AIR EMISSIONS SOURCE
CONSTRUCTION PERMIT

Source ID No.: 0550023

Effective Date: Draft

Source Name: Holcomb Station

SIC Code: 4911; Electric Services

NAICS Code: 221112; Fossil Fuel Electric Power Generation

Source Location: 2440 Holcomb Lane
Holcomb, Kansas

Mailing Address: P.O. Box 430
Holcomb, Kansas 67851

Contact Persons: Mr. Paul Reynolds
Manager, Generation Engineering/Environment
Telephone Number: (620) 277-4522

This permit is issued pursuant to K.S.A. 65-3008 as amended.

I. Description of Activity Subject to Air Pollution Control Regulations

The Sunflower Electric Power Corporation (Sunflower) is proposing to install emission control technologies at its existing Holcomb Generating Station (Holcomb) located in Finney County, Holcomb, Kansas. Sunflower will reduce Nitrogen Oxides ($NO_{X)}$ emissions on Holcomb Unit 1 (H1) through the use of a new Low NO_X combustion system comprised of low NO_X burners (LNB) and overfire air (OFA) combustion control methods.

The project will not result in any increase in fuel consumption, heat input, or steam generation. However, due to the inverse relationship between NO_X and Carbon Monoxide (CO) emissions, the new LNB/OFA equipment will result in an increase in CO emissions, and thus subject the proposed modification to the requirements of 40 CFR 52.21, Prevention of Significant Deterioration (PSD), as adopted under K.A.R. 28-19-350, as a result of being a major modification of a major stationary source for at least one regulated pollutant emitted in excess of the PSD significant emission levels. H1 is an affected source subject to Title IV of the Federal Clean Air Act, Acid Deposition Control. The proposed project does not constitute a modification or reconstruction for the purpose of determining applicability of New Source Performance Standard (NSPS) requirements. This project is subject to the provision of K.A.R. 28-19-300 (Construction permits and approvals; applicability) because the potential-to emit of CO exceeds 100 tons per year.

None of the following emissions will increase as a result of this project: particulate matter (PM), PM with a diameter less than 10 microns (PM_{10}), PM with a diameter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), volatile organic compounds (VOC), lead, sulfuric acid mist, fluorides, hydrogen sulfide (H_2S), total reduced sulfur, and carbon dioxide equivalent (CO_2e).

The initial PSD construction permit for H1, dated May 19, 1980, contained a CO limit of 0.064 lb/mmBTU. However, Condition No. 1 of that permit indicates that "if the CO and NO_X BACT emission limits cannot be achieved simultaneously, the NO_X emission limit shall take precedence and a new CO/BACT emission limit shall be established by the EPA (or its delegated representative)…" Condition No. 1 of the permit also states: "As part of any readjustment of the CO/BACT emission limit under this permit condition, the owner/operator of Unit No. 1 must make a determination through the use of agency-approved dispersion models that emissions from Unit No. 1 will not cause or significantly contribute to a violation of the National ambient Air Quality Standards (NAAQS) for CO."

The Air Emissions Limits for this permit, as indicated in sections V.A. and V.B, were established based on the above criteria.

An ambient impact analysis using the AERSCREEN version 11126 dispersion model, as approved by the Kansas Department of Health and Environment, and a Best Available Control Technology (BACT) determination were conducted as a part of the construction permit application process.

II. Significant Applicable Air Regulations

The proposed activity is subject to Kansas Administrative Regulations (K.A.R.) relating to air pollution control. The following air quality regulations were determined to be applicable to this source:

K.A.R. 28-19-19 Continuous Emission Monitoring;

K.A.R. 28-19-30 Indirect Heating Equipment Emission General Provisions;

K.A.R. 28-19-31 Indirect Heating Equipment Emission Limitations;

K.A.R. 28-19-300 Construction permits and approvals; applicability;

K.A.R. 28-19-350 Prevention of significant deterioration of air quality;

K.A.R. 28-19-650 Emissions Opacity Limits.

III. Air Emission Unit Technical Specifications

The following equipment or equivalent is approved:

> Installation of a Low NO_X combustion system comprised of low NO_X burners (LNB) and overfire air (OFA) combustion control methods.

IV. Air Emissions Estimates from the Proposed Activity

Pollutant Type	Baseline Actual (tons per year)	Projected Actual (tons per year)	Change in Emissions (tons per year)
CO	509.1	3,711.0	3,201.8
NO_X	4,687.2	2,671.9	-2,015.3
CO_2e	--	--	-5,030.3[1]

V. Air Emission Limitations

Each emission limitation established or referenced in this permit applies to the respective emission source subject to that limitation at all times, including startup, shutdown and malfunction, unless the applicability of that limitation is expressly excluded under certain conditions as to which a different limitation is applicable under a specific provision of this permit. All requirements and conditions included in or referenced in this permit must be met. The exceedance of any emission limitation established by or referenced in this permit will constitute a violation of the permit and may be subject to enforcement action.

On and after the required performance tests referenced in 40 CFR Part 60 and K.A.R. 28-19-212, the emission of each pollutant expressed as lbs/mmBtu or as lbs/MWh shall not exceed the limit referenced hereunder. Test requirements and compliance with this standard is described in the section entitled Compliance and Other Performance Testing.

Holcomb Unit 1

A. The thirty (30) day rolling average emission rate of carbon monoxide (CO) emissions shall not exceed 0.25 lb/MMBtu.

B. The 12-month rolling average emission rate of nitrogen oxide (NO_X) emissions shall not exceed 0.22 lb/MMBtu excluding periods of startup, shutdown and malfunction[2]. Compliance with the NO_X standard will begin twelve (12) months after installation, following an initial compliance test.

[1] Net emission change for CO_2 is based on the direct molar ratio of CO to CO_2. As no new sources of carbon are being introduced into the system, the increase in CO will lead to a corresponding decrease in CO_2. Hence baseline and project potential emissions are not relevant for this permit.

[2] Pursuant to the May 4, 2009 Settlement Agreement between Sunflower and the State of Kansas.

VI. Compliance and Other Performance Testing

A. Within 180 days after initial operation, the owner or operator shall conduct performance tests to demonstrate compliance with the applicable conditions and limitations for H1 set forth in this permit for CO and NO_X.

B. In conducting the performance testing required by this permit, the reference test methods and procedures outlined in K.A.R. 28-19-212 and 40 CFR Part 60 shall be used to demonstrate compliance with the limitation and conditions set forth in this permit. The owner or operator shall prepare and submit to the department, at least thirty (30) days in advance of the performance test, a performance test protocol. The protocol shall be prepared in accordance with ***Attachment A – Air Quality Performance Test Guidelines.***

VII. Monitoring, Recordkeeping and Reporting

A. All continuous monitoring systems required by 40 CFR Part 60 and this permit shall meet the applicable requirements of 40 CFR Part 60.13, Appendix B and Appendix F for certifying, maintaining and operating and assuring quality of the systems, and where applicable, with requirements of 40 CFR Part 75.

B. Compliance with the CO BACT limit for H1, and the NO_X emission limit once it becomes effective, shall be demonstrated with continuous emission monitoring systems (CEMS). The CEMS shall be certified, operated, maintained, and quality assured according to 40 CFR 60, Appendix B, and 40 CFR 60, Appendix F (Quality Assurance/ Quality Control).

C. Reports of excess emissions shall be submitted semi-annually in accordance with the requirements in 40 CFR 60.7(c). Additionally, a summary report, as referenced in 40 CFR 60.7(c) and defined in 40 CFR 60.7(d) should be submitted semi-annually to assure that both the CO and NO_X CEMS are properly functioning.

D. The owner or operator shall maintain records of the occurrence and duration of any startup, shut-down, or malfunction in the operation of each unit subject to 40 CFR Part 60; any malfunction of any air pollution control equipment; and all periods during which a continuous monitoring system or monitoring device is inoperative. These requirements are described in 40 CFR 60.7(b).

E. Records shall be kept on site for 2 years in accordance with 40 CFR 60.7(f).

VIII. Notification

The owner or operator shall submit written notifications in accordance with 40 CFR 60.7(a) including the following.

A. The date construction starts, postmarked no later than 30 days after such date.

B. The date of initial startup post marked within 15 days of such date.

C. 40 CFR 60.7(a)(4) requires that written notification be provided for any physical or operational change which may increase the emission rate of any air pollutant to which a standard applies. Such notice is to be postmarked 60 days, or as soon as practicable, before the change is commenced and is to include the following information:

1. the precise nature of the change;

2. present and proposed emission control systems;

3. the productive capacity of Unit 1 before and after the change;

4. the expected completion date.

D. The date on which demonstration of the continuous monitoring system performance commences consistent with 40 CFR 60.13(c) post marked not less than 30 days after such date.

IX. General Provisions

A. This document shall become void if the construction or modification has not commenced within 18 months of the effective date, or if the construction or modification is interrupted for a period of 18 months or longer.

B. A construction permit or approval must be issued by KDHE prior to commencing any construction or modification of equipment or processes which results in an increase of potential-to-emit equal to or greater than the thresholds specified by K.A.R 28-19-300.

C. Upon presentation of credentials and other documents as may be required by law, representatives of KDHE (including authorized contractors of KDHE) shall be allowed to:

1. enter upon the premises where a regulated facility or activity is located or conducted or where records must be kept under conditions of this document;

2. have access to and copy, at reasonable times, any records that must be kept under conditions of this document;

3. inspect at reasonable times, any facilities, equipment (including monitoring and control equipment) practices or operations regulated or required under this document; and

4. sample or monitor, at reasonable times, for the purposes of assuring compliance with this document or as otherwise authorized by the Secretary of KDHE, any substances or parameters at any location.

D. The emission unit or stationary source which is the subject of this document shall be operated in compliance with all applicable requirements of the Kansas Air Quality Act and the Federal Clean Air Act.

E. This document does not relieve the facility of the obligation to obtain other approvals, permits, licenses or documents of sanction which may be required by other federal, state or local government agencies.

Permit Writer

_____ _____

Larry D. Lowry, P.E. Date Signed
Environmental Engineer
Air Permitting Section

LDL:saw

c: SWDO
C-9635

DRAFT PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

PERMIT SUMMARY SHEET

Permit No.: 0550023

Source Name: Sunflower Electric Power Corporation – Holcomb Unit 1

Source Location: Holcomb Generating Station, S32, T24S, R33W, Finney County, Kansas 67851

I. Area Designation

K.A.R. 28-19-350, Prevention of significant deterioration of air quality, affects new major sources and major modifications to major sources in areas designated as "attainment" or "unclassifiable" under section 107 of the Clean Air Act (CAA) for any criteria pollutant. The State of Kansas is classified as attainment for the National Ambient Air Quality Standards (NAAQS) for all the criteria pollutants.

The Holcomb area in Finney County, Kansas, where this modification is taking place, is currently in attainment or unclassifiable for all criteria pollutants. As such, the PSD program, as administered by the State of Kansas under K.A.R. 28-19-350, will apply to the proposed project.

II. Project Description

Sunflower Electric Power Corporation (Sunflower) owns and operates the 360-MW coal-fired Holcomb 1 (H1) electric utility generating unit (EGU) and associated facilities and equipment at its Holcomb Generating Station (Holcomb Station) located near the City of Holcomb, Finney County Kansas

Sunflower plans to reduce NO_X emissions on H1 through the use of a new Low NO_X Combustion System comprised of low NO_X burners and an overfire air system. Construction and operation of this permit in compliance with the NO_X emission limit will fulfill Article 2.1 of the Settlement Agreement signed on May 4, 2009 by Sunflower and the Governor of Kansas.

III. Significant Applicable Air Emission Regulations

This source is subject to Kansas Administrative Regulations relating to air pollution control. The application for this permit was reviewed and evaluated for compliance with the following applicable regulations:

A. K.A.R. 28-19-300. Construction Permits and Approvals; Applicability. "Any person who proposes to construct or modify a stationary source or emissions unit shall obtain a construction permit before commencing such construction or modification."

B. K.A.R. 28-19-350. Prevention of significant deterioration of air quality. "The provisions of K.A.R. 28-19-350 shall apply to the construction of major stationary sources and major modifications of major stationary sources in the areas of the state designated as an attainment area or an unclassified area for any pollutant under the procedures prescribed by section 107(d) of the federal clean air act (42 U.S.C. 7407 (d))."

IV. Air Emissions from the Project

The potential-to-emit of at least one of the PSD regulated pollutants from the existing Holcomb Station exceeds 100 tons per year. Hence, Holcomb Station is considered to be a major stationary source under provisions of K.A.R. 28-19-350.

The total projected emissions increases from the proposed modification are listed in Table 1-3 of Section 1 and detailed out in Appendix C of the application. Proposed projected emissions increases of carbon monoxide (CO), oxides of nitrogen (NO_X) and carbon dioxide equivalent (CO_2e) were compared with the Significant Emission Rates for PSD applicability for the criteria and non-criteria pollutants. The projected emissions increase is above the PSD significance level for CO and will be reviewed under the PSD regulations. NO_X emissions will be greatly reduced under this modification. CO_2e emissions will also be reduced under this modification.

Hence, this project will be a major modification of an existing major stationary source resulting in a net significant increase of CO. This project will be subject to the various aspects of K.A.R. 28-19-350, such as the use of best available control technology, ambient air quality analysis, and additional impacts upon soils, vegetation and visibility. Good combustion practices were selected as BACT for CO with a limitation of 0.25 lb/MMBtu. Compliance with the CO limitation will be determined with a continuous emission monitor system (CEMS).

The proposed NO_X emissions reduction project is described in Section 1 of the application. The May 4, 2009 Settlement Agreement (see Section II) requires Sunflower achieve compliance with a NO_X limitation of 0.22 lb/mmBTU. The emission limitation will be contained in the permit and compliance will determined with a CEMS

It should be noted that the initial PSD construction permit for H1, dated May 19, 1980, contained a CO limit of 0.064 lb/mmBTU. However, Condition No. 1 of that permit indicates that "if the CO and NO_X BACT emission limits cannot be achieved simultaneously, the NO_X emission limit shall take precedence and a new CO/BACT emission limit shall be established by the EPA (or its delegated representative)…" Condition No. 1 of the permit also states: "As part of any readjustment of the CO-BACT emission limit under this permit condition, the owner/operator of Unit No. 1 must make a determination through the use of agency-approved dispersion models that emissions from Unit No. 1 will not cause or significantly contribute to a violation of the National ambient Air Quality Standards (NAAQS) for CO."

Condition 1 of the May 19, 1980 PSD permit also required that as part of any readjustment of the CO/BACT emission limit, the owner/operator of Unit 1 must make a determination through the use of EPA-approved dispersion models that emissions from Unit 1 will not cause or significantly contribute to a violation of the National Ambient Air Quality (NAAQS) for CO and that the modeling studies were subject to KDHE and EPA review and approval. Condition 1 also indicated that the CO/BACT emission limit shall not be adjusted to an emission rate that would cause or contribute to a violation of the CO NAAQS. The air dispersion modeling analysis submitted with the permit application satisfied these criteria.

The Air Emissions Limits for this permit, as indicated in sections V.A and V.B of the permit, were established based on the above criteria.

A separate permit modification to the May 19, 1980 permit is also being issued concurrently with this permit to reflect the change to the CO emissions limit.

On June 3, 2010, the U.S. Environmental Protection Agency (EPA) issued the final Greenhouse Gas (GHG) Tailoring Rule (75 FR 31514). This rule established the thresholds for GHG emissions under the PSD permit program for new and existing industrial facilities. GHGs are a single air pollutant defined as the aggregate group of the following six gases:

- carbon dioxide (CO_2)
- nitrous oxide (N_2O)
- methane (CH_4)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulfur hexafluoride (SF_6)

Starting in January 2011, sources currently subject to the PSD permitting program (i.e., those that are newly-constructed or modified in a way that significantly increases emissions of a pollutant other than GHGs) are subject to permitting requirements for their GHG emissions under PSD. For those affected facilities,

only GHG emissions increases of 75,000 tpy or more of total GHG, on a carbon dioxide equivalent (CO_2e) basis, need to determine the Best Available Control Technology (BACT) for their GHG emissions.

PSD does not apply to the GHG emissions from this proposed project. Even though the proposed modification is considered a major modification under the PSD permit program and Sunflower is required to obtain a PSD permit (called an "anyway source"), there is no potential emissions increase of GHGs from the modification.

V. Best Available Control Technology (BACT)

The BACT requirement applies to each new or modified affected emissions unit and pollutant emitting activity. Also, individual BACT determinations are performed for each pollutant emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review. Sunflower was required to prepare a BACT analysis for KDHE's review according to the process described in Attachment A. KDHE's evaluation of the BACT for the proposed Emission Reduction Project's analysis is presented in Attachment B.

KDHE has concurred with Sunflower for the following:

BACT for Carbon Monoxide is 0.25 lb/mmBtu, thirty day rolling average, including periods of startup and shutdown. BACT for CO is good combustion practices.

Ambient Air Impact Analysis

The owner or operator must demonstrate that allowable emission increases from the proposed facility, in conjunction with all other applicable emissions increases or reductions, would not cause or contribute to air pollution in violation of:

1) any national ambient air quality standard (NAAQS) in any air quality control region; or
2) any applicable maximum allowable increase over the baseline concentration in any area (increment).

Sunflower used the EPA approved AERSCREEN model to evaluate the impacts of CO that will result from the project at H1 for 1-hour CO and 8-hour CO. Sunflower's evaluation was reviewed by KDHE using EPA's AERSCREEN program, which incorporates the latest version of AERMOD in its calculations.

The emission rate, point location, and stack parameters for the emission source used in the model were based on the data presented in the permit application. These input data are shown in the table below.

Stack Parameters for H1 Steam Generator[1]				
Load	**Stack height (ft)**	**Stack diameter (ft)**	**Exit temperature (°F)**	**Exit velocity (ft/s)**
100%	475	16.33	180	113.5
75%				85.2
50%				56.8
25%				28.4

After a review of the appropriate satellite imagery and land use data obtained from the U.S. Geological Survey (USGS), it was concluded that the area is "rural" for air modeling purposes.

AERSCREEN estimates concentrations without the need for the user to input meteorological data. The "regulatory default" settings for minimum and maximum temperature, minimum wind speed, and anemometer height were used to determine the meteorology in this model. The meteorology was calculated using the AERMET seasonal tables. Being in western Kansas, the surface characteristics option had the number six selection of "Grassland." The dominant surface profile is average moisture since western Kansas is not classified as an arid region.

Sunflower's H1 generating unit stack height exceeds 65 meters; therefore, the model's Building Downwash option was selected and the building dimensions supplied by Sunflower were used for the model run.

The modeled emission rate was set at 1.0 grams per second (1 g/s) for all load cases. Since only one source is being modeled, this was done so the results are directly scalable to this rate and multiple emission rates do not need to be considered in separate modeling runs. The resulting concentration from the AERSCREEN model can be directly multiplied by the proposed emission rate for H1 to arrive at a corresponding concentration. The AERSCREEN program also includes averaging time factors for worst-case 1-hour and 8-hour averages. The results from the significance determination are shown in the table below.

[1] Emissions from this unit are based on a 0.25 lb/MMBtu emission rate and Unit 1's heat input rate of 3,390 MMBtu/hr. See also Table 5-5 in Part 5.0 of the Permit Application, the Air Disperson Modeling Analysis.

Significance Determination Table						
Load	**Averaging Period**	**Maximum Concentration ($\mu g/m^3$)**	**Proposed Emission rate (g/s)**	**Scaled Concentration ($\mu g/m^3$)**	**Modeling SIL ($\mu g/m^3$)**	**Exceeds SIL?**
100%	1-hour	1.743	92.33	160.9	2,000	No
	8-hour	1.568		144.8	500	No
75%	1-hour	1.912	69.25	132.4	2,000	No
	8-hour	1.720		119.1	500	No
50%	1-hour	2.287	46.17	105.6	2,000	No
	8-hour	2.059		95.1	500	No
25%	1-hour	3.240	23.08	74.8	2,000	No
	8-hour	2.916		67.3	500	No

For the 1-hour and 8-hour CO averaging periods the modeled impacts for the proposed facility fall below the modeling SIL so no refined modeling is required. The modeling results are also well below the pre-application monitoring threshold of 575 $\mu g/m^3$ for the 8-hour averaging period. There is no pre-application threshold established for the 1-hour averaging period. Therefore, pre-construction monitoring is not required for CO.

VI. Additional Impact Analysis

A. Commercial, Residential, and Industrial Growth

The growth analysis considers predicted air quality impacts due to emissions resulting from the commercial, industrial and residential growth associated with the LNB/OFA project. Only permanent growth is considered and impacts from emissions from temporary and mobile sources are not included in the analysis.

There will be no associated growth due to the LNB/OFA project. Project construction will be limited and no commercial or residential growth is projected to occur because of this project. Given the temporary nature of the construction and the lack of other source growth in the area, the Project is not expected to cause any adverse construction or growth related air quality impacts

B. Visibility Impairment

An additional visibility impact analysis may be used to determine if the air emission increases associated with a proposed PSD project will have an impact on Class II sensitive areas such as state parks, wilderness areas, or scenic sites and overlooks. Visibility impairment is a function of the

emissions of primary particulate matter, NO_X (including NO_2), elemental carbon (soot), and primary sulfate (SO_4). This project will substantially decrease the emissions of NO_X, thereby improving visibility over current conditions. As CO, not a visibility impairing pollutant, is the only pollutant with an emission increase, the project is not predicted to negatively impact visibility.

Federally designated Class I areas are afforded special protection in the air permitting process. Generally, Class I area visibility analyses are only conducted for projects located within 100 km of a Class I area. The nearest Federal Class I Area is the Great Sand Dunes National Monument, nearly 400 km west of the proposed facility. Wichita Mountains National Wildlife Refuge is slightly more than 400 km southeast of the proposed facility. A visibility analysis was not required since the proposed project results in a substantial decrease in NO_X emissions and there is no increase in any other visibility-impairing pollutants.

C. Vegetation

In accordance with 40 CFR 52.21(o)(1), the owner shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the modification to the source. Sunflower determined that the proposed project and the associated increase in CO are not expected to have significant effects on vegetation.

Air pollutants can affect vegetation through direct absorption through the foliage, or uptake from the soil of trace elements deposited in the soil. The effects of air pollution on vegetation can include visible damage to foliage and fruit, changes in metabolic function, adverse changes in plant activity, and crop yield reduction. The effects of air pollutants on vegetation fall into three categories: acute (short exposure to high concentration), chronic (lower concentration over months or years), and long term (abnormal changes to ecosystems and physiological alterations in organisms that occur gradually over very long time periods).

The United States Department of Interior (USDOI) has published a document called Impacts of Coal Fired Power Plants on Fish, Wildlife, and their Habitats. This document was used to consider the effects of CO on vegetation. Sunflower Electric Power Corporation conducted a survey of the vegetation located in the vicinity of the modification, which indicated the predominant types of vegetation are pasture and crop land. Switchgrass, little bluestem, big bluestem, Indian grass, and Canada wild rye are found in pastures and meadows. Wheat, corn, soybeans, and alfalfa are the predominant row crops. Trees occur in hedgerows, creek beds, and along the Arkansas River. While adequate information is available to make generalizations regarding air pollution impacts on various types of vegetation, concrete conclusions as to site-specific vegetation exposure

impacts cannot be presently concluded from available research study data. At the Sunflower facility vegetation is composed of disturbance-tolerant weedy species including lamb's-quarters (*Chenopodium album*), pigweed (*Amaranthus sp.*), and Russian thistle (*Salsola kali*). Turf grasses, such as western wheatgrass (*Agropyron smithii*) and tall fescue (*Festuca arundinacea*) are planted in lawn areas.

Concentrations of CO, even in polluted atmospheres, are not typically detrimental to vegetation. CO has not been found to produce detrimental effects on plant growth at concentrations below 1,800,000 $\mu g/m^3$ for a one week exposure.[2] NAAQS are set for 1-hour and 8-hour averaging periods, at rates more stringent than the literature exposure threshold. Therefore, the NAAQS were utilized for comparison with modeled concentrations to predict any CO effects on vegetation. Additionally, the USEPA has stated that "*for most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary national ambient air quality standards (NAAQS) will not result in harmful effects*."[3] Since the maximum model-predicted 1-hour and 8-hour CO impacts are significantly lower than the NAAQS, no adverse impacts to vegetation due to the proposed project are expected from CO emissions.

D. Soils

Two soil types are mapped at or near the project site (Harner *et al.* 1965). They include:

- Tivoli fine sand
- Tivoli-Vona loamy fine sands

Both soil types are deep, noncalcareous, very sandy soils in steep, duny (numerous sand-dunes) terrain. The soils are low in fertility and drain very easily. Water is absorbed quickly, and consequently, runoff is very low. Blowout of the soil is prevalent where vegetation is lacking. Erosion often is a problem.

Sulfates and nitrates caused by SO_2 and NO_X deposition on soil can be beneficial and detrimental to soils depending on its composition. However, the modification on H1 will not affect SO_2 emissions from the unit, and NO_X emissions will be decreasing as a result of the project, so no adverse effects are anticipated.

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[2] Smith, A.E. and J.B. Levenson. *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals.* Argonne National Laboratory, USEPA Publication EPA-450/2-81-078. December 12, 1980.

[3] *New Source Review Workshop Manual.* Environmental Protection Agency, Office of Air Quality Planning and Standards, October 1990, Draft. (NSR Manual).

Attachment A

KEY STEPS IN THE "TOP-DOWN" BACT ANALYSIS

STEP 1: IDENTIFY ALL POTENTIAL AVAILABLE CONTROL TECHNOLOGIES.

The first step in a "Top-Down" analysis is to identify, for the emission unit in question, "all available" control options. Available control options are those air pollution control technologies or techniques with a PRACTICAL POTENTIAL FOR APPLICATION to the emissions unit and the regulated pollutant under review. This includes technologies employed outside of the United States. Air pollution control technologies and techniques include the application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant.

STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

The technical feasibility of the control options identified in Step 1 is evaluated with respect to the source-specific (or emissions unit specific) factors. In general, a demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that difficulties would preclude the successful use of the control option on the emissions unit under review. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

All remaining control alternatives not eliminated in Step 2 are ranked and then listed in order of over-all control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emissions unit subject to a BACT analysis. The list should present the array of control technology alternatives and should include the following types of information:

1) control efficiencies;
2) expected emission rate;
3) expected emission reduction;
4) environmental impacts;
5) energy impacts; and
6) economic impacts.

STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

The applicant presents the analysis of the associated impacts of the control option in the listing. For each option, the applicant is responsible for presenting an objective

evaluation of each impact. Both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative. The applicant proceeds to consider whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. In the event the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding should be fully documented for the public record. Then the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology cannot be eliminated.

STEP 5: SELECT BACT.

The most effective control option not eliminated in Step 4 is proposed as BACT for the emission unit to control the pollutant under review.

Attachment B

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT'S EVALUATION OF SUNFLOWR ELECTRIC POWER CORPORATION, HOLCOMB GENERATING STATION UNIT 1 PROPOSED BEST AVAILABLE CONTROL TECHNOLOGY (BACT) OPTIONS

Sunflower Electric Power Corporation (Sunflower) evaluated the BACT analysis to control emissions from the Emission Reduction Project. The only significant emission increase from this project is Carbon Monoxide (CO).

CO BACT for the Emission Reduction Project

CO controls consist of good combustion practices or oxidation catalyst. Overfire air can provide an element of CO control as it allows further burn-out of the pollutant. Otherwise, the best identified method to control CO emission from a coal-fired boiler is through the use of appropriate combustion control techniques.

The PSD regulations require BACT, which requires the source to evaluate the control options for technical feasibility. Regenerative Thermal Oxidation (RTO) and catalytic oxidation were examined as possible CO control options. Both RTO and catalytic oxidation were found to be infeasible as a CO control method for the steam generator due to critical technical problems.

No instances of a thermal oxidation system being used to control emission from a gas stream similar in makeup to the H1 coal-fired stream generator have been identified. As such, thermal oxidation has been determined to be technically infeasible. Installing an oxidation catalyst to control CO emission was deemed technically infeasible because, in addition to oxidizing CO, an oxidation catalyst will also oxidize a significant portion of SO_2 to SO_3 in the gas stream. SO_3 in the presence of water forms sulfuric acid mist which is highly corrosive to equipment downstream of the catalyst. Also, due to the high amount of PM present in the flue gas stream, the ash acts as a scouring mechanism, plugging and eroding the catalyst after a very brief period of operation, resulting in extremely high operational and maintenance costs to effect more frequent catalysts replacement.

Based on the technical constraints, the use of good combustion practices to meet CO emission levels of 0.25 lb/mmBTU is proposed by Sunflower as BACT. KDHE agrees with this analysis.

Air Quality Impact Analysis Review

Sunflower Electric Power Corporation
Holcomb Unit 1
Low NOx Burner/Overfire Air Project
Air Quality Construction Permit Application

Kansas
Department of Health and Environment
Bureau of Air

Source ID No. 0550023
C-9635

Kansas Department of Health and Environment
Bureau of Air
Air Permitting Section

DRAFT

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I. Introduction

Sunflower Electric Power Corporation (Sunflower) submitted a prevention of significant deterioration (PSD) air permit application for the installation of low nitrogen oxide burners (LNB) and overfire air (OFA) System on the existing Holcomb 1 steam generator system (H1). The PSD application was received by KDHE on June 6, 2011.

An air dispersion modeling protocol and an update were received by KDHE on March 16 and May 5, 2011respectively. Comments about the protocol from EPA and KDHE were provided to Sunflower on June 1st, 2011.

An Air Quality Impact Analysis (AQIA) is required as part of a PSD construction permit application to show the impact of the proposed project on the National Ambient Air Quality Standards (NAAQS) and air quality-related values. This document summarizes the KDHE review and evaluation of Sunflower's AQIA.

Dispersion modeling for this project includes a demonstration of compliance with the NAAQS for carbon monoxide (CO), since it is the only primary pollutant that increases in emission level with the installation of LNB/OFA, and which exceeds the PSD significant emission rate for CO of 100 tons per year.

II. Facility Description

The existing facility is a pulverized coal (PC) electric generating station. The H1 steam generator is designed to use low sulfur Powder River Basin (PRB) coal with a nominal net generation capacity of 360 megawatts (MW). The facility is located south of the city of Holcomb in Finney County, Kansas. Finney County is designated as an attainment area for all criteria pollutants.

III. Air Quality Impact Analysis Applicability

The proposed facility is a major source as defined by K.A.R. 28-19-350, Prevention of Significant Deterioration. Therefore, the owner or operator must demonstrate that allowable emission increases from the proposed facility would not cause or contribute to air pollution in violation of:

1) any NAAQS in any air quality control region; or
2) any applicable maximum allowable increase of PM_{10}, SO_2, or NO_2 over the baseline concentration in any area (increment).

The only emissions to be affected by the proposed project are nitrogen oxides and carbon monoxide. The emissions change for these two pollutants from the proposed project and significant emission thresholds are listed in Table 1 below. New major stationary sources with pollutant emissions exceeding significant emission rates must undergo PSD review.

Table 1. Emissions Change From the Proposed Project and PSD Significant Emission Rates					
Pollutant	**Baseline Emissions (tpy)**	**Proposed Project Potential Emissions (tpy)**	**Net Emissions Change (tpy)**	**Significant Emission Rate (tpy)**	**PSD Review Required**
NO_x	4687.2	2671.9	-2015.3	40	No
CO	509.1	3711.0	3201.8	100	Yes

IV. Model Selection

The emissions were modeled using the latest version (11126) of AERSCREEN. AERSCREEN is based on AERMOD, EPA's preferred near-field dispersion model, and replaces SCREEN3 as the recommended screening model based on the *Guideline on Air Quality Models*. Similar to SCREEN3, AERSCREEN allows for user entry of emission inputs, source coordinates, building information (for downwash), receptor information, and meteorological information in a quick and easy fashion, either through an input file, or interactive prompts. However, AERSCREEN incorporates several enhancements relative to the SCREEN3 model. For example, AERSCREEN generates application-specific worst-case meteorology, via MAKEMET, that takes full advantage of the boundary layer scaling algorithms implemented in the AERMET meteorological processor using representative minimum and maximum ambient air temperatures, and site-specific surface characteristics (albedo, Bowen ratio, and surface roughness). AERSCREEN incorporates the PRIME downwash algorithms that are part of the AERMOD refined model and utilizes the BPIPPRIM tool to provide a detailed analysis of downwash influences on a direction-specific basis. AERSCREEN also incorporates AERMOD's complex terrain algorithms and utilizes the AERMAP terrain processor to account for the actual terrain in the vicinity of the source on a direction-specific basis[1].

AERSCREEN was produced to give the user two options for modeling: either by using the command prompt interface to give a more automated process for the user or by using the MAKEMET program which gives the user more flexibility for defining receptors. Sunflower used the command-prompt interface of the AERSCREEN model for this air quality impact analysis because the MAKEMET approach is more appropriate for an area with a more complex terrain than Holcomb. All "regulatory default" options in the AERSCREEN model were used for this air quality impact analysis.

Based on the proposed facility emissions, carbon monoxide (CO) was evaluated as part of the AQIA. AERSCREEN was used by Sunflower to evaluate the impacts of CO that will result from the LNB/OFA project at H1 for 1-hour CO and 8-hour CO. Sunflower's evaluation was reviewed by KDHE using AERSCREEN version 11126.

[1] *AERSCREEN Released as the EPA Recommended Screening Model* Memorandum by Tyler Fox issued on April 11, 2011 (http://www.epa.gov/ttn/scram/20110411_AERSCREEN_Release_Memo.pdf).

V. Model Inputs

A. Source Data

The emission rate, point location, and stack parameters for the emission source used in the model were based on the data presented in the permit application. Modeling runs were conducted at full and partial loads to confirm that operation of the steam generator would not result in impacts greater than the NAAQS or PSD increments. The H1 steam generator load (and consequently the hourly emission rates) was modeled at four different load points (100%, 75%, 50% and 25%) to account for varying loads and process conditions. The low load conditions (25% and 50%) will account for startup and shutdown conditions. This methodology will account for all worst-case conditions that can be experienced at the facility. These input data are shown in the table below.

Table 2. Stack Parameters for H1 Steam Generator[2]

Load	Stack height (ft)	Stack diameter (ft)	Exit temperature (°F)	Exit velocity (ft/s)
100%	475	16.33	180	113.5
75%				85.2
50%				56.8
25%				28.4

B. Urban or Rural

The area surrounding the facility is deemed "rural" for air modeling purposes.

C. Terrain

The terrain in the vicinity of the facility is relatively flat therefore no terrain was included in the modeling.

D. Meteorological Data

AERSCREEN estimates concentrations without the need for the user to input meteorological data. The "regulatory default" settings for minimum and maximum temperature, minimum wind speed, and anemometer height were used to determine the meteorology in this model. The meteorology was calculated using the AERMET seasonal tables. Being in western Kansas, the surface characteristics option had the number six selection of "Grassland." The dominant surface profile is average moisture since western Kansas is not classified as an arid region.

E. Building Downwash

[2] Emissions from this unit are based on a 0.25 lb/MMBtu emission rate and Unit 1's heat input rate of 3,390 MMBtu/hr. See also Table 5-5 in Part 5.0 of the Permit Application, the Air Disperson Modeling Analysis.

Good engineering practice stack height for stacks constructed after January 12, 1979 is defined as the greater of:

- 65 meters, measured from the base of the stack, and
- Stack height calculated from the following formula:

$$Hg = H + 1.5L$$

Where

Hg = the GEP stack height

H = the height of the nearby structure

L = the lesser of the building height or the greatest crosswind distance of the building also known as maximum projected width

The H1 generating unit stack height exceeds 65 meters; therefore, the model's Building Downwash option was selected and the building dimensions supplied by Sunflower were used for the model run.

F. Receptors

Receptors were placed so that the maximum offsite ground-level concentrations can be determined. The only receptor information that AERSCREEN requires in its command-prompt user interface program is the maximum receptor distance, the distance to the fence line, and the height of any flagpole receptor. The closest fence line to H1 is at a distance of approximately 1,300 meters. That value was used as the minimum distance to ambient air in the AERSCREEN program. For the maximum distance to a receptor, a value of 10 kilometers was used. Flag pole receptors were not used in the model.

VI. Significance Determination

A facility that proposes to emit any pollutant above the PSD significant emission rate thresholds must submit an ambient air quality impact analysis. In order to determine if a full impact model analysis and/or ambient air monitoring is necessary, a facility must complete a preliminary modeling analysis. The preliminary analysis includes only the proposed source or modification so it can be determined if a significant modeled impact will take place. For each pollutant that the model predicts the high first high concentration to be below the significant impact level (SIL) threshold, no further analysis is necessary for that pollutant.

The modeled emission rate was set at 1.0 grams per second (1 g/s) for all load cases. Since only one source is being modeled, this was done so the results are directly scalable to this rate and multiple emission rates do not need to be considered in separate modeling runs. The resulting concentration from the AERSCREEN model can be directly multiplied by the proposed emission rate for H1 to arrive at a corresponding concentration. The AERSCREEN program also includes averaging time factors for worst-case 1-hour and 8-hour averages. The results from the significance determination are shown in Table 3 below.

Table 3. Significance Determination Table						
Load	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Proposed Emission rate (g/s)	Scaled Concentration ($\mu g/m^3$)	Modeling SIL ($\mu g/m^3$)	Exceeds SIL?
100%	1-hour	1.743	92.33	160.9	2,000	No
	8-hour	1.568		144.8	500	No
75%	1-hour	1.912	69.25	132.4	2,000	No
	8-hour	1.720		119.1	500	No
50%	1-hour	2.287	46.17	105.6	2,000	No
	8-hour	2.059		95.1	500	No
25%	1-hour	3.240	23.08	74.8	2,000	No
	8-hour	2.916		67.3	500	No

For the 1-hour and 8-hour CO averaging periods the modeled impacts for the proposed facility fall below the modeling SIL so no refined modeling is required. The modeling results are also well below the pre-application monitoring threshold of 575 $\mu g/m^3$ for the 8-hour averaging period. There is no pre-application threshold established for the 1-hour averaging period. Therefore, pre-construction monitoring is not required for CO.

VII. Additional PSD Impact Analyses

A. Commercial, Residential, and Industrial Growth

The growth analysis considers predicted air quality impacts due to emissions resulting from the commercial, industrial and residential growth associated with the LNB/OFA project. Only permanent growth is considered and impacts from emissions from temporary and mobile sources are not included in the analysis.

There will be no associated growth due to the LNB/OFA project. Project construction will be limited and no commercial or residential growth is projected to occur because of this project. Given the temporary nature of the construction and the lack of other source growth in the area, the Project is not expected to cause any adverse construction or growth related air quality impacts

B. Visibility Impairment

An additional visibility impact analysis may be used to determine if the air emission increases associated with a proposed PSD project will have an impact on Class II sensitive areas such as state parks, wilderness areas, or scenic sites and overlooks. Visibility impairment is a function of the emissions of primary particulate matter, NO_x (including NO_2), elemental carbon (soot), and primary sulfate (SO_4). This project will substantially decrease the emissions of NO_x, thereby improving visibility over current conditions. As CO, not a visibility impairing pollutant, is the only pollutant with an emission increase, the project is not predicted to negatively impact visibility.

Federally designated Class I areas are afforded special protection in the air permitting process. Generally, Class I area visibility analyses are only conducted for projects located within 100 km of a Class I area. The nearest Federal Class I Area is the Great Sand Dunes National Monument, nearly 400 km west of the proposed facility. Wichita Mountains National Wildlife Refuge is slightly more than 400 km southeast of the proposed facility. A visibility analysis was not required since the proposed project results in a substantial decrease in NO_x emissions and there is no increase in any other visibility-impairing pollutants.

C. Vegetation

In accordance with 40 CFR 52.21(o)(1), the owner shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the modification to the source. Sunflower determined that the proposed project and the associated increase in CO are not expected to have significant effects on vegetation.

Air pollutants can affect vegetation through direct absorption through the foliage, or uptake from the soil of trace elements deposited in the soil. The effects of air pollution on vegetation can include visible damage to foliage and fruit, changes in metabolic function, adverse changes in plant activity, and crop yield reduction. The effects of air pollutants on vegetation fall into three categories: acute (short exposure to high concentration), chronic (lower concentration over months or years), and long term (abnormal changes to ecosystems and physiological alterations in organisms that occur gradually over very long time periods).

The United States Department of Interior (USDOI) has published a document called Impacts of Coal Fired Power Plants on Fish, Wildlife, and their Habitats. This document was used to consider the effects of CO on vegetation. Sunflower Electric Power Corporation conducted a survey of the vegetation located in the vicinity of the modification, which indicated the predominant types of vegetation are pasture and crop land. Switchgrass, little bluestem, big bluestem, Indian grass, and Canada wild rye are found in pastures and meadows. Wheat, corn, soybeans, and alfalfa are the predominant row crops. Trees occur in hedgerows, creek beds, and along the Arkansas River. While adequate information is available to make generalizations regarding air pollution impacts on various types of vegetation, concrete conclusions as to site-specific vegetation exposure impacts cannot be presently concluded from available research study data. At the Sunflower facility vegetation is composed of disturbance-tolerant weedy species including lamb's-quarters (*Chenopodium album*), pigweed (*Amaranthus sp.*), and Russian thistle (*Salsola kali*). Turf grasses, such as western wheatgrass (*Agropyron smithii*) and tall fescue (*Festuca arundinacea*) are planted in lawn areas.

Concentrations of CO, even in polluted atmospheres, are not typically detrimental to vegetation. CO has not been found to produce detrimental effects on plant growth at concentrations below 1,800,000 $\mu g/m^3$ for a one week exposure.[3] NAAQS are set for 1-hour and 8-hour averaging periods, at rates more stringent than the literature exposure threshold. Therefore, the NAAQS were utilized for comparison with modeled

[3] Smith, A.E. and J.B. Levenson. *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals*. Argonne National Laboratory, USEPA Publication EPA-450/2-81-078. December 12, 1980.

concentrations to predict any CO effects on vegetation. Additionally, the USEPA has stated that "*for most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary national ambient air quality standards (NAAQS) will not result in harmful effects*."[4] Since the maximum model-predicted 1-hour and 8-hour CO impacts are significantly lower than the NAAQS, no adverse impacts to vegetation due to the proposed project are expected from CO emissions.

D. Soils

Two soil types are mapped at or near the project site (Harner *et al.* 1965). They include:

- Tivoli fine sand
- Tivoli-Vona loamy fine sands

Both soil types are deep, noncalcareous, very sandy soils in steep, duny (numerous sand-dunes) terrain. The soils are low in fertility and drain very easily. Water is absorbed quickly, and consequently, runoff is very low. Blowout of the soil is prevalent where vegetation is lacking. Erosion often is a problem.

Sulfates and nitrates caused by SO_2 and NO_x deposition on soil can be beneficial and detrimental to soils depending on its composition. However, the modification on H1 will not affect SO_2 emissions from the unit, and NO_x emissions will be decreasing as a result of the project, so no adverse effects are anticipated.

IX. Conclusions

- Evaluation of the facility potential emissions indicated that emissions of CO above current levels are expected.
- The AERSCREEN model (version 11126) was used to determine predicted maximum ground level concentrations.
- The analysis indicated that concentration levels of CO resulting from the proposed project would not significantly cause or contribute to an exceedance of the NAAQS.
- The modeled impacts for the proposed facility fall below the pre-application monitoring threshold and the modeling SIL for the 8-hour and 1-hour averaging periods.
- The analysis indicated that concentration levels of all pollutants resulting from the proposed project would comply with PSD Class II increments.
- The analysis indicated that no evaluation of visibility impacts is required.

[4] *New Source Review Workshop Manual.* Environmental Protection Agency, Office of Air Quality Planning and Standards, October 1990, Draft. (NSR Manual).

AERSCREEN 11126 / AERMOD 1110 08/30/11
13:45:20

TITLE: 25% LOAD

********** STACK PARAMETERS **********

SOURCE EMISSION RATE: 1.0000 g/s 7.937 lb/hr
STACK HEIGHT: 144.78 meters 475.00 feet
STACK INNER DIAMETER: 4.977 meters 195.96 inches
PLUME EXIT TEMPERATURE: 355.4 K 180.0 Deg F
PLUME EXIT VELOCITY: 8.656 m/s 28.40 ft/s
STACK AIR FLOW RATE: 356891 ACFM
RURAL OR URBAN: RURAL

INITIAL PROBE DISTANCE = 10000. meters 32808. feet

********** BUILDING DOWNWASH PARAMETERS **********

USER DEFINED BPIPPRM INPUT FILE: H1 SOURCE ONLY.PIP

MAXIMUM BUILDING HEIGHT: 82.3 meters 270.0 feet

MAXIMUM BUILDING LENGTH: 88.3 meters 289.6 feet

MINIMUM BUILDING WIDTH: 0.0 meters 0.0 feet

********** FLOW SECTOR ANALYSIS **********
25 meter receptor spacing: 1300. meters - 5000. meters
50 meter receptor spacing: 5050. meters - 10000. meters

FLOW SECTOR	BUILD WIDTH	BUILD LENGTH	XBADJ	YBADJ	MAX 1-HR CONC	DIST (m)	TEMPORAL PERIOD
10*	167.42	68.06	-239.47	-102.75	3.239	1525.0	WIN
20	66.42	59.47	-145.04	-37.39	3.239	1525.0	WIN
30	57.66	56.05	-79.46	-33.36	3.239	1525.0	WIN
40	58.91	58.37	-74.04	-41.79	3.239	1525.0	WIN
50	59.01	68.44	3.18	19.79	3.239	1525.0	WIN
60	65.75	61.06	2.07	27.14	3.239	1525.0	WIN

70	70.70	52.02	0.89	33.77	3.239	1525.0	WIN
80	73.67	41.58	-0.31	39.46	3.239	1525.0	WIN
90	0.00	0.00	0.00	0.00	3.239	1525.0	WIN
100	0.00	0.00	0.00	0.00	3.239	1525.0	WIN
110	78.63	40.64	-21.18	45.14	3.239	1525.0	WIN
120	77.36	46.89	-30.20	43.77	3.239	1525.0	WIN
130	73.93	51.71	-38.31	41.16	3.239	1525.0	WIN
140	58.91	58.36	19.76	-36.92	3.239	1525.0	WIN
150	57.66	56.05	26.59	-27.86	3.239	1525.0	WIN
160	54.66	52.03	32.60	-17.95	3.239	1525.0	WIN
170	31.58	18.10	-142.25	29.86	3.239	1525.0	WIN
180	32.61	14.29	-143.40	6.18	3.239	1525.0	WIN
190	32.96	11.49	-141.46	-17.66	3.239	1525.0	WIN
200	54.66	52.03	30.43	23.93	3.239	1525.0	WIN
210	57.66	56.05	23.41	33.36	3.239	1525.0	WIN
220	58.91	58.37	15.67	41.79	3.239	1525.0	WIN
230	59.01	68.44	-71.62	-19.79	3.239	1525.0	WIN
240	65.75	61.06	-63.13	-27.14	3.239	1525.0	WIN
250	70.70	52.02	-52.92	-33.77	3.239	1525.0	WIN
260	73.67	41.58	-41.27	-39.46	3.239	1525.0	WIN
270	0.00	0.00	0.00	0.00	3.239	1525.0	WIN
280	0.00	0.00	0.00	0.00	3.239	1525.0	WIN
290	78.63	40.64	-19.45	-45.14	3.239	1525.0	WIN
300	42.93	35.91	-157.59	30.95	3.239	1525.0	WIN
310	41.84	39.47	-162.63	6.23	3.239	1525.0	WIN
320	89.95	88.26	-288.71	62.73	3.239	1525.0	WIN
330	88.91	83.88	-293.70	19.30	3.239	1525.0	WIN
340	85.16	76.96	-289.77	-24.71	3.239	1525.0	WIN
350	78.83	67.70	-277.03	-67.97	3.239	1525.0	WIN
360	130.06	56.39	-255.88	-79.19	3.239	1525.0	WIN

* = worst case flow sector

********** MAKEMET METEOROLOGY PARAMETERS **********

MIN/MAX TEMPERATURE: 250.0 / 310.0 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
DOMINANT CLIMATE TYPE: Average Moisture
DOMINANT SEASON: Winter

ALBEDO: 0.60
BOWEN RATIO: 1.50
ROUGHNESS LENGTH: 0.001 (meters)

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

YR MO DY JDY HR
10 01 27 27 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
25.07	0.037	0.300	0.020	214.	16.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 876.3 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

YR MO DY JDY HR
10 01 27 27 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
25.07	0.037	0.300	0.020	214.	16.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 876.3 meters

********** AERSCREEN AUTOMATED DISTANCES **********
OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
1300.00	3.164	4425.00	1.767
1325.00	3.181	4450.00	1.759
1350.00	3.196	4475.00	1.752
1375.00	3.209	4500.00	1.744
1400.00	3.219	4525.00	1.736
1425.00	3.227	4550.00	1.729

1450.00	3.232	4575.00	1.721
1475.00	3.236	4600.00	1.714
1500.00	3.239	4625.00	1.706
1525.00	3.239	4650.00	1.699
1550.00	3.237	4675.00	1.692
1575.00	3.234	4700.00	1.685
1600.00	3.229	4725.00	1.678
1625.00	3.222	4750.00	1.670
1650.00	3.212	4775.00	1.663
1675.00	3.200	4800.00	1.656
1700.00	3.186	4825.00	1.650
1725.00	3.170	4850.00	1.643
1750.00	3.155	4875.00	1.636
1775.00	3.142	4900.00	1.629
1800.00	3.129	4925.00	1.622
1825.00	3.116	4950.00	1.616
1850.00	3.102	4975.00	1.609
1875.00	3.088	5000.00	1.603
1900.00	3.074	5050.00	1.590
1925.00	3.059	5100.00	1.577
1950.00	3.044	5150.00	1.565
1975.00	3.029	5200.00	1.552
2000.00	3.013	5250.00	1.540
2025.00	2.998	5300.00	1.528
2050.00	2.982	5350.00	1.517
2075.00	2.966	5400.00	1.505
2100.00	2.950	5450.00	1.494
2125.00	2.933	5500.00	1.482
2150.00	2.917	5550.00	1.471
2175.00	2.901	5600.00	1.460
2200.00	2.884	5650.00	1.450
2225.00	2.868	5700.00	1.439
2250.00	2.851	5750.00	1.429
2275.00	2.835	5800.00	1.419
2300.00	2.818	5850.00	1.408
2325.00	2.802	5900.00	1.398
2350.00	2.785	5950.00	1.389
2375.00	2.769	6000.00	1.379
2400.00	2.752	6050.00	1.369
2425.00	2.736	6100.00	1.360
2450.00	2.719	6150.00	1.351
2475.00	2.703	6200.00	1.342
2500.00	2.687	6250.00	1.332
2525.00	2.671	6300.00	1.324
2550.00	2.655	6350.00	1.315
2575.00	2.639	6400.00	1.306
2600.00	2.623	6450.00	1.298
2625.00	2.607	6500.00	1.289
2650.00	2.591	6550.00	1.281
2675.00	2.576	6600.00	1.272
2700.00	2.560	6650.00	1.264
2725.00	2.545	6700.00	1.256
2750.00	2.530	6750.00	1.248
2775.00	2.514	6800.00	1.241

2800.00	2.499	6850.00	1.233
2825.00	2.484	6900.00	1.225
2850.00	2.470	6950.00	1.218
2875.00	2.455	7000.00	1.210
2900.00	2.440	7050.00	1.203
2925.00	2.426	7100.00	1.196
2950.00	2.411	7150.00	1.188
2975.00	2.397	7200.00	1.181
3000.00	2.383	7250.00	1.174
3025.00	2.369	7300.00	1.167
3050.00	2.355	7350.00	1.160
3075.00	2.341	7400.00	1.154
3100.00	2.328	7450.00	1.147
3125.00	2.314	7500.00	1.140
3150.00	2.301	7550.00	1.134
3175.00	2.288	7600.00	1.127
3200.00	2.275	7650.00	1.121
3225.00	2.262	7700.00	1.115
3250.00	2.249	7750.00	1.108
3275.00	2.236	7800.00	1.102
3300.00	2.223	7850.00	1.096
3325.00	2.211	7900.00	1.090
3350.00	2.198	7950.00	1.084
3375.00	2.186	8000.00	1.078
3400.00	2.174	8050.00	1.072
3425.00	2.162	8100.00	1.066
3450.00	2.150	8150.00	1.061
3475.00	2.138	8200.00	1.055
3500.00	2.126	8250.00	1.049
3525.00	2.115	8300.00	1.044
3550.00	2.103	8350.00	1.038
3575.00	2.092	8400.00	1.033
3600.00	2.080	8450.00	1.027
3625.00	2.069	8500.00	1.022
3650.00	2.058	8550.00	1.017
3675.00	2.047	8600.00	1.012
3700.00	2.036	8650.00	1.006
3725.00	2.026	8700.00	1.001
3750.00	2.015	8750.00	0.9961
3775.00	2.005	8800.00	0.9911
3800.00	1.994	8850.00	0.9861
3825.00	1.984	8900.00	0.9812
3850.00	1.974	8950.00	0.9763
3875.00	1.963	9000.00	0.9714
3900.00	1.953	9050.00	0.9666
3925.00	1.943	9100.00	0.9619
3950.00	1.934	9150.00	0.9572
3975.00	1.924	9200.00	0.9525
4000.00	1.914	9250.00	0.9479
4025.00	1.905	9300.00	0.9433
4050.00	1.895	9350.00	0.9388
4075.00	1.886	9400.00	0.9343
4100.00	1.876	9450.00	0.9298
4125.00	1.867	9500.00	0.9254

4150.00	1.858	9550.00	0.9210
4175.00	1.849	9600.00	0.9167
4200.00	1.841	9650.00	0.9124
4225.00	1.832	9700.00	0.9082
4250.00	1.824	9750.00	0.9039
4275.00	1.816	9800.00	0.8997
4300.00	1.807	9850.00	0.8956
4325.00	1.799	9900.00	0.8915
4350.00	1.791	9950.00	0.8874
4375.00	1.783	10000.00	0.8834
4400.00	1.775		

********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	3.239	3.239	2.915	1.943	0.3239

DISTANCE FROM SOURCE 1515.00 meters directed toward 10 degrees

IMPACT AT THE AMBIENT BOUNDARY	3.164	3.164	2.848	1.898	0.3164

DISTANCE FROM SOURCE 1300.00 meters directed toward 10 degrees

AERSCREEN 11126 / AERMOD 1110 08/30/11
13:41:17

TITLE: 50% LOAD

********** STACK PARAMETERS **********

SOURCE EMISSION RATE: 1.0000 g/s 7.937 lb/hr
STACK HEIGHT: 144.78 meters 475.00 feet
STACK INNER DIAMETER: 4.977 meters 195.96 inches
PLUME EXIT TEMPERATURE: 355.4 K 180.0 Deg F
PLUME EXIT VELOCITY: 17.313 m/s 56.80 ft/s
STACK AIR FLOW RATE: 713783 ACFM
RURAL OR URBAN: RURAL

INITIAL PROBE DISTANCE = 10000. meters 32808. feet

********** BUILDING DOWNWASH PARAMETERS **********

USER DEFINED BPIPPRM INPUT FILE: H1 SOURCE ONLY.PIP

MAXIMUM BUILDING HEIGHT: 82.3 meters 270.0 feet

MAXIMUM BUILDING LENGTH: 88.3 meters 289.6 feet

MINIMUM BUILDING WIDTH: 0.0 meters 0.0 feet

********** FLOW SECTOR ANALYSIS **********
25 meter receptor spacing: 1300. meters - 5000. meters
50 meter receptor spacing: 5050. meters - 10000. meters

FLOW SECTOR	BUILD WIDTH	BUILD LENGTH	XBADJ	YBADJ	MAX 1-HR CONC	DIST (m)	TEMPORAL PERIOD
10*	167.42	68.06	-239.47	-102.75	2.286	1925.0	WIN
20	66.42	59.47	-145.04	-37.39	2.286	1925.0	WIN
30	57.66	56.05	-79.46	-33.36	2.286	1925.0	WIN
40	58.91	58.37	-74.04	-41.79	2.286	1925.0	WIN
50	59.01	68.44	3.18	19.79	2.286	1925.0	WIN
60	65.75	61.06	2.07	27.14	2.286	1925.0	WIN
70	70.70	52.02	0.89	33.77	2.286	1925.0	WIN

80	73.67	41.58	-0.31	39.46	2.286	1925.0	WIN
90	0.00	0.00	0.00	0.00	2.286	1925.0	WIN
100	0.00	0.00	0.00	0.00	2.286	1925.0	WIN
110	78.63	40.64	-21.18	45.14	2.286	1925.0	WIN
120	77.36	46.89	-30.20	43.77	2.286	1925.0	WIN
130	73.93	51.71	-38.31	41.16	2.286	1925.0	WIN
140	58.91	58.36	19.76	-36.92	2.286	1925.0	WIN
150	57.66	56.05	26.59	-27.86	2.286	1925.0	WIN
160	54.66	52.03	32.60	-17.95	2.286	1925.0	WIN
170	31.58	18.10	-142.25	29.86	2.286	1925.0	WIN
180	32.61	14.29	-143.40	6.18	2.286	1925.0	WIN
190	32.96	11.49	-141.46	-17.66	2.286	1925.0	WIN
200	54.66	52.03	30.43	23.93	2.286	1925.0	WIN
210	57.66	56.05	23.41	33.36	2.286	1925.0	WIN
220	58.91	58.37	15.67	41.79	2.286	1925.0	WIN
230	59.01	68.44	-71.62	-19.79	2.286	1925.0	WIN
240	65.75	61.06	-63.13	-27.14	2.286	1925.0	WIN
250	70.70	52.02	-52.92	-33.77	2.286	1925.0	WIN
260	73.67	41.58	-41.27	-39.46	2.286	1925.0	WIN
270	0.00	0.00	0.00	0.00	2.286	1925.0	WIN
280	0.00	0.00	0.00	0.00	2.286	1925.0	WIN
290	78.63	40.64	-19.45	-45.14	2.286	1925.0	WIN
300	42.93	35.91	-157.59	30.95	2.286	1925.0	WIN
310	41.84	39.47	-162.63	6.23	2.286	1925.0	WIN
320	89.95	88.26	-288.71	62.73	2.286	1925.0	WIN
330	88.91	83.88	-293.70	19.30	2.286	1925.0	WIN
340	85.16	76.96	-289.77	-24.71	2.286	1925.0	WIN
350	78.83	67.70	-277.03	-67.97	2.286	1925.0	WIN
360	130.06	56.39	-255.88	-79.19	2.286	1925.0	WIN

* = worst case flow sector

********** MAKEMET METEOROLOGY PARAMETERS **********

MIN/MAX TEMPERATURE: 250.0 / 310.0 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
DOMINANT CLIMATE TYPE: Average Moisture
DOMINANT SEASON: Winter

ALBEDO: 0.60
BOWEN RATIO: 1.50
ROUGHNESS LENGTH: 0.001 (meters)

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

YR MO DY JDY HR
-- -- -- --- --
10 01 17 17 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
21.92	0.036	0.300	0.020	223.	16.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 1286.6 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

YR MO DY JDY HR
-- -- -- --- --
10 01 11 17 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
12.28	0.034	0.300	0.020	263.	15.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 1353.4 meters

********** AERSCREEN AUTOMATED DISTANCES **********
OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
1300.00	1.953	4425.00	1.503
1325.00	1.974	4450.00	1.497
1350.00	1.993	4475.00	1.490
1375.00	2.019	4500.00	1.484
1400.00	2.047	4525.00	1.477
1425.00	2.073	4550.00	1.471
1450.00	2.097	4575.00	1.465

1475.00	2.120	4600.00	1.459
1500.00	2.140	4625.00	1.452
1525.00	2.159	4650.00	1.446
1550.00	2.177	4675.00	1.440
1575.00	2.192	4700.00	1.434
1600.00	2.207	4725.00	1.428
1625.00	2.219	4750.00	1.422
1650.00	2.231	4775.00	1.416
1675.00	2.241	4800.00	1.411
1700.00	2.250	4825.00	1.405
1725.00	2.258	4850.00	1.399
1750.00	2.265	4875.00	1.393
1775.00	2.271	4900.00	1.388
1800.00	2.275	4925.00	1.382
1825.00	2.279	4950.00	1.376
1850.00	2.282	4975.00	1.371
1875.00	2.284	5000.00	1.365
1900.00	2.286	5050.00	1.355
1925.00	2.286	5100.00	1.344
1950.00	2.286	5150.00	1.333
1975.00	2.285	5200.00	1.323
2000.00	2.284	5250.00	1.313
2025.00	2.282	5300.00	1.303
2050.00	2.279	5350.00	1.293
2075.00	2.276	5400.00	1.283
2100.00	2.272	5450.00	1.273
2125.00	2.268	5500.00	1.264
2150.00	2.263	5550.00	1.254
2175.00	2.258	5600.00	1.245
2200.00	2.253	5650.00	1.236
2225.00	2.247	5700.00	1.227
2250.00	2.241	5750.00	1.218
2275.00	2.235	5800.00	1.210
2300.00	2.228	5850.00	1.201
2325.00	2.221	5900.00	1.193
2350.00	2.213	5950.00	1.184
2375.00	2.206	6000.00	1.176
2400.00	2.198	6050.00	1.168
2425.00	2.189	6100.00	1.160
2450.00	2.181	6150.00	1.152
2475.00	2.172	6200.00	1.144
2500.00	2.162	6250.00	1.136
2525.00	2.152	6300.00	1.129
2550.00	2.142	6350.00	1.121
2575.00	2.132	6400.00	1.114
2600.00	2.121	6450.00	1.106
2625.00	2.109	6500.00	1.099
2650.00	2.099	6550.00	1.092
2675.00	2.089	6600.00	1.085
2700.00	2.079	6650.00	1.078
2725.00	2.070	6700.00	1.071
2750.00	2.060	6750.00	1.065
2775.00	2.050	6800.00	1.058
2800.00	2.040	6850.00	1.051

2825.00	2.030	6900.00	1.045
2850.00	2.020	6950.00	1.038
2875.00	2.011	7000.00	1.032
2900.00	2.002	7050.00	1.026
2925.00	1.993	7100.00	1.019
2950.00	1.984	7150.00	1.013
2975.00	1.974	7200.00	1.007
3000.00	1.964	7250.00	1.001
3025.00	1.955	7300.00	0.9952
3050.00	1.945	7350.00	0.9893
3075.00	1.934	7400.00	0.9835
3100.00	1.925	7450.00	0.9778
3125.00	1.915	7500.00	0.9722
3150.00	1.906	7550.00	0.9665
3175.00	1.897	7600.00	0.9610
3200.00	1.888	7650.00	0.9555
3225.00	1.879	7700.00	0.9501
3250.00	1.870	7750.00	0.9448
3275.00	1.861	7800.00	0.9395
3300.00	1.852	7850.00	0.9342
3325.00	1.843	7900.00	0.9290
3350.00	1.834	7950.00	0.9239
3375.00	1.825	8000.00	0.9188
3400.00	1.816	8050.00	0.9138
3425.00	1.807	8100.00	0.9088
3450.00	1.799	8150.00	0.9039
3475.00	1.790	8200.00	0.8991
3500.00	1.782	8250.00	0.8942
3525.00	1.773	8300.00	0.8895
3550.00	1.765	8350.00	0.8848
3575.00	1.756	8400.00	0.8801
3600.00	1.748	8450.00	0.8755
3625.00	1.740	8500.00	0.8709
3650.00	1.731	8550.00	0.8664
3675.00	1.723	8600.00	0.8619
3700.00	1.715	8650.00	0.8574
3725.00	1.707	8700.00	0.8530
3750.00	1.699	8750.00	0.8487
3775.00	1.691	8800.00	0.8444
3800.00	1.683	8850.00	0.8401
3825.00	1.675	8900.00	0.8359
3850.00	1.667	8950.00	0.8317
3875.00	1.660	9000.00	0.8275
3900.00	1.652	9050.00	0.8234
3925.00	1.644	9100.00	0.8194
3950.00	1.637	9150.00	0.8153
3975.00	1.629	9200.00	0.8113
4000.00	1.622	9250.00	0.8074
4025.00	1.614	9300.00	0.8034
4050.00	1.607	9350.00	0.7996
4075.00	1.600	9400.00	0.7957
4100.00	1.592	9450.00	0.7919
4125.00	1.585	9500.00	0.7881
4150.00	1.578	9550.00	0.7844

4175.00	1.571	9600.00	0.7806
4200.00	1.564	9650.00	0.7770
4225.00	1.557	9700.00	0.7733
4250.00	1.550	9750.00	0.7697
4275.00	1.543	9800.00	0.7661
4300.00	1.536	9850.00	0.7626
4325.00	1.530	9900.00	0.7590
4350.00	1.523	9950.00	0.7555
4375.00	1.516	10000.00	0.7521
4400.00	1.510		

********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	2.286	2.286	2.058	1.372	0.2286

DISTANCE FROM SOURCE 1930.00 meters directed toward 10 degrees

IMPACT AT THE
AMBIENT BOUNDARY 1.953 1.953 1.758 1.172 0.1953

DISTANCE FROM SOURCE 1300.00 meters directed toward 10 degrees

AERSCREEN 11126 / AERMOD 1110 08/30/11
13:37:07

TITLE: 75% LOAD

********** STACK PARAMETERS **********

SOURCE EMISSION RATE: 1.0000 g/s 7.937 lb/hr
STACK HEIGHT: 144.78 meters 475.00 feet
STACK INNER DIAMETER: 4.977 meters 195.96 inches
PLUME EXIT TEMPERATURE: 355.4 K 180.0 Deg F
PLUME EXIT VELOCITY: 25.969 m/s 85.20 ft/s
STACK AIR FLOW RATE: 1070676 ACFM
RURAL OR URBAN: RURAL

INITIAL PROBE DISTANCE = 10000. meters 32808. feet

********** BUILDING DOWNWASH PARAMETERS **********

USER DEFINED BPIPPRM INPUT FILE: H1 SOURCE ONLY.PIP

MAXIMUM BUILDING HEIGHT: 82.3 meters 270.0 feet

MAXIMUM BUILDING LENGTH: 88.3 meters 289.6 feet

MINIMUM BUILDING WIDTH: 0.0 meters 0.0 feet

********** FLOW SECTOR ANALYSIS **********
25 meter receptor spacing: 1300. meters - 5000. meters
50 meter receptor spacing: 5050. meters - 10000. meters

FLOW SECTOR	BUILD WIDTH	BUILD LENGTH	XBADJ	YBADJ	MAX 1-HR CONC	DIST (m)	TEMPORAL PERIOD
10*	167.42	68.06	-239.47	-102.75	1.911	1925.0	WIN
20	66.42	59.47	-145.04	-37.39	1.911	1925.0	WIN
30	57.66	56.05	-79.46	-33.36	1.911	1925.0	WIN
40	58.91	58.37	-74.04	-41.79	1.911	1925.0	WIN
50	59.01	68.44	3.18	19.79	1.911	1925.0	WIN
60	65.75	61.06	2.07	27.14	1.911	1925.0	WIN
70	70.70	52.02	0.89	33.77	1.911	1925.0	WIN

80	73.67	41.58	-0.31	39.46	1.911	1925.0	WIN
90	0.00	0.00	0.00	0.00	1.911	1925.0	WIN
100	0.00	0.00	0.00	0.00	1.911	1925.0	WIN
110	78.63	40.64	-21.18	45.14	1.911	1925.0	WIN
120	77.36	46.89	-30.20	43.77	1.911	1925.0	WIN
130	73.93	51.71	-38.31	41.16	1.911	1925.0	WIN
140	58.91	58.36	19.76	-36.92	1.911	1925.0	WIN
150	57.66	56.05	26.59	-27.86	1.911	1925.0	WIN
160	54.66	52.03	32.60	-17.95	1.911	1925.0	WIN
170	31.58	18.10	-142.25	29.86	1.911	1925.0	WIN
180	32.61	14.29	-143.40	6.18	1.911	1925.0	WIN
190	32.96	11.49	-141.46	-17.66	1.911	1925.0	WIN
200	54.66	52.03	30.43	23.93	1.911	1925.0	WIN
210	57.66	56.05	23.41	33.36	1.911	1925.0	WIN
220	58.91	58.37	15.67	41.79	1.911	1925.0	WIN
230	59.01	68.44	-71.62	-19.79	1.911	1925.0	WIN
240	65.75	61.06	-63.13	-27.14	1.911	1925.0	WIN
250	70.70	52.02	-52.92	-33.77	1.911	1925.0	WIN
260	73.67	41.58	-41.27	-39.46	1.911	1925.0	WIN
270	0.00	0.00	0.00	0.00	1.911	1925.0	WIN
280	0.00	0.00	0.00	0.00	1.911	1925.0	WIN
290	78.63	40.64	-19.45	-45.14	1.911	1925.0	WIN
300	42.93	35.91	-157.59	30.95	1.911	1925.0	WIN
310	41.84	39.47	-162.63	6.23	1.911	1925.0	WIN
320	89.95	88.26	-288.71	62.73	1.911	1925.0	WIN
330	88.91	83.88	-293.70	19.30	1.911	1925.0	WIN
340	85.16	76.96	-289.77	-24.71	1.911	1925.0	WIN
350	78.83	67.70	-277.03	-67.97	1.911	1925.0	WIN
360	130.06	56.39	-255.88	-79.19	1.911	1925.0	WIN

* = worst case flow sector

********** MAKEMET METEOROLOGY PARAMETERS **********

MIN/MAX TEMPERATURE: 250.0 / 310.0 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
DOMINANT CLIMATE TYPE: Average Moisture
DOMINANT SEASON: Winter

ALBEDO: 0.60
BOWEN RATIO: 1.50
ROUGHNESS LENGTH: 0.001 (meters)

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

YR MO DY JDY HR
-- -- -- --- --
10 01 11 11 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
12.28	0.034	0.300	0.020	263.	15.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 1688.7 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

YR MO DY JDY HR
-- -- -- --- --
10 01 11 11 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
12.28	0.034	0.300	0.020	263.	15.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 1688.7 meters

********** AERSCREEN AUTOMATED DISTANCES **********
OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
1300.00	1.650	4425.00	1.339
1325.00	1.675	4450.00	1.333
1350.00	1.699	4475.00	1.328
1375.00	1.721	4500.00	1.323
1400.00	1.741	4525.00	1.317
1425.00	1.760	4550.00	1.312
1450.00	1.778	4575.00	1.307

1475.00	1.794	4600.00	1.301
1500.00	1.809	4625.00	1.296
1525.00	1.822	4650.00	1.291
1550.00	1.834	4675.00	1.286
1575.00	1.846	4700.00	1.280
1600.00	1.856	4725.00	1.275
1625.00	1.865	4750.00	1.270
1650.00	1.873	4775.00	1.265
1675.00	1.880	4800.00	1.260
1700.00	1.887	4825.00	1.255
1725.00	1.892	4850.00	1.250
1750.00	1.897	4875.00	1.245
1775.00	1.901	4900.00	1.240
1800.00	1.904	4925.00	1.236
1825.00	1.907	4950.00	1.231
1850.00	1.909	4975.00	1.226
1875.00	1.910	5000.00	1.222
1900.00	1.911	5050.00	1.212
1925.00	1.911	5100.00	1.203
1950.00	1.911	5150.00	1.194
1975.00	1.910	5200.00	1.185
2000.00	1.909	5250.00	1.176
2025.00	1.907	5300.00	1.168
2050.00	1.905	5350.00	1.159
2075.00	1.902	5400.00	1.151
2100.00	1.898	5450.00	1.142
2125.00	1.894	5500.00	1.134
2150.00	1.889	5550.00	1.126
2175.00	1.883	5600.00	1.118
2200.00	1.877	5650.00	1.110
2225.00	1.870	5700.00	1.102
2250.00	1.862	5750.00	1.094
2275.00	1.855	5800.00	1.087
2300.00	1.849	5850.00	1.079
2325.00	1.843	5900.00	1.072
2350.00	1.837	5950.00	1.064
2375.00	1.831	6000.00	1.057
2400.00	1.824	6050.00	1.050
2425.00	1.818	6100.00	1.043
2450.00	1.812	6150.00	1.036
2475.00	1.805	6200.00	1.029
2500.00	1.798	6250.00	1.022
2525.00	1.792	6300.00	1.016
2550.00	1.785	6350.00	1.009
2575.00	1.778	6400.00	1.002
2600.00	1.771	6450.00	0.9960
2625.00	1.764	6500.00	0.9897
2650.00	1.757	6550.00	0.9834
2675.00	1.750	6600.00	0.9771
2700.00	1.743	6650.00	0.9710
2725.00	1.736	6700.00	0.9649
2750.00	1.729	6750.00	0.9589
2775.00	1.722	6800.00	0.9530
2800.00	1.715	6850.00	0.9472

2825.00	1.709	6900.00	0.9414
2850.00	1.705	6950.00	0.9357
2875.00	1.700	7000.00	0.9300
2900.00	1.696	7050.00	0.9244
2925.00	1.691	7100.00	0.9189
2950.00	1.686	7150.00	0.9135
2975.00	1.682	7200.00	0.9081
3000.00	1.677	7250.00	0.9027
3025.00	1.672	7300.00	0.8975
3050.00	1.666	7350.00	0.8923
3075.00	1.661	7400.00	0.8871
3100.00	1.656	7450.00	0.8820
3125.00	1.650	7500.00	0.8770
3150.00	1.645	7550.00	0.8720
3175.00	1.639	7600.00	0.8671
3200.00	1.634	7650.00	0.8622
3225.00	1.628	7700.00	0.8574
3250.00	1.622	7750.00	0.8526
3275.00	1.616	7800.00	0.8479
3300.00	1.610	7850.00	0.8432
3325.00	1.604	7900.00	0.8386
3350.00	1.598	7950.00	0.8340
3375.00	1.592	8000.00	0.8295
3400.00	1.586	8050.00	0.8250
3425.00	1.580	8100.00	0.8206
3450.00	1.574	8150.00	0.8162
3475.00	1.568	8200.00	0.8119
3500.00	1.562	8250.00	0.8076
3525.00	1.556	8300.00	0.8034
3550.00	1.550	8350.00	0.7992
3575.00	1.543	8400.00	0.7950
3600.00	1.537	8450.00	0.7909
3625.00	1.531	8500.00	0.7868
3650.00	1.525	8550.00	0.7828
3675.00	1.519	8600.00	0.7788
3700.00	1.512	8650.00	0.7748
3725.00	1.506	8700.00	0.7709
3750.00	1.500	8750.00	0.7670
3775.00	1.493	8800.00	0.7631
3800.00	1.487	8850.00	0.7593
3825.00	1.481	8900.00	0.7556
3850.00	1.474	8950.00	0.7518
3875.00	1.468	9000.00	0.7481
3900.00	1.462	9050.00	0.7445
3925.00	1.455	9100.00	0.7408
3950.00	1.449	9150.00	0.7372
3975.00	1.442	9200.00	0.7337
4000.00	1.436	9250.00	0.7301
4025.00	1.429	9300.00	0.7266
4050.00	1.423	9350.00	0.7232
4075.00	1.417	9400.00	0.7197
4100.00	1.411	9450.00	0.7163
4125.00	1.405	9500.00	0.7129
4150.00	1.399	9550.00	0.7096

4175.00	1.394	9600.00	0.7063
4200.00	1.388	9650.00	0.7030
4225.00	1.382	9700.00	0.6997
4250.00	1.376	9750.00	0.6965
4275.00	1.371	9800.00	0.6933
4300.00	1.366	9850.00	0.6901
4325.00	1.360	9900.00	0.6870
4350.00	1.355	9950.00	0.6839
4375.00	1.349	10000.00	0.6808
4400.00	1.344		

********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	1.911	1.911	1.720	1.147	0.1911

DISTANCE FROM SOURCE 1925.00 meters directed toward 10 degrees

IMPACT AT THE AMBIENT BOUNDARY	1.650	1.650	1.485	0.9898	0.1650

DISTANCE FROM SOURCE 1300.00 meters directed toward 10 degrees

AERSCREEN 11126 / AERMOD 1110 08/08/11
15:18:33

TITLE: 100% LOAD

********** STACK PARAMETERS **********

SOURCE EMISSION RATE: 1.0000 g/s 7.937 lb/hr
STACK HEIGHT: 144.78 meters 475.00 feet
STACK INNER DIAMETER: 4.977 meters 195.96 inches
PLUME EXIT TEMPERATURE: 355.4 K 180.0 Deg F
PLUME EXIT VELOCITY: 34.595 m/s 113.50 ft/s
STACK AIR FLOW RATE: 1426309 ACFM
RURAL OR URBAN: RURAL

INITIAL PROBE DISTANCE = 10000. meters 32808. feet

********** BUILDING DOWNWASH PARAMETERS **********

USER DEFINED BPIPPRM INPUT FILE: H1 SOURCE ONLY.PIP

MAXIMUM BUILDING HEIGHT: 82.3 meters 270.0 feet

MAXIMUM BUILDING LENGTH: 88.3 meters 289.6 feet

MINIMUM BUILDING WIDTH: 0.0 meters 0.0 feet

********** FLOW SECTOR ANALYSIS **********
25 meter receptor spacing: 1300. meters - 5000. meters
50 meter receptor spacing: 5050. meters - 10000. meters

FLOW SECTOR	BUILD WIDTH	BUILD LENGTH	XBADJ	YBADJ	MAX 1-HR CONC	DIST (m)	TEMPORAL PERIOD
10*	167.42	68.06	-239.47	-102.75	1.743	2075.0	WIN
20	66.42	59.47	-145.04	-37.39	1.743	2075.0	WIN
30	57.66	56.05	-79.46	-33.36	1.743	2075.0	WIN
40	58.91	58.37	-74.04	-41.79	1.743	2075.0	WIN
50	59.01	68.44	3.18	19.79	1.743	2075.0	WIN
60	65.75	61.06	2.07	27.14	1.743	2075.0	WIN

70	70.70	52.02	0.89	33.77	1.743	2075.0	WIN
80	73.67	41.58	-0.31	39.46	1.743	2075.0	WIN
90	0.00	0.00	0.00	0.00	1.743	2075.0	WIN
100	0.00	0.00	0.00	0.00	1.743	2075.0	WIN
110	78.63	40.64	-21.18	45.14	1.743	2075.0	WIN
120	77.36	46.89	-30.20	43.77	1.743	2075.0	WIN
130	73.93	51.71	-38.31	41.16	1.743	2075.0	WIN
140	58.91	58.36	19.76	-36.92	1.743	2075.0	WIN
150	57.66	56.05	26.59	-27.86	1.743	2075.0	WIN
160	54.66	52.03	32.60	-17.95	1.743	2075.0	WIN
170	31.58	18.10	-142.25	29.86	1.743	2075.0	WIN
180	32.61	14.29	-143.40	6.18	1.743	2075.0	WIN
190	32.96	11.49	-141.46	-17.66	1.743	2075.0	WIN
200	54.66	52.03	30.43	23.93	1.743	2075.0	WIN
210	57.66	56.05	23.41	33.36	1.743	2075.0	WIN
220	58.91	58.37	15.67	41.79	1.743	2075.0	WIN
230	59.01	68.44	-71.62	-19.79	1.743	2075.0	WIN
240	65.75	61.06	-63.13	-27.14	1.743	2075.0	WIN
250	70.70	52.02	-52.92	-33.77	1.743	2075.0	WIN
260	73.67	41.58	-41.27	-39.46	1.743	2075.0	WIN
270	0.00	0.00	0.00	0.00	1.743	2075.0	WIN
280	0.00	0.00	0.00	0.00	1.743	2075.0	WIN
290	78.63	40.64	-19.45	-45.14	1.743	2075.0	WIN
300	42.93	35.91	-157.59	30.95	1.743	2075.0	WIN
310	41.84	39.47	-162.63	6.23	1.743	2075.0	WIN
320	89.95	88.26	-288.71	62.73	1.743	2075.0	WIN
330	88.91	83.88	-293.70	19.30	1.743	2075.0	WIN
340	85.16	76.96	-289.77	-24.71	1.743	2075.0	WIN
350	78.83	67.70	-277.03	-67.97	1.743	2075.0	WIN
360	130.06	56.39	-255.88	-79.19	1.743	2075.0	WIN

* = worst case flow sector

********** MAKEMET METEOROLOGY PARAMETERS **********

MIN/MAX TEMPERATURE: 250.0 / 310.0 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
DOMINANT CLIMATE TYPE: Average Moisture
DOMINANT SEASON: Winter

ALBEDO: 0.60
BOWEN RATIO: 1.50
ROUGHNESS LENGTH: 0.001 (meters)

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

YR MO DY JDY HR
-- -- -- --- --
10 01 11 11 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
12.28	0.034	0.300	0.020	263.	15.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 1981.1 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

YR MO DY JDY HR
-- -- -- --- --
10 01 11 11 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
12.28	0.034	0.300	0.020	263.	15.	-1.0	0.001	1.50	0.60	0.50

HT	REF TA	HT
10.0	310.0	2.0

ESTIMATED FINAL PLUME HEIGHT (non-downwash): 1981.1 meters

********** AERSCREEN AUTOMATED DISTANCES **********
OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
1300.00	1.390	4425.00	1.233
1325.00	1.418	4450.00	1.228
1350.00	1.445	4475.00	1.223
1375.00	1.470	4500.00	1.218
1400.00	1.494	4525.00	1.213
1425.00	1.516	4550.00	1.208

1450.00	1.537	4575.00	1.203
1475.00	1.556	4600.00	1.198
1500.00	1.574	4625.00	1.193
1525.00	1.591	4650.00	1.188
1550.00	1.607	4675.00	1.183
1575.00	1.622	4700.00	1.179
1600.00	1.635	4725.00	1.174
1625.00	1.648	4750.00	1.169
1650.00	1.659	4775.00	1.165
1675.00	1.670	4800.00	1.160
1700.00	1.680	4825.00	1.155
1725.00	1.689	4850.00	1.151
1750.00	1.697	4875.00	1.146
1775.00	1.704	4900.00	1.142
1800.00	1.711	4925.00	1.137
1825.00	1.716	4950.00	1.133
1850.00	1.722	4975.00	1.128
1875.00	1.726	5000.00	1.124
1900.00	1.730	5050.00	1.115
1925.00	1.733	5100.00	1.107
1950.00	1.736	5150.00	1.098
1975.00	1.738	5200.00	1.090
2000.00	1.740	5250.00	1.082
2025.00	1.741	5300.00	1.074
2050.00	1.742	5350.00	1.066
2075.00	1.743	5400.00	1.058
2100.00	1.743	5450.00	1.050
2125.00	1.742	5500.00	1.042
2150.00	1.741	5550.00	1.035
2175.00	1.740	5600.00	1.027
2200.00	1.739	5650.00	1.020
2225.00	1.737	5700.00	1.013
2250.00	1.735	5750.00	1.006
2275.00	1.732	5800.00	0.9990
2300.00	1.729	5850.00	0.9923
2325.00	1.727	5900.00	0.9855
2350.00	1.723	5950.00	0.9789
2375.00	1.720	6000.00	0.9722
2400.00	1.716	6050.00	0.9656
2425.00	1.712	6100.00	0.9591
2450.00	1.708	6150.00	0.9529
2475.00	1.704	6200.00	0.9467
2500.00	1.699	6250.00	0.9406
2525.00	1.694	6300.00	0.9345
2550.00	1.688	6350.00	0.9286
2575.00	1.683	6400.00	0.9227
2600.00	1.677	6450.00	0.9168
2625.00	1.670	6500.00	0.9111
2650.00	1.664	6550.00	0.9054
2675.00	1.657	6600.00	0.8998
2700.00	1.650	6650.00	0.8942
2725.00	1.642	6700.00	0.8887
2750.00	1.635	6750.00	0.8833
2775.00	1.629	6800.00	0.8779

2800.00	1.623	6850.00	0.8726
2825.00	1.617	6900.00	0.8673
2850.00	1.610	6950.00	0.8621
2875.00	1.604	7000.00	0.8570
2900.00	1.598	7050.00	0.8519
2925.00	1.591	7100.00	0.8469
2950.00	1.585	7150.00	0.8419
2975.00	1.578	7200.00	0.8370
3000.00	1.572	7250.00	0.8321
3025.00	1.565	7300.00	0.8273
3050.00	1.559	7350.00	0.8226
3075.00	1.553	7400.00	0.8179
3100.00	1.546	7450.00	0.8132
3125.00	1.540	7500.00	0.8086
3150.00	1.533	7550.00	0.8041
3175.00	1.527	7600.00	0.7996
3200.00	1.520	7650.00	0.7951
3225.00	1.514	7700.00	0.7907
3250.00	1.507	7750.00	0.7864
3275.00	1.501	7800.00	0.7821
3300.00	1.494	7850.00	0.7778
3325.00	1.488	7900.00	0.7736
3350.00	1.482	7950.00	0.7694
3375.00	1.475	8000.00	0.7652
3400.00	1.469	8050.00	0.7611
3425.00	1.463	8100.00	0.7571
3450.00	1.456	8150.00	0.7531
3475.00	1.450	8200.00	0.7491
3500.00	1.444	8250.00	0.7452
3525.00	1.438	8300.00	0.7413
3550.00	1.431	8350.00	0.7374
3575.00	1.425	8400.00	0.7336
3600.00	1.419	8450.00	0.7298
3625.00	1.413	8500.00	0.7261
3650.00	1.407	8550.00	0.7224
3675.00	1.401	8600.00	0.7187
3700.00	1.395	8650.00	0.7151
3725.00	1.389	8700.00	0.7115
3750.00	1.383	8750.00	0.7079
3775.00	1.377	8800.00	0.7044
3800.00	1.371	8850.00	0.7009
3825.00	1.365	8900.00	0.6974
3850.00	1.359	8950.00	0.6940
3875.00	1.353	9000.00	0.6906
3900.00	1.347	9050.00	0.6872
3925.00	1.341	9100.00	0.6839
3950.00	1.336	9150.00	0.6806
3975.00	1.330	9200.00	0.6773
4000.00	1.324	9250.00	0.6741
4025.00	1.319	9300.00	0.6709
4050.00	1.313	9350.00	0.6677
4075.00	1.307	9400.00	0.6645
4100.00	1.302	9450.00	0.6614
4125.00	1.296	9500.00	0.6583

4150.00	1.291	9550.00	0.6552
4175.00	1.285	9600.00	0.6522
4200.00	1.280	9650.00	0.6492
4225.00	1.275	9700.00	0.6462
4250.00	1.269	9750.00	0.6432
4275.00	1.264	9800.00	0.6403
4300.00	1.259	9850.00	0.6373
4325.00	1.253	9900.00	0.6344
4350.00	1.248	9950.00	0.6316
4375.00	1.243	10000.00	0.6287
4400.00	1.238		

********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	1.743	1.743	1.568	1.046	0.1743

DISTANCE FROM SOURCE 2085.00 meters directed toward 10 degrees

IMPACT AT THE AMBIENT BOUNDARY	1.390	1.390	1.251	0.8339	0.1390

DISTANCE FROM SOURCE 1300.00 meters directed toward 10 degrees

Air Quality
Performance Test Guidelines

Kansas Department of Health and Environment
Bureau of Air and Radiation

December 22, 2004

TABLE OF CONTENTS

1. INTRODUCTION

The purpose of this document is to provide guidance for companies and individuals conducting air quality performance tests for a compliance demonstration in the State of Kansas. It is intended to serve as a reference guide. This guidance will assist in planning and preparing for testing, conducting the test, and preparing a complete and accurate report. With the assistance of this document, consistent quality and documentation for such tests can be obtained.

This guidance is not intended to supersede any specific requirements of the Environmental Protection Agency's (EPA's) Test Methods. Nor does it relieve a facility or the contracted test company from fulfilling their obligations as described by their permit and the applicable county, state, and/or federal rules and regulations. This guidance should be utilized as a means to improve the process of planning, conducting, and reporting performance tests. Many of the concepts underlying this guidance come from the EPA's "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III. Stationary Sources Specific Methods," document number EPA/600/R-94/038c, dated April 1994. Test companies are encouraged to become familiar with this document. KDHE also encourages stack testing companies and companies required to conduct performance tests to become familiar with the National Stack Testing Guidance, which can be found at:

http://www.4cleanair.org/members/committee/permits/EPADraftStackTestingGUIDANCE.pdf

Companies should also review Preparation and Review of Site Specific Test Plans (GD 42), and Preparation and Review of Emission Test Reports (GD 43), which can be found at:

http://www.epa.gov/ttn/emc/guidlnd.html

2. TEST PLANNING

The purpose of performance tests (a.k.a. source tests, compliance tests or stack tests) is to extract from a stack or emission point a sample that is representative of emissions from that equipment during representative operating conditions at the facility. For compliance determinations, representative conditions may include a worst-case scenario that will allow the facility to demonstrate compliance at all times of operation.

2.1 EPA Test Methods - The EPA Test Methods are designed to provide representative and reliable data. EPA Test Methods are found in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A. Continuous emission monitor (CEM) performance specifications are located in 40 CFR Part 60, App B. Additional EPA Test Methods may be found in other sections of the CFR, such as Part 51, Appendix M and Part 63, Appendix A. Adherence to these standardized procedures for sampling and analyses is essential. Documentation of tests by maintaining complete and accurate records is of utmost importance.

2.2 Test Protocols - Testing shall not be conducted without an approved test protocol as required in the facility's permit conditions. The test protocol is a complete description of the production processes and associated operating parameters, proposed test methods, and specific details about the sampling site. Any proposed deviations (minor modifications) from the Federal Reference Testing Methods must also be included under separate letterhead for approval. Postponement of the test, or rejection of the test results, may occur if the test method requirements are not met. The facility and test company shall both identify a representative who

will participate in coordinating the test. The facility representative shall be able to identify all of the process and control equipment parameters needed to establish the system's operating conditions during testing. It is recommended that an on-site pre-test survey be performed with the test company to establish stack dimensions, sample port locations or installation requirements, scaffolding or lift equipment requirements, electrical power requirements, operating conditions and safety requirements and procedures. Any nonscheduled maintenance or changes should be avoided for two weeks before the test for system stabilization. The facility should also confirm stack accessibility by removing caps from sample ports and verify that all monitoring instrumentation is installed and working properly. Attachment 1 identifies the minimum documentation that the Department will require in a test protocol. The protocol should follow this format and input should be provided for each item to assure protocol approval. The test protocol shall be submitted at least 30 calendar days prior to the test unless otherwise specified in permit conditions or regulations. The Department shall be notified of the actual test date and time at least 14 calendar days prior to the test. KDHE accepts notifications and protocols in the form of hard copy, e-mail, and fax.

2.3 Confidentiality Claims - Any confidentiality claims shall be accompanied by a notice of confidentiality pursuant to K.S.A. 65-3015 that precisely identifies the information that is considered confidential. The notice shall contain sufficient supporting information to allow the Department to evaluate whether such information satisfies the requirements related to trade secrets or how the information could cause substantial harm to the facility's competitive edge. If claiming confidentiality, two copies of the test protocol shall be submitted: one complete copy with the confidential information and a second copy for public record with the confidential information masked or removed.

3. PERFORMANCE TESTING

When conducting a performance test, great care must be taken collecting the data. The goal is complete and accurate information at representative conditions. In order to accomplish this, it is essential to coordinate testing with production and maintain contact between the facility and test team throughout the test. The following items are considered additional guidance for the data collection phase beyond the requirements provided in the individual Test Methods:

3.1 Units - Units of data collection shall be consistent with the Test Method and within the test report, and units must also be consistent with previous information supplied for the facility.

3.2 Traverse Distances - The traverse point locations shall be clearly marked on the probe or pitot tube and shall include the port length, when applicable.

3.3 Cyclonic Flow - Testing for the absence of cyclonic gas flow must be performed prior to the test and the results shall be presented in the test report.

3.4 Permanent Data Record Keeping - Non-erasable ink must be used to record data. In the event of an error, the data taker crosses through the erroneous value with a single line, records the correct value above it, and initials the change. Strip charts and data-logger data must be clearly identified with the date, test start/stop times, parameters being recorded concurrently (with a clear and concise method of identifying each), span values, test run number, and individual tracking the data.

3.5 Sample Identification and Handling - All samples and filters must be labeled and uniquely numbered to ensure positive identification throughout the sampling and analysis procedures. Identification shall be provided for each container with the number of the container recorded on the field forms, the chain of custody sheets, and on the analysis data forms. Chain of custody sheets will be updated any time a sample changes hands. This includes samples taken to an in-house laboratory. Samples with limited hold times or requiring special handling, such as refrigeration, must have this information available on the chain of custody sheet.

3.6 Reagent/Filter Preparation - Reagents and pre-weighed filters must have a maintenance record, listing the date, the person by whom it was prepared, and any standardization calculations of reagents. This documentation must be included in the test report.

3.7 Records Retention - Test teams should be aware that the records retention requirement for sources is a minimum of five years. Thus, any field notes, laboratory analysis sheets and original data sheets shall be retained for this period.

3.8 Audit Samples - EPA audit samples provide the opportunity to check the accuracy of the laboratory's analytical procedures and can be initiated by the facility, test company, or Department. The Department shall be notified at least 30 days prior to the test date if either the facility or test company requests audit samples. The laboratory or test company shall call the Department with the analysis results of the audit samples prior to analyzing the performance test samples. If the audit sample results are within the acceptable range, the Department will give approval for the performance test samples to be analyzed. Otherwise, the laboratory will be informed that they do not have the correct results and additional analyses must be attempted.

3.9 Number of Test Runs - In accordance with 40 CFR 60 Section 60.8, each performance test is to consist of three separate test runs, and the arithmetic mean of the results shall apply. "In the event that a sample is accidentally lost or conditions occur in which one of the three runs must be discontinued because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances beyond the owner or operator's control, compliance may, upon the Department's approval, be determined using the arithmetic mean of the results of the two other runs." The Department will not allow one test run to be excluded unless these conditions are met. The allowance to accept two test runs does not apply for regulations outside 40 CFR 60.

3.10 Data Witnessing - The Department attempts to provide a regulatory observer for each performance test. In the event that the Department has approved testing without a regulatory observer present, velocity traverse and Method 5 data sheets, when used, shall be transmitted to the Department by facsimile within 24 hours of completing each test run. In the event that a change to the test procedures is necessary without a regulatory observer present, the test company shall contact the Department for approval prior to proceeding with the unapproved methodology. Unapproved modifications to the approved test methods may result in rejection of the test results.

3.11 Time Keeping - All field data sheets shall document the exact starting and stopping times for each set of data collected.

3.12 Sample Time/Sample Volume - Unless otherwise specified in a Test Method, permit conditions or written approval, the minimum sample time is 60 minutes per test run. When sample volumes are not part of the Test Method, at least 30 dry standard cubic feet (dscf) shall be sampled for each test run.

4. TEST REPORTING

The accuracy of data taken during a performance test is determined by the test report review. This includes copies of all original field data sheets (computer generated copies of the field data may be included but not substituted for original hand-written sheets), clearly labeled strip chart records (may require color copies for clarity), laboratory analyses, calculations and instrument calibrations. Non-detect sample results shall be reported as the detection limit and this value shall be used in emissions calculations.

4.1 Test Reports - Attachment 2 provides a summary of the minimum documentation that the Department will accept in a test report submitted for review and approval. This listing is expanded from EPA document #340/1-91-008, "Manual for Coordinating of VOC Emissions Testing Using EPA Methods 18, 21, 25, and 25A" and applies to all relevant performance tests conducted for regulatory compliance. The test report shall follow this format and input shall be provided for each item. The test report must be submitted within 30 calendar days of the last day of testing unless otherwise specified in permit conditions or regulations. If circumstances prevent report submission within the required time frame, Department approval must be requested as soon as possible. A description of the circumstances will be required for evaluation. Performance tests are normally required to be conducted within a specified time frame. The test is not considered complete until the complete performance test report has been received by KDHE.

4.2 Confidentiality Claims - Any confidentiality claims shall be accompanied by a notice of confidentiality pursuant to K.S.A. 65-3015 that precisely identifies the information that is considered confidential. The notice shall contain sufficient supporting information to allow the Department to evaluate whether such information satisfies the requirements related to trade secrets or how the information could cause substantial harm to the facility's competitive edge. If claiming confidentiality, two copies of the test report shall be submitted: one complete copy with the confidential information and a second copy for public record with the confidential information masked or removed.

5. CONTACT INFORMATION

Mailing address:
KDHE
BAR Permits and Compliance Section
1000 SW Jackson, Suite 310
Topeka, KS 66612

Phone:
(785) 296-6281
(785) 296-1544

Fax:
(785) 291-3953

ATTACHMENT 1

PERFORMANCE TEST PROTOCOL REQUIREMENTS

1. COVER INFORMATION

- Facility name, source ID number, location, and mailing address (if different).
- Manufacturer, model number and unit identification number of equipment tested.
- Air quality permit number.
- Test company name and address.

2. FACILITY INFORMATION

- Facility name, mailing address and physical address of equipment (if different).
- Facility contact name and telephone number.
- General description of overall facility operations.
- Safety precautions and equipment required on site.

3. TEST COMPANY INFORMATION

- Test company name and address.
- Test company contact name and telephone number.
- Laboratory name, address and telephone number.

4. TEST INFORMATION

- Reason for testing (permit condition, MACT, NSPS, etc.) list of all applicable regulations and regulatory requirements.
- Test schedule to include the proposed date and estimated start time of test.
- Types of pollutants to be sampled including applicable emission limits and demonstration requirements.
- Test methods and analysis procedures including methods to be performed concurrently. (Provide a synopsis of each test method, not a copy of each entire test method.)
- Documentation of any proposed variations from the specified procedures and the reason necessary.
- Sampling equipment to be utilized including a schematic diagram of the sampling trains.

5. EMISSION POINT INFORMATION

- Drawing with actual dimensions indicating the exhaust gas flow direction from the process, through the control equipment, and to the emission point.
- Diagram of the stack showing actual dimensions, the sampling locations, and the distances downstream and upstream from flow disturbances per EPA Test Method 1.
- Cross-sectional sketch of the stack at the sampling locations that include the sampling traverse points and port lengths.
- Estimated or measured flue gas conditions at the sampling location including temperature, moisture content, and volumetric flow rate. Specific test methods may require additional estimated parameters such as estimated VOC concentration for EPA Test Method 25A calibration gas selections.

ATTACHMENT 1

PERFORMANCE TEST PROTOCOL REQUIREMENTS

6. CONTROL EQUIPMENT INFORMATION

- Complete description of the emission control system including the manufacturer, model number, rated capacity, rated efficiency and unit identification number.
- Control equipment data to be monitored and recorded during the test to ensure representative operation, who will be responsible for recording the data (facility or test team), the interval over which the data will be recorded and the proposed format.
- Minimum acceptable values of control equipment operating parameters.
- Description of any gas conditioning prior to the control equipment.
- Description of any adjustments to or maintenance procedures performed on the control equipment for the previous six months.
- Description of any modifications or failures since the last performance test.

7. PROCESS EQUIPMENT INFORMATION

- Complete description of the process operation including a process flow sheet, if helpful.
- Type and quantity of raw material being used or products being manufactured by the process.
- Maximum rated capacity of the process.
- Actual maximum achieved capacity of the process. The process or production rate of the process during the tests shall be the maximum allowable rate for which the facility will be permitted to operate.
- Actual operating capacity of the process during the previous six months.
- Normal process operating schedule during a 24-hour operating period.
- Process data to be monitored and recorded during the test to ensure representative operation, the person responsible for recording the data (facility or test team), the interval over which the data will be recorded and the proposed format.

8. QUALITY CONTROL INFORMATION

- Copies of all field data sheets to be used during the test.
- Description of the procedures and forms to be utilized in order to maintain the integrity of the samples collected. The description shall include a sample container numbering scheme, how these numbers are identified on the data sheets, chain of custody records, and what sample holding times (if any) are applicable.
- Statement that calibration sheets for the dry gas meter, pitot tube, nozzle, calibration gases, and any other test equipment will be made available prior to the start of testing.
- Quality assurance for the analytical procedures to be used in the analyses of test samples.

9. RELATIVE ACCURACY TEST AUDITS

- A one page abbreviated protocol is acceptable.
- Should include documentation in Items 1-3, plus additional information listed here.
    a. Reason for testing (permit condition, MACT, NSPS, etc.) list of all applicable regulations and regulatory requirements.
    b. Test schedule to include the proposed date and estimated start time of test.
    c. Types of pollutants to be sampled including applicable emission limits and demonstration requirements.
    d. Documentation of any proposed variations from the specified procedures and the reason necessary.

ATTACHMENT 2

PERFORMANCE TEST REPORT REQUIREMENTS

1. COVER INFORMATION

- Facility name, source ID number, location, and mailing address (if different)
- Manufacturer, model number and unit identification number of equipment tested.
- Test date.
- Test company name and address.

2. CERTIFICATION

- Certification by test team leader as to authenticity of test data.
- Certification by reviewer as to accuracy of test results.

3. TEST INFORMATION

- Reason for testing (permit condition, MACT, NSPS, etc.) list of all applicable regulations and regulatory requirements.
- Type of process and control equipment.
- Type of pollutants sampled.
- List of all applicable regulations and regulatory requirements.
- Test date.
- Project participants and titles (facility representatives, test team members, consultants and regulatory observers).

4. SUMMARY OF RESULTS

- Emission results and comparison with applicable limits and demonstration requirements. Results must be reported in the same units as the emission limit.
- Audit sample results, if applicable.
- Discussion of any errors or anomalies that occurred during the test (facility or test related).

5. PROCESS AND CONTROL EQUIPMENT INFORMATION

- Complete description of the emission control system including the manufacturer, model number, rated capacity, rated efficiency and unit identification number.
- Complete description of the process operation including a process flow sheet, if helpful.
- Actual capacity of the process during the test.

6. SAMPLING AND ANALYTICAL PROCEDURES

- Brief description of test methods utilized.
- Brief description of analytical procedures.
- Description of any procedures that deviated from the specified procedures.

7. APPENDICES

- Complete test results with one complete set of example calculations for each test method or pollutant using actual data.
- Raw field data (copies of originals; computer copies are optional).
- Laboratory reports including chain of custody forms and contact name and phone number.
- Process and control equipment data.
- Test equipment calibration sheets for the dry gas meter, pitot tube, nozzle, calibration gases and any other test equipment utilized.

State of Kansas

Kansas Department of Health and Environment
Notice Concerning Proposed Kansas Air Quality
Construction Permit and Public Hearing

Notice is hereby given that the Kansas Department of Health and Environment (KDHE) is soliciting comments regarding a proposed new air quality construction permit and modification to an existing air quality construction permit. Sunflower Electric Power Corporation (Sunflower) has applied for an air quality construction permit in accordance with the provisions of K.A.R. 28-19-300 to initiate installation of a low NO_x combustion system comprised of low NO_x burners (LNB) and overfire air (OFA) combustion controls at the existing Holcomb Generating Station Unit 1 (H1). Carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM), PM with a diameter less than 10 microns (PM_{10}), PM with a diameter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide ($SO_{2),}$ volatile organic compounds (VOC), lead, sulfuric acid mist (H_2SO_4), fluorides, hydrogen sulfide (H_2S), total reduced sulfur, and CO_2e, were evaluated during the permit review process.

The proposed permit is to be issued in accordance with the provisions of K.A.R. 28-19-350, *Prevention of Significant Deterioration* (PSD), which adopt the federal standards, procedures and requirements of 40 CFR 52.21 by reference. These air quality regulations apply to major stationary emission sources located in areas designated as "attainment" under the federal Clean Air Act (CAA). Attainment areas are areas where the air quality meets or is better than the national ambient air quality standards (NAAQS).

In addition to the new proposed PSD construction permit, KDHE has determined that a permit modification to the original PSD construction permit for Holcomb

Generating Station Unit 1, issued by the U.S. Environmental Protection Agency (EPA) on May 19, 1980, to reflect a change to the CO Emission limit. This proposed modification is due to Sunflower requesting approval to construct the new low NO_x combustion system on H1, and the resulting change to the air emission limit for CO.

The PSD regulations require evaluation of emission reduction techniques to identify the best available control technology (BACT) for each pollutant for which the emission rate exceeds the PSD significant level. The purpose of BACT is to affect the maximum degree of reduction achievable, taking into account energy, environmental and economic impacts for each pollutant under review. Evaluation of the estimated emissions for the proposed Holcomb Generating Station Unit 1 project indicates that the emission rate of carbon monoxide exceeds the significance level. Sunflower conducted the required BACT analysis for CO. The department has reviewed Sunflower's BACT analysis and concurs with its finding that good combustion practices are BACT for CO.

An ambient impact analysis was performed on the potential air emissions of CO from the proposed low NO_x combustion system on H1. The CO screening modeling analysis demonstrated no significant impact on the 1-hour or 8-hour ambient air quality and that the emissions would not cause or contribute to any violation of ambient air standards. EPA has not established Class II maximum allowable increments for CO. Accordingly, no calculation of the potential consumption of increment is possible. No Class I areas are located within 100 km of the facility. Any federal land manager who has reason to believe he/she may have a Class I area adversely impacted by the emissions from the expansion project has the opportunity to present KDHE with analysis of the

adverse impact on the air quality-related values of that Class I area during the comment period. No adverse impacts on soils and vegetation in the area are expected.

A public comment period has been established to allow citizens the opportunity to express any concerns they may have about these proposed permitting actions. The public comment period is to begin on November 10, 2011 and end on December 12, 2011. All comments should be submitted in writing to Larry D. Lowry, Bureau of Air, 1000 SW Jackson, Suite 310, Topeka, KS 66612-1366, or, presented at the public hearing.

Any member of the public may request to hold a public hearing to receive comments on the proposed issuance of these draft air quality construction permits. Written request to hold a public hearing should be sent to the attention of Ms. Sharon Burrell at the address listed above or by FAX to (785) 291-3953 and must be received by noon on December 1, 2011.

If no requests to hold the public hearing are received by noon December 1, 2011, the public hearing will be cancelled. A notice of the cancellation will be posted at the KDHE website at http://www.kdheks.gov/bar/public_notice.html.

If a request is received, a public hearing is tentatively scheduled at Garden City Community College, Joyce Auditorium, 801 Campus Drive, Garden City, KS, on December 14, 2011, from 5:00 p.m. to 7:00 p.m.

If a hearing is conducted, all interested parties will be given a reasonable opportunity to present their views orally or by submission of written materials during the hearing. In order to give all parties an opportunity to present their views, it may be necessary to request that each participant limit oral presentations to a specific time limit.

Any individual with a disability may request accommodation in order to participate in the public hearing and may request the proposed materials in an accessible format. Requests for accommodations must be made no later than December 12, 2011.

Copies of the proposed permits, permit applications, all supporting documentation, and all information relied upon during the permit application review process are available for public review for a period of 30 days from the date of publication during normal business hours (8:00 AM to 5:00 PM) at the KDHE, Bureau of Air (BOA), 1000 SW Jackson, Suite 310, Topeka, KS 66612-1366. Also, a copy of the proposed permits and all supporting documentation, can be reviewed at the KDHE Southwest District Office, 302 West McArtor Road, Dodge City, KS 67801. To obtain or review the proposed permits and all supporting documentation, contact Larry D. Lowry, (785) 296-6281, at the central office of the KDHE, or contact the Air Quality District Representative, Ethel Evans, at (620) 356-1075, in the KDHE Southwest District Office. The standard departmental cost will be assessed for any copies requested.

The same materials are available free of charge, at the KDHE Bureau of Air website, http://www.kdheks.gov/bar/index.html.

Robert Moser, MD, Secretary

Kansas Department of Health and Environment