Response to Questions from 1/5/04 Task Force Meeting

Prepared for the

Corrales Air Quality Study Task Force

An EPA funded effort sponsored by the New Mexico Environment Department

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Motivation

- Task Force meeting on 1/5/04
  - Julian Garza asked for comparative standard
    - How do we know when there's a problem?
    - What are the relevant concentration thresholds?
    - Are these pollutants really bad or not?
  - Roy Soto called for factual answers in a form that could be read and understood

Outline

- Tonight we will discuss
  - What a pollutant is and how to measure it
  - A process for evaluating pollutant measurements against thresholds
  - What is an acceptable pollutant threshold
  - A data collection that can be used with this process
  - Results of applying this process to collected data

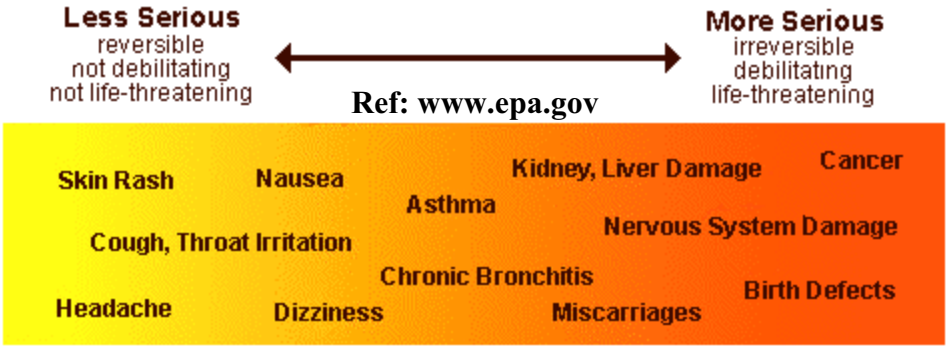
- These results will clearly demonstrate that many pollutants in the vicinity of Intel greatly exceed accepted safe levels

What are Toxic Air Pollutants?

- Toxic air pollutants are airborne substances that:
  - can cause health problems when you are exposed
  - can cause damage to both plants and animals (environment)
- Example: Benzene is known to cause cancer
  - Benzene is found in many industrial settings
  - Is also found in gasoline
    - Many gasoline stations are installing vapor recovery systems
    - If you have a choice - use these stations!
- EPA has defined 188 toxic air pollutants
  - Called Hazardous Air Pollutants (HAPs) by EPA
  - HAPs handbook can be found on the Internet (www.epa.gov)

What are Toxic Air Pollutants?

- We should be concerned when one or more of the following are true:
  - Emissions are known to cause serious health effects
  - Emissions are large enough to be toxic
    - Even short term exposure to high levels of a pollutant can adversely impact our health
  - Emissions can reach many people or are constantly exposed
    - The long term health effects of many pollutants are not yet known
    - Proceed with caution!



TARA Effects Evaluation Procedure

- Details a procedure to evaluate the potential for pollutants to cause adverse health or welfare effects
  - Compares pollutant concentrations to Effects Screening Levels
    - The Effects Screening Level (ESL) list is updated annually
  - Note: Texas is not known for progressive environmental policies however, this procedure
    - was developed by Texas Toxicology & Risk Assessment Section (TARA) of Texas Commission on Environmental Quality (TCEQ)
    - is acceptable to the EPA
    - determines facility compliance with the Texas Clean Air Act
    - was adopted by the TCEQ and has been in use since 1993
      - Latest version found in Appendix C of TCEQ, RG-324, Oct. 2001

TARA Effects Evaluation Procedure - Good in NM?

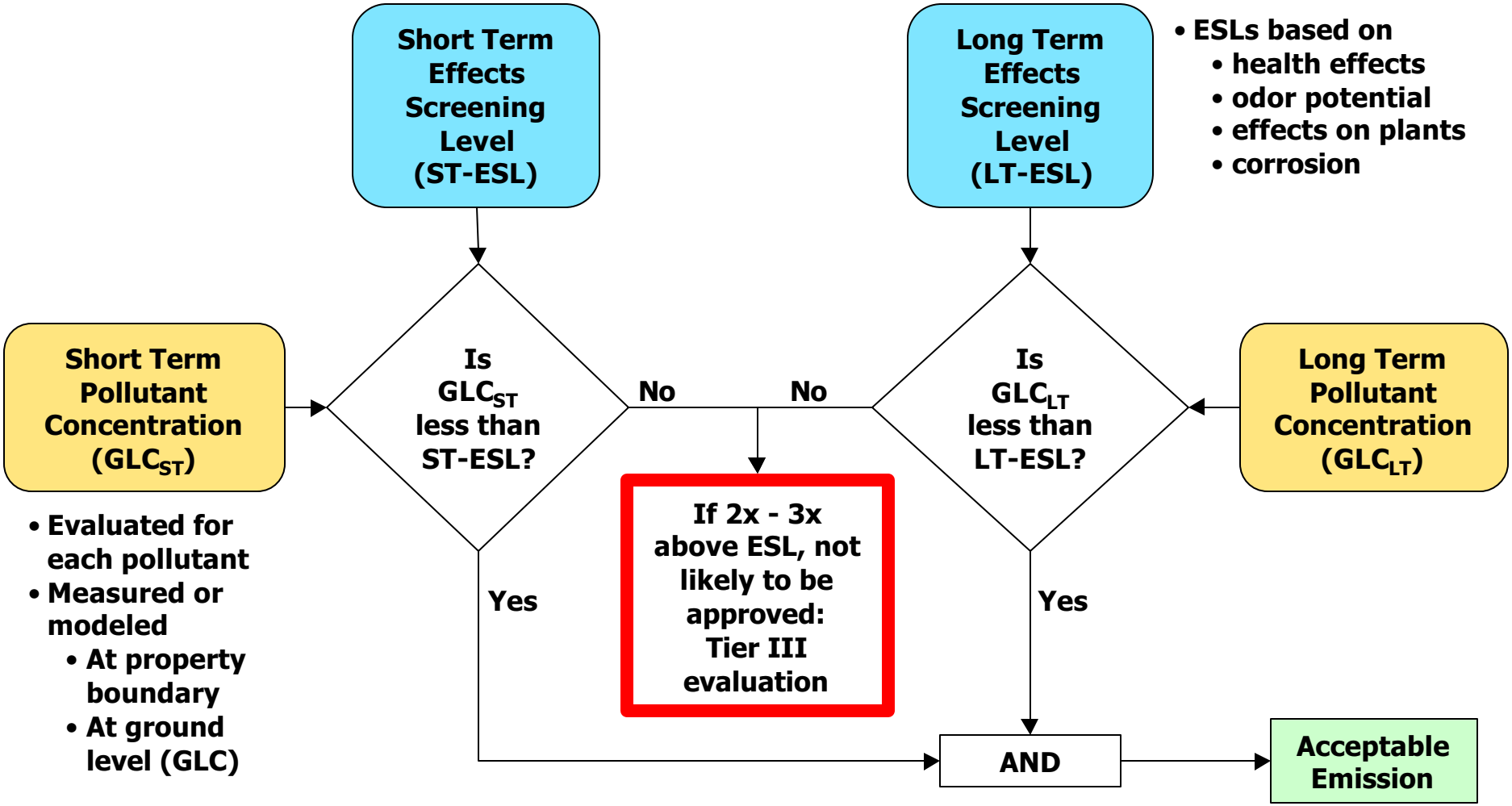
- Unfortunately
  - NMED/Air Quality Board does not have a toxicology unit to evaluate air toxics as does Texas (TCEQ / TARA)
- Fortunately,
  - NMED suggested that Intel use the Texas screening levels while developing the current Intel Air Permit (325-M-9)
  - Intel did use the Texas TARA ESLs in developing Emission Factors for HAPs per NMED guidance
    - See Table 2 of Intel Air Permit 325-M-9
  - NMED has used TARA ESLs in Task Force evaluations
- NMED, "believes that the TCEQ program is valid"
  - reference correspondence with NMED, 1/27/04

What are Effects Screening Levels (ESLs)?

- Emission concentrations are compared to guideline concentrations called Effects Screening Levels (ESLs)
  - Determines potential to cause adverse health or welfare effects especially when homes, child care facilities, recreational areas, and other businesses are located close to points of emission

- ESLs are set lower than known health effects levels to
  - account for the difference between humans and lab animals used in toxicological studies
  - account for differences between healthy adults versus children, the elderly, pregnant women and the sick
    - ESL list is updated annually by TARA
      - Ref: www.tnrcc.state.tx.us

Effects Evaluation Process Diagram



Tier II evaluation not applicable: process simplified to fit

Tier III Evaluation

- There are case specific factors to consider
  - What is the surrounding land use
    - is the public exposed?
  - How much over ESL is the pollutant?
  - How often is it over ESL?
  - How much of the pollutant is already there?
  - How toxic is the pollutant?
  - How much do we know about the health effects of the pollutant?
  - More...

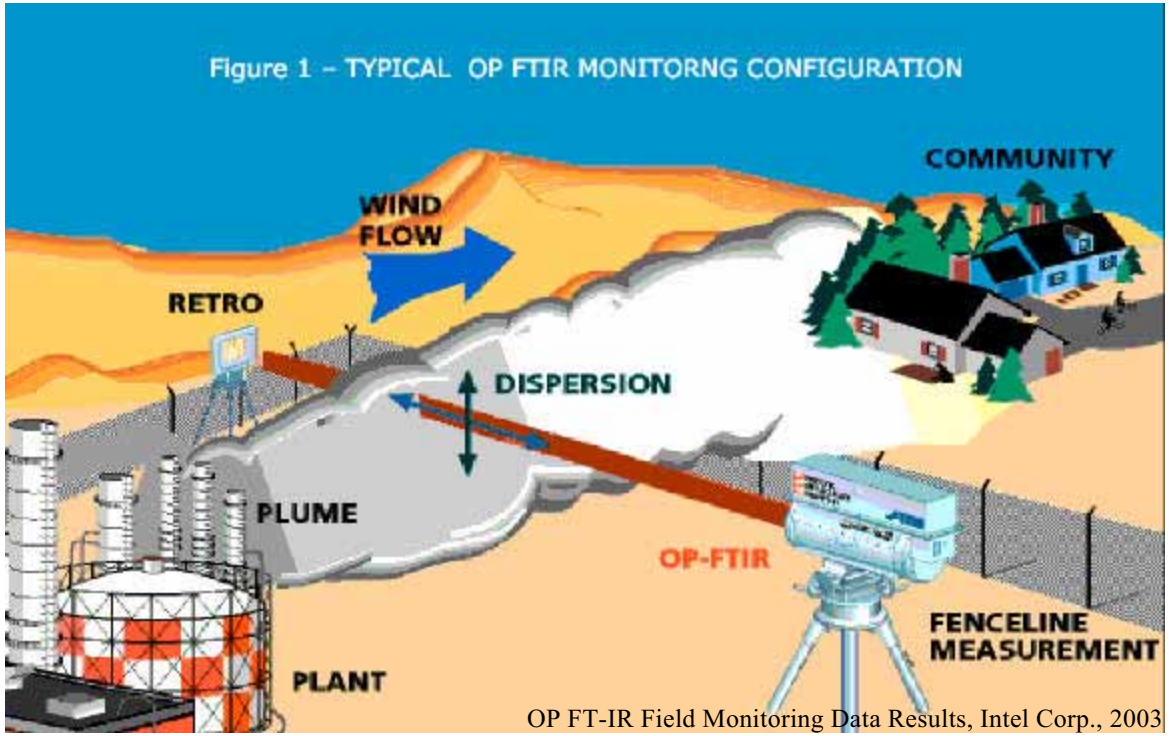
Tier III Evaluation

- But, in all Tier III evaluation cases:
  - Emissions that are greater than 2 - 3 times the ESL are not approved without determining that
    - the potential for public exposure is almost nonexistent
    - the predicted concentrations that are high don't occur often
    - others…
- Purpose:
  - Allows for an adequate margin of safety between estimated exposure levels and levels at which adverse effects are known to occur

Ref: Appendix C of TCEQ, RG-324, Oct. 2001

OP-FTIR Measurements

- An OP-FTIR measures light intensity across the infra-red band
  - Each compound absorbs light at specific frequencies corresponding to it's molecular structure
  - Can differentiate between many different compounds based on the light absorption pattern
  - Measured concentrations are assumed to be uniformly distributed across the FTIR beam path



OP FT-IR Field Monitoring Data Results, Intel Corp., 2003

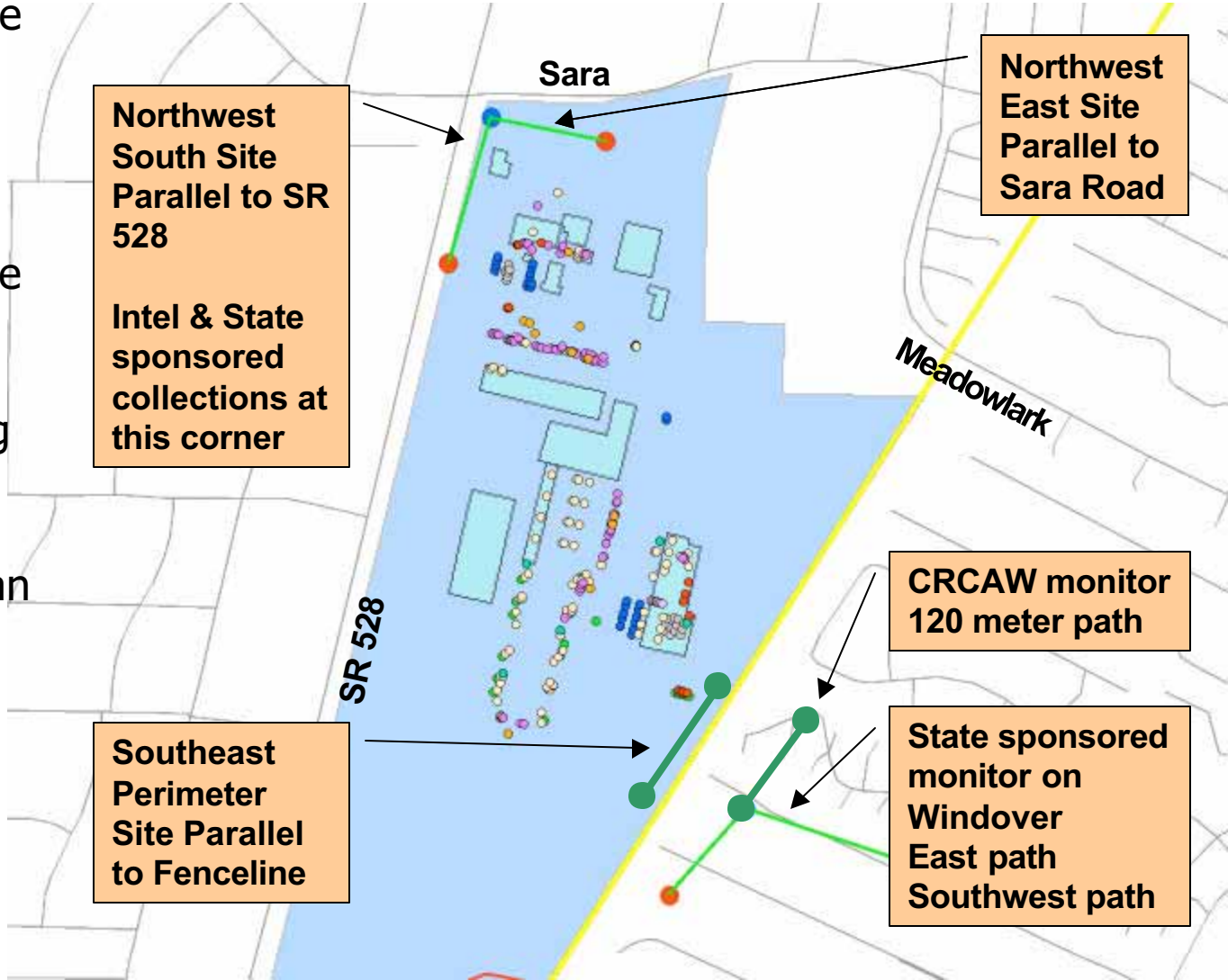
Data Collections

- OP-FTIR convergence during the month of August, 2003
  - State sponsored data collection analyzed by Arcadis
  - CRCAW OP-FTIR also was collecting during August 2003
  - Intel funded TRC data collected simultaneously
    - Collected for ~150 hours between 8/1/03 - 8/8/03
    - Collected for ~169 hours between 8/9/03 - 8/21/03
    - Collected for ~343 hours between 8/21/03 - 9/7/03
    - Intel collection and analysis is comprehensive and rigorous
    - Follows all relevant EPA methods & procedures including TO-16
    - "A model for how it should be done"
    - TRC also supports quarterly stack monitoring and analysis as required by State permit 325-M-9

August 2003 Data Collection Sites

NMED map of Intel Site

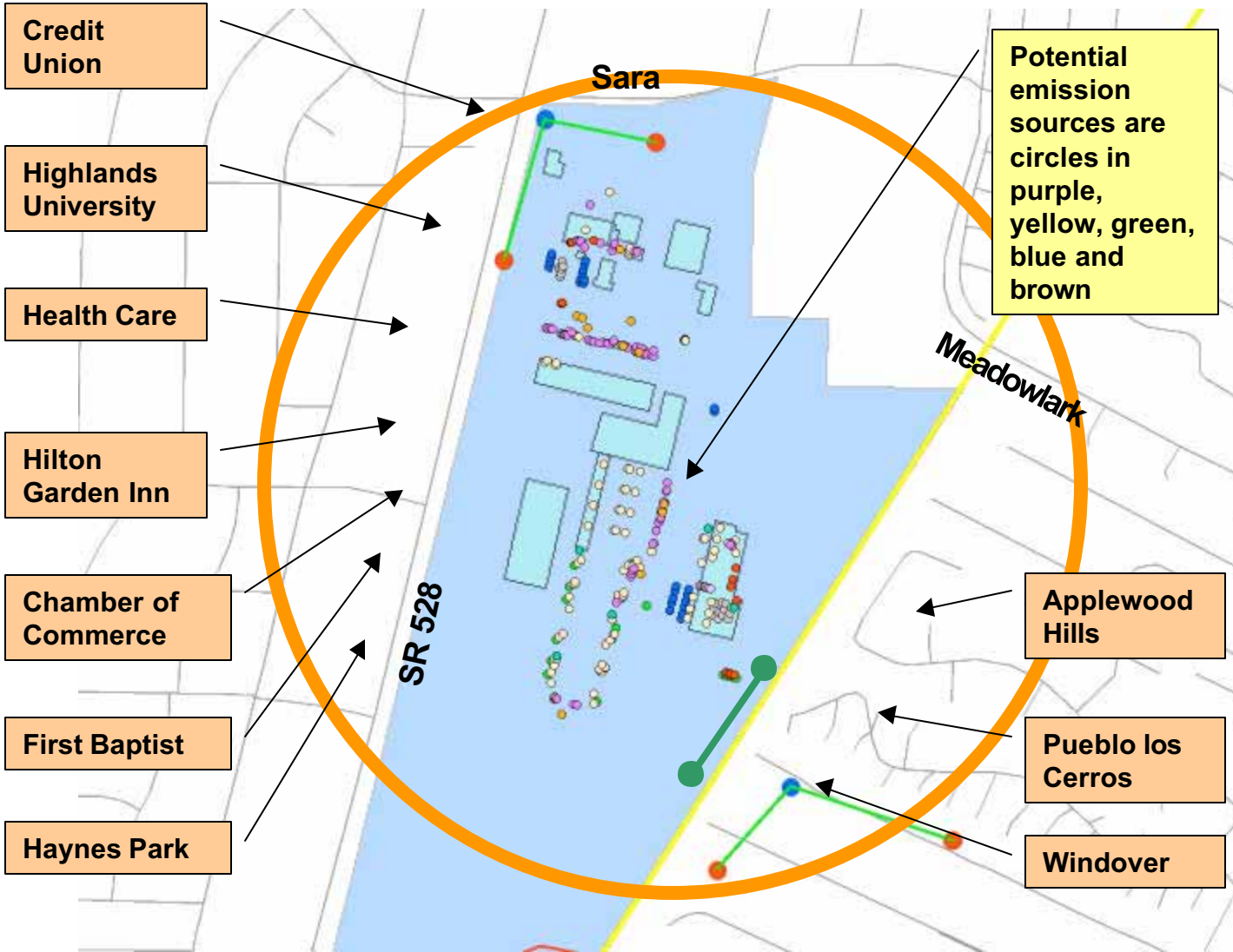
- Data collections focused on Intel site and Corrales residential area to the southeast
- Data collected during August when emissions were reportedly "lower than normal"



What's around Intel?

NMED map of Intel Site

- Intel is surrounded by heavily populated residential and commercial facilities



TRC Pollutant List

Not a complete list of local emissions, just the ones requested in TRC study

- 44 pollutants
- At least 28 in Intel permit or Intel / State Risk Studies

TRC pollutant	Short Term ST-ESL ppb	Long Term LT-ESL ppb	TRC pollutant	Short Term ST-ESL ppb	Long Term LT-ESL ppb
Acetaldehyde	50.0	5.00	m-Cresol	1.1	0.11
Acetone	2,500.0	250.00	Methanol		
Ammonia	250.0	25.00	Methyl Methacrylate	80.0	8.00
Arsine	0.5	0.05	m-Xylene	850.0	85.00
Benzaldehyde	5.0	0.50	n-Butyl Acetate	390.0	39.00
Benzene	25.0	1.00	n-Butyl Alcohol	200	20.00
Bromoform	5.0	0.50	n-Butyraldehyde	5.0	0.50
Carbon Monoxide			n-Hexane	500.0	50.00
Carbon Tetrachloride	20.0	2.00	Nitric Acid	20.0	2.00
Carbon Tetrafluoride	5000	500.00	Nitric Oxide	250.0	25.00
Carbonyl Fluoride	6.0	0.60	Nitrogen Dioxide		
Carbonyl Sulfide	3.0	0.30	Nitrous Oxide	500.0	50.00
Chloroform	20.0	2.00	o-Cresol	1.1	0.11
Chloromethane	500.0	50.00	o-Xylene	850.0	85.00
Dichloromethane	75.0	7.50	Ozone		
Ethanol			p-Cresol	1.1	0.11
Formaldehyde	12.0	1.20	PGMEA	120.0	12.00
Hexafluoroethane	5,000.0	500.00	Phosgene	1.0	0.10
Hydrogen Chloride	50	0.07	Phosphine	3.0	0.30
Hydrogen Cyanide	4.7	0.47	Propionaldehyde	8.4	0.84
Hydrogen Fluoride	6.0	0.60	p-Xylene	480.0	48.00
Iso-Propanol	3,200.0	320.00	Sulfur Dioxide		

Hazardous Air Pollutants

Compound	Health Effects
Acetaldehyde	Irritation of the eyes, skin, and respiratory tract. Probable carcinogen - not sufficiently studied.
Benzene	May cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and at high levels, unconsciousness. Known carcinogen.
Bromoform	Slows down brain functions, and injury to the liver and kidney. Probable carcinogen - not sufficiently studied.
m-Cresol, o-Cresol, p-Cresol	Respiratory tract irritation, with symptoms such as dryness, nasal constriction, and throat irritation. Probable carcinogen - not sufficiently studied.
Formaldehyde	Respiratory symptoms, and eye, nose, and throat irritation. Probable carcinogen - not sufficiently studied.
Hydrogen Fluoride	Severe respiratory damage in humans, including severe irritation and pulmonary edema
n-Hexane	Mild central nervous system effects, including dizziness, giddiness, slight nausea, and headache
o-Xylene	Exposure to mixed Xylenes results in irritation of the eyes, nose, and throat, gastrointestinal effects, and neurological effects
Phosgene	Severe respiratory effects, including pulmonary edema, pulmonary emphysema, and death
Propionaldehyde	Animal studies show exposure to high levels caused anesthesia and liver damage. Not well studied.

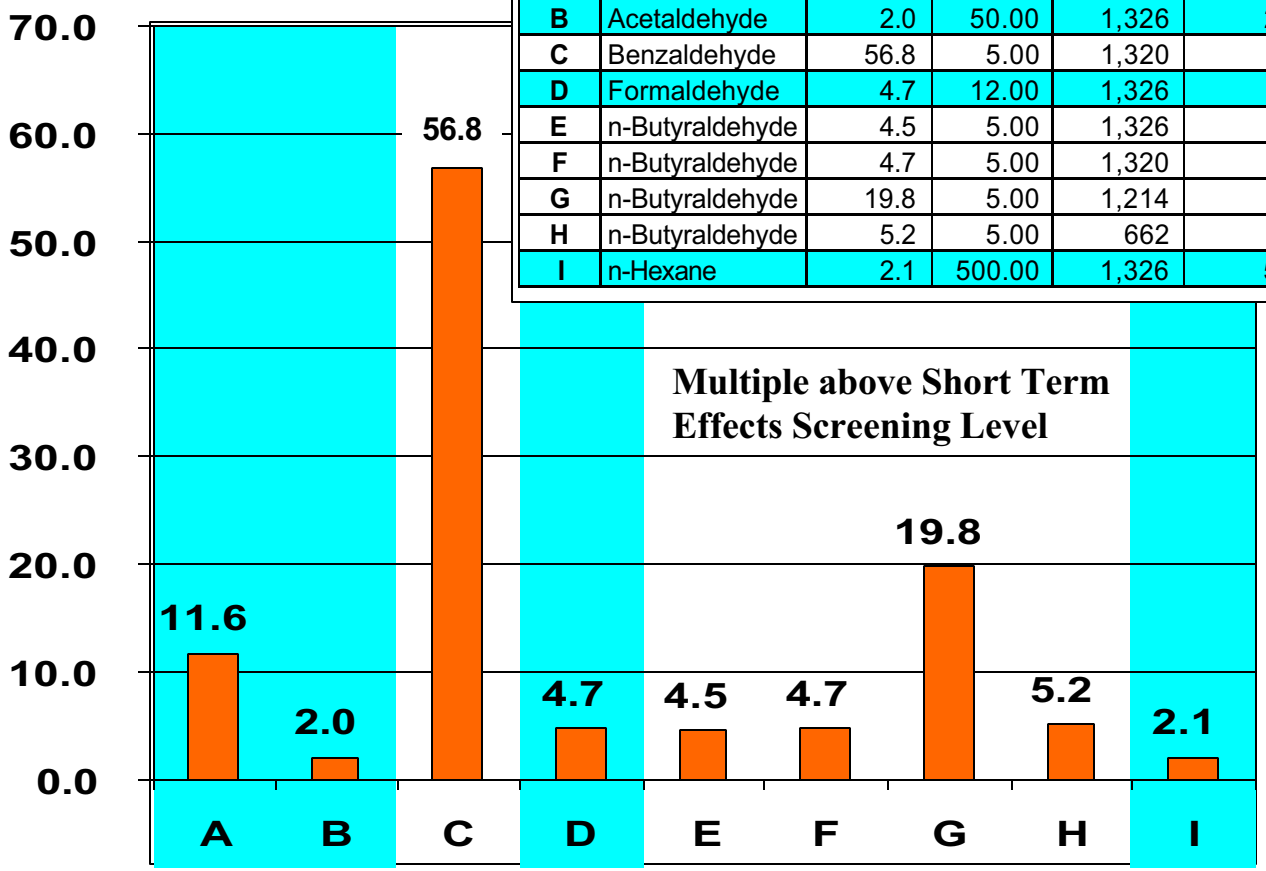
Data Analysis Approach

- TRC data summary tables were analyzed using Effects Evaluation Procedure and TRC reported long term average concentrations for each site
  - Several Long Term Effects Screening Level (ESL) thresholds were exceeded
  - This is of concern, but not focus of this discussion
- Detailed, day by day data in the TRC report were screened against Short Term ESLs (ST-ESLs)
  - 1000's of data points were screened against each of the 44 pollutants listed in the previous chart
  - Many very short term (less than 15 minute) spikes grossly exceed ST-ESL (Bromoform @ 667 times ST-ESL), but not the focus here
- Focus on Average Short Term Emissions longer than 15 minutes and greater than 2 times ST-ESL when found
  - A conservative approach

Northwest Corner Parallel to SR 528

Data collected over 9 days between 8/1/03 - 8/8/03: ~150 hours

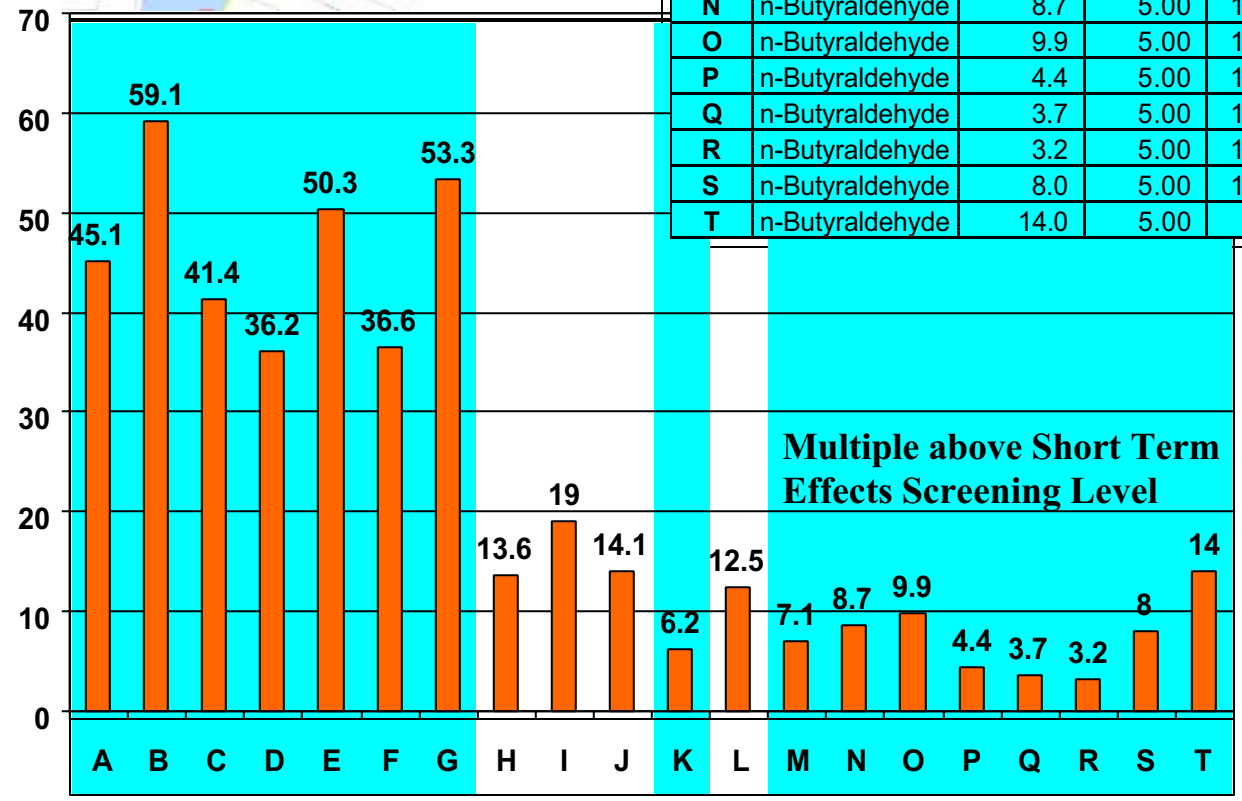
Index	TRC name	Multiple above ST-ESL	ST-ESL ppb	N meas	N detect	Avg Conc ppb	Max Conc ppb	Duration hours	Date
A	Acetaldehyde	11.6	50.00	1,326	229	581.41	833.66	3.5	08/02/03
B	Acetaldehyde	2.0	50.00	1,326	213	100.76	169.78	3.3	08/03/03
C	Benzaldehyde	56.8	5.00	1,320	41	284.20	401.34	0.6	08/05/03
D	Formaldehyde	4.7	12.00	1,326	79	55.93	64.81	1.2	08/02/03
E	n-Butyraldehyde	4.5	5.00	1,326	18	22.43	68.25	0.3	08/04/03
F	n-Butyraldehyde	4.7	5.00	1,320	34	23.30	87.16	0.5	08/05/03
G	n-Butyraldehyde	19.8	5.00	1,214	28	98.89	300.31	0.4	08/06/03
H	n-Butyraldehyde	5.2	5.00	662	19	26.18	58.48	0.3	08/08/03
I	n-Hexane	2.1	500.00	1,326	528	1,047.20	5,345.50	8.1	08/02/03



- Only showing cases for which detections are
- greater than 15 minutes AND
- greater than 2 times the Short Term ESL

Northwest Corner Parallel to Sara Road

Index	TRC name	Multiple above ST-ESL	ST-ESL ppb	N meas	N detect	Avg Conc ppb	Max Conc ppb	Duration hours	Date
A	o-Cresol	45.1	1.10	1,257	45	49.66	109.19	0.7	08/13/03
B	o-Cresol	59.1	1.10	1,335	402	64.98	142.03	6.2	08/14/03
C	o-Cresol	41.4	1.10	1,334	137	45.53	80.92	2.1	08/15/03
D	o-Cresol	36.2	1.10	1,336	87	39.84	82.34	1.3	08/16/03
E	o-Cresol	50.3	1.10	1,336	41	55.38	124.25	0.6	08/17/03
F	o-Cresol	36.6	1.10	1,245	40	40.27	116.86	0.6	08/18/03
G	o-Cresol	53.3	1.10	1,327	37	58.65	112.36	0.6	08/20/03
H	p-Cresol	13.6	1.10	1,334	16	14.91	20.53	0.2	08/15/03
I	p-Cresol	19.0	1.10	1,327	38	20.93	29.71	0.6	08/20/03
J	p-Cresol	14.1	1.10	898	17	15.56	22.21	0.3	08/21/03
K	Benzene	6.2	25.00	1,246	79	155.50	252.71	1.2	08/18/03
L	m-Cresol	12.5	1.10	426	16	13.78	20.52	0.2	08/12/03
M	n-Butyraldehyde	7.1	5.00	426	31	35.66	80.24	0.5	08/12/03
N	n-Butyraldehyde	8.7	5.00	1,257	54	43.65	71.37	0.8	08/13/03
O	n-Butyraldehyde	9.9	5.00	1,335	57	49.40	74.91	0.9	08/14/03
P	n-Butyraldehyde	4.4	5.00	1,336	22	22.07	88.59	0.3	08/16/03
Q	n-Butyraldehyde	3.7	5.00	1,336	37	18.54	46.59	0.6	08/17/03
R	n-Butyraldehyde	3.2	5.00	1,245	28	15.82	29.60	0.4	08/18/03
S	n-Butyraldehyde	8.0	5.00	1,327	56	40.21	137.98	0.9	08/20/03
T	n-Butyraldehyde	14.0	5.00	898	27	70.10	413.27	0.4	08/21/03



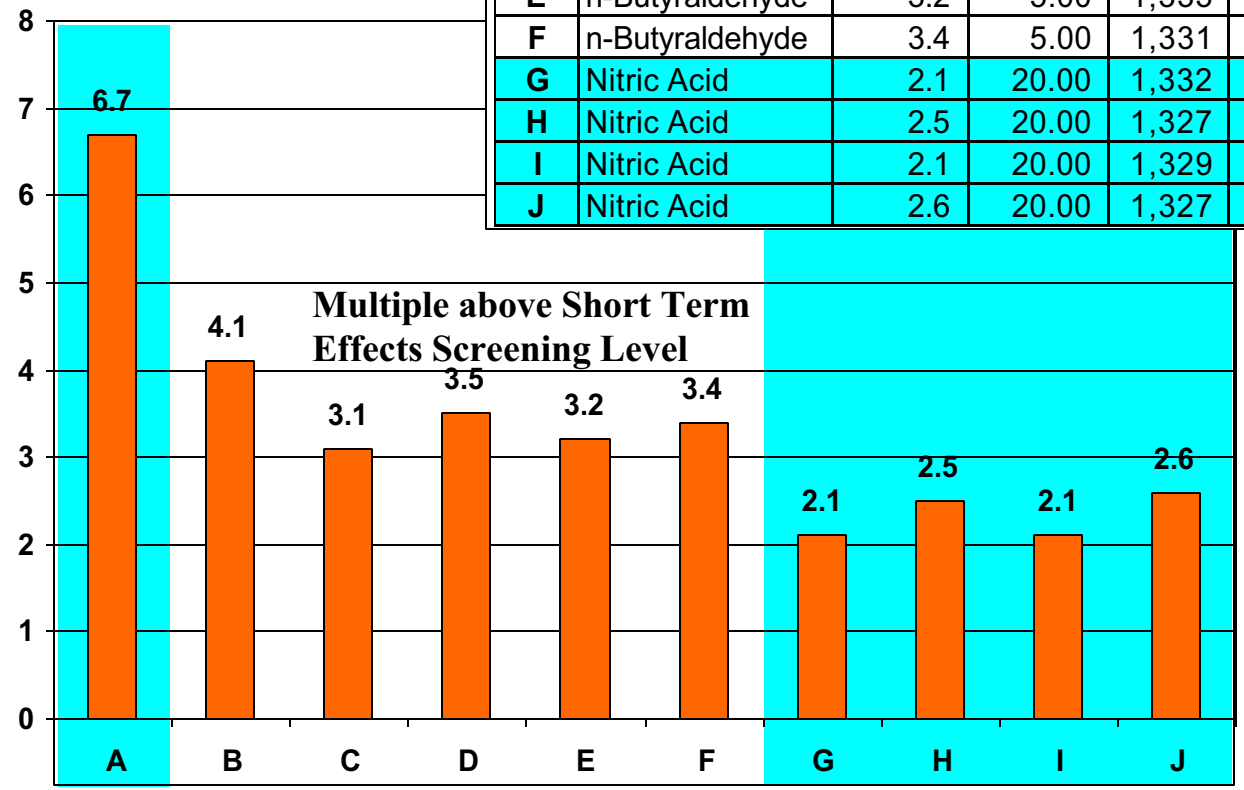
- Only showing cases for which detections are
- greater than 15 minutes AND
- greater than 2 times the Short Term ESL

Data collected over 13 days between 8/9/03 - 9/21/03: ~169 hours

Southeast Perimeter Parallel to Fenceline

Data collected over 18 days between 8/21/03 - 9/7/03: ~343 hours

Index	TRC name	Multiple above ST-ESL	ST-ESL ppb	N meas	N detect	Avg Conc ppb	Max Conc ppb	Duration hours	Date
A	Benzene	6.7	25.00	1,330	22	167.45	242.43	0.3	08/27/03
B	n-Butyraldehyde	4.1	5.00	1,327	79	20.56	36.55	1.2	08/28/03
C	n-Butyraldehyde	3.1	5.00	1,332	51	15.69	45.13	0.8	08/31/03
D	n-Butyraldehyde	3.5	5.00	1,327	23	17.26	49.23	0.4	09/03/03
E	n-Butyraldehyde	3.2	5.00	1,333	22	15.84	24.02	0.3	09/04/03
F	n-Butyraldehyde	3.4	5.00	1,331	25	17.23	30.56	0.4	09/06/03
G	Nitric Acid	2.1	20.00	1,332	1,332	42.96	50.70	20.5	08/24/03
H	Nitric Acid	2.5	20.00	1,327	1,320	49.84	64.84	20.3	08/25/03
I	Nitric Acid	2.1	20.00	1,329	1,329	41.73	57.38	20.4	08/26/03
J	Nitric Acid	2.6	20.00	1,327	380	51.42	66.96	5.8	08/28/03



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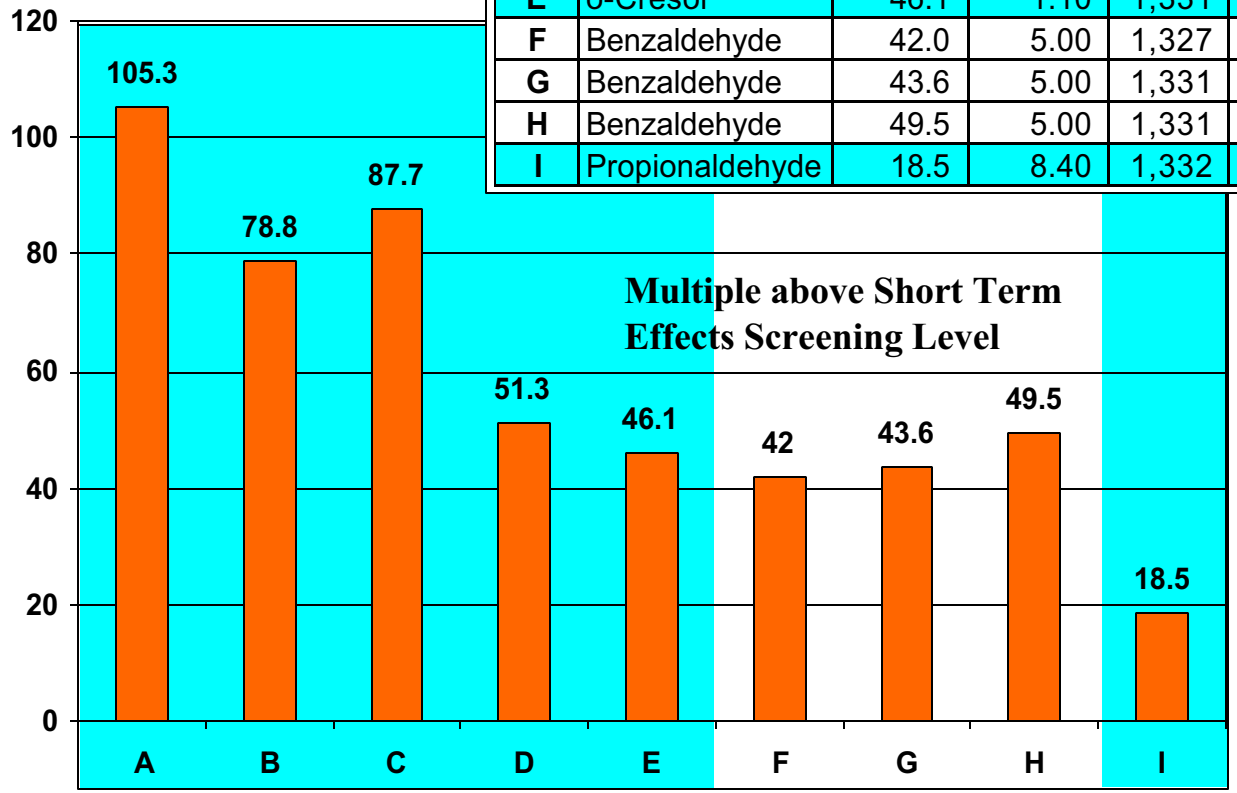
Southeast Perimeter Parallel to Fenceline

Data collected over 18 days between 8/21/03 - 9/7/03 : ~343 hours

Index	TRC name	Multiple above ST-ESL	ST-ESL ppb	N meas	N detect	Avg Conc ppb	Max Conc ppb	Duration hours	Date
A	o-Cresol	105.3	1.10	1,330	65	115.88	219.36	1.0	08/27/03
B	o-Cresol	78.8	1.10	1,489	44	86.68	220.75	0.7	08/29/03
C	o-Cresol	87.7	1.10	1,775	136	96.49	133.73	2.1	08/30/03
D	o-Cresol	51.3	1.10	1,332	61	56.38	87.43	0.9	08/31/03
E	o-Cresol	46.1	1.10	1,331	52	50.72	76.87	0.8	09/01/03
F	Benzaldehyde	42.0	5.00	1,327	29	209.80	275.79	0.4	08/25/03
G	Benzaldehyde	43.6	5.00	1,331	44	218.07	282.91	0.7	09/05/03
H	Benzaldehyde	49.5	5.00	1,331	55	247.35	315.93	0.8	09/06/03
I	Propionaldehyde	18.5	8.40	1,332	176	155.23	210.22	2.7	09/02/03



- Only showing cases for which detections are
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Summary

- The Effects Screening Procedure is clear, simple and accepted
- The Effects Screening Level (ESL) thresholds are well established and updated annually by the Texas Toxicology and Risk Assessment section
- The Intel sponsored TRC data collection & analysis is of the highest quality and should be acceptable to all
- TRC measured data clearly and substantially exceed Short Term ESL guidelines accepted and used by the states of Texas and New Mexico

Conclusion

- Hazardous levels of many compounds have been measured at the boundaries of the Intel facility
  - Shown to grossly exceed acceptable short term criteria
  - Measurements were taken during August when Intel emissions have been reported to be lower than normal
  - Intel has stated that emission levels will increase as Intel "ramps-up" facility production

- As bad as this appears, these emissions don't violate the existing permit because there are no limits on short term emissions in the permit!

Conclusion

- This clearly substantiates the need for
  - Additional investigation by NMED / AQB and EPA
  - Modification of the Intel operating permit to include
    - Short Term Emission Limits
    - Continuous Monitoring to validate Short Term Emission directly
- EPA guidance: Being classified as a Minor Source Emitter is a privilege, NOT a right
- You Decide!