MEMORANDUM

DATE: December 20, 2009

TO: Carole Zundel, Air Quality Analyst, Air Program

FROM: Kevin Schilling, Stationary Source Modeling Coordinator, Air Program

PROJECT NUMBER: P-2009.0136

SUBJECT: Modeling Review for the J.R. Simplot Company Application for a Permit to Construct for their Potato Processing Facility Outside Caldwell, Idaho

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1.0 SUMMARY

J.R. Simplot Company (Simplot) submitted an application for a permit to construct (PTC) for modifications to their potato processing facility located outside of Caldwell, Idaho. The PTC will allow combustion of biogas in Boiler No. 1. Air quality analyses involving atmospheric dispersion modeling of increased emissions were performed to demonstrate the facility would not cause or significantly contribute to a violation of any ambient air quality standard (IDAPA 58.01.01.203.02 [Idaho Air Rules Section 203.02]) and would comply with new source review requirements for Toxic Air Pollutants (Idaho Air Rules Section 203.03). ENVIRON International Corporation (Environ), Simplot's consultant, performed the site-specific ambient air quality impact analyses.

A technical review of the submitted analyses was conducted by DEQ. The submitted analyses and information: 1) utilized appropriate methods and models; 2) was conducted using reasonably accurate or conservative model parameters and input data; 3) adhered to established DEQ guidelines for new source review dispersion modeling; 4) showed either a) that predicted pollutant concentrations from emissions associated with the proposed modification were below significant contribution levels (SCLs) or other applicable regulatory thresholds; or b) that predicted pollutant concentrations from emissions associated with the facility and any potentially co-contributing sources, when appropriately combined with background concentrations, were below applicable air quality standards at all locations outside of the facility's property boundary. Table 1 presents key assumptions and results that should be considered in the development of the permit.

Table 1. KEY ASSUMPTIONS USED IN MODELING ANALYSES

Criteria/Assumption/Result	Explanation/Consideration
Facility-wide SO_2 impacts are overstated by the modeling analyses.	Facility-wide modeling analyses used emissions rates for both Boiler No. 1 and the flare that were based on combustion of biogas at the maximum short-term and annual production rate through each.
Modeling analyses easily demonstrated compliance with all applicable ambient air quality standards.	No special operational provisions or restrictions, beyond those described in the application, are needed in the permit to assure compliance with standards. This assumes all sources were accurately accounted for and modeled in the submitted application.

2.0 BACKGROUND INFORMATION

2.1 Applicable Air Quality Impact Limits and Modeling Requirements

This section identifies applicable ambient air quality limits and analyses used to demonstrate compliance.

2.1.1 Area Classification

The Simplot facility is located near Caldwell, Idaho. The area is designated as an attainment or unclassifiable area for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$), and sulfur oxides (SOx).

There are no Class I areas within 10 kilometers of this location.

2.1.2 Significant and Cumulative NAAQS Impact Analyses

If estimated maximum pollutant impacts to ambient air from the emissions sources associated with the proposed modification exceed the significant contribution levels (SCLs) of Idaho Air Rules Section 006.102, then a cumulative NAAQS impact analysis is necessary to demonstrate compliance with National Ambient Air Quality Standards (NAAQS) and Idaho Air Rules Section 203.02. A cumulative NAAQS impact analysis for attainment area pollutants involves adding ambient impacts from facility-wide emissions, and emissions from any nearby co-contributing sources, to DEQ-approved background concentration values that are appropriate for the criteria pollutant/averaging-time at the facility location and the area of significant impact. The resulting maximum pollutant concentrations in ambient air are then compared to the NAAQS listed in Table 2. Table 2 also lists SCLs and specifies the modeled value that must be used for comparison to the NAAQS.

New source review requirements for assuring compliance with $PM_{2.5}$ standards have not yet been completed and promulgated into regulation. EPA has asserted through a policy memorandum that compliance with $PM_{2.5}$ standards will be assured through an air quality analysis for the corresponding PM_{10} standard. Although the PM_{10} annual standard was revoked in 2006, compliance with the revoked PM_{10} annual standard must be demonstrated as a surrogate to the annual $PM_{2.5}$ standard.

2.1.3 Toxic Air Pollutant Analyses

Emissions of toxic substances are generally addressed by Idaho Air Rules Section 161:

Any contaminant which is by its nature toxic to human or animal life or vegetation shall not be emitted in such quantities or concentrations as to alone, or in combination with other contaminants, injure or unreasonably affect human or animal life or vegetation.

Permit requirements for toxic air pollutants (TAPs) from new or modified sources are specifically addressed by Idaho Air Rules Section 203.03 and require the applicant to demonstrate to the satisfaction of DEQ the following:

Using the methods provided in Section 210, the emissions of toxic air pollutants from the stationary source or modification would not injure or unreasonably affect human or animal life or vegetation as required by Section 161. Compliance with all applicable toxic air pollutant carcinogenic increments and *toxic air pollutant non-carcinogenic increments will also demonstrate preconstruction compliance with Section 161 with regards to the pollutants listed in Sections 585 and 586.*

Table 2. APPLICABLE REGULATORY LIMITS

Pollutant	Averaging Period	Significant Contribution Levels[a] ($\mu g/m^3$)[b]	Regulatory Limit[c] ($\mu g/m^3$)	Modeled Value Used[d]
PM_{10}[e]	Annual[f]	1.0	50[g]	Maximum 1st highest[h]
	24-hour	5.0	150[i]	Maximum 6th highest[j]
$PM_{2.5}$[k]	Annual	Not established	15	Use PM_{10} as surrogate
	24-hour	Not established	35	Use PM_{10} as surrogate
Carbon monoxide (CO)	8-hour	500	10,000[l]	Maximum 2nd highest[h]
	1-hour	2,000	40,000[l]	Maximum 2nd highest[h]
Sulfur Dioxides (SO_x)	Annual	1.0	80[g]	Maximum 1st highest[h]
	24-hour	5	365[l]	Maximum 2nd highest[h]
	3-hour	25	1,300[l]	Maximum 2nd highest[h]
Nitrogen Dioxide (NO_2)	Annual	1.0	100[g]	Maximum 1st highest[h]
Lead (Pb)	Quarterly	NA	1.5[g]	Maximum 1st highest[h]
	3-month[m]	NA	0.15[g]	Maximum 1st highest[h]

a) Idaho Air Rules Section 006.102.
b) Micrograms per cubic meter.
c) Idaho Air Rules Section 577 for criteria pollutants.
d) The maximum 1st highest modeled value is always used for significant impact analysis.
e) Particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers.
f) The annual PM_{10} standard was revoked in 2006. The standard is still listed because compliance with the annual $PM_{2.5}$ standard is demonstrated by a PM_{10} analysis that demonstrates compliance with the revoked PM_{10} standard.
g) Not to be exceeded in any calendar year.
h) Concentration at any modeled receptor.
i) Never expected to be exceeded more than once in any calendar year.
j) Concentration at any modeled receptor when using five years of meteorological data.
k) Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
l) Not to be exceeded more than once per year.
m) 3-month rolling average.

Per Section 210, if the emissions increase associated with a new source or modification exceeds screening emission levels (ELs) of Idaho Air Rules Section 585 or 586, then the ambient impact of the emissions increase must be estimated. If ambient impacts are less than applicable Acceptable Ambient Concentrations (AACs) for non-carcinogens of Idaho Air Rules Section 585 and Acceptable Ambient Concentrations for Carcinogens (AACCs) of Idaho Air Rules Section 586, then compliance with TAP requirements has been demonstrated. If DEQ determines T-RACT is used to control emissions of carcinogenic TAPs, then modeled concentrations of 10 times the AACC are considered acceptable, as per Idaho Air Rules Section 210.12.

2.2 Background Concentrations

Background concentrations are used in the cumulative NAAQS impact analyses to account for impacts from sources in the general area that were not explicitly modeled. Modeling was only required for SO_2; therefore, only SO_2 background concentrations are listed in this memorandum. Table 3 lists appropriate SO_2 background concentrations for the Caldwell, Idaho area.

Background concentrations were revised for all areas of Idaho by DEQ in March 2003[1]. Background concentrations in areas where no monitoring data are available were based on monitoring data from areas

[1] Hardy, Rick and Schilling, Kevin. *Background Concentrations for Use in New Source Review Dispersion Modeling*. Memorandum to Mary Anderson, March 14, 2003.

with similar population density, meteorology, and emissions sources. Background concentrations in these analyses were based on DEQ default values for small town / suburban areas.

Table 3. BACKGROUND CONCENTRATIONS

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)[a]
Sulfur dioxide (SO_2)	3-hour	42
	24-hour	26
	Annual	8

a) Micrograms per cubic meter.

3.0 MODELING IMPACT ASSESSMENT

3.1 Modeling Methodology

This section describes the modeling methods used by the applicant to demonstrate compliance with applicable air quality standards.

3.1.1 Overview of Analyses

Table 4 provides a brief description of parameters used in the submitted modeling analyses.

Table 4. MODELING PARAMETERS

Parameter	Description/Values	Documentation/Addition Description
General Facility Location	Caldwell, Idaho	
Model	AERMOD	AERMOD with the PRIME downwash algorithm, version 09292.
Meteorological data	Boise surface and upper air	2001-2005 data processed by the applicant's consultant.
Terrain	Considered	Receptor, building, and emissions source elevations were determined using 1/3[rd] arc-second data from the National Elevation Dataset (NED).
Building downwash	Considered	Buildings present on the site that could reasonably cause plume downwash were included in the analyses through the use of the BPIP-PRIME program.
Receptor Grid	Grid 1	25-meter spacing along the property boundary .
	Grid 2	50-meter spacing in a 2,000 meter by 2,000 meter grid centered on the facility.
	Grid 3	200-meter spacing in a 5,000 meter by 5,000 meter grid centered on the facility.
	Grid 4	500-meter spacing in a 10,000 meter by 10,000 meter grid centered on the facility.

3.1.2 Modeling Protocol and Methodology

Refined air impact analyses were performed by Environ. A modeling protocol was submitted to DEQ prior to the application and DEQ provided conditional approval of the protocol to Environ. Modeling was generally conducted using data and methods described in the protocol and/or in the *State of Idaho Air Quality Modeling Guideline*.

3.1.3 Model Selection

Idaho Air Rules Section 202.02 requires that estimates of ambient concentrations be based on air quality models specified in 40 CFR 51, Appendix W (Guideline on Air Quality Models). The refined, steady state, multiple source, Gaussian dispersion model AERMOD was promulgated as the replacement model for ISCST3 in December 2005. EPA provided a one-year transition period during which either ISCST3 or AERMOD could be used at the discretion of the permitting agency. AERMOD must be used for all air impact analyses, performed in support of air quality permitting, conducted after November 2006.

AERMOD retains the single straight line trajectory of ISCST3, but includes more advanced algorithms to assess turbulent mixing processes in the planetary boundary layer for both convective and stable stratified layers.

AERMOD offers the following improvements over ISCST3:

- Improved dispersion in the convective boundary layer and the stable boundary layer.
- Improved plume rise and buoyancy calculations.
- Improved treatment of terrain affects on dispersion.
- New vertical profiles of wind, turbulence, and temperature.

The Boiler No. 1 condensing economizer stack is equipped with a rain cap. To account for this while still accounting for thermal buoyancy of the plume, the AERMOD beta version that accounts for capped and horizontal releases was used. DEQ concurred with Environ that use of the beta version was appropriate for this project.

3.1.4 Meteorological Data

Environ processed five years (2001-2005) of meteorological data with AERMET version 06341 to create the meteorological input file for AERMOD. National Weather Service meteorological data collected at the Boise airport were used for surface and upper air input to AERMET.

AERSURFACE, version 08009, was used to establish surface characteristics for the area surrounding the meteorological data collection site. DEQ reviewed the meteorological data processing analysis submitted but did not rerun AERSURFACE or AERMET to verify results.

Review of the landuse data (NLCD 92) used in the AERSURFACE analysis showed the presence of open water very near the Boise national Weather Service tower. Current aerial photographs show no substantial areas of open water. DEQ did not require further investigation or correction of this because: 1) the area assigned as "open water" in any sector was relatively small, thereby minimizing its influence; 2) modeled concentrations were well below applicable standards, making it highly improbable that slight changes to the meteorological data resulting from processing would change the NAAQS compliance status.

3.1.5 Terrain Effects

Terrain effects on dispersion were considered in the analyses. Receptor elevations and hill heights were obtained by Environ using AERMAP (version 09040) and elevation data from the 1/3rd arc-second National Elevation Dataset (NED). Receptor locations were expressed using the NAD 27 Datum. Since the NED data are expressed as NAD 83, AERMET was set to convert NAD 83 back to NAD 27 to be consistent with the established locations of buildings and emissions points.

3.1.6 Facility Layout

The facility is located on relatively flat terrain. Aerial photographs from Google Earth were used to check for proper positioning of buildings, the ambient air boundary, and emissions sources.

3.1.7 Building Downwash

Downwash effects potentially caused by structures at the facility and on adjacent properties were accounted for in the dispersion modeling analyses. The Building Profile Input Program for the PRIME downwash algorithm (BPIP-PRIME) was used to calculate direction-specific building dimensions and Good Engineering Practice (GEP) stack height information from building dimensions/configurations and emissions release parameters for AERMOD.

3.1.8 Ambient Air Boundary

Ambient air is defined in Section 006 of the Idaho Air Rules as "that portion of the atmosphere, external to buildings, to which the general public has access." The establishment of the ambient air boundary used in the submitted analyses was described in previously submitted applications. Environ used the facility's property boundary as the ambient air boundary. DEQ assumed reasonable measures will be taken by the facility to preclude public access to the property.

3.1.9 Receptor Network

Table 4 describes the receptor grid used in the submitted analyses. The receptor grid met the minimum recommendations specified in the State of Idaho Air Quality Modeling Guideline. DEQ determined the receptor grid was adequate to reasonably resolve maximum modeled concentrations.

3.2 Emission Rates

Emissions rates used in the modeling analyses for the proposed project were equal to those presented in other sections of the permit application or the DEQ Statement of Basis.

3.2.1 Criteria Pollutant Emissions Rates

Table 5 provides project-specific and facility-wide SO_2 emissions used in the modeling analyses. Emissions and modeling analyses of NOx, CO, and PM_{10} were not provided in the application. Project-specific estimated emissions increases of these other pollutants were well below DEQ-established thresholds that trigger a modeling analysis.

Emissions from Boiler No. 1 can either be vented from its traditional stack or routed through a condensing economizer and vented through an alternate stack. The modeling analyses accounted for this by using three operational scenarios: 1) all emissions vented through the traditional stack; 2) 50 percent of emissions vented through the traditional stack and 50 percent vented through the condensing economizer stack; 3) all emissions vented through the condensing economizer stack.

Table 5. CRITERIA POLLUTANT EMISSIONS RATES USED FOR MODELING ANALYSES

Scenario	Emissions Point	Stack ID	Emissions Rates (lb/hr)
			SO_2
SIA[a] – 1	Boiler No. 1 traditional stack	BO1	28.8
	Condensing Economizer	CE	0.0
SIA[a] – 2	Boiler No. 1 traditional stack	BO1	14.4
	Condensing Economizer	CE	14.4
SIA[a] – 3	Boiler No. 1 traditional stack	BO1	0.0
	Condensing Economizer	CE	28.8
FIA[b] - 1	Boiler No. 1 traditional stack	BO1	28.9
	Condensing Economizer	CE	0.0
FIA[b] - 2	Boiler No. 1 traditional stack	BO1	14.45
	Condensing Economizer	CE	14.45
FIA[b] - 3	Boiler No. 1 traditional stack	BO1	0.0
	Condensing Economizer	CE	28.9
FIA – 1, 2, 3	Boiler 8	B8	0.04753
	Dryer 1 stack 1	D1A	0.001467
	Dryer 1 stack 2	D1B	0.001467
	Flare	FLARE	28.81
	AMU4	AMU4	0.003176
	AMU5	AMU5	0.005956
	AMU6	AMU6	0.003235
	AMU7	AMU7	0.003265
	AMU8	AMU8	0.003176
	AMU9	AMU9	0.003176
	AMU10	AMU10	0.003176
	AMU11	AMU11	0.003235
	AMU12	AMU12	0.004706
	Dryer 6 stack 1	D6A1	0.003529
	Dryer 6 stack 2	D6A2	0.003529
	Dryer 6 stack 3	D6B1	0.003529
	Dryer 6 stack 4	D6B2	0.003529

a) Emissions for Significant Impact Analysis
b) Emissions for Cumulative NAAQS Impact Analysis

3.2.2 TAP Emissions Rates

TAP emissions regulations under Idaho Air Rules Section 220 are only applicable for new or modified sources constructed before July 1, 1995. All TAP emissions increases listed in the application were below screening emissions limits (ELs) listed in Idaho Air Rules Section 585 and 586.

3.3 Emission Release Parameters

Table 6 provides emissions release parameters used in the modeling analyses, including stack height, stack diameter, exhaust temperature, and exhaust velocity. All parameters were within reasonably expected ranges and DEQ did not verify the accuracy of release parameters.

Table 6. EMISSIONS RELEASE PARAMETERS

Scenario	Release Point/Location	Stack Height (m)[a]	Modeled Diameter (m)	Stack Gas Temp. (K)[b]	Stack Gas Flow Velocity (m/sec)[c]
1[d]	BO1	14.17	1.22	450	13.78
2[e]	BO1	14.17	1.22	450	6.89
	CE[g]	17.37	1.22	294	4.51
3[f]	CE[g]	17.37	1.22	294	9.01
1, 2, 3	B8	13.7	1.22	436	11.32
	D1A	19.7	0.64	310	13.40
	D1B	19.7	0.70	308	11.00
	FLARE	11.4	1.10	1273	20.00
	AMU4	8.4	0.20	323	0.001
	AMU5	8.4	0.20	323	0.001
	AMU6	7.8	0.20	323	0.001
	AMU7	7.8	0.20	323	0.001
	AMU8	7.8	0.20	323	0.001
	AMU9	6.4	0.20	323	0.001
	AMU10	13.6	0.20	323	0.001
	AMU11	13.6	0.20	323	0.001
	AMU12	13.6	0.20	323	0.001
	D6A1	21.0	0.71	343	9.90
	D6A2	21.0	0.71	331	8.42
	D6B1	21.0	0.71	331	5.74
	D6B2	21.0	0.71	325	6.43

a) Meters
b) Kelvin
c) Meters per second
d) Scenario 1 involves all emissions vented from the traditional boiler stack
e) Scenario 2 involves 50% of emissions vented from the traditional boiler stack and 50% vented from the condensing economizer stack.
f) Scenario 3 involves all emissions vented from the condensing economizer stack.
g) Modeled as a capped release using the AERMOD beta version.

3.4 Results for Significant and Cumulative NAAQS Impact Analyses

Results from the submitted significant impact analyses showed that impacts from the proposed project will have a significant SO_2 impact for all averaging periods, thereby triggering full cumulative NAAQS impact analyses. Table 7 provides the results for the cumulative NAAQS impact analyses. Impacts of SO_2 are well below the applicable standards for all operational scenarios and all averaging periods.

Table 7. SO_2 RESULTS FOR CUMULATIVE IMPACT ANALYSES

Averaging Period	Scenario	Maximum Modeled Concentration ($\mu g/m^3$)[a]	Background Concentration ($\mu g/m^3$)	Total Ambient Impact ($\mu g/m^3$)	NAAQS[b] ($\mu g/m^3$)	Percent of NAAQS
3-hour	1	969	42	1011	1300	77
	2	969	42	1011	1300	77
	3	970	42	1012	1300	78
24-hour	1	221	26	247	365	68
	2	221	26	247	365	68
	3	221	26	247	365	68
annual	1	23	8	31	80	39
	2	25	8	33	80	41
	3	26	8	34	80	43

a) Micrograms per cubic meter.
b) National ambient air quality standards.

3.5 Results for TAPs Analyses

Emissions of all TAPs were below applicable ELs and modeling analyses were not required.

4.0 CONCLUSIONS

The ambient air impact analyses demonstrated to DEQ's satisfaction that emissions from the facility will not cause or significantly contribute to a violation of any air quality standard.