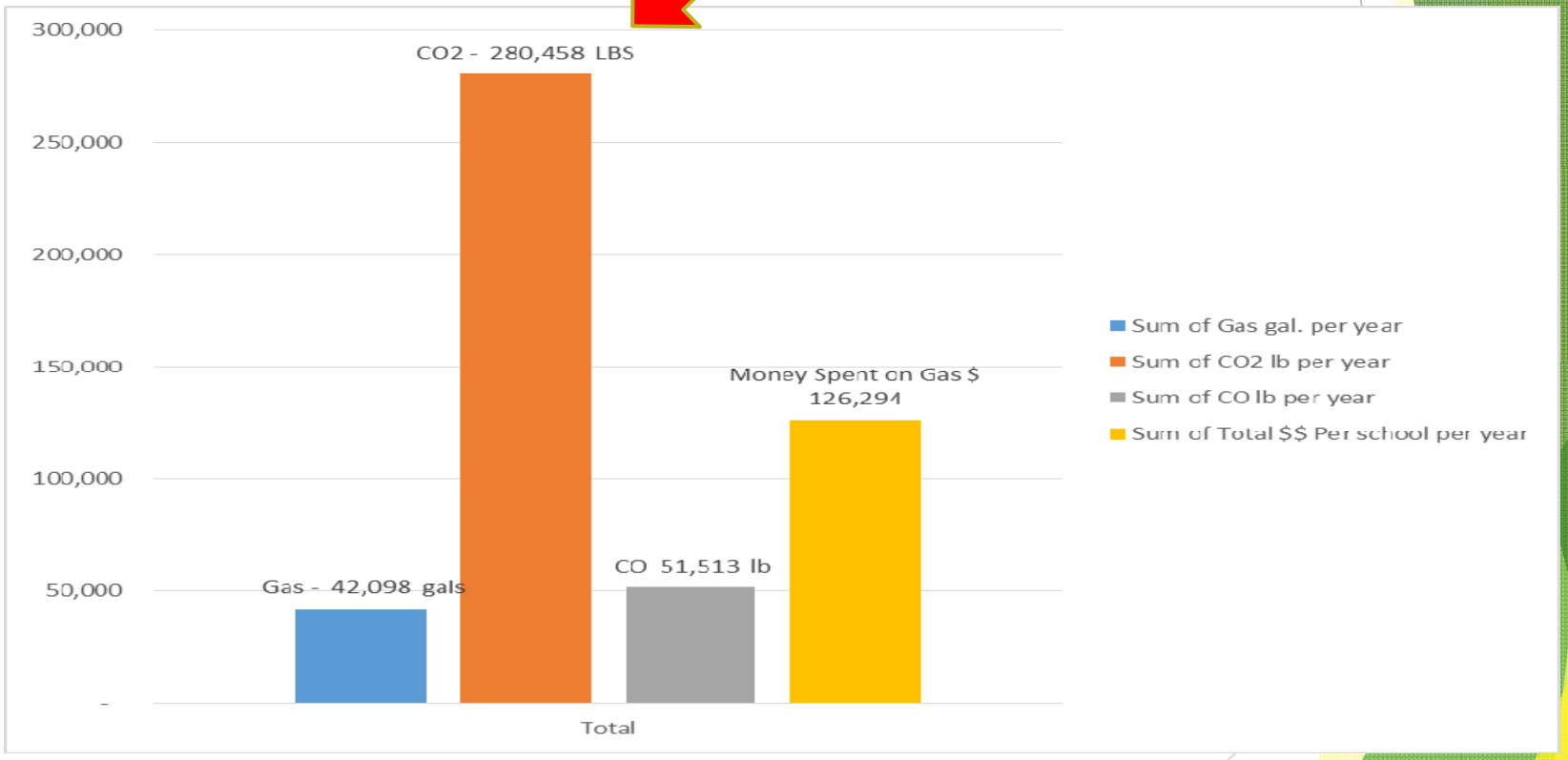
Average Idling Time 9 Minutes



Recorded Idling Time and CO2 emissions during school dismissal time (from 3:00PM to 3:45PM)



District 204 (Elementary & Middle)
Yearly Projections during school dismissal time



Proposed Solution

Accommodate 55 to 60 Students

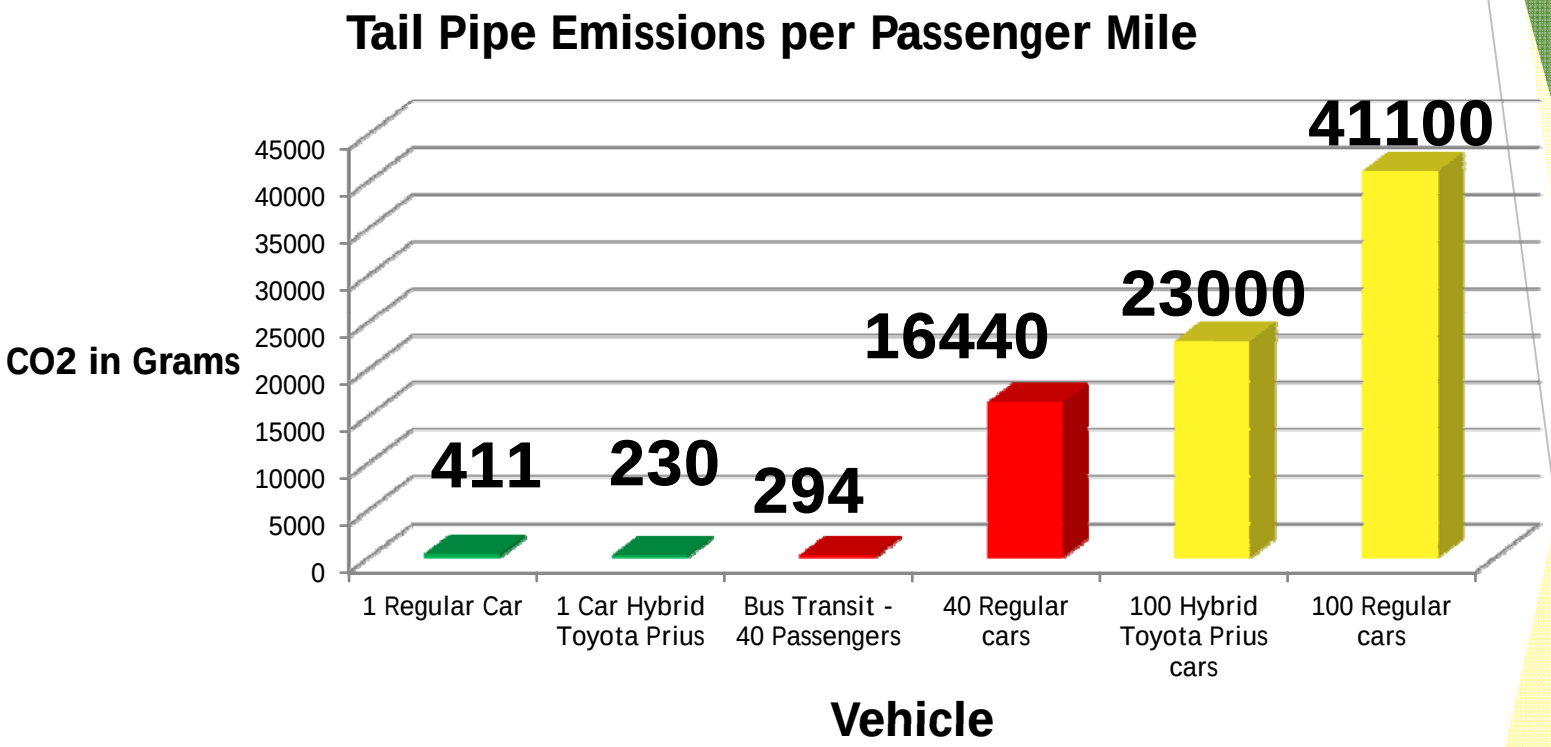
- Eliminates atleast 60 cars on the road

Prohibited from idling

- Safest Commute

Can we really afford additional school bus route ?

Bus Vs Car Tail Pipe Emissions



Passenger car emissions are 294% more than bus with 40 passengers

Not practical to have all 100 cars to be Toyota Prius to cut emissions to half

How much school bus route cost ?

#	Options	New Routes /school	Per Day Cost in $	Number of School Days	Total Cost in $
1	Use current pricing for full year	2	220	200	$2.2 Million
2	Use current pricing for winter	2	220	60	$ 660k
3	Discount price for shorter route for full year	2	110	200	$1.1 Million
4	Discount price for shorter route for Winter	2	110	60	$ 330k

- Schools requiring new school bus routes : 25
- Not all walkers would need school bus if they live opposite to school
- School Bus Company must offer a discount for 1.5m route since less distance and less driving time should cost less

School Funding Sources

#	Options	Amount $	Comments
1	If each Student in IPSD pay 50c (28,000 students/day)for 200 days	$ 2.8Million	Extra cost per student /family = $100
2	If each Student in IPSD pay 50c (28,000 students/day)for 60 days	$ 840k	Extra cost per student/family = $30
3	Funding from State and Federal Government for Green Incentive	$ 500k	Suggested approximate State or Federal Funding
4	If each Student in IPSD pay 55c (20,000 students) a day for Full year	$ 2.8Million	Approx 8000 families who may be eligible for fee waiver

More Government Grant for Climate Change combat , lesser burden on families

Solution
Determine final cost to IPSD 204

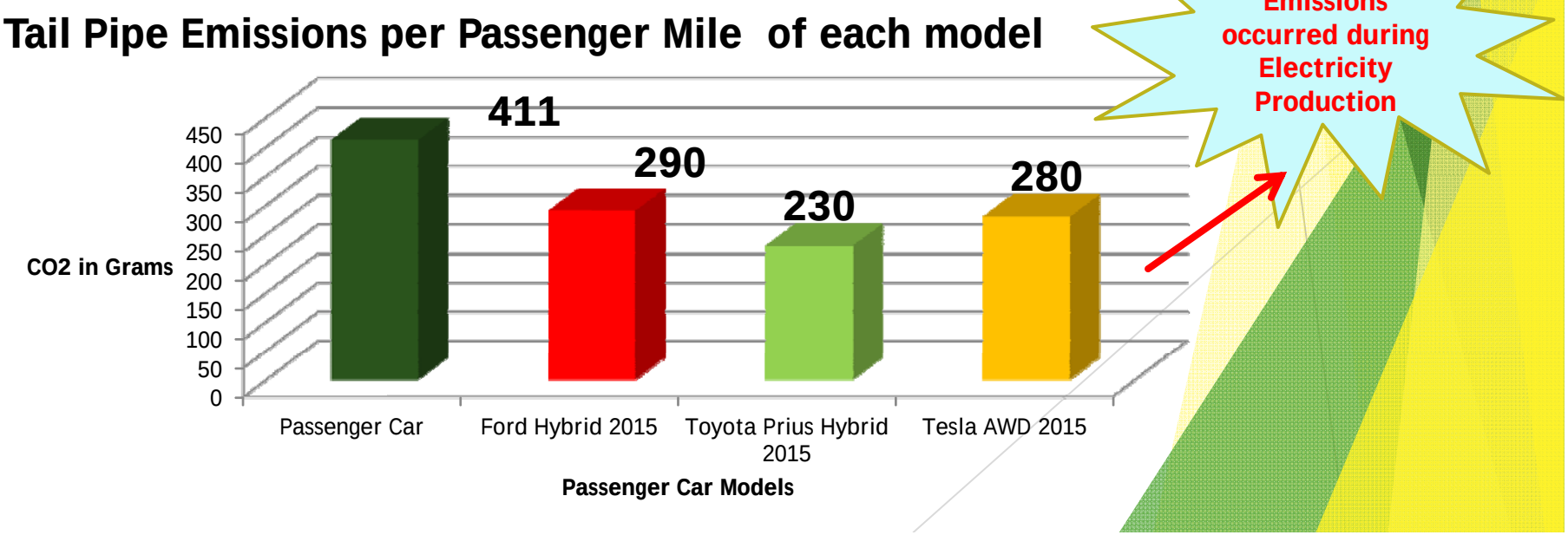
#	Options	Funding $	Total Cost in $	Balance $	Comments
1	Use current pricing for full year	$ 2.8Million	$2,2Million	$ 600k	Full year funding
2	Use current pricing for winter service	$ 840k	$ 660k	$ 180k	
3	Discount price for shorter route for full year	$ 2.8Million	$1,1Million	$ 1.7 Million	
4	Discount price for shorter route for Winter	$ 840k	$ 330K	$ 510k	
5	Funding for full year excluding fee waivers	$ 2,2Million	$2,2Million	$ ----------	

More saving with mileage discount

Affordable even with fee waiver

Other Solutions : Doing Our Share for Cleaner Air

- Raise awareness about the effects of idling among parents
- Encourage students
  - to bike or walk when possible
  - Students eligible for school buses to use them
  - students and parents to carpool
- Enforcing Idling Law
- Hybrid and Electric Vehicles



At the Paris climate conference in December 2015,

195 countries adopted the first-ever universal, legally binding global climate deal to limit global warming to well below 2°C.

We are paying a huge price that is impacting future generations !

We need to make change NOW !

Change begins at home and at school !

Let's join hands to combat climate change.

Thank you!

Reduce Emissions

Acknowledgements

We would like to thank

- **IPSD204 Administration for giving us approval to conduct scientific inquiry**
- **City of Naperville Administration giving us opportunity to share our results.**

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- **IPSD 204 Transportation Program**

Ms.Elesha Banks

- **IPSD 204 School Principals**

Ms.Kimberly Cornish , Still Middle School ; Ms. Laurie Hillman Fry Elementary

Ms.Joan Peterson ,Welch Elementary ;Ms.Timothy Krahenbuhl, White Eagle Elementary

Thank You