

**SUSITNA  
HYDROELECTRIC PROJECT**

**FEDERAL ENERGY REGULATORY COMMISSION  
PROJECT No. 7114**

**HARZA-EBASCO**

Susitna Joint Venture  
Document Number

2613

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**DOCUMENT CONTROL**

**RESPONSE TO FEDERAL ENERGY  
REGULATORY COMMISSION  
DATA REQUEST OF  
MARCH 4, 1985**

**VOLUME 2**

**ITEMS 3d - 3g  
ITEM 4**

**HARZA-EBASCO  
SUSITNA JOINT VENTURE**

**MARCH 19, 1985**

**ALASKA POWER AUTHORITY**

SUSITNA  
HYDROELECTRIC PROJECT

Federal Energy Regulatory Commission  
Project No. 7114

ALASKA POWER AUTHORITY

RESPONSE TO

FEDERAL ENERGY REGULATORY COMMISSION

DATA REQUEST OF

MARCH 4, 1985

Volume 2  
Items 3d-3g  
Item 4

March 19, 1985

Item 3d: "ISCST model calculations for fugitive dust on p. 5-16 . . .  
Lignite Creek mine and power plant impacts."

Response:

1. Attached is a copy of the ISCST computer runs for Lignite Creek mine fugitive dust that were referred to in Section 5.2.3.5 Modeling Approach for Fugitive Dust, page 5-16 of the text.
2. Attached is a copy of the ISCST computer runs for power plant fugitive dust that were referred to in Section 5.2.3.5 Modeling Approach for Fugitive Dust, page 5-16 of the text.

3.d.1.

ISCST Computer Runs for

Mine Site Fugitive Dust

Summary: Mine Site Fugitive Dust Impacts

- o Maximum 24-hr emissions = 3,359 lbs/day  
Average Annual emissions = 2,067 lbs/day
- o Particle size and deposition characteristics are listed in the ISC computer output.
- o Maximum 24-hr impacts were calculated using 2.5 mps wind speed at F stability, with a 6-hour daily occurrence, and using the ISC model.
- o Average annual impacts were calculated using the average annual wind speed at Nenana (2.45 mps), D stability, with a 20% frequency of wind direction occurrence either up-valley or down-valley.



\*\*\* Susitan DEIS Comments: Annual Mine Fus Dust Impacts

\*\*\*

CALCULATE (CONCENTRATION=1,DEPOSITION=2)  
 RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)  
 DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)  
 TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)  
 CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)  
 LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)

ISW(1) = 1  
 ISW(2) = 3  
 ISW(3) = 1  
 ISW(4) = 0  
 ISW(5) = 0  
 ISW(6) = 2

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
 WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)  
 2-HOUR (YES=1,NO=0)  
 3-HOUR (YES=1,NO=0)  
 4-HOUR (YES=1,NO=0)  
 6-HOUR (YES=1,NO=0)  
 8-HOUR (YES=1,NO=0)  
 12-HOUR (YES=1,NO=0)  
 24-HOUR (YES=1,NO=0)  
 PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)

ISW(7) = 1  
 ISW(8) = 0  
 ISW(9) = 0  
 ISW(10) = 0  
 ISW(11) = 0  
 ISW(12) = 0  
 ISW(13) = 0  
 ISW(14) = 0  
 ISW(15) = 0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
 SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)  
 HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)  
 MAXIMUM 50 TABLES (YES=1,NO=0)  
 METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)  
 RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)  
 WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
 VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
 SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)  
 PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)  
 PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

ISW(16) = 0  
 ISW(17) = 1  
 ISW(18) = 0  
 ISW(19) = 2  
 ISW(20) = 0  
 ISW(21) = 1  
 ISW(22) = 1  
 ISW(23) = 0  
 ISW(24) = 1  
 ISW(25) = 1

NUMBER OF INPUT SOURCES  
 NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)  
 TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)  
 NUMBER OF X (RANGE) GRID VALUES  
 NUMBER OF Y (THETA) GRID VALUES  
 NUMBER OF DISCRETE RECEPTORS  
 NUMBER OF HOURS PER DAY IN METEOROLOGICAL DATA  
 NUMBER OF DAYS OF METEOROLOGICAL DATA  
 SOURCE EMISSION RATE UNITS CONVERSION FACTOR  
 ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE  
 ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE  
 HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED  
 LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA  
 ALLOCATED DATA STORAGE  
 REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

NSOURC = 1  
 NGROUP = 0  
 IPERD = 1  
 NXPNTS = 10  
 NYPNTS = 1  
 NXWYPT = 0  
 NHOURS = 1  
 NDAYS = 1  
 TK = .10000E+07  
 BETA1 = 0.600  
 BETA2 = 0.600  
 ZR = 10.00 METERS  
 IMET = 5  
 LIMIT = 43500 WORDS  
 MIMIT = 296 WORDS

\*\*\* Susitan DEIS Comments: Annual Mine Fus Dust Impacts

\*\*\*

\*\*\* UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES \*\*\*  
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

\*\*\* X-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

1000.0, 2000.0, 3000.0, 4000.0, 5000.0, 6000.0, 7000.0, 8000.0, 9000.0, 10000.0,

\*\*\* Y-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

0.0,

2

\*\*\* Susitan DEIS Comments: Annual Mine Fus Dust Impacts

\*\*\*

\*\*\* SOURCE DATA \*\*\*

| T W        |       | Y A NUMBER |       | EMISSION RATE<br>TYPE=0,1<br>(GRAMS/SEC) |               |               | BASE<br>ELEV. | HEIGHT | TEMP.<br>TYPE=0<br>(DEG.K);<br>VERT.DIM<br>TYPE=1<br>(METERS) | EXIT VEL.<br>TYPE=0<br>(M/SEC);<br>HORZ.DIM<br>TYPE=1,2<br>(METERS) | DIAMETER<br>TYPE=0<br>(METERS) | BLDG.<br>HEIGHT<br>TYPE=0<br>(METERS) | BLDG.<br>LENGTH<br>TYPE=0<br>(METERS) | BLDG.<br>WIDTH<br>TYPE=0<br>(METERS) |
|------------|-------|------------|-------|------------------------------------------|---------------|---------------|---------------|--------|---------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------|---------------------------------------|---------------------------------------|--------------------------------------|
| SOURCE P K | PART. | NUMBER     | CATS. | TYPE=2<br>(GRAMS/SEC)                    | X<br>(METERS) | Y<br>(METERS) |               |        |                                                               |                                                                     |                                |                                       |                                       |                                      |
| NUMBER E E |       |            |       | *PER METER**2                            |               |               |               |        |                                                               |                                                                     |                                |                                       |                                       |                                      |
| 1          | 2 0   | 6          |       | 0.16100E-03 ✓                            | -130.0        | -130.0        | 0.0           | 0.00   | 0.00                                                          | 260.00                                                              | 0.00                           | 0.00                                  | 0.00                                  | 0.00                                 |
| 17 acres   |       |            |       |                                          |               |               |               |        |                                                               |                                                                     |                                |                                       |                                       |                                      |

3

\*\*\* Susitan DEIS Comments: Annual Mine Fus Dust Impacts

\*\*\*

\*\*\* SOURCE PARTICULATE DATA \*\*\*

\*\*\* SOURCE NUMBER = 1 \*\*\*

MASS FRACTION =

0.10000,0.40000,0.28000,0.12000,0.06000,0.04000,

SETTLING VELOCITY(METERS/SEC) =

0.0010, 0.0070, 0.0190, 0.0370, 0.0610, 0.0990,

SURFACE REFLECTION COEFFICIENT =

1.00000,0.82000,0.72000,0.65000,0.59000,0.50000,

\*\*\* Susitan DEIS Comments: Annual Mine Fug Dust Impacts

\*\*\*

MET. DATA  
DAY 1

\* METEOROLOGICAL DATA FOR DAY 1 \*

| HOUR | FLOW<br>VECTOR<br>(DEGREES) | WIND<br>SPEED<br>(MPS) | MIXING<br>HEIGHT<br>(METERS) | TEMP.<br>(DEG. K) | POT. TEMP.<br>GRADIENT<br>(DEG. K<br>PER METER) | STABILITY<br>CATEGORY | WIND<br>PROFILE<br>EXPONENT | DECAY<br>COEFFICIENT<br>(PER SEC) |
|------|-----------------------------|------------------------|------------------------------|-------------------|-------------------------------------------------|-----------------------|-----------------------------|-----------------------------------|
| 1    | 90.0                        | 2.50                   | 1000.0                       | 273.0             | 0.0000                                          | 4                     | 0.2500                      | 0.000000E+00                      |

5

HIGH  
1-HR  
SGROUP# 1

\*\*\* Susitan DEIS Comments: Annual Mine Fug Dust Impacts

\*\*\*

\* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)

\* FROM ALL SOURCES \*

\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 326.14108 AND OCCURRED AT ( 1000.0, 0.0) \*

| Y-AXIS<br>(METERS) |                   | 1000.0            | 2000.0           | 3000.0           | 4000.0           | 5000.0 |
|--------------------|-------------------|-------------------|------------------|------------------|------------------|--------|
| 0.0 /              | 326.14108 ( 1, 1) | 165.43056 ( 1, 1) | 96.01053 ( 1, 1) | 63.42310 ( 1, 1) | 45.39715 ( 1, 1) |        |



HIGH  
1-HR  
SGROUP# 1

\*\*\* Susitan DEIS Comments: Annual Mine Fug Dust Impacts

\*\*\*

\* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM ALL SOURCES \*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 326.14108 AND OCCURRED AT ( 1000.0, 0.0) \*

| Y-AXIS<br>(METERS) | / | 6000.0           | 7000.0           | X-AXIS (METERS)<br>8000.0 | 9000.0           | 10000.0          |
|--------------------|---|------------------|------------------|---------------------------|------------------|------------------|
| 0.0 /              |   | 34.35088 ( 1, 1) | 27.05759 ( 1, 1) | 21.96640 ( 1, 1)          | 18.25697 ( 1, 1) | 15.46601 ( 1, 1) |

7

24-Hour

\*\*\* Susitan DEIS Comments: Worst Case Mine Fug Dust Impacts \*\*\*

CALCULATE (CONCENTRATION=1, DEPOSITION=2)  
 RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)  
 DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1, POLAR=2)  
 TERRAIN ELEVATIONS ARE READ (YES=1, NO=0)  
 CALCULATIONS ARE WRITTEN TO TAPE (YES=1, NO=0)  
 LIST ALL INPUT DATA (NO=0, YES=1, MET DATA ALSO=2)

ISW(1) = 1  
 ISW(2) = 3  
 ISW(3) = 1  
 ISW(4) = 0  
 ISW(5) = 0  
 ISW(6) = 2

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
 WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1, NO=0)  
 2-HOUR (YES=1, NO=0)  
 3-HOUR (YES=1, NO=0)  
 4-HOUR (YES=1, NO=0)  
 6-HOUR (YES=1, NO=0)  
 8-HOUR (YES=1, NO=0)  
 12-HOUR (YES=1, NO=0)  
 24-HOUR (YES=1, NO=0)

ISW(7) = 1  
 ISW(8) = 0  
 ISW(9) = 0  
 ISW(10) = 0  
 ISW(11) = 0  
 ISW(12) = 0  
 ISW(13) = 0  
 ISW(14) = 0  
 ISW(15) = 0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
 SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1, NO=0)  
 HIGHEST & SECOND HIGHEST TABLES (YES=1, NO=0)  
 MAXIMUM 50 TABLES (YES=1, NO=0)

ISW(16) = 0  
 ISW(17) = 1  
 ISW(18) = 0  
 ISW(19) = 2  
 ISW(20) = 0  
 ISW(21) = 1  
 ISW(22) = 1  
 ISW(23) = 0  
 ISW(24) = 1  
 ISW(25) = 1

METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1, CARD=2)  
 RURAL-URBAN OPTION (RURAL=0, URBAN MODE 1=1, URBAN MODE 2=2)  
 WIND PROFILE EXPONENT VALUES (DEFAULTS=1, USER ENTERS=2, 3)  
 VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1, USER ENTERS=2, 3)  
 SCALE EMISSION RATES FOR ALL SOURCES (NO=0, YES=1)  
 PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1, NO=2)  
 PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2, NO=1)

NSOURC = 1  
 NGROUP = 0  
 IPERD = 1  
 NXFPTS = 10  
 NYPNTS = 1  
 NXWYPT = 0  
 NHOURS = 1  
 NDAYS = 1  
 TK = .10000E+07  
 BETA1 = 0.600  
 BETA2 = 0.600  
 ZR = 10.00 METERS  
 IMET = 5  
 LIMIT = 43500 WORDS  
 MIMIT = 296 WORDS

NUMBER OF INPUT SOURCES  
 NUMBER OF SOURCE GROUPS (=0, ALL SOURCES)  
 TIME PERIOD INTERVAL TO BE PRINTED (=0, ALL INTERVALS)  
 NUMBER OF X (RANGE) GRID VALUES  
 NUMBER OF Y (THETA) GRID VALUES  
 NUMBER OF DISCRETE RECEPTORS  
 NUMBER OF HOURS PER DAY IN METEOROLOGICAL DATA  
 NUMBER OF DAYS OF METEOROLOGICAL DATA  
 SOURCE EMISSION RATE UNITS CONVERSION FACTOR  
 ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE  
 ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE  
 HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED  
 LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA  
 ALLOCATED DATA STORAGE  
 REQUIRED DATA STORAGE FOR THIS PROBLEM RUN



\*\*\* Susitan DEIS Comments: Worst Case Mine Fug Dust Impacts \*\*\*

\*\*\* UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES \*\*\*  
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

\*\*\* X-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

1000.0, 2000.0, 3000.0, 4000.0, 5000.0, 6000.0, 7000.0, 8000.0, 9000.0, 10000.0,

\*\*\* Y-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

0.0,

\*\*\* Susitan DEIS Comments: Worst Case Mine Fus Dust Impacts

\*\*\*

\*\*\* SOURCE DATA \*\*\*

| SOURCE<br>NUMBER | T<br>P | W<br>K | Y A<br>NUMBER | EMISSION RATE<br>TYPE=0,1<br>(GRAMS/SEC)<br>TYPE=2<br>(GRAMS/SEC)<br>*PER METER**2 | X<br>(METERS) | Y<br>(METERS) | BASE<br>ELEV.<br>(METERS) | HEIGHT<br>(METERS) | TEMP.<br>TYPE=0<br>(DEG.K);<br>VERT.DIM<br>TYPE=1<br>(METERS) | EXIT VEL.<br>TYPE=0<br>(M/SEC);<br>HORZ.DIM<br>TYPE=1,2<br>(METERS) | DIAMETER<br>TYPE=0<br>(METERS) | BLDG.<br>HEIGHT<br>TYPE=0<br>(METERS) | BLDG.<br>LENGTH<br>TYPE=0<br>(METERS) | BLDG.<br>WIDTH<br>TYPE=0<br>(METERS) |
|------------------|--------|--------|---------------|------------------------------------------------------------------------------------|---------------|---------------|---------------------------|--------------------|---------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------|---------------------------------------|---------------------------------------|--------------------------------------|
| 1                | 2      | 0      | 6             | 0.26000E-03                                                                        | -130.0        | -130.0        | 0.0                       | 0.00               | 0.00                                                          | 260.00                                                              | 0.00                           | 0.00                                  | 0.00                                  | 0.00                                 |

\*\*\* Susitan DEIS Comments: Worst Case Mine Fus Dust Impacts

\*\*\*

\*\*\* SOURCE PARTICULATE DATA \*\*\*

\*\*\* SOURCE NUMBER = 1 \*\*\*

MASS FRACTION =  
0.10000,0.40000,0.28000,0.12000,0.06000,0.04000,

SETTLING VELOCITY(METERS/SEC) =  
0.0010, 0.0070, 0.0190, 0.0370, 0.0610, 0.0990,

SURFACE REFLECTION COEFFICIENT =  
1.00000,0.82000,0.72000,0.65000,0.59000,0.50000,

\*\*\* Susitan DEIS Comments: Worst Case Mine Fug Dust Impacts \*\*\*

\* METEOROLOGICAL DATA FOR DAY 1 \*

| HOUR | FLOW<br>VECTOR<br>(DEGREES) | WIND<br>SPEED<br>(MPS) | MIXING<br>HEIGHT<br>(METERS) | TEMP.<br>(DEG. K) | POT. TEMP.<br>GRADIENT<br>(DEG. K<br>PER METER) | STABILITY<br>CATEGORY | WIND<br>PROFILE<br>EXPONENT | DECAY<br>COEFFICIENT<br>(PER SEC) |
|------|-----------------------------|------------------------|------------------------------|-------------------|-------------------------------------------------|-----------------------|-----------------------------|-----------------------------------|
| 1    | 90.0                        | 2.50                   | 1000.0                       | 273.0             | 0.0350                                          | 6                     | 0.3000                      | 0.000000E+00                      |

HIGH  
1-HR  
SGROUP# 1

\*\*\* Susitan DEIS Comments: Worst Case Mine Fug Dust Impacts \*\*\*

\* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM ALL SOURCES \*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 1109.70313 AND OCCURRED AT ( 1000.0, 0.0) \*

| Y-AXIS<br>(METERS) | / | 1000.0             | 2000.0            | 3000.0            | 4000.0            | 5000.0            |
|--------------------|---|--------------------|-------------------|-------------------|-------------------|-------------------|
| 0.0 /              |   | 1109.70313 ( 1, 1) | 672.32013 ( 1, 1) | 467.61719 ( 1, 1) | 339.73032 ( 1, 1) | 255.06181 ( 1, 1) |

3.d.2.

ISCST Computer Runs for

Power Plant Fugitive Dust

Summary: Power Plant Site Fugitive Dust Impacts

- o Assumed maximum 24-hr emissions = 938 lbs/day  
Annual average emissions = 478 lbs/day
- o Particle size and deposition characteristics are listed in the ISC computer output.
- o Maximum 24-hr impacts were calculated using ISC model with F stability, 2.5 mps wind speed, and 6-hr daily occurrence.
- o Average annual impacts were calculated using ISC model with D stability, average wind speed for Nenana (2.47 mps) and an assumed 13% frequency of wind direction occurrence based on Nenana wind rose.



\*\*\* Susitan DEIS Comments: Nenana 200MW Worst Annual FUG DUST \*\*\*

CALCULATE (CONCENTRATION=1,DEPOSITION=2)  
 RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)  
 DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)  
 TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)  
 CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)  
 LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)

ISW(1) = 1  
 ISW(2) = 3  
 ISW(3) = 1  
 ISW(4) = 0  
 ISW(5) = 0  
 ISW(6) = 2

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
 WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)  
 2-HOUR (YES=1,NO=0)  
 3-HOUR (YES=1,NO=0)  
 4-HOUR (YES=1,NO=0)  
 6-HOUR (YES=1,NO=0)  
 8-HOUR (YES=1,NO=0)  
 12-HOUR (YES=1,NO=0)  
 24-HOUR (YES=1,NO=0)  
 PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)

ISW(7) = 1  
 ISW(8) = 0  
 ISW(9) = 0  
 ISW(10) = 0  
 ISW(11) = 0  
 ISW(12) = 0  
 ISW(13) = 0  
 ISW(14) = 0  
 ISW(15) = 0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
 SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)  
 HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)  
 MAXIMUM 50 TABLES (YES=1,NO=0)  
 METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)  
 RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)  
 WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
 VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
 SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)  
 PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)  
 PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

ISW(16) = 0  
 ISW(17) = 1  
 ISW(18) = 0  
 ISW(19) = 2  
 ISW(20) = 0  
 ISW(21) = 1  
 ISW(22) = 1  
 ISW(23) = 0  
 ISW(24) = 1  
 ISW(25) = 1

NUMBER OF INPUT SOURCES  
 NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)  
 TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)  
 NUMBER OF X (RANGE) GRID VALUES  
 NUMBER OF Y (THETA) GRID VALUES  
 NUMBER OF DISCRETE RECEPTORS  
 NUMBER OF HOURS PER DAY IN METEOROLOGICAL DATA  
 NUMBER OF DAYS OF METEOROLOGICAL DATA  
 SOURCE EMISSION RATE UNITS CONVERSION FACTOR  
 ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE  
 ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE  
 HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED  
 LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA  
 ALLOCATED DATA STORAGE  
 REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

NSOURC = 1  
 NGROUP = 0  
 IPERD = 1  
 NXPNTS = 10  
 NYPNTS = 1  
 NXWYPT = 0  
 NHOURS = 1  
 NDAYS = 1  
 TK = .10000E+07  
 BETA1 = 0.600  
 BETA2 = 0.600  
 ZR = 10.00 METERS  
 IMET = 5  
 LIMIT = 43500 WORDS  
 MIMIT = 296 WORDS

\*\*\* Susitan DEIS Comments: Nenana 200MW Worst Annual FUG DUST \*\*\*

\*\*\* UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES \*\*\*  
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

\*\*\* X-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

1000.0, 2000.0, 3000.0, 4000.0, 5000.0, 6000.0, 7000.0, 8000.0, 9000.0, 10000.0,

\*\*\* Y-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

0.0,

2



\*\*\* Susitan DEIS Comments: Nenana 200MW Worst Annual FUG DUST \*\*\*

\*\*\* SOURCE DATA \*\*\*

| SOURCE<br>NUMBER | T<br>P | W<br>K | Y<br>A | NUMBER<br>PART. | EMISSION RATE<br>TYPE=0,1<br>(GRAMS/SEC)<br>TYPE=2<br>(GRAMS/SEC)<br>*PER METER**2 | X<br>(METERS) | Y<br>(METERS) | BASE<br>ELEV.<br>(METERS) | HEIGHT<br>(METERS) | TEMP.<br>TYPE=0<br>(DEG.K);<br>VERT.DIM<br>TYPE=1<br>(METERS) | EXIT VEL.<br>TYPE=0<br>(M/SEC);<br>HORZ.DIM<br>TYPE=1,2<br>(METERS) | DIAMETER<br>TYPE=0<br>(METERS) | BLDG.<br>HEIGHT<br>TYPE=0<br>(METERS) | BLDG.<br>LENGTH<br>TYPE=0<br>(METERS) | BLDG.<br>WIDTH<br>TYPE=0<br>(METERS) |
|------------------|--------|--------|--------|-----------------|------------------------------------------------------------------------------------|---------------|---------------|---------------------------|--------------------|---------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------|---------------------------------------|---------------------------------------|--------------------------------------|
| 1                | 2      | 0      | 6      |                 | 0.10000E-04                                                                        | -250.0        | -250.0        | 0.0                       | 0.00               | 0.00                                                          | 500.00                                                              | 0.00                           | 0.00                                  | 0.00                                  | 0.00                                 |

\*\*\* Susitan DEIS Comments: Nenana 200MW Worst Annual FUG DUST \*\*\*

\*\*\* SOURCE PARTICULATE DATA \*\*\*

\*\*\* SOURCE NUMBER = 1 \*\*\*

MASS FRACTION =  
0.10000, 0.40000, 0.28000, 0.12000, 0.06000, 0.04000,

SETTLING VELOCITY(METERS/SEC) =  
0.0010, 0.0070, 0.0190, 0.0370, 0.0610, 0.0990,

SURFACE REFLECTION COEFFICIENT =  
1.00000, 0.82000, 0.72000, 0.65000, 0.59000, 0.50000,

\*\*\* Susitan DEIS Comments: Nenana 200MW Worst Annual FUG DUST \*\*\*

MET. DATA  
DAY 1

\* METEOROLOGICAL DATA FOR DAY 1 \*

| HOUR | FLOW<br>VECTOR<br>(DEGREES) | WIND<br>SPEED<br>(MPS) | MIXING<br>HEIGHT<br>(METERS) | TEMP.<br>(DEG. K) | POT. TEMP.<br>GRADIENT<br>(DEG. K<br>PER METER) | STABILITY<br>CATEGORY | WIND<br>PROFILE<br>EXPONENT | DECAY<br>COEFFICIENT<br>(PER SEC) |
|------|-----------------------------|------------------------|------------------------------|-------------------|-------------------------------------------------|-----------------------|-----------------------------|-----------------------------------|
| 1    | 90.0                        | 2.50                   | 1000.0                       | 273.0             | 0.0000                                          | 4                     | 0.2500                      | 0.000000E+00                      |

5

HIGH  
1-HR  
SGROUP# 1

\*\*\* Susitan DEIS Comments: Nenana 200MW Worst Annual FUG DUST \*\*\*

\* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM ALL SOURCES \*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 37.70994 AND OCCURRED AT ( 1000.0, 0.0) \*

| Y-AXIS<br>(METERS) |                  | 1000.0           | 2000.0           | 3000.0           | 4000.0          | 5000.0 |
|--------------------|------------------|------------------|------------------|------------------|-----------------|--------|
| 0.0 /              | 37.70994 ( 1, 1) | 24.52426 ( 1, 1) | 17.28294 ( 1, 1) | 12.57087 ( 1, 1) | 9.46517 ( 1, 1) |        |

HIGH  
1-HR  
SGROUP# 1

\*\*\* Susitan DEIS Comments: Nenana 200MW Worst Annual FUG DUST \*\*\*

\* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM ALL SOURCES \*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 37.70994 AND OCCURRED AT ( 1000.0, 0.0) \*

| Y-AXIS<br>(METERS) |                 |                 |                 | X-AXIS (METERS) |                 |        |         |
|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------|---------|
|                    | 6000.0          |                 | 7000.0          | 8000.0          |                 | 9000.0 | 10000.0 |
| 0.0 /              | 7.37424 ( 1, 1) | 5.91524 ( 1, 1) | 4.86045 ( 1, 1) | 4.07359 ( 1, 1) | 3.47280 ( 1, 1) |        |         |

7

\*\*\* Susitan DEIS Comments: Nenana 200 MW Worst SQ? PP FUG DUST \*\*\*

CALCULATE (CONCENTRATION=1,DEPOSITION=2)  
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)  
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)  
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)  
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)  
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)

ISW(1) = 1 ✓  
ISW(2) = 3  
ISW(3) = 1  
ISW(4) = 0  
ISW(5) = 0  
ISW(6) = 2

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)  
WITH THE FOLLOWING TIME PERIODS:

HOURLY (YES=1,NO=0)  
2-HOUR (YES=1,NO=0)  
3-HOUR (YES=1,NO=0)  
4-HOUR (YES=1,NO=0)  
6-HOUR (YES=1,NO=0)  
8-HOUR (YES=1,NO=0)  
12-HOUR (YES=1,NO=0)  
24-HOUR (YES=1,NO=0)  
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)

ISW(7) = 1  
ISW(8) = 0  
ISW(9) = 0  
ISW(10) = 0  
ISW(11) = 0  
ISW(12) = 0  
ISW(13) = 0  
ISW(14) = 0  
ISW(15) = 0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE  
SPECIFIED BY ISW(7) THROUGH ISW(14):

DAILY TABLES (YES=1,NO=0)  
HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)  
MAXIMUM 50 TABLES (YES=1,NO=0)  
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)  
RURAL-URBAN OPTION (RURAL=0,URBAN MODE 1=1,URBAN MODE 2=2)  
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES=1)  
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)  
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)

ISW(16) = 0  
ISW(17) = 1  
ISW(18) = 0  
ISW(19) = 2  
ISW(20) = 0  
ISW(21) = 1  
ISW(22) = 1  
ISW(23) = 0  
ISW(24) = 1  
ISW(25) = 1

8  
NUMBER OF INPUT SOURCES  
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)  
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)  
NUMBER OF X (RANGE) GRID VALUES  
NUMBER OF Y (THETA) GRID VALUES  
NUMBER OF DISCRETE RECEPTORS  
NUMBER OF HOURS PER DAY IN METEOROLOGICAL DATA  
NUMBER OF DAYS OF METEOROLOGICAL DATA  
SOURCE EMISSION RATE UNITS CONVERSION FACTOR  
ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE  
ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE  
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED  
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA  
ALLOCATED DATA STORAGE  
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN

NSOURC = 1  
NGROUP = 0  
IPERD = 1  
NXPNTS = 10  
NYPNTS = 1  
NXWYPT = 0  
NHOURS = 1  
NDAYS = 1  
TK = .10000E+07  
BETA1 = 0.600  
BETA2 = 0.600  
ZR = 10.00 METERS  
IMET = 5  
LIMIT = 43500 WORDS  
MIMIT = 296 WORDS



\*\*\* Susitan DEIS Comments: Nenana 200 MW Worst SO2 PP FUG DUST \*\*\*

\*\*\* UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES \*\*\*  
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

\*\*\* X-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

1000.0, 2000.0, 3000.0, 4000.0, 5000.0, 6000.0, 7000.0, 8000.0, 9000.0, 10000.0,

\*\*\* Y-COORDINATES OF RECTANGULAR GRID SYSTEM \*\*\*  
(METERS)

0.0,

\*\*\* Susitan DEIS Comments: Nenana 200 MW Worst SO2 PP FUG DUST \*\*\*

\*\*\* SOURCE DATA \*\*\*

| SOURCE<br>NUMBER | P<br>E | K<br>E | T<br>W<br>Y<br>A<br>NUMBER | PART.<br>CATS. | EMISSION RATE                                                     | X<br>(METERS) | Y<br>(METERS) | BASE<br>ELEV.<br>(METERS) | HEIGHT<br>(METERS) | TEMP.                                      | EXIT VEL.                                              | BLDG.<br>HEIGHT<br>(METERS) | BLDG.<br>LENGTH<br>(METERS) | BLDG.<br>WIDTH<br>(METERS) |
|------------------|--------|--------|----------------------------|----------------|-------------------------------------------------------------------|---------------|---------------|---------------------------|--------------------|--------------------------------------------|--------------------------------------------------------|-----------------------------|-----------------------------|----------------------------|
|                  |        |        |                            |                | TYPE=0,1<br>(GRAMS/SEC)<br>TYPE=2<br>(GRAMS/SEC)<br>*PER METER**2 |               |               |                           |                    | (DEG.K);<br>VERT.DIM<br>TYPE=1<br>(METERS) | TYPE=0<br>(M/SEC);<br>HORZ.DIM<br>TYPE=1,2<br>(METERS) |                             |                             |                            |
| 1                | 2      | 0      | 6                          | ✓              | 0.19600E-04 ✓                                                     | -250.0        | -250.0        | 0.0                       | 0.00               | 0.00                                       | 500.00 ✓<br>(62 acres)                                 | 0.00                        | 0.00                        | 0.00                       |



\*\*\* Susitan DEIS Comments: Nenana 200 MW Worst SO2 PP FUG DUST \*\*\*

\*\*\* SOURCE PARTICULATE DATA \*\*\*

\*\*\* SOURCE NUMBER = 1 \*\*\*

MASS FRACTION =  
0.10000,0.40000,0.28000,0.12000,0.06000,0.04000,

SETTLING VELOCITY(METERS/SEC) =  
0.0010, 0.0070, 0.0190, 0.0370, 0.0610, 0.0990,

SURFACE REFLECTION COEFFICIENT =  
1.00000,0.82000,0.72000,0.65000,0.59000,0.50000,

MET. DATA  
DAY 1

\*\*\* Susitan DEIS Comments: Nenana 200 MW Worst SO2 PP FUG DUST \*\*\*

\* METEOROLOGICAL DATA FOR DAY 1 \*

| HOUR | FLOW<br>VECTOR<br>(DEGREES) | WIND<br>SPEED<br>(MPS) | MIXING<br>HEIGHT<br>(METERS) | TEMP.<br>(DEG. K) | POT. TEMP.<br>GRADIENT<br>(DEG. K<br>PER METER) | STABILITY<br>CATEGORY | WIND<br>PROFILE<br>EXPONENT | DECAY<br>COEFFICIENT<br>(PER SEC) |
|------|-----------------------------|------------------------|------------------------------|-------------------|-------------------------------------------------|-----------------------|-----------------------------|-----------------------------------|
| 1    | 90.0                        | 2.50                   | 1000.0                       | 273.0             | 0.0350                                          | 6                     | 0.3000                      | 0.000000E+00                      |

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\*\*\* Susitan DEIS Comments: Nenana 200 MW Worst SO2 PP FUG DUST \*\*\*

\* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM ALL SOURCES \*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 158.04836 AND OCCURRED AT ( 1000.0, 0.0) \*

| Y-AXIS<br>(METERS) | / |                   |                  |                  | X-AXIS (METERS)  |  |                  |  |        |
|--------------------|---|-------------------|------------------|------------------|------------------|--|------------------|--|--------|
|                    | / | 1000.0            |                  | 2000.0           | 3000.0           |  | 4000.0           |  | 5000.0 |
| 0.0 /              |   | 158.04836 ( 1, 1) | 98.86779 ( 1, 1) | 75.28107 ( 1, 1) | 61.49975 ( 1, 1) |  | 51.06887 ( 1, 1) |  |        |

HIGH  
1-HR  
SGROUP# 1

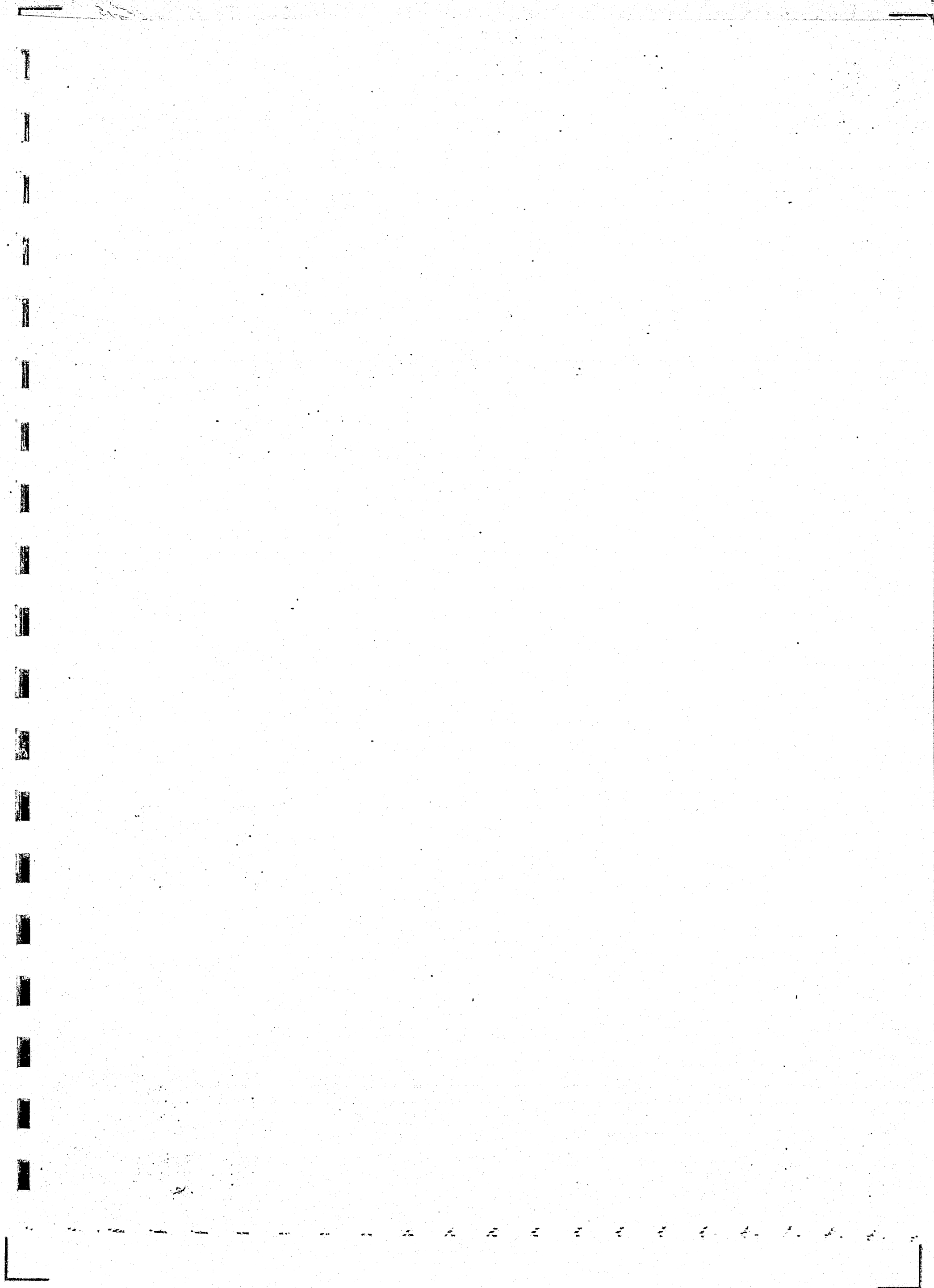
\*\*\* Susitan DEIS Comments: Nenana 200 MW Worst SO2 PP FUG DUST \*\*\*

\* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) \*  
\* FROM ALL SOURCES \*  
\* FOR THE RECEPTOR GRID \*

\* MAXIMUM VALUE EQUALS 158.04836 AND OCCURRED AT ( 1000.0, 0.0) \*

| Y-AXIS<br>(METERS) | / | 6000.0           | 7000.0           | X-AXIS (METERS)<br>8000.0 | 9000.0           | 10000.0          |
|--------------------|---|------------------|------------------|---------------------------|------------------|------------------|
| 0.0 /              |   | 42.70031 ( 1, 1) | 35.98395 ( 1, 1) | 30.64677 ( 1, 1)          | 26.31807 ( 1, 1) | 22.79152 ( 1, 1) |

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Item 3e:

"Acid deposition calculations on p. 5-25 to 5-27."

Response:

Attached are three pages of acid deposition calculations that were referred to in Section 5.2.5 Acid Precipitation, pages 5-25 and 5-27 of the text.



# EBASCO SERVICES INCORPORATED

BY JMW DATE 8/05/84

SHEET 1 OF 3

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT Alaska Power Authority

PROJECT Thermal Alternatives Appendix

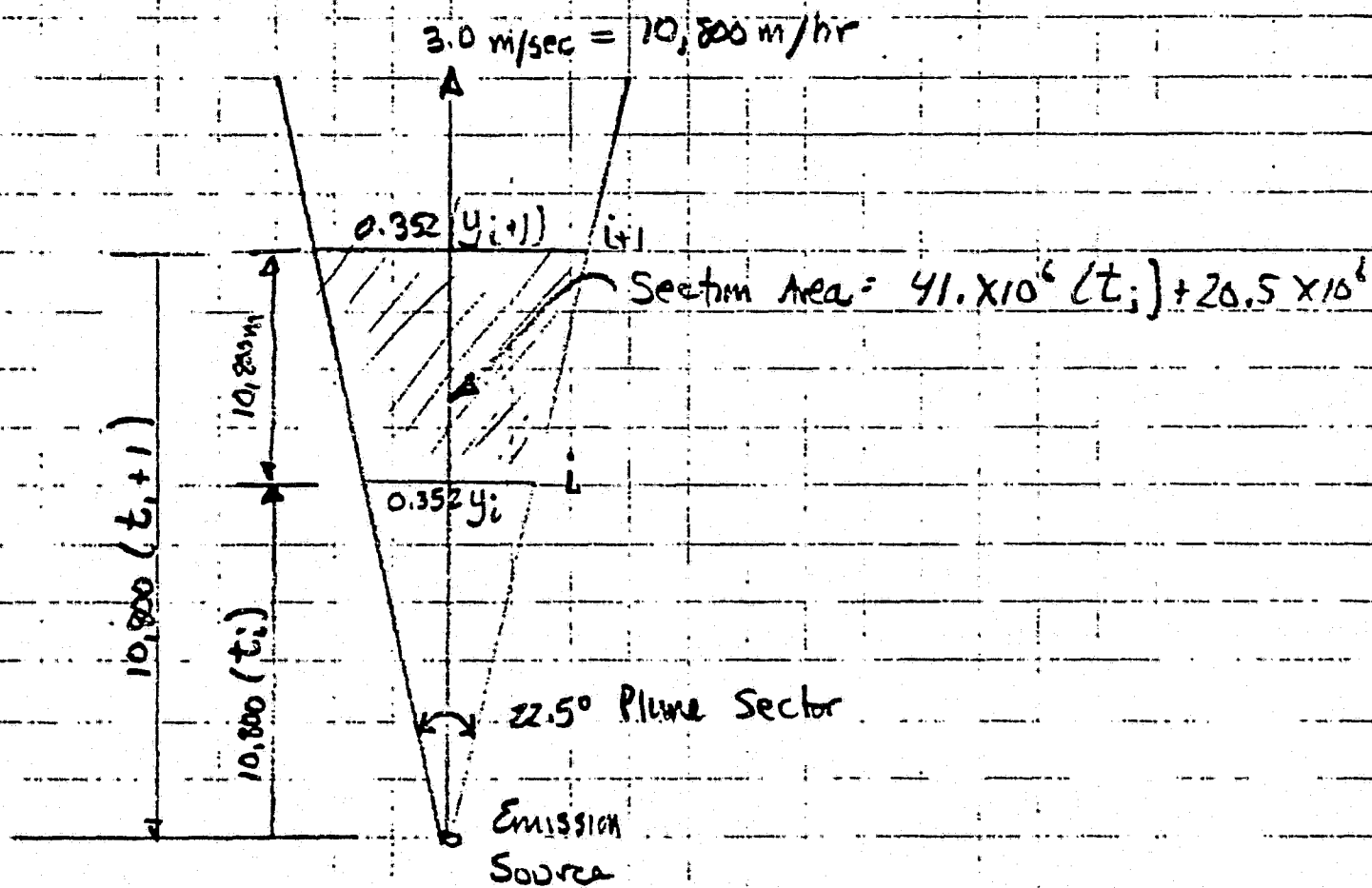
SUBJECT Acid Rain for 600 MW Power Plant

Assumptions:  $0.25\%/hr$   $SO_2 \rightarrow SO_4$  oxidation rate } \*  
 $1.0\%/hr$   $NO_x \rightarrow NO_3$  oxidation rate }  
 Assume  $3.0$  m/sec wind speed,  $22^\circ$  plume sector  
 Assume  $50\%$  wind direction occurrence

$SO_2$  emission rate =  $52$  g/sec for  $600$  MW

$NO_x$  emission rate =  $440$  g/sec for  $600$  MW

Assume  $10\%$  of acid comes down as precip



F

\* Based on National Research Council, "Acid Deposition Processes in N. America", 1983.

# EBASCO SERVICES INCORPORATED

BY \_\_\_\_\_ DATE \_\_\_\_\_

SHEET 2 OF 3

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT \_\_\_\_\_

SUBJECT \_\_\_\_\_

Mass of SO<sub>4</sub> deposition per hour =

$$52 \frac{\text{g SO}_2}{\text{sec}} \times \frac{0.25\%}{\text{hr}} \times \frac{1}{100} \times 10\% \text{ SO}_4 \downarrow \times 50\% \text{ wind occurrence}$$

$$= 0.0065 \text{ g/sec} \times 3600 \times 24 \times 365 = 205,000 \text{ g/yr SO}_4 \downarrow \text{ per section}$$

| Plume<br>Travel Time | Plume<br>Distance | Section<br>Area, m <sup>2</sup> | SO <sub>4</sub> Deposition<br>g/yr | Normalized SO <sub>4</sub><br>Deposition, g/m <sup>2</sup> /yr |
|----------------------|-------------------|---------------------------------|------------------------------------|----------------------------------------------------------------|
| 3                    | 32 km             | 145 x 10 <sup>6</sup>           | 205,000                            | 0.0014                                                         |
| 6                    | 65 km             | 267 x 10 <sup>6</sup>           | "                                  | 0.00077                                                        |
| 12                   | 130 km            | 513 x 10 <sup>6</sup>           | "                                  | 0.00040                                                        |
| 24                   | 260 km            | "                               | "                                  | 0.00020                                                        |
| 48                   | 520 km            | "                               | "                                  | 0.00010                                                        |



# EBASCO SERVICES INCORPORATED

BY \_\_\_\_\_ DATE \_\_\_\_\_

SHEET 3 OF 3

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT \_\_\_\_\_

SUBJECT \_\_\_\_\_

Assuming a 10% /hr  $\text{NO}_x \rightarrow \text{NO}_2$  Conversion Rate

$$\begin{aligned} \text{So } \text{NO}_x &= \left[ 440 \text{ g/sec} \times 3600 \frac{\text{sec}}{\text{hr}} \right] \times 0.1 \text{ t} \\ &= 158,400 \text{ t g NO}_2 \text{ per 1-hr parcel} \\ &\quad \text{until 12 hrs} \end{aligned}$$

$$\text{NO}_2 \rightarrow \text{HNO}_3 = 0.01 / \text{hr} \times 10\% \text{ deposition} = 0.001 / \text{hr}$$

$$\begin{aligned} \text{So total HNO}_3 &= \frac{158,400 \text{ t}}{2} (0.001) = 79 \text{ t g HNO}_3 / \text{hr} \\ &\quad \times 24 \times 365 \times 50\% \end{aligned}$$

| Plume Travel Time | Plume Distance | $\text{NO}_2$ in 1-hr Parcel | $\text{HNO}_3$ in 1-hr Parcel | Plume Section Area              | Deposition Rate, g/m <sup>2</sup> /yr |
|-------------------|----------------|------------------------------|-------------------------------|---------------------------------|---------------------------------------|
| 3                 | 32 km          | 475,000                      | 7,128                         | $145 \times 10^6 \text{ m}^2$   | 0.0215                                |
| 6                 | 64             | 950,000                      | 28,500                        | $267 \times 10^6 \text{ m}^2$   | 0.0467                                |
| 12                | 128            | 1,580,000                    | 79,200                        | $513 \times 10^6 \text{ m}^2$   | 0.0676                                |
| 24                | 256            | 1,500,000                    | 270,000                       | $1,026 \times 10^6 \text{ m}^2$ | 0.115                                 |
| 48                | 520            | 1,275,000                    | 490,000                       |                                 | 0.104                                 |

Item 3f:

"PLUEVUE model runs described on p. 5-31 to 5-36."

Response:

Attached is a copy of the PLUVUE computer runs referred to in Section 5.3 Plume Visibility Impacts, pages 5-31 to 5-36 of the text.

VISUAL IMPACT ASSESSMENT FOR 400 MW at Willow

EMISSIONS SOURCE DATA

ELEVATION OF SITE = 200. FEET MSL  
51. METERS MSL

NO. OF UNITS = 1.

STACK HEIGHT = 440. FEET  
134. METERS

FLUE GAS FLOW RATE = 2000000. CU FT/MIN  
943.76 CU M/SEC

FLUE GAS TEMPERATURE = 190. F  
361. K

FLUE GAS OXYGEN CONTENT = 3.0 MOL PERCENT

SO2 EMISSION RATE (TOTAL) = 16.40 TONS/DAY  
1.722E+02 G/SEC

NOX EMISSION RATE (TOTAL AS NO2) = 27.90 TONS/DAY  
2.929E+02 G/SEC

PARTICULATE EMISSION RATE (TOTAL) = 0.23 TONS/DAY  
2.415E+00 G/SEC

# METEOROLOGICAL AND AMBIENT AIR QUALITY DATA

WINDSPEED = 4.5 MILES/HR  
2.0 M/SEC

PASQUILL-GIFFORD-TURNER STABILITY CATEGORY D

LAPSE RATE = 1.10 F/1000 FT  
2.005E-03 K/M

POTENTIAL TEMPERATURE LAPSE RATE = 1.181E-02 K/M

AMBIENT TEMPERATURE = 50.0 F  
283.2 K

RELATIVE HUMIDITY = 20.0 %

MIXING DEPTH = 1000. M

AMBIENT PRESSURE = 0.99 ATM

BACKGROUND NOX CONCENTRATION = 0.000 PPM

BACKGROUND NO2 CONCENTRATION = 0.000 PPM

BACKGROUND OZONE CONCENTRATION = 0.040 PPM

BACKGROUND SO2 CONCENTRATION = 0.000 PPM

BACKGROUND COARSE MODE CONCENTRATION = 1.0 UG/M3

BACKGROUND SULFATE CONCENTRATION = 0.8 UG/M3

BACKGROUND NITRATE CONCENTRATION = 0.0 UG/M3

BACKGROUND VISUAL RANGE = 300.0 KILOMETERS

SO2 DEPOSITION VELOCITY = 1.00 CM/SEC

NOX DEPOSITION VELOCITY = 1.00 CM/SEC

COARSE PARTICULATE DEPOSITION VELOCITY = 0.10CM/SEC./  
SUBMICRON PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC

## AEROSOL STATISTICS

|                                      | BACKGROUND           |                | PLUME                |                |
|--------------------------------------|----------------------|----------------|----------------------|----------------|
|                                      | ACCUMULATION<br>MODE | COARSE<br>MODE | ACCUMULATION<br>MODE | COARSE<br>MODE |
| MASS MEDIAN<br>RADIUS<br>MICROMETERS | 0.160                | 3.000          | 0.100                | 1.000          |
| GEOMETRIC<br>STANDARD<br>DEVIATION   | 2.000                | 2.200          | 2.000                | 2.000          |
| PARTICLE<br>DENSITY                  |                      |                |                      |                |

GEOMETRY OF USER-SPECIFIED PLUME-OBSERVER-SUN ORIENTATION

WIND DIRECTION (DEGREES) = 180.0

SIMULATION IS FOR 1600 HOURS ON 6/21

SOLAR ZENITH ANGLE (DEGREES) = 69.3

SOLAR AZIMUTH ANGLE (DEGREES) = 281.3

GEOMETRIES FOR LINES-OF-SIGHT THROUGH PLUME PARCELS AT GIVEN DOWNWIND DISTANCES (X).

| X (KM) | AZIMUTH | RP    | ALPHA | BETA | THETA |
|--------|---------|-------|-------|------|-------|
| 1.0    | 311.5   | 46.8  | 48.5  | 0.4  | 35.8  |
| 2.5    | 312.9   | 47.8  | 47.1  | 0.4  | 36.9  |
| 5.0    | 315.0   | 49.5  | 45.0  | 0.4  | 38.7  |
| 10.0   | 318.8   | 53.2  | 41.2  | 0.3  | 41.9  |
| 13.0   | 320.9   | 55.4  | 39.1  | 0.3  | 43.7  |
| 32.0   | 330.6   | 71.2  | 29.4  | 0.3  | 52.3  |
| 70.0   | 340.7   | 105.9 | 19.3  | 0.2  | 61.5  |
| 166.0  | 349.9   | 199.1 | 10.1  | 0.1  | 70.0  |

BACKGROUND CONDITIONS

ACCUMULATION MODE  
MASS RADIUS SIGMA BSCAT.55/MASS  
0.1600E+00 0.2000E+01 0.3718E-02

COARSE PARTICLE MODE  
MASS RADIUS SIGMA BSCAT.55/MASS  
0.3000E+01 0.2200E+01 0.3343E-03

PRIMARY PARTICLE MODE  
MASS RADIUS SIGMA BSCAT.55/MASS  
0.1000E+01 0.2000E+01 0.1053E-02

COEFFICIENTS AT 0.55 MICROMETERS , 1./KM  
BTARAY =0.1155E-01 BTAAER =0.3176E-02 ABSNO2 =0.0000E+00 BTABAC =0.1304E-01

\* T PLUWIL.OUT

4



VISUAL IMPACT ASSESSMENT FOR 400 MW at Willow

EMISSIONS SOURCE DATA

ELEVATION OF SITE = 200. FEET MSL  
61. METERS MSL

NO. OF UNITS = 1.

STACK HEIGHT = 440. FEET  
134. METERS

FLUE GAS FLOW RATE = 2000000. CU FT/MIN  
943.76 CU M/SEC

FLUE GAS TEMPERATURE = 190. F  
361. K

FLUE GAS OXYGEN CONTENT = 3.0 MOL PERCENT

SO<sub>2</sub> EMISSION RATE (TOTAL) = 16.40 TONS/DAY  
.1.722E+02 G/SEC

NO<sub>x</sub> EMISSION RATE (TOTAL, AS NO<sub>2</sub>) = 27.90 TONS/DAY  
2.929E+02 G/SEC

PARTICULATE EMISSION RATE (TOTAL) = 0.23 TONS/DAY  
2.415E+00 G/SEC

# METEOROLOGICAL AND AMBIENT AIR QUALITY DATA

WINDSPEED = 4.5 MILES/HR  
2.0 M/SEC

PASQUILL-GIFFORD-TURNER STABILITY CATEGORY D

LAPSE RATE = 1.10 F/1000 FT  
2.005E-03 K/M

POTENTIAL TEMPERATURE LAPSE RATE = 1.181E-02 K/M

AMBIENT TEMPERATURE = 50.0 F  
283.2 K

RELATIVE HUMIDITY = 20.0 %

MIXING DEPTH = 1000 M

AMBIENT PRESSURE = 0.99 ATM

BACKGROUND NOX CONCENTRATION = 0.000 PPM

BACKGROUND NO2 CONCENTRATION = 0.000 PPM

BACKGROUND OZONE CONCENTRATION = 0.040 PPM

BACKGROUND SO2 CONCENTRATION = 0.000 PPM

BACKGROUND COARSE MODE CONCENTRATION = 1.0 UG/M3

BACKGROUND SULFATE CONCENTRATION = 0.8 UG/M3

BACKGROUND NITRATE CONCENTRATION = 0.0 UG/M3

BACKGROUND VISUAL RANGE = 300.0 KILOMETERS

SO2 DEPOSITION VELOCITY = 1.00 CM/SEC

NOX DEPOSITION VELOCITY = 1.00 CM/SEC

COARSE PARTICULATE DEPOSITION VELOCITY = 0.10CM/SEC,  
SUBMICRON PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC

## AEROSOL STATISTICS

|                                      | BACKGROUND           |                | PLUME                |                |
|--------------------------------------|----------------------|----------------|----------------------|----------------|
| MASS MEDIAN<br>RADIUS<br>MICROMETERS | ACCUMULATION<br>MODE | COARSE<br>MODE | ACCUMULATION<br>MODE | COARSE<br>MODE |
|                                      | 0.160                | 3.000          | 0.100                | 1.000          |
| GEOMETRIC<br>STANDARD<br>DEVIATION   | 2.000                | 2.200          | 2.000                | 2.000          |
| PARTICLE<br>DENSITY                  |                      |                |                      |                |



# GEOMETRY OF USER-SPECIFIED PLUME-OBSERVER-SUN ORIENTATION

WIND DIRECTION (DEGREES) = 180.0

SIMULATION IS FOR 1600. HOURS ON 6/21

SOLAR ZENITH ANGLE (DEGREES) = 69.3

SOLAR AZIMUTH ANGLE (DEGREES) = 281.3

## GEOMETRIES FOR LINES-OF-SIGHT THROUGH PLUME PARCELS AT GIVEN DOWNWIND DISTANCES (X),

| X (KM) | AZIMUTH | RP    | ALPHA | BETA | THETA |
|--------|---------|-------|-------|------|-------|
| 1.0    | 311.5   | 46.8  | 48.5  | 0.4  | 35.8  |
| 2.5    | 312.9   | 47.8  | 47.1  | 0.4  | 36.9  |
| 5.0    | 315.0   | 49.5  | 45.0  | 0.4  | 38.7  |
| 10.0   | 318.8   | 53.2  | 41.2  | 0.3  | 41.9  |
| 13.0   | 320.9   | 55.4  | 39.1  | 0.3  | 43.7  |
| 32.0   | 330.6   | 71.2  | 29.4  | 0.3  | 52.3  |
| 70.0   | 340.7   | 105.9 | 19.3  | 0.2  | 61.5  |
| 166.0  | 349.9   | 199.1 | 10.1  | 0.1  | 70.0  |

# BACKGROUND CONDITIONS

ACCUMULATION MODE  
 MASS RADIUS SIGMA BSCAT.55/MASS  
 0.1600E+00 0.2000E+01 0.3718E-02

COARSE PARTICLE MODE  
 MASS RADIUS SIGMA BSCAT.55/MASS  
 0.3000E+01 0.2200E+01 0.3343E-03

PRIMARY PARTICLE MODE  
 MASS RADIUS SIGMA BSCAT.55/MASS  
 0.1000E+01 0.2000E+01 0.1053E-02

COEFFICIENTS AT 0.55 MICROMETERS , 1./KM  
 BTARAY =0.1155E-01 BTAAER =0.3176E-02 ABSNO2 =0.0000E+00 BTABAC =0.1304E-01

## INITIAL PLUME RISE AND DILUTION AND NITROGEN DIOXIDE FORMATION

400 MW at Willow

| TIME<br>(SEC) | X<br>(M) | DELTA H<br>(M) | U<br>(M/S) | W<br>(M/S) | V<br>(M/S) | SIGMA<br>(M) | TEMP<br>(K) | O2<br>MOL P | NO2-NO<br>EQUIL | RATIO<br>ACTUAL | NOX<br>(PPM) | NO<br>(PPM) | NO2T<br>(PPM) | SO2<br>(PPM) | PARTICULATE<br>UG/M3 |
|---------------|----------|----------------|------------|------------|------------|--------------|-------------|-------------|-----------------|-----------------|--------------|-------------|---------------|--------------|----------------------|
| 0.            | 0.0      | 0.0            | 5.23       | 20.10      | 20.10      | 0.0          | 360.9       | 3.0         | 1.6E+04         | 1.4E-03         | 201.227      | 200.947     | 0.279         | 85.035       | 3.12E+03             |
| 10.           | 52.3     | 34.6           | 5.23       | 1.69       | 5.50       | 8.1          | 311.4       | 14.4        | 3.3E+05         | 2.4E-03         | 73.208       | 73.031      | 0.178         | 30.937       | 1.14E+03             |
| 20.           | 104.7    | 55.0           | 5.23       | 1.36       | 5.41       | 12.8         | 293.9       | 18.5        | 8.2E+05         | 4.7E-03         | 27.881       | 27.750      | 0.131         | 11.782       | 4.32E+02             |
| 30.           | 157.0    | 72.0           | 5.23       | 1.19       | 5.37       | 16.7         | 289.4       | 19.5        | 1.0E+06         | 6.0E-03         | 16.103       | 16.007      | 0.095         | 6.805        | 2.50E+02             |
| 40.           | 209.3    | 87.2           | 5.23       | 1.09       | 5.34       | 20.3         | 287.4       | 20.0        | 1.1E+06         | 6.7E-03         | 10.943       | 10.870      | 0.073         | 4.624        | 1.70E+02             |
| 50.           | 261.6    | 101.2          | 5.23       | 1.01       | 5.33       | 23.5         | 286.3       | 20.2        | 1.2E+06         | 7.3E-03         | 8.119        | 8.060       | 0.059         | 3.431        | 1.26E+02             |
| 60.           | 314.0    | 114.3          | 5.23       | 0.95       | 5.32       | 26.6         | 285.6       | 20.4        | 1.3E+06         | 7.7E-03         | 6.365        | 6.316       | 0.049         | 2.690        | 9.87E+01             |
| 70.           | 366.3    | 126.7          | 5.23       | 0.91       | 5.31       | 29.5         | 285.2       | 20.5        | 1.3E+06         | 8.0E-03         | 5.182        | 5.141       | 0.041         | 2.190        | 8.04E+01             |
| 80.           | 418.6    | 138.5          | 5.23       | 0.87       | 5.30       | 32.2         | 284.8       | 20.6        | 1.3E+06         | 8.3E-03         | 4.337        | 4.301       | 0.036         | 1.833        | 6.73E+01             |
| 90.           | 471.0    | 149.8          | 5.23       | 0.83       | 5.30       | 34.8         | 284.6       | 20.6        | 1.3E+06         | 8.5E-03         | 3.707        | 3.676       | 0.031         | 1.567        | 5.75E+01             |
| 100.          | 523.3    | 160.7          | 5.23       | 0.80       | 5.29       | 37.4         | 284.4       | 20.7        | 1.3E+06         | 8.7E-03         | 3.222        | 3.194       | 0.028         | 1.362        | 5.00E+01             |
| 110.          | 575.6    | 171.3          | 5.23       | 0.78       | 5.29       | 39.8         | 284.2       | 20.7        | 1.3E+06         | 8.9E-03         | 2.838        | 2.813       | 0.025         | 1.199        | 4.40E+01             |
| 120.          | 627.9    | 181.5          | 5.23       | 0.76       | 5.29       | 42.2         | 284.1       | 20.7        | 1.3E+06         | 9.0E-03         | 2.528        | 2.505       | 0.023         | 1.068        | 3.92E+01             |
| 130.          | 680.3    | 186.5          | 5.23       | 0.74       | 5.28       | 43.4         | 284.1       | 20.7        | 1.4E+06         | 9.1E-03         | 2.395        | 2.373       | 0.022         | 1.012        | 3.71E+01             |
| 140.          | 732.6    | 186.5          | 5.23       | 0.72       | 5.28       | 43.4         | 284.1       | 20.7        | 1.4E+06         | 9.3E-03         | 2.396        | 2.374       | 0.022         | 1.012        | 3.72E+01             |
| 150.          | 784.9    | 186.5          | 5.23       | 0.70       | 5.28       | 43.4         | 284.1       | 20.7        | 1.4E+06         | 9.4E-03         | 2.397        | 2.374       | 0.022         | 1.013        | 3.72E+01             |
| 160.          | 837.2    | 186.5          | 5.23       | 0.69       | 5.28       | 43.4         | 284.1       | 20.7        | 1.4E+06         | 9.5E-03         | 2.398        | 2.375       | 0.023         | 1.013        | 3.72E+01             |
| 170.          | 889.6    | 186.5          | 5.23       | 0.68       | 5.28       | 43.4         | 284.1       | 20.7        | 1.4E+06         | 9.7E-03         | 2.399        | 2.376       | 0.023         | 1.014        | 3.72E+01             |
| 180.          | 941.9    | 186.5          | 5.23       | 0.66       | 5.27       | 43.4         | 284.1       | 20.7        | 1.4E+06         | 9.8E-03         | 2.399        | 2.376       | 0.023         | 1.014        | 3.72E+01             |
| 190.          | 994.2    | 186.5          | 5.23       | 0.65       | 5.27       | 43.4         | 284.1       | 20.7        | 1.4E+06         | 9.9E-03         | 2.400        | 2.376       | 0.024         | 1.014        | 3.72E+01             |

# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 1.0  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 74.  
 SIGMA Z (M) = 33.  
 SO2-SO4 CONVERSION RATE = 0.0000 PERCENT/HR  
 NOX-NO3 CONVERSION RATE = 0.0000 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | SO3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|--------------|----------------------|-----------------------|--------------|-----------------|-----------------------|--------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |              |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.250        | 0.041        | 0.000        | 16.411               | 0.000                 | 0.105        | 0.000           | 0.000                 | -0.038       | 3.871              | 0.041                   | 0.000            |
| TOTAL AMB] | 0.250        | 0.041        | 0.000        | 16.411               | 0.000                 | 0.105        | 0.764           | 0.184                 | 0.002        | 5.635              | 0.073                   | 39.181           |
| H+1S       |              |              |              |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 1.119        | 0.051        | 0.000        | 4.536                | 0.000                 | 0.473        | 0.000           | 0.000                 | -0.040       | 17.348             | 0.183                   | 0.000            |
| TOTAL AMB] | 1.119        | 0.051        | 0.000        | 4.536                | 0.000                 | 0.473        | 0.764           | 0.041                 | 0.000        | 19.113             | 0.214                   | 13.250           |
| H          |              |              |              |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 1.844        | 0.058        | 0.000        | 3.149                | 0.000                 | 0.779        | 0.000           | 0.000                 | -0.040       | 28.603             | 0.301                   | 0.000            |
| TOTAL AMB] | 1.844        | 0.058        | 0.000        | 3.149                | 0.000                 | 0.779        | 0.764           | 0.025                 | 0.000        | 30.367             | 0.333                   | 8.534            |
| H-1S       |              |              |              |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 1.119        | 0.051        | 0.000        | 4.536                | 0.000                 | 0.473        | 0.000           | 0.000                 | -0.040       | 17.348             | 0.183                   | 0.000            |
| TOTAL AMB] | 1.119        | 0.051        | 0.000        | 4.536                | 0.000                 | 0.473        | 0.764           | 0.041                 | 0.000        | 19.113             | 0.214                   | 13.250           |
| H-2S       |              |              |              |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.250        | 0.041        | 0.000        | 16.411               | 0.000                 | 0.105        | 0.000           | 0.000                 | -0.038       | 3.871              | 0.041                   | 0.000            |
| TOTAL AMB] | 0.250        | 0.041        | 0.000        | 16.411               | 0.000                 | 0.105        | 0.764           | 0.184                 | 0.002        | 5.635              | 0.073                   | 39.181           |
| 0          |              |              |              |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.000        | 0.000        | 0.000        | 0.000                | 0.000                 | 0.000        | 0.000           | 0.000                 | 0.000        | 0.000              | 0.000                   | 0.000            |
| TOTAL AMB] | 0.000        | 0.000        | 0.000        | 0.000                | 0.000                 | 0.000        | 0.764           | 100.000               | 0.040        | 1.764              | 0.032                   | 89.473           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2] 0.0000  
 NOX] 0.0000  
 PRIMARY PARTICULATE] 0.0000  
 SO4] 0.0000  
 NO3] 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 1.0  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 46.8  
AZIMUTH OF LINE-OF-SIGHT = 311.5  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV   | %REDUCED | YCAP  | L      | X      | Y DELYCAP | DELL  | C(550)  | BRATIO | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|------|----------|-------|--------|--------|-----------|-------|---------|--------|--------|--------|---------------|
| 36.   |       |        |      |          |       |        |        |           |       |         |        |        |        |               |
| 48.   | 0.16  | 299.1  | 0.31 | 99.79    | 99.92 | 0.3308 | 0.3454 | -0.30     | -0.12 | -0.0032 | 0.9908 | 0.0008 | 0.0005 | 0.6961 0.4412 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 1.0  
PLUME-OBSERVER DISTANCE (KM) = 46.8  
AZIMUTH OF LINE-OF-SIGHT = 311.5  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 36.

| REFLECT. | RP/RV0 | RO/RV0 | YCAP   | L      | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |
|----------|--------|--------|--------|--------|--------|--------|---------|-------|---------|--------|--------|--------|--------|--------|
| 1.0      | 0.16   | 0.64   | 102.23 | 100.86 | 0.3393 | 0.3464 | -0.32   | -0.12 | -0.0033 | 0.9931 | 0.0007 | 0.0005 | 0.6284 | 0.4063 |
| 0.3      | 0.16   | 0.64   | 95.33  | 98.17  | 0.3279 | 0.3417 | -0.23   | -0.09 | -0.0026 | 0.9907 | 0.0008 | 0.0006 | 0.6976 | 0.4397 |
| 0.0      | 0.16   | 0.64   | 92.37  | 96.97  | 0.3226 | 0.3395 | -0.20   | -0.08 | -0.0023 | 0.9892 | 0.0009 | 0.0006 | 0.7315 | 0.4568 |

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# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 1.0  
 PLUME-OBSERVER DISTANCE (KM) = 46.8  
 AZIMUTH OF LINE-OF-SIGHT = 311.5  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4  
 SOLAR ZENITH ANGLE = 69.3 " AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

36.

FOR SKY BACKGROUND:

0. 0.16 299.2

FOR WHITE BACKGROUND:

0. 0.16 299.2

FOR GRAY BACKGROUND:

0. 0.16 299.2

FOR BLACK BACKGROUND:

0. 0.16 299.1

| RV   | %REDUCED | YCAP   | L      | X      | Y     | DELYCAP | DELL    | C(550) | BRATIO | DELY   | E(LUV) | E(LAB) |
|------|----------|--------|--------|--------|-------|---------|---------|--------|--------|--------|--------|--------|
| 0.27 | 101.01   | 100.39 | 0.3338 | 0.3460 | -0.14 | -0.05   | -0.0015 | 0.9940 | 0.0005 | 0.0003 | 0.4120 | 0.2587 |
| 0.27 | 102.67   | 101.02 | 0.3393 | 0.3464 | -0.15 | -0.06   | -0.0016 | 0.9956 | 0.0004 | 0.0003 | 0.3759 | 0.2408 |
| 0.28 | 95.57    | 98.26  | 0.3277 | 0.3415 | -0.08 | -0.03   | -0.0010 | 0.9932 | 0.0005 | 0.0004 | 0.4432 | 0.2788 |
| 0.29 | 92.52    | 97.04  | 0.3223 | 0.3393 | -0.04 | -0.02   | -0.0007 | 0.9917 | 0.0006 | 0.0004 | 0.4837 | 0.2984 |



# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 2.5  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 163.  
 SIGMA Z (M) = 60.  
 SO2-SO4 CONVERSION RATE= 0.0000 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0000 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | 03<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.063        | 0.032        | 0.000         | 51.461               | 0.000                 | 0.027        | 0.000           | 0.000                 | -0.032      | 0.977              | 0.010                   | 0.002            |
| TOTAL AMB] | 0.063        | 0.032        | 0.000         | 51.461               | 0.000                 | 0.027        | 0.764           | 0.726                 | 0.008       | 2.742              | 0.042                   | 67.573           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.282        | 0.042        | 0.000         | 14.840               | 0.000                 | 0.119        | 0.000           | 0.000                 | -0.039      | 4.381              | 0.046                   | 0.000            |
| TOTAL AMB] | 0.282        | 0.042        | 0.000         | 14.840               | 0.000                 | 0.119        | 0.764           | 0.163                 | 0.001       | 6.145              | 0.078                   | 36.482           |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.466        | 0.045        | 0.000         | 9.675                | 0.000                 | 0.197        | 0.000           | 0.000                 | -0.039      | 7.222              | 0.076                   | 0.000            |
| TOTAL AMB] | 0.466        | 0.045        | 0.000         | 9.675                | 0.000                 | 0.197        | 0.764           | 0.099                 | 0.001       | 8.986              | 0.108                   | 26.356           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.282        | 0.042        | 0.000         | 14.840               | 0.000                 | 0.119        | 0.000           | 0.000                 | -0.039      | 4.381              | 0.046                   | 0.000            |
| TOTAL AMB] | 0.282        | 0.042        | 0.000         | 14.840               | 0.000                 | 0.119        | 0.764           | 0.163                 | 0.001       | 6.145              | 0.078                   | 36.482           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.063        | 0.032        | 0.000         | 51.461               | 0.000                 | 0.027        | 0.000           | 0.000                 | -0.032      | 0.977              | 0.010                   | 0.002            |
| TOTAL AMB] | 0.063        | 0.032        | 0.000         | 51.461               | 0.000                 | 0.027        | 0.764           | 0.726                 | 0.008       | 2.742              | 0.042                   | 67.573           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.000        | 0.000        | 0.000         | 0.000                | 0.000                 | 0.000        | 0.000           | 0.027                 | 0.000       | 0.000              | 0.000                   | 9.327            |
| TOTAL AMB] | 0.000        | 0.000        | 0.000         | 83.913               | 0.000                 | 0.000        | 0.764           | 99.885                | 0.040       | 1.764              | 0.032                   | 89.473           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2] 0.0000  
 NOX] 0.0000  
 PRIMARY PARTICULATE] 0.0000  
 SO4] 0.0000  
 NO3] 0.0000



VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 2.5  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 47.8  
AZIMUTH OF LINE-OF-SIGHT = 312.9  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV   | ZREDUCED | YCAP  | L      | X      | Y DELYCAP | DELL  | C(550)  | BRATIO | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|------|----------|-------|--------|--------|-----------|-------|---------|--------|--------|--------|---------------|
| 37.   |       |        |      |          |       |        |        |           |       |         |        |        |        |               |
| 47.   | 0.16  | 299.1  | 0.29 | 97.47    | 99.02 | 0.3305 | 0.3451 | -0.66     | -0.26 | -0.0070 | 0.9884 | 0.0013 | 0.0008 | 1.1107 0.7187 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 2.5  
PLUME-OBSERVER DISTANCE (KM) = 47.8  
AZIMUTH OF LINE-OF-SIGHT = 312.9  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 37.

| REFLECT | RP/RVO | RO/RVO | YCAP   | L      | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|--------|--------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.16   | 0.68   | 100.02 | 100.01 | 0.3393 | 0.3461    | -0.63 | -0.26  | -0.0071 | 0.9898 | 0.0012 | 0.0008 | 1.0506 | 0.6869 |
| 0.3     | 0.16   | 0.68   | 93.90  | 97.59  | 0.3286 | 0.3419    | -0.59 | -0.24  | -0.0065 | 0.9886 | 0.0012 | 0.0008 | 1.0854 | 0.6998 |
| 0.0     | 0.16   | 0.68   | 91.28  | 96.53  | 0.3236 | 0.3400    | -0.56 | -0.23  | -0.0063 | 0.9878 | 0.0012 | 0.0009 | 1.1028 | 0.7065 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 2.5

PLUME-OBSERVER DISTANCE (KM) = 47.8

AZIMUTH OF LINE-OF-SIGHT = 312.9

ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4

SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21

THETA LENGTH RP/RVO RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

37.

FOR SKY BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.4 | 0.21 | 98.80 | 99.53 | 0.3333 | 0.3455 | -0.35 | -0.14 | -0.0038 | 0.9932 | 0.0007 | 0.0005 | 0.6227 | 0.4013 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR WHITE BACKGROUND:

|    |      |       |      |        |        |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.4 | 0.21 | 100.58 | 100.22 | 0.3391 | 0.3459 | -0.36 | -0.14 | -0.0038 | 0.9941 | 0.0007 | 0.0004 | 0.5980 | 0.3893 |
|----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR GRAY BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.3 | 0.22 | 94.26 | 97.74 | 0.3282 | 0.3416 | -0.30 | -0.12 | -0.0034 | 0.9928 | 0.0007 | 0.0005 | 0.6337 | 0.4046 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR BLACK BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.3 | 0.23 | 91.56 | 96.64 | 0.3231 | 0.3397 | -0.28 | -0.11 | -0.0032 | 0.9921 | 0.0007 | 0.0005 | 0.6510 | 0.4124 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

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# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 5.0  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 301.  
 SIGMA Z (M) = 91.  
 SO2-SO4 CONVERSION RATE= 0.0000 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0002 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSF-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.022        | 0.017        | 0.000         | 75.167               | 0.000                 | 0.009        | 0.000           | 0.000                 | -0.017      | 0.346              | 0.004                   | 0.028            |
| TOTAL AMB] | 0.022        | 0.017        | 0.000         | 75.167               | 0.000                 | 0.009        | 0.764           | 2.022                 | 0.023       | 2.110              | 0.035                   | 80.262           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.100        | 0.037        | 0.000         | 36.714               | 0.000                 | 0.042        | 0.000           | 0.000                 | -0.036      | 1.551              | 0.016                   | 0.003            |
| TOTAL AMB] | 0.100        | 0.037        | 0.000         | 36.714               | 0.000                 | 0.042        | 0.764           | 0.458                 | 0.004       | 3.315              | 0.048                   | 59.083           |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.165        | 0.040        | 0.000         | 24.132               | 0.000                 | 0.070        | 0.000           | 0.000                 | -0.038      | 2.558              | 0.027                   | 0.001            |
| TOTAL AMB] | 0.165        | 0.040        | 0.000         | 24.132               | 0.000                 | 0.070        | 0.764           | 0.279                 | 0.002       | 4.322              | 0.059                   | 48.414           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.100        | 0.037        | 0.000         | 36.714               | 0.000                 | 0.042        | 0.000           | 0.000                 | -0.036      | 1.551              | 0.016                   | 0.003            |
| TOTAL AMB] | 0.100        | 0.037        | 0.000         | 36.714               | 0.000                 | 0.042        | 0.764           | 0.458                 | 0.004       | 3.315              | 0.048                   | 59.083           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.022        | 0.017        | 0.000         | 75.166               | 0.000                 | 0.009        | 0.000           | 0.000                 | -0.017      | 0.346              | 0.004                   | 0.028            |
| TOTAL AMB] | 0.022        | 0.017        | 0.000         | 75.166               | 0.000                 | 0.009        | 0.764           | 2.022                 | 0.023       | 2.110              | 0.035                   | 80.261           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT] | 0.001        | 0.001        | 0.000         | 83.346               | 0.267                 | 0.000        | 0.001           | 0.075                 | -0.001      | 0.011              | 0.000                   | 22.089           |
| TOTAL AMB] | 0.001        | 0.001        | 0.000         | 83.346               | 0.267                 | 0.000        | 0.765           | 39.531                | 0.039       | 1.775              | 0.032                   | 89.161           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2] 0.0000  
 NOX] 0.0000  
 PRIMARY PARTICULATE] 0.0000  
 SO4] 0.0000  
 NO3] 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 5.0  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 49.5  
AZIMUTH OF LINE-OF-SIGHT = 315.0  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELY   | E(LUV) | E(LAB)               |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|----------------------|
| 39.   | 45.   | 0.16   | 299.0 | 0.32     | 94.13 | 97.69 | 0.3297 | 0.3442    | -0.93 | -0.37  | -0.0101 | 0.9862 | 0.0017 | 0.0011 1.4574 0.9476 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 5.0  
PLUME-OBSERVER DISTANCE (KM) = 49.5  
AZIMUTH OF LINE-OF-SIGHT = 315.0  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 39.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.16   | 0.73   | 96.75 | 98.73 | 0.3388 | 0.3453    | -0.95 | -0.37  | -0.0102 | 0.9872 | 0.0016 | 0.0010 | 1.3938 | 0.9130 |
| 0.3     | 0.16   | 0.73   | 91.68 | 96.69 | 0.3292 | 0.3418    | -0.87 | -0.35  | -0.0097 | 0.9865 | 0.0016 | 0.0011 | 1.4157 | 0.9189 |
| 0.0     | 0.16   | 0.73   | 89.50 | 95.79 | 0.3248 | 0.3403    | -0.83 | -0.34  | -0.0095 | 0.9860 | 0.0016 | 0.0011 | 1.4268 | 0.9223 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 5.0

PLUME-OBSERVER DISTANCE (KM) = 49.5

AZIMUTH OF LINE-OF-SIGHT = 315.0

ELEVATION ANGLE OF LINE-OF-SIGHT = 0.4

SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21

| THETA | LENGTH | RP/RVO | RV | %REDUCED | YCAP | L | X | Y | DELYCAP | DELL | C(550) | BRATIO | DELX | DELY | E(LUV) | E(LAB) |
|-------|--------|--------|----|----------|------|---|---|---|---------|------|--------|--------|------|------|--------|--------|
|-------|--------|--------|----|----------|------|---|---|---|---------|------|--------|--------|------|------|--------|--------|

39.

FOR SKY BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.3 | 0.24 | 95.40 | 98.19 | 0.3326 | 0.3446 | -0.61 | -0.24 | -0.0067 | 0.9908 | 0.0011 | 0.0007 | 0.9569 | 0.6223 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR WHITE BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.3 | 0.24 | 97.27 | 98.94 | 0.3385 | 0.3451 | -0.62 | -0.25 | -0.0068 | 0.9914 | 0.0011 | 0.0007 | 0.9340 | 0.6111 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR GRAY BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.3 | 0.25 | 92.04 | 96.84 | 0.3288 | 0.3415 | -0.56 | -0.23 | -0.0064 | 0.9907 | 0.0011 | 0.0007 | 0.9556 | 0.6184 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR BLACK BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. | 0.16 | 299.2 | 0.25 | 89.80 | 95.92 | 0.3243 | 0.3399 | -0.54 | -0.22 | -0.0062 | 0.9902 | 0.0011 | 0.0007 | 0.9663 | 0.6222 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|



# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 10.0  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 556.  
 SIGMA Z (M) = 137.  
 SO2-SO4 CONVERSION RATE= 0.0001 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0008 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.008        | 0.007        | 0.000         | 81.215               | 0.004                 | 0.003        | 0.000           | 0.001                 | -0.006      | 0.125              | 0.001                   | 0.329            |
| TOTAL AMB1 | 0.008        | 0.007        | 0.000         | 81.226               | 0.004                 | 0.003        | 0.764           | 5.405                 | 0.034       | 1.889              | 0.033                   | 85.912           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.036        | 0.024        | 0.000         | 67.459               | 0.000                 | 0.015        | 0.000           | 0.000                 | -0.024      | 0.561              | 0.006                   | 0.027            |
| TOTAL AMB1 | 0.036        | 0.024        | 0.000         | 67.469               | 0.000                 | 0.015        | 0.764           | 1.259                 | 0.016       | 2.325              | 0.038                   | 75.451           |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.060        | 0.032        | 0.000         | 53.560               | 0.000                 | 0.025        | 0.000           | 0.000                 | -0.031      | 0.924              | 0.010                   | 0.013            |
| TOTAL AMB1 | 0.060        | 0.032        | 0.000         | 53.567               | 0.000                 | 0.025        | 0.764           | 0.767                 | 0.009       | 2.688              | 0.041                   | 68.487           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.036        | 0.024        | 0.000         | 67.419               | 0.000                 | 0.015        | 0.000           | 0.000                 | -0.024      | 0.562              | 0.006                   | 0.027            |
| TOTAL AMB1 | 0.036        | 0.024        | 0.000         | 67.428               | 0.000                 | 0.015        | 0.764           | 1.256                 | 0.016       | 2.326              | 0.038                   | 75.429           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.010        | 0.008        | 0.000         | 80.633               | 0.004                 | 0.004        | 0.000           | 0.001                 | -0.008      | 0.150              | 0.002                   | 0.329            |
| TOTAL AMB1 | 0.010        | 0.008        | 0.000         | 80.644               | 0.004                 | 0.004        | 0.764           | 4.543                 | 0.032       | 1.914              | 0.033                   | 85.231           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.008        | 0.006        | 0.000         | 80.910               | 0.526                 | 0.003        | 0.016           | 0.124                 | -0.006      | 0.119              | 0.002                   | 31.887           |
| TOTAL AMB1 | 0.008        | 0.006        | 0.000         | 80.922               | 0.526                 | 0.003        | 0.780           | 5.788                 | 0.034       | 1.883              | 0.034                   | 86.324           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO21 0.0001  
 NOX1 0.0001  
 PRIMARY PARTICULATE1 0.0000  
 SO41 0.0000  
 NO31 0.0000



VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 10.0  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 53.2  
AZIMUTH OF LINE-OF-SIGHT = 318.8  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV   | XREDUCED | YCAP  | L      | X      | Y     | DELYCAP | DELL    | C(550) | BRATIO | DELY   | E(LUV) | E(LAB) |
|-------|-------|--------|------|----------|-------|--------|--------|-------|---------|---------|--------|--------|--------|--------|--------|
| 42.   |       |        |      |          |       |        |        |       |         |         |        |        |        |        |        |
| 41.   | 0.18  | 298.9  | 0.38 | 89.09    | 95.62 | 0.3282 | 0.3427 | -1.06 | -0.44   | -0.0122 | 0.9859 | 0.0018 | 0.0011 | 1.5990 | 1.0410 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 10.0  
PLUME-OBSERVER DISTANCE (KM) = 53.2  
AZIMUTH OF LINE-OF-SIGHT = 318.8  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 42.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.18   | 0.71   | 91.80 | 96.74 | 0.3379 | 0.3439 | -1.09   | -0.44 | -0.0123 | 0.9867 | 0.0018 | 0.0010 | 1.5289 | 1.0019 |
| 0.3     | 0.18   | 0.71   | 86.30 | 94.45 | 0.3271 | 0.3399 | -0.98   | -0.42 | -0.0117 | 0.9861 | 0.0018 | 0.0011 | 1.5427 | 1.0023 |
| 0.0     | 0.18   | 0.71   | 83.94 | 93.43 | 0.3221 | 0.3380 | -0.94   | -0.41 | -0.0113 | 0.9858 | 0.0018 | 0.0012 | 1.5509 | 1.0036 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 10.0  
 PLUME-OBSERVER DISTANCE (KM) = 53.2  
 AZIMUTH OF LINE-OF-SIGHT = 318.8  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
 SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

| ETA                   | LENGTH | RP/RVO | RV   | %REDUCED | YCAP  | L      | X      | Y     | DELYCAP | DELL    | C(550) | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |
|-----------------------|--------|--------|------|----------|-------|--------|--------|-------|---------|---------|--------|--------|--------|--------|--------|--------|
| 42.                   |        |        |      |          |       |        |        |       |         |         |        |        |        |        |        |        |
| FOR SKY BACKGROUND:   |        |        |      |          |       |        |        |       |         |         |        |        |        |        |        |        |
| 2.                    | 0.18   | 299.0  | 0.32 | 90.11    | 96.05 | 0.3314 | 0.3432 | -0.90 | -0.37   | -0.0103 | 0.9883 | 0.0015 | 0.0009 | 1.3202 | 0.8614 |        |
| FOR WHITE BACKGROUND: |        |        |      |          |       |        |        |       |         |         |        |        |        |        |        |        |
| 2.                    | 0.18   | 299.0  | 0.32 | 92.18    | 96.90 | 0.3379 | 0.3440 | -0.92 | -0.37   | -0.0104 | 0.9888 | 0.0015 | 0.0009 | 1.2951 | 0.8489 |        |
| FOR GRAY BACKGROUND:  |        |        |      |          |       |        |        |       |         |         |        |        |        |        |        |        |
| 2.                    | 0.18   | 299.0  | 0.34 | 86.52    | 94.54 | 0.3269 | 0.3398 | -0.83 | -0.35   | -0.0098 | 0.9882 | 0.0015 | 0.0010 | 1.3090 | 0.8501 |        |
| FOR BLACK BACKGROUND: |        |        |      |          |       |        |        |       |         |         |        |        |        |        |        |        |
| 2.                    | 0.18   | 299.0  | 0.34 | 84.09    | 93.50 | 0.3218 | 0.3379 | -0.79 | -0.34   | -0.0095 | 0.9878 | 0.0015 | 0.0010 | 1.3172 | 0.8516 |        |

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# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 13.0  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 701.  
 SIGMA Z (M) = 159.  
 SO2-SO4 CONVERSION RATE= 0.0006 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0040 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | SO3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|--------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.006        | 0.005        | 0.000         | 81.934               | 0.015                 | 0.002        | 0.000           | 0.003                 | -0.004       | 0.086              | 0.001                   | 1.077            |
| TOTAL AMBJ | 0.006        | 0.005        | 0.000         | 82.084               | 0.015                 | 0.002        | 0.764           | 7.714                 | 0.036        | 1.850              | 0.033                   | 87.006           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.025        | 0.018        | 0.000         | 73.844               | 0.000                 | 0.010        | 0.000           | 0.000                 | -0.018       | 0.384              | 0.004                   | 0.111            |
| TOTAL AMBJ | 0.025        | 0.018        | 0.000         | 73.979               | 0.000                 | 0.010        | 0.764           | 1.830                 | 0.022        | 2.148              | 0.036                   | 79.374           |
| H          |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.041        | 0.026        | 0.000         | 64.603               | -0.001                | 0.017        | 0.000           | 0.000                 | -0.026       | 0.633              | 0.007                   | 0.042            |
| TOTAL AMBJ | 0.041        | 0.026        | 0.000         | 64.721               | -0.001                | 0.017        | 0.764           | 1.118                 | 0.014        | 2.397              | 0.038                   | 73.953           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.025        | 0.019        | 0.000         | 73.638               | 0.000                 | 0.011        | 0.000           | 0.000                 | -0.018       | 0.390              | 0.004                   | 0.111            |
| TOTAL AMBJ | 0.025        | 0.019        | 0.000         | 73.772               | 0.000                 | 0.011        | 0.764           | 1.802                 | 0.022        | 2.154              | 0.036                   | 79.231           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.011        | 0.008        | 0.000         | 80.170               | 0.013                 | 0.004        | 0.000           | 0.003                 | -0.008       | 0.164              | 0.002                   | 0.953            |
| TOTAL AMBJ | 0.011        | 0.008        | 0.000         | 80.317               | 0.013                 | 0.004        | 0.765           | 4.188                 | 0.032        | 1.928              | 0.033                   | 84.871           |
| 0          |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.010        | 0.008        | 0.000         | 79.616               | 0.676                 | 0.004        | 0.028           | 0.160                 | -0.008       | 0.164              | 0.003                   | 37.608           |
| TOTAL AMBJ | 0.010        | 0.008        | 0.000         | 79.761               | 0.677                 | 0.004        | 0.792           | 4.342                 | 0.032        | 1.928              | 0.035                   | 85.323           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0018  
 NOXJ 0.0018  
 PRIMARY PARTICULATEJ 0.0002  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 13.0  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 55.4  
AZIMUTH OF LINE-OF-SIGHT = 320.9  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|---------------|
| 44.   | 39.   | 0.18   | 298.9 | 0.38     | 86.69 | 94.61 | 0.3271 | 0.3418    | -1.01 | -0.43  | -0.0119 | 0.9872 | 0.0017 | 0.0010 | 1.5001 0.9765 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 13.0  
PLUME-OBSERVER DISTANCE (KM) = 55.4  
AZIMUTH OF LINE-OF-SIGHT = 320.9  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 44.

| REFLECT | RP/RV0 | RO/RV0 | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELY   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.18   | 0.69   | 89.49 | 95.79 | 0.3371 | 0.3432    | -1.04 | -0.43  | -0.0121 | 0.9880 | 0.0017 | 0.0009 | 1.4305 | 0.9376 |
| 0.3     | 0.18   | 0.69   | 83.74 | 93.34 | 0.3256 | 0.3388    | -0.93 | -0.40  | -0.0114 | 0.9874 | 0.0017 | 0.0010 | 1.4405 | 0.9357 |
| 0.0     | 0.18   | 0.69   | 81.27 | 92.26 | 0.3203 | 0.3368    | -0.88 | -0.39  | -0.0110 | 0.9870 | 0.0016 | 0.0011 | 1.4478 | 0.9362 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 13.0  
 PLUME-OBSERVER DISTANCE (KM) = 55.4  
 AZIMUTH OF LINE-OF-SIGHT = 320.9  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
 SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

44.

FOR SKY BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 3. | 0.18 | 299.0 | 0.35 | 87.60 | 95.00 | 0.3304 | 0.3425 | -0.92 | -0.39 | -0.0109 | 0.9885 | 0.0015 | 0.0009 | 1.3292 | 0.8613 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR WHITE BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 3. | 0.18 | 299.0 | 0.35 | 89.81 | 95.92 | 0.3373 | 0.3434 | -0.95 | -0.39 | -0.0110 | 0.9890 | 0.0015 | 0.0008 | 1.3043 | 0.8551 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR GRAY BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 3. | 0.18 | 298.9 | 0.36 | 83.89 | 93.41 | 0.3256 | 0.3388 | -0.85 | -0.37 | -0.0103 | 0.9884 | 0.0015 | 0.0009 | 1.3142 | 0.8535 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR BLACK BACKGROUND:

|    |      |       |      |       |       |        |        |       |       |         |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 3. | 0.18 | 298.9 | 0.37 | 81.36 | 92.30 | 0.3201 | 0.3367 | -0.80 | -0.35 | -0.0100 | 0.9881 | 0.0015 | 0.0010 | 1.3212 | 0.8541 |
|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|



# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 32.0  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 1537.  
 SIGMA Z (M) = 257.  
 SO2-SO4 CONVERSION RATE = 0.0011 PERCENT/HR  
 NOX-NO3 CONVERSION RATE = 0.0079 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | G3<br>(PPM) | PRIMARY BSP-TOTAL<br>(UG/M3) (10-4 M-1) | BSPEN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|-----------------------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.002        | 0.001        | 0.000         | 81.542               | 0.100                 | 0.001        | 0.001           | 0.020                 | -0.001      | 0.025                                   | 7.020            |
| TOTAL AMBJ | 0.002        | 0.001        | 0.000         | 83.234               | 0.102                 | 0.001        | 0.765           | 22.666                | 0.039       | 1.789                                   | 88.749           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.007        | 0.006        | 0.000         | 79.996               | -0.001                | 0.003        | 0.000           | 0.003                 | -0.006      | 0.108                                   | 0.972            |
| TOTAL AMBJ | 0.007        | 0.006        | 0.000         | 81.656               | -0.001                | 0.003        | 0.764           | 6.304                 | 0.034       | 1.872                                   | 86.378           |
| H          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.012        | 0.009        | 0.000         | 78.274               | -0.010                | 0.005        | 0.000           | 0.001                 | -0.009      | 0.186                                   | 0.355            |
| TOTAL AMBJ | 0.012        | 0.009        | 0.000         | 79.899               | -0.010                | 0.005        | 0.764           | 3.774                 | 0.031       | 1.950                                   | 84.289           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.010        | 0.008        | 0.000         | 78.723               | -0.001                | 0.004        | 0.000           | 0.003                 | -0.008      | 0.166                                   | 0.949            |
| TOTAL AMBJ | 0.010        | 0.008        | 0.000         | 80.358               | -0.001                | 0.004        | 0.765           | 4.207                 | 0.032       | 1.930                                   | 84.818           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.010        | 0.008        | 0.000         | 78.740               | 0.046                 | 0.004        | 0.002           | 0.011                 | -0.008      | 0.163                                   | 3.887            |
| TOTAL AMBJ | 0.010        | 0.008        | 0.000         | 80.374               | 0.047                 | 0.004        | 0.766           | 4.282                 | 0.032       | 1.927                                   | 84.914           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.010        | 0.008        | 0.000         | 78.118               | 0.793                 | 0.004        | 0.033           | 0.188                 | -0.008      | 0.163                                   | 41.582           |
| TOTAL AMBJ | 0.010        | 0.008        | 0.000         | 79.740               | 0.810                 | 0.004        | 0.797           | 4.455                 | 0.032       | 1.927                                   | 85.415           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0203  
 NOXJ 0.0202  
 PRIMARY PARTICULATEJ 0.0020  
 SO4J 0.0000  
 NO3J 0.0000



VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 32.0  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 71.2  
AZIMUTH OF LINE-OF-SIGHT = 330.6  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV    | XREDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |
|-------|-------|--------|-------|----------|-------|-------|--------|--------|---------|-------|---------|--------|--------|--------|--------|--------|
| 52.   | 29.   | 0.24   | 298.8 | 0.40     | 76.48 | 90.09 | 0.3221 | 0.3370 | -0.67   | -0.31 | -0.0091 | 0.9939 | 0.0010 | 0.0004 | 0.9007 | 0.5896 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 32.0  
PLUME-OBSERVER DISTANCE (KM) = 71.2  
AZIMUTH OF LINE-OF-SIGHT = 330.6  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 52.

| REFLECT | RP/RV0 | RO/RV0 | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.24   | 0.63   | 80.01 | 91.70 | 0.3345 | 0.3395    | -0.71 | -0.32  | -0.0094 | 0.9947 | 0.0010 | 0.0003 | 0.8394 | 0.5574 |
| 0.3     | 0.24   | 0.63   | 72.97 | 88.44 | 0.3193 | 0.3328    | -0.58 | -0.28  | -0.0083 | 0.9941 | 0.0010 | 0.0004 | 0.8279 | 0.5396 |
| 0.0     | 0.24   | 0.63   | 69.95 | 86.98 | 0.3120 | 0.3297    | -0.53 | -0.26  | -0.0077 | 0.9937 | 0.0010 | 0.0005 | 0.8293 | 0.5354 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 32.0  
 PLUME-OBSERVER DISTANCE (KM) = 71.2  
 AZIMUTH OF LINE-OF-SIGHT = 330.6  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
 SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

52.

FOR SKY BACKGROUND:

|                       | 8. | 0.24 | 298.8 | 0.39 | 77.16 | 90.40 | 0.3259 | 0.3376 | -0.66 | -0.30 | -0.0090 | 0.9943 | 0.0010 | 0.0004 | 0.8484 | 0.5585 |
|-----------------------|----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| FOR WHITE BACKGROUND: | 8. | 0.24 | 298.9 | 0.38 | 80.30 | 91.83 | 0.3349 | 0.3397 | -0.70 | -0.31 | -0.0093 | 0.9948 | 0.0010 | 0.0003 | 0.8319 | 0.5525 |
| FOR GRAY BACKGROUND:  | 8. | 0.24 | 298.8 | 0.41 | 73.06 | 88.49 | 0.3194 | 0.3329 | -0.57 | -0.27 | -0.0082 | 0.9942 | 0.0009 | 0.0004 | 0.8187 | 0.5338 |
| FOR BLACK BACKGROUND: | 8. | 0.24 | 298.7 | 0.43 | 69.96 | 86.99 | 0.3120 | 0.3297 | -0.52 | -0.25 | -0.0076 | 0.9937 | 0.0009 | 0.0005 | 0.8197 | 0.5291 |

FOR WHITE BACKGROUND:

FOR GRAY BACKGROUND:

FOR BLACK BACKGROUND:

DELX DELY E(LUV) E(LAB)

33

# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 70.0  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 2989.  
 SIGMA Z (M) = 382.  
 SO2-SO4 CONVERSION RATE= 0.0070 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0490 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4= /STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|------------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENTJ | 0.001        | 0.001        | 0.000         | 74.338               | 0.825                 | 0.001        | 0.005           | 0.167                  | -0.001      | 0.025              | 0.000                   | 38.880           |
| TOTAL AMBJ | 0.001        | 0.001        | 0.000         | 82.588               | 0.916                 | 0.001        | 0.769           | 23.942                 | 0.039       | 1.759              | 0.032                   | 88.792           |
| H+1S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENTJ | 0.002        | 0.002        | 0.000         | 74.748               | 0.034                 | 0.001        | 0.001           | 0.029                  | -0.002      | 0.041              | 0.000                   | 10.095           |
| TOTAL AMBJ | 0.002        | 0.002        | 0.000         | 83.043               | 0.038                 | 0.001        | 0.765           | 16.114                 | 0.038       | 1.805              | 0.032                   | 88.291           |
| H          |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENTJ | 0.004        | 0.004        | 0.000         | 74.256               | -0.057                | 0.002        | 0.001           | 0.013                  | -0.004      | 0.076              | 0.001                   | 4.890            |
| TOTAL AMBJ | 0.004        | 0.004        | 0.000         | 82.497               | -0.063                | 0.002        | 0.765           | 9.384                  | 0.036       | 1.840              | 0.033                   | 87.291           |
| H-1S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENTJ | 0.004        | 0.004        | 0.000         | 74.228               | -0.026                | 0.002        | 0.002           | 0.019                  | -0.004      | 0.076              | 0.001                   | 6.796            |
| TOTAL AMBJ | 0.004        | 0.004        | 0.000         | 82.465               | -0.029                | 0.002        | 0.766           | 9.389                  | 0.036       | 1.840              | 0.033                   | 87.297           |
| H-2S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENTJ | 0.004        | 0.004        | 0.000         | 74.144               | 0.073                 | 0.002        | 0.003           | 0.037                  | -0.004      | 0.076              | 0.001                   | 12.457           |
| TOTAL AMBJ | 0.004        | 0.004        | 0.000         | 82.372               | 0.081                 | 0.002        | 0.767           | 9.407                  | 0.036       | 1.840              | 0.033                   | 87.319           |
| 0          |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENTJ | 0.004        | 0.004        | 0.000         | 73.020               | 1.441                 | 0.002        | 0.031           | 0.372                  | -0.004      | 0.076              | 0.002                   | 58.670           |
| TOTAL AMBJ | 0.004        | 0.004        | 0.000         | 81.124               | 1.500                 | 0.002        | 0.795           | 9.744                  | 0.036       | 1.840              | 0.034                   | 87.704           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0996  
 NOXJ 0.0985  
 PRIMARY PARTICULATEJ 0.0101  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 70.0  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 105.9  
AZIMUTH OF LINE-OF-SIGHT = 340.7  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELY   | E(LUV) | E(LAB) |        |        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 62.   | 19.   | 0.35   | 298.4 | 0.55     | 68.04 | 86.04 | 0.3169 | 0.3325    | -0.41 | -0.21  | -0.0065 | 0.9985 | 0.0005 | 0.0000 | 0.4605 | 0.3264 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 70.0  
PLUME-OBSERVER DISTANCE (KM) = 105.9  
AZIMUTH OF LINE-OF-SIGHT = 340.7  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 62.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP. | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV)  | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|------------|-------|--------|---------|--------|--------|---------|--------|--------|
| 1.0     | 0.35   | 0.63   | 72.12 | 88.04 | 0.3316 | 0.3360     | -0.47 | -0.23  | -0.0072 | 0.9997 | 0.0003 | -0.0002 | 0.4215 | 0.3214 |
| 0.3     | 0.35   | 0.63   | 65.09 | 84.54 | 0.3145 | 0.3284     | -0.33 | -0.17  | -0.0054 | 0.9988 | 0.0004 | 0.0000  | 0.3654 | 0.2608 |
| 0.0     | 0.35   | 0.63   | 62.08 | 82.97 | 0.3063 | 0.3248     | -0.27 | -0.14  | -0.0046 | 0.9982 | 0.0004 | 0.0000  | 0.3544 | 0.2417 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 70.0  
 PLUME-OBSERVER DISTANCE (KM) = 105.9  
 AZIMUTH OF LINE-OF-SIGHT = 340.7  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
 SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV ZREDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

62.

|                       |      |       |      |       |       |        |        |       |       |         |        |        |         |        |        |
|-----------------------|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|---------|--------|--------|
| FOR SKY BACKGROUND:   |      |       |      |       |       |        |        |       |       |         |        |        |         |        |        |
| 23.                   | 0.35 | 298.4 | 0.54 | 68.65 | 86.34 | 0.3213 | 0.3330 | -0.41 | -0.20 | -0.0065 | 0.9990 | 0.0004 | -0.0001 | 0.4198 | 0.3070 |
| FOR WHITE BACKGROUND: |      |       |      |       |       |        |        |       |       |         |        |        |         |        |        |
| 23.                   | 0.35 | 298.4 | 0.52 | 72.39 | 88.17 | 0.3321 | 0.3363 | -0.48 | -0.23 | -0.0073 | 0.9996 | 0.0004 | -0.0002 | 0.4290 | 0.3255 |
| FOR GRAY BACKGROUND:  |      |       |      |       |       |        |        |       |       |         |        |        |         |        |        |
| 23.                   | 0.35 | 298.3 | 0.57 | 65.17 | 84.59 | 0.3147 | 0.3285 | -0.33 | -0.17 | -0.0055 | 0.9988 | 0.0004 | 0.0000  | 0.3700 | 0.2634 |
| FOR BLACK BACKGROUND: |      |       |      |       |       |        |        |       |       |         |        |        |         |        |        |
| 23.                   | 0.35 | 298.2 | 0.59 | 62.08 | 82.97 | 0.3063 | 0.3248 | -0.27 | -0.14 | -0.0046 | 0.9981 | 0.0004 | 0.0000  | 0.3580 | 0.2436 |



# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

400 MW at Willow

DOWNWIND DISTANCE (KM) = 166.0  
 PLUME ALTITUDE (M) = 321.  
 SIGMA Y (M) = 6082.  
 SIGMA Z (M) = 580.  
 SO2-SO4 CONVERSION RATE = 0.0212 PERCENT/HR  
 NOX-NO3 CONVERSION RATE = 0.1482 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4-/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.001        | 0.001        | 0.000         | 57.593               | 4.166                 | 0.000        | 0.021           | 0.915                 | -0.001      | 0.021              | 0.001                   | 78.063           |
| TOTAL AMB1 | 0.001        | 0.001        | 0.000         | 78.742               | 5.696                 | 0.000        | 0.785           | 31.992                | 0.039       | 1.785              | 0.033                   | 89.123           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.001        | 0.001        | 0.000         | 60.386               | 0.800                 | 0.000        | 0.007           | 0.290                 | -0.001      | 0.022              | 0.000                   | 52.960           |
| TOTAL AMB1 | 0.001        | 0.001        | 0.000         | 82.562               | 1.094                 | 0.000        | 0.771           | 30.639                | 0.039       | 1.786              | 0.032                   | 88.923           |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.002        | 0.001        | 0.000         | 60.989               | -0.040                | 0.001        | 0.005           | 0.140                 | -0.001      | 0.031              | 0.001                   | 35.286           |
| TOTAL AMB1 | 0.002        | 0.001        | 0.000         | 83.385               | -0.055                | 0.001        | 0.769           | 23.437                | 0.039       | 1.795              | 0.032                   | 88.621           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.002        | 0.001        | 0.000         | 60.911               | 0.053                 | 0.001        | 0.005           | 0.158                 | -0.001      | 0.031              | 0.001                   | 38.107           |
| TOTAL AMB1 | 0.002        | 0.001        | 0.000         | 83.278               | 0.072                 | 0.001        | 0.770           | 23.456                | 0.039       | 1.795              | 0.032                   | 88.630           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.002        | 0.001        | 0.000         | 60.701               | 0.305                 | 0.001        | 0.007           | 0.207                 | -0.001      | 0.031              | 0.001                   | 44.625           |
| TOTAL AMB1 | 0.002        | 0.001        | 0.000         | 82.992               | 0.416                 | 0.001        | 0.771           | 23.507                | 0.039       | 1.795              | 0.032                   | 88.652           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.001        | 0.001        | 0.000         | 58.290               | 3.207                 | 0.001        | 0.033           | 0.948                 | -0.001      | 0.031              | 0.002                   | 78.657           |
| TOTAL AMB1 | 0.001        | 0.001        | 0.000         | 79.696               | 4.385                 | 0.001        | 0.797           | 24.281                | 0.039       | 1.795              | 0.033                   | 88.974           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO21 0.2668  
 NOX1 0.2611  
 PRIMARY PARTICULATE1 0.0287  
 SO41 0.0002  
 NO31 0.0000



VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
400 MW at Willow

DOWNWIND DISTANCE (KM) = 166.0  
PLUME ALTITUDE (M) = 321.  
PLUME-OBSERVER DISTANCE (KM) = 199.1  
AZIMUTH OF LINE-OF-SIGHT = 349.9  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV   | %REDUCED | YCAP  | L      | X      | Y DELYCAP | DELL  | C(550)  | BRATIO | DELY   | E(LUV)  | E(LAB)        |
|-------|-------|--------|------|----------|-------|--------|--------|-----------|-------|---------|--------|--------|---------|---------------|
| 70.   |       |        |      |          |       |        |        |           |       |         |        |        |         |               |
| 10.   | 0.66  | 297.1  | 0.95 | 62.54    | 83.22 | 0.3134 | 0.3293 | -0.14     | -0.08 | -0.0026 | 0.9993 | 0.0001 | -0.0001 | 0.1620 0.1272 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

400 MW at Willow

DOWNWIND DISTANCE (KM) = 166.0  
PLUME-OBSERVER DISTANCE (KM) = 199.1  
AZIMUTH OF LINE-OF-SIGHT = 349.9  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
THETA = 70.

REFLECT RP/RVO RO/RVO YCAP L X Y DELYCAP DELL C(550) BRAT/O DELX DELY E(LUV) E(LAB)  
BACKGROUND OBJECT IS BETWEEN OBSERVER AND CENTER OF PLUME AND CALCULATION IS STOPPED.

40

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

400 MW at Willow

DOWNWIND DISTANCE (KM) = 166.0  
 PLUME-OBSERVER DISTANCE (KM) = 199.1  
 AZIMUTH OF LINE-OF-SIGHT = 349.9  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 69.3 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

70.

FOR SKY BACKGROUND:

|                       | RP   | RVO   | RV   | %REDUCED | YCAP  | L      | X      | Y     | DELYCAP | DELL    | C(550) | BRATIO | DELY    | E(LUV) | E(LAB) |
|-----------------------|------|-------|------|----------|-------|--------|--------|-------|---------|---------|--------|--------|---------|--------|--------|
| 87.                   | 0.66 | 297.3 | 0.91 | 63.20    | 83.56 | 0.3189 | 0.3297 | -0.15 | -0.08   | -0.0027 | 1.0006 | 0.0000 | -0.0002 | 0.1480 | 0.1280 |
| FOR WHITE BACKGROUND: |      |       |      |          |       |        |        |       |         |         |        |        |         |        |        |
| 5.                    | 0.66 | 299.9 | 0.05 | 69.03    | 86.53 | 0.3334 | 0.3362 | -0.02 | -0.01   | -0.0004 | 1.0001 | 0.0000 | 0.0000  | 0.0207 | 0.0179 |
| FOR GRAY BACKGROUND:  |      |       |      |          |       |        |        |       |         |         |        |        |         |        |        |
| 5.                    | 0.66 | 299.8 | 0.05 | 58.83    | 81.22 | 0.3097 | 0.3238 | -0.01 | 0.00    | -0.0001 | 1.0000 | 0.0000 | 0.0000  | 0.0065 | 0.0055 |
| FOR BLACK BACKGROUND: |      |       |      |          |       |        |        |       |         |         |        |        |         |        |        |
| 5.                    | 0.66 | 299.8 | 0.06 | 54.46    | 78.75 | 0.2976 | 0.3174 | 0.00  | 0.00    | 0.0000  | 0.9999 | 0.0000 | 0.0000  | 0.0031 | 0.0020 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 1.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 2.5 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1555          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.39 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 5.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1547          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1552          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.37 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.3                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.61 |
|                       |               |                                    |      |      |      |      |      | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.39 |

# HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 10.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1531          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1536          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.3                   | 1544          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.42 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.97 |
| 0.5                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.39 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.75 |
|                       |               |                                    |      |      |      |      | 0.14 | 0.02                               | 0.00 | 0.00 | 0.00 | 0.02 | 1.00 |



HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 13.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1521          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1526          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.53 |
| 0.3                   | 1534          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 |
| 0.5                   | 1550          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 |
| 0.7                   | 1600          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |

| NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|------------------------------------|------|------|------|------|------|
| H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 3.69 |
| 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 3.47 |
| 0.03                               | 0.00 | 0.00 | 0.00 | 0.03 | 1.32 |
| 0.08                               | 0.01 | 0.00 | 0.01 | 0.06 | 0.08 |

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HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 32.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | O    | H+2S                               | H+1S | H    | H-1S | H-2S | O    |
| 0.1                   | 1421          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1426          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.3                   | 1434          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.59 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 4.12 |
| 0.5                   | 1449          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.56 | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 3.90 |
| 0.7                   | 1459          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.03                               | 0.00 | 0.00 | 0.00 | 0.03 | 1.51 |
| 1.7                   | 1600          | 0.02                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.09                               | 0.01 | 0.00 | 0.01 | 0.07 | 0.10 |
|                       |               |                                    |      |      |      | 0.01 | 0.01 | 0.12                               | 0.02 | 0.01 | 0.02 | 0.06 | 0.06 |

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HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 70.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1220          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1225          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 1.08 |
| 0.3                   | 1232          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 1.03 |
| 0.5                   | 1248          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.43 |
| 0.7                   | 1258          | 0.03                               | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 |
| 1.7                   | 1358          | 0.04                               | 0.01 | 0.00 | 0.01 | 0.02 | 0.02 |
| 3.7                   | 1600          | 0.06                               | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |

NOX-TO-HNO3 CONVERSION RATE (%/HR)

| H+2S | H+1S | H    | H-1S | H-2S | 0    |
|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.34 |
| 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 7.24 |
| 0.07 | 0.01 | 0.00 | 0.01 | 0.07 | 3.00 |
| 0.20 | 0.03 | 0.01 | 0.03 | 0.16 | 0.21 |
| 0.27 | 0.04 | 0.02 | 0.04 | 0.13 | 0.13 |
| 0.44 | 0.09 | 0.05 | 0.06 | 0.06 | 0.06 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 166.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |       |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|-------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0     |
| 0.1                   | 714           | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  |
| 0.1                   | 719           | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.28 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  |
| 0.3                   | 727           | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 2.24 | 0.04                               | 0.00 | 0.00 | 0.00 | 0.04 | 15.97 |
| 0.5                   | 743           | 0.02                               | 0.00 | 0.00 | 0.00 | 0.02 | 1.00 | 0.16                               | 0.02 | 0.01 | 0.02 | 0.16 | 15.65 |
| 0.7                   | 752           | 0.07                               | 0.01 | 0.00 | 0.01 | 0.06 | 0.08 | 0.51                               | 0.08 | 0.03 | 0.07 | 0.41 | 7.03  |
| 1.7                   | 853           | 0.10                               | 0.02 | 0.01 | 0.02 | 0.05 | 0.05 | 0.73                               | 0.12 | 0.06 | 0.12 | 0.36 | 0.54  |
| 3.7                   | 1054          | 0.26                               | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 1.79                               | 0.38 | 0.20 | 0.23 | 0.24 | 0.36  |
| 8.8                   | 1600          | 0.07                               | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.48                               | 0.29 | 0.15 | 0.15 | 0.15 | 0.15  |

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# PLOT FILE VERIFICATION

## OBSERVER-BASED DATA

### SKY BACKGROUND

| NX                                   | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| DISTANCE (KM)                        | 1.     | 3.     | 5.     | 10.    | 13.    | 32.    | 70.    | 166.   |
| REDUCTION OF VISUAL RANGE (%)        | 0.307  | 0.287  | 0.323  | 0.377  | 0.382  | 0.399  | 0.550  | 0.951  |
| BLUE-RED RATIO                       | 0.991  | 0.988  | 0.986  | 0.986  | 0.987  | 0.994  | 0.999  | 0.999  |
| PLUME CONTRAST AT 0.55 MICRONS       | -0.003 | -0.007 | -0.010 | -0.012 | -0.012 | -0.009 | -0.007 | -0.003 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.441  | 0.719  | 0.948  | 1.041  | 0.977  | 0.590  | 0.326  | 0.127  |

### WHITE BACKGROUND

| NX                                   | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8     |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|-------|
| DISTANCE (KM)                        | 1.     | 3.     | 5.     | 10.    | 13.    | 32.    | 70.    | 166.  |
| REDUCTION OF VISUAL RANGE (%)        | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000 |
| BLUE-RED RATIO                       | 0.993  | 0.990  | 0.987  | 0.987  | 0.988  | 0.995  | 1.000  | 0.000 |
| PLUME CONTRAST AT 0.55 MICRONS       | -0.003 | -0.007 | -0.010 | -0.012 | -0.012 | -0.009 | -0.007 | 0.000 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.406  | 0.687  | 0.913  | 1.002  | 0.938  | 0.557  | 0.321  | 0.000 |

### GRAY BACKGROUND

| NX                                   | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8     |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|-------|
| DISTANCE (KM)                        | 1.     | 3.     | 5.     | 10.    | 13.    | 32.    | 70.    | 166.  |
| REDUCTION OF VISUAL RANGE (%)        | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000 |
| BLUE-RED RATIO                       | 0.991  | 0.989  | 0.986  | 0.986  | 0.987  | 0.994  | 0.999  | 0.000 |
| PLUME CONTRAST AT 0.55 MICRONS       | -0.003 | -0.007 | -0.010 | -0.012 | -0.011 | -0.008 | -0.005 | 0.000 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.440  | 0.700  | 0.919  | 1.002  | 0.936  | 0.540  | 0.261  | 0.000 |

BLACK BACKGROUND

| NX                                      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8     |
|-----------------------------------------|--------|--------|--------|--------|--------|--------|--------|-------|
| DISTANCE (KM)                           | 1.     | 3.     | 5.     | 10.    | 13.    | 32.    | 70.    | 166.  |
| REDUCTION OF VISUAL<br>RANGE (%)        | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000 |
| BLUE-RED RATIO                          | 0.989  | 0.988  | 0.986  | 0.986  | 0.987  | 0.994  | 0.998  | 0.000 |
| PLUME CONTRAST AT<br>0.55 MICRONS       | -0.002 | -0.004 | -0.009 | -0.011 | -0.011 | -0.008 | -0.005 | 0.000 |
| PLUME PERCEPTIBILITY<br>DELTA E(L*A*B*) | 0.457  | 0.707  | 0.922  | 1.004  | 0.936  | 0.535  | 0.242  | 0.000 |

T PLUNEN.00T

VISUAL IMPACT ASSESSMENT FOR 600 MW at Nenana

EMISSIONS SOURCE DATA

ELEVATION OF SITE = 350. FEET MSL  
107. METERS MSL

NO. OF UNITS = 1

STACK HEIGHT = 440. FEET  
134. METERS

FLUE GAS FLOW RATE = 3000000. CU FT/MIN  
1415.63 CU M/SEC

FLUE GAS TEMPERATURE = 190. F  
361. K

FLUE GAS OXYGEN CONTENT = 3.0 MOL PERCENT

SO2 EMISSION RATE (TOTAL) = 8.16 TONS/DAY  
8.568E+01 G/SEC

NOX EMISSION RATE (TOTAL, AS NO2) = 41.90 TONS/DAY  
4.400E+02 G/SEC

PARTICULATE EMISSION RATE (TOTAL) = 0.34 TONS/DAY  
3.570E+00 G/SEC

METEOROLOGICAL AND AMBIENT AIR QUALITY DATA

WINDSPEED = 4.5 MILES/HR  
2.0 M/SEC

PASQUILL-GIFFORD-TURNER STABILITY CATEGORY D

LAPSE RATE = 1.00 F/1000 FT  
1.823E-03 K/M

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AMBIENT TEMPERATURE = 50.0 F  
283.2 K

RELATIVE HUMIDITY = 75.0 %

MIXING DEPTH = 1000. M

AMBIENT PRESSURE = 0.99 ATM

BACKGROUND NOX CONCENTRATION = 0.000 PPM

BACKGROUND NO2 CONCENTRATION = 0.000 PPM

BACKGROUND OZONE CONCENTRATION = 0.040 PPM

BACKGROUND SO2 CONCENTRATION = 0.000 PPM

BACKGROUND COARSE MODE CONCENTRATION = 10.0 UG/M3

BACKGROUND SULFATE CONCENTRATION = 0.2 UG/M3

BACKGROUND NITRATE CONCENTRATION = 0.0 UG/M3

BACKGROUND VISUAL RANGE = 250.0 KILOMETERS

SO2 DEPOSITION VELOCITY = 1.00 CM/SEC

NOX DEPOSITION VELOCITY = 1.00 CM/SEC

COARSE PARTICULATE DEPOSITION VELOCITY = 0.10CM/SEC,  
SUBMICRON PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC

#### AEROSOL STATISTICS

|                                      | BACKGROUND           |                | PLUME                |                |
|--------------------------------------|----------------------|----------------|----------------------|----------------|
|                                      | ACCUMULATION<br>MODE | COARSE<br>MODE | ACCUMULATION<br>MODE | COARSE<br>MODE |
| MASS MEDIAN<br>RADIUS<br>MICROMETERS | 0.160                | 3.000          | 0.100                | 1.000          |
| GEOMETRIC<br>STANDARD<br>DEVIATION   | 2.000                | 2.200          | 2.000                | 2.000          |
| PARTICLE<br>DENSITY<br>G/(CM**3)     | 1.500                | 2.500          | 1.500                | 2.500          |

GEOMETRY OF USER-SPECIFIED PLUME-OBSERVER-SUN ORIENTATION

WIND DIRECTION (DEGREES) = 18.0



SIMULATION IS FOR 1600. HOURS ON 6/21

SOLAR ZENITH ANGLE (DEGREES) = 68.5

SOLAR AZIMUTH ANGLE (DEGREES) = 279.6

GEOMETRIES FOR LINES-OF-SIGHT THROUGH PLUME PARCELS AT GIVEN DOWNWIND DISTANCES (X).

| X (KM) | AZIMUTH | RP    | ALPHA | BETA | THETA |
|--------|---------|-------|-------|------|-------|
| 1.0    | 352.2   | 150.4 | 25.8  | 0.1  | 73.8  |
| 2.5    | 352.0   | 149.1 | 26.0  | 0.1  | 73.6  |
| 5.0    | 351.6   | 148.8 | 26.4  | 0.1  | 73.2  |
| 10.0   | 350.7   | 142.4 | 27.3  | 0.1  | 72.4  |
| 64.0   | 336.0   | 97.6  | 42.1  | 0.2  | 58.9  |
| 96.0   | 319.8   | 76.9  | 58.2  | 0.2  | 44.6  |
| 112.0  | 308.5   | 69.8  | 69.5  | 0.2  | 35.3  |
| 128.0  | 295.4   | 65.9  | 82.6  | 0.3  | 26.2  |

BACKGROUND CONDITIONS

ACCUMULATION MODE  
MASS RADIUS SIGMA  
0.1600E+00 0.2000E+01

BSCAT.55/MASS  
0.1072E-01

COARSE PARTICLE MODE

MASS RADIUS SIGMA BSCAT.55/MASS  
0.3000E+01 0.220E+01 0.3343E-03

PRIMARY PARTICLE MODE

MASS RADIUS SIGMA BSCAT.55/MASS  
0.1000E+01 0.2000E+01 0.1053E-02

COEFFICIENTS AT 0.55 MICROMETERS, 1./KM  
BTARAY = 0.1149E-01 BTAAER = 0.5830E-02 ABSN02 = 0.0000E+00 BTABAC = 0.1565E-01



600 MW at Nenana

| TIME<br>(SEC) | X<br>(M) | DELTA H<br>(M) | U<br>(M/S) | W<br>(M/S) | V<br>(M/S) | SIGMA<br>(M) | TEMP<br>(K) | O2<br>MOL P | NO2-NO<br>EQUIL | RATIO<br>ACTUAL | NOX<br>(PPM) | NO<br>(PPM) | NO2T<br>(PPM) | SO2<br>(PPM) | PARTICULATE<br>UG/M3 |
|---------------|----------|----------------|------------|------------|------------|--------------|-------------|-------------|-----------------|-----------------|--------------|-------------|---------------|--------------|----------------------|
| 0.            | 0.0      | 0.0            | 5.34       | 20.10      | 20.10      | 0.0          | 360.9       | 3.0         | 1.6E+04         | 1.4E-03         | 202.529      | 202.246     | 0.283         | 28.355       | 3.09E+03             |
| 10.           | 53.4     | 40.2           | 5.34       | 1.97       | 5.69       | 9.3          | 313.8       | 13.9        | 2.9E+05         | 2.4E-03         | 79.776       | 79.581      | 0.195         | 11.169       | 1.22E+03             |
| 20.           | 106.9    | 63.8           | 5.34       | 1.59       | 5.57       | 14.8         | 294.8       | 18.3        | 7.8E+05         | 4.8E-03         | 30.387       | 30.241      | 0.146         | 4.254        | 4.64E+02             |
| 30.           | 160.3    | 83.6           | 5.34       | 1.39       | 5.52       | 19.4         | 289.9       | 19.4        | 1.0E+06         | 6.1E-03         | 17.565       | 17.457      | 0.107         | 2.459        | 2.68E+02             |
| 40.           | 213.8    | 101.3          | 5.34       | 1.27       | 5.49       | 23.6         | 287.7       | 19.9        | 1.1E+06         | 7.0E-03         | 11.944       | 11.862      | 0.083         | 1.672        | 1.82E+02             |
| 50.           | 267.2    | 117.5          | 5.34       | 1.18       | 5.47       | 27.3         | 286.6       | 20.2        | 1.2E+06         | 7.6E-03         | 8.866        | 8.800       | 0.067         | 1.241        | 1.35E+02             |
| 60.           | 320.6    | 132.7          | 5.34       | 1.11       | 5.46       | 30.9         | 285.8       | 20.3        | 1.2E+06         | 8.0E-03         | 6.953        | 6.898       | 0.055         | 0.974        | 1.06E+02             |
| 70.           | 374.1    | 147.1          | 5.34       | 1.06       | 5.45       | 34.2         | 285.3       | 20.4        | 1.3E+06         | 8.4E-03         | 5.663        | 5.616       | 0.047         | 0.793        | 8.65E+01             |
| 80.           | 427.5    | 160.8          | 5.34       | 1.01       | 5.44       | 37.4         | 285.0       | 20.5        | 1.3E+06         | 8.7E-03         | 4.741        | 4.700       | 0.041         | 0.664        | 7.24E+01             |
| 90.           | 480.9    | 173.9          | 5.34       | 0.97       | 5.43       | 40.4         | 284.7       | 20.6        | 1.3E+06         | 8.9E-03         | 4.053        | 4.018       | 0.036         | 0.568        | 6.19E+01             |
| 100.          | 534.4    | 186.6          | 5.34       | 0.94       | 5.43       | 43.4         | 284.5       | 20.6        | 1.3E+06         | 9.1E-03         | 3.523        | 3.492       | 0.032         | 0.493        | 5.38E+01             |
| 110.          | 587.8    | 198.8          | 5.34       | 0.91       | 5.42       | 46.2         | 284.3       | 20.7        | 1.3E+06         | 9.3E-03         | 3.104        | 3.075       | 0.029         | 0.435        | 4.74E+01             |
| 120.          | 641.3    | 210.7          | 5.34       | 0.88       | 5.42       | 49.0         | 284.2       | 20.7        | 1.3E+06         | 9.5E-03         | 2.765        | 2.739       | 0.026         | 0.387        | 4.22E+01             |
| 130.          | 694.7    | 214.6          | 5.34       | 0.86       | 5.41       | 49.9         | 284.2       | 20.7        | 1.3E+06         | 9.6E-03         | 2.667        | 2.641       | 0.025         | 0.373        | 4.07E+01             |
| 140.          | 748.1    | 214.6          | 5.34       | 0.84       | 5.41       | 49.9         | 284.2       | 20.7        | 1.3E+06         | 9.7E-03         | 2.668        | 2.643       | 0.026         | 0.374        | 4.07E+01             |
| 150.          | 801.6    | 214.6          | 5.34       | 0.82       | 5.41       | 49.9         | 284.2       | 20.7        | 1.3E+06         | 9.9E-03         | 2.670        | 2.644       | 0.026         | 0.374        | 4.08E+01             |
| 160.          | 855.0    | 214.6          | 5.34       | 0.80       | 5.40       | 49.9         | 284.2       | 20.7        | 1.3E+06         | 1.0E-02         | 2.671        | 2.645       | 0.027         | 0.374        | 4.08E+01             |
| 170.          | 908.5    | 214.6          | 5.34       | 0.79       | 5.40       | 49.9         | 284.2       | 20.7        | 1.3E+06         | 1.0E-02         | 2.672        | 2.645       | 0.027         | 0.374        | 4.08E+01             |
| 180.          | 961.9    | 214.6          | 5.34       | 0.77       | 5.40       | 49.9         | 284.2       | 20.7        | 1.3E+06         | 1.0E-02         | 2.673        | 2.646       | 0.027         | 0.374        | 4.08E+01             |

# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 1.0  
 PLUME ALTITUDE (M) = 349.  
 SIGMA Y (M) = 78.  
 SIGMA Z (M) = 35.  
 SO2-SO4 CONVERSION RATE= 0.0000 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0000 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.332        | 0.042        | 0.000         | 12.725               | 0.000                 | 0.046        | 0.000           | 0.000                 | -0.039      | 5.070              | 0.053                   | 0.000            |
| TOTAL AMB1 | 0.332        | 0.042        | 0.000         | 12.725               | 0.000                 | 0.046        | 0.232           | 0.127                 | 0.001       | 15.302             | 0.112                   | 22.265           |

|            |       |       |       |        |       |       |       |         |        |        |       |        |
|------------|-------|-------|-------|--------|-------|-------|-------|---------|--------|--------|-------|--------|
| TOTAL AMB] | 1.488 | 0.055 | 0.000 | 3.701  | 0.000 | 0.208 | 0.000 | 0.028   | 0.000  | 32.955 | 0.298 | 0.000  |
| H          |       |       |       |        |       |       |       |         |        |        |       |        |
| INCREMENT] | 2.454 | 0.065 | 0.000 | 2.655  | 0.000 | 0.344 | 0.000 | 0.000   | -0.040 | 37.463 | 0.394 | 0.000  |
| TOTAL AMB] | 2.454 | 0.065 | 0.000 | 2.655  | 0.000 | 0.344 | 0.232 | 0.017   | 0.000  | 47.695 | 0.453 | 5.492  |
| H-1S       |       |       |       |        |       |       |       |         |        |        |       |        |
| INCREMENT] | 1.488 | 0.055 | 0.000 | 3.701  | 0.000 | 0.208 | 0.000 | 0.000   | -0.040 | 22.723 | 0.239 | 0.000  |
| TOTAL AMB] | 1.488 | 0.055 | 0.000 | 3.701  | 0.000 | 0.208 | 0.232 | 0.028   | 0.000  | 32.955 | 0.298 | 8.357  |
| H-2S       |       |       |       |        |       |       |       |         |        |        |       |        |
| INCREMENT] | 0.332 | 0.042 | 0.000 | 12.725 | 0.000 | 0.046 | 0.000 | 0.000   | -0.039 | 5.070  | 0.053 | 0.000  |
| TOTAL AMB] | 0.332 | 0.042 | 0.000 | 12.725 | 0.000 | 0.046 | 0.232 | 0.127   | 0.001  | 15.302 | 0.112 | 22.265 |
| 0          |       |       |       |        |       |       |       |         |        |        |       |        |
| INCREMENT] | 0.000 | 0.000 | 0.000 | 0.000  | 0.000 | 0.000 | 0.000 | 0.000   | 0.000  | 0.000  | 0.000 | 0.000  |
| TOTAL AMB] | 0.000 | 0.000 | 0.000 | 0.000  | 0.000 | 0.000 | 0.232 | 100.000 | 0.040  | 10.232 | 0.058 | 42.655 |

# CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2] 0.0000  
 NOX] 0.0000  
 PRIMARY PARTICULATE] 0.0000  
 SO4] 0.0000  
 NO3] 0.0000

## VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS 600 MW at Nenana

DOWNWIND DISTANCE (KM) = 1.0  
 PLUME ALTITUDE (M) = 349.  
 PLUME-OBSERVER DISTANCE (KM) = 150.4  
 AZIMUTH OF LINE-OF-SIGHT = 352.2  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 SIGHT PATH IS THROUGH PLUME CENTER

THETA ALPHA RP/RV0 RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 1.0  
PLUME-OBSERVER DISTANCE (KM) = 150.4  
AZIMUTH OF LINE-OF-SIGHT = 352.2  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA = 74.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX    | DELY    | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|---------|---------|--------|--------|
| 1.0     | 0.60   | 0.80   | 61.13 | 82.47 | 0.3192 | 0.3268 | -0.17   | -0.09 | -0.0027 | 1.0040 | -0.0002 | -0.0002 | 0.1529 | 0.1250 |
| 0.3     | 0.60   | 0.80   | 57.44 | 80.44 | 0.3085 | 0.3219 | -0.06   | -0.03 | -0.0012 | 1.0002 | 0.0000  | -0.0001 | 0.0648 | 0.0531 |
| 0.0     | 0.60   | 0.80   | 55.86 | 79.55 | 0.3036 | 0.3197 | -0.01   | -0.01 | -0.0005 | 0.9978 | 0.0001  | 0.0000  | 0.0973 | 0.0614 |

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 1.0  
PLUME-OBSERVER DISTANCE (KM) = 150.4  
AZIMUTH OF LINE-OF-SIGHT = 352.2  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA LENGTH RP/RVO RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

74.

FOR SKY BACKGROUND:

0. 0.60 248.4

0.66

58.92

81.27

0.3117

0.3242

-0.07

-0.04

-0.0013

1.0009

0.0000

-0.0001

0.0636

0.0563

FOR WHITE BACKGROUND:

0. 0.60 248.4

0.64

61.34

82.58

0.3195

0.3270

-0.13

-0.07

-0.0021

1.0040

-0.0002

-0.0002

0.1382

0.1049

FOR GRAY BACKGROUND:

0. 0.60 248.3

0.67

57.51

80.48

0.3086

0.3220

-0.04

-0.02

-0.0008

1.0002

0.0000

0.0000

0.0414

0.0339

FOR BLACK BACKGROUND:

0. 0.60 248.3

0.69

55.87

79.56

0.3036

0.3197

0.00

0.00

-0.0002

0.9978

0.0001

0.0000

0.0826

0.0511

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 2.5  
PLUME ALTITUDE (M) = 349.  
SIGMA Y (M) = 167.  
SIGMA Z (M) = 61.

NOX-NO3 CONVERSION RATE=

0.0001 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY BSP-TOTAL<br>(UG/M3) (10-4 M-1) | ESPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|-----------------------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.089        | 0.036        | 0.000         | 39.918               | 0.000                 | 0.012        | 0.000           | 0.000                 | -0.035      | 1.362                                   | 0.006            |
| TOTAL AMBJ | 0.089        | 0.036        | 0.000         | 39.918               | 0.000                 | 0.012        | 0.232           | 0.471                 | 0.005       | 11.594                                  | 0.073            |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.400        | 0.044        | 0.000         | 11.004               | 0.000                 | 0.056        | 0.000           | 0.000                 | -0.039      | 6.103                                   | 0.001            |
| TOTAL AMBJ | 0.400        | 0.044        | 0.000         | 11.004               | 0.000                 | 0.056        | 0.232           | 0.105                 | 0.001       | 16.335                                  | 0.123            |
| H          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.659        | 0.049        | 0.000         | 7.360                | 0.000                 | 0.092        | 0.000           | 0.000                 | -0.039      | 10.062                                  | 0.001            |
| TOTAL AMBJ | 0.659        | 0.049        | 0.000         | 7.360                | 0.000                 | 0.092        | 0.232           | 0.064                 | 0.001       | 20.294                                  | 0.164            |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.400        | 0.044        | 0.000         | 11.004               | 0.000                 | 0.056        | 0.000           | 0.000                 | -0.039      | 6.103                                   | 0.001            |
| TOTAL AMBJ | 0.400        | 0.044        | 0.000         | 11.004               | 0.000                 | 0.056        | 0.232           | 0.105                 | 0.001       | 16.335                                  | 0.123            |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.089        | 0.036        | 0.000         | 39.918               | 0.000                 | 0.012        | 0.000           | 0.000                 | -0.035      | 1.362                                   | 0.006            |
| TOTAL AMBJ | 0.089        | 0.036        | 0.000         | 39.918               | 0.000                 | 0.012        | 0.232           | 0.471                 | 0.005       | 11.594                                  | 0.073            |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.000        | 0.000        | 0.000         | 0.000                | 0.000                 | 0.000        | 0.000           | 0.030                 | 0.000       | 0.000                                   | 9.776            |
| TOTAL AMBJ | 0.000        | 0.000        | 0.000         | 82.705               | 0.000                 | 0.000        | 0.232           | 99.977                | 0.040       | 10.232                                  | 0.058            |

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

|                      |        |
|----------------------|--------|
| SO2J                 | 0.0000 |
| NOXJ                 | 0.0000 |
| PRIMARY PARTICULATEJ | 0.0000 |
| SO4J                 | 0.0000 |
| NO3J                 | 0.0000 |

DOWNWIND DISTANCE (KM) = 2.5  
 PLUME ALTITUDE (M) = 349.  
 PLUME-OBSERVER DISTANCE (KM) = 149.1  
 AZIMUTH OF LINE-OF-SIGHT = 352.0  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|-------|-------|--------|-------|----------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 74.   |       |        |       |          |       |       |        |        |         |       |         |        |        |         |        |        |
| 26.   |       | 0.60   | 247.9 | 0.84     | 59.04 | 81.33 | 0.3096 | 0.3245 | -0.16   | -0.09 | -0.0030 | 0.9957 | 0.0001 | -0.0001 | 0.1697 | 0.1359 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
 OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
 FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 2.5  
 PLUME-OBSERVER DISTANCE (KM) = 149.1  
 AZIMUTH OF LINE-OF-SIGHT = 352.0  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 THETA = 74.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX    | DELY    | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|---------|---------|--------|--------|
| 1.0     | 0.60   | 0.80   | 61.25 | 82.53 | 0.3194 | 0.3269 | -0.21   | -0.11 | -0.0036 | 1.0025 | -0.0001 | -0.0002 | 0.1747 | 0.1550 |
| 0.3     | 0.60   | 0.80   | 57.55 | 80.51 | 0.3086 | 0.3221 | -0.10   | -0.06 | -0.0020 | 1.0002 | 0.0000  | -0.0001 | 0.1062 | 0.0880 |
| 0.0     | 0.60   | 0.80   | 55.97 | 79.61 | 0.3037 | 0.3199 | -0.06   | -0.03 | -0.0012 | 0.9987 | 0.0001  | 0.0000  | 0.1057 | 0.0738 |

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 2.5  
 PLUME-OBSERVER DISTANCE (KM) = 149.1  
 AZIMUTH OF LINE-OF-SIGHT = 352.0  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

| THETA                 | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX    | DELY    | E(LUV) | E(LAB) |
|-----------------------|-------|--------|-------|----------|-------|-------|--------|--------|---------|-------|---------|--------|---------|---------|--------|--------|
| 74.                   |       |        |       |          |       |       |        |        |         |       |         |        |         |         |        |        |
| FOR SKY BACKGROUND:   |       |        |       |          |       |       |        |        |         |       |         |        |         |         |        |        |
| 1.                    |       | 0.60   | 248.5 | 0.58     | 59.07 | 81.35 | 0.3119 | 0.3244 | -0.09   | -0.05 | -0.0017 | 1.0006 | 0.0000  | -0.0001 | 0.0812 | 0.0712 |
| FOR WHITE BACKGROUND: |       |        |       |          |       |       |        |        |         |       |         |        |         |         |        |        |
| 1.                    |       | 0.60   | 248.6 | 0.57     | 61.49 | 82.66 | 0.3197 | 0.3272 | -0.14   | -0.07 | -0.0023 | 1.0024 | -0.0001 | -0.0002 | 0.1154 | 0.1003 |
| FOR GRAY BACKGROUND:  |       |        |       |          |       |       |        |        |         |       |         |        |         |         |        |        |
| 1.                    |       | 0.60   | 248.5 | 0.60     | 57.65 | 80.51 | 0.3087 | 0.3222 | -0.07   | -0.03 | -0.0011 | 1.0001 | 0.0000  | -0.0001 | 0.0415 | 0.0508 |



| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELY   | E(LUV)  | E(LAB) |        |
|-------|-------|--------|-------|----------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 74.   | 26.   | 0.60   | 247.9 | 0.84     | 59.04 | 81.33 | 0.3096 | 0.3245 | -0.16   | -0.09 | -0.0030 | 0.9997 | 0.0001 | -0.0001 | 0.1697 | 0.1359 |

600 MW at Nenana

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX    | DELY    | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|---------|---------|--------|--------|
| 1.0     | 0.60   | 0.80   | 61.25 | 82.53 | 0.3194 | 0.3269 | -0.21   | -0.11 | -0.0036 | 1.0025 | -0.0001 | -0.0002 | 0.1747 | 0.1550 |
| 0.3     | 0.60   | 0.80   | 57.55 | 80.51 | 0.3086 | 0.3221 | -0.10   | -0.06 | -0.0020 | 1.0002 | 0.0000  | -0.0001 | 0.1062 | 0.0880 |
| 0.0     | 0.60   | 0.80   | 55.97 | 79.61 | 0.3037 | 0.3199 | -0.06   | -0.03 | -0.0012 | 0.9987 | 0.0001  | 0.0000  | 0.1057 | 0.0738 |

600 MW at Nenana

| THETA LENGTH RP/RVO   | RV   | ZREDUCED | YCAP | L     | X     | Y      | DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY    | E(LUV)  | E(LAB)        |
|-----------------------|------|----------|------|-------|-------|--------|---------|-------|--------|---------|--------|---------|---------|---------------|
| 74.                   |      |          |      |       |       |        |         |       |        |         |        |         |         |               |
| FOR SKY BACKGROUND:   |      |          |      |       |       |        |         |       |        |         |        |         |         |               |
| 1.                    | 0.60 | 248.5    | 0.58 | 59.07 | 81.35 | 0.3119 | 0.3244  | -0.09 | -0.05  | -0.0017 | 1.0006 | 0.0000  | -0.0001 | 0.0812 0.0712 |
| FOR WHITE BACKGROUND: |      |          |      |       |       |        |         |       |        |         |        |         |         |               |
| 1.                    | 0.60 | 248.6    | 0.57 | 61.49 | 82.66 | 0.3197 | 0.3272  | -0.14 | -0.07  | -0.0023 | 1.0024 | -0.0001 | -0.0002 | 0.1154 0.1003 |
| FOR GRAY BACKGROUND:  |      |          |      |       |       |        |         |       |        |         |        |         |         |               |
| 1.                    | 0.60 | 248.5    | 0.60 | 57.65 | 80.54 | 0.3087 | 0.3222  | -0.04 | -0.03  | -0.0011 | 1.0001 | 0.0000  | -0.0001 | 0.0615 0.0508 |

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 5.0  
 PLUME ALTITUDE (M) = 349.  
 SIGMA Y (M) = 304.  
 SIGMA Z (M) = 92.  
 SO2-SO4 CONVERSION RATE = 0.0001 PERCENT/HR  
 NOX-NO3 CONVERSION RATE = 0.0007 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | NO3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|--------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.032        | 0.022        | 0.000         | 69.110               | 0.000                 | 0.005        | 0.000           | 0.000                 | -0.022       | 0.493              | 0.005                   | 0.069            |
| TOTAL AMBJ | 0.032        | 0.022        | 0.000         | 69.110               | 0.000                 | 0.005        | 0.232           | 1.290                 | 0.018        | 10.725             | 0.063                   | 39.171           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.145        | 0.039        | 0.000         | 26.925               | 0.000                 | 0.020        | 0.000           | 0.000                 | -0.037       | 2.209              | 0.023                   | 0.009            |
| TOTAL AMBJ | 0.145        | 0.039        | 0.000         | 26.925               | 0.000                 | 0.020        | 0.232           | 0.291                 | 0.003        | 12.441             | 0.082                   | 30.491           |
| H          |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.239        | 0.042        | 0.000         | 17.583               | 0.000                 | 0.033        | 0.000           | 0.000                 | -0.038       | 3.642              | 0.038                   | 0.005            |
| TOTAL AMBJ | 0.239        | 0.042        | 0.000         | 17.583               | 0.000                 | 0.033        | 0.232           | 0.177                 | 0.002        | 13.874             | 0.097                   | 25.730           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.145        | 0.039        | 0.000         | 26.925               | 0.000                 | 0.020        | 0.000           | 0.000                 | -0.037       | 2.209              | 0.023                   | 0.009            |
| TOTAL AMBJ | 0.145        | 0.039        | 0.000         | 26.925               | 0.000                 | 0.020        | 0.232           | 0.291                 | 0.003        | 12.441             | 0.082                   | 30.491           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.032        | 0.022        | 0.000         | 69.110               | 0.000                 | 0.005        | 0.000           | 0.000                 | -0.022       | 0.493              | 0.005                   | 0.069            |
| TOTAL AMBJ | 0.032        | 0.022        | 0.000         | 69.110               | 0.000                 | 0.005        | 0.232           | 1.290                 | 0.018        | 10.725             | 0.063                   | 39.171           |
| 0          |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENTJ | 0.000        | 0.000        | 0.000         | 0.000                | 0.285                 | 0.000        | 0.000           | 0.081                 | 0.000        | 0.006              | 0.000                   | 22.897           |
| TOTAL AMBJ | 0.000        | 0.000        | 0.000         | 82.877               | 0.285                 | 0.000        | 0.232           | 52.922                | 0.040        | 10.238             | 0.058                   | 42.628           |

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0000  
 NOXJ 0.0000  
 PRIMARY PARTICULATEJ 0.0000  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
600 MW at Nenana

DOWNWIND DISTANCE (KM) = 5.0  
PLUME ALTITUDE (M) = 349  
PLUME-OBSERVER DISTANCE (KM) = 146.8  
AZIMUTH OF LINE-OF-SIGHT = 351.6  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|-------|-------|--------|-------|----------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 73.   |       |        |       |          |       |       |        |        |         |       |         |        |        |         |        |        |
| 26.   |       | 0.59   | 247.5 | 0.99     | 59.24 | 81.44 | 0.3099 | 0.3248 | -0.22   | -0.12 | -0.0040 | 0.9998 | 0.0002 | -0.0002 | 0.2352 | 0.1865 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 5.0  
PLUME-OBSERVER DISTANCE (KM) = 146.8  
AZIMUTH OF LINE-OF-SIGHT = 351.6  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA = 73.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 1.0     | 0.59   | 0.80   | 61.44 | 82.63 | 0.3196 | 0.3271 | -0.27   | -0.14 | -0.0047 | 1.0018 | 0.0000 | -0.0003 | 0.2361 | 0.2077 |
| 0.3     | 0.59   | 0.80   | 57.76 | 80.62 | 0.3088 | 0.3223 | -0.15   | -0.08 | -0.0029 | 1.0002 | 0.0001 | -0.0001 | 0.1537 | 0.1274 |
| 0.0     | 0.59   | 0.80   | 56.18 | 79.73 | 0.3039 | 0.3201 | -0.10   | -0.06 | -0.0020 | 0.9992 | 0.0001 | -0.0001 | 0.1365 | 0.1012 |

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 5.0  
PLUME-OBSERVER DISTANCE (KM) = 146.8



ELE ON A OF E-OF HT 0. SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 THETA LENGTH RP/RV0 RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

73.

FOR SKY BACKGROUND:

2. 0.59 248.3 0.68 59.29 81.47 0.3121 0.3246 -0.13 -0.07 -0.0024 1.0004 0.0000 -0.0001 0.1243 0.1061

FOR WHITE BACKGROUND:

2. 0.59 248.4 0.66 61.69 82.77 0.3199 0.3274 -0.18 -0.10 -0.0031 1.0017 0.0000 -0.0002 0.1525 0.1354

FOR GRAY BACKGROUND:

2. 0.59 248.3 0.69 57.86 80.68 0.3089 0.3224 -0.09 -0.05 -0.0018 1.0001 0.0000 -0.0001 0.0970 0.0802

FOR BLACK BACKGROUND:

2. 0.59 248.2 0.71 56.22 79.76 0.3039 0.3202 -0.06 -0.03 -0.0012 0.9992 0.0001 0.0000 0.0913 0.0654

# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 10.0

PLUME ALTITUDE (M) = 349.

SIGMA Y (M) = 559.

SIGMA Z (M) = 137.

SO2-SO4 CONVERSION RATE= 0.0003 PERCENT/HR

NOX-NO3 CONVERSION RATE= 0.0024 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4= /STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|------------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENT1 | 0.012        | 0.009        | 0.000         | 79.232               | 0.010                 | 0.002        | 0.000           | 0.002                  | -0.009      | 0.180              | 0.002                   | 0.759            |
| TOTAL AMB1 | 0.012        | 0.009        | 0.000         | 79.236               | 0.010                 | 0.002        | 0.232           | 3.456                  | 0.031       | 10.412             | 0.060                   | 41.325           |
| H+1S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENT1 | 0.053        | 0.030        | 0.000         | 56.908               | 0.000                 | 0.007        | 0.000           | 0.000                  | -0.029      | 0.807              | 0.009                   | 0.073            |
| TOTAL AMB1 | 0.053        | 0.030        | 0.000         | 56.911               | 0.000                 | 0.007        | 0.232           | 0.792                  | 0.011       | 11.039             | 0.067                   | 37.234           |
| H          |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENT1 | 0.087        | 0.036        | 0.000         | 41.078               | 0.000                 | 0.012        | 0.000           | 0.000                  | -0.034      | 1.331              | 0.014                   | 0.038            |
| TOTAL AMB1 | 0.087        | 0.036        | 0.000         | 41.080               | 0.000                 | 0.012        | 0.232           | 0.482                  | 0.006       | 11.563             | 0.072                   | 34.394           |
| H-1S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENT1 | 0.053        | 0.030        | 0.000         | 56.896               | 0.000                 | 0.007        | 0.000           | 0.000                  | -0.029      | 0.807              | 0.009                   | 0.073            |
| TOTAL AMB1 | 0.053        | 0.030        | 0.000         | 56.899               | 0.000                 | 0.007        | 0.232           | 0.792                  | 0.011       | 11.039             | 0.067                   | 37.232           |
| H-2S       |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENT1 | 0.013        | 0.010        | 0.000         | 78.927               | 0.010                 | 0.002        | 0.000           | 0.002                  | -0.010      | 0.192              | 0.002                   | 0.759            |
| TOTAL AMB1 | 0.013        | 0.010        | 0.000         | 78.931               | 0.010                 | 0.002        | 0.232           | 3.251                  | 0.030       | 10.424             | 0.060                   | 41.241           |
| 0          |              |              |               |                      |                       |              |                 |                        |             |                    |                         |                  |
| INCREMENT1 | 0.007        | 0.006        | 0.000         | 80.287               | 0.892                 | 0.001        | 0.007           | 0.189                  | -0.006      | 0.106              | 0.002                   | 40.960           |
| TOTAL AMB1 | 0.007        | 0.006        | 0.000         | 80.291               | 0.892                 | 0.001        | 0.239           | 5.889                  | 0.034       | 10.338             | 0.060                   | 42.601           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO21 0.0000  
 NOX1 0.0000  
 PRIMARY PARTICULATE1 0.0000  
 SO41 0.0000  
 NO31 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
600 MW at Nenana

DOWNWIND DISTANCE (KM) = 10.0  
PLUME ALTITUDE (M) = 349.  
PLUME-OBSERVER DISTANCE (KM) = 142.4  
AZIMUTH OF LINE-OF-SIGHT = 350.7  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

63

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|-------|-------|--------|-------|----------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 72.   | 27.   | 0.57   | 247.2 | 1.11     | 59.65 | 81.66 | 0.3103 | 0.3252 | -0.28   | -0.15 | -0.0051 | 0.9998 | 0.0002 | -0.0002 | 0.3012 | 0.2366 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 10.0  
PLUME-OBSERVER DISTANCE (KM) = 142.4  
AZIMUTH OF LINE-OF-SIGHT = 350.7  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA = 72.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 1.0     | 0.57   | 0.80   | 61.83 | 82.84 | 0.3198 | 0.3275 | -0.33   | -0.17 | -0.0058 | 1.0014 | 0.0000 | -0.0004 | 0.2987 | 0.2589 |
| 0.3     | 0.57   | 0.80   | 58.16 | 80.84 | 0.3092 | 0.3228 | -0.20   | -0.11 | -0.0038 | 1.0001 | 0.0001 | -0.0002 | 0.2047 | 0.1682 |
| 0.0     | 0.57   | 0.80   | 56.58 | 79.94 | 0.3043 | 0.3204 | -0.14   | -0.08 | -0.0028 | 0.9994 | 0.0001 | -0.0001 | 0.1784 | 0.1354 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 10.0  
 PLUME-OBSERVER DISTANCE (KM) = 142.4  
 AZIMUTH OF LINE-OF-SIGHT = 350.7  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

72.

FOR SKY BACKGROUND:

3. 0.57 247.8 0.88 59.70 81.69 0.3125 0.3251 -0.20 -0.11 -0.0037 1.0003 0.0001 -0.0002 0.2004 0.1673

FOR WHITE BACKGROUND:

3. 0.57 247.9 0.86 62.06 82.96 0.3202 0.3278 -0.26 -0.14 -0.0046 1.0013 0.0000 -0.0003 0.2347 0.2042

FOR GRAY BACKGROUND:

3. 0.57 247.7 0.90 58.25 80.90 0.3093 0.3229 -0.16 -0.09 -0.0029 1.0001 0.0001 -0.0001 0.1598 0.1310

FOR BLACK BACKGROUND:

3. 0.57 247.7 0.92 56.62 79.98 0.3043 0.3207 -0.11 -0.06 -0.0022 0.9994 0.0001 -0.0001 0.1404 0.1053

## CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 64.0  
 PLUME ALTITUDE (M) = 349.  
 SIGMA Y (M) = 2775.  
 SIGMA Z (M) = 365.  
 SO2-SO4 CONVERSION RATE = 0.0014 PERCENT/HR  
 NOX-NO3 CONVERSION RATE = 0.0096 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.003        | 0.002        | 0.000         | 80.548               | 0.450                 | 0.000        | 0.001           | 0.085                 | -0.002      | 0.041              | 0.001                   | 23.728           |
| TOTAL AMBJ | 0.003        | 0.002        | 0.000         | 82.062               | 0.458                 | 0.000        | 0.233           | 13.803                | 0.038       | 10.273             | 0.059                   | 42.472           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.004        | 0.003        | 0.000         | 80.410               | 0.015                 | 0.001        | 0.000           | 0.009                 | -0.003      | 0.066              | 0.001                   | 3.065            |
| TOTAL AMBJ | 0.004        | 0.003        | 0.000         | 81.921               | 0.016                 | 0.001        | 0.232           | 9.003                 | 0.037       | 10.298             | 0.059                   | 42.172           |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.008        | 0.006        | 0.000         | 79.366               | -0.009                | 0.001        | 0.000           | 0.004                 | -0.006      | 0.117              | 0.001                   | 1.287            |
| TOTAL AMBJ | 0.008        | 0.006        | 0.000         | 80.858               | -0.009                | 0.001        | 0.232           | 5.299                 | 0.034       | 10.349             | 0.060                   | 41.787           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.008        | 0.006        | 0.000         | 79.334               | 0.015                 | 0.001        | 0.000           | 0.009                 | -0.006      | 0.117              | 0.001                   | 3.063            |
| TOTAL AMBJ | 0.008        | 0.006        | 0.000         | 80.826               | 0.016                 | 0.001        | 0.232           | 5.304                 | 0.034       | 10.349             | 0.060                   | 41.809           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.008        | 0.006        | 0.000         | 79.010               | 0.414                 | 0.001        | 0.003           | 0.079                 | -0.006      | 0.117              | 0.002                   | 22.383           |
| TOTAL AMBJ | 0.008        | 0.006        | 0.000         | 80.495               | 0.421                 | 0.001        | 0.235           | 5.372                 | 0.034       | 10.349             | 0.060                   | 42.117           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.007        | 0.006        | 0.000         | 77.787               | 1.932                 | 0.001        | 0.016           | 0.387                 | -0.006      | 0.117              | 0.003                   | 58.671           |
| TOTAL AMBJ | 0.007        | 0.006        | 0.000         | 79.249               | 1.968                 | 0.001        | 0.248           | 5.639                 | 0.034       | 10.349             | 0.061                   | 43.435           |

# CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0184  
 NOXJ 0.0182  
 PRIMARY PARTICULATEJ 0.0018  
 SO4J 0.0000  
 NO3J 0.0000

## VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS 600 MW at Nenana

DOWNWIND DISTANCE (KM) = 64.0  
 PLUME ALTITUDE (M) = 349.  
 PLUME-OBSERVER DISTANCE (KM) = 97.6  
 AZIMUTH OF LINE-OF-SIGHT = 336.0  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|---------------|
| 59.   | 42.   | 0.39   | 248.9 | 0.43     | 69.32 | 86.67 | 0.3171 | 0.3313    | -0.29 | -0.14  | -0.0044 | 0.9987 | 0.0004 | 0.0000 | 0.3337 0.2294 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
 OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
 FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

600 MW at Nenana

65

PLU BSE DIS E ( =  
 AZIMUTH OF LINE-OF-SIGHT = 336.0  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 THETA = 59.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.39   | 0.80   | 71.18 | 87.58 | 0.3250 | 0.3327    | -0.30 | -0.15  | -0.0046 | 0.9992 | 0.0003 | 0.0000 | 0.3004 | 0.2162 |
| 0.3     | 0.39   | 0.80   | 67.44 | 85.74 | 0.3158 | 0.3288    | -0.24 | -0.12  | -0.0039 | 0.9988 | 0.0003 | 0.0000 | 0.2866 | 0.1973 |
| 0.0     | 0.39   | 0.80   | 65.83 | 84.93 | 0.3116 | 0.3269    | -0.22 | -0.11  | -0.0035 | 0.9986 | 0.0003 | 0.0001 | 0.2838 | 0.1911 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 64.0  
 PLUME-OBSERVER DISTANCE (KM) = 97.6  
 AZIMUTH OF LINE-OF-SIGHT = 336.0  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

59.

| FOR SKY BACKGROUND:   | 10. | 0.39 | 248.9 | 0.43 | 69.44 | 86.74 | 0.3196 | 0.3313 | -0.28 | -0.14 | -0.0043 | 0.9989 | 0.0003 | 0.0000 | 0.3035 | 0.2130 |
|-----------------------|-----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| FOR WHITE BACKGROUND: | 10. | 0.39 | 249.0 | 0.42 | 71.35 | 87.67 | 0.3253 | 0.3329 | -0.30 | -0.15 | -0.0046 | 0.9992 | 0.0003 | 0.0000 | 0.3009 | 0.2164 |
| FOR GRAY BACKGROUND:  | 10. | 0.39 | 248.9 | 0.44 | 67.49 | 85.76 | 0.3159 | 0.3288 | -0.24 | -0.12 | -0.0038 | 0.9988 | 0.0003 | 0.0000 | 0.2856 | 0.1967 |
| FOR BLACK BACKGROUND: | 10. | 0.39 | 248.9 | 0.45 | 65.83 | 84.93 | 0.3116 | 0.3269 | -0.22 | -0.11 | -0.0035 | 0.9986 | 0.0003 | 0.0001 | 0.2826 | 0.1902 |

# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 96.0  
 PLUME ALTITUDE (M) = 349.  
 SIGMA Y (M) = 3891.  
 SIGMA Z (M) = 446.  
 SO2-SO4 CONVERSION RATE= 0.0498 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.3485 PERCENT/HR

| ALTITUDE   | NOX (PPM) | NO2 (PPM) | NO3- (PPM) | NO2/NTOT (MOLE %) | NO3-/NTOT (MOLE %) | SO2 (PPM) | SO4= (UG/M3) | SO4=/STOT (MOLE %) | O3 (PPM) | PRIMARY (UG/M3) | BSP-TOTAL (10-4 M-1) | BSPSN/BSP (%) |
|------------|-----------|-----------|------------|-------------------|--------------------|-----------|--------------|--------------------|----------|-----------------|----------------------|---------------|
| H+2S       |           |           |            |                   |                    |           |              |                    |          |                 |                      |               |
| INCREMENTJ | 0.002     | 0.002     | 0.000      | 73.652            | 3.033              | 0.000     | 0.010        | 0.664              | -0.002   | 0.041           | 0.001                | 71.024        |
| TOTAL AMBJ | 0.002     | 0.002     | 0.000      | 79.800            | 3.286              | 0.000     | 0.242        | 15.107             | 0.038    | 10.273          | 0.060                | 43.359        |
| H+1S       |           |           |            |                   |                    |           |              |                    |          |                 |                      |               |
| INCREMENTJ | 0.003     | 0.002     | 0.000      | 75.578            | 0.556              | 0.000     | 0.003        | 0.195              | -0.002   | 0.047           | 0.001                | 41.926        |
| TOTAL AMBJ | 0.003     | 0.002     | 0.000      | 81.887            | 0.602              | 0.000     | 0.235        | 13.044             | 0.038    | 10.279          | 0.059                | 42.644        |
| H          |           |           |            |                   |                    |           |              |                    |          |                 |                      |               |
| INCREMENTJ | 0.005     | 0.004     | 0.000      | 75.498            | 0.017              | 0.001     | 0.003        | 0.096              | -0.004   | 0.077           | 0.001                | 26.120        |
| TOTAL AMBJ | 0.005     | 0.004     | 0.000      | 81.800            | 0.018              | 0.001     | 0.235        | 8.385              | 0.036    | 10.308          | 0.059                | 42.351        |

| INFLUENCE   | INITIAL | 0.000 | 0.004 | 0.000  | 75.332 | 0.154 | 0.001 | 0.235 | 8.413  | 0.036  | 10.308 | 0.059  | 42.434 |
|-------------|---------|-------|-------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
| H-2S        |         |       |       |        |        |       |       |       |        |        |        |        |        |
| INCREMENTAL | 0.005   | 0.004 | 0.000 | 73.975 | 1.895  | 0.001 | 0.013 | 0.463 | -0.004 | 0.077  | 0.002  | 43.090 |        |
| TOTAL AMBI  | 0.005   | 0.004 | 0.000 | 80.150 | 2.054  | 0.001 | 0.245 | 8.749 | 0.036  | 10.308 | 0.060  | 43.393 |        |
| 0           |         |       |       |        |        |       |       |       |        |        |        |        |        |
| INCREMENTAL | 0.004   | 0.004 | 0.000 | 69.528 | 7.403  | 0.001 | 0.047 | 1.675 | -0.004 | 0.077  | 0.006  | 86.088 |        |
| TOTAL AMBI  | 0.004   | 0.004 | 0.000 | 75.332 | 8.021  | 0.001 | 0.278 | 9.952 | 0.036  | 10.308 | 0.064  | 46.581 |        |

# CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

|                      |        |
|----------------------|--------|
| SO2I                 | 0.0761 |
| NOXI                 | 0.0724 |
| PRIMARY PARTICULATEI | 0.0078 |
| SO4I                 | 0.0001 |
| NO3I                 | 0.0000 |

## VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS 600 MW at Nenana

DOWNWIND DISTANCE (KM) = 96.0  
 PLUME ALTITUDE (M) = 349.  
 PLUME-OBSERVER DISTANCE (KM) = 76.9  
 AZIMUTH OF LINE-OF-SIGHT = 319.8  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
 SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
 SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV   | %REDUCED | YCAP  | L      | X      | Y DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |
|-------|-------|--------|------|----------|-------|--------|--------|-----------|-------|---------|--------|--------|--------|--------|--------|
| 45.   |       |        |      |          |       |        |        |           |       |         |        |        |        |        |        |
| 58.   | 0.31  | 249.3  | 0.29 | 86.77    | 94.64 | 0.3244 | 0.3402 | -0.33     | -0.14 | -0.0040 | 0.9974 | 0.0005 | 0.0002 | 0.4105 | 0.2668 |



PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 96.0  
PLUME-OBSERVER DISTANCE (KM) = 76.9  
AZIMUTH OF LINE-OF-SIGHT = 319.8  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA = 45.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.31   | 0.80   | 88.18 | 95.24 | 0.3304 | 0.3409    | -0.33 | -0.14  | -0.0040 | 0.9978 | 0.0004 | 0.0001 | 0.3795 | 0.2499 |
| 0.3     | 0.31   | 0.80   | 84.43 | 93.64 | 0.3230 | 0.3379    | -0.29 | -0.13  | -0.0036 | 0.9975 | 0.0004 | 0.0002 | 0.3805 | 0.2463 |
| 0.0     | 0.31   | 0.80   | 82.82 | 92.94 | 0.3197 | 0.3366    | -0.27 | -0.12  | -0.0035 | 0.9973 | 0.0004 | 0.0002 | 0.3822 | 0.2456 |

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 96.0  
PLUME-OBSERVER DISTANCE (KM) = 76.9  
AZIMUTH OF LINE-OF-SIGHT = 319.8  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.2  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA LENGTH RP/RVO RV %REDUCED YCAP

|                       | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB) |        |
|-----------------------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 45.                   |        |       |          |       |       |        |           |       |        |         |        |        |        |        |        |
| FOR SKY BACKGROUND:   |        |       |          |       |       |        |           |       |        |         |        |        |        |        |        |
| 11.                   | 0.31   | 249.3 | 0.28     | 87.23 | 94.84 | 0.3272 | 0.3406    | -0.33 | -0.14  | -0.0040 | 0.9978 | 0.0004 | 0.0001 | 0.3895 | 0.2558 |
| FOR WHITE BACKGROUND: |        |       |          |       |       |        |           |       |        |         |        |        |        |        |        |
| 11.                   | 0.31   | 249.3 | 0.27     | 88.35 | 95.31 | 0.3306 | 0.3411    | -0.34 | -0.14  | -0.0041 | 0.9978 | 0.0004 | 0.0001 | 0.3819 | 0.2522 |
| FOR GRAY BACKGROUND:  |        |       |          |       |       |        |           |       |        |         |        |        |        |        |        |
| 11.                   | 0.31   | 249.3 | 0.28     | 84.47 | 93.66 | 0.3231 | 0.3380    | -0.30 | -0.13  | -0.0037 | 0.9975 | 0.0004 | 0.0002 | 0.3804 | 0.2474 |
| FOR BLACK BACKGROUND: |        |       |          |       |       |        |           |       |        |         |        |        |        |        |        |
| 11.                   | 0.31   | 249.3 | 0.29     | 82.81 | 92.94 | 0.3197 | 0.3366    | -0.28 | -0.12  | -0.0035 | 0.9974 | 0.0004 | 0.0002 | 0.3811 | 0.2461 |

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 112.0  
PLUME ALTITUDE (M) = 349.  
SIGMA Y (M) = 4418.  
SIGMA Z (M) = 480.  
SO2-SO4 CONVERSION RATE= 0.0849 PERCENT/HR  
NOX-NO3 CONVERSION RATE= 0.5941 PERCENT/HR

| ALTITUDE | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY PSP-TOTAL<br>(UG/M3) (10-4 M-1) | BSPSN/BSP<br>(%) |
|----------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|-----------------------------------------|------------------|
|----------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|-----------------------------------------|------------------|

|           |     |       |       |       |        |        |       |       |        |        |        |       |        |
|-----------|-----|-------|-------|-------|--------|--------|-------|-------|--------|--------|--------|-------|--------|
| INL       | NTJ | 0.0   | 0.002 | 0.000 | 68.313 | 7.603  | 0.000 | 0.253 | 16.812 | 0.038  | 10.271 | 0.061 | 44.520 |
| TOTAL AMB |     | 0.002 | 0.002 | 0.000 | 76.313 | 7.603  | 0.000 | 0.253 | 16.812 | 0.038  | 10.271 | 0.061 | 44.520 |
| H+1S      |     |       |       |       |        |        |       |       |        |        |        |       |        |
| INCREMENT |     | 0.002 | 0.002 | 0.000 | 71.120 | 2.342  | 0.000 | 0.010 | 0.629  | -0.002 | 0.042  | 0.001 | 69.963 |
| TOTAL AMB |     | 0.002 | 0.002 | 0.000 | 80.350 | 2.609  | 0.000 | 0.242 | 14.949 | 0.038  | 10.274 | 0.060 | 43.332 |
| H         |     |       |       |       |        |        |       |       |        |        |        |       |        |
| INCREMENT |     | 0.004 | 0.003 | 0.000 | 73.054 | 0.743  | 0.001 | 0.008 | 0.328  | -0.003 | 0.066  | 0.002 | 54.854 |
| TOTAL AMB |     | 0.004 | 0.003 | 0.000 | 81.390 | 0.827  | 0.001 | 0.240 | 10.087 | 0.037  | 10.297 | 0.060 | 42.967 |
| H-1S      |     |       |       |       |        |        |       |       |        |        |        |       |        |
| INCREMENT |     | 0.004 | 0.003 | 0.000 | 72.897 | 0.930  | 0.001 | 0.009 | 0.372  | -0.003 | 0.066  | 0.002 | 57.948 |
| TOTAL AMB |     | 0.004 | 0.003 | 0.000 | 81.216 | 1.036  | 0.001 | 0.241 | 10.131 | 0.037  | 10.297 | 0.060 | 43.074 |
| H-2S      |     |       |       |       |        |        |       |       |        |        |        |       |        |
| INCREMENT |     | 0.004 | 0.003 | 0.000 | 70.819 | 3.493  | 0.001 | 0.021 | 0.882  | -0.003 | 0.066  | 0.003 | 76.557 |
| TOTAL AMB |     | 0.004 | 0.003 | 0.000 | 78.900 | 3.892  | 0.001 | 0.253 | 10.642 | 0.037  | 10.297 | 0.061 | 44.285 |
| O         |     |       |       |       |        |        |       |       |        |        |        |       |        |
| INCREMENT |     | 0.003 | 0.003 | 0.000 | 64.496 | 11.283 | 0.001 | 0.063 | 2.641  | -0.003 | 0.066  | 0.007 | 90.726 |
| TOTAL AMB |     | 0.003 | 0.003 | 0.000 | 71.856 | 12.570 | 0.001 | 0.295 | 12.407 | 0.037  | 10.297 | 0.066 | 48.096 |

# CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2] 0.1008  
 NOX] 0.0947  
 PRIMARY PARTICULATE] 0.0105  
 SO4] 0.0002  
 NO3] 0.0000

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## VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS 600 MW at Nenana

DOWNWIND DISTANCE (KM) = 112.0  
 PLUME ALTITUDE (M) = 349.  
 PLUME-OBSERVER DISTANCE (KM) = 69.8  
 AZIMUTH OF LINE-OF-SIGHT = 308.5



DOWNWIND DISTANCE (KM) = 128.0  
 PLUME ALTITUDE (M) = 349.  
 SIGMA Y (M) = 4928.  
 SIGMA Z (M) = 512.  
 SO2-SO4 CONVERSION RATE= 0.1039 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.7275 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.002        | 0.002        | 0.000         | 64.200               | 9.688                 | 0.000        | 0.029           | 2.163                 | -0.002      | 0.037              | 0.004                   | 88.929           |
| TOTAL AMB1 | 0.002        | 0.002        | 0.000         | 73.497               | 11.091                | 0.000        | 0.261           | 18.505                | 0.038       | 10.269             | 0.062                   | 45.280           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.002        | 0.002        | 0.000         | 68.733               | 4.133                 | 0.000        | 0.015           | 1.050                 | -0.002      | 0.039              | 0.002                   | 79.592           |
| TOTAL AMB1 | 0.002        | 0.002        | 0.000         | 78.686               | 4.732                 | 0.000        | 0.247           | 16.741                | 0.038       | 10.271             | 0.060                   | 43.883           |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.003        | 0.003        | 0.000         | 70.548               | 1.584                 | 0.000        | 0.012           | 0.565                 | -0.003      | 0.057              | 0.002                   | 67.723           |
| TOTAL AMB1 | 0.003        | 0.003        | 0.000         | 80.763               | 1.813                 | 0.000        | 0.244           | 11.790                | 0.037       | 10.289             | 0.060                   | 43.435           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.003        | 0.003        | 0.000         | 70.376               | 1.789                 | 0.000        | 0.013           | 0.614                 | -0.003      | 0.057              | 0.002                   | 69.509           |
| TOTAL AMB1 | 0.003        | 0.003        | 0.000         | 80.567               | 2.048                 | 0.000        | 0.245           | 11.840                | 0.037       | 10.289             | 0.060                   | 43.538           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.003        | 0.003        | 0.000         | 68.093               | 4.594                 | 0.000        | 0.025           | 1.179                 | -0.003      | 0.057              | 0.003                   | 81.416           |
| TOTAL AMB1 | 0.003        | 0.003        | 0.000         | 77.953               | 5.259                 | 0.000        | 0.257           | 12.413                | 0.037       | 10.289             | 0.062                   | 44.704           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.003        | 0.002        | 0.000         | 61.223               | 13.022                | 0.000        | 0.065           | 3.104                 | -0.002      | 0.057              | 0.008                   | 92.019           |
| TOTAL AMB1 | 0.003        | 0.002        | 0.000         | 70.089               | 14.908                | 0.000        | 0.297           | 14.362                | 0.038       | 10.289             | 0.066                   | 48.332           |

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.1241  
 NOXJ 0.1153  
 PRIMARY PARTICULATEJ 0.0132  
 SO4J 0.0003  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
600 MW at Nenana

DOWNWIND DISTANCE (KM) = 128.0  
PLUME ALTITUDE (M) = 349.  
PLUME-OBSERVER DISTANCE (KM) = 65.9  
AZIMUTH OF LINE-OF-SIGHT = 295.4  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP   | L      | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|-------|----------|--------|--------|--------|-----------|-------|--------|---------|--------|--------|--------|---------------|
| 26.   |       |        |       |          |        |        |        |           |       |        |         |        |        |        |               |
|       | 83.   | 0.26   | 249.3 | 0.29     | 125.49 | 109.11 | 0.3409 | 0.3522    | -0.28 | -0.09  | -0.0024 | 0.9958 | 0.0005 | 0.0003 | 0.4801 0.2991 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 128.0  
PLUME-OBSERVER DISTANCE (KM) = 65.9  
AZIMUTH OF LINE-OF-SIGHT = 295.4  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA = 26.

| REFLECT | RP/RVO | RO/RVO | YCAP   | L      | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB)        |
|---------|--------|--------|--------|--------|--------|-----------|-------|--------|---------|--------|--------|--------|---------------|
| 1.0     | 0.26   | 0.80   | 126.48 | 109.44 | 0.3448 | 0.3523    | -0.28 | -0.09  | -0.0024 | 0.9962 | 0.0005 | 0.0002 | 0.4488 0.2807 |
| 0.3     | 0.26   | 0.80   | 122.72 | 108.18 | 0.3399 | 0.3505    | -0.24 | -0.08  | -0.0021 | 0.9958 | 0.0005 | 0.0003 | 0.4615 0.2868 |
| 0.0     | 0.26   | 0.80   | 121.11 | 107.64 | 0.3377 | 0.3496    | -0.22 | -0.08  | -0.0020 | 0.9956 | 0.0005 | 0.0003 | 0.4677 0.2899 |

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

600 MW at Nenana

DOWNWIND DISTANCE (KM) = 128.0  
PLUME-OBSERVER DISTANCE (KM) = 65.9  
AZIMUTH OF LINE-OF-SIGHT = 295.4  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.3  
SOLAR ZENITH ANGLE = 68.5 AT 1600. ON 6/21  
THETA LENGTH RP/RVO RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

26.

FOR WHITE BACKGROUND:

|     |      |       |      |        |        |        |        |       |       |         |        |        |        |        |        |
|-----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 12. | 0.26 | 249.4 | 0.25 | 126.58 | 109.47 | 0.3450 | 0.3524 | -0.35 | -0.11 | -0.0029 | 0.9764 | 0.0005 | 0.0002 | 0.4560 | 0.2886 |
|-----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR GRAY BACKGROUND:

|     |      |       |      |        |        |        |        |       |       |         |        |        |        |        |        |
|-----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 12. | 0.26 | 249.4 | 0.26 | 122.70 | 108.18 | 0.3400 | 0.3505 | -0.31 | -0.10 | -0.0027 | 0.9961 | 0.0005 | 0.0003 | 0.4626 | 0.2909 |
|-----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR BLACK BACKGROUND:

|     |      |       |      |        |        |        |        |       |       |         |        |        |        |        |        |
|-----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 12. | 0.26 | 249.4 | 0.26 | 121.04 | 107.61 | 0.3377 | 0.3496 | -0.29 | -0.10 | -0.0026 | 0.9960 | 0.0005 | 0.0003 | 0.4661 | 0.2923 |
|-----|------|-------|------|--------|--------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 1.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

NOX-TO-HNO3 CONVERSION RATE (%/HR)

| H+2S | H+1S | H    | H-1S | H-2S | Q    |
|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 2.5 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TQ-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | O    |
| 0.1                   | 1555          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 |

NOX-TO-HNO3 CONVERSION RATE (%/HR)

| H+2S | H+1S | H    | H-1S | H-2S | 0    |
|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.65 |

## HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 5.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-T0-SO4= CONVERSION RATE (%/HR) |      |   |      |      |   |
|-----------------------|---------------|------------------------------------|------|---|------|------|---|
|                       |               | H+2S                               | H+1S | H | H-1S | H-2S | 0 |

NOX-TO-HNO3 CONVERSION RATE (%/HR)

|      |      |   |      |      |   |
|------|------|---|------|------|---|
| H+28 | H+16 | H | H-16 | H-28 | 0 |
|------|------|---|------|------|---|

0.1 1531 0.00 0.00 0.00 0.00 0.00 0.38

0.01 0.00 0.00 0.00 0.01 2.65

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 10.0 KM

| PARCEL AGE (HR) | LOCAL TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------|------------|------------------------------------|------|------|------|------|------|
|                 |            | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1             | 1531       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1             | 1536       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 |
| 0.3             | 1544       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.43 |
| 0.5             | 1600       | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.38 |

NOX-TO-HNO3 CONVERSION RATE (%/HR)

| H+2S | H+1S | H    | H-1S | H-2S | 0    |
|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.18 |
| 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 2.98 |
| 0.05 | 0.00 | 0.00 | 0.00 | 0.05 | 2.65 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 64.0 KM

| PARCEL AGE (HR) | LOCAL TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------|------------|------------------------------------|------|------|------|------|------|
|                 |            | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1             | 1243       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1             | 1248       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.55 |
| 0.3             | 1255       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 |
| 0.5             | 1311       | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.47 |
| 3.3             | 1600       | 0.03                               | 0.00 | 0.00 | 0.00 | 0.03 | 0.05 |

NOX-TO-HNO3 CONVERSION RATE (%/HR)

| H+2S | H+1S | H    | H-1S | H-2S | 0    |
|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.30 | 3.84 |
| 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 3.64 |
| 0.06 | 0.01 | 0.00 | 0.01 | 0.06 | 3.31 |
| 0.21 | 0.02 | 0.01 | 0.02 | 0.19 | 0.38 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 94.0 KM

| PARCEL AGE (HR) | LOCAL TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |       |
|-----------------|------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|-------|
|                 |            | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0     |
| 0.1             | 1103       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  |
| 0.1             | 1108       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 1.91 | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 13.35 |
| 0.3             | 1116       | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 1.87 | 0.07                               | 0.01 | 0.01 | 0.01 | 0.07 | 13.08 |
| 0.5             | 1131       | 0.04                               | 0.00 | 0.00 | 0.00 | 0.04 | 1.80 | 0.30                               | 0.03 | 0.02 | 0.03 | 0.30 | 12.62 |
| 3.3             | 1420       | 0.15                               | 0.02 | 0.01 | 0.02 | 0.14 | 0.27 | 1.02                               | 0.13 | 0.06 | 0.13 | 0.95 | 1.88  |
| 5.0             | 1600       | 0.16                               | 0.09 | 0.05 | 0.05 | 0.05 | 0.05 | 1.09                               | 0.65 | 0.35 | 0.35 | 0.35 | 0.36  |

# HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 112.0 KM

| PARCEL AGE (HR) | LOCAL TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |       |
|-----------------|------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|-------|
|                 |            | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0     |
| 0.1             | 1013       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  |
| 0.1             | 1018       | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.60 | 0.02                               | 0.00 | 0.00 | 0.00 | 0.02 | 18.17 |
| 0.3             | 1026       | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 2.57 | 0.10                               | 0.01 | 0.01 | 0.01 | 0.10 | 17.98 |
| 0.5             | 1041       | 0.06                               | 0.01 | 0.00 | 0.01 | 0.06 | 2.52 | 0.44                               | 0.05 | 0.03 | 0.05 | 0.44 | 17.66 |
| 3.3             | 1330       | 0.22                               | 0.03 | 0.01 | 0.03 | 0.20 | 0.41 | 1.53                               | 0.20 | 0.10 | 0.20 | 1.42 | 2.89  |
| 5.0             | 1510       | 0.47                               | 0.28 | 0.15 | 0.15 | 0.15 | 0.16 | 3.31                               | 1.96 | 1.06 | 1.06 | 1.08 | 1.15  |
| 5.8             | 1600       | 0.17                               | 0.14 | 0.08 | 0.08 | 0.09 | 0.09 | 1.20                               | 1.01 | 0.59 | 0.59 | 0.61 | 0.65  |

# HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 128.0 KM

| PARCEL AGE (HR) | LOCAL TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |       |
|-----------------|------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|-------|
|                 |            | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0     |
| 0.1             | 923        | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  |
| 0.1             | 928        | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 2.70 | 0.02                               | 0.00 | 0.00 | 0.00 | 0.02 | 18.93 |
| 0.3             | 936        | 0.02                               | 0.00 | 0.00 | 0.00 | 0.02 | 2.69 | 0.11                               | 0.01 | 0.01 | 0.01 | 0.11 | 18.86 |
| 0.5             | 951        | 0.07                               | 0.01 | 0.00 | 0.01 | 0.07 | 2.68 | 0.47                               | 0.05 | 0.03 | 0.05 | 0.47 | 18.76 |
| 3.3             | 1240       | 0.24                               | 0.03 | 0.02 | 0.03 | 0.22 | 0.46 | 1.68                               | 0.23 | 0.11 | 0.22 | 1.56 | 3.22  |
| 5.0             | 1420       | 0.69                               | 0.40 | 0.22 | 0.22 | 0.22 | 0.25 | 4.80                               | 2.83 | 1.52 | 1.52 | 1.57 | 1.72  |
| 5.8             | 1510       | 0.33                               | 0.27 | 0.16 | 0.16 | 0.16 | 0.18 | 2.32                               | 1.91 | 1.12 | 1.12 | 1.15 | 1.27  |
| 6.7             | 1600       | 0.19                               | 0.17 | 0.10 | 0.10 | 0.11 | 0.12 | 1.35                               | 1.18 | 0.73 | 0.73 | 0.75 | 0.83  |

## PLOT FILE VERIFICATION

## OBSERVER-BASED DATA

## SKY BACKGROUND

| NX                                   | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| DISTANCE (KM)                        | 1.     | 3.     | 5.     | 10.    | 64.    | 96.    | 112.   | 128.   |
| REDUCTION OF VISUAL RANGE (%)        | 0.792  | 0.841  | 0.991  | 1.109  | 0.430  | 0.287  | 0.278  | 0.288  |
| BLUE-RED RATIO                       | 1.000  | 1.000  | 1.000  | 1.000  | 0.999  | 0.997  | 0.996  | 0.996  |
| PLUME CONTRAST AT 0.55 MICRONS       | -0.002 | -0.003 | -0.004 | -0.005 | -0.004 | -0.004 | -0.003 | -0.002 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.095  | 0.136  | 0.186  | 0.237  | 0.229  | 0.267  | 0.285  | 0.299  |

## WHITE BACKGROUND

| NX                                   | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| DISTANCE (KM)                        | 1.     | 3.     | 5.     | 10.    | 64.    | 96.    | 112.   | 128.   |
| REDUCTION OF VISUAL RANGE (%)        | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| BLUE-RED RATIO                       | 1.004  | 1.002  | 1.002  | 1.001  | 0.999  | 0.998  | 0.997  | 0.996  |
| PLUME CONTRAST AT 0.55 MICRONS       | -0.003 | -0.004 | -0.005 | -0.006 | -0.005 | -0.004 | -0.003 | -0.002 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.125  | 0.155  | 0.208  | 0.259  | 0.216  | 0.250  | 0.267  | 0.281  |

## GRAY BACKGROUND

| NX                                   | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| DISTANCE (KM)                        | 1.     | 3.     | 5.     | 10.    | 64.    | 96.    | 112.   | 128.   |
| REDUCTION OF VISUAL RANGE (%)        | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| BLUE-RED RATIO                       | 1.000  | 1.000  | 1.000  | 1.000  | 0.999  | 0.997  | 0.996  | 0.996  |
| PLUME CONTRAST AT 0.55 MICRONS       | -0.001 | -0.002 | -0.003 | -0.004 | -0.004 | -0.004 | -0.003 | -0.002 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.053  | 0.088  | 0.127  | 0.168  | 0.197  | 0.246  | 0.269  | 0.287  |



|                                         |       |        |        |        |        |        |        |        |
|-----------------------------------------|-------|--------|--------|--------|--------|--------|--------|--------|
| BLACK BACKGROUND                        |       |        |        |        |        |        |        |        |
| NX                                      | 1     | 2      | 3      | 4      | 5      | 6      | 7      | 8      |
| DISTANCE (KM)                           | 1.    | 3.     | 5.     | 10.    | 64.    | 96.    | 112.   | 128.   |
| REDUCTION OF VISUAL<br>RANGE (%)        | 0.000 | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| BLUE-RED RATIO                          | 0.998 | 0.999  | 0.999  | 0.999  | 0.999  | 0.997  | 0.996  | 0.996  |
| PLUME CONTRAST AT<br>0.55 MICRONS       | 0.000 | -0.001 | -0.002 | -0.003 | -0.004 | -0.003 | -0.003 | -0.002 |
| PLUME PERCEPTIBILITY<br>DELTA E(L*A*B*) | 0.061 | 0.074  | 0.101  | 0.135  | 0.191  | 0.246  | 0.271  | 0.290  |

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EMISSIONS SOURCE DATA

ELEVATION OF SITE = 0. FEET MSL  
0. METERS MSL

NO. OF UNITS = 8.

STACK HEIGHT = 65. FEET  
20. METERS

FLUE GAS FLOW RATE = 785000. CU FT/MIN  
370.42 CU M/SEC

FLUE GAS TEMPERATURE = 350. F  
450. K

FLUE GAS OXYGEN CONTENT = 3.0 MOL PERCENT

SO2 EMISSION RATE (TOTAL) = 0.33 TONS/DAY  
3.465E+00 G/SEC

NOX EMISSION RATE (TOTAL, AS NO2) = 12.60 TONS/DAY  
1.323E+02 G/SEC

PARTICULATE EMISSION RATE (TOTAL) = 0.50 TONS/DAY  
5.250E+00 G/SEC



# METEOROLOGICAL AND AMBIENT AIR QUALITY DATA

WINDSPEED = 5.0 MILES/HR  
2.2 M/SEC

PASQUILL-GIFFORD-TURNER STABILITY CATEGORY D

LAPSE RATE = 1.00 F/1000 FT  
1.823E-03 K/M

POTENTIAL TEMPERATURE LAPSE RATE = 1.162E-02 K/M

AMBIENT TEMPERATURE = 50.0 F  
283.2 K

RELATIVE HUMIDITY = 75.0 %

MIXING DEPTH = 1000. M

AMBIENT PRESSURE = 1.00 ATM

BACKGROUND NOX CONCENTRATION = 0.005 PPM

BACKGROUND NO2 CONCENTRATION = 0.004 PPM

BACKGROUND OZONE CONCENTRATION = 0.040 PPM

BACKGROUND SO2 CONCENTRATION = 0.003 PPM

BACKGROUND COARSE MODE CONCENTRATION = -0.2 UG/M3

BACKGROUND SULFATE CONCENTRATION = 0.0 UG/M3

BACKGROUND NITRATE CONCENTRATION = 0.0 UG/M3

BACKGROUND VISUAL RANGE = 350.0 KILOMETERS

SO2 DEPOSITION VELOCITY = 1.00 CM/SEC

NOX DEPOSITION VELOCITY = 1.00 CM/SEC

COARSE PARTICULATE DEPOSITION VELOCITY = 0.10CM/SEC./  
SUBMICRON PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC

## AEROSOL STATISTICS

|                                      | BACKGROUND           |                | PLUME                |                |
|--------------------------------------|----------------------|----------------|----------------------|----------------|
| MASS MEDIAN<br>RADIUS<br>MICROMETERS | ACCUMULATION<br>MODE | COARSE<br>MODE | ACCUMULATION<br>MODE | COARSE<br>MODE |
|                                      | 0.160                | 3.000          | 0.100                | 1.000          |
| GEOMETRIC<br>STANDARD<br>DEVIATION   | 2.000                | 2.200          | 2.000                | 2.000          |
| PARTICLE<br>DENSITY                  |                      |                |                      |                |

GEOMETRY OF USER-SPECIFIED PLUME-OBSERVER-SUN ORIENTATION

WIND DIRECTION (DEGREES) = 32.0

SIMULATION IS FOR 1600. HOURS ON 6/21

SOLAR ZENITH ANGLE (DEGREES) = 69.9

SOLAR AZIMUTH ANGLE (DEGREES) = 282.3

GEOMETRIES FOR LINES-OF-SIGHT THROUGH PLUME PARCELSAT GIVEN DOWNWIND DISTANCES (X).

| X (KM) | AZIMUTH | RP    | ALPHA | BETA | THETA |
|--------|---------|-------|-------|------|-------|
| 1.0    | 269.2   | 60.5  | 57.2  | 0.1  | 23.7  |
| 2.5    | 268.0   | 61.4  | 56.0  | 0.1  | 24.4  |
| 5.0    | 266.1   | 62.8  | 54.1  | 0.1  | 25.5  |
| 10.0   | 262.6   | 65.8  | 50.6  | 0.1  | 27.8  |
| 48.0   | 244.5   | 94.6  | 32.5  | 0.1  | 42.0  |
| 96.0   | 233.7   | 137.6 | 21.7  | 0.1  | 51.5  |
| 155.0  | 227.2   | 193.6 | 15.2  | 0.0  | 57.4  |
| 205.0  | 224.1   | 242.2 | 12.1  | 0.0  | 60.3  |

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# BACKGROUND CONDITIONS

## ACCUMULATION MODE

MASS RADIUS SIGMA BSCAT.55/MASS  
0.1600E+00 0.2000E+01 0.1072E-01

## COARSE PARTICLE MODE

MASS RADIUS SIGMA BSCAT.55/MASS  
0.3000E+01 0.2200E+01 0.3343E-03

## PRIMARY PARTICLE MODE

MASS RADIUS SIGMA BSCAT.55/MASS  
0.1000E+01 0.2000E+01 0.1053E-02

## COEFFICIENTS AT 0.55 MICROMETERS , 1./KM

BTARAY =0.1162E-01 BTAAER =-.5262E-04 ABSN02 =0.1304E-02 BTABAC =0.1118E-01

## INITIAL PLUME RISE AND DILUTION AND NITROGEN DIOXIDE FORMATION

1540 MW gas fired at Bel

| TIME<br>(SEC) | X<br>(M) | DELTA H<br>(M) | U<br>(M/S) | W<br>(M/S) | V<br>(M/S) | SIGMA<br>(M) | TEMP<br>(K) | O2<br>MOL P | NO2-NO<br>EQUIL | RATIO<br>ACTUAL | NOX<br>(PPM) | NO<br>(PPM) | NO2T<br>(PPM) | SO2<br>(PPM) | PARTICULATE<br>UG/M3 |
|---------------|----------|----------------|------------|------------|------------|--------------|-------------|-------------|-----------------|-----------------|--------------|-------------|---------------|--------------|----------------------|
| 0.            | 0.0      | 0.0            | 5.21       | 20.10      | 20.10      | 0.0          | 449.8       | 3.0         | 2.8E+02         | 2.7E-05         | 35.817       | 35.816      | 0.001         | 0.674        | 2.67E+03             |
| 10.           | 52.1     | 43.9           | 5.21       | 1.68       | 5.47       | 10.2         | 294.4       | 19.7        | 8.3E+05         | 1.7E-04         | 2.422        | 2.422       | 0.000         | 0.046        | 1.81E+02             |
| 20.           | 104.1    | 69.7           | 5.21       | 1.35       | 5.38       | 16.2         | 287.6       | 20.5        | 1.1E+06         | 2.8E-04         | 0.955        | 0.954       | 0.000         | 0.018        | 7.13E+01             |
| 30.           | 156.2    | 91.4           | 5.21       | 1.19       | 5.34       | 21.3         | 285.7       | 20.7        | 1.3E+06         | 3.3E-04         | 0.556        | 0.556       | 0.000         | 0.010        | 4.15E+01             |
| 40.           | 208.2    | 110.7          | 5.21       | 1.03       | 5.32       | 25.7         | 284.9       | 20.8        | 1.3E+06         | 3.6E-04         | 0.380        | 0.380       | 0.000         | 0.007        | 2.83E+01             |
| 50.           | 260.3    | 128.5          | 5.21       | 0.95       | 5.29       | 29.9         | 284.5       | 20.8        | 1.3E+06         | 3.8E-04         | 0.282        | 0.282       | 0.000         | 0.005        | 2.11E+01             |
| 60.           | 312.3    | 145.1          | 5.21       | 0.90       | 5.28       | 33.7         | 284.2       | 20.8        | 1.3E+06         | 4.1E-04         | 0.222        | 0.222       | 0.000         | 0.004        | 1.65E+01             |
| 70.           | 364.4    | 160.8          | 5.21       | 0.86       | 5.28       | 37.4         | 284.0       | 20.9        | 1.4E+06         | 4.2E-04         | 0.181        | 0.181       | 0.000         | 0.003        | 1.35E+01             |
| 80.           | 416.4    | 175.7          | 5.21       | 0.83       | 5.27       | 40.9         | 283.9       | 20.9        | 1.4E+06         | 4.2E-04         | 0.151        | 0.151       | 0.000         | 0.003        | 1.13E+01             |
| 90.           | 468.5    | 186.2          | 5.21       | 0.80       | 5.27       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.3E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 100.          | 520.6    | 186.2          | 5.21       | 0.78       | 5.26       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.4E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 110.          | 572.6    | 186.2          | 5.21       | 0.75       | 5.26       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.5E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 120.          | 624.7    | 186.2          | 5.21       | 0.73       | 5.26       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.5E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 130.          | 676.7    | 186.2          | 5.21       | 0.72       | 5.25       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.6E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 140.          | 728.8    | 186.2          | 5.21       | 0.70       | 5.25       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.7E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 150.          | 780.8    | 186.2          | 5.21       | 0.69       | 5.25       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.7E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 160.          | 832.9    | 186.2          | 5.21       | 0.67       | 5.25       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.8E-04         | 0.135        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 170.          | 884.9    | 186.2          | 5.21       | 0.66       | 5.25       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 4.9E-04         | 0.136        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 180.          | 937.0    | 186.2          | 5.21       | 0.65       | 5.25       | 43.3         | 283.8       | 20.9        | 1.4E+06         | 5.0E-04         | 0.136        | 0.135       | 0.000         | 0.003        | 1.01E+01             |
| 190.          | 989.0    | 186.2          | 5.21       |            |            |              |             |             |                 |                 |              |             |               |              |                      |

# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 1.0  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 78.  
 SIGMA Z (M) = 35.  
 SO2-SO4 CONVERSION RATE = 0.0000 PERCENT/HR  
 NOX-NO3 CONVERSION RATE = 0.0000 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | 03<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.103        | 0.036        | 0.000         | 34.615               | 0.000                 | 0.002        | 0.000           | 0.000                 | -0.036      | 7.688              | 0.081                   | 0.000            |
| TOTAL AMBJ | 0.108        | 0.040        | 0.000         | 36.907               | 0.000                 | 0.005        | 0.000           | 0.000                 | 0.004       | 7.530              | 0.080                   | 0.000            |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.461        | 0.039        | 0.000         | 8.550                | 0.000                 | 0.009        | 0.000           | 0.000                 | -0.039      | 34.453             | 0.363                   | 0.000            |
| TOTAL AMBJ | 0.466        | 0.044        | 0.000         | 9.360                | 0.000                 | 0.012        | 0.000           | 0.000                 | 0.001       | 34.296             | 0.362                   | 0.000            |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.761        | 0.040        | 0.000         | 5.247                | 0.000                 | 0.014        | 0.000           | 0.000                 | -0.040      | 56.804             | 0.598                   | 0.000            |
| TOTAL AMBJ | 0.766        | 0.044        | 0.000         | 5.762                | 0.000                 | 0.017        | 0.000           | 0.000                 | 0.000       | 56.647             | 0.598                   | 0.000            |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.461        | 0.039        | 0.000         | 8.550                | 0.000                 | 0.009        | 0.000           | 0.000                 | -0.039      | 34.453             | 0.363                   | 0.000            |
| TOTAL AMBJ | 0.466        | 0.044        | 0.000         | 9.360                | 0.000                 | 0.012        | 0.000           | 0.000                 | 0.001       | 34.296             | 0.362                   | 0.000            |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.103        | 0.036        | 0.000         | 34.615               | 0.000                 | 0.002        | 0.000           | 0.000                 | -0.036      | 7.688              | 0.081                   | 0.000            |
| TOTAL AMBJ | 0.108        | 0.040        | 0.000         | 36.907               | 0.000                 | 0.005        | 0.000           | 0.000                 | 0.004       | 7.530              | 0.080                   | 0.000            |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.000        | 0.000        | 0.000         | 0.000                | 0.000                 | 0.000        | 0.000           | 0.000                 | 0.000       | 0.000              | 0.000                   | 0.000            |
| TOTAL AMBJ | 0.005        | 0.004        | 0.000         | 84.141               | 0.000                 | 0.003        | 0.000           | 0.000                 | 0.040       | -0.157             | -0.001                  | 0.000            |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0000  
 NOXJ 0.0000  
 PRIMARY PARTICULATEJ 0.0000  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 1.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 60.5  
AZIMUTH OF LINE-OF-SIGHT = 269.2  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL | C(550) | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |
|-------|-------|--------|-------|----------|-------|-------|--------|--------|---------|------|--------|--------|--------|--------|--------|--------|
| 24.   | 57.   | 0.17   | 347.4 | 0.73     | 79.93 | 91.66 | 0.3354 | 0.3509 | 0.87    | 0.39 | 0.0091 | 0.9633 | 0.0018 | 0.0009 | 1.3426 | 0.8870 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 1.0  
PLUME-OBSERVER DISTANCE (KM) = 60.5  
AZIMUTH OF LINE-OF-SIGHT = 269.2  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 24.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL | C(550) | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|------|--------|--------|--------|--------|--------|--------|--------|
| 1.0     | 0.17   | 0.29   | 86.95 | 94.72 | 0.3537 | 0.3552    | 0.75 | 0.32   | 0.0076 | 0.9814 | 0.0012 | 0.0007 | 1.0088 | 0.6812 |
| 0.3     | 0.17   | 0.29   | 63.10 | 83.51 | 0.3158 | 0.3318    | 1.19 | 0.63   | 0.0171 | 0.9508 | 0.0026 | 0.0016 | 1.8005 | 1.2230 |
| 0.0     | 0.17   | 0.29   | 52.88 | 77.82 | 0.2920 | 0.3171    | 1.38 | 0.82   | 0.0236 | 0.9062 | 0.0037 | 0.0024 | 2.3620 | 1.6020 |

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# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 1.0  
 PLUME-OBSERVER DISTANCE (KM) = 60.5  
 AZIMUTH OF LINE-OF-SIGHT = 269.2  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
 THETA LENGTH RP/RV0 RV %REDUCED YCAP L X Y DELYCAP DELL C(550) BRATIO DELX DELY E(LUV) E(LAB)

24.

FOR SKY BACKGROUND:

|    |      |       |      |       |       |        |        |      |      |        |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|
| 0. | 0.17 | 347.5 | 0.70 | 81.71 | 92.45 | 0.3332 | 0.3441 | 0.97 | 0.43 | 0.0104 | 0.9677 | 0.0015 | 0.0009 | 1.1888 | 0.8080 |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|

FOR WHITE BACKGROUND:

|    |      |       |      |       |       |        |        |      |      |        |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|
| 0. | 0.17 | 347.7 | 0.65 | 89.52 | 95.80 | 0.3477 | 0.3496 | 0.84 | 0.35 | 0.0085 | 0.9825 | 0.0011 | 0.0007 | 0.9197 | 0.6379 |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|

FOR GRAY BACKGROUND:

|    |      |       |      |       |       |        |        |      |      |        |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|
| 0. | 0.17 | 346.9 | 0.88 | 65.01 | 84.50 | 0.3099 | 0.3252 | 1.24 | 0.64 | 0.0175 | 0.9518 | 0.0024 | 0.0016 | 1.7253 | 1.1771 |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|

FOR BLACK BACKGROUND:

|    |      |       |      |       |       |        |        |      |      |        |        |        |        |        |        |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|
| 0. | 0.17 | 346.4 | 1.03 | 54.50 | 78.77 | 0.2862 | 0.3100 | 1.42 | 0.83 | 0.0236 | 0.9071 | 0.0036 | 0.0023 | 2.2829 | 1.5478 |
|----|------|-------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|

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# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 2.5  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 166.  
 SIGMA Z (M) = 61.  
 SO2-SO4 CONVERSION RATE = 0.0001 PERCENT/HR  
 NOX-NO3 CONVERSION RATE = 0.0005 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | 03<br>(PPM) | PRIMARY BSP-TOTAL<br>(UG/M3) (10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|-----------------------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.027        | 0.019        | 0.000         | 71.140               | 0.000                 | 0.001        | 0.000           | 0.000                 | -0.019      | 2.045                                   | 0.001            |
| TOTAL AMBJ | 0.032        | 0.024        | 0.000         | 73.143               | 0.000                 | 0.004        | 0.000           | 0.000                 | 0.021       | 1.888                                   | 0.001            |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.123        | 0.037        | 0.000         | 29.820               | 0.000                 | 0.002        | 0.000           | 0.000                 | -0.036      | 9.165                                   | 0.000            |
| TOTAL AMBJ | 0.128        | 0.041        | 0.000         | 31.945               | 0.000                 | 0.005        | 0.000           | 0.000                 | 0.004       | 9.007                                   | 0.000            |
| H          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.202        | 0.038        | 0.000         | 18.964               | 0.000                 | 0.004        | 0.000           | 0.000                 | -0.038      | 15.110                                  | 0.000            |
| TOTAL AMBJ | 0.207        | 0.043        | 0.000         | 20.535               | 0.000                 | 0.007        | 0.000           | 0.000                 | 0.002       | 14.953                                  | 0.000            |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.123        | 0.037        | 0.000         | 29.820               | 0.000                 | 0.002        | 0.000           | 0.000                 | -0.036      | 9.165                                   | 0.000            |
| TOTAL AMBJ | 0.128        | 0.041        | 0.000         | 31.945               | 0.000                 | 0.005        | 0.000           | 0.000                 | 0.004       | 9.007                                   | 0.000            |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.027        | 0.019        | 0.000         | 71.139               | 0.000                 | 0.001        | 0.000           | 0.000                 | -0.019      | 2.045                                   | 0.001            |
| TOTAL AMBJ | 0.032        | 0.024        | 0.000         | 73.142               | 0.000                 | 0.004        | 0.000           | 0.000                 | 0.021       | 1.888                                   | 0.001            |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.001        | 0.001        | 0.000         | 82.444               | 0.034                 | 0.000        | 0.000           | 0.006                 | -0.001      | 0.095                                   | 0.001            |
| TOTAL AMBJ | 0.006        | 0.005        | 0.000         | 83.776               | 0.007                 | 0.003        | 0.000           | 0.000                 | 0.039       | -0.062                                  | 0.058            |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0000  
 NOXJ 0.0000  
 PRIMARY PARTICULATEJ 0.0000  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 2.5  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 61.4  
AZIMUTH OF LINE-OF-SIGHT = 268.0  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL | C(550) | BRATIO | DELX   | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|------|--------|--------|--------|--------|--------|---------------|
| 24.   |       |        |       |          |       |       |        |           |      |        |        |        |        |        |               |
|       | 56.   | 0.18   | 348.3 | 0.49     | 79.04 | 91.26 | 0.3349 | 0.3506    | 0.22 | 0.10   | 0.0014 | 0.9775 | 0.0013 | 0.0006 | 0.9953 0.6150 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 2.5  
PLUME-OBSERVER DISTANCE (KM) = 61.4  
AZIMUTH OF LINE-OF-SIGHT = 268.0  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 24.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL | C(550) | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|------|--------|--------|--------|--------|--------|--------|--------|
| 1.0     | 0.18   | 0.29   | 86.18 | 94.40 | 0.3536 | 0.3550    | 0.12 | 0.05   | 0.0004 | 0.9880 | 0.0010 | 0.0004 | 0.7968 | 0.4889 |
| 0.3     | 0.18   | 0.29   | 62.27 | 83.07 | 0.3150 | 0.3312    | 0.50 | 0.27   | 0.0067 | 0.9707 | 0.0017 | 0.0010 | 1.1690 | 0.7503 |
| 0.0     | 0.18   | 0.29   | 52.02 | 77.31 | 0.2906 | 0.3161    | 0.66 | 0.40   | 0.0110 | 0.9443 | 0.0023 | 0.0015 | 1.4738 | 0.9628 |

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# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 2.5  
 PLUME-OBSERVER DISTANCE (KM) = 61.4  
 AZIMUTH OF LINE-OF-SIGHT = 268.0  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

|                       | L     | X     | Y      | DELYCAP | DELL | C(550) | BRATIO | DELX   | DELY   | E(LUV) | E(LAB)        |
|-----------------------|-------|-------|--------|---------|------|--------|--------|--------|--------|--------|---------------|
| 24.                   |       |       |        |         |      |        |        |        |        |        |               |
| FOR SKY BACKGROUND:   |       |       |        |         |      |        |        |        |        |        |               |
| 1. 0.18 348.4 0.45    | 80.87 | 92.08 | 0.3327 | 0.3437  | 0.34 | 0.15   | 0.0030 | 0.9808 | 0.0011 | 0.0005 | 0.8143 0.5092 |
| FOR WHITE BACKGROUND: |       |       |        |         |      |        |        |        |        |        |               |
| 1. 0.18 348.5 0.42    | 88.79 | 95.50 | 0.3476 | 0.3493  | 0.24 | 0.10   | 0.0018 | 0.9892 | 0.0009 | 0.0004 | 0.6695 0.4143 |
| FOR GRAY BACKGROUND:  |       |       |        |         |      |        |        |        |        |        |               |
| 1. 0.18 348.0 0.57    | 64.20 | 84.08 | 0.3090 | 0.3245  | 0.57 | 0.29   | 0.0076 | 0.9719 | 0.0015 | 0.0009 | 1.0746 0.6960 |
| FOR BLACK BACKGROUND: |       |       |        |         |      |        |        |        |        |        |               |
| 1. 0.18 347.7 0.67    | 53.66 | 78.28 | 0.2847 | 0.3090  | 0.71 | 0.42   | 0.0115 | 0.9454 | 0.0021 | 0.0014 | 1.3822 0.9073 |

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# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 5.0  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 304.  
 SIGMA Z (M) = 92.  
 SO2-SO4 CONVERSION RATE= 0.0003 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0024 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.010        | 0.008        | 0.000         | 79.423               | 0.005                 | 0.000        | 0.000           | 0.001                 | -0.008      | 0.738              | 0.008                   | 0.010            |
| TOTAL AMBJ | 0.015        | 0.012        | 0.000         | 81.007               | 0.003                 | 0.003        | 0.000           | 0.000                 | 0.032       | 0.580              | 0.007                   | 0.010            |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.044        | 0.027        | 0.000         | 61.020               | 0.000                 | 0.001        | 0.000           | 0.000                 | -0.027      | 3.306              | 0.035                   | 0.001            |
| TOTAL AMBJ | 0.049        | 0.031        | 0.000         | 63.371               | 0.000                 | 0.004        | 0.000           | 0.000                 | 0.013       | 3.148              | 0.034                   | 0.001            |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.073        | 0.033        | 0.000         | 45.478               | 0.000                 | 0.001        | 0.000           | 0.000                 | -0.033      | 5.451              | 0.057                   | 0.001            |
| TOTAL AMBJ | 0.078        | 0.037        | 0.000         | 47.961               | 0.000                 | 0.004        | 0.000           | 0.000                 | 0.007       | 5.293              | 0.057                   | 0.001            |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.044        | 0.027        | 0.000         | 60.912               | 0.000                 | 0.001        | 0.000           | 0.000                 | -0.027      | 3.319              | 0.035                   | 0.001            |
| TOTAL AMBJ | 0.049        | 0.031        | 0.000         | 63.266               | 0.000                 | 0.004        | 0.000           | 0.000                 | 0.013       | 3.161              | 0.034                   | 0.001            |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.013        | 0.010        | 0.000         | 78.044               | 0.005                 | 0.000        | 0.000           | 0.001                 | -0.010      | 0.994              | 0.010                   | 0.010            |
| TOTAL AMBJ | 0.018        | 0.015        | 0.000         | 79.709               | 0.003                 | 0.003        | 0.000           | 0.000                 | 0.030       | 0.836              | 0.010                   | 0.010            |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.012        | 0.009        | 0.000         | 78.533               | 0.081                 | 0.000        | 0.000           | 0.014                 | -0.009      | 0.894              | 0.009                   | 0.140            |
| TOTAL AMBJ | 0.017        | 0.014        | 0.000         | 80.185               | 0.057                 | 0.003        | 0.000           | 0.001                 | 0.031       | 0.737              | 0.009                   | 0.148            |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0001  
 NOXJ 0.0001  
 PRIMARY PARTICULATEJ 0.0000  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 5.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 62.8  
AZIMUTH OF LINE-OF-SIGHT = 266.1  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELY   | E(LUV) | E(LAB) |        |        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 25.   | 54.   | 0.18   | 348.6 | 0.39     | 78.27 | 90.91 | 0.3347 | 0.3503    | -0.10 | -0.04  | -0.0024 | 0.9844 | 0.0012 | 0.0004 | 0.8608 | 0.5242 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 5.0  
PLUME-OBSERVER DISTANCE (KM) = 62.8  
AZIMUTH OF LINE-OF-SIGHT = 266.1  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 25.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.18   | 0.29   | 85.58 | 94.14 | 0.3537 | 0.3549    | -0.19 | -0.08  | -0.0032 | 0.9913 | 0.0010 | 0.0003 | 0.7324 | 0.4450 |
| 0.3     | 0.18   | 0.29   | 61.65 | 82.74 | 0.3146 | 0.3308    | 0.18  | 0.09   | 0.0018  | 0.9804 | 0.0013 | 0.0007 | 0.8840 | 0.5454 |
| 0.0     | 0.18   | 0.29   | 51.40 | 76.94 | 0.2898 | 0.3155    | 0.33  | 0.20   | 0.0053  | 0.9631 | 0.0016 | 0.0011 | 1.0627 | 0.6720 |



# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW gas fire at Bel

DOWNWIND DISTANCE (KM) = 5.0  
 PLUME-OBSERVER DISTANCE (KM) = 62.8  
 AZIMUTH OF LINE-OF-SIGHT = 266.1  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

25.

FOR SKY BACKGROUND:

|               | L    | X     | Y     | DELYCAP | DELL   | C(550) | BRAT(0) | DELX    | DELY   | E(LUV) | E(LAB) |        |        |
|---------------|------|-------|-------|---------|--------|--------|---------|---------|--------|--------|--------|--------|--------|
| 1. 0.18 348.7 | 0.38 | 80.07 | 91.72 | 0.3325  | 0.3433 | -0.04  | -0.02   | -0.0016 | 0.9865 | 0.0010 | 0.0004 | 0.7394 | 0.4435 |

FOR WHITE BACKGROUND:

|               |      |       |       |        |        |       |       |         |        |        |        |        |        |
|---------------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|
| 1. 0.18 348.8 | 0.35 | 88.14 | 95.22 | 0.3477 | 0.3492 | -0.15 | -0.06 | -0.0026 | 0.9919 | 0.0009 | 0.0003 | 0.6691 | 0.4009 |
|---------------|------|-------|-------|--------|--------|-------|-------|---------|--------|--------|--------|--------|--------|

FOR GRAY BACKGROUND:

|               |      |       |       |        |        |      |      |        |        |        |        |        |        |
|---------------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|
| 1. 0.18 348.3 | 0.47 | 63.57 | 83.75 | 0.3086 | 0.3241 | 0.20 | 0.10 | 0.0021 | 0.9810 | 0.0012 | 0.0007 | 0.8326 | 0.5095 |
|---------------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|

FOR BLACK BACKGROUND:

|               |      |       |       |        |        |      |      |        |        |        |        |        |        |
|---------------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|
| 1. 0.18 348.1 | 0.56 | 53.04 | 77.92 | 0.2840 | 0.3083 | 0.35 | 0.21 | 0.0054 | 0.9638 | 0.0015 | 0.0010 | 1.0120 | 0.6364 |
|---------------|------|-------|-------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|

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# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 10.0  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 559.  
 SIGMA Z (M) = 137.  
 SO2-SO4 CONVERSION RATE= 0.0014 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0098 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | 03<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.004        | 0.003        | 0.000         | 81.295               | 0.036                 | 0.000        | 0.000           | 0.007                 | -0.003      | 0.269              | 0.003                   | 0.066            |
| TOTAL AMB1 | 0.009        | 0.007        | 0.000         | 83.089               | 0.015                 | 0.003        | 0.000           | 0.000                 | 0.037       | 0.111              | 0.002                   | 0.081            |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.016        | 0.012        | 0.000         | 76.520               | 0.004                 | 0.000        | 0.000           | 0.001                 | -0.012      | 1.206              | 0.013                   | 0.010            |
| TOTAL AMB1 | 0.021        | 0.017        | 0.000         | 78.580               | 0.003                 | 0.003        | 0.000           | 0.000                 | 0.028       | 1.048              | 0.012                   | 0.010            |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.027        | 0.019        | 0.000         | 71.189               | 0.001                 | 0.001        | 0.000           | 0.000                 | -0.019      | 2.009              | 0.021                   | 0.004            |
| TOTAL AMB1 | 0.032        | 0.023        | 0.000         | 73.488               | 0.001                 | 0.004        | 0.000           | 0.000                 | 0.021       | 1.852              | 0.021                   | 0.004            |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.020        | 0.015        | 0.000         | 74.860               | 0.004                 | 0.000        | 0.000           | 0.001                 | -0.015      | 1.474              | 0.016                   | 0.010            |
| TOTAL AMB1 | 0.025        | 0.019        | 0.000         | 77.002               | 0.003                 | 0.003        | 0.000           | 0.000                 | 0.025       | 1.316              | 0.015                   | 0.010            |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.017        | 0.013        | 0.000         | 75.986               | 0.028                 | 0.000        | 0.000           | 0.005                 | -0.013      | 1.290              | 0.014                   | 0.053            |
| TOTAL AMB1 | 0.022        | 0.017        | 0.000         | 78.078               | 0.022                 | 0.003        | 0.000           | 0.001                 | 0.027       | 1.133              | 0.013                   | 0.055            |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENTJ | 0.017        | 0.013        | 0.000         | 75.916               | 0.119                 | 0.000        | 0.000           | 0.021                 | -0.013      | 1.290              | 0.014                   | 0.208            |
| TOTAL AMB1 | 0.022        | 0.017        | 0.000         | 78.023               | 0.093                 | 0.003        | 0.000           | 0.002                 | 0.027       | 1.133              | 0.013                   | 0.217            |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0044  
 NOXJ 0.0044  
 PRIMARY PARTICULATEJ 0.0004  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 10.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 65.8  
AZIMUTH OF LINE-OF-SIGHT = 262.6  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV   | %REDUCED | YCAP  | L      | X      | Y DELYCAP | DELL  | C(550)  | BRATIO | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|------|----------|-------|--------|--------|-----------|-------|---------|--------|--------|--------|---------------|
| 28.   |       |        |      |          |       |        |        |           |       |         |        |        |        |               |
| 51.   | 0.19  | 348.9  | 0.30 | 77.19    | 90.42 | 0.3342 | 0.3499 | -0.20     | -0.09 | -0.0033 | 0.9898 | 0.0008 | 0.0003 | 0.6430 0.3954 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 10.0  
PLUME-OBSERVER DISTANCE (KM) = 65.8  
AZIMUTH OF LINE-OF-SIGHT = 262.6  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 28.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELY   | DELY   | E(LUV) | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 1.0     | 0.19   | 0.29   | 84.87 | 93.83 | 0.3538 | 0.3549    | -0.23 | -0.12  | -0.0040 | 0.9944 | 0.0007 | 0.0002 | 0.5623 | 0.3486 |
| 0.3     | 0.19   | 0.29   | 60.89 | 82.34 | 0.3143 | 0.3305    | 0.03  | 0.02   | -0.0001 | 0.9875 | 0.0009 | 0.0005 | 0.6000 | 0.3650 |
| 0.0     | 0.19   | 0.29   | 50.61 | 76.47 | 0.2891 | 0.3149    | 0.16  | 0.10   | 0.0026  | 0.9763 | 0.0011 | 0.0007 | 0.7041 | 0.4388 |

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# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 10.0  
 PLUME-OBSERVER DISTANCE (KM) = 65.8  
 AZIMUTH OF LINE-OF-SIGHT = 262.6  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 5/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

| ETA                   | LENGTH | RP/RVO | RV | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY   | E(LUV) | E(LAB) |
|-----------------------|--------|--------|----|----------|-------|-------|--------|--------|---------|-------|---------|--------|--------|--------|--------|--------|
| 28.                   |        |        |    |          |       |       |        |        |         |       |         |        |        |        |        |        |
| FOR SKY BACKGROUND:   |        |        |    |          |       |       |        |        |         |       |         |        |        |        |        |        |
| 2.                    | 0.19   | 348.8  |    | 0.37     | 78.96 | 91.23 | 0.3321 | 0.3428 | -0.25   | -0.11 | -0.0040 | 0.9907 | 0.0008 | 0.0002 | 0.6436 | 0.3937 |
| FOR WHITE BACKGROUND: |        |        |    |          |       |       |        |        |         |       |         |        |        |        |        |        |
| 2.                    | 0.19   | 348.9  |    | 0.31     | 87.36 | 94.90 | 0.3478 | 0.3491 | -0.36   | -0.15 | -0.0050 | 0.9942 | 0.0008 | 0.0002 | 0.6249 | 0.3883 |
| FOR GRAY BACKGROUND:  |        |        |    |          |       |       |        |        |         |       |         |        |        |        |        |        |
| 2.                    | 0.19   | 348.5  |    | 0.41     | 62.80 | 83.35 | 0.3082 | 0.3237 | -0.01   | 0.00  | -0.0008 | 0.9875 | 0.0009 | 0.0004 | 0.6281 | 0.3761 |
| FOR BLACK BACKGROUND: |        |        |    |          |       |       |        |        |         |       |         |        |        |        |        |        |
| 2.                    | 0.19   | 348.3  |    | 0.49     | 52.27 | 77.46 | 0.2832 | 0.3077 | 0.14    | 0.08  | 0.0022  | 0.9762 | 0.0011 | 0.0007 | 0.7227 | 0.4419 |

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# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 48.0  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 2176.  
 SIGMA Z (M) = 316.  
 SO2-SO4 CONVERSION RATE= 0.0068 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.0475 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | 03<br>(PPM) | PRIMARY BSP-TOTAL<br>(UG/M3) (10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|-----------------------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.000        | 0.000        | 0.000         | 0.000                | 0.498                 | 0.000        | 0.000           | 0.088                 | 0.000       | 0.033                                   | 0.890            |
| TOTAL AMBJ | 0.005        | 0.005        | 0.000         | 83.995               | 0.041                 | 0.003        | 0.000           | 0.000                 | 0.040       | -0.124                                  | -1.767           |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.002        | 0.002        | 0.000         | 74.707               | 0.132                 | 0.000        | 0.000           | 0.027                 | -0.001      | 0.149                                   | 0.271            |
| TOTAL AMBJ | 0.007        | 0.006        | 0.000         | 83.593               | 0.039                 | 0.003        | 0.000           | 0.000                 | 0.039       | -0.009                                  | 0.407            |
| H          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.004        | 0.003        | 0.000         | 74.153               | 0.059                 | 0.000        | 0.000           | 0.014                 | -0.003      | 0.314                                   | 0.143            |
| TOTAL AMBJ | 0.009        | 0.007        | 0.000         | 83.000               | 0.028                 | 0.003        | 0.000           | 0.000                 | 0.037       | 0.156                                   | 0.170            |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.004        | 0.003        | 0.000         | 74.116               | 0.101                 | 0.000        | 0.000           | 0.021                 | -0.003      | 0.314                                   | 0.218            |
| TOTAL AMBJ | 0.009        | 0.007        | 0.000         | 82.982               | 0.049                 | 0.003        | 0.000           | 0.001                 | 0.037       | 0.156                                   | 0.259            |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.004        | 0.003        | 0.000         | 74.071               | 0.154                 | 0.000        | 0.000           | 0.031                 | -0.003      | 0.314                                   | 0.310            |
| TOTAL AMBJ | 0.009        | 0.007        | 0.000         | 82.960               | 0.074                 | 0.003        | 0.000           | 0.001                 | 0.037       | 0.156                                   | 0.368            |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                                         |                  |
| INCREMENTJ | 0.004        | 0.003        | 0.000         | 73.976               | 0.269                 | 0.000        | 0.000           | 0.050                 | -0.003      | 0.314                                   | 0.510            |
| TOTAL AMBJ | 0.009        | 0.007        | 0.000         | 82.915               | 0.129                 | 0.003        | 0.000           | 0.001                 | 0.037       | 0.156                                   | 0.606            |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2J 0.0907  
 NOXJ 0.0906  
 PRIMARY PARTICULATEJ 0.0091  
 SO4J 0.0000  
 NO3J 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 48.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 94.6  
AZIMUTH OF LINE-OF-SIGHT = 244.5  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9° AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RV0 | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELY   | E(LUV) | E(LAB) |        |        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|--------|--------|
| 42.   | 33.   | 0.27   | 349.1 | 0.26     | 69.94 | 86.98 | 0.3317 | 0.3474    | -0.19 | -0.09  | -0.0032 | 0.9975 | 0.0003 | 0.0000 | 0.2813 | 0.1896 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 48.0  
PLUME-OBSERVER DISTANCE (KM) = 94.6  
AZIMUTH OF LINE-OF-SIGHT = 244.5  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 - AT 1600. ON 6/21  
THETA = 42.

| REFLECT | RF/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV)  | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|---------|--------|--------|
| 1.0     | 0.27   | 0.41   | 77.25 | 90.44 | 0.3541 | 0.3524    | -0.25 | -0.11  | -0.0038 | 0.9999 | 0.0002 | -0.0001 | 0.2391 | 0.1774 |
| 0.3     | 0.27   | 0.41   | 61.09 | 82.44 | 0.3201 | 0.3355    | -0.08 | -0.04  | -0.0017 | 0.9971 | 0.0003 | 0.0000  | 0.2220 | 0.1395 |
| 0.0     | 0.27   | 0.41   | 54.16 | 78.58 | 0.3008 | 0.3260    | -0.01 | 0.00   | -0.0005 | 0.9936 | 0.0004 | 0.0001  | 0.2603 | 0.1592 |



# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 48.0  
 PLUME-OBSERVER DISTANCE (KM) = 94.6  
 AZIMUTH OF LINE-OF-SIGHT = 244.5  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

|     |                       |       |      |       | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|-----|-----------------------|-------|------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 42. | FOR SKY BACKGROUND:   |       |      |       |       |        |        |         |       |         |        |        |         |        |        |
| 10. | 0.27                  | 348.3 | 0.48 | 72.08 | 88.02 | 0.3299 | 0.3393 | -0.46   | -0.22 | -0.0075 | 0.9977 | 0.0004 | -0.0002 | 0.5029 | 0.3687 |
|     | FOR WHITE BACKGROUND: |       |      |       |       |        |        |         |       |         |        |        |         |        |        |
| 10. | 0.27                  | 348.4 | 0.45 | 79.56 | 91.49 | 0.3470 | 0.3455 | -0.60   | -0.27 | -0.0088 | 0.9995 | 0.0004 | -0.0003 | 0.5492 | 0.4168 |
|     | FOR GRAY BACKGROUND:  |       |      |       |       |        |        |         |       |         |        |        |         |        |        |
| 10. | 0.27                  | 348.1 | 0.55 | 63.16 | 83.54 | 0.3130 | 0.3280 | -0.27   | -0.14 | -0.0050 | 0.9967 | 0.0004 | -0.0001 | 0.4014 | 0.2745 |
|     | FOR BLACK BACKGROUND: |       |      |       |       |        |        |         |       |         |        |        |         |        |        |
| 10. | 0.27                  | 347.9 | 0.61 | 56.13 | 79.71 | 0.2940 | 0.3181 | -0.13   | -0.07 | -0.0028 | 0.9931 | 0.0005 | 0.0001  | 0.3986 | 0.2487 |



# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 96.0  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 3891.  
 SIGMA Z (M) = 446.  
 SO2-SO4 CONVERSION RATE= 0.0381 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.2669 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | SO3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|--------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.000        | 0.000        | 0.000         | 0.000                | 2.775                 | 0.000        | 0.000           | 0.534                 | 0.000        | 0.037              | 0.000                   | 5.205            |
| TOTAL AMB] | 0.005        | 0.005        | 0.000         | 83.809               | 0.262                 | 0.003        | 0.000           | 0.002                 | 0.040        | -0.120             | 0.000                   | -19.700          |
| H+1S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.001        | 0.001        | 0.000         | 66.378               | 1.156                 | 0.000        | 0.000           | 0.240                 | -0.001       | 0.069              | 0.001                   | 2.407            |
| TOTAL AMB] | 0.006        | 0.005        | 0.000         | 83.772               | 0.189                 | 0.003        | 0.000           | 0.001                 | 0.039        | -0.088             | 0.000                   | 8.185            |
| H          |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.002        | 0.001        | 0.000         | 66.504               | 0.682                 | 0.000        | 0.000           | 0.155                 | -0.001       | 0.143              | 0.002                   | 1.569            |
| TOTAL AMB] | 0.007        | 0.006        | 0.000         | 83.530               | 0.202                 | 0.003        | 0.000           | 0.002                 | 0.039        | -0.015             | 0.001                   | 2.395            |
| H-1S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.002        | 0.001        | 0.000         | 66.364               | 0.852                 | 0.000        | 0.000           | 0.187                 | -0.001       | 0.143              | 0.002                   | 1.885            |
| TOTAL AMB] | 0.007        | 0.005        | 0.000         | 83.488               | 0.252                 | 0.003        | 0.000           | 0.002                 | 0.039        | -0.015             | 0.001                   | 2.872            |
| H-2S       |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.002        | 0.001        | 0.000         | 66.207               | 1.041                 | 0.000        | 0.000           | 0.223                 | -0.001       | 0.143              | 0.002                   | 2.238            |
| TOTAL AMB] | 0.007        | 0.005        | 0.000         | 83.442               | 0.308                 | 0.003        | 0.000           | 0.003                 | 0.039        | -0.015             | 0.001                   | 3.403            |
| 0          |              |              |               |                      |                       |              |                 |                       |              |                    |                         |                  |
| INCREMENT] | 0.002        | 0.001        | 0.000         | 65.907               | 1.406                 | 0.000        | 0.000           | 0.290                 | -0.001       | 0.143              | 0.002                   | 2.898            |
| TOTAL AMB] | 0.007        | 0.005        | 0.000         | 83.353               | 0.416                 | 0.003        | 0.000           | 0.004                 | 0.039        | -0.015             | 0.001                   | 4.392            |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2] 0.1856  
 NOX] 0.1846  
 PRIMARY PARTICULATE] 0.0195  
 SO4] 0.0000  
 NO3] 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 96.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 137.6  
AZIMUTH OF LINE-OF-SIGHT = 233.7  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | XREDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV)  | E(LAB) |        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|---------|--------|--------|
| 52.   | 22.   | 0.39   | 348.9 | 0.31     | 64.71 | 84.35 | 0.3298 | 0.3455    | -0.12 | -0.06  | -0.0024 | 0.9985 | 0.0001 | -0.0001 | 0.1621 | 0.1230 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 96.0  
PLUME-OBSERVER DISTANCE (KM) = 137.6  
AZIMUTH OF LINE-OF-SIGHT = 233.7  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 52.

| REFLECT | RP/RV0 | RO/RV0 | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 1.0     | 0.39   | 0.71   | 68.76 | 86.40 | 0.3490 | 0.3470 | -0.15   | -0.08 | -0.0026 | 1.0009 | 0.0000 | -0.0002 | 0.1311 | 0.1157 |
| 0.3     | 0.39   | 0.71   | 62.44 | 83.16 | 0.3298 | 0.3416 | -0.09   | -0.05 | -0.0018 | 0.9990 | 0.0001 | -0.0001 | 0.1161 | 0.0900 |
| 0.0     | 0.39   | 0.71   | 59.73 | 81.71 | 0.3205 | 0.3391 | -0.06   | -0.03 | -0.0014 | 0.9975 | 0.0001 | -0.0001 | 0.1288 | 0.0908 |

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 96.0  
PLUME-OBSERVER DISTANCE (KM) = 137.6  
AZIMUTH OF LINE-OF-SIGHT = 233.7  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 52.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV)  | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|---------|--------|--------|
| 1.0     | 0.39   | 0.71   | 68.76 | 86.40 | 0.3490 | 0.3470    | -0.15 | -0.08  | -0.0026 | 1.0009 | 0.0000 | -0.0002 | 0.1311 | 0.1157 |
| 0.3     | 0.39   | 0.71   | 62.44 | 83.16 | 0.3298 | 0.3416    | -0.09 | -0.05  | -0.0018 | 0.9990 | 0.0001 | -0.0001 | 0.1161 | 0.0900 |
| 0.0     | 0.39   | 0.71   | 59.73 | 81.71 | 0.3205 | 0.3391    | -0.06 | -0.03  | -0.0014 | 0.9975 | 0.0001 | -0.0001 | 0.1288 | 0.0908 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW was fired at Bal

DOWNWIND DISTANCE (KM) = 96.0  
 PLUME-OBSERVER DISTANCE (KM) = 137.6  
 AZIMUTH OF LINE-OF-SIGHT = 233.7  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1  
 SOLAR ZENITH ANGLE = 69.9 AT 1400. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

| META LENGTH RP/RVO    |      | RV    | %REDUCED | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|-----------------------|------|-------|----------|-------|-------|--------|--------|---------|-------|---------|--------|--------|---------|--------|--------|
| 52.                   |      |       |          |       |       |        |        |         |       |         |        |        |         |        |        |
| FOR SKY BACKGROUND:   |      |       |          |       |       |        |        |         |       |         |        |        |         |        |        |
| 26.                   | 0.39 | 346.4 | 1.02     | 67.32 | 85.68 | 0.3284 | 0.3368 | -0.53   | -0.26 | -0.0092 | 1.0000 | 0.0001 | -0.0006 | 0.5255 | 0.4435 |
| FOR WHITE BACKGROUND: |      |       |          |       |       |        |        |         |       |         |        |        |         |        |        |
| 26.                   | 0.39 | 346.5 | 0.99     | 70.95 | 87.47 | 0.3407 | 0.3391 | -0.63   | -0.30 | -0.0104 | 1.0018 | 0.0000 | -0.0007 | 0.5650 | 0.4880 |
| FOR GRAY BACKGROUND:  |      |       |          |       |       |        |        |         |       |         |        |        |         |        |        |
| 26.                   | 0.39 | 346.3 | 1.05     | 64.62 | 84.30 | 0.3217 | 0.3335 | -0.43   | -0.22 | -0.0079 | 0.9996 | 0.0001 | -0.0005 | 0.4525 | 0.3769 |
| FOR BLACK BACKGROUND: |      |       |          |       |       |        |        |         |       |         |        |        |         |        |        |
| 26.                   | 0.39 | 346.2 | 1.08     | 61.91 | 82.88 | 0.3126 | 0.3308 | -0.35   | -0.19 | -0.0067 | 0.9977 | 0.0002 | -0.0004 | 0.4226 | 0.3385 |

# CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Del

DOWNWIND DISTANCE (KM) = 155.0  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 5756.  
 SIGMA Z (M) = 561.  
 SO2-SO4 CONVERSION RATE= 0.0535 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.3745 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPEN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 8.976                 | 0.000        | 0.001           | 1.879                 | 0.000       | 0.038              | 0.000                   | 16.334           |
| TOTAL AMB1 | 0.005        | 0.004        | 0.000         | 83.309               | 0.879                 | 0.003        | 0.001           | 0.006                 | 0.040       | -0.119             | 0.000                   | -173.127         |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 4.987                 | 0.000        | 0.001           | 1.098                 | 0.000       | 0.047              | 0.001                   | 10.236           |
| TOTAL AMB1 | 0.005        | 0.005        | 0.000         | 83.528               | 0.586                 | 0.003        | 0.001           | 0.004                 | 0.040       | -0.111             | 0.000                   | 281.010          |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.001        | 0.001        | 0.000         | 57.445               | 3.346                 | 0.000        | 0.001           | 0.786                 | -0.001      | 0.082              | 0.001                   | 7.546            |
| TOTAL AMB1 | 0.006        | 0.005        | 0.000         | 83.379               | 0.648                 | 0.003        | 0.001           | 0.006                 | 0.039       | -0.076             | 0.000                   | 17.361           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.001        | 0.001        | 0.000         | 57.148               | 3.706                 | 0.000        | 0.001           | 0.858                 | -0.001      | 0.082              | 0.001                   | 8.182            |
| TOTAL AMB1 | 0.006        | 0.005        | 0.000         | 83.321               | 0.718                 | 0.003        | 0.001           | 0.006                 | 0.039       | -0.076             | 0.000                   | 18.657           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.001        | 0.001        | 0.000         | 56.831               | 4.090                 | 0.000        | 0.001           | 0.935                 | -0.001      | 0.082              | 0.001                   | 8.856            |
| TOTAL AMB1 | 0.006        | 0.005        | 0.000         | 83.260               | 0.793                 | 0.003        | 0.001           | 0.007                 | 0.039       | -0.076             | 0.000                   | 20.006           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.001        | 0.001        | 0.000         | 56.270               | 4.769                 | 0.000        | 0.001           | 1.070                 | -0.001      | 0.082              | 0.001                   | 10.003           |
| TOTAL AMB1 | 0.006        | 0.005        | 0.000         | 83.151               | 0.924                 | 0.003        | 0.001           | 0.008                 | 0.039       | -0.076             | 0.000                   | 22.245           |

## CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO21 0.2707  
 NOX1 0.2659  
 PRIMARY PARTICULATE1 0.0298  
 SO41 0.0001  
 NO31 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 155.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 193.6  
AZIMUTH OF LINE-OF-SIGHT = 227.2  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | BP/RVO | RV   | %REDUCED | YCAP  | L      | X      | Y DELYCAP | DELL  | C(550)  | BRATIO | DELX   | DELY    | E(LUV) | E(LAB) |
|-------|-------|--------|------|----------|-------|--------|--------|-----------|-------|---------|--------|--------|---------|--------|--------|
| 57.   |       |        |      |          |       |        |        |           |       |         |        |        |         |        |        |
| 15.   | 0.55  | 348.7  | 0.38 | 61.67    | 82.75 | 0.3287 | 0.3443 | -0.07     | -0.04 | -0.0014 | 0.9986 | 0.0001 | -0.0001 | 0.0995 | 0.0761 |



PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 155.0  
PLUME-OBSERVER DISTANCE (KM) = 193.6  
AZIMUTH OF LINE-OF-SIGHT = 227.2  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 57.

| REFLECT | RP/RV0 | RO/RV0 | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY    | E(LUV)  | E(LAB) |        |
|---------|--------|--------|-------|-------|--------|-----------|-------|--------|---------|--------|---------|---------|--------|--------|
| 1.0     | 0.55   | 0.97   | 64.33 | 84.15 | 0.3450 | 0.3444    | -0.08 | -0.04  | -0.0014 | 1.0013 | -0.0001 | -0.0001 | 0.0895 | 0.0732 |
| 0.3     | 0.55   | 0.97   | 61.32 | 82.57 | 0.3336 | 0.3426    | -0.05 | -0.03  | -0.0011 | 0.9998 | 0.0000  | -0.0001 | 0.0618 | 0.0528 |
| 0.0     | 0.55   | 0.97   | 60.04 | 81.87 | 0.3284 | 0.3417    | -0.04 | -0.02  | -0.0009 | 0.9987 | 0.0000  | -0.0001 | 0.0651 | 0.0514 |



# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 155.0  
 PLUME-OBSERVER DISTANCE (KM) = 193.6  
 AZIMUTH OF LINE-OF-SIGHT = 227.2  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0  
 SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

|                       |      |       |      |       | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX    | DELY    | E(LUV) | E(LAB) |
|-----------------------|------|-------|------|-------|-------|--------|--------|---------|-------|---------|--------|---------|---------|--------|--------|
| 57.                   |      |       |      |       |       |        |        |         |       |         |        |         |         |        |        |
| FOR SKY BACKGROUND:   |      |       |      |       |       |        |        |         |       |         |        |         |         |        |        |
| 55.                   | 0.55 | 343.0 | 2.01 | 64.71 | 84.35 | 0.3280 | 0.3354 | -0.50   | -0.26 | -0.0091 | 1.0015 | -0.0003 | -0.0008 | 0.5356 | 0.4555 |
| FOR WHITE BACKGROUND: |      |       |      |       |       |        |        |         |       |         |        |         |         |        |        |
| 55.                   | 0.55 | 343.0 | 1.99 | 66.65 | 85.34 | 0.3360 | 0.3363 | -0.58   | -0.29 | -0.0100 | 1.0034 | -0.0004 | -0.0009 | 0.5994 | 0.5047 |
| FOR GRAY BACKGROUND:  |      |       |      |       |       |        |        |         |       |         |        |         |         |        |        |
| 55.                   | 0.55 | 342.9 | 2.03 | 63.69 | 83.82 | 0.3249 | 0.3343 | -0.44   | -0.23 | -0.0082 | 1.0013 | -0.0002 | -0.0007 | 0.4783 | 0.4077 |
| FOR BLACK BACKGROUND: |      |       |      |       |       |        |        |         |       |         |        |         |         |        |        |
| 55.                   | 0.55 | 342.8 | 2.05 | 62.42 | 83.15 | 0.3198 | 0.3334 | -0.38   | -0.20 | -0.0074 | 0.9998 | -0.0001 | -0.0006 | 0.4382 | 0.3723 |

CONCENTRATION OF AEROSOL AND GASES CONTRIBUTED BY

1540 MW gas fired at Bel

DOWNWIND DISTANCE (M) = 205.0  
 PLUME ALTITUDE (M) = 206.  
 SIGMA Y (M) = 7205.  
 SIGMA Z (M) = 641.  
 SO2-SO4 CONVERSION RATE= 0.0617 PERCENT/HR  
 NOX-NO3 CONVERSION RATE= 0.4317 PERCENT/HR

| ALTITUDE   | NOX<br>(PPM) | NO2<br>(PPM) | NO3-<br>(PPM) | NO2/NTOT<br>(MOLE %) | NO3-/NTOT<br>(MOLE %) | SO2<br>(PPM) | SO4=<br>(UG/M3) | SO4=/STOT<br>(MOLE %) | O3<br>(PPM) | PRIMARY<br>(UG/M3) | BSP-TOTAL<br>(10-4 M-1) | BSPSN/BSP<br>(%) |
|------------|--------------|--------------|---------------|----------------------|-----------------------|--------------|-----------------|-----------------------|-------------|--------------------|-------------------------|------------------|
| H+2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 16.379                | 0.000        | 0.001           | 3.774                 | 0.000       | 0.035              | 0.001                   | 28.321           |
| TOTAL AMB1 | 0.005        | 0.004        | 0.000         | 82.779               | 1.540                 | 0.003        | 0.001           | 0.011                 | 0.040       | -0.122             | 0.000                   | -1102.891        |
| H+1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 12.233                | 0.000        | 0.001           | 2.783                 | 0.000       | 0.038              | 0.001                   | 22.561           |
| TOTAL AMB1 | 0.005        | 0.004        | 0.000         | 83.040               | 1.214                 | 0.003        | 0.001           | 0.009                 | 0.040       | -0.119             | 0.000                   | -1757.837        |
| H          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 9.312                 | 0.000        | 0.001           | 2.186                 | 0.000       | 0.059              | 0.001                   | 18.627           |
| TOTAL AMB1 | 0.005        | 0.005        | 0.000         | 82.845               | 1.385                 | 0.003        | 0.001           | 0.011                 | 0.040       | -0.098             | 0.000                   | 59.045           |
| H-1S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 9.638                 | 0.000        | 0.001           | 2.256                 | 0.000       | 0.059              | 0.001                   | 19.109           |
| TOTAL AMB1 | 0.005        | 0.005        | 0.000         | 82.805               | 1.434                 | 0.003        | 0.001           | 0.012                 | 0.040       | -0.098             | 0.000                   | 59.803           |
| H-2S       |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 9.971                 | 0.000        | 0.001           | 2.328                 | 0.000       | 0.059              | 0.001                   | 19.598           |
| TOTAL AMB1 | 0.005        | 0.005        | 0.000         | 82.764               | 1.483                 | 0.003        | 0.001           | 0.012                 | 0.040       | -0.098             | 0.000                   | 60.554           |
| 0          |              |              |               |                      |                       |              |                 |                       |             |                    |                         |                  |
| INCREMENT1 | 0.000        | 0.000        | 0.000         | 0.000                | 10.513                | 0.000        | 0.001           | 2.443                 | 0.000       | 0.059              | 0.001                   | 20.365           |
| TOTAL AMB1 | 0.005        | 0.005        | 0.000         | 82.697               | 1.564                 | 0.003        | 0.001           | 0.013                 | 0.040       | -0.098             | 0.000                   | 61.695           |

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO21 0.3248  
 NOX1 0.3135  
 PRIMARY PARTICULATE1 0.0373  
 SO41 0.0003  
 NO31 0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 205.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 242.2  
AZIMUTH OF LINE-OF-SIGHT = 224.1  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA ALPHA | RP/RV0 | RV   | %REDUCED | YCAP | L     | X     | Y DELYCAP | DELL   | C(550) | BRATIO | DELX    | DELY   | E(LUV) | E(LAB) |        |        |
|-------------|--------|------|----------|------|-------|-------|-----------|--------|--------|--------|---------|--------|--------|--------|--------|--------|
| 60.         | 12.    | 0.69 | 348.5    | 0.41 | 60.29 | 82.01 | 0.3281    | 0.3437 | -0.04  | -0.02  | -0.0008 | 0.9981 | 0.0001 | 0.0000 | 0.0776 | 0.0550 |

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VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS  
1540 MW was fired at Bel

DOWNWIND DISTANCE (KM) = 205.0  
PLUME ALTITUDE (M) = 206.  
PLUME-OBSERVER DISTANCE (KM) = 242.2  
AZIMUTH OF LINE-OF-SIGHT = 224.1  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
SIGHT PATH IS THROUGH PLUME CENTER

| THETA | ALPHA | RP/RVO | RV    | %REDUCED | YCAP  | L     | X      | Y DELYCAP | DELL  | C(550) | BRATIO  | DELX   | DELY   | E(LUV) | E(LAB)        |
|-------|-------|--------|-------|----------|-------|-------|--------|-----------|-------|--------|---------|--------|--------|--------|---------------|
| 60.   | 12.   | 0.69   | 348.5 | 0.41     | 60.29 | 82.01 | 0.3281 | 0.3437    | -0.04 | -0.02  | -0.0008 | 0.9981 | 0.0001 | 0.0000 | 0.0776 0.0550 |

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PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS  
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS  
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES

1540 MW gas fired at 221

DOWNWIND DISTANCE (KM) = 205.0  
PLUME-OBSERVER DISTANCE (KM) = 242.2  
AZIMUTH OF LINE-OF-SIGHT = 224.1  
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0  
SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
THETA = 60.

| REFLECT | RP/RVO | RO/RVO | YCAP  | L     | X      | Y      | DELYCAP | DELL  | C(550)  | BRATIO | DELX    | DELY    | E(LUV) | E(LAB) |
|---------|--------|--------|-------|-------|--------|--------|---------|-------|---------|--------|---------|---------|--------|--------|
| 1.0     | 0.69   | 1.01   | 62.83 | 83.37 | 0.3443 | 0.3438 | -0.06   | -0.03 | -0.0009 | 1.0015 | -0.0001 | -0.0001 | 0.0787 | 0.0563 |
| 0.3     | 0.69   | 1.01   | 60.18 | 81.95 | 0.3337 | 0.3423 | -0.03   | -0.01 | -0.0005 | 0.9997 | 0.0000  | 0.0000  | 0.0317 | 0.0270 |
| 0.0     | 0.69   | 1.01   | 59.04 | 81.33 | 0.3289 | 0.3416 | -0.01   | -0.01 | -0.0004 | 0.9984 | 0.0000  | 0.0000  | 0.0386 | 0.0283 |

# VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1540 MW gas fired at Bel

DOWNWIND DISTANCE (KM) = 205.0  
 PLUME-OBSERVER DISTANCE (KM) = 242.2  
 AZIMUTH OF LINE-OF-SIGHT = 224.1  
 ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0  
 SOLAR ZENITH ANGLE = 69.9 AT 1600. ON 6/21  
 THETA LENGTH RP/RVO RV %REDUCED YCAP

60.

FOR SKY BACKGROUND:

|                       | 86. | 0.69 | 339.1 | 3.10 | 63.60 | 83.77 | 0.3279 | 0.3350 | -0.44 | -0.23 | -0.0079 | 1.0021 | -0.0005 | -0.0007 | 0.5057 | 0.4126 |
|-----------------------|-----|------|-------|------|-------|-------|--------|--------|-------|-------|---------|--------|---------|---------|--------|--------|
| FOR WHITE BACKGROUND: | 86. | 0.69 | 339.3 | 3.07 | 65.26 | 84.63 | 0.3349 | 0.3357 | -0.54 | -0.28 | -0.0092 | 1.0045 | -0.0007 | -0.0008 | 0.6308 | 0.4977 |
| FOR GRAY BACKGROUND:  | 86. | 0.69 | 339.0 | 3.13 | 62.69 | 83.29 | 0.3248 | 0.3341 | -0.37 | -0.19 | -0.0068 | 1.0013 | -0.0004 | -0.0006 | 0.4252 | 0.3510 |
| FOR BLACK BACKGROUND: | 86. | 0.69 | 339.0 | 3.16 | 61.59 | 82.71 | 0.3202 | 0.3334 | -0.29 | -0.16 | -0.0058 | 0.9996 | -0.0002 | -0.0005 | 0.3520 | 0.2963 |

FOR WHITE BACKGROUND:

FOR GRAY BACKGROUND:

FOR BLACK BACKGROUND:

DELX DELY E(LUV) E(LAB)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 1.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

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HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 2.5 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1555          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1600          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.51 |



HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 5.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1547          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1551          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.56 |
| 0.3                   | 1600          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.06 | 0.05                               | 0.00 | 0.00 | 0.00 | 0.05 | 0.39 |

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HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 10.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |  | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |  |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|--|------------------------------------|------|------|------|------|------|--|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |  | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |  |
| 0.1                   | 1531          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |  | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |  |
| 0.1                   | 1535          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 |  | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.64 |  |
| 0.3                   | 1543          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.07 |  | 0.05                               | 0.01 | 0.00 | 0.01 | 0.05 | 0.46 |  |
| 0.5                   | 1600          | 0.02                               | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 |  | 0.14                               | 0.02 | 0.01 | 0.02 | 0.11 | 0.12 |  |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 48.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1329          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1334          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.82 |
| 0.3                   | 1342          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.09 | 0.07                               | 0.01 | 0.00 | 0.01 | 0.07 | 0.60 |
| 0.5                   | 1358          | 0.03                               | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.19                               | 0.03 | 0.01 | 0.03 | 0.15 | 0.16 |
| 2.6                   | 1600          | 0.04                               | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.28                               | 0.09 | 0.05 | 0.07 | 0.08 | 0.08 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 48.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 1329          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1334          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.82 |
| 0.3                   | 1342          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.09 | 0.07                               | 0.01 | 0.00 | 0.01 | 0.07 | 0.60 |
| 0.5                   | 1358          | 0.03                               | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.19                               | 0.03 | 0.01 | 0.03 | 0.15 | 0.16 |
| 2.6                   | 1600          | 0.04                               | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.28                               | 0.09 | 0.05 | 0.07 | 0.08 | 0.08 |

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HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 96.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | O    | H+2S                               | H+1S | H    | H-1S | H-2S | O    |
| 0.1                   | 1055          | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 1100          | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.39 | 0.05                               | 0.01 | 0.00 | 0.01 | 0.05 | 2.76 |
| 0.3                   | 1108          | 0.04                               | 0.00 | 0.00 | 0.00 | 0.04 | 0.30 | 0.27                               | 0.03 | 0.02 | 0.03 | 0.27 | 2.08 |
| 0.5                   | 1124          | 0.10                               | 0.02 | 0.01 | 0.02 | 0.08 | 0.09 | 0.73                               | 0.14 | 0.07 | 0.13 | 0.56 | 0.62 |
| 2.6                   | 1326          | 0.17                               | 0.06 | 0.03 | 0.05 | 0.05 | 0.05 | 1.21                               | 0.41 | 0.23 | 0.33 | 0.38 | 0.38 |
| 5.1                   | 1600          | 0.07                               | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.47                               | 0.36 | 0.27 | 0.27 | 0.27 | 0.27 |

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 155.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|------------------------------------|------|------|------|------|------|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |
| 0.1                   | 746           | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.1                   | 751           | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.77 | 0.10                               | 0.02 | 0.01 | 0.02 | 0.10 | 5.38 |
| 0.3                   | 759           | 0.08                               | 0.01 | 0.01 | 0.01 | 0.08 | 0.60 | 0.57                               | 0.08 | 0.04 | 0.08 | 0.57 | 4.19 |
| 0.5                   | 815           | 0.22                               | 0.04 | 0.02 | 0.04 | 0.17 | 0.19 | 1.54                               | 0.30 | 0.15 | 0.30 | 1.19 | 1.31 |
| 2.6                   | 1017          | 0.40                               | 0.14 | 0.08 | 0.11 | 0.13 | 0.13 | 2.78                               | 0.95 | 0.55 | 0.77 | 0.89 | 0.89 |
| 5.1                   | 1251          | 0.37                               | 0.29 | 0.22 | 0.22 | 0.22 | 0.22 | 2.60                               | 2.02 | 1.51 | 1.51 | 1.51 | 1.52 |
| 8.3                   | 1600          | 0.07                               | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.47                               | 0.43 | 0.37 | 0.37 | 0.37 | 0.38 |

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HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 205.0 KM

| PARCEL<br>AGE<br>(HR) | LOCAL<br>TIME | SO2-TO-SO4= CONVERSION RATE (%/HR) |      |      |      |      |      |  | NOX-TO-HNO3 CONVERSION RATE (%/HR) |      |      |      |      |      |  |
|-----------------------|---------------|------------------------------------|------|------|------|------|------|--|------------------------------------|------|------|------|------|------|--|
|                       |               | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |  | H+2S                               | H+1S | H    | H-1S | H-2S | 0    |  |
| 0.1                   | 506           | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |  | 0.00                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |  |
| 0.1                   | 511           | 0.01                               | 0.00 | 0.00 | 0.00 | 0.01 | 0.62 |  | 0.08                               | 0.01 | 0.01 | 0.01 | 0.08 | 4.33 |  |
| 0.3                   | 519           | 0.07                               | 0.01 | 0.00 | 0.01 | 0.07 | 0.49 |  | 0.47                               | 0.06 | 0.03 | 0.06 | 0.47 | 3.46 |  |
| 0.5                   | 535           | 0.19                               | 0.04 | 0.02 | 0.04 | 0.15 | 0.16 |  | 1.34                               | 0.26 | 0.13 | 0.26 | 1.04 | 1.15 |  |
| 2.6                   | 737           | 0.38                               | 0.13 | 0.07 | 0.11 | 0.12 | 0.12 |  | 2.66                               | 0.91 | 0.52 | 0.74 | 0.85 | 0.86 |  |
| 5.1                   | 1011          | 0.74                               | 0.57 | 0.43 | 0.43 | 0.43 | 0.43 |  | 5.16                               | 4.01 | 3.01 | 3.01 | 3.02 | 3.03 |  |
| 8.3                   | 1319          | 0.47                               | 0.43 | 0.38 | 0.38 | 0.38 | 0.38 |  | 3.26                               | 3.04 | 2.64 | 2.64 | 2.65 | 2.65 |  |
| 10.9                  | 1600          | 0.07                               | 0.07 | 0.06 | 0.06 | 0.06 | 0.06 |  | 0.47                               | 0.46 | 0.43 | 0.43 | 0.43 | 0.43 |  |

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## PLOT FILE VERIFICATION

## OBSERVER-BASED DATA

## SKY BACKGROUND

| NX                                   | 1     | 2     | 3      | 4      | 5      | 6      | 7      | 8      |
|--------------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|
| DISTANCE (KM)                        | 1.    | 3.    | 5.     | 10.    | 48.    | 96.    | 155.   | 205.   |
| REDUCTION OF VISUAL RANGE (%)        | 0.733 | 0.488 | 0.389  | 0.303  | 0.258  | 0.314  | 0.376  | 0.415  |
| BLUE-RED RATIO                       | 0.963 | 0.978 | 0.984  | 0.990  | 0.997  | 0.998  | 0.999  | 0.998  |
| PLUME CONTRAST AT 0.55 MICRONS       | 0.009 | 0.001 | -0.002 | -0.003 | -0.003 | -0.002 | -0.001 | -0.001 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.887 | 0.615 | 0.524  | 0.395  | 0.190  | 0.123  | 0.076  | 0.055  |

## WHITE BACKGROUND

| NX                                   | 1     | 2     | 3      | 4      | 5      | 6      | 7      | 8      |
|--------------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|
| DISTANCE (KM)                        | 1.    | 3.    | 5.     | 10.    | 48.    | 96.    | 155.   | 205.   |
| REDUCTION OF VISUAL RANGE (%)        | 0.000 | 0.000 | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| BLUE-RED RATIO                       | 0.981 | 0.988 | 0.991  | 0.994  | 1.000  | 1.001  | 1.001  | 1.002  |
| PLUME CONTRAST AT 0.55 MICRONS       | 0.008 | 0.000 | -0.003 | -0.004 | -0.004 | -0.003 | -0.001 | -0.001 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 0.681 | 0.489 | 0.445  | 0.349  | 0.177  | 0.116  | 0.073  | 0.056  |

## GRAY BACKGROUND

| NX                                   | 1     | 2     | 3     | 4     | 5      | 6      | 7      | 8      |
|--------------------------------------|-------|-------|-------|-------|--------|--------|--------|--------|
| DISTANCE (KM)                        | 1.    | 3.    | 5.    | 10.   | 48.    | 96.    | 155.   | 205.   |
| REDUCTION OF VISUAL RANGE (%)        | 0.000 | 0.000 | 0.000 | 0.000 | 0.000  | 0.000  | 0.000  | 0.000  |
| BLUE-RED RATIO                       | 0.951 | 0.971 | 0.980 | 0.987 | 0.997  | 0.999  | 1.000  | 1.000  |
| PLUME CONTRAST AT 0.55 MICRONS       | 0.017 | 0.007 | 0.002 | 0.000 | -0.002 | -0.002 | -0.001 | -0.001 |
| PLUME PERCEPTIBILITY DELTA E(L*A*B*) | 1.223 | 0.750 | 0.545 | 0.365 | 0.139  | 0.090  | 0.053  | 0.027  |

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BLACK BACKGROUND

NX

1 2 3 4 5 6 7 8

DISTANCE (KM)

1. 3. 5. 10. 48. 96. 155. 205.

REDUCTION OF VISUAL  
RANGE (%)

0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

BLUE-RED RATIO

0.906 0.943 0.963 0.976 0.994 0.997 0.999 0.998

PLUME CONTRAST AT  
0.55 MICRONS

0.024 0.011 0.005 0.003 -0.001 -0.001 -0.001 0.000

PLUME PERCEPTIBILITY  
DELTA E(L\*A\*B\*)

1.602 0.963 0.672 0.439 0.159 0.091 0.051 0.020

\* J1{~r}1111\{~r}KO.

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Item 3g:

"All noise impact calculations including coal mine blasting (p.5-56), continuous mining noise (p. 5-57), train noise (p.5-59), and power plant noise (p.5-59)."

Response:

1. Attached are four pages of coal mine blast noise calculations and supporting information, referred to in Section 5.9.1 Coal Mine Blasting Noise, pages 5-56 and 5-57 of the text.
2. Attached are three pages of continuous mining noise calculations referred to in Section 5.9.2 Continuous Mining Noises, page 5-57 of the text.
3. Attached are eight pages of train noise calculations and supporting information referred to in Section 5.9.3. Train Noise, page 5-59 of the text.
4. Attached are twelve pages of power plant noise calculations and one page of 70 MW turbine power plant noise calculations referred to in Section 5.9.4 Power Plant Noise, page 5-59 of the text.

3.g.1.

Coal Mine Blast Noise Calculations

610541

J. W. Ider  
8/13/85  
1/2

## Winter Blast Noise

Assume: Source Level = 83 dBA at 5,000 ft

(Based on "typical" measured values at other mines. See attached.)

Assume Winter Conditions: 10°F, 70% RH

Assume Noise Frequency = 400 Hz

Atm. Attenuation\* = 0.04 dBA / 100 ft

winter (10°F, 70% RH)

= 0.06 dBA / 100 ft

summer (70°F, 70% RH)

### Winter Conditions

| <u>Distance</u> | <u>dBA</u> | <u>Hemisp. Loss</u> | <u>Atm. Loss</u> | <u>Net dBA</u> |
|-----------------|------------|---------------------|------------------|----------------|
| 5,000           | 83         | -6                  | -2               | 75             |
| 10,000          | 75         | -6                  | -4               | 65             |
| 20,000          | 65         | -3                  | -4               | 58             |
| 30,000          | 58         | -3                  | -4               | 51             |
| 40,000          | 51         | -2                  | -4               | 45             |
| 50,000          | 45         | -2                  | -4               | 39             |
| 60,000          | 39         | -2                  | -4               | 33             |
| 70,000          | 33         | -2                  | -4               | 27             |
| 80,000          | 27         |                     |                  |                |

### Summer

|        |    |    |     |    |
|--------|----|----|-----|----|
| 5,000  | 83 | -6 | -3  | 74 |
| 10,000 | 74 | -6 | -6  | 62 |
| 20,000 | 62 | -6 | -12 | 44 |
| 40,000 | 44 | -4 | -12 | 34 |
| 60,000 | 28 | -2 | -6  | 20 |

\* Attenuation rates based on USFS, "Predicting Impacts of Noise on  
Recreation", 1980

# EBASCO SERVICES INCORPORATED

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2/2

BY JMW DATE \_\_\_\_\_

SHEET \_\_\_\_\_ OF \_\_\_\_\_

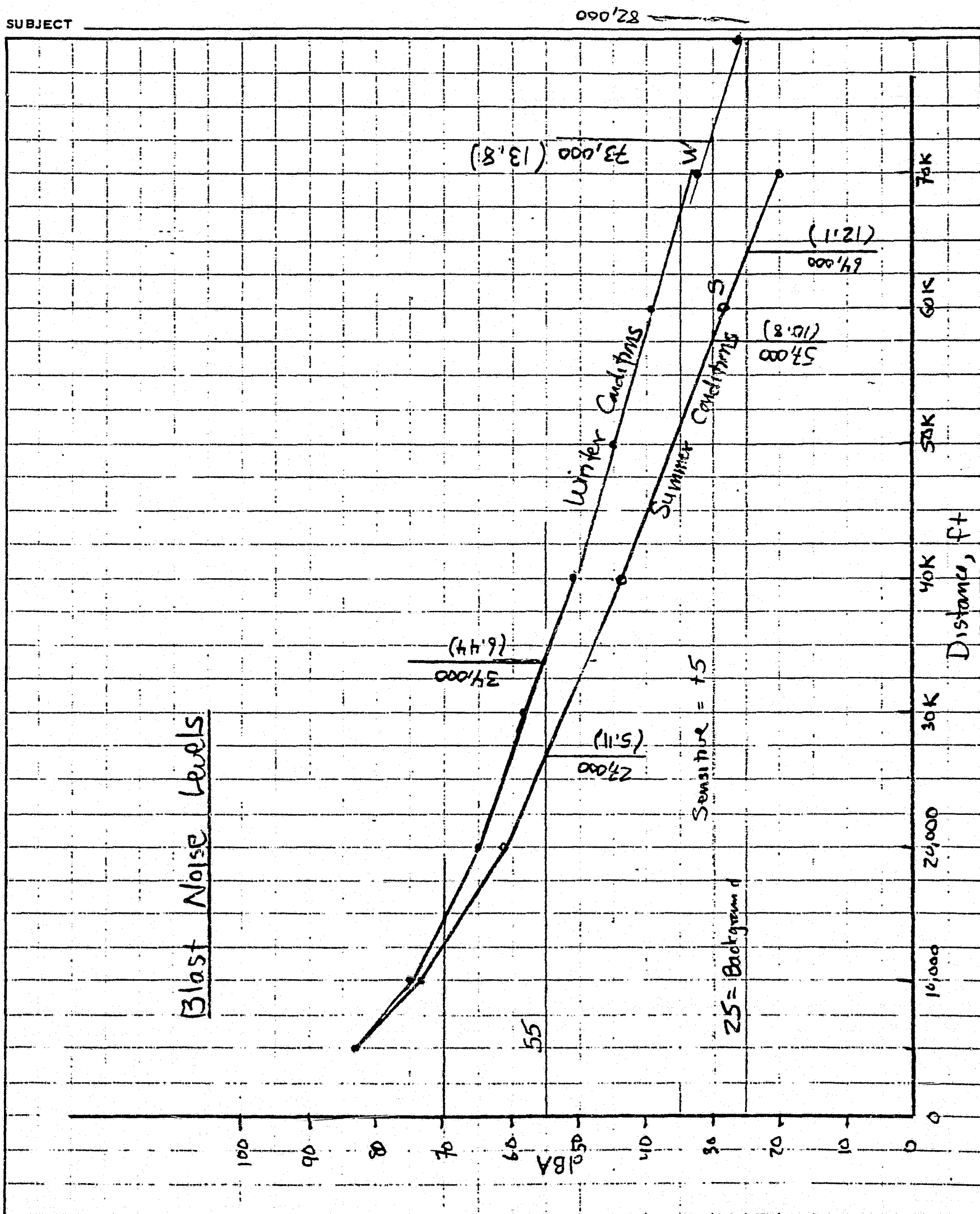
CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT \_\_\_\_\_

SUBJECT \_\_\_\_\_



TECHNICAL REPORT ON  
SOUND LEVELS IN  
BRYCE CANYON NATIONAL PARK  
AND  
THE NOISE IMPACT OF THE  
PROPOSED ALTON COAL MINE\*

BY  
DR. JAMES D. FOCH, JR.  
AND  
GEOFF S. OLIVER

NOISE TECHNICAL ASSISTANCE CENTER  
UNIVERSITY OF COLORADO  
BOULDER, COLORADO 80309

OCTOBER 1980

# BRYCE CANYON/WESTERN SLOPE BLAST DATA

| DATE | LOCATION      | EQUIPMENT,<br>SYSTEM | TYPE OF<br>BLAST | DISTANCE<br>TO BLAST,<br>FEET | MAXIMUM<br>SOUND PRESSURE<br>LEVEL, dB | MAXIMUM<br>SOUND<br>LEVEL, dBA |
|------|---------------|----------------------|------------------|-------------------------------|----------------------------------------|--------------------------------|
| 6/6  | Yovimpa Point | A                    | Air I            | 26,900                        | -                                      | 61                             |
| "    | Rainbow Point | D                    | "                | 28,000                        | ≥ 92.7                                 | 68.8                           |
| "    | Bryce Point   | C                    | "                | 74,000                        | 86.2                                   | 56.4                           |
| "    | Yovimpa Point | A                    | Air II           | 26,900                        | -                                      | 69                             |
| "    | Rainbow Point | D                    | "                | 28,000                        | ≥ 95.7                                 | 68.8                           |
| "    | Bryce Point   | C                    | "                | 74,000                        | 86.9                                   | ≥ 58.5                         |
| 6/23 | EFC*          | E                    | Coal             | 1,500                         | -                                      | 79                             |
| "    | "             | H                    | "                | 8,000                         | 84.2                                   | 66.1                           |
| "    | "             | E                    | "                | 8,000                         | -                                      | 65.7                           |
| "    | "             | E                    | Overburden       | 8,000                         | -                                      | 86.2                           |
| "    | "             | G                    | "                | 16,000                        | 89.2                                   | 65.2                           |
| "    | "             | E                    | "                | 16,000                        | -                                      | 67.8                           |
| 6/24 | EFC           | E                    | Overburden       | 18,500                        | -                                      | 57.2                           |
| "    | "             | G                    | "                | 24,900                        | 80.8                                   | 57.0                           |
| "    | P & M**       | G                    | Coal             | 5,000                         | 107.2                                  | 80.4                           |
| "    | "             | E                    | "                | 5,000                         | -                                      | 83.1                           |
| "    | "             | H                    | "                | 6,500                         | 99.5                                   | 74.9                           |
| "    | "             | E                    | "                | 6,500                         | -                                      | 75.0                           |
| 6/25 | UII***        | H                    | Coal             | 11,700                        | 92.1                                   | 55.5                           |
| "    | "             | E                    | "                | 12,500                        | -                                      | 60.2                           |
| "    | "             | E                    | "                | 20,500                        | -                                      | 55.4                           |
| 6/26 | "             | E                    | Overburden       | 13,000                        | -                                      | 62.1                           |
| "    | "             | E                    | "                | 21,400                        | -                                      | 55.1                           |
| "    | "             | E                    | Coal             | 12,400                        | -                                      | 66.1                           |
| "    | "             | H                    | "                | 17,000                        | 106.7                                  | 75.3                           |
| "    | "             | E                    | "                | 23,000                        | -                                      | 54.5                           |
| 8/20 | Yovimpa Point | H                    | Air I            | 184,800                       | 65.1                                   | 36.2                           |
| 8/20 | Yovimpa Point | H                    | Air II           | 184,800                       | 65.3                                   | 43.4                           |
| 8/20 | Rainbow Point | M                    | Air III          | 184,800                       | ≥ 78.7                                 | 42.4                           |

\*EFC = Energy Fuels Corp. Mine No. 3

\*\*P&M = Pittsburg & Midway Mine

\*\*\*UII = Utah International Inc. Trapper Mine



3.g.2.

### Continuous Mining Noise Calculations

610541



JW  
7/20/88  
1/3

## Winter: Summer Mine Noise

Source Noise Level = 104 dBA @ 50'

Assume: Noise Frequency = 250 Hz for Trucks

Winter Condition: 70% RH; 10°F  $\Rightarrow$  Attenuation = 0.06 dBA/100 ft \*

Summer Condition: 70% RH; 70°F  $\Rightarrow$  Attenuation = 0.09 dBA/100 ft \*

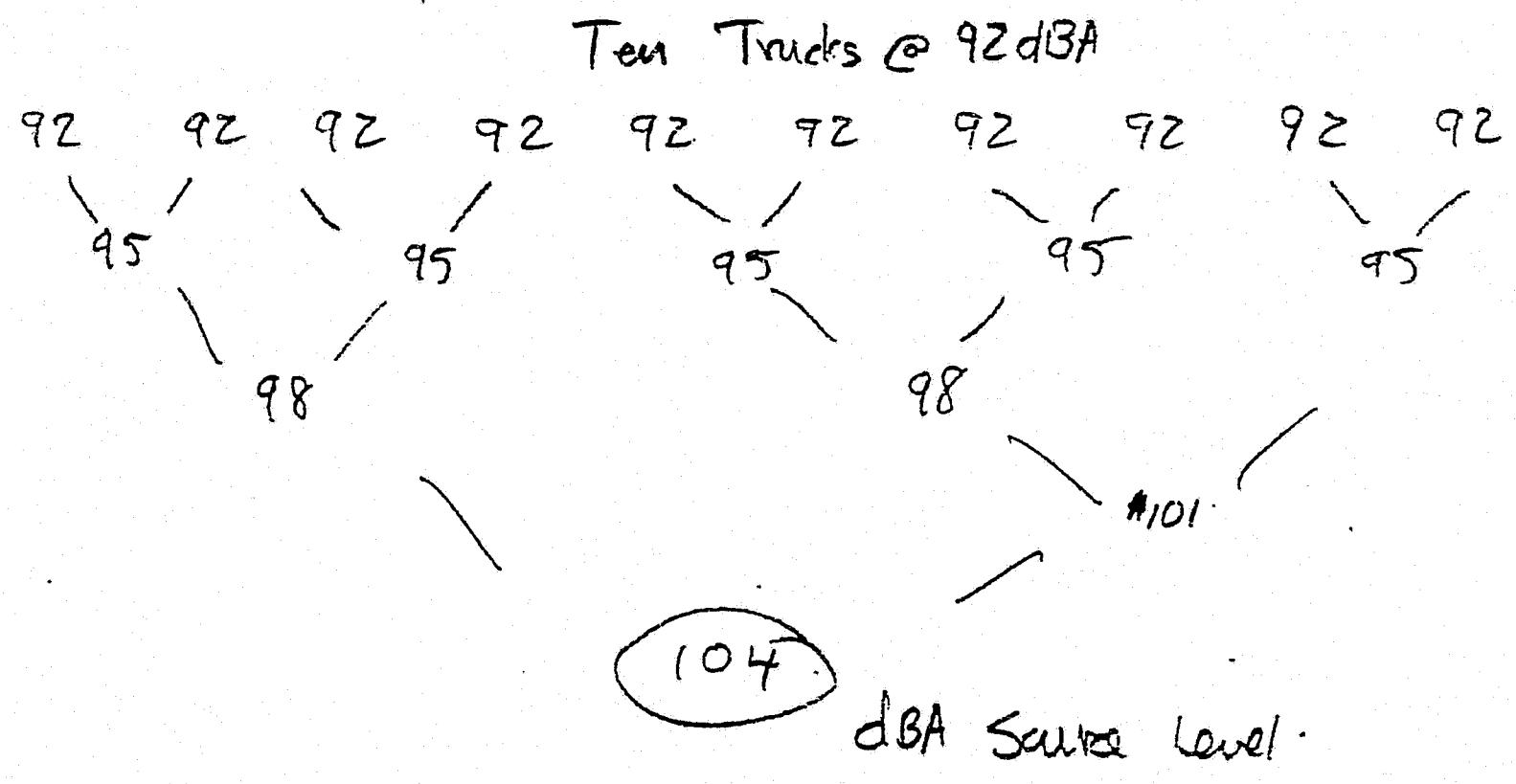
### Winter Condition

|        | dBA | <u>Hemisphere Loss</u> | <u>Atm. Loss</u> | <u>Total Loss</u> | <u>dB</u> |
|--------|-----|------------------------|------------------|-------------------|-----------|
| 50'    | 104 | -6                     | -0               | -6                | 98        |
| 100    | 98  | -6                     | -0               | -6                | 92        |
| 200    | 92  | -6                     | 0                | -6                | 86        |
| 400    | 86  | -6                     | 0                | -6                | 80        |
| 600    | 80  | -6                     | 0                | -6                | 74        |
| 1,000  | 74  | -6                     | -1               | -7                | 67        |
| 3,200  | 67  | -6                     | -2               | -8                | 59        |
| 6,400  | 59  | -6                     | -4               | -10               | 49        |
| 12,800 | 49  | -6                     | -8               | -14               | 35        |
| 25,000 | 35  | -6                     | -15              | -21               | 14        |
| 50,000 | 14  |                        |                  |                   |           |

\* Attenuation rates based on USFS, "Predict Impacts of Noise on Recreationists", 1980

# Mining Equipment Assumptions

- 5 Haul Trucks
- 2 Front End Loaders
- 2 Scrapers



# EBASCO SERVICES INCORPORATED

JW  
3/3

BY JNW DATE \_\_\_\_\_

SHEET \_\_\_\_\_ OF \_\_\_\_\_

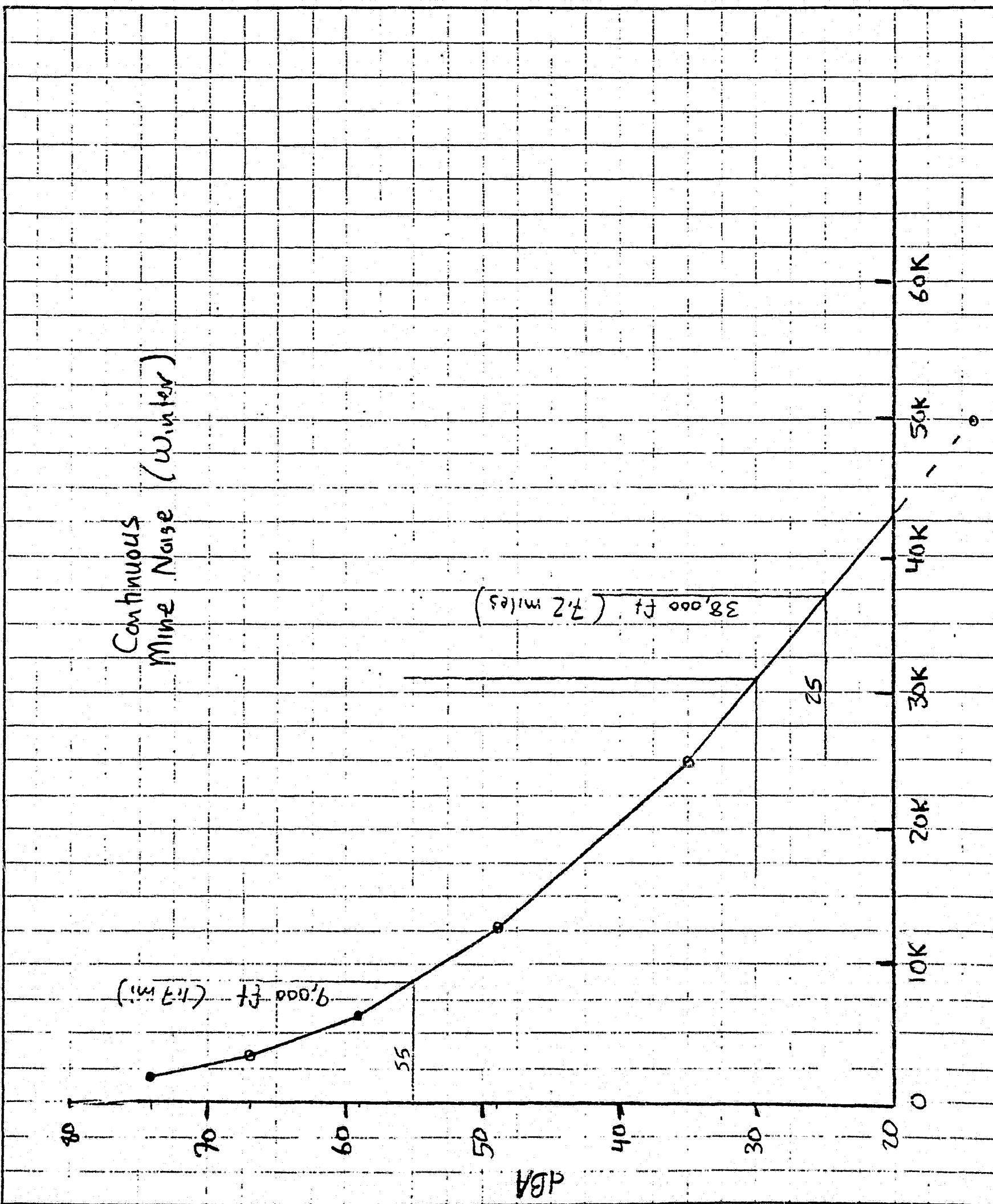
CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT \_\_\_\_\_

SUBJECT \_\_\_\_\_



3.g.3

### Train Noise Calculations

610541

# EBASCO SERVICES INCORPORATED

BY T. Adams DATE 7-24-84

SHEET 1 OF 3

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT APA

PROJECT SUSITNA DEIS COMMENTS

SUBJECT RAILROAD NOISE EXPOSURE CONTOURS

SOURCE: Jack W. Swing, 1975, "Simplified Procedure for Developing Railroad Noise Exposure Contours", Jnl. of Sound & Vib. Feb, 1975

## A, EXISTING CONDITIONS ALONG FAIRBANKS TO ANCHORAGE LINE:

- Assumptions:
1. Trains are equally distributed over the 24-hour period i.e.,  $15/24$  during day &  $9/24$  during night.
  2. All trains are freight. This is according to the procedure when there is a mix of passenger and freight.
  3. No unusual track conditions exist which would cause the noise levels to be higher than typical.

Procedure: - calculate effective "N".  
Summer - 26 trains/week = 3.7 trains/day

$$\text{day train} = 3.7 \times 15/24 = 2.3$$

$$\text{night train} = 3.7 \times 9/24 = 1.4$$

$$N = N_{\text{DAY}} + 10 N_{\text{NIGHT}}$$

$$N = 2.3 + 10(1.4) = 16.3 \text{ trains/day}$$

SUMMER

Winter - 12 trains/week = 1.7 trains/day

$$\text{day train} = 1.7 \times 15/24 = 1.06$$

$$\text{night train} = 1.7 \times 9/24 = 0.64$$

$$N = 1.06 + 10(0.64)$$

$$N = 7.5 \text{ trains/day}$$

WINTER

Read Contour From Chart - Fig. 1 in (Swing, 1975)

| LDN | DISTANCE TO CONTOUR (FEET) |        |
|-----|----------------------------|--------|
|     | SUMMER                     | WINTER |
| 65  | 100                        | < 100  |
| 60  | 250                        | 150    |
| 55  | 450                        | 300    |
| 50  | 800                        | 500    |

(CONTINUED NEXT PAGE)

# EBASCO SERVICES INCORPORATED

BY T. Abame DATE 7-24-84

SHEET 2 OF 3

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT APA

PROJECT SUSITNA DEIS COMMENTS

SUBJECT RAILROAD NOISE EXPOSURE CONTOURS

B. FUTURE CONDITIONS WITH COAL TRAINS ADDED TO LINE ALONG EAST BOUNDARY OF MT. MCKINLEY PARK.

Assumptions: Same as in section "A".

Procedure: Calculate "N" for coal trains and add to "N" from section "A".

Coal trains = 4/day throughout the year.

Day train =  $4 \times 15/24 = 2.5$

Night train =  $4 \times 9/24 = 1.5$

$N = 2.5 + 10(1.5) = 17.5$

Summer =  $16.3 (\text{existing}) + 17.5 (\text{coal}) = 33.8 \text{ trains/day}$

Winter =  $7.5 (\text{existing}) + 17.5 (\text{coal}) = 25.0 \text{ trains/day}$

Read Contour from Chart (Fig. 1 in Swing, 1975)

| LDN | Distance to Contour (feet) |        |
|-----|----------------------------|--------|
|     | Summer                     | Winter |
| 65  | 190                        | 170    |
| 60  | 350                        | 310    |
| 55  | 630                        | 580    |
| 50  | 1100                       | 1000   |

(CONTINUED NEXT PAGE)

EBASCO SERVICES INCORPORATED

BY T. Adams DATE 7-24-84

SHEET 3 OF 3

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT APA

PROJECT SUSITNA DEIS COMMENTS

SUBJECT RAILROAD NOISE EXPOSURE CONTOURS

C. FUTURE CONDITIONS WITH COAL TRAINS ADDED TO LINE NORTH OF MT. MCKINLEY PARK

Assumptions: Same as in Section A.

Procedure: Calculate "N" for coal train and add to "N" from Section A.

Coal train = 6/day throughout the year

Day trains =  $6 \times 15/24 = 3.75$

Night train =  $6 \times 9/24 = 2.25$

$N = 3.75 + 10(2.25)$

$N = 26.25$  trains/day

Summer =  $16.3(\text{existing}) + 26.25(\text{coal}) = 42.6$  trains/day

Winter =  $7.5(\text{existing}) + 26.25(\text{coal}) = 33.8$  trains/day

Read contour from chart (Fig. 1, Swing. 1975)

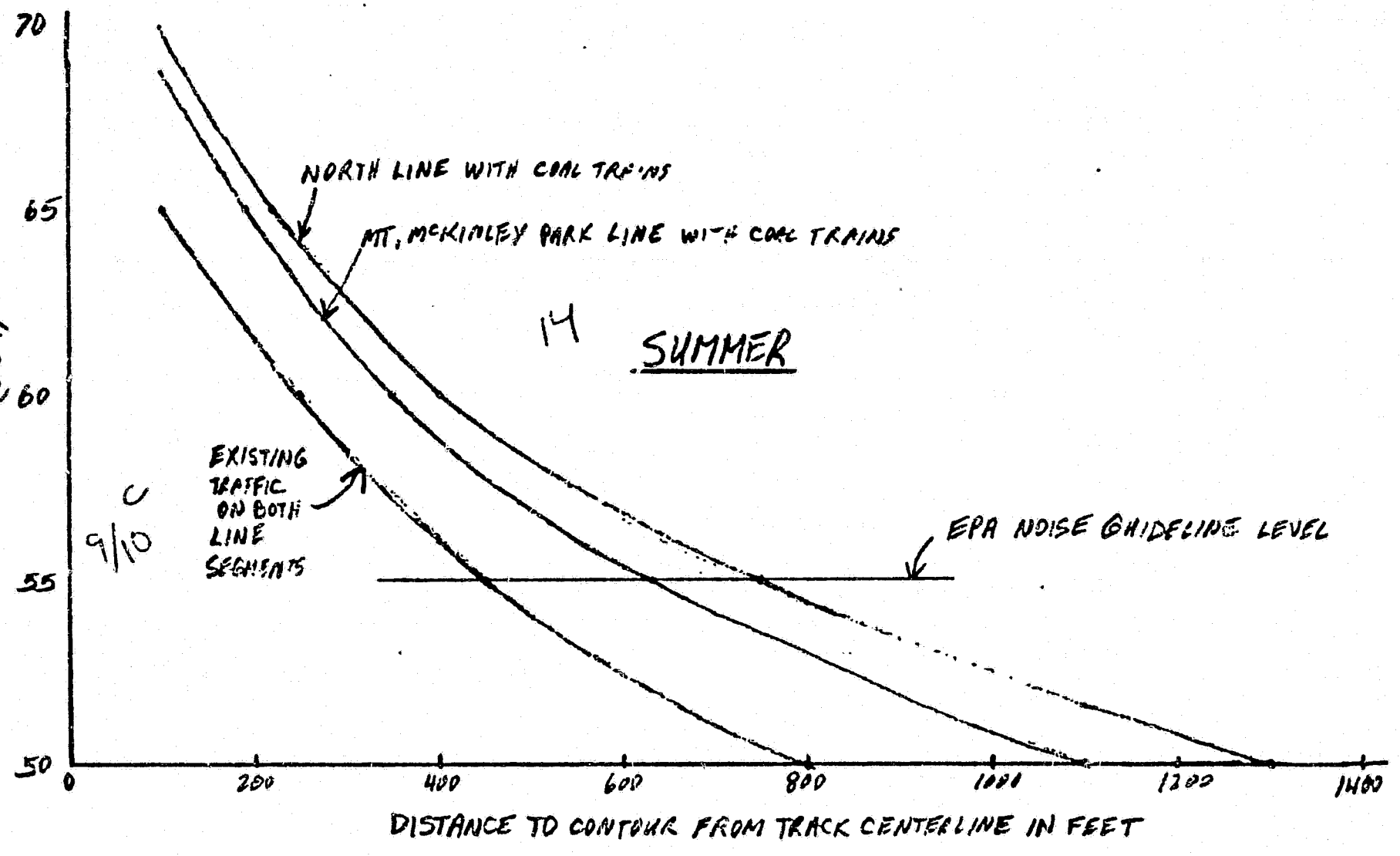
| LDN | <u>Distance to Contour (feet)</u> |               |
|-----|-----------------------------------|---------------|
|     | <u>Summer</u>                     | <u>Winter</u> |
| 65  | 220                               | 200           |
| 60  | 400                               | 360           |
| 55  | 750                               | 680           |
| 50  | 1300                              | 1150          |



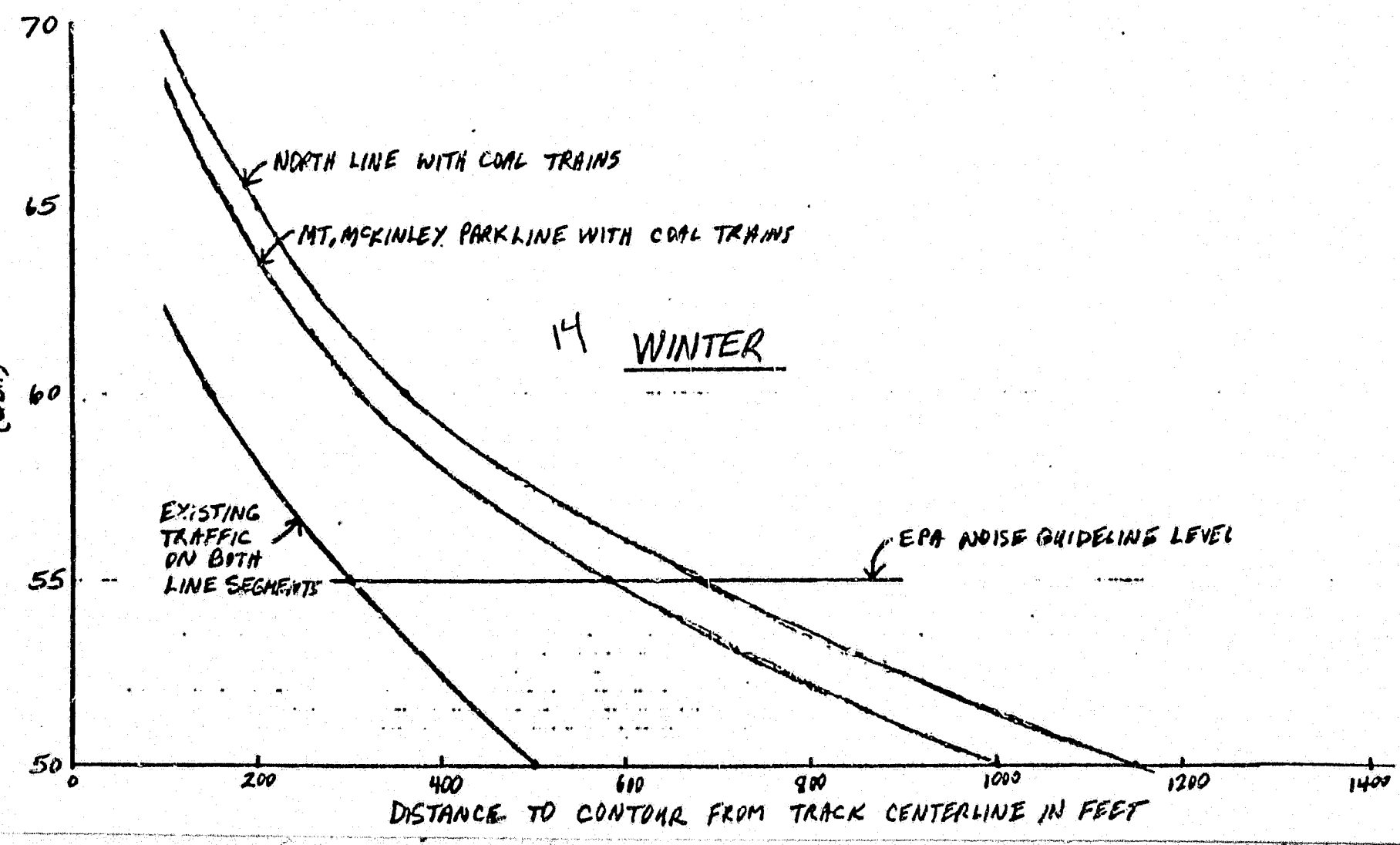
18C RAILROAD DAY/NIGHT NOISE LEVEL CONTOURS (LDN)

12/25

DAY/NIGHT NOISE LEVEL (LDN) (dBA)



DAY/NIGHT NOISE LEVEL (LDN) (dBA)





TELEPHONE MEMO

TELEPHONE NO. (907) 265-2649 CC: J. WILDER  
 DATE: JULY 17, 1984 TIME: 3:15 p.m. PROJ. FILE  
 FROM: TOM ADAMS OF ATLANTA ENVIROSPHERE CO.  
 TO: MR. DON JUBB, CHIEF TRAIN DISPATCHER OF THE ALASKA RAILROAD  
 PROJECT: SUSITNA DEIS COMMENTS NO. APA 2592.104  
 SUBJECT: TRAIN TRAFFIC ON THE ALASKA RAILROAD

SUMMARY OF TELEPHONE DISCUSSION

1. THIS INFORMATION WILL BE USED IN THE NOISE ANALYSIS FOR THE ALTERNATIVE COAL-FIRED PLANTS.
2. ACCORDING TO MR. JUBB, THE CURRENT TRAIN TRAFFIC MAKEUP IS AS DESCRIBED BELOW WITH ONLY MINOR VARIATION FOR THE SECTION OF RAILROAD BORDERING MT. MCKINLEY NATIONAL PARK ON THE EAST SIDE BETWEEN CANTWELL AND HEALY, ALASKA.

| SEASON  | TRAIN TYPE          | # CARS | # ENGINES | AUG. SPEED | TRANS/ DAY | TRANS/ WEEK |
|---------|---------------------|--------|-----------|------------|------------|-------------|
| SUMMER: | PASSENGER           | 10     | 2         | 35         | 2          | 14          |
|         | FREIGHT             | 60     | 4         | 30         | ~ 2        | 12          |
| WINTER  | PASSENGER + FREIGHT | 25     | 3         | 35         | -          | 2           |
|         | FREIGHT ONLY        | 60     | 4         | 30         | -          | 10          |

# Simplified Procedure for Developing Railroad Noise Exposure Contours

Jack W. Swing, State of California, Berkeley, California

Railroad line operations are one source of community noise which should be included in community noise planning. A simplified procedure is presented for estimating the noise impact of such operations, in terms of the Day-Night Average Sound Level ( $L_{dn}$ ).

Current efforts in community planning are paying increased attention to the noise environment of residents, particularly in California where communities are now required by State Law [Senate Bill 691, State Code 65302(g)] to include noise as a specific element of their general plans. To assist city planners in complying with the requirements of this law, which includes quantitative descriptions of the noise environment created by ground transportation noise sources, a number of simplified nomograms have been developed. Based on rigorous analytical procedures and computer augmented techniques they can be easily used by persons untrained in acoustics and they yield a good first approximation of noise exposure for specific sources.

The method presented here for on-line railroad operations is derived from a study performed by Wyle Research for the Southern Pacific Transportation Company in conjunction with the Atchison Topeka and Santa Fe and Union Pacific Railway Companies and the Association of American Railroads.<sup>1</sup>

This method presents a simplified procedure for the estimation of noise impact created by on-line railroad operations in terms of Day-Night Average Level ( $L_{dn}$ ) noise contours.  $L_{dn}$  noise contours account for the A-weighted noise magnitude of individual occurrences, as well as the time duration of each event. Additionally, they account for the total number of single event occurrences during the 24-hour day. They also weight these occurrences relative to the time of day in which they occur to account for increased human sensitivity to noise at night.

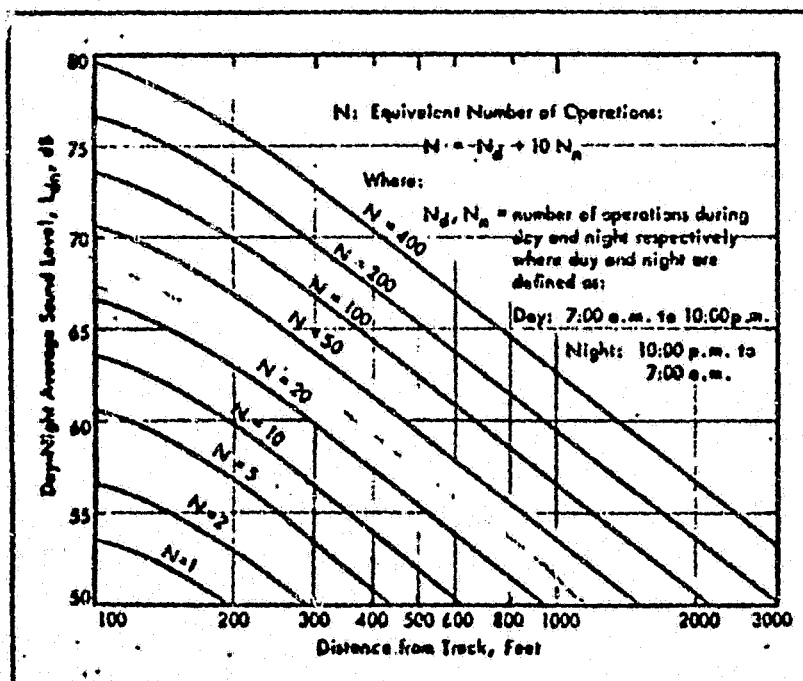


Figure 1 - Distances to day-night average level ( $L_{dn}$ ) noise contours for railroad line operations.

The procedure consists of first determining the equivalent number of operations  $N$  which is equal to the actual number which occurs during the DAY time period (7: a.m. to 10:00 p.m.) plus 10 times the number occurring during the NIGHT time period (10:00 p.m. to 7:00 a.m.). The factor of 10 relates to increased noise sensitivity during the NIGHT time period. A graphical look-up chart is provided such that the distance to a desired contour value (i.e., 65, 70, 75 dB) may be read directly by entering the chart at the calculated value of equivalent operations,  $N$ .

Finally, adjustment factors may be included to account for increased noise levels (and hence, broader reaching noise contours) resulting from tight radius curves, switching frogs, unwelded rail, and bridgework.

## Directions for Usage

### Step 1 — Equivalent Number of Operations

Calculate equivalent number of on-line operations from the formula:

$$N = N_D + 10N_N$$

where:

$N$  = equivalent number of operations

$N_D$  = number of daytime operations occurring between 7:00 a.m. and 10:00 p.m.

$N_N$  = number of nighttime operations occurring between 10:00 p.m. and 7:00 a.m.

### Step 2 — Distance to $L_{dn}$ Contour Values

To find the distance to a given contour value, enter Figure 1 at this value on the left vertical axis and move horizontally to the right until the curve corresponding to the desired value of equivalent number of operations is reached. Move vertically down from that point and read the distance in feet from the track to this contour value. Contour values so determined do not take into account miscellaneous track irregularities which may increase noise generation at specific locations.

Table 1 - Adjustments to  $L_{dn}$  Noise Contours

| Variables Affecting Noise Output                               | Correction to Desired $L_{dn}$ Value, dB |
|----------------------------------------------------------------|------------------------------------------|
| 1. Passenger trains only                                       | -1                                       |
| (If combination of passenger and freight — assume all freight) |                                          |
| 2. Presence of helper engines:                                 |                                          |
| a. Level grade or descending grade                             | 0                                        |
| b. Ascending grade                                             | +2                                       |
| 3. Mainline welded or jointed track                            | 0                                        |
| 4. Low speed classified jointed track                          | +4                                       |
| 5. Presence of switching frogs or grade crossings              | +4                                       |
| 6. Tight radius curve                                          |                                          |
| a. Radius less than 600 feet                                   | +4                                       |
| b. Radius 600 to 900 feet                                      | +0.5                                     |
| c. Radius greater than 900 feet                                | 0                                        |
| 7. Presence of bridgework                                      |                                          |
| a. Light steel trestle                                         | +14                                      |
| b. Heavy steel trestle                                         | +5                                       |
| c. Concrete structure                                          | 0                                        |

### Step 3 — Additional Factors Affecting Noise Output

Table 1 summarizes the net effect of these additional variables on the  $L_{dn}$  noise contours produced by railroad line operations. To include these factors in the analysis, derive an "adjusted contour value" by subtracting the adjustment value determined from Table 1 from the value of the contour desired. (In the case of multiple occurrence of the items shown in this Table, only the larger of the adjustment values should be used.) Enter Figure 1 at the new adjusted contour value to obtain the distance to the originally-desired contour value. (This procedure effectively moves a given contour farther from the tracks to account for the increased noise output.

#### Example

Given: Passenger and Freight Operations activity over a segment of north-south welded mainline track as summarized in the table below:

| Type/Direction         | Number of Daily Operations |       |
|------------------------|----------------------------|-------|
|                        | Day                        | Night |
| Freight - Northbound   | 6                          | 2     |
| Freight - Southbound   | 4                          | 1     |
| Passenger - Northbound | 3                          | 0     |
| Passenger - Southbound | 3                          | 0     |
| Total                  | 16                         | 3     |

The equivalent number of operations  $N$  are calculated as:

$$N = N_D + 10N_N = 16 + 10 \times 3 = 49^*$$

Assume we wish to compute the distances to the 70, 65, and 60 dB contours.

Given  $N = 46$ , these distances are determined from Figure 1 and shown below.

| Contour Value, dB | Distance from Tracks, feet |
|-------------------|----------------------------|
| 70                | 115                        |
| 65                | 250                        |
| 60                | 450                        |

If we now wish to include the effects of track irregularities over certain segments on the line, for example, presence of a switching frog, the following adjustment are made: Value of adjustment from Table 1 = +4 dB (Thus the switching frog will increase the noise level by 4 dB and extend the breadth of the contours). The effect of the increased noise level at the point of the switching frog on the contour is summarized below.

| Desired Contour Value, dB | Adjustment Factor — from Table 1 | Adjusted Contour Value, dB | Distance to Desired Contour Value, feet |
|---------------------------|----------------------------------|----------------------------|-----------------------------------------|
| 70                        | +4                               | 66                         | 220                                     |
| 65                        | +4                               | 61                         | 400                                     |
| 60                        | +4                               | 56                         | 730                                     |

#### References

1. Swing, J. W. and Pies, D. P., "Assessment of Noise Environments Around Railroad Operations," Wyle Laboratories Research Report No. WCR 73-5, July 1973.

\* Note that per direction given in Table 1 under "Passenger Trains Only," when the traffic consists of both passenger and freight operations, all operations should be treated as freight operations.

# EBASCO SERVICES INCORPORATED

BY T. Adams DATE 7-24-84

SHEET 1 OF 1

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT APA

PROJECT SHSITNA DEIS COMMENTS

SUBJECT RAIL ROAD NOISE

## COMPARATIVE ANALYSIS OF EXISTING RAIL TRAFFIC WITH INCREASED TRAFFIC DUE TO POWER PLANTS.

### A. TRACK SEGMENT - EAST BOUNDARY OF MT. MCKINLEY PARK (2 plants south of park, mine north of park)

|        | <u>EXISTING</u>                   | <u>PROPOSED<br/>COAL TRAINS</u> | <u>ROUGH<br/>ANALYSIS</u>                                                                           |
|--------|-----------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------|
| SUMMER | 4/DAY<br>(2 passenger, 2 freight) | 4/DAY<br>(2 Full, 2 Empty)      | 8 TOTAL/DAY<br>Traffic will double &<br>sound level will<br>increase by ~ 3 dBA                     |
| WINTER | 12/WEEK<br>(2 pass., 10 freight)  | 28/WEEK<br>(14 Full, 14 Empty)  | 40 TOTAL/WEEK<br>Traffic will increase<br>by about 233%.<br>Sound level will<br>increase by ~ 5 dBA |

### B. TRACK SEGMENT - NORTH OF MT. MCKINLEY PARK (3 plants north of park & mine north of park.)

|        | <u>EXISTING</u>                  | <u>PROPOSED<br/>COAL TRAINS</u> | <u>ROUGH<br/>ANALYSIS</u>                                                                         |
|--------|----------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------|
| SUMMER | 4/DAY<br>(2 pass., 2 freight)    | 6/DAY<br>(3 full, 3 empty)      | Traffic will increase<br>150% to a total of 10/day.<br>Sound level will increase<br>about 4 dBA.  |
| WINTER | 12/week<br>(2 pass., 10 freight) | 42/week<br>(21 full, 21 empty)  | Traffic will increase<br>350% to a total of 54/week<br>Sound level will increase<br>about 6.5 dBA |

3.g.4

Power Plant Noise Calculations

610541



# EBASCO SERVICES INCORPORATED

BY T. A. [Signature] DATE 7-23-84

SHEET \_\_\_\_\_ OF \_\_\_\_\_

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT SUSITNA DEIS COMMENTS

SUBJECT PLANT PLANT NOISE ATTENUATION CALCULATIONS

ATTENUATION SOURCES INCLUDE HEMISPHERICAL SPREADING,  
MOLECULAR ABSORPTION, AND ANOMALOUS EXCESS ATTENUATION  
BASED ON STANDARD DAY CONDITIONS. (PAGE 5-4, EFF)

|                                        | 31  | 63  | 125 | 250  | 500  | 1K   | 2K   | 4K   | 8K   | TOTAL     |
|----------------------------------------|-----|-----|-----|------|------|------|------|------|------|-----------|
| PLANT SPECTRUM                         | 79  | 94  | 106 | 112  | 117  | 120  | 117  | 113  | 104  | 123.9 dBA |
| DISTANCE FACTOR <sup>(D.F.)</sup> 100m | -48 | -48 | -48 | -48  | -49  | -49  | -50  | -51  | -50  |           |
| S.L. @ 100m                            | 39  | 46  | 58  | 64   | 68   | 71   | 67   | 62   | 50   | 74.6 dBA  |
| PLANT SPECTRUM                         | 79  | 94  | 106 | 112  | 117  | 120  | 117  | 113  | 104  |           |
| D.F. @ 250m                            | -56 | -56 | -56 | -57  | -57  | -58  | -60  | -65  | -70  |           |
| S.L. @ 250m                            | 23  | 38  | 50  | 55   | 60   | 62   | 57   | 48   | 34   | 65.5 dBA  |
| PLANT SPECTRUM                         | 79  | 94  | 106 | 112  | 117  | 120  | 117  | 113  | 104  |           |
| D.F. @ 500m                            | -62 | -63 | -63 | -64  | -65  | -67  | -70  | -79  | -91  |           |
| S.L. @ 500m                            | 17  | 31  | 43  | 48   | 52   | 53   | 47   | 34   | 13   | 56.9 dBA  |
| PLANT SPECTRUM                         | 79  | 94  | 106 | 112  | 117  | 120  | 117  | 113  | 104  |           |
| D.F. @ 1000m                           | -69 | -69 | -71 | -72  | -74  | -78  | -85  | -103 | -126 |           |
| S.L. @ 1000m                           | 10  | 25  | 35  | 40   | 43   | 42   | 32   | 10   | -    | 47.1 dBA  |
| PLANT SPECTRUM                         | 79  | 94  | 106 | 112  | 117  | 120  | 117  | 113  | 104  |           |
| D.F. @ 2500m                           | -78 | -79 | -83 | -86  | -91  | -101 | -118 | -163 | -222 |           |
| S.L. @ 2500m                           | 1   | 15  | 23  | 26   | 26   | 19   | -    | -    | -    | 32.4 dBA  |
| PLANT SPECTRUM                         | 79  | 94  | 106 | 112  | 117  | 120  | 117  | 113  | 104  |           |
| D.F. @ 5000m                           | -87 | -90 | -96 | -102 | -111 | -131 | -167 | -256 | -372 |           |
| S.L. @ 5000m                           | -   | 4   | 10  | 10   | 6    | -    | -    | -    | -    | 14.2 dBA  |
| PLANT SPECTRUM                         | 79  | 94  | 106 | 112  | 117  | 120  | 117  | 113  | 104  |           |
| D.F. @ 1750m                           | -75 | -75 | -78 | -81  | -83  | -91  | -103 | -135 | -176 |           |
| S.L. @ 1750m                           | 4   | 19  | 28  | 31   | 34   | 29   | 14   | -    | -    | 37.2 dBA  |

ASSUME 15dB correction  
for all indoor sources.

WORKSHEET 1.a.

OVERALL AND A-WEIGHTED SOUND POWER LEVEL AND ELEVATION OF ALL SOUND SOURCES AT POWER PLANT

Plant NEWENH, ALPSKF MWe Rating 200 Fuel: ☐ Oil or Gas ☒ Coal ☐ Nuclear

Check One: ☐ Outdoor Sources

Check One: ☒ Continuous Sources

☒ Indoor Sources

☐ Intermittent Sources

| Col. 1<br>Sound Source<br>(Refer to Table 4.1) | Col. 2<br>Quantity | Col. 3<br>Reference,<br>Chapter 4<br>Page No. | Col. 4<br>L <sub>w</sub> of Total Sources |            | Col. 6<br>Ground<br>Elevation <sup>†</sup><br>(m) | Col. 7<br>Source<br>Elevation <sup>‡</sup><br>(m) | Col. 8<br>Code No.<br>For This<br>Source | Col. 9<br>A-WEIGHTED |
|------------------------------------------------|--------------------|-----------------------------------------------|-------------------------------------------|------------|---------------------------------------------------|---------------------------------------------------|------------------------------------------|----------------------|
|                                                |                    |                                               | Overall*                                  | A-Weighted |                                                   |                                                   |                                          |                      |
| BOILER                                         | 1                  | 4-4                                           | 118.5                                     | 106.5      | 900                                               | 930                                               | 1                                        | 91.5                 |
| TURBINE-GENERATOR<br>-EXCITER                  | 1                  | 4-8                                           |                                           | 112        |                                                   | 906                                               | 2                                        | 97                   |
| TURBINE CONDENSER                              | 1                  | 4-15                                          | 122                                       | 114        |                                                   | 910                                               | 3                                        | 99                   |
| ELECTRIC MOTORS                                |                    | 4-19                                          | 102                                       | 101        |                                                   | 910                                               | 4                                        | 86                   |
| BOILER FEED PUMPS                              | 3                  | 4-20                                          | 105                                       | 104        |                                                   | 900                                               | 5                                        | 89                   |
| UNINSULATED FAN<br>HOUSINGS                    | 2                  | 4-68                                          |                                           | 108        |                                                   | 906                                               | 6                                        | 93                   |
| UNINSULATED FAN<br>BEARING HOUSINGS            | 2                  | 4-74                                          |                                           | 97         |                                                   | 910                                               | 7                                        | 82                   |
| COAL MILLS OR<br>PULVERIZERS                   | 5                  | 4-90                                          |                                           | 115        |                                                   | 892                                               | 8                                        | 100                  |
| ELEVATION ASSUMED                              |                    |                                               |                                           |            |                                                   |                                                   |                                          |                      |

Notes: Use extra sheets for additional sources

\* Overall values are optional here and in all following worksheets; they are not required in the octave band or A-weighted sound level analysis.

† Give all elevation values relative to mean sea level or to local reference elevation.

ASSUME 15dB reduction  
for all indoor sources

WORKSHEET 1.b.

OVERALL AND A-WEIGHTED SOUND POWER LEVEL AND ELEVATION OF ALL SOUND SOURCES AT POWER PLANT

Plant: NEENAH, ALASKA MWe Rating 200 Fuel: ☐ Oil or Gas ☒ Coal ☐ Nuclear

Check One: ☐ Outdoor Sources ☒ Indoor Sources  
Check One: ☐ Continuous Sources ☒ Intermittent Sources

| Col. 1<br>Sound Source<br>(Refer to Table 4.1) | Col. 2<br>Quantity | Col. 3<br>Reference,<br>Chapter 4<br>Page No. | Col. 4 Col. 5<br>L <sub>w</sub> of Total Sources |            | Col. 6<br>Ground<br>Elevations<br>(m) | Col. 7<br>Source<br>Elevations<br>(m) | Col. 8<br>Code No.<br>For This<br>Source | OUTDOOR<br>A-WEIGHTED            |
|------------------------------------------------|--------------------|-----------------------------------------------|--------------------------------------------------|------------|---------------------------------------|---------------------------------------|------------------------------------------|----------------------------------|
|                                                |                    |                                               | Overall*                                         | A-Weighted |                                       |                                       |                                          |                                  |
| BOTTOM DUMPER<br>(RAIL CAR)                    | 1                  |                                               |                                                  | 128        | 900                                   | 902                                   | 9                                        | 113<br>- 22 dBA<br>91            |
| COAL CRUSHERS                                  | 2                  | 4-83                                          |                                                  | 124        | 900                                   | 907                                   | 10                                       | 109<br>- 6 dBA<br>+ 3 dBA<br>106 |

Notes: Use extra sheets for additional sources  
\* Overall values are optional here and in all following worksheets; they are not required in the octave band or A-weighted sound level analysis.  
† Give all elevation values relative to mean sea level or to local reference elevation.



WORKSHEET 1, C.

OVERALL AND A-WEIGHTED SOUND POWER LEVEL AND ELEVATION OF ALL SOUND SOURCES AT POWER PLANT

Plant NENANA, ALASKA MWe Rating 200 Fuel: ☐ Oil or Gas ☒ Coal ☐ Nuclear

Check One: ☒ Outdoor Sources

Check One: ☒ Continuous Sources

☐ Indoor Sources

☐ Intermittent Sources

| Col. 1<br>Sound Source<br>(Refer to Table 4.1) | Col. 2<br>Quantity | Col. 3<br>Reference,<br>Chapter 4<br>Page No. | Col. 4 Col. 5<br>L <sub>w</sub> of Total Sources |            | Col. 6<br>Ground<br>Elevation <sup>1</sup><br>(m) | Col. 7<br>Source<br>Elevation <sup>1</sup><br>(m) | Col. 8<br>Code No.<br>For This<br>Source |
|------------------------------------------------|--------------------|-----------------------------------------------|--------------------------------------------------|------------|---------------------------------------------------|---------------------------------------------------|------------------------------------------|
|                                                |                    |                                               | Overall*                                         | A-Weighted |                                                   |                                                   |                                          |
| TRANSFORMERS                                   | 1 MAIN             | 4-17                                          |                                                  | 102.4      | 900                                               | 904                                               | 11                                       |
| COOLING TOWERS<br>MECHANICAL<br>1200 H.P.      | 1 BANK             | 4-40                                          | 126                                              | 116        | 900                                               | 913                                               | 12                                       |
| INLET OF FORCED<br>DRAFT FANS                  | 2                  | 4-54                                          | 119.5                                            | 114.5      | 900                                               | 960                                               | 13                                       |
| OUTLET OF INDUCED<br>DRAFT FANS                | 2                  | 4-54                                          | 120.5                                            | 115.5      | 900                                               | 960                                               | 14                                       |
| COOLING TOWER<br>PUMPS                         | 3                  | 4-24                                          | 108                                              | 104        | 900                                               | 901                                               | 15                                       |
| DEPARTING VENT                                 | 1                  | 4-27                                          | 105                                              | 105        | 900                                               | 930                                               | 16                                       |
| VENTILATING FANS                               | 2                  | 4-66                                          |                                                  | 109        | 900                                               | 920                                               | 17                                       |

Notes: Use extra sheets for additional sources.

\* Overall values are optional here and in all following worksheets; they are not required in the octave band or A-weighted sound level analysis.

<sup>1</sup> Give all elevation values relative to mean sea level or to local reference elevation.

WORKSHEET 1, d.

OVERALL AND A-WEIGHTED SOUND POWER LEVEL AND ELEVATION OF ALL SOUND SOURCES AT POWER PLANT

Plant NENANA, ALASKA MWe Rating 200 Fuel: ☐ Oil or Gas ☒ Coal ☐ Nuclear

Check One: ☒ Outdoor Sources

Check One: ☐ Continuous Sources

☐ Indoor Sources

☒ Intermittent Sources

| Col. 1<br>Sound Source<br>(Refer to Table 4.1) | Col. 2<br>Quantity | Col. 3<br>Reference,<br>Chapter 4<br>Page No. | Col. 4 Col. 5<br>L <sub>w</sub> of Total Sources |                          | Col. 6<br>Ground<br>Elevations<br>(m) | Col. 7<br>Source<br>Elevations<br>(m) | Col. 8<br>Code No.<br>For This<br>Source |
|------------------------------------------------|--------------------|-----------------------------------------------|--------------------------------------------------|--------------------------|---------------------------------------|---------------------------------------|------------------------------------------|
|                                                |                    |                                               | Overall*                                         | A-Weighted               |                                       |                                       |                                          |
| CONVEYORS &<br>TRANSFER TOWERS                 | 1                  | 4-85                                          |                                                  | 119<br>- 3 UTILIZ<br>116 | 900                                   | 915                                   | 18                                       |
| HIGH PRES. VENTS                               | 1                  | 4-92                                          |                                                  | 143                      | 900                                   | 960                                   | 19                                       |

Notes: Use extra sheets for additional sources

\* Overall values are optional here and in all following worksheets; they are not required in the octave band or A-weighted sound level analysis.

† Give all elevation values relative to mean sea level or to local reference elevation.

WORKSHEET 2.a,

EQUIVALENT ENERGY-AVERAGE SOUND POWER LEVEL OF INTERMITTENT SOUND SOURCES

Plant NENANA, ALASKA

Check One: ☐ Outdoor Sources ☒ Indoor Sources

| Col. 1<br>Sound Source | Col. 2 Col. 3<br>Source Power Level |            | Col. 4 Col. 5<br>Estimated Use Factor |               | Col. 6 Col. 7<br>Equivalent Energy-Average Sound Power Level |                                              | Col. 8<br>Code Number<br>For This Source<br>(From Col. 8 of<br>Worksheet 1) |
|------------------------|-------------------------------------|------------|---------------------------------------|---------------|--------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|
|                        | Overall                             | A-Weighted | % of Time                             | dB Equivalent | Overall                                                      | A-Weighted                                   |                                                                             |
| BOTTOM CAR DUMPER (1)  |                                     | 128        | 0.6                                   | -22           |                                                              | 106<br>-15<br><u>91</u>                      | 9                                                                           |
| COAL CRUSHERS (2)      |                                     | 124        | 25                                    | -6            |                                                              | 118<br>-15<br><u>103</u><br>+3<br><u>106</u> | 10                                                                          |

WORKSHEET 2.b

EQUIVALENT ENERGY-AVERAGE SOUND POWER LEVEL OF INTERMITTENT SOUND SOURCES

Plant NENANA, ALASKA

Check One: ☒ Outdoor Sources ☐ Indoor Sources

| Col. 1<br>Sound Source      | Col. 2 Col. 3<br>Source Power Level |            | Col. 4 Col. 5<br>Estimated Use Factor |               | Col. 6 Col. 7<br>Equivalent Energy-Average<br>Sound Power Level |            | Col. 8<br>Code Number<br>For This Source<br>(From Col. 8 of<br>Worksheet 1) |
|-----------------------------|-------------------------------------|------------|---------------------------------------|---------------|-----------------------------------------------------------------|------------|-----------------------------------------------------------------------------|
|                             | Overall                             | A-Weighted | % of Time                             | dB Equivalent | Overall                                                         | A-Weighted |                                                                             |
| CONVEYORS + TRANSFER TOWERS |                                     | 119        | 50                                    | -3            |                                                                 | 116        | 18                                                                          |
| HIGH PRESSURE VENTS         |                                     | 143        | 0.005                                 | -43           |                                                                 | 100        | 19                                                                          |

1-19

OUTDOOR SOUND POWER LEVEL OF SOUND RADIATED IN VARIOUS DIRECTIONS BY INDOOR SOUND SOURCE  
(Refer to Section 6.8.2 for calculation details.)

☐ Check here, if  
tonal source.

Indicate octave bands containing tone, if known

|       |                |
|-------|----------------|
| _____ | H <sub>2</sub> |
| _____ | H <sub>2</sub> |
| _____ | H <sub>2</sub> |
| _____ | H <sub>2</sub> |

[illegible]

WORKSHEET 6.A

SUMMATION OF PLANT SOURCE CONTRIBUTIONS IN VARIOUS DIRECTIONS FOR SOURCE ELEVATION GROUPS 1, 2, 3

- Angular direction from plant, for this summation (circle one):  
 0° 22° 45° 67° 90° 112° 135° 157° 180° 202° 225° 247° 270° 292° 315° 337° Other  
 (If "other": Specify angle ALL, and indicate receiver position of interest, by code letter \_\_\_\_\_).  
 Angles are measured from acoustic center.
- Source elevation group included in this summation (check one):  
 (Elevations are above ground elevation at the acoustic center of the plant.)  
☒ Group 1, 0-20 m      ☐ Group 2, 20-30 m      ☐ Group 3, above 30 m, excluding Group 4 sources
- Sound power levels of ten strongest sources radiating toward direction marked in Item 1 above. Obtain power levels in this direction from Worksheets 3 and 5. Indicate tonal sources with an asterisk (\*) by the source code number, and add the asterisk to sound power level values in octave bands known or believed to contain tonal components.

| Source Code Number | Outdoor Radiated Sound Power Level, in dB |    |     |     |     |      |      |      |      |            |
|--------------------|-------------------------------------------|----|-----|-----|-----|------|------|------|------|------------|
|                    | Octave Band Center Frequency, Hz          |    |     |     |     |      |      |      |      | A-Weighted |
|                    | 31                                        | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |            |
| 2                  |                                           |    |     |     |     |      |      |      |      | 97 ✓       |
| 3                  |                                           |    |     |     |     |      |      |      |      | 99 ✓       |
| 15                 |                                           |    |     |     |     |      |      |      |      | 109 ✓      |
| 17                 |                                           |    |     |     |     |      |      |      |      | 112 ✓      |
| 6                  |                                           |    |     |     |     |      |      |      |      | 96 ✓       |
| 18                 |                                           |    |     |     |     |      |      |      |      | 116 ✓      |
| 9                  |                                           |    |     |     |     |      |      |      |      | 91 ✓       |
| 10                 |                                           |    |     |     |     |      |      |      |      | 100 ✓      |
| 11                 |                                           |    |     |     |     |      |      |      |      | 102 ✓      |
| 12                 |                                           |    |     |     |     |      |      |      |      | 116 ✓      |

- Decibel summation of all item 3 levels

|  |  |  |  |  |  |  |  |  |  |       |
|--|--|--|--|--|--|--|--|--|--|-------|
|  |  |  |  |  |  |  |  |  |  | 120.4 |
|--|--|--|--|--|--|--|--|--|--|-------|

These values represent the total plant sound power levels radiated toward the direction of Item 1 from the source elevation of Item 2.

- Insert the source code number of each tonal source (Item 3, asterisk) then give, in the proper octave band space, the difference between the octave band sound power level in Item 4 and the octave band sound power level in Item 3 for each band value marked with an asterisk.

| Source<br>Code<br>Number | Difference Between Item 4 and Item 3 for Tonal Sources |    |     |     |     |      |      |      |      | Rating<br>for<br>Tonal<br>Source |
|--------------------------|--------------------------------------------------------|----|-----|-----|-----|------|------|------|------|----------------------------------|
|                          | Octave Band Center Frequency, Hz                       |    |     |     |     |      |      |      |      |                                  |
|                          | 31                                                     | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                                  |
|                          |                                                        |    |     |     |     |      |      |      |      |                                  |
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- Fill in the rating column in Item 5 as follows. If all differences are greater than 15 dB, mark "4" in rating column; if the smallest difference ranges between 11 and 15 dB, mark "3" in the column, and underline that smallest difference in red; if smallest difference ranges between 6 and 10 dB, mark "2" in rating column, and underline that smallest difference in red; if smallest difference ranges between 0 and 5 dB, mark "1" in rating column, and underline that smallest difference in red.

$$121.3 + 120.4 = 123.9$$

TOTAL PLANT 123.9 dBA

WORKSHEET 5.b

SUMMATION OF PLANT SOURCE CONTRIBUTIONS IN VARIOUS DIRECTIONS FOR SOURCE ELEVATION GROUPS 1, 2, 3

- Angular direction from plant, for this summation (circle one):  
 0° 22° 45° 67° 90° 112° 135° 157° 180° 202° 225° 247° 270° 292° 315° 337° Other  
 (If "Other": Specify angle ALL, and indicate receiver position of interest, by code letter \_\_\_\_\_).  
 Angles are measured from acoustic center.
- Source elevation group included in this summation (check one):  
 (Elevations are above ground elevation at the acoustic center of the plant)
 

☐ Group 1,  
0-20 m

☐ Group 2,  
20-30 m

☒ Group 3, above 30 m,  
excluding Group 4  
sources
- Sound power levels of ten strongest sources radiating toward direction marked in Item 1 above. Obtain power levels in this direction from Worksheets 3 and 5. Indicate tonal sources with an asterisk (\*) by the source code number, and add the asterisk to sound power level values in octave bands known or believed to contain tonal components.

| Source Code Number | Outdoor Radiated Sound Power Level, in dB |    |     |     |     |      |      |      |      |            |
|--------------------|-------------------------------------------|----|-----|-----|-----|------|------|------|------|------------|
|                    | Octave Band Center Frequency, Hz          |    |     |     |     |      |      |      |      | A-Weighted |
|                    | 31                                        | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |            |
| 13                 |                                           |    |     |     |     |      |      |      |      | 117 ✓      |
| 14                 |                                           |    |     |     |     |      |      |      |      | 119 ✓      |
| 19                 |                                           |    |     |     |     |      |      |      |      | 100 ✓      |
| 1                  |                                           |    |     |     |     |      |      |      |      | 92 -       |
| 16                 |                                           |    |     |     |     |      |      |      |      | 105 -      |
|                    |                                           |    |     |     |     |      |      |      |      |            |
|                    |                                           |    |     |     |     |      |      |      |      |            |
|                    |                                           |    |     |     |     |      |      |      |      |            |
|                    |                                           |    |     |     |     |      |      |      |      |            |
|                    |                                           |    |     |     |     |      |      |      |      |            |
|                    |                                           |    |     |     |     |      |      |      |      |            |
|                    |                                           |    |     |     |     |      |      |      |      |            |

960  
960  
960  
930  
930

4. Decibel summation of all item 3 levels

|  |  |  |  |  |  |  |  |  |  |       |
|--|--|--|--|--|--|--|--|--|--|-------|
|  |  |  |  |  |  |  |  |  |  | 121.3 |
|--|--|--|--|--|--|--|--|--|--|-------|

These values represent the total plant sound power levels radiated toward the direction of Item 1 from the source elevation of Item 2.

- Insert the source code number of each tonal source (Item 3, asterisk) then give, in the proper octave band space, the difference between the octave band sound power level in Item 4 and the octave band sound power level in Item 3 for each band value marked with an asterisk.

| Source<br>Code<br>Number | Difference Between Item 4 and Item 3 for Tonal Sources |    |     |     |     |      |      |      |      | Rating<br>for<br>Tonal<br>Source |
|--------------------------|--------------------------------------------------------|----|-----|-----|-----|------|------|------|------|----------------------------------|
|                          | Octave Band Center Frequency, Hz                       |    |     |     |     |      |      |      |      |                                  |
|                          | 31                                                     | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                                  |
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- Fill in the rating column in Item 5 as follows. If all differences are greater than 15 dB, mark "4" in rating column; if the smallest difference ranges between 11 and 15 dB, mark "3" in the column, and underline that smallest difference in red; if smallest difference ranges between 6 and 10 dB, mark "2" in rating column, and underline that smallest difference in red; if smallest difference ranges between 0 and 5 dB, mark "1" in rating column, and underline that smallest difference in red.



# EBASCO SERVICES INCORPORATED

BY T. Adams DATE 7-19-84

SHEET \_\_\_\_\_ OF \_\_\_\_\_

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT SUSITNA DEIS COMMENTS

SUBJECT MISCELLANEOUS POWER PLANT COMPONENT CALCULATIONS (200 MWE)

BOILER: A-WEIGHTED  $L_w = 72 + 15 \log 200 = 106.5 \text{ dBA}$   
(pg. 4-4, EEI)

TRANSFORMER: MAIN ~ 200 MVA RATING  
(pg. 4-17 EEI) NEMA SOUND RATING ~  $55 + 12 \log 200 = 82.6 \text{ dBA}$   
TRANSFORMER SIDEWALL AREA (S):  
 $10 \log(S) = 14 + 2.5 \log \text{MVA} = 19.75$   
A-WEIGHTED SOUND LEVEL:  $L_w = \text{NEMA SR} + 10 \log(S)$   
 $L_w = 82.6 + 19.75 = 102.4 \text{ dBA}$

COOLING TOWER FANS:  
(pg. 4-40, EEI) A-WEIGHTED  $L_w = 85 + 10 \log(\text{H.P. TOTAL})$

ASSUME 1200 H.P. PER MR. TALBOT  
MARLEY COOLING TOWER CO.  $L_w = 85 + 10 \log(1200) = 116 \text{ dBA}$

FORCED DRAFT FANS:  
(pg. 4-54, EEI) ASSUME 2 FANS @  $450,000 \text{ m}^3/\text{hr}$  (265,000 cfm)  
@ 370 mm (14.6 in) water  
A-WEIGHTED  $L_w = 37 + 10 \log(265,000) + 20 \log(14.6) = 114.5 \text{ dBA}$   
X 2 UNITS = 117.5 dBA

INDUCED DRAFT FANS:  
(pg. 4-54, EEI) ASSUME 2 FANS @ 355,000 cfm @ 14.2 in WATER  
A-WEIGHTED  $L_w = 37 + 10 \log(355,000) + 20 \log(14.2) = 115.5 \text{ dBA}$   
X 2 UNITS = 118.5 dBA



# EBASCO SERVICES INCORPORATED

BY T. Adams DATE 7-20-84

SHEET \_\_\_\_\_ OF \_\_\_\_\_

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT SUSITNA DEIS COMMENTS

SUBJECT POWER PLANT NOISE SPECTRUM CALCULATIONS

A-WEIGHTED SOUND POWER LEVEL OF TOTAL PLANT = 123.9 dBA  
(WORKSHEET 6)

## DOMINANT 4 SOURCES OF OUTDOOR NOISE:

- # 12 COOLING TOWER BANK @ 116 dBA
- # 13 INLET OF F.D. FANS (2) @ 117 dBA (COMBINED)
- # 14 OUTLET OF I.D. FANS (2) @ 119 dBA (COMBINED)
- # 18 COAL CONVEYORS + TRANS. TOWERS @ 116 dBA

SUB TOTAL = 123.2 dBA

ASSUME FAN NOISE SPECTRUM IS REPRESENTATIVE OF ALL OUTDOOR PLANT NOISE.

SUBTRACT FOLLOWING VALUES FROM THE OVERALL SOUND POWER LEVEL AFTER ADDING 5dB TO OVERALL dBA LEVEL:  $124 + 5 = 129$  dB

↑  
WORKSHEET #1

|                                         | HERTZ |     |     |     |     |     |     |     |             |
|-----------------------------------------|-------|-----|-----|-----|-----|-----|-----|-----|-------------|
|                                         | 31    | 63  | 125 | 250 | 500 | 1K  | 2K  | 4K  | 8K          |
| OVERALL SOUND POWER TO GET FAN SPECTRUM | 129   | 129 | 129 | 129 | 129 | 129 | 129 | 129 | 129         |
|                                         | -11   | -9  | -7  | -8  | -9  | -9  | -13 | -17 | -24         |
| FAN SPECTRUM CONVERT TO dBA             | 118   | 120 | 122 | 121 | 120 | 120 | 116 | 112 | 105         |
|                                         | -39   | -26 | -16 | -9  | -3  | 0   | +1  | +1  | -1          |
| FAN dBA                                 | 79    | 94  | 106 | 112 | 117 | 120 | 117 | 113 | 104         |
|                                         |       |     |     |     |     |     |     |     | = 123.9 dBA |

(PAGE 4-54, EEI)

= 128.5 dB

(PAGE 77 GENRAD)

3.g.4

70-MW Turbine Power Plant Noise Calculations

610541

# EBASCO SERVICES INCORPORATED

BY JMW DATE 7/25/84

SHEET 1 OF 1

CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT \_\_\_\_\_

PROJECT \_\_\_\_\_

SUBJECT 70 MW Gas Turbine Noise Levels

| Assume Noise is at 1,000 Hz                                                   |                |           |             |                  |      |
|-------------------------------------------------------------------------------|----------------|-----------|-------------|------------------|------|
| Basis = 58 dBA at 400 feet (General Electric Co. data)                        |                |           |             |                  |      |
| Ambient Temp = 32°F; 60% humidity $\Rightarrow$ Abs. Loss = 0.15 dBA/100 ft * |                |           |             |                  |      |
| Distance                                                                      | Hemisp. Losses | Abs. Loss | Ground Loss | Noise Level, dBA |      |
|                                                                               |                |           |             | Leg              | Line |
| 200                                                                           | -6             | 0         | -4          | 68               | 74   |
| 400                                                                           | -6             | -1        | 0           | 58               | 64   |
| 800                                                                           | -6             | -1        | 0           | 51               | 57   |
| 1,600                                                                         | -6             | -2        |             | 44               | 50   |
| 3,200                                                                         | -6             | -4        |             | 36               | 42   |
| 6,400                                                                         |                |           |             | 26               | 32   |

\* Attenuation rates based on USFS, "Predicting Impacts of Noise on Recreationists", 1980

Item 4: "Provide a copy of the 1984 Annual Report on Wolverines (1984 field data)."

Response:

The most recent information on wolverine in the Susitna Project area was filed with FERC on November 21, 1984, in the following report:

"Alaska Department of Fish and Game, 1984. Susitna Hydroelectric Project Big Game Studies, 1983 Annual Report, Volume VII, Wolverine."

This report provides data gathered during the 1983 field season. There was no field work on wolverine during the 1984 field season and there is none planned for the future.