STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

JAMES P. BROOKS
ACTING COMMISSIONER

University of Maine
Penobscot County
Orono, Maine
A-204-77-3-A

Departmental
Findings of Fact and Order
New Source Review
Amendment #3

After review of the air emissions license amendment application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 M.R.S.A., §344 and §590, the Department finds the following facts:

I. REGISTRATION

A. Introduction

FACILITY	University of Maine (UMaine)
CURRENT PART 70 LICENSE NUMBER	A-204-70-F-R
LICENSE TYPE	06-096 CMR 115, Minor Modification
NAICS CODES	611310
NATURE OF BUSINESS	Educational Facility
FACILITY LOCATION	Orono, Maine
NSR AMENDMENT ISSUANCE DATE	**June 9, 2011**

B. Amendment Description

UMaine has submitted a New Source Review (NSR) application for the replacement of Boilers #3 and #4 with a new boiler at the central steam plant. The new unit, Boiler #8, will have the capability of firing natural gas and landfill gas. Also included in the application is the modification of Boiler #7 to allow the firing of landfill gas in addition to the current fuels of #6 fuel oil and natural gas.

Once Boiler #8 is installed and landfill gas is initially delivered to the steam plant, UMaine proposes to limit the sulfur content of #6 fuel oil at the steam plant to 0.5%, which is a reduction from the current 2.0% sulfur limit.

C. Emission Equipment

The following equipment is addressed in this air emission license:

Boilers

Equipment	Maximum Capacity (MMBtu/hr)	Firing Rate	Fuel Type	Stack #	Changes
Boiler #5	86.8	579 gal/hr	# 6 fuel (0.5% sulfur)	4	Reduce #6 fuel oil sulfur to 0.5% once landfill gas is delivered
Boiler #6	86.8	579 gal/hr	# 6 fuel (0.5% sulfur)	4	Reduce #6 fuel oil sulfur to 0.5% once landfill gas is delivered
Boiler #7	86.8	579 gal/hr	# 6 fuel (0.5% sulfur)	1	Add landfill gas as fuel and reduce #6 fuel oil sulfur to 0.5% once landfill gas is delivered
		85,098 scf/hr	Natural gas		
		214,427 scf/hr	Landfill gas		
Boiler #8	75	73,529 scf/hr	Natural gas	1	Add unit to license (replaces boilers 3 and 4)
		185,277 scf/hr	Landfill Gas		

Notes:

Existing boilers #3 and #4 (each 37.9 MMBtu/hr and firing #6 fuel oil) shall be removed once Boiler #8 is installed and operating.

Firing rate calculations for landfill gas were based on 404.8 Btu/scf heat content. Firing rate calculations for natural gas were based on 1020 Btu/scf heat content.

D. Application Classification

The modification of a major source is considered a major modification based on whether or not expected emissions increases exceed the "Significant Emission Increase Levels" as given in *Definitions Regulation*, 06-096 CMR 100 (as amended).

The emission increases are determined by subtracting the average actual emissions of the 24 months preceding the modification (or representative 24 months) from the maximum future license allowed emissions. The results of this calculation are as follows:

Pollutant	Average Past Actuals 2008 –2009 (ton/year)	Future License (ton/year)	Net Change (ton/year)	Significance Level (ton/year)
PM	7.3	32.2	+24.9	25
PM_{10}	6.3	21.2	+14.9	15
SO_2	95.9	135.8	+39.9	40
NO_x	60.6	100.5	+39.9	40
CO	16.4	116.3	+99.9	100
VOC	1.0	26.3	+25.3	40

Note: The above numbers are for the steam plant only. Average past actual numbers were based on the operation of Boilers #3, #4, #5, #6, and #7. Future license allowed numbers will be met with Boilers #5, #6, #7, and #8 and were calculated by adding slightly less than significance levels to the past actuals, except for VOC. The future licensed limits are lower than the existing license limits for the steam plant.

Therefore, this amendment is determined to be a minor modification under *Minor and Major Source Air Emission License Regulations* 06-096 CMR 115 (as amended) since the changes being made are not addressed or prohibited in the Part 70 air emission license. UMaine will need to apply to incorporate this amendment into the Part 70 air emission license no later than 12 months from commencement of the proposed project.

II. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in 06-096 CMR 100. Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in 06-096 CMR 100. BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

Before proceeding with the requirements for the proposed project, the following is a general facility description of current steam plant operations and an overview of the proposed modifications:

UMaine's current steam plant consists of Boilers #3 and #4 (oil fired), Boilers #5 and #6 (oil fired), and Boiler #7 (oil and natural gas fired). Boilers #3, #4, and #7 exhaust out stack 1 and Boilers #5 and #6 exhaust out stack 4.

The proposed project is to replace Boilers #3 and #4 with Boiler #8 (a natural gas and landfill gas unit) and to allow Boiler #7 to fire landfill gas. Boilers #5 and #6 will remain the same.

Fuel oil sulfur content for all steam plant boilers shall be reduced to 0.5% from 2% once landfill gas is initially delivered to the steam plant, or two years from issuance of this license (whichever comes first). UMaine submitted an ambient air quality modeling analysis as part of this proposed project showing compliance with standards at 0.5% sulfur fuel oil.

Based on past sulfur constraints with a nearby source, the maximum hourly #6 fuel oil heat input rate limit to the steam plant is currently 147 MMBtu/hr or less from October 1 through April 30 and 108 MMBtu/hr or less from May 1 through September. UMaine has proposed to keep the 147 MMBtu/hr restriction all year as part of this project.

B. Boiler #8

The proposed Boiler #8 is a natural gas and landfill gas-fired watertube boiler rated at 75 MMBtu/hr maximum heat input. Boilers #3 and #4 will be removed from the steam plant and Boiler #8 will be installed in their vacated location and connected to the existing stack #1. Boiler #8 will have separate burners for landfill gas and natural gas, but will not be equipped to fire fuel oil. A burner control system will allow for the firing of landfill gas and natural gas individually as well as the co-firing of both burners simultaneously.

NSPS requirements
Boiler #8 is subject to the New Source Performance Standards (NSPS) 40 CFR Part 60, Subpart Dc, *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units*, for units between 10 and 100 MMBtu/hr constructed, modified, or reconstructed after June 9, 1989.

NESHAP requirements
Boiler #8 is not subject to the recently promulgated 40 CFR Part 63, Subpart JJJJJJ, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial and Institutional Boilers Area Sources* since the boiler is gas-fired only. UMaine is a major source for criteria air pollutants, but is considered an area source for hazardous air pollutants. 40 CFR Part 63, Subpart JJJJJJ, §63.11195(e) states that gas-fired boilers are not subject to the subpart and to any requirements in the subpart. Gaseous fuels are defined as including, but

not limited to, natural gas, process gas, landfill gas, coal derived gas, refinery gas, hydrogen, and biogas (§63.11237).

BACT

UMaine submitted a BACT analysis as part of the license application. EPA's RACT/BACT/LAER Clearinghouse and EPA's Landfill Methane Outreach Program (LMOP) website were both reviewed for requirements on similar units.

The summary of the BACT analysis for Boiler #8 is as follows:

PM/PM_{10} – Particulate matter emissions are minimal from landfill gas and natural gas exhaust. Based on research and database searches, no landfill or natural gas fired boilers of similar size are known to operate with add-on controls for PM.

UMaine proposes to utilize state-of-the-art gas burners and a combustion control system for the control of PM from Boiler #8.

The BACT emission limit for PM/PM_{10} from Boiler #8 is 0.02 lb/MMBtu (1.5 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas and 0.01 lb/MMBtu (0.75 lb/hr) when firing natural gas only.

SO_2 – The options for controlling sulfur dioxide from fuel combustion include low sulfur fuel with good combustion controls, and technologies to remove the SO_2 formed when the sulfur compounds in the fuel are combusted. Available flue gas desulfurization technologies are dry sorbent injection, wet scrubber systems, and spray dryer absorber, and a low sulfur fuel with good combustion controls.

The sulfur content of the fuel is directly correlated to SO_2 emissions if no add-on control is utilized. The landfill gas supply to UMaine will be limited to a maximum of 0.18 lb/MMBtu sulfur on an annual weighted average basis. The resulting SO_2 emissions generated from firing 0.18 lb/MMBtu sulfur content fuel is 0.36 lb/MMBtu SO_2 which is equivalent to the SO_2 emissions produced from burning a typical #2 fuel oil (#2 fuel oil usually has a range of between 0.2% to 0.4% sulfur by weight). Additional conditioning of the landfill gas after delivery to UMaine was not considered given the already low sulfur content of the landfill gas to be contractually supplied. BACT for add-on SO_2 controls was evaluated based on firing landfill gas with an annual 0.18 lb/MMBtu sulfur specification (0.36 lb/MMBtu SO_2).

Due to the inherently low sulfur pipeline natural gas, additional SO_2 control from natural gas was not considered economically practical.

Dry sorbent injection consists of adding a dry reagent (limestone or sodium bicarbonate) into the boiler furnace or the exhaust duct to directly convert SO_2 to either calcium or sodium salts. The salts are then removed as a particulate downstream in a particulate removal device. This type of technology works best with high particulate matter loadings and requires a high degree of particulate matter removal. Since Boiler #8 will only fire gaseous fuels, dry sorbent injection was not considered a practical option for SO_2 control.

Spray dryer technology uses an aqueous scrubbing media which is sprayed into a chamber in the exhaust train. The reagent in the liquid droplets reacts and leaves behind salts that are carried by the gas stream to a particulate control device. Spray dryer absorbers are generally used when the SO_2 content of the flue gas is significant and high removal efficiencies are needed. As with dry sorbent injection, spray dryer technology works best with high particulate matter loadings and requires a high degree of particulate matter removal. Since Boiler #8 will only fire gaseous fuels, spray dryer technology was not considered a practical option for SO_2 control.

Wet scrubbing uses an aqueous scrubbing media (sodium or calcium based) sprayed into a cross-flow or counter flow scrubber vessel and re-circulates scrubbing liquid streams. Spray towers and packed bed absorbers are common scrubber designs for SO_2 removal from relatively clean exhaust gas streams. The scrubbing media reacts with the acid gas to form salts that are then removed with the spent scrubbing liquor. Since SO_2 is highly soluble in water, wet scrubbers can be an effective method of SO_2 control. UMaine looked at a wet scrubbing system to control both Boiler #7 and Boiler #8. Assuming an SO_2 removal efficiency of 95%-99%, a wet scrubbing system would have the potential to remove 85 to 90 tons per year from Boilers #7 and #8 when firing landfill gas, although actual reductions would probably be less. With the scrubbing system, there would be negative environmental and energy impacts, considering the spent liquor would require disposal (possible needing pre-treatment equipment prior to disposal in the municipal sewer) and the relatively high electrical energy consumption due to scrubber pumps and fans. The economic impact for a wet scrubbing system for Boilers #7 and #8 was estimated to be over $1 million. This was calculated from information supplied by Verantis ($300,000 for the scrubber vessel, fan, and controls); the need for a new corrosion-resistant interior stack ($500,000 to $1,000,000); additional capital costs for engineering, foundation work, and a new building to house the equipment; and the annual operating costs for electric power, makeup chemicals, spent scrubbing liquor disposal, and

maintenance. It was concluded that the expense of the scrubber system was not justified for the SO_2 reductions achieved.

UMaine proposes to use landfill gas that has a maximum sulfur content of 0.18 lb/MMBtu on an annual weighted average and pipeline quality natural gas which has inherently low sulfur to minimize SO_2 emissions from Boiler #8.

The BACT emission limit for SO_2 from Boiler #8 is 0.36 lb/MMBtu (27.0 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas. This limit is for landfill gas with a maximum hourly sulfur content of 0.18 lb/MMBtu. For the occasional scenario when the landfill gas sulfur content may be above 0.18 lb/MMBtu on an hourly basis, this emission limit will be adjusted.

The SO_2 emission limit when firing natural gas only is 0.006 lb/MMBtu (0.45 lb/hr).

NO_X – The options for controlling nitrogen oxides from the boiler include combustion control, selective catalytic reduction (SCR), and selective non-catalytic reduction (SNCR).

Combustion controls considered for Boiler #8 include low NO_X burners and flue gas recirculation. Low NO_X burners consist of a set of burner components that are designed to mix the fuel and combustion air in a way that limits NO_X formation. Usually the combustion air and fuel are mixed in multiple stages. Specially designed nozzles and/or diffusers are used to achieve a particular flame pattern. Fuel gas recirculation consists of bringing a portion of the boiler's exhaust gas back to the burner where it is mixed with combustion air and introduced into the combustion zone. The relatively cool flue gas absorbs heat released by the burner flame, lowering peak flame temperature and reducing NO_X formation. The recirculation rate is controlled based on the boiler's combustion conditions. Low NO_X burners and flue gas recirculation have commonly been found to be BACT on gas fired boilers less than 100 MMBtu/hr.

SCR uses a reducing agent (ammonia-based) and a catalyst placed in the flue gas stream at a specific temperature to convert NO_X to nitrogen gas. The optimum temperature range for SCR is typically 600°F to 750°F. Although SCR can result in NO_X reductions up to 90%, SCR has a high capital cost and is rarely economically feasible on boilers with a heat input capacity of less than 100 MMBtu/hr. Utilizing SCR on a landfill gas boiler can be problematic due to siloxanes in the landfill gas. Siloxanes, which are man-made compounds, can be found in certain deodorants,

cosmetics, and lubricants. Siloxanes present in landfill gas will break down when oxidized and form a small amount of silica powder which will likely deposit out in the SCR catalyst bed. SCR was not considered a technically feasible option for controlling NO_X from Boiler #8 due to the probable pluggage and contamination of the catalyst from siloxanes, rendering the control technology ineffective.

SNCR uses injection of ammonia or urea into the flue gas just downstream of the combustion zone. The high temperature of the injection zone (1600°F-2100°F) supports a chemical reaction of NO_2 into nitrogen and water vapor so that a catalyst is not required. SNCR reduces NO_X up to 70% in combination with combustion controls. However, for Boiler #8, combustion controls will reduce NO_X to a level where SNCR will not be effective as a control technology because of the low NO_X concentrations that will remain and the substantial cost associated with SNCR. SNCR was not considered as BACT for NO_X control from Boiler #8.

UMaine proposes to use good combustion controls to minimize NO_X emissions from Boiler #8. This includes low NO_X burners for landfill gas and natural gas, and using a flue gas recirculation system that uses the boiler's combustion air fan to induce the exhaust gases back to the burner.

The BACT emission limit for NO_X from Boiler #8 is 0.05 lb/MMBtu (3.75 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas and 0.04 lb/MMBtu (3.0 lb/hr) when firing natural gas only.

CO – The options for controlling carbon monoxide from the boiler include good combustion control and an oxidation catalyst. The catalyst lowers the activation energy necessary for CO to react with exhaust oxygen to produce CO_2. However, using an oxidation catalyst is impacted by siloxanes in the landfill gas. The oxidation catalyst would likely become plugged and contaminated by the fine silica material once the siloxanes are oxidized in the boiler. An oxidation catalyst was determined to be technically infeasible for Boiler #8.

UMaine proposes to use a combustion control system and low NO_X burners to minimize the formation of multiple pollutants, including CO.

The BACT emission limit for CO from Boiler #8 is 0.08 lb/MMBtu (6.0 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas and 0.04 lb/MMBtu (3.0 lb/hr) when firing natural gas only.

VOC – Volatile organic compound emissions are minimal from landfill gas and natural gas exhaust. Based on research and database searches, no landfill

or natural gas fired boilers of similar size are known to operate with add-on controls for VOC.

UMaine proposes to utilize state-of-the-art gas burners and a combustion control system for the control of VOC from Boiler #8.

The BACT emission limit for VOC from Boiler #8 is 0.02 lb/MMBtu (1.5 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas and 0.01 lb/MMBtu (0.75 lb/hr) when firing natural gas only.

Opacity – When Boiler #8 is operating alone or Boiler #7 and #8 are operating simultaneously on natural gas and/or landfill gas, visible emissions from stack 1 shall not exceed 10% opacity on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 3-hour period.

Once the maximum sulfur content limit of 0.5% for #6 fuel oil takes effect at UMaine, the following shall apply: When Boiler #7 and #8 are operating simultaneously with Boiler #7 on #6 fuel oil, visible emissions from stack 1 shall not exceed 20% opacity on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 3-hour period.

Control Equipment
Emissions from Boiler #8 will be controlled with a low NO_X burner, flue gas recirculation, and good combustion controls.

Periodic Monitoring
Per 40 CFR Part 60, Subpart Dc, §60.48c (g)(2), UMaine shall record and maintain records of the amount of each fuel combusted during each calendar month.

For inventory purposes, UMaine shall keep monthly and 12 month rolling total records of fuel use for both landfill gas and natural gas in Boiler #8, and monthly average sulfur content of the landfill gas.

Report Submittals
UMaine shall submit initial notifications, maintain records, and submit reports as required by NSPS 40 CFR Part 60, Subparts A and Dc, including:

Initial Notification

The initial notification required under 40 CFR Part 60, Subpart Dc §60.48c(a) shall include the date of construction and actual startup, the design heat input capacity of the affected facility and identification of

fuels to be combusted in the affected facility, and the annual capacity factor at which the owner or operator anticipates operating the affected facility based on all fuels fired and based on each individual fuel fired.

Fuels Combusted

UMaine shall submit a fuels report each six-month period to EPA. The report shall be postmarked by the 30th day following the end of the reporting period (§60.48c(i)).

C. Boiler #7

The existing Boiler #7 is rated at 86.8 MMBtu/hr maximum heat input and currently fires #6 fuel oil and natural gas. Burner changes will be made to allow for the additional capability of firing landfill gas. Continued design and engineering reviews need to be performed to determine whether the existing natural gas Coen burner will be modified to burn landfill gas or whether new burners will be needed. It is expected that once retrofitted, Boiler #7 will fire primarily natural gas and/or landfill gas, and #6 fuel oil under limited circumstances.

NSPS requirements

Boiler #7, installed in 1966, is not subject to the New Source Performance Standards (NSPS) 40 CFR Part 60, Subpart Dc, *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units*, for units between 10 and 100 MMBtu/hr constructed, modified, or reconstructed after June 9, 1989. The allowance of the additional fuel does not constitute a new construction, modification, or reconstruction since there will be no increase in the emission rate of a pollutant to which a standard applies (the standards are PM and SO_2 for this subpart).

NESHAP requirements

Boiler #7 is subject to the recently promulgated 40 CFR Part 63, Subpart JJJJJJ, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial and Institutional Boilers Area Sources*. The boiler fires fuel oil, in addition to gaseous fuels, and therefore the requirements for existing units firing fuel oil shall be met. The Maine Department of Environmental Protection has not taken delegation of this area source MACT (Maximum Achievable Control Technology) rule promulgated by EPA, however UMaine is still subject to the applicable requirements.

BACT

UMaine submitted a BACT analysis as part of the license application. EPA's RACT/BACT/LAER Clearinghouse and EPA's Landfill Methane Outreach Program (LMOP) website were both reviewed for requirements on similar units.

Except for a reduction in sulfur content of #6 fuel oil from 2% to 0.5% when landfill gas becomes available, a corresponding reduction of the #6 fuel oil PM emission limit, and a reduction of the natural gas NO_X limit, the current licensed emissions for fuel oil and natural gas from Boiler #7 will remain as licensed.

The summary of the BACT analysis for Boiler #7 is as follows:

PM/PM_{10} – Particulate matter emissions are minimal from landfill gas and natural gas exhaust. Based on research and database searches, no landfill or natural gas fired boilers of similar size are known to operate with add-on controls for PM.

UMaine proposes to utilize efficient burners and a combustion control system for the control of PM from Boiler #7.

The BACT emission limit for PM/PM_{10} from Boiler #7 is 0.02 lb/MMBtu (1.74 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas.

The PM/PM_{10} emission limit when firing natural gas only is 0.01 lb/MMBtu (0.87 lb/hr).

When firing #6 fuel oil, the PM/PM_{10} emission limit will be reduced to 0.1 lb/MMBtu (8.68 lb/hr) due to the use of a lower sulfur content fuel. The current license limit is 0.2 lb/MMBtu and the AP-42 factor for PM for #6 fuel oil at 0.5% sulfur is approximately 0.05 lb/MMBtu.

SO_2 – The SO_2 technology analysis for Boiler #7 is similar to Boiler #8, with the exception of addressing a lower sulfur content of #6 fuel oil (0.5%) when firing oil in Boiler #7. To control SO_2 when firing landfill gas, the following were considered: low sulfur landfill gases with good combustion controls, dry sorbent injection, wet scrubber systems, and spray dryer absorber. As noted in the Boiler #8 BACT summary, dry sorbent injection and spray dryer absorber technologies were rejected based on technical feasibility and a wet scrubber system was rejected based on negative environmental and energy impacts, as well as high capital, operating, and maintenance cost.

UMaine proposes to use landfill gas that has a maximum sulfur content of 0.18 lb/MMBtu on an annual weighted average, pipeline quality natural gas which has inherently low sulfur, and a #6 fuel oil sulfur content of 0.5% to minimize SO_2 emissions from Boiler #7.

The BACT emission limit for SO_2 from Boiler #7 is 0.36 lb/MMBtu (31.25 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas. This limit is for landfill gas with a maximum hourly sulfur content of 0.18 lb/MMBtu. For the occasional scenario when the landfill gas sulfur content may be above 0.18 lb/MMBtu, this emission limit will be adjusted.

The SO_2 emission limits when firing natural gas only is 0.006 lb/MMBtu (0.52 lb/hr) and when firing #6 fuel oil is 0.52 lb/MMBtu (45.14 lb/hr).

NO_X – The NO_X technology analysis for Boiler #7 is similar to Boiler #8. Low NO_X burners and flue gas recirculation are technically feasible control options and have been commonly found to be BACT on gas fired boilers less than 100 MMBtu/hr. Selective non-catalytic reduction (SNCR) is a theoretically feasible option, although Boiler #7 would have to be retrofitted to accommodate an SNCR system and would impose capital and operating costs while achieving minimal environmental benefit. Selective catalytic reduction (SCR) is not viable due to the siloxanes in the landfill gas that could result in plugging, causing the catalyst to become ineffective.

UMaine proposes to use good combustion controls to minimize NO_X emissions from Boiler #7. If the current Coen burner needs to be replaced with new burners in order to allow for landfill gas firing, UMaine will select low NO_X burners as the replacement. Whether the existing burners are utilized or new burners are installed, UMaine will install a flue gas recirculation system for NO_X control.

The BACT emission limit for NO_X from Boiler #7 is 0.1 lb/MMBtu (8.68 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas. This is lower than the 0.2 lb/MMBtu limit proposed by UMaine.

The NO_X emission limits when firing natural gas only shall be 0.1 lb/MMBtu (8.68 lb/hr) and when firing #6 fuel oil is 0.55 lb/MMBtu (47.74 lb/hr). The natural gas limit is a reduction from the previous NO_X license limit of 0.2 lb/MMBtu.

CO – As with Boiler #8, the only viable option for minimizing CO from Boiler #7 is combustion control. An oxidation catalyst would not be feasible due to the siloxanes in the landfill gas and the contamination of silica powder in the catalyst.

UMaine proposes to use a combustion control system to minimize the formation of multiple pollutants, including CO from Boiler #7.

The BACT emission limit for CO from Boiler #7 is 0.15 lb/MMBtu (13.02 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas.

The CO emission limits when firing natural gas only is 0.15 lb/MMBtu (13.02 lb/hr) and when firing #6 fuel oil is 0.6 lb/MMBtu (52.08 lb/hr).

VOC – Volatile organic compound emissions are minimal from landfill gas and natural gas exhaust. Based on research and database searches, no landfill or natural gas fired boilers of similar size are known to operate with add-on controls for VOC.

UMaine proposes to utilize a combustion control system for the control of VOC from Boiler #7.

The BACT emission limit for VOC from Boiler #7 is 0.02 lb/MMBtu (1.74 lb/hr) when firing landfill gas or when co-firing landfill gas with natural gas.

The VOC emission limits when firing natural gas only is 0.01 lb/MMBtu (0.87 lb/hr) and when firing #6 fuel oil is 0.1 lb/MMBtu (8.68 lb/hr).

Opacity – When Boiler #7 is operating alone on natural gas and/or landfill gas, or Boiler #7 and #8 are operating simultaneously on natural gas and/or landfill gas, visible emissions from stack 1 shall not exceed 10% opacity on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 3-hour period.

Once the maximum sulfur content limit of 0.5% for #6 fuel oil takes effect at UMaine, the following shall apply: When Boiler #7 is on #6 fuel oil, operating alone or with Boiler #8, visible emissions from stack 1 shall not exceed 20% opacity on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 3-hour period.

Control Equipment
Emissions from Boiler #7 will be controlled with flue gas recirculation, and good combustion. If the existing natural gas burner needs to be replaced to accommodate landfill gas combustion, low NO_X burners for natural gas and landfill gas will be installed.

Periodic Monitoring
For inventory purposes, UMaine shall keep monthly and 12 month rolling total records of fuel use for landfill gas, natural gas, and #6 fuel oil for Boiler #7.

Records shall also be maintained to demonstrate compliance with the sulfur requirement of #6 fuel oil (supplier delivery certifications are acceptable documentation) and the sulfur content of the landfill gas.

D. Landfill Gas Sulfur Content

UMaine shall be limited to a landfill gas sulfur content of 0.18 lb/MMBtu on an annual weighted average basis (0.36 lb/MMBtu SO_2).

To determine the landfill gas sulfur content, UMaine shall use hourly hydrogen sulfide (H_2S) monitoring data, a correction factor to account for any additional reduced sulfur compounds in the landfill gas, and landfill gas energy data to calculate the landfill gas sulfur content on an hourly average basis. The arithmetic average of the hourly landfill gas sulfur content values will be used to determine a monthly average landfill gas sulfur content. The monthly average landfill gas sulfur content values and the monthly landfill gas consumption rates expressed in MMBtu will be used to determine the weighted average landfill gas sulfur content on a 12-month rolling average basis. All data will be collected and maintained by UMaine and supplied upon request of the Department.

To determine the correction factor to account for reduced sulfur compounds in addition to H_2S in the landfill gas, UMaine will collect, or contract with the landfill gas supplier to collect landfill gas samples manually either at the steam plant or at the landfill and have them analyzed for individual reduced sulfur compounds. Initially, the sulfur speciation analysis and the determination of a corresponding adjustment factor will be performed on a quarterly basis. Should the ratio of H_2S to total reduced sulfur compounds for four consecutive quarterly analyses vary by less than 5%, the sulfur speciation analysis will be reduced to an annual basis. Should an annual sulfur speciation analyses indicate a 5% or greater difference in the ratio of H_2S to total reduced sulfur, the sulfur speciation analysis and determination of a corresponding adjustment factor will return to a quarterly basis.

E. Boilers #5 and #6

Boilers #5 and #6 (each 86.8 MMBtu/hr) are not being modified, however the PM, PM_{10}, and SO_2 emission limits shall all be reduced. Once landfill gas is initially delivered to the steam plant, UMaine shall fire only #6 fuel oil with a maximum sulfur content of 0.5% in Boilers #5 and #6. The revised PM and SO_2 emission limits from each of Boiler #5 and #6 shall be the following once landfill gas is initially delivered to the steam plant:

PM - The PM and PM_{10} emission limits will be reduced to 0.1 lb/MMBtu (8.68 lb/hr) due to the use of a lower sulfur content fuel. The current license

limit is 0.2 lb/MMBtu and the AP-42 factor for PM for #6 fuel oil at 0.5% sulfur is approximately 0.05 lb/MMBtu.

SO_2 - The SO_2 emission limit will be 0.52 lb/MMBtu (45.14 lb/hr), based on firing #6 fuel oil with a maximum sulfur content of 0.5%.

NESHAP requirements
Boilers #5 and #6 are subject to the recently promulgated 40 CFR Part 63, Subpart JJJJJJ, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial and Institutional Boilers Area Sources.* The boilers fire fuel oil and therefore the requirements for existing units firing fuel oil shall be met. The Maine Department of Environmental Protection has not taken delegation of this area source MACT (Maximum Achievable Control Technology) rule promulgated by EPA, however UMaine is still subject to the applicable requirements.

F. Steam Plant Restrictions and Recordkeeping

1. Restrictions

a. Hourly Heat Input and Stack 1 Hourly SO_2 Limits
In the application for this project, UMaine included various operating scenarios to allow for short term fluctuations in landfill gas sulfur content while meeting ambient air quality standards. All scenarios had no greater than a 147 MMBtu/hr heat input regardless of fuels fired and boilers being operated. The results of the air quality analysis indicated that the hourly heat input rate of natural gas to the steam plant does not need to be included in the 147 MMBtu/hr heat input restriction because of the negligible SO_2 emissions and the added increase in exhaust flow rate from natural gas combustion.

The ambient air quality analysis showed that UMaine's proposed scenario 6 resulted in the maximum impact for 1 hour SO_2. This scenario consisted of an SO_2 emission rate of 98 lb/hr from stack 1 (Boilers #7 and #8) and a relatively low flow. After review of the ambient air quality analysis results, it has been determined that a restriction of 98 lb/hr SO_2 from stack 1 is appropriate to protect the SO_2 1 hour ambient standard. The other scenarios with higher flows and higher emission rates resulted in lower impacts and the scenarios with the maximum impact results for SO_2 3-hour, SO_2 24-hour, NO_X 1-hour, and PM_{10} 24-hour were well below the ambient air quality standards (see Table III-5).

The eight proposed operating scenarios have been simplified for compliance purposes. To assure compliance with SO_2 ambient air quality

standards, the steam plant (Boilers #5, #6, #7, and #8) shall have the following restrictions in addition to the emission limits on the individual units and the sulfur requirements on #6 fuel oil and landfill gas:

- the combined hourly heat input rate of landfill gas and #6 fuel oil shall not exceed 147 MMBtu/hr; and
- Stack 1 shall have a maximum SO_2 emission rate of 98 lb/hr.

b. Minor Modification Annual Limits
To establish this project as a minor modification, UMaine will be restricted to the following annual emissions from the steam plant once landfill gas is initially delivered to the steam plant:

PM (tpy)	PM_{10} (tpy)	SO_2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)
32.2	21.2	135.8	100.5	116.3	26.3

In order to allow flexibility for the type of fuels fired, the number of boilers operated, and the short term sulfur content of the landfill gas at any given time, UMaine shall calculate the 12 month rolling total for each of the pollutants rather than be subject to specific fuel limits and total heat input per year.

Prior to landfill gas initially delivered to the steam plant, UMaine will be under the limits established above since the emissions from the installation of Boiler #8 firing only natural gas and operating at worst case (8760 hours/year) are below the minor modification thresholds.

2. Recordkeeping

a. Hourly Heat Input Rate
UMaine shall keep records of the hourly heat input rate of landfill gas and #6 fuel oil to the steam plant which includes the total of Boilers #5, #6, #7, and #8 to demonstrate compliance with the 147 MMBtu/hr limit.

b. Stack 1 Hourly SO_2 Records
UMaine shall establish a recordkeeping plan and keep records to demonstrate compliance with the 98 lb/hr SO_2 limit from stack 1. When the hourly average sulfur content of the landfill gas is equal to or less than 0.33 lb/MMBtu, it is not physically possible for the Stack 1 SO_2 emission rate to exceed 98 lb/hr under any combination of fuels. Therefore, when the hourly average landfill gas sulfur content is equal to or less than 0.33 lb/MMBtu, UMaine shall demonstrate compliance with the 98 lb/hr SO_2 limit through records of hourly landfill gas sulfur content. When the hourly average landfill gas sulfur content is greater than 0.33 lb/MMBtu, UMaine shall demonstrate

compliance with the 98 lb/hr limit by calculating and keeping records of the hourly Stack 1 SO_2 emission rate based on the hourly heat input rates and sulfur contents of each fuel being fired. The hourly records shall include the fuels being fired in Boilers #7 and #8, the hourly heat input rate of each boiler, the hourly landfill gas sulfur content converted to an SO_2 emission rate, and the license SO_2 emission factors for natural gas and #6 fuel oil.

c. Steam Plant Annual Limits
Once landfill gas is initially delivered to the steam plant, UMaine shall maintain records and calculations in order to demonstrate compliance with the annual tons per year emission limitations, on a 12 month rolling total basis from Boilers #5, #6, #7, and #8. UMaine shall calculate PM, PM_{10}, SO_2, NO_X, CO, and VOC tons on monthly and 12 month rolling total basis using the following information and methods:

- Monthly fuel use records for each of the boilers.

- The heat content values listed below:

Type of Fuel	Heat Content
#6 Fuel Oil	0.15 MMBtu/gal
Natural Gas	measured by the gas supplier *
Landfill Gas	measured by the gas supplier *

* will be used to report UMaine's actual fuel consumption in units of MMBtu per month.

- The monthly heat input value for # 6 fuel oil (MMBtu/month) shall be calculated by multiplying the monthly fuel consumption values for each boiler by the heat content given in the above table.

- For each consecutive 12 month period in which the total #6 fuel oil consumption at the steam plant is less than 320,000 MMBtu, UMaine shall determine the monthly steam plant emissions by using the actual monthly heat input rates for each boiler and fuel combination in conjunction with the maximum lb/MMBtu emission rates specified in the license (with the exception of SO_2 from landfill gas for which the monthly average landfill gas sulfur content value will be used). Using the 320,000 MMBtu #6 fuel oil threshold and the maximum license allowed emission limits will document that UMaine is below the minor modification tons per year limits without additional recordkeeping.

- For added flexibility, UMaine has requested the ability to use actual #6 fuel oil emission rates (versus licensed allowed) if #6 fuel oil consumption is equal to or greater than 320,000 MMBtu. For any consecutive 12 month period in which total #6 fuel oil consumption is equal to or greater than 320,000 MMBtu., UMaine shall determine the monthly emissions from natural gas and landfill gas combustion as described above (using the actual monthly heat input rates for each boiler and fuel combination in conjunction with the maximum lb/MMBtu emission rates specified in the license - with the exception of SO_2 from landfill gas for which the monthly average landfill gas sulfur content value will be used). For determining monthly SO_2 emissions from #6 fuel oil, UMaine shall use the actual sulfur content of the #6 fuel oil as documented by the fuel oil supplier. For determining monthly emissions of PM, PM_{10}, NO_X, CO, and VOC from #6 fuel oil, UMaine shall use the lb/MMBtu emission rates obtained from stack testing performed on the boiler(s) that are firing fuel oil. To ensure that the emission rates from stack testing have been established prior to UMaine exceeding the 320,000 MMBtu of total #6 fuel oil use in any consecutive 12 month period, UMaine shall conduct the required stack testing and submit the results to the Department prior to the steam plant exceeding a total #6 fuel oil consumption rate of 250,000 MMBtu in any consecutive 12 month period.

G. Annual Emissions

Once landfill gas is initially delivered to the steam plant, UMaine shall be restricted to the following annual emissions from the facility based on the limits for this proposed steam plant project, 8760 hours/year operation each for the two Global Science Center Boilers, and 500 hours/year for each of the generators:

Annual Facility Tons/year
(used in the annual license fee calculation)

	PM	PM_{10}	SO_2	NO_x	CO	VOC
Steam Plant Boilers #5, #6, #7, #8	32.2	21.2	135.8	100.5	116.3	26.3
Global Science Ctr Boilers (total of two)	4.6	4.6	-	14.0	11.4	0.4
Portable Electric Generator	0.1	0.1	0.05	2.0	0.5	0.03
Hitchner Hall Generator	0.1	0.1	0.05	2.3	1.0	0.03
Aubert Hall Generator	0.1	0.1	0.04	2.3	0.7	0.04
Science and Engineering Ctr Generator	0.1	0.1	0.04	2.3	0.7	0.04
Recreation Center Generator	0.1	0.1	0.05	1.5	0.2	0.03
Hilltop Commons Generator	0.2	0.2	0.07	2.9	0.2	0.03
Maine Center for the Arts Gen.	0.12	0.12	0.05	1.30	0.37	0.02
Alfond Generator	0.2	0.2	0.3	2.2	0.5	0.2
Printing Services						2.0
TOTALS	**37.82**	**26.82**	**136.45**	**131.3**	**131.87**	**29.12**

III. AMBIENT AIR QUALITY ANALYSIS

A. Overview

A refined modeling analysis was performed to show that emissions from UMaine, in conjunction with other sources, will not cause or contribute to violations of Maine and National Ambient Air Quality Standards (MAAQS/NAAQS) for SO_2, PM_{10}, NO_2 or CO. It has been determined that UMaine does not consume SO_2, PM_{10} or NO_2 increment, therefore, Class II SO_2, PM_{10}, and NO_2 increment analyses were not performed.

Since the current licensing action for UMaine represents a minor modification to an existing major source, it has been determined by MEDEP-BAQ that an assessment of Class I Air Quality Related Values (AQRVs) is not required.

B. Model Inputs

The AERMOD-PRIME refined model was used to address standards in all areas. The modeling analysis accounted for the potential of building wake and cavity effects on emissions from all modeled stacks that are below their calculated formula GEP stack heights.

All modeling was performed in accordance with all applicable requirements of the Maine Department of Environmental Protection, Bureau of Air Quality (MEDEP-BAQ) and the United States Environmental Protection Agency (USEPA).

A valid 5-year hourly off-site meteorological database was used in the AERMOD-PRIME refined modeling analysis. Wind data was collected at two levels (10 and 76 meters) at the Old Town Mill's meteorological monitoring site, located in Old Town, during the 5-year period 1991-1995. Surface data collected at the Bangor NWS site were substituted for missing surface data. All other missing data were interpolated or coded as missing, per USEPA guidance. In addition, hourly Bangor NWS data, from the same time period, were used to supplement the primary surface dataset for the required variables that were not explicitly collected at the Old Town Mill's monitoring site.

The surface meteorological data was combined with concurrent hourly cloud cover and upper-air data obtained from the Caribou National Weather Service (NWS). Missing cloud cover and/or upper-air data values were interpolated or coded as missing, per USEPA guidance.

All necessary representative micrometeorological surface variables for inclusion into AERMET (surface roughness, Bowen ratio and albedo) were calculated using AERSURFACE from procedures recommended by USEPA.

Point-source parameters used in the modeling are listed in Table III-1.

TABLE III-1: Point Source Stack Parameters

Facility/Stack	Stack Base Elevation (m)	Stack Height (m)	GEP Stack Height (m)	Stack Diameter (m)	UTM Easting NAD83 (km)	UTM Northing NAD83 (km)
CURRENT/PROPOSED						
UMaine						
• Stack #1	26.12	42.06	24.76	3.20	525.767	4971.758
• Stack #4	26.12	45.72	24.76	1.52	525.779	4971.789
Old Town Fuel & Fiber						
• Riley Boiler	25.17	45.42	106.89	2.74	528.904	4973.970
• #5 Boiler	27.68	54.86	89.99	2.29	528.763	4973.939
• Biomass Boiler	26.95	41.15	86.69	1.98	528.774	4973.860
• Recovery Boiler	24.87	76.20	105.94	2.95	528.906	4973.901
• Smelt Dissolving Tank	24.93	76.20	105.09	1.50	528.904	4973.913
• Lime Kiln	27.28	49.68	104.72	1.22	528.826	4974.053
• Gas Turbine Stack	27.64	24.38	33.11	2.44	582.749	4973.729

Emission parameters for MAAQS and NAAQS modeling are listed in Table III-2.

For the purposes of determining PM_{10} and NO_2 impacts, all PM and NO_x emissions were conservatively assumed to convert to PM_{10} and NO_2, respectively.

TABLE III-2: Stack Emission Parameters

Facility/Stack	Averaging Periods	SO_2 (g/s)	PM_{10} (g/s)	NO_2 (g/s)	CO (g/s)	Stack Temp (K)	Stack Velocity (m/s)
MAXIMUM LICENSE ALLOWED							
UMaine – Scenario 1							
• Stack #4	All	9.64	3.71	10.20	11.12	450.00	12.48
UMaine – Scenario 2							
• Stack #1	All	5.69	2.19	6.02	nm	450.00	1.66
• Stack #4	All	3.95	1.52	4.18	nm	450.00	5.11
UMaine – Scenario 5							
• Stack #1	All	8.60	nm	nm	nm	450.00	1.77
• Stack #4	All	4.07	nm	nm	nm	450.00	5.11
UMaine – Scenario 6							
• Stack #1	All	12.35	nm	nm	nm	450.00	2.08
UMaine – Scenario 7							
• Stack #1	All	11.47	nm	nm	nm	446.00	1.77
Old Town Fuel & Fiber							
• Riley Boiler	All	1.62	0.93	6.17	nm	499.80	1.23
• #5 Boiler	All	16.00	2.51	8.78	nm	455.40	9.50
• Biomass Boiler	All	0.84	1.00	8.35	nm	444.00	15.31
• Recovery Boiler	All	18.02	4.32	19.45	nm	505.40	17.65
• Smelt Dissolving Tank	All	0.42	0.95	0.01	nm	348.70	3.78
• Lime Kiln	All	0.89	4.15	4.54	nm	338.70	10.30
• Gas Turbine Stack	All	0.05	0.10	2.00	nm	735.90	78.22

C. Single Source Modeling Impacts

Refined modeling was performed for a total of nine operating scenarios that represented a range of maximum, typical and minimum operations and fuel types.

The AERMOD-PRIME model results for UMaine alone are shown in Table III-3. Maximum predicted impacts that exceed their respective significance level are indicated in boldface type. No further modeling was required for pollutant/terrain combinations that did not exceed their respective significance levels.

TABLE III-3: Maximum AERMOD-PRIME impacts from UMaine Alone

Pollutant	Averaging Period	Max Impact ($\mu g/m^3$)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)	Max Impact Scenario	Class II Significance Level ($\mu g/m^3$)
SO_2	1-hour	**93.66**[1]	525.927	4972.046	33.00	1	**10**[2]
	3-hour	**68.09**	525.527	4971.546	22.00	1	**25**
	24-hour	**27.26**	525.927	4971.446	29.38	1	**5**
	Annual	0.94	526.327	4971.446	35.15	1	**1**
PM_{10}	24-hour	**10.49**	525.927	4971.446	29.38	1	**5**
	Annual	0.36	526.327	4971.446	35.15	1	**1**
NO_2	1-hour	**99.18**[1]	525.927	4972.046	33.00	1	**10**[3]
	Annual	0.99	526.327	4971.446	35.15	1	**1**
CO	1-hour	108.13	525.927	4972.046	33.00	1	**2000**
	8-hour	59.32	525.527	4971.546	22.00	1	**500**

[1] Value based on the H1H (high-1st-high) concentration
[2] Interim Significant Impact Level (SIL) adopted by Maine
[3] Interim Significant Impact Level (SIL) adopted by NESCAUM states

D. Combined Source Modeling Impacts

For predicted modeled impacts from UMaine alone that exceeded significance levels, as indicated in boldface type in Table III-3, other sources not explicitly included in the modeling analysis must be accounted for by using representative background concentrations for the area.

Background concentrations, listed in Table III-4, are derived from representative rural background data for use in the Eastern Maine region.

TABLE III-4 : Background Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)
SO_2	1-hour	47[1]
	3-hour	18[2]
	24-hour	11[2]
PM_{10}	24-hour	42[3]
NO_2	1-hour	47[4]

[1] Village Green Site - Rumford
[2] MacFarland Hill Site - Acadia National Park
[3] Background Site -Baileyville
[4] MicMac Site - Presque Isle

MEDEP examined other nearby sources to determine if any impacts would be significant in or near UMaine's significant impact area. Due to UMaine's location, extent of the predicted significant impact area and other nearby source's

emissions, MEDEP has determined that one additional source would be considered for combined source modeling: Old Town Fuel & Fiber.

For pollutant averaging periods that exceeded significance levels, the maximum modeled impacts from the scenario predicting the highest concentrations were added with conservative rural background concentrations to demonstrate compliance with MAAQS, as shown in Table III-5.

TABLE III-5: Maximum Combined Sources Impacts

Pollutant	Averaging Period	Max Impact ($\mu g/m^3$)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)	Max Impact Scenario	Back-Ground ($\mu g/m^3$)	Max Total Impact ($\mu g/m^3$)	MAAQS/ NAAQS ($\mu g/m^3$)
SO_2	1-hour	**147.17**	526.027	4971.546	33.40	6	**47**	**194.47**	**196**
	3-hour	**175.23**	525.627	4971.546	28.76	7	**18**	**193.23**	**1150**
	24-hour	**66.91**	525.727	4971.246	25.18	5	**11**	**77.91**	**230**
PM_{10}	24-hour	**19.36**	525.727	4971.246	25.18	2	**42**	**61.36**	**150**
NO_2	1-hour	**101.70**	525.627	4971.346	28.72	2	**47**	**148.70**	**188**

E. Increment

It has been determined that UMaine does not consume SO_2, PM_{10} or NO_2 increment, therefore, Class II SO_2, PM_{10}, and NO_2 increment analyses were not performed.

Federal guidance and 06-096 CMR 115 require that any major new source or major source undergoing a major modification provide additional analyses of impacts that would occur as a direct result of the general, commercial, residential, industrial and mobile-source growth associated with the construction and operation of that source. Since this licensing action represents a minor modification to an existing major source, no additional analyses were required.

F. Class I Impacts

Since the current licensing action for UMaine represents a minor modification to an existing major source, it has been determined by MEDEP-BAQ that an assessment of Class I Air Quality Related Values (AQRVs) is not required.

G. Summary

In summary, it has been demonstrated that UMaine will not cause or contribute to violations of Maine and National Ambient Air Quality Standards (MAAQS/NAAQS) for SO_2, PM_{10}, NO_2 or CO; or any SO_2, PM_{10} or NO_2 averaging period Class II increment standards.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards, and
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-204-77-3-A pursuant to the preconstruction licensing requirements of 06-096 CMR 115 and subject to the standard and special conditions below.

Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

(1) **Landfill Gas Sulfur Content – Annual Weighted Average**

A. UMaine shall not fire landfill gas with greater than 0.18 lb/MMBtu sulfur content (0.36 lb/MMBtu SO_2) on an annual weighted average in Boilers #7 and #8 based on a 12 month rolling average.

B. UMaine shall use hourly hydrogen sulfide (H_2S) monitoring data, a correction factor to account for any additional reduced sulfur compounds in the landfill gas, and landfill gas energy data to calculate the landfill gas sulfur content on an hourly average basis. The arithmetic average of the hourly landfill gas sulfur content values shall be used to determine a monthly average landfill gas sulfur content. The monthly average landfill gas sulfur content values and the monthly landfill gas consumption rates expressed in MMBtu shall be used to determine the weighted average landfill gas sulfur content on a 12-month rolling average basis. All data shall be collected and maintained by UMaine and supplied to the Department upon request.

C. To determine the correction factor to account for reduced sulfur compounds in addition to H_2S, UMaine shall collect, or contract with the landfill gas supplier to collect landfill gas samples manually either at the steam plant or at the landfill, and analyze them for individual reduced sulfur compounds. The sulfur speciation analysis and the determination of a corresponding adjustment factor shall be performed on a quarterly basis. If the ratio of H_2S to total reduced sulfur compounds for four consecutive quarterly analyses varies by less than 5%, the sulfur speciation analysis shall be reduced to an annual basis. If two consecutive annual sulfur speciation analyses indicate a 5% or greater difference in the ratio of H_2S to total reduced sulfur, the sulfur speciation analysis and determination of a corresponding adjustment factor shall return to a quarterly basis.

D. UMaine shall keep records of the weighted average landfill gas sulfur content on a monthly and 12-month rolling average basis.

[06-096 CMR 115, BACT]

(2) **#6 Fuel Oil Sulfur Content**

A. Once the landfill gas is initially delivered to the steam plant, or two years from the issuance of this license (whichever is first), the sulfur content of #6 fuel oil fired at the UMaine steam plant shall not exceed 0.5% sulfur by weight. As an exception, UMaine may burn the fuel oil remaining in the storage tank at the time the landfill gas is initially delivered to the steam plant. [06-096 CMR 115, BACT]

B. Records shall be maintained documenting the sulfur content of the #6 fuel oil. The fuel oil specification sheets provided by the supplier may be used as sulfur content compliance documentation. [06-096 CMR 115, BACT]

(3) **Boilers #5 and #6**

These conditions are in addition to the license conditions in air emission license A-204-70-F-R:

A. UMaine is licensed to fire #6 fuel oil in Boilers #5 and #6. [06-096 CMR 115, BACT]

B. Boilers #5 and #6 shall each not exceed the following emission limits once the facility is required to fire 0.5% sulfur fuel oil:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.10	06-096 CMR 115, BACT
PM_{10}	0.10	06-096 CMR 115, BACT
NO_X (≤0.45% nitrogen)*	0.50	06-096 CMR 138
NO_X (>0.45% nitrogen)*	0.55	06-096 CMR 138

Pollutant	Lb/hr	Origin and Authority
PM	8.68	06-096 CMR 115, BACT
PM_{10}	8.68	06-096 CMR 115, BACT
SO_2	45.14	06-096 CMR 115, BACT
NO_X (≤0.45% nitrogen)*	43.4	06-096 CMR 140, BPT
NO_X (>0.45% nitrogen)*	47.7	06-096 CMR 140, BPT
CO	52.1	06-096 CMR 140, BPT
VOC	8.7	06-096 CMR 140, BPT

* denotes the nitrogen content in the fuel

(4) **Boiler #7**

These conditions are in addition to the license conditions in air emission license A-204-70-F-R for firing #6 fuel oil and natural gas in Boiler #7:

A. UMaine may fire landfill gas in Boiler #7. [06-096 CMR 115, BACT]

B. Boiler #7 shall not exceed the following emission limits when firing either landfill gas or co-firing landfill gas and natural gas:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.02	06-096 CMR 115, BACT
PM_{10}	0.02	06-096 CMR 115, BACT
NO_X	0.1	06-096 CMR 115, BACT

Pollutant	lb/hr	Origin and Authority
PM	1.74	06-096 CMR 115, BACT
PM_{10}	1.74	06-096 CMR 115, BACT
SO_2	98*	06-096 CMR 115, BACT
NO_X	8.68	06-096 CMR 115, BACT
CO	13.02	06-096 CMR 115, BACT
VOC	1.74	06-096 CMR 115, BACT

* the lb/hr limit includes Boiler #8 (98 lb/hr is the total SO_2 emission limit from Stack 1).

C. Once Boiler #7 has been modified to burn landfill gas, Boiler #7 shall not exceed the following emission limits when firing natural gas only:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.01	06-096 CMR 140, BPT
PM_{10}	0.20	06-096 CMR 103
NO_X	0.10	06-096 CMR 115, BACT

Pollutant	lb/hr	Origin and Authority	Enforceability
PM	0.87	06-096 CMR 140, BPT	**Enforceable by State-only**
PM_{10}	0.87	06-096 CMR 140, BPT	**Enforceable by State-only**
SO_2	0.52	06-096 CMR 115, BACT	-
NO_X	8.68	06-096 CMR 115, BACT	-
CO	13.02	06-096 CMR 140, BPT	**Enforceable by State-only**
VOC	0.87	06-096 CMR 140, BPT	**Enforceable by State-only**

D. Once the facility is required to fire 0.5% sulfur fuel oil, Boiler #7 shall not exceed the following emission limits when firing #6 fuel oil:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.10	06-096 CMR 115, BACT
PM_{10}	0.10	06-096 CMR 115, BACT
NO_X (≤0.45% nitrogen)*	0.50	06-096 CMR 138
NO_X (>0.45% nitrogen)*	0.55	06-096 CMR 138

Pollutant	lb/hr	Origin and Authority
PM	8.68	06-096 CMR 115, BACT
PM_{10}	8.68	06-096 CMR 115, BACT
SO_2	45.14[+]	06-096 CMR 115, BACT
NO_X (≤0.45% nitrogen)*	43.4	06-096 CMR 140, BPT
NO_X (>0.45% nitrogen)*	47.7	06-096 CMR 140, BPT
CO	52.1	06-096 CMR 140, BPT
VOC	8.7	06-096 CMR 140, BPT

* denotes the nitrogen content in the fuel

[+] 98 lb/hr is the total SO_2 emission limit from Stack 1 (including Boiler #7 and Boiler #8).

E. Once Boiler #7 has been modified to burn landfill gas, emissions from Boiler #7 when firing landfill gas and/or natural gas shall be controlled with flue gas recirculation, and good combustion. If the existing natural gas burner needs to be

replaced to accommodate landfill gas combustion, low NO_X burners for landfill gas and natural gas shall be installed. [06-096 CMR 115, BACT]

F. UMaine shall keep monthly and 12 month rolling total records of fuel use for landfill gas, natural gas, and #6 fuel oil in Boiler #7. [06-096 CMR 115, BACT and 06-096 CMR 137]

(5) **Removal of Boilers #3 and #4**

UMaine shall remove Boilers #3 and #4 (37.9 MMBtu/hr each) prior to installing Boiler #8. [06-096 CMR 115, BACT]

(6) **Boiler #8**

A. UMaine may install Boiler #8 with the capability of firing natural gas and landfill gas. [06-096 CMR 115, BACT]

B. Boiler #8 shall not exceed the following emission limits when firing natural gas only:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.01	06-096 CMR 115, BACT
PM_{10}	0.01	06-096 CMR 115, BACT
NO_X	0.04	06-096 CMR 115, BACT

Pollutant	lb/hr	Origin and Authority
PM	0.75	06-096 CMR 115, BACT
PM_{10}	0.75	06-096 CMR 115, BACT
SO_2	0.45	06-096 CMR 115, BACT
NO_X	3.0	06-096 CMR 115, BACT
CO	3.0	06-096 CMR 115, BACT
VOC	0.75	06-096 CMR 115, BACT

C. Boiler #8 shall not exceed the following emission limits when firing either landfill gas or co-firing landfill gas and natural gas:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.02	06-096 CMR 115, BACT
PM_{10}	0.02	06-096 CMR 115, BACT
NO_X	0.05	06-096 CMR 115, BACT

Pollutant	lb/hr	Origin and Authority
PM	1.5	06-096 CMR 115, BACT
PM_{10}	1.5	06-096 CMR 115, BACT
SO_2	98.0*	06-096 CMR 115, BACT
NO_X	3.75	06-096 CMR 115, BACT
CO	6.0	06-096 CMR 115, BACT
VOC	1.5	06-096 CMR 115, BACT

* the lb/hr limit includes Boiler #7 (98 lb/hr is the total SO_2 emission limit from Stack 1).

D. Emissions from Boiler #8 shall be controlled with a low NO_X burner, flue gas recirculation, and good combustion controls. [06-096 CMR 115, BACT]

E. UMaine shall keep monthly and 12 month rolling total records of fuel use for both landfill gas and natural gas in Boiler #8. [06-096 CMR 115, BACT and 06-096 CMR 137, and 40 CFR Part 60, Subpart Dc, §60.48c (g)(2)]

F. NSPS 40 CFR Part 60, Subpart Dc Requirements

1. UMaine shall meet the applicable requirements of 40 CFR Part 60, Subpart Dc, including initial notifications submittals, maintaining records, and report submittals. [40 CFR Part 60, Subpart Dc]

2. The initial notification required under 40 CFR Part 60, Subpart Dc shall include the date of construction and actual startup, the design heat input capacity of the affected facility and identification of fuels to be combusted in the affected facility, and the annual capacity factor at which the owner or operator anticipates operating the affected facility based on all fuels fired and based on each individual fuel fired. [40 CFR Part 60, Subpart Dc, §60.48c(a)]

3. UMaine shall submit a fuels report each six-month period to EPA. The report shall be postmarked by the 30th day following the end of the reporting period. [40 CFR Part 60, Subpart Dc, §60.48c (i)]

(7) **Stack 1 Restrictions**

A. Visible Emissions

1. Visible emissions from stack 1 when Boiler #7 and #8 are operating alone or simultaneously on natural gas and/or landfill gas, shall not exceed 10% opacity on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 3-hour period.

2. Once the maximum sulfur content limit of 0.5% for #6 fuel oil takes effect at UMaine, the following shall apply: Visible emissions from stack 1 when Boiler #7 is on #6 fuel oil, operating alone or with Boiler #8, shall not exceed 20% opacity on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 3-hour period.

[06-096 CMR 115, BACT]

B. Hourly SO_2 Limit

1. Once landfill gas is initially delivered to the steam plant, UMaine shall be restricted to 98 lb/hr of SO_2 from stack 1 on an hourly basis.
[06-096 CMR 115, BACT]

2. UMaine shall establish a recordkeeping plan and keep records to demonstrate compliance with the hourly SO_2 limit from stack 1. When the hourly average sulfur content of the landfill gas is equal to or less than 0.33 lb/MMBtu, UMaine shall demonstrate compliance with the 98 lb/hr SO_2 limit through records of hourly landfill gas sulfur content. When the hourly average landfill gas sulfur content is greater than 0.33 lb/MMBtu, UMaine shall demonstrate compliance with the 98 lb/hr limit by calculating and keeping records of the hourly stack 1 SO_2 emission rate based on the hourly heat input rates and sulfur contents of each fuel being fired. The hourly records shall include the fuels being fired in Boilers #7 and #8, the hourly heat input rate of each boiler, and the hourly landfill gas sulfur content converted to an SO_2 emission rate. These hourly records shall be used along with the licensed SO_2 emission factors for natural gas and #6 fuel oil in order to calculate the SO_2 lb/hr from stack 1. [09-096 CMR 115, BACT]

(8) **Steam Plant Restrictions**

A. Steam Plant Hourly Heat Input Limit

1. The combined hourly heat input rate at the steam plant from landfill gas and #6 fuel oil shall not exceed 147 MMBtu/hr, except when bringing a boiler on-line to replace a boiler that is being taken off-line. The duration of time for which the combined hourly heat input rate may exceed 147 MMBtu/hr for this purpose shall be limited to a maximum of three hours.

2. UMaine shall keep records of the hourly heat input rate of landfill gas and #6 fuel oil to the steam plant which includes the total of Boilers #5, #6, #7, and #8.

[09-096 CMR 115, BACT]

B. Annual Steam Plant Tons per Year Limit

1. UMaine shall be limited to the following annual emissions from the steam plant (Boilers #5, #6, #7, and #8) on a 12 month rolling total basis once landfill gas is initially delivered to the steam plant:

PM (tpy)	PM_{10} (tpy)	SO_2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)
32.2	21.2	135.8	100.5	116.3	26.3

2. Once landfill gas is initially delivered to the steam plant, UMaine shall maintain records and calculations in order to demonstrate compliance with the annual steam plant tons per year emission limitations, on a 12 month rolling total basis using the following:

   a. Monthly fuel use records for each of the boilers.

   b. The heat content values listed below:

Type of Fuel	Heat Content
#6 Fuel Oil	0.15 MMBtu/gal
Natural Gas	measured by the gas supplier *
Landfill Gas	measured by the gas supplier *

   * will be used to report UMaine's actual fuel consumption in units of MMBtu per month.

   c. The monthly heat input value for #6 fuel oil (MMBtu/month) shall be calculated by multiplying the monthly fuel consumption values for each boiler by the heat content given in the above table.

   d. Monthly Emissions Calculation

      i. For each consecutive 12 month period in which the total #6 fuel oil consumption at the steam plant is less than 320,000 MMBtu, UMaine shall determine the monthly steam plant emissions by using the actual monthly heat input rates for each boiler and fuel combination in conjunction with the maximum lb/MMBtu emission rates specified in the license (with the exception of SO_2 from landfill gas for which the monthly average landfill gas sulfur content values as determined from the arithmetic average of hourly landfill gas sulfur measurements during the month shall be used).

ii. For any consecutive 12 month period in which total #6 fuel oil consumption is equal to or greater than 320,000 MMBtu, UMaine shall:

(a) determine the monthly emissions from natural gas and landfill gas combustion as described above (using the actual monthly heat input rates for each boiler and fuel combination in conjunction with the maximum lb/MMBtu emission rates specified in the license - with the exception of SO_2 from landfill gas for which the monthly average landfill gas sulfur content value will be used); and

(b) determine monthly emissions from #6 fuel oil by using the actual sulfur content of the #6 fuel oil as documented by the fuel oil supplier for SO_2. To determine monthly emissions of PM, PM_{10}, NO_X, CO, and VOC from #6 fuel oil, UMaine shall use the lb/MMBtu emission rates obtained from stack testing performed on the boiler(s) that are firing fuel oil. The stack testing shall be conducted, and the results submitted to the Department, prior to the steam plant exceeding a total #6 fuel oil consumption rate of 250,000 MMBtu in any consecutive 12 month period.

(9) UMaine shall submit an application to incorporate this amendment into the Part 70 air emission license no later than 12 months from commencement of the requested operation. [06-096 CMR 140, Section 2(J)(2)(c)]

DONE AND DATED IN AUGUSTA, MAINE THIS 9th DAY OF June , 2011.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Melanie Loyzim for
JAMES P. BROOKS, ACTING COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: February 18, 2011
Date of application acceptance: February 24, 2011

Date filed with the Board of Environmental Protection: _____

This Order prepared by Kathleen E. Tarbuck, Bureau of Air Quality.

Filed
JUN 14 2011
State of Maine
Board of Environmental Protection