Braintree Electric Light Department
Thomas A. Watson Generating Station

Air Plan Approval / NSR / PSD Application
Transmittal No. W120701

Submitted to:
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Section 1.0

Introduction

1.0 INTRODUCTION

1.1 Project Overview

Braintree Electric Light Department (BELD), a municipal utility serving the Town of Braintree, proposes to construct and operate an approximately 116 MW quick-start, simple-cycle, dual-fuel generating facility at its Potter Road facility in East Braintree. The new facility has been named the Thomas A. Watson Generating Station ("Watson Station" or the "Project") in honor of BELD's founder.

BELD's Potter Road facility has been used for power generation for nearly fifty years. The 23-acre site currently houses Potter II, an operating dual-fuel (natural gas or No. 2 distillate) combined-cycle power plant with a nominal rating of 95 MW, a 2.25 MW diesel generator set, and a 115 kV switchyard. BELD's administrative offices, the operations center, and equipment storage areas are also located at the Potter Road facility. Figure 1-1 provides an aerial view of BELD's existing Potter Road facilities.

In developing the proposed Watson Station, BELD has worked closely with Braintree's State Representatives and Senator, Town of Braintree officials, Braintree's Representative Town Meeting and the citizens of Braintree. In two separate votes, Town Meeting has given overwhelming approval to the project concept and has authorized the necessary bonding.[1] Of equal importance, the Braintree state legislative delegation sponsored a successful home rule petition which enables BELD to use an Engineering, Procurement and Construction (EPC) firm to build the new plant. This legislation was signed into law in March 2006.[2]

The Watson Station will consist of two quick-start, simple-cycle Rolls-Royce Trent 60 combustion turbines, and the necessary ancillary facilities, including interconnections of approximately 300 feet of 115 kV overhead transmission line, a short run of high pressure gas (to be installed by Algonquin Gas Transmission Company ("AGT"))[3] line and an upgrade of an existing oil pipeline that runs from the adjacent CITGO terminal to the Potter II station. The Watson Station will be rated at 116 MW and will have the ability to go from a cold start to full load in ten minutes or less on either natural gas or Ultra Low Sulfur Distillate (ULSD) oil. In its recent system planning studies, the New England Independent System Operator (ISO-NE) has identified a need for several hundred MWs of Future Locational Forward Reserve Market Requirements by 2010, some of which needs to be met by quick-start facilities.[4]

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1 Braintree Town Meeting votes were held on October 24, 2005, (Special Town Meeting) and on May 9, 2006 (Annual Town Meeting).

2 St. 2006, c. 43.

3 A Unit of Spectra Energy.

4 ISO New England 2006 Regional System Plan, October 26, 2006, page 6 and page 11.

Figure 1-1
Project Site Area

Source: Windows Live Local, 2006

Thomas A. Watson Generating Station
Braintree, Massachusetts

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1.2 Regulatory Summary

The air related regulatory requirements applicable to the proposed facility include:

U.S. Environmental Protection Agency (EPA) New Source Performance Standards (NSPS) (40 CFR 60)

New Source Review (NSR) which includes a demonstration of compliance with National Ambient Air Quality Standards (NAAQS) (40 CFR 51)

Prevention of Significant Deterioration (PSD) Regulations including Best Available Control Technology (BACT) (40 CFR 52)

Clean Air Act Amendments of 1990 (Public Law 101-549)

Massachusetts Department of Environmental Protection (DEP) Non-Major Comprehensive Plan Approval (310 CMR 7.02 - BWP AQ 02)

DEP Emission Limits (310 CMR 7.02, 7.09)

DEP Requirements for BACT, (310 CMR 7.02)

DEP Air Toxics Policy (August, 1989 – Air Toxics Implementation Update and Revised Air Guidelines, December, 1995)

DEP Noise Control Regulations and Policy (310 CMR 7.10 and DEP Noise Policy 90-001)

1.3 Outline of Application

The remainder of this application is organized in six additional sections.

Section 2 provides a detailed description and estimate of emissions for the proposed Watson Station.

Section 3 describes the Federal, state and local air quality regulations applicable to the project.

Section 4 is the BACT/Lowest Achievable Emission Rate (LAER) Analysis for the project.

Section 5 describes the project site characteristics including background meteorological data and the good engineering practice (GEP) stack height analysis.

Section 6 describes the air quality modeling methodology and results for compliance demonstration.

Section 7 describes the sound level assessment, including existing conditions and future operational sound levels.

Section 8 contains proposed permit conditions.

The Appendices include the permit forms, vendor information, supporting calculations, RACT/BACT/LAER Clearinghouse Determinations, noise data and air quality modeling inputs.

Section 2.0

Project Description and Emissions

2.0 PROJECT DESCRIPTION AND EMISSIONS

2.1 Project Description

The proposed 116 MW Watson Station is built around two Rolls-Royce Trent 60 WLE gas turbines. The Trent 60 WLE is derived from the Rolls-Royce Trent 800 aircraft engine. The Trent 800 and its predecessor, the Trent 700, have accumulated more than 7,500,000 hours of operation in twin engine long haul aircraft such as the Boeing 777 and the Airbus A330.

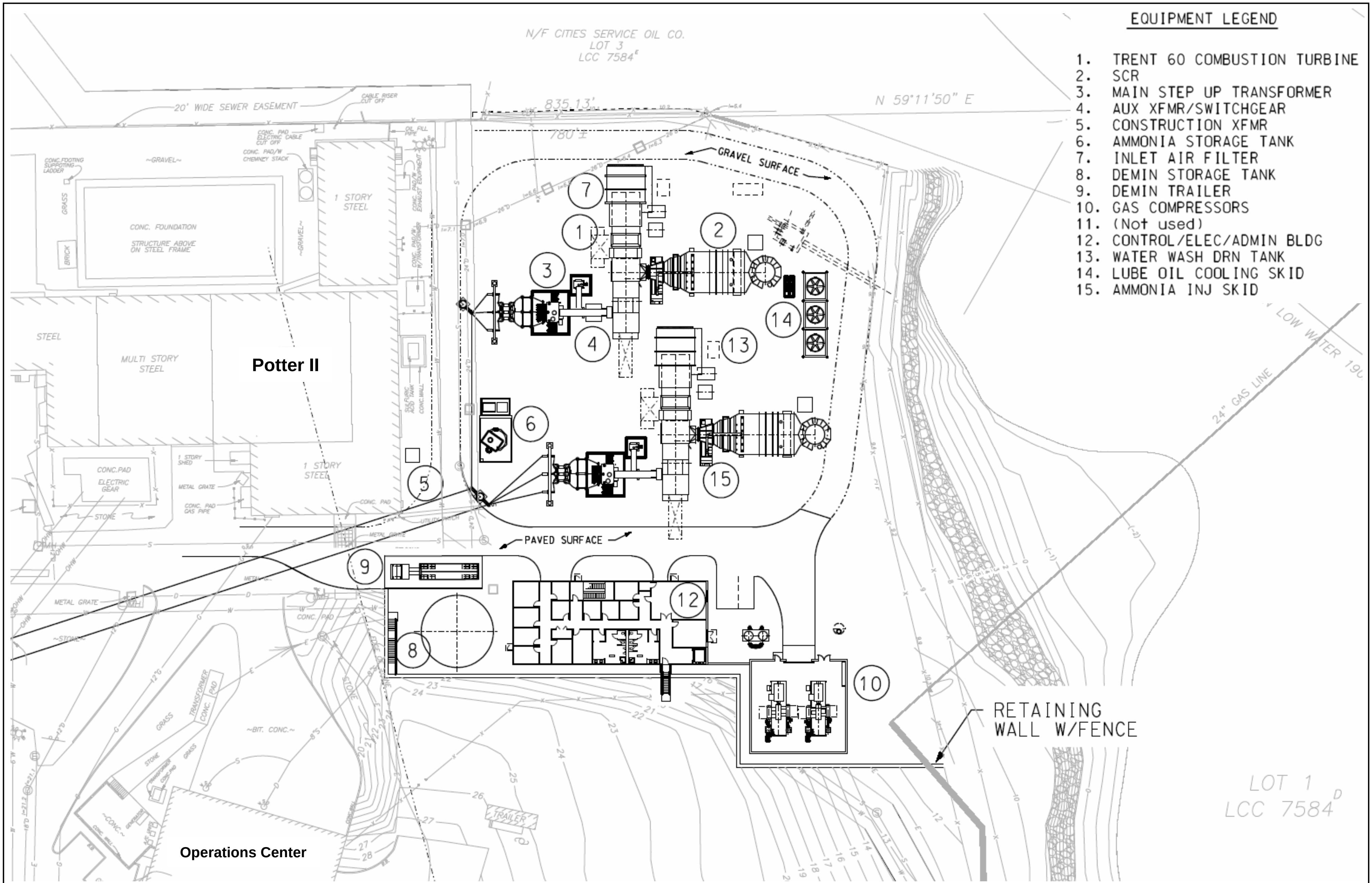
The Rolls-Royce Trent 60 WLE is capable of either base load or peaking duty and is rated at 58 MW. The efficient unit has a heat rate of 9,519 Btu/kW-hr (Higher Heating Value, "HHV") in a simple-cycle mode and can achieve full power within 10 minutes from a cold start on either natural gas or ULSD. The Trent 60 WLE unit is designed to have low NO_x emissions using minimum water to achieve 25 ppm at the turbine exhaust. The Trent 60 package is designed with a modular concept to allow for both quick installation and ease of maintenance. The Trent 60 fleet has accumulated over 130,000 hours of operating experience. An introductory Rolls-Royce brochure on the Trent 60 gas turbine is provided as Appendix B.

The Watson Station will include two Trent 60 gas turbine generators, each with their associated inlet air filter, Selective Catalytic Reduction (SCR) system, ammonia injection skid, oxidation catalyst, exhaust stack, main step-up transformer, auxiliary transformer and switchgear.

The Watson Station also will include a number of common components: a control center, a gas compressor station, a trailer mounted demineralizer system, a lube oil cooling skid, a 400,000 gallon demineralized water storage tank and a 15,000 gallon fully diked vertical aqueous ammonia storage tank and a perimeter access road. A general arrangement drawing is provided as Figure 2-1. A corresponding three dimensional graphic is provided as Figure 2-2.

The proposed Watson Station will occupy a two-acre parcel on the northeast corner of the BELD complex. The gas turbines and the associated equipment will be placed on concrete foundations and pads. The general yard area will be finished with crushed stone. A gravel perimeter access road will provide routine and emergency access to the new facility. The new perimeter road will connect to the internal roadway which currently provides access to Potter II. This internal roadway connects, in turn, to Potter Road. Access to the entire BELD complex can be controlled via security gates at the top of Potter Road, just off Route 53/Quincy Avenue.

The Watson Station includes two buildings, a control center (approximately 50 feet by 100 feet in plan) and a gas compressor station (approximately 50 feet by 50 feet in plan). Two small enclosures for the continuous emissions monitoring system (CEMS) are located at the



Source: C2HMHill

Figure 2-1
General Equipment Arrangement

Thomas A. Watson Generating Station
Braintree, Massachusetts

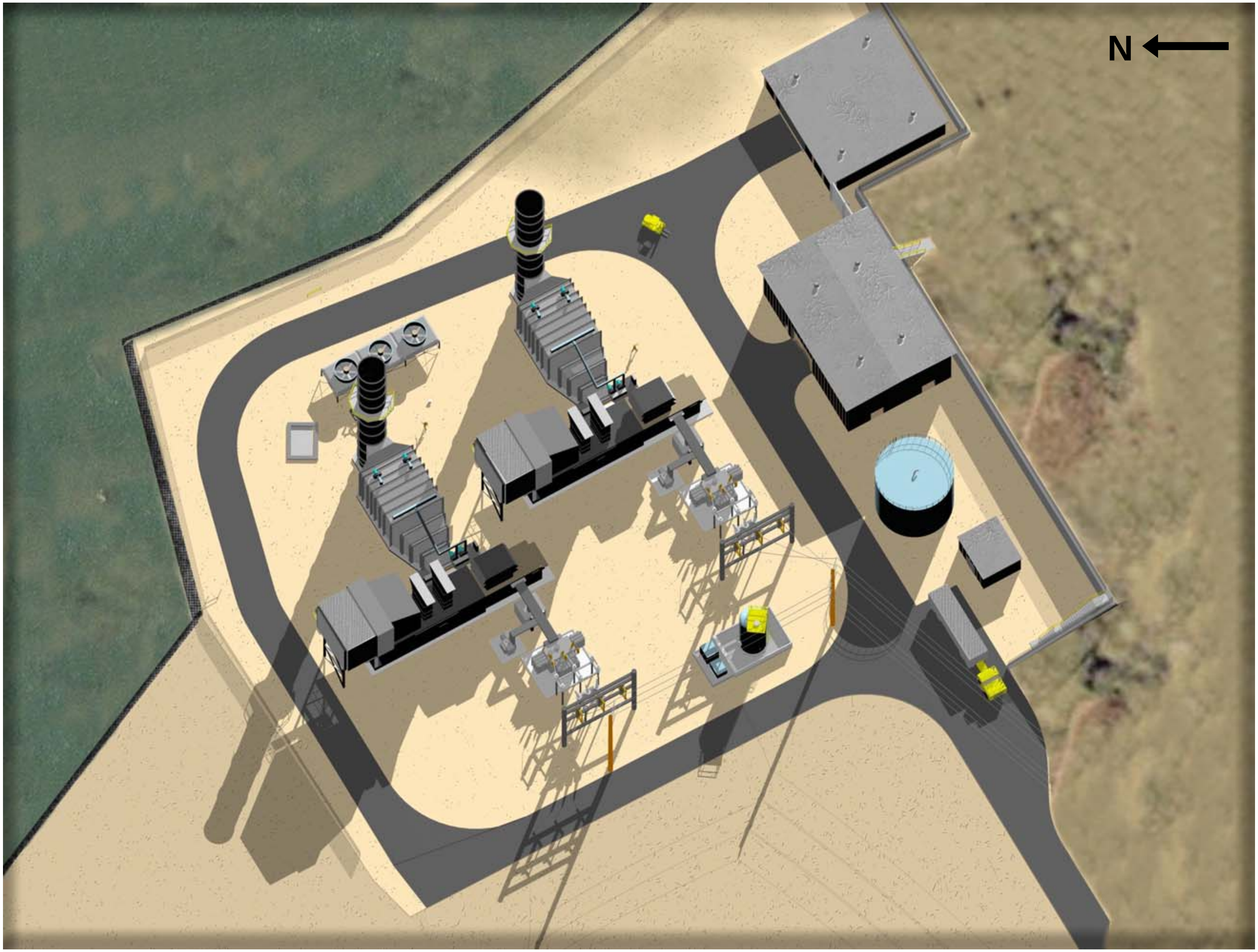


Figure 2-2
Rolls Royce Trent 60 WLE Rendering

Source: C2HMHill

Thomas A. Watson Generating Station
Braintree, Massachusetts

Epsilon ASSOCIATES INC.

base of the gas turbine exhaust stacks. The buildings are located on the south side of the proposed Watson Station site. The two story control center will include the plant control room, office space, a meeting/planning room, restrooms and some storage space. A retaining wall and fence will separate the south side of the Watson Station site from the rest of the BELD complex. Existing fencing along the east side of the site (Fore River side) will be maintained or upgraded.

Preliminary renderings of the proposed Watson Station are provided as Figures 2-3 and 2-4. Figure 2-3 is a view from the BELD administrative offices and employee parking area, looking to the northwest. BELD's existing Potter II station is on the left side of the photo. The facilities visible in the background include the MWRA sludge palletizing facility (white buildings/white stack) and the "Goliath" crane, a visual landmark at the former Fore River shipyard. Figure 2-4 is a view from the residential area of Weymouth, looking across the Fore River to the BELD complex. The existing BELD operations center is visible to the left of the new plant, while Potter II appears on the right. The background includes rising terrain/Potter Road on the left, and the CITGO tanks on the right. The bow section of an oil tanker being unloaded at CITGO is also visible. For perspective, the existing Potter II stack is 130 feet above grade while the stack for the nearby 775 MW Fore River Generating Station is 255 feet in height. The appearance of the new Watson Station is consistent with the surrounding area. Moreover, the new plant is well screened from residential areas to the south and west.

Ancillary facilities include a 300 foot run of 115 kV overhead lines to connect the main step-up transformers to the BELD substation. As shown on Figure 2-1, these lines run between Potter II and the BELD operations center and are entirely within BELD's existing complex. With respect to any offsite transmission upgrades/improvements associated with the new Watson Station, a system interconnection study is underway at ISO-NE. BELD does not anticipate the need for any significant offsite work.

Other ancillary facilities include fuel supply and utility connections. A short run of new high pressure gas line will be installed by AGT from the existing stub on the AGT line to the new gas meter building. The existing stub is located about 100 feet to the east of the BELD employee parking lot. The existing approximately 1,600 foot distillate oil supply line from the CITGO terminal to Potter II will be upgraded to serve the new Watson Station. The Town of Braintree will connect Watson Station to the Town water and sewer lines which traverse the BELD property. The water line connection will supply the demineralization system as well as potable water for restrooms in the control building. The sanitary sewer connection will serve the restrooms in the control building. All of these connections will be within the BELD Potter Road facility.

The balance of Section 2 provides a more detailed description of the major plant components and systems.

Figure 2-3
Rolls Royce Trent 60 WLE Rendering – View from BELD Offices/Parking Lot
Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: C2HMHill

Epsilon ASSOCIATES INC.

Figure 2-4
Rolls Royce Trent 60 WLE Rendering – View from Weymouth

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: C2HMHill

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2.1.1 Gas Turbine

The heart of the new Watson Station will be two Rolls-Royce Trent 60 WLE Gas Turbines. These flexible aero-derivative machines can run on either natural gas or distillate fuels (in this case ULSD). They are rated at 58 MW each (at any temperature below 19 degrees Centigrade (°C) (~66 degrees Fahrenheit (°F))). The Trent 60 WLE has a heat rate of approximately 9,500 HHV Btu/kW-hr and a corresponding thermal efficiency of 35.8%. A Trent 60 nominal performance curve is provided as Figure 2-5.

The Trent 60 is a "quick-start" machine. As shown on Figure 2-6, the machine can be started and brought to full power (58 MW) in slightly less than 10 minutes. This response time is very useful to the grid operators (ISO-NE). The Trent 60 can run efficiently at as little as 50% of its full rated power. Accordingly, the two unit facility could operate in a range extending from 29 MW (one unit at 50% load) to 116 MW (two units at 100% load).

Assembled at the Rolls-Royce plant in Mount Vernon, Ohio, the Trent 60 has a weatherproof painted carbon steel enclosure which houses the gas turbine itself, the inlet plenum, fuel and oil systems, exhaust volute and enclosure ventilation air systems. Figure 2-7 provides a photo of the gas turbine enclosure, with the gas turbine itself removed for inspection.

As shown in Figure 2-8, a sizeable inlet filter is located on the top of the gas turbine enclosure. Combustion air and ventilation air for the gas turbine enclosure pass through this inlet filter; the filter removes most of the particulate matter present in ambient air.

2.1.2 AC Generator

Each gas turbine will drive a two pole, open air-cooled AC generator operating at 13.8 kV, three phase, 60 Hz. The generator is housed in an acoustic enclosure. The generator package includes the generator cooling air system and a weatherproof painted carbon steel canopy for sheltering the AC generator, exciter, line and neutral cubicles

2.1.3 Air Pollution Control System

The other major element of the gas turbine package is the air pollution control system. In addition to the combustion chamber water injection system and combustion controls, the air pollution control system includes an SCR system, the associated ammonia injection system, an oxidation catalyst, a Continuous Emissions Monitoring System (CEMS) and an exhaust stack.

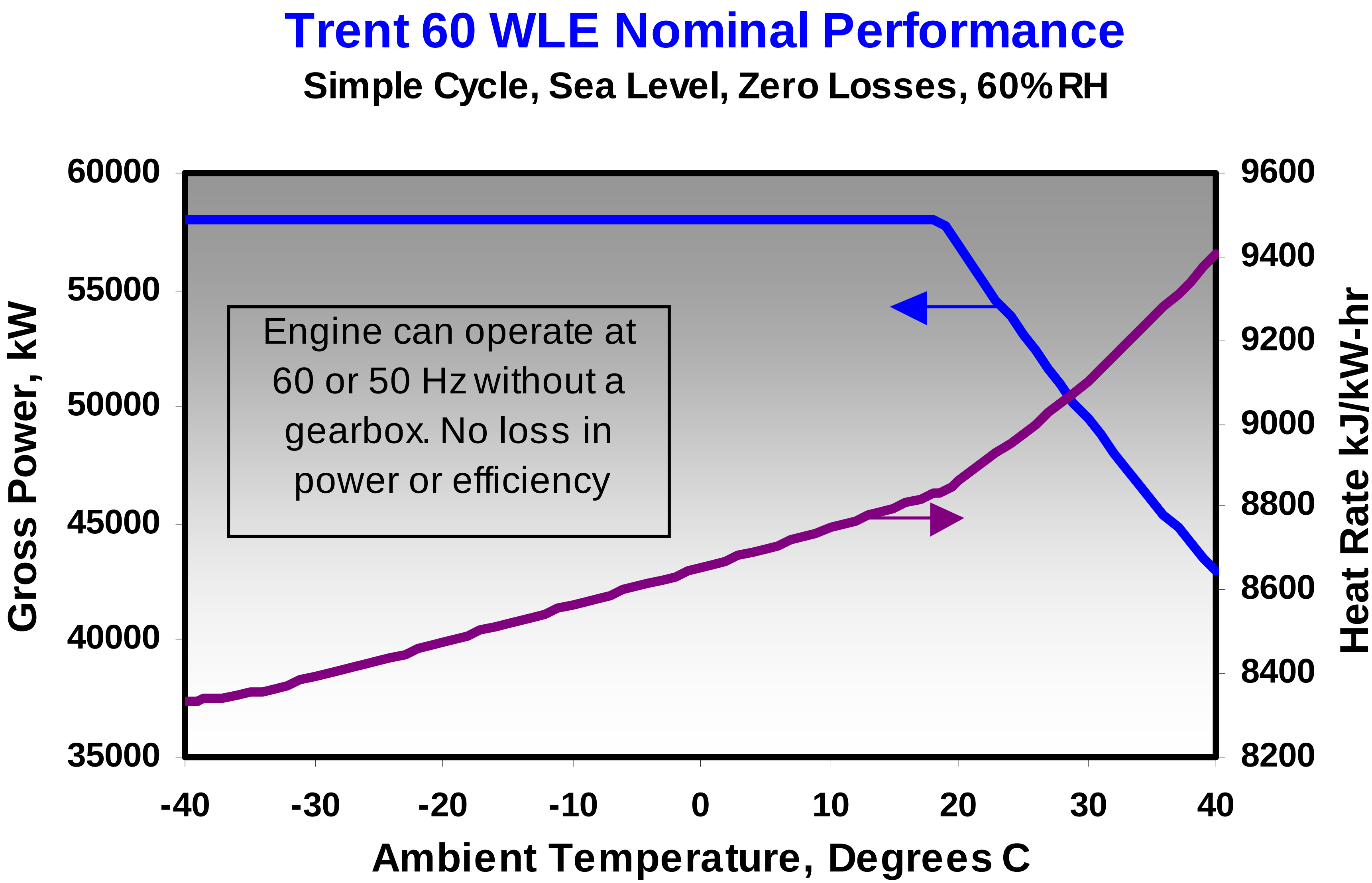

Figure 2-5
Performance Curve Trent 60 (Gas and Oil)

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: Rolls-Royce

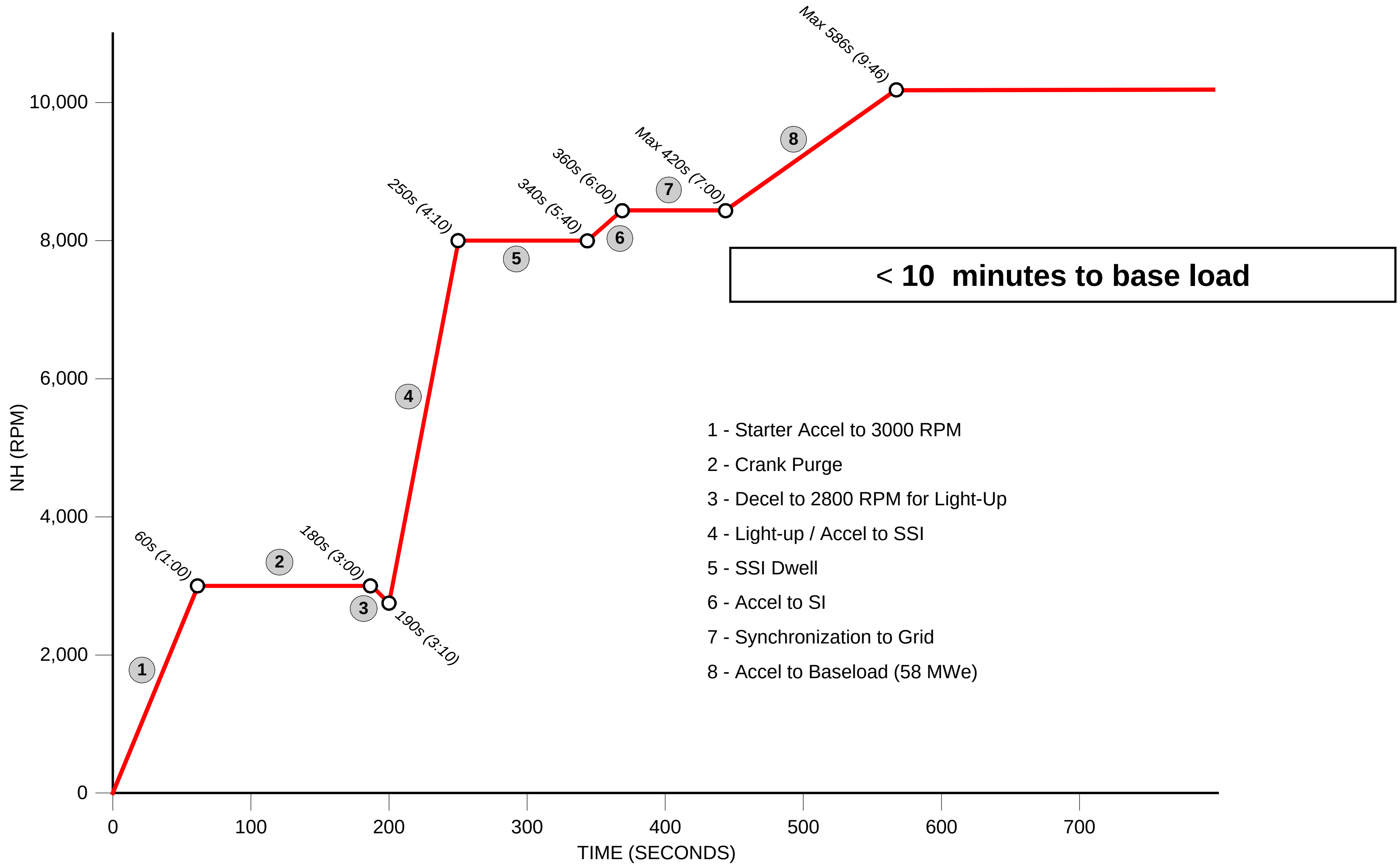

Figure 2-6
Start-up Sequence

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: Rolls-Royce

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Figure 2-7
Photo of Gas Turbine Enclosure

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: Rolls-Royce

Trent 60 GenSet - Package

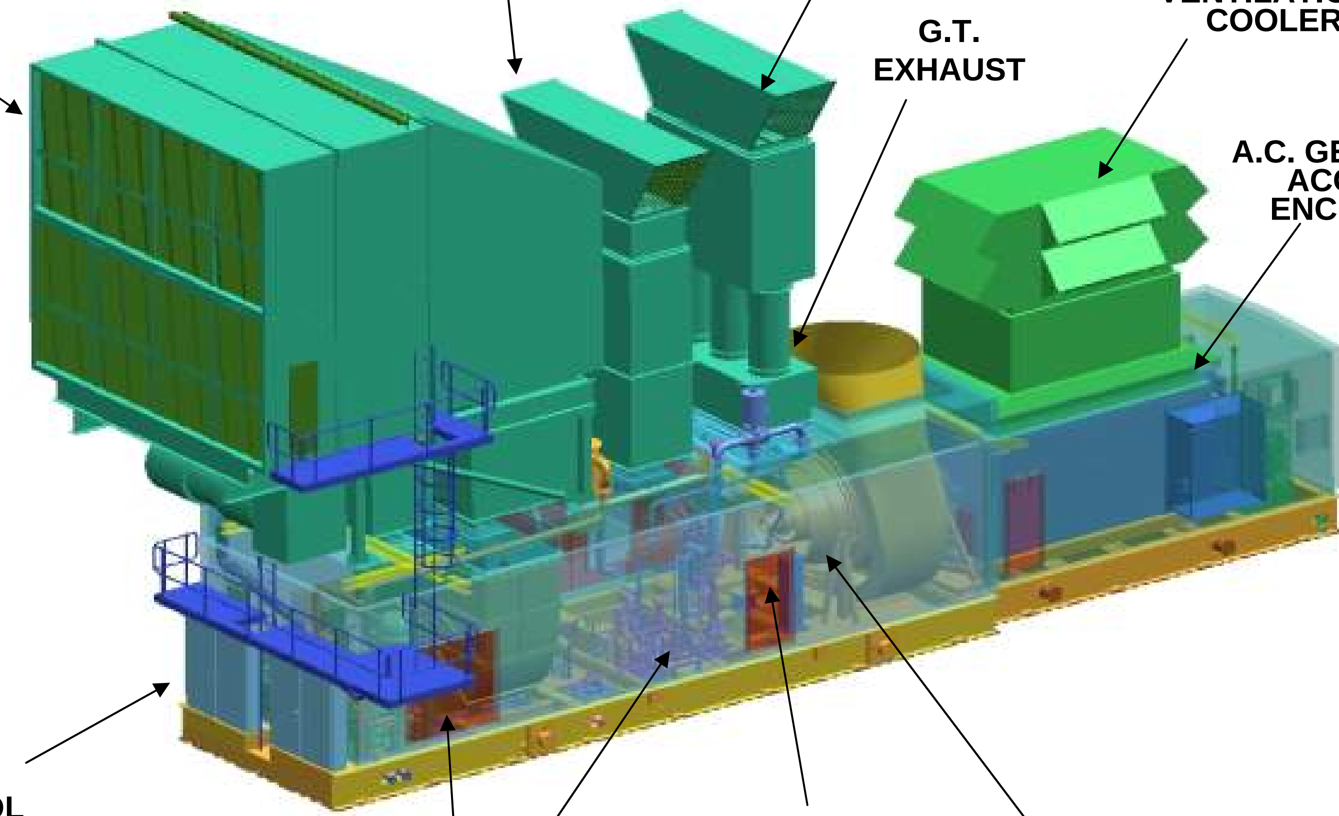

Figure 2-8
Inlet Filter

Source: Rolls-Royce

Thomas A. Watson Generating Station
Braintree, Massachusetts

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NO_x emissions will be controlled by the use of water injection and SCR to limit NO_x emissions to 2.5 parts per million, volumetric dry corrected to 15% O_2 (ppmvd)[5] when firing on gas and to 5.0 ppmvd when firing on ULSD oil. CO emissions will be controlled to 5.0 ppmvd when firing gas or ULSD by combustion controls and an oxidation catalyst. VOC emissions will be controlled to a maximum of 2.5 ppm when firing gas or 4.5 ppm when firing ULSD via combustion controls and an oxidation catalyst. $PM_{10}/PM_{2.5}$ emissions will be limited to 0.009-0.012 lb/MMBtu when firing natural gas and 0.027-0.051 lb/MMBtu when firing ULSD.

For each turbine, the SCR system and the oxidation catalyst are housed in an insulated steel enclosure. As shown on Figure 2-9, the enclosure is expected to be approximately 30 feet in length and 22 feet in height. Exhaust gases from the gas turbine pass through the catalyst beds, and then exit via the exhaust stack. The Watson Station will have two 100 foot tall steel stacks.

2.1.4 Water Supply and Demineralization System

The Rolls-Royce Trent 60 WLE introduces demineralized water into the annular combustion system so as minimize the formation of nitrogen oxides. The Trent 60 is equipped with an online monitoring system which allows for a reduction in water usage due to changes in power demand and ambient conditions while continuing to maintain the desired NO_x levels at the turbine exhaust (25 ppm).

Water from the Town of Braintree municipal system will be used to supply a 400 gallon per minute (gpm) trailer-mounted demineralization system. The high purity treated water will be stored in a 400,000 gallon demineralized water storage tank until it is needed. As necessary, the trailer-mounted demineralization system will be removed from the site and replaced by a fresh system. The spent demineralization system will be regenerated at an offsite commercial facility and subsequently reused. At expected load conditions, the demineralizer system will be removed/replaced on a weekly basis.

The proposed Watson Station will use approximately 137,000 gallons per day (gpd) of water when operating under high-demand summer load conditions (two Rolls-Royce Trent 60 combustion turbines at 100% load for 16 hours per day, with evaporative coolers in operation). Demineralized water requirements for the new facility will be considerably lower on an expected annual average basis. Other plant water uses will be minor (control building rest rooms, periodic maintenance wash water). The Town of Braintree Department of Public Works has indicated that the Town system has sufficient capability to provide the water required for operation of the Watson power project.

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5 All concentration based emissions for turbines are assumed to be corrected to 15%O_2.

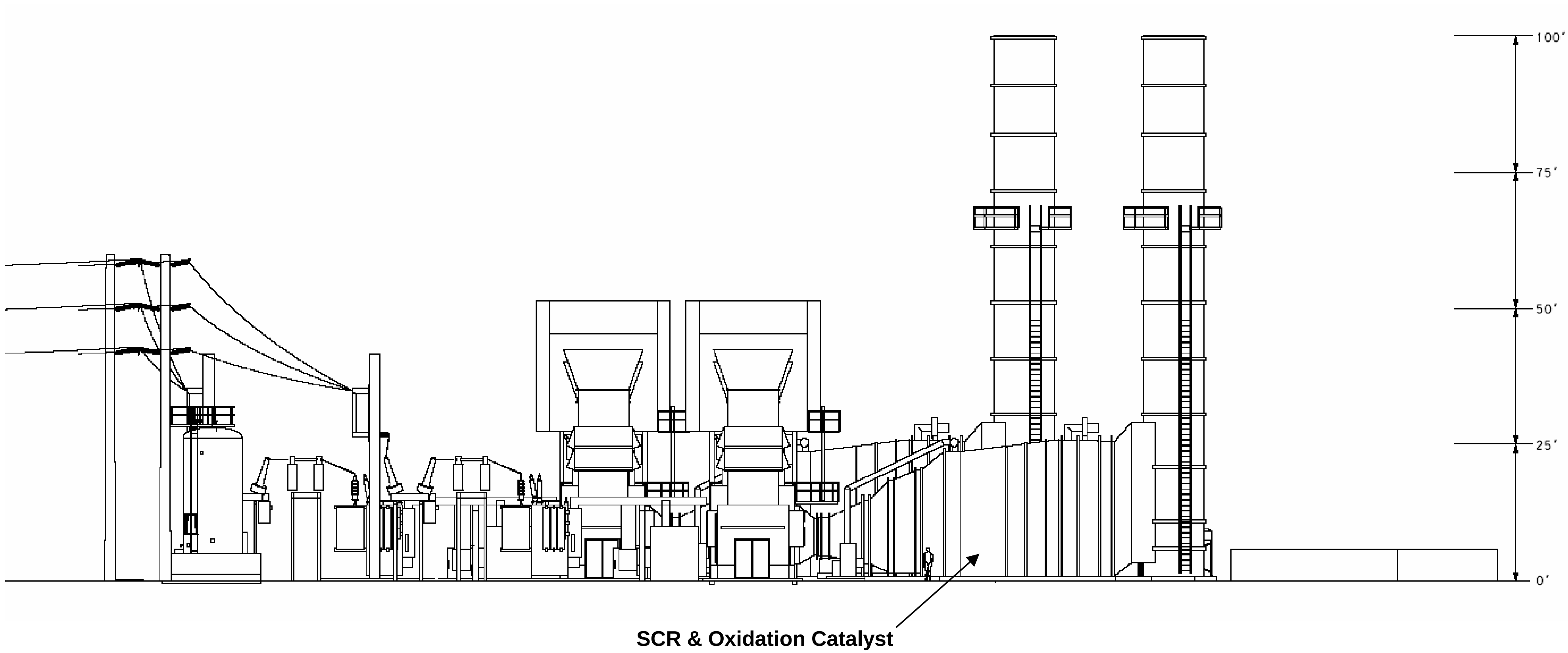

Figure 2-9
SCR System and Oxidation Catalyst

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: CH2MHILL

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2.1.5 *Aqueous Ammonia Storage*

Aqueous ammonia, a water solution containing up to 19% ammonia by weight, is the reagent used in the SCR system. In the presence of a catalyst, ammonia (NH_3) selectively reacts with nitrogen oxides (NO_2, NO) to form water (H_2O) and nitrogen gas (N_2), the primary component of the Earth's atmosphere.

The aqueous ammonia storage tank will have a capacity of approximately 15,000 gallons. This represents about 30 days of storage at the maximum usage rate. This tank size will allow BELD to accept full trailer deliveries (typically 6,000 gallons) thus minimizing the number of deliveries required each year. Aqueous ammonia can be supplied from Borden & Remington Chemicals in Fall River, MA (which currently supplies the Fore River Generating Station) or by other suppliers.

The vertical tank will be approximately 25 feet in height and will be placed in a full capacity (110%) concrete dike. The dike will include a layer of small floatable spheres so as to minimize exposed surface area in the event of a leak or spill. This is a standard mitigation measure for aqueous ammonia storage tanks. The truck offloading area will be properly curbed with a sump to contain any spill during unloading.

2.1.6 *Facility Noise Control Features*

In addition to full acoustical enclosures for the gas turbines and the generators, the Watson Station will be equipped with a full complement of acoustical controls. These controls will include combustion air inlet silencers, multi layer insulation for the SCR/oxidation catalyst enclosure, additional silencing within the SCR enclosure, gas turbine exhaust silencers, and an acoustically treated building to house the natural gas compressors. A complete discussion of the expected noise control features and their effectiveness in limiting noise at the nearest residences is provided in Section 7.

2.2 Emissions Summary

2.2.1 *Criteria Emissions*

The proposed emissions rates and annual potential emissions from the Watson Station are summarized in Table 2-1. The potential emissions are calculated based on 8,760 hours per year of full load operation, (5,880 hours on natural gas and 2,880 hours on ULSD). The conservatively assumed sulfur content of natural gas (0.8 gr/ccf) is higher than the sulfur content of ULSD (15 ppm); therefore potential annual SO_2 emissions are conservatively calculated assuming that natural gas is fired 8,760 hours per year.

Facility emissions will be controlled to BACT/LAER levels. The facility proposes to use water injection and SCR to minimize NO_x emissions. Combustion controls and an Oxidation Catalyst will be used to minimize CO and Volatile Organic Compound (VOC) emissions.

Sulfur Dioxide (SO_2) and Particulate Matter (PM_{10} and $PM_{2.5}$) emissions will be controlled via the use of the cleanest fossil fuels, natural gas and ULSD. The full air pollution control technology analysis is presented in Section 4.

Table 2-1 BACT/LAER Emissions Summary, Watson Station

Fuel	Natural Gas		ULSD			
Pollutant	ppm[6]	lb/MMBtu	ppm[6]	lb/MMBtu	tpy	Method
NO_x	2.5	0.0091	5.0	0.019	58.8	Water injection and SCR
CO	5.0	0.011	5.0	0.012	53.5	Combustion Controls and Oxidation Catalyst
VOC	1.0-2.5	0.0013-0.0031	1.5-4.5	0.0020-0.0059	7.6	Combustion Controls and Oxidation Catalyst
PM_{10}/$PM_{2.5}$	NA	0.01-0.02	NA	0.03-0.05	72.9	Use of natural gas and Ultra Low Sulfur Distillate (ULSD)
SO_2	NA	0.0024[7]	NA	0.0015[8]	11.5	Use of natural gas and ULSD.

In concert with the commissioning of the proposed Watson Station, BELD has committed to use ULSD at the existing 95 MW Potter II combined-cycle unit. ULSD has a sulfur content of 0.0015% (15 ppm) as opposed to the current 0.3% (3,000 ppm) distillate used at Potter II. Accordingly, the facility's **potential** and **permitted** SO_2 emissions will be reduced from 1,337 tpy to 40 tpy[9]. As summarized in Table 3-2, **actual** SO_2 emissions from Potter II firing 0.3% sulfur distillate and natural gas have been approximately 62 tons per year in recent years.

Potter II's potential, permitted and proposed permitted emissions are summarized in Table 2-2.

6 All turbine emissions reported in ppm are in units of ppmvd @ 15% O_2.

7 Emission rate conservatively assumes 0.8 gr/ccf sulfur content. The sulfur content in the Algonquin pipeline has never been greater than 0.5 gr/ccf resulting in a conservative estimate of SO_2 emissions for the proposed Watson Station.

8 Emission rate uses ULSD sulfur content of 15 ppm.

9 40 tpy potential/permitted SO_2 emission rate based on 8760 hours per year operation, conservatively firing natural gas with an assumed sulfur content of 3 gr/ccf (per BELD's current operating permit).

Table 2-2 Potter II Emissions Summary (existing 95 MW combined-cycle unit)

Pollutant	Potential Emissions, tpy	Current Permitted Emissions, tpy	Proposed Permitted Emissions, tpy
NO_x	2,029	902	902
CO	655	655	655
VOC	10	10	10
$PM_{10}/PM_{2.5}$	523	523	523
SO_2	1,337	1,337	40

As an existing facility, Potter II is subject to Reasonably Achievable Control Technology (RACT) standards. Under RACT, permitted emissions for NO_x are 42 ppm (0.155 lb/MMBtu) when firing natural gas and 65 ppm (0.253 lb/MMBtu) when firing oil. As Potter II's tested emissions are somewhat higher (approximately 0.22 lb/MMBtu when firing natural gas and 0.47 lb/MMBtu when firing oil), BELD has elected to achieve compliance with its NO_x RACT emission limits by purchasing the necessary emission offsets.

Potter II's actual emissions are summarized in Section 3.1 with respect to Nonattainment New Source Review (NSR) and Prevention of Significant Deterioration (PSD) requirements.

2.2.2 Non-Criteria Emissions

The proposed emissions rates and annual potential non-criteria pollutant emissions from the Watson Station are summarized in Tables 2-3 (Hazardous Air Pollutants) and 2-4 (Other Non-Criteria Pollutants). Identical assumptions were made for full load operation. In the case where the natural gas emission rate is higher than the ULSD emission rate, the natural gas rate is assumed for 8,760 hours per year.

Table 2-3 Non-Criteria Emission Rates (Hazardous Air Pollutants)

Emissions	Natural Gas			ULSD			Maximum
Units	lb/MMBtu[1]	lb/hr[2]	tpy	lb/MMBtu[1]	lb/hr[2]	tpy	tpy
1,3-Butadiene[3]	4.3E-07	4.7E-04	0.002	1.6E-05	1.7E-02	0.025	0.026
Acetaldehyde	4.0E-05	4.4E-02	0.19				0.19
Acrolein	6.4E-06	7.0E-03	0.03				0.03
Benzene	1.2E-05	1.3E-02	0.057	5.5E-05	5.9E-02	0.085	0.12
Ethylbenzene	3.2E-05	3.5E-02	0.15				0.15
Formaldehyde	7.1E-04	7.7E-01	3.39	2.8E-04	3.0E-01	0.432	3.39
Naphthalene	1.3E-06	1.4E-03	0.0062	3.5E-05	3.7E-02	0.054	0.058
PAH	2.2E-06	2.4E-03	0.01	4.0E-05	4.3E-02	0.062	0.07
Propylene oxide[3]	2.9E-05	3.2E-02	0.14				0.14
Toluene	1.3E-04	1.4E-01	0.62				0.62
Xylenes	6.4E-05	7.0E-02	0.31				0.31
Arsenic[4]				1.1E-05	1.2E-02	0.017	0.017
Beryllium[3]				3.1E-07	3.3E-04	0.0005	0.0005
Cadmium				4.8E-06	5.1E-03	0.007	0.007
Chromium				1.1E-05	1.2E-02	0.017	0.017
Lead				1.4E-05	1.5E-02	0.022	0.022
Manganese				7.9E-04	8.5E-01	1.218	1.22
Mercury				1.2E-06	1.3E-03	0.002	0.002
Nickel[3]				4.6E-06	4.9E-03	0.007	0.007
Selenium[3]				2.5E-05	2.7E-02	0.039	0.04
Total HAPs							6.44
Maximum HAP							3.39

1) Emission factors are, except where noted, from AP-42, 4/2000.
2) Maximum hourly emission rate based on oil-firing 100% Load, 59°F ambient temperature, gas-firing based on 100% load, 59ºF.
3) Compound was listed as "not detected" in AP-42. The emission factor denotes one-half the detection limit.
4) Arsenic emissions were based on a Survey of Ultra-Trace Metals in Gas Turbine Fuels, by Rising, Wu and Sorurbakhsh, presented at the 11th Annual International Petroleum Environmental Conference, Oct 12-15, 2004. The paper can be found at: http://ipec.utulsa.edu/Conf2004/Papers/rising_wu_sorurbakhsh.pdf

The emission rates for total Hazardous Air Pollutants (HAPs) are less than 25 tons per year and each individual HAP is less than 10 tons per year. Therefore, the facility is a minor source of HAPs.

Table 2-4 Other Non-Criteria Emission Rates

Emissions	Natural Gas			ULSD			Maximum
Units	lb/MMBtu	lb/hr[1]	tpy	lb/MMBtu[1]	lb/hr[2]	tpy	tpy
Ammonia[2]	6.7E-03	7.32	32.08	7.1E-03	7.64	11.00	32.53
Sulfuric Acid[3]	2.6E-03	2.81	12.29	1.6E-03	1.74	2.50	12.29

[1] Maximum hourly emission rate based on oil-firing 100% Load, 59°F ambient temperature, gas-firing based on 100% load, 59ºF.
[2] Ammonia is based on 5.0 ppmvd corrected to 15% O_2 (ammonia slip) on natural gas and ULSD.
[3] Sulfuric Acid is derived based on a nominal 70 percent conversion of sulfur in fuel to SO_3 by oxidation over the combustion turbine and CO catalyst (if any), and SCR catalyst. It is further conservatively assumed that 100% if the SO_3 converts to H_2SO_4 rather than to ammonium sulfate salts or remaining SO_2.

Section 3.0

Regulatory Requirements

3.0 REGULATORY REQUIREMENTS

The principal air quality regulatory programs that potentially apply to the proposed facility are the Massachusetts Air Plan Approval program (310 CMR 7.02), the Nonattainment NSR provisions (310 CMR 7.00 Appendix A and B) and the PSD requirements of 40 CFR 52.21. The Air Plan program is administered by DEP while the NSR and PSD programs are administered by the EPA.

3.1 Overview of Applicability of Federal Regulations

As discussed further in Section 3.1.3 below, the EPA has promulgated NAAQS and Massachusetts has adopted similar state air quality standards (MAAQS). Federal and state air regulations are designed to ensure that ambient air quality is in compliance with the ambient standards. Each area of the country has been classified as in "attainment," "nonattainment," or "unclassified" with respect to ambient standards. If an area is classified as "attainment" or "unclassified" for a particular pollutant, then PSD review applies, including the application of BACT and a demonstration of compliance with the NAAQS. If an area is designated as "nonattainment" for any pollutant, and if the proposed facility is a major source of the nonattainment pollutant, then Nonattainment NSR applies. This includes the application of more stringent pollution control requirements known as LAER and the need to secure emission offsets.

The NSR and PSD regulations apply to new "major sources" and also to "major modifications" of existing stationary sources of emissions. EPA regulations will treat as a single source "all of the pollutant emitting activities which belong to the same industrial grouping (SIC/NAICS Code), are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control)."[10] Watson Station and Potter II belong to the same industrial grouping (electric power generation, fossil fuel) and are located on the same larger, single parcel, and will both be under the control of BELD. Accordingly, Potter II's emissions will need to be taken into account for purposes of applying NSR and PSD to Watson Station.

In March of 2003, the US EPA promulgated new regulations implementing changes to the NSR programs for PSD and Nonattainment NSR. Massachusetts did not accept the changes to the NSR program and as consequence relinquished authority for implementation of the PSD part of the NSR program. Since Massachusetts is no longer a "delegated" state under PSD, new major sources and major modifications to existing sources must obtain approval from the US EPA under the federal program at 40 CFR 52.21. Massachusetts is currently evaluating Nonattainment NSR under 310 CMR 7.00 Appendix A.

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[10] 40 C.F.R. §§ 51.165 (a)(1)(i) and (iv).

The NSR requirements for major sources include meeting the New Source Performance Standards (NSPS), which constitute a set of national emission standards for major stationary sources of air pollution. These emission standards are applicable to specific categories of sources and apply only to new sources of air pollution. The major requirements are summarized below:

- The Facility cannot cause or contribute to the violation of any National or Massachusetts State Ambient Air Quality Standard;
- The Facility must meet all requirements of the NSR program;
- The Facility must meet all requirements of the Clean Air Act Amendments of 1990; and
- The Proponent must obtain a Massachusetts Plan Approval for the facility before commencement of construction at the site and an Operating Permit before commencement of commercial operations.

In September of 2006, EPA issued revised NAAQS for $PM_{2.5}$ which went into effect in December of 2006. The new NAAQS for $PM_{2.5}$ went from a daily standard of 65 $\mu g/m^3$ to 35 $\mu g/m^3$. The annual standard remains unchanged at 15 $\mu g/m^3$. EPA is in the process of revising the NSR and PSD thresholds for $PM_{2.5}$. Until the $PM_{2.5}$ thresholds are promulgated, it is our understanding that States should use PM_{10} as surrogate to address the $PM_{2.5}$ requirements for NSR and PSD.

As demonstrated in this Application, the Project will meet all applicable emissions standards and ambient air quality standards.

3.1.1 Nonattainment New Source Review

The Clean Air Act Amendments of 1990 (CAAA) define levels of nonattainment classifications for ozone (O_3). The entire Commonwealth of Massachusetts is classified as a moderate nonattainment area for O_3 (40 CFR 81.322). Accordingly, there are special requirements for sources of VOC and NO_x which are the two O_3 precursors that are regulated by the Clean Air Act (Clean Air Act §182(f), 42 U.S.C. 7511(f)). Nonattainment NSR relative to O_3 is required for emissions of VOC and/or NO_x for new major sources or major modifications to existing sources. In moderate ozone nonattainment areas, the threshold for applicability of NSR for nonattainment is 50 tons per year (tpy) for new “major sources”, and 25 tpy for “major modifications“.

Potter II is an existing facility with potential NO_x emissions which exceed 100 tpy, therefore, the existing Potter II facility is considered a “major” source of NO_x. (See Table 2-2) Potential VOC emissions for Potter II are less than 50 tpy (approximately 7.6 tpy of potential emissions); therefore, the facility is not a “major” source of VOC. Accordingly, the proposed plant is not subject to NSR for VOC.

In that Potter II is a "major" source of NO_x, the next step in the process is to examine the applicability of the "major modification" threshold. To make this determination, "past actual" emissions from Potter II are compared with "future potential" emissions from the proposed Watson Station. Future potential emissions are conservatively calculated based on the assumption that the Watson Station will operate at 100% capacity, 8760 hours per year. The potential NO_x emissions for the proposed Watson Station are 58.8 tons per year. (See Table 3-1, below)

The baseline NO_x emissions for the BELD's Potter II plant are 76 tons of NO_x, the average of the most representative emissions (2001 and 2002) from the last five years of available data. Potential emissions from the new Watson Station plus the baseline emissions are 134.4 tons per year (58.8 tpy + 75.6 tpy), an increase of 58.8 tons per year. Since the NO_x emissions increase is greater than 25 tons per year, the proposed Watson Station is subject to nonattainment NSR for NO_x.

Applicable NSR requirements for nonattainment include application of LAER technology and acquisition of emission offsets. For major sources of NO_x in a moderate ozone nonattainment region, offsets are required at a minimum ratio of 1.26 to 1.[11] BELD will purchase the necessary NO_x offsets for the new Watson Station (58.8 tpy x 1.26 = 74 tpy NO_x offsets required). NO_x offsets are available from the facilities that have generated real and quantifiable reductions in emissions by either shutting down equipment or over-controlling beyond the regulatory requirements.

Table 3-1 Maximum Potential Annual Emissions for the Proposed Watson Station

Pollutant	Maximum Potential Annual Emission Rate (tpy)
NO_x	58.8
SO_2	11.5
$PM_{10}/PM_{2.5}$	72.9
CO	53.5
VOC	7.6

Notes: assumes turbines operate 245 days per year on natural gas at 100% load (59°F), and 120 days on ULSD 100% load (59°F).

SO_2 emissions conservatively assume 365 days per year on natural gas at 100% load (59°F) as the sulfur content of natural gas is higher than ULSD, so potential SO_2 emissions would be greater on natural gas.

11 5% over 1.2:1 ratio is required for the use of any offset per 310 CMR 7.00 Appendix B.

3.1.2 Prevention of Significant Deterioration (PSD)

The prevention of significant deterioration of air quality (PSD) applicability procedures are given in 40 CFR 52.21 (a)(2). PSD requirements apply to the construction of new major stationary sources or major modifications in areas designated as attainment or unclassifiable under Sections 107 (d)(1)(A)(ii) or (iii) of the Clean Air Act. The project is considered a major modification if it causes a significant emissions increase and results in a significant net emissions increase. The procedure for calculating whether a significant increase will occur is given in 52.21 (a)(2*)(c)*-(*f*).

The existing Potter II unit (combined cycle turbine) is a fossil fuel-fired steam electric plant of more than 250 million Btu/hr heat input (one of the 28 source categories defined in 52.21 (b)(1)(i)(*a*)). The potential to emit from the existing unit exceeds 100 tons per year for NO_x, SO_2, PM_{10} and CO; therefore it is considered an existing major stationary source.

As part of this project, the Potter II unit will reduce SO_2 emissions by switching from conventional distillate fuel oil (0.3%S or 3,000 ppm) to ULSD (0.0015%S or 15 ppm). The current and proposed potential emissions for the existing facility (Potter II unit) are given below.

Table 3-2 Maximum Potential Annual Emissions for the Existing Potter II Unit

Pollutant	Current Permitted Emissions (tpy)	Proposed Potential Emissions (tpy)
NO_x	902	902
CO	655	655
PM_{10}	523	523
SO_2	1,337	40

The facility is located in an area where the air quality is designated as in attainment for NO_x, CO, SO_2, and PM_{10}.

The proposed Watson Station simple cycle units will be considered a "major modification" of this facility and therefore are subject to PSD regulations if emissions increases are equal to or greater than EPA significance criteria ("PSD Significant Emission Rates" as per 52.21(b)(40) for major modifications). The emission increases from the modification exceed the PSD Significant Emission Rates for NO_x and PM_{10} as shown in Table 3-3.

Table 3-3 Significant Emissions Increase Test for Comparison to PSD Significant Emission Increase Rates

Pollutant	Watson Station Units Maximum Potential Annual Emissions Rate (tpy)	PSD Significant Emission Rates (tpy)	Exceeds PSD Significant Emission Rates
NO_x	58.8	40	Yes, >40
CO	53.5	100	No, <100
PM_{10}	72.9	15	Yes, >15
SO_2	11.5	40	No, <40

As shown in Table 3-2, BELD does not plan to reduce NO_x and PM_{10} emissions from the existing Potter II facility so there is no need to conduct the second test for PSD applicability, a net emissions increase determination (52.21(b)(3)).

The project is not a major modification for SO_2 and CO. Since the proposed project SO_2 and CO emissions are not significant, the PSD regulations do not require consideration of contemporaneous emissions increases or decreases of SO_2 or CO.

Based on the significant emissions increase analysis, the proposed modification is subject to PSD review for both NO_x and PM_{10}. As per 52.21 the project will need to meet BACT for NO_x and PM_{10}. However, BACT for NO_x will be identical to the proposed LAER limit, (SCR combined with water injection). BACT for PM_{10} will be the use of natural gas as the primary fuel and ULSD as the alternate fuel.

Based on the refined modeling results (See Table 6-9), modeled ground level concentrations are well below Significant Impact Levels (SILs) for all pollutants and averaging periods. Therefore, a PSD increment consumption analysis will not be required.

3.1.3 Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, EPA has promulgated NAAQS for these criteria pollutants; nitrogen dioxide (NO_2), SO_2, PM (PM_{10} and $PM_{2.5}$), CO, O_3, and lead (Pb). The DEP has also promulgated these limits, plus it has also adopted a 1-hour ambient guideline limit for NO_2 as the MAAQS. The NAAQS/MAAQS along with the appropriate SILs are listed in Table 3-3.

The NAAQS presented in Table 3-3 specify concentration levels for various averaging times. The NAAQS include both "primary" and "secondary" standards. The primary standards are intended to protect human health; whereas, the secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation. The more stringent of the primary or secondary standards are applicable to the evaluation of the proposed Project.

Table 3-3 National and Massachusetts Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS/MAAQS ($\mu g/m^3$)		Significant Impact Level ($\mu g/m^3$)
		Primary	Secondary	
NO_2	Annual (1)	100	Same	1
	1-hour(2)	320	None	32
SO_2	Annual (1)	80	None	1
	24-hour (2)	365	None	5
	3-hour (2)	None	1,300	25
PM_{10}	Annual (6)	Revoked by EPA, 50 (MAAQS)	Same	1
	24-hour (3)	150	Same	5
$PM_{2.5}$	Annual (4)	15	Same	TBD
	24-hour (5)	35	Same	TBD
CO	8-hour (2)	10,000	Same	500
	1-hour (2)	40,000	Same	2,000
Ozone	8-hour (3)	235	Same	N/A
Pb	3-month (1)	1.5	Same	N/A

[1] Not to be exceeded

[2] Not to be exceeded more than once per year.

[3] Not to be exceeded more than an average of one day per year over three years.

[4] Not to be exceeded by the arithmetic average of the annual arithmetic averages from 3 successive years.

[5] Not to be exceeded based on the 98th percentile of data collection.

[6] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).

Source: 40 CFR 50 and 310 CMR 6.00

The NAAQS also reflect various durations of exposure. The NAAQS for short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term NAAQS refer to limits that cannot be exceeded for exposure averaged over three months or longer.

The Inhalable Particulate (PM_{10}) NAAQS were promulgated on July 1, 1987 at the federal level with the intent of replacing the existing standards limiting ambient levels of Total Suspended Particulate (TSP). EPA also promulgated a new Fine Particulate ($PM_{2.5}$) NAAQS effective December 2006. Based on recent discussions with DEP, air dispersion modeling should be conducted for comparison to the annual standard of 15 $\mu g/m^3$ and the 24-hour standard of 35 $\mu g/m^3$.

The Braintree area in Norfolk County is presently unclassified or in attainment for NO_2, SO_2, PM_{10}, CO and Pb and classified as a moderate nonattainment area for the 8-hour ozone standard. The area is currently classified as attainment/unclassifiable for $PM_{2.5}$.

In order to identify those new sources with the potential to significantly alter ambient air quality, the EPA and DEP have adopted SILs for the contaminants with ambient air quality standards. As shown in Table 3-3, the SILs are small fractions of the health protective National Ambient Air Quality Standards. For new sources that exceed these levels, the air quality impact analysis is required to include the new source, existing interactive sources and measured background levels. If the new project impacts are above the SILs, then interactive source modeling is required for comparison to the NAAQS. As discussed in Section 6, the proposed Project will be well below SILs for all pollutants. Accordingly, interactive modeling is not required.

3.1.4 New Source Performance Standards

The NSPS regulate the amount of air contaminants that may be emitted from a given process. For combustion sources, emission standards are typically expressed in terms of fuel quality or exhaust gas concentration. The EPA has established NSPS for various categories of new sources. The EPA NSPS requirement applicable to the new BELD Project is 40 CFR 60 Subpart KKKK for the gas turbine. This requirement applies to all stationary combustion turbines with a heat input greater than 10 MMBtu/hr constructed after February 18, 2005. Project emissions rates will be well below the NSPS.

The applicable NO_x standard for the proposed turbine is 0.43 lb/MW-hr (approximately 15 ppmvd) when firing natural gas and 1.3 lb/MW-hr (approximately 42 ppmvd) firing oil. Accordingly, project NO_x emissions, 0.085 lb/MW-hr (2.5 ppm) when firing natural gas and 0.18 lb/MW-hr (5 ppm) when firing ULSD) will be far below the NSPS limit.

Under the Federal NSPS, SO_2 emissions are limited based on fuel sulfur content (20 grains per 100 cubic feet (gr/ccf) of natural gas or 0.05% (500 ppm) sulfur by weight in fuel oil). For the proposed Watson Station, the estimated sulfur content of natural gas is 0.8 gr/ccf while ULSD will have a 0.0015% (15 ppm) sulfur content. Both fuels are well below the NSPS limits.

3.1.5 Title IV Sulfur Dioxide Allowances and Monitoring (40 CFR 72 and 75)

Pursuant to 40 CFR 72, the proposed Watson Station will be designated as a Phase II Acid Rain "New Affected Unit" on January 1, 2009, or 90 days after commencement of commercial activities, whichever comes later, but not after the date the facility declares itself commercial. As one of the features of the Acid Rain Program, EPA has established a program to reduce SO_2 emissions from existing power plants by allocating allowances to existing power plants and by requiring new plants to purchase allowances to offset their potential to emit SO_2. Allowances are available through the Chicago Board of Trade and will be secured by the Project.

In accordance with these regulations, the Project will have a Designated Representative (DR) and install a Continuous Emissions Monitor System (CEMS). The DR is the facility representative responsible for submitting required permits, compliance plans, emission monitoring reports, offset plans, compliance certification, and is responsible for the trading of allowances. The CEMS will meet the requirements specified in EPA 40 CFR 75 for monitoring SO_2, NO_x, and CO_2 emissions (lb/MMBtu) as well as opacity and volumetric flow of the flue gas. EPA allows gas and oil-fired facilities to conduct fuel quality and fuel flow monitoring in place of SO_2 monitoring.

3.2 Massachusetts Regulations and Policies

3.2.1 Air Plan Approval

The DEP requires an Air Plan Approval for all new facilities exceeding specific thresholds set forth in 310 CMR 7.02. Because of the potential to emit greater than 50 tons of NO_x annually, the Watson Station will require a Major Source Comprehensive Air Plan approval. The regulation prohibits the construction, substantial reconstruction, or alteration of any regulated facility unless the plans, specifications, proposed standard operating procedures and proposed maintenance procedures for such a facility have been approved by the DEP. It is through this preconstruction permit review process that the DEP implements the key federal requirements for demonstration of compliance with the NAAQS, nonattainment NSR and compliance with NSPS. In addition, the Air Plan Approval process serves as the state's mechanism for reviews in accordance with the State's noise policy.

In addition to the requirements set forth in 310 CMR 7.02, the regulations also require the application of "Massachusetts BACT" for each pollutant regulated as part of the Air Plan review. Therefore, in addition to LAER requirements for NO_x, the proposed Project will incorporate Massachusetts BACT for the remaining criteria pollutants and Massachusetts BACT for all pollutants. BACT is based on the maximum degree of reduction of any regulated air contaminant, which the DEP determines, on a case-by-case basis, is achievable taking into account energy, environmental and economic impacts. In this case, proposed MA BACT limits are equal to the proposed Federal level BACT and LAER Requirements (see Table 2-1).

Based on emissions data provided by Rolls-Royce, LAER for the proposed Watson Station is proposed to be:

- Water injection and SCR for natural gas and ULSD combustion to reduce NO_x emissions; and

BACT for the remaining pollutants is proposed to be:

- The use of natural gas as the primary fuel, thus lowering all criteria and non-criteria pollutants compared to other fuels;
- The use of ULSD (0.0015 percent sulfur) oil as a secondary fuel that lowers SO_2 and $PM_{10}/PM_{2.5}$ emissions compared to higher sulfur oils;[12] and
- An advanced technology combustion turbine, providing a high level of efficiency. The turbine also minimizes incomplete combustion, thus minimizing emissions of VOC, CO and $PM_{10}/PM_{2.5}$.
- Efficient combustion design and an oxidation catalyst to reduce CO and VOC emissions.

The combination of an efficient simple cycle aero-derivative turbine, clean fossil fuels, combustion controls and very effective air pollution control system will produce emissions rates which comply with the aggressive LAER and BACT requirements.

3.2.2 Noise Control Regulation and Policy

DEP regulations, set forth in 310 CMR 7.10 and as interpreted in the DEP Noise Policy 90-001, limit noise increases to 10 dBA over the existing L_{90} ambient level at the closest residence and at property lines. For developed areas, the DEP has utilized a "waiver provision" at the property line in certain cases. This is appropriate when are there are no noise-sensitive land uses at the property line and the adjacent property owner agrees to waive the 10-dBA limit. This may occur when the impact is in an area that is not noise-sensitive such as an adjacent industrial parcel. The ambient noise level may also be established by other means with DEP's consent. DEP also prohibits "pure tone" sounds, defined as any octave band level which exceeds the levels in the two adjacent octave bands by 3 dB or more. A full discussion of noise considerations is provided in Section 7 below.

3.2.3 Emission Limitations for Fossil Fuel Utilization

DEP regulations at 310 CMR 7.02(8), Table 1 limit new fossil fuel utilization facilities greater than 250 MMBtu/hr heat input to a PM emission rate of 0.05 lb/MMBtu. BELD's proposed PM limit ranges from 0.01 to 0.02 lb/MMBtu on natural gas and 0.03 to 0.05 lb/MMBtu on ULSD, thus complying with the DEP limit.

It should be noted Watson Station's emission limits are conservatively based on "front and back half" (method 5 and 202A) catch for PM testing. Based on available data, the "front half" or filterable particulates account for approximately 80% of the total particulate

12 BELD is also switching Potter II from 0.3% sulfur distillate to ULSD. This fuel switch will reduce potential emissions by 1,330 tons of SO_2 per year.

emissions. The PM emission rate specified at 310 CMR 7.02(8), Table 1, (0.05 lb/MMBtu) only specifies front half catch (method 5).

3.2.4 Visible Emissions

Opacity is limited by 310 CMR 7.06 to 20 percent. The Project's opacity will be well below 10 percent.

3.2.5 Short-term NO_2 Policy

On April 20, 1978 and in an update on November 3, 1980 DEP adopted a policy entitled "New Source Performance Criteria for Allowable Ambient NO_2 Concentrations." The policy applies only to new major sources or modifications to an existing source, which would result in increased emissions of 250 tpy of NO_x. The proposed facility is not subject to the DEP NO_2 policy because the Project will have maximum potential NO_x emissions of 58.8 tpy, far below the threshold of 250 tpy of NO_x.

However, the Project's ambient air quality analysis does include a comparison with the 1-hour NO_2 policy limit. The policy requires new major sources to demonstrate that emissions will not result in ambient NO_2 concentrations in excess of 320 $\mu g/m^3$ for any one-hour period on more than one day per year. The compliance demonstration must include the existing background NO_2 level, the impact of the existing area sources, as well as the impact of the new source. For areas where the existing NO_2 level already exceeds 320 $\mu g/m^3$, the impact of the proposed new source will be considered acceptable if it will not increase the hourly concentration by more than 32 $\mu g/m^3$ on more than one day per year when the concentration exceeds 320 $\mu g/m^3$.

As shown in Section 6, the modeled maximum one hour NO_x concentration for the proposed Project is 9.3 $\mu g/m^3$; this is well below the most stringent policy limit.

3.2.6 Operating Permit

BELD will file an application for an operating permit pursuant to 310 CMR 7.00, Appendix C(4)(a). The operating permit is for a fixed term of five years and will define applicable requirements for the facility, including emission limitations, emissions monitoring, operating conditions, and recordkeeping and reporting.

3.2.7 Emission Offsets

As discussed in Section 3.1.1, the facility's proposed emissions increase is greater than 25 tpy of NO_x, so the new facility is required to apply LAER technology and obtain emission offsets for NO_x. Emission offsets will be required at a minimum ratio of 1.26:1 per 310 CMR 7.00 Appendices A and B. NO_x offsets are available from the facilities that have generated real and quantifiable reductions in emissions by either shutting down equipment or over-controlling beyond the regulatory requirements. BELD will obtain the necessary

NO_x offsets (58.8 tpy potential NO_x emissions x 1.26 =74 tpy NO_x offsets) at the appropriate time in the permitting process and construction process.

3.2.8 Intent to Comply with DEP Clean Air Construction Initiative (construction stage)

BELD proposes that all contractors associated with the construction of the Project meet the DEP's Clean Air Construction Initiative.[13] The main aspects of this program include:

- All contractors shall use ULSD fuel in diesel-powered non-road vehicles.
- All non-road engines used on the construction site shall meet the applicable non-road engine standard limitations per 40 CFR 89.112.
- All contractors shall utilize the best available technology for reducing the emission of particulate matter and nitrogen oxides for diesel-powered non-road vehicles. The best available technology for reducing the emission of pollutants is that which has been verified by the EPA or the California Air Resources Board for use in non-road vehicles or on-road vehicles where such technology may also be used in non-road vehicles.
- All contractors shall turn off diesel combustion engines on construction equipment not in active use and on dump trucks that are idling while waiting to load or unload material for five minutes or more.
- All contractors shall establish a staging zone for trucks that are waiting to load or unload material at the work zone in a location where diesel emissions from the trucks will not be noticeable to the public, and;
- All contractors shall locate construction equipment away from sensitive receptors such as fresh air intakes to buildings, air conditioners, and windows.

[13] On November 10, 1998 the Clean Air Construction Initiative was announced in Massachusetts to reduce air emissions generated by heavy-duty construction equipment used in the Central Artery/Tunnel Project. The Clean Air Construction Initiative was sponsored by the Massachusetts Turnpike Authority, the Central Artery/Tunnel Project, EPA-Region I New England, Massachusetts Executive Office of Environmental Affairs, Massachusetts Department of Environmental Protection, Manufacturers of Emissions Control Association and NESCAUM.

Section 4.0

BACT LAER Analysis

4.0 BACT LAER ANALYSIS

Air emissions from BELD's Thomas A. Watson generating facility (Watson Station) will be controlled very efficiently to extremely low levels by the control methods described in this section.

4.1 Emissions Summary

BELD proposes to install two Rolls Royce Trent 60 WLE dual-fuel simple-cycle turbines. The LAER and BACT emission limits for the turbines at this facility are summarized in Table 4-1 and are discussed in greater detail in Sections 4.2 and 4.3.

Table 4-1 BACT/LAER Summary

Fuel	Natural Gas		ULSD		
Pollutant	ppm[1]	lb/MMBtu	ppm[1]	lb/MMBtu	Method
NO_x	2.5	0.0091	5.0	0.019	Water injection and SCR
CO	5.0	0.011	5.0	0.012	Combustion Controls and Oxidation Catalyst
VOC	1.0-2.5	0.0013-0.0031	1.5-4.5	0.0020-0.0059	Combustion Controls and Oxidation Catalyst
$PM_{10}/PM_{2.5}$[2]	NA	0.01-0.02	NA	0.03-0.05	Use of natural gas and ULSD
SO_2	NA	0.0024[3]	NA	0.0015[4]	Use of natural gas and ULSD

[1] All turbine emissions reported in ppm are in units of ppmvd @ 15% O_2.
[2] Emissions based on guarantee of 5 lb/hr on natural gas and 15 lb/hr on ULSD.
[3] Emission rate conservatively assumes 0.8 gr/ccf sulfur content.
[4] Emission rate uses ULSD sulfur content of 15 ppm.

BELD conducted a LAER analysis and a top-down BACT analysis for several types of emissions reduction technology, consistent with EPA and DEP guidance. The results of this analysis are described on a pollutant-specific basis in Sections 4.2 and 4.3 and confirm that the above emission limits meet the definition of LAER and BACT.

4.2 Lowest Achievable Emission Rate Analysis

LAER is defined as "the most stringent emission limitation contained in the implementation plan of any State for such class or category of source, or the most stringent emission limitation achieved in practice by such class or category of source" (US EPA, 1990). The Massachusetts Department of Environmental Protection (DEP) defines LAER in 310 CMR 7.00 as,

. . . for any source, the more stringent rate of emissions based on the following:

(a) The most stringent emissions limitation which is contained in any state SIP for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or

(b) The most stringent emissions limitation which is achieved in practice by such class or category of stationary source. This limitation, when applied to a modification, means the lowest achievable emissions rate for the new or modified emissions units within a stationary source.

LAER is expressed as an emission rate, and may be achieved from one or the combination of: (1) change in the raw material processes; (2) a process modification; and (3) add-on controls. Each technique for achieving LAER is evaluated below.

LAER is specified as both a numerical emissions limit (lb/MMBtu) and an emissions rate (lb/hr). In evaluating LAER, BELD reviewed EPA's recommended sources of information for determining LAER, specifically:

- State Implementation Plan (SIP) limits for that particular class or category of sources;
- Pre-construction or operating permits issued in nonattainment areas; and
- The RACT/BACT/LAER Clearinghouse (RBLC).

4.2.1 Evaluation of Emissions Limiting Techniques

This section reviews potential emissions limiting techniques to determine their applicability to Watson Station.

4.2.1.1 Change in Raw Materials

This emission limiting technique is typically considered for industrial processes that use chemicals such as solvents where substitution with a lower emitting chemical may be technically feasible. In this case, the "raw material" is a fuel to be combusted for the generation of electricity. The only fuels for this project will be natural gas as the main fuel and ULSD as the alternate fuel, which are the fossil fuels that result in the lowest uncontrolled NO_x emissions.

4.2.1.2 Process Modifications

Process modifications are typically considered for industrial processes that use chemicals where a change in the process methods or conditions may result in lower emissions. In this case, the "process" is a combustion turbine firing natural gas as the main fuel and ULSD as the alternate fuel. Watson Station will use the Rolls Royce Trent 60, a very advanced aeroderivative simple-cycle combustion turbine with low-NO_x combustor using water injection for additional NO_x control. This simple-cycle turbine is highly efficient and is designed to be at full power in 10 minutes. These combustors can be considered a "process modification" compared to earlier simple-cycle combustor designs that required more time to reach full power.

Another process modification that has been used to reduce emissions is a dry low-NO_x combustor. A dry low-NO_x combustor does not use water injection to achieve its NO_x limits. However, dry low-NO_x combustors are not available for burners firing both natural gas and ULSD. Additionally, it should be noted that a dry low-NO_x burner for this unit would not result in a lower NO_x emission rate because it provides the same emissions as a water injected unit.

4.2.1.3 Add-on Controls

In addition to the use of a low-NO_x combustor with water injection for additional NO_x control, BELD will install an SCR system. This add-on technology is considered LAER for this type of application.

Two other add-on technologies were considered, but were determined not to be technically feasible of LAER for BELD. These are: 1) Catalytica's combustion based technology, XONON for NO_x control and 2) Emerachem's EMx (SCONOx) system for NO_x control. Neither of these technologies is available for simple-cycle combustion turbines of this size, (*i.e.*, 58 MW firing natural gas and ULSD).

4.2.2 Sources Used to Evaluate LAER

A number of different sources were used to evaluate LAER emission limits. The first step was to perform a search on the EPA's RBLC. The RBLC was searched using the "Find Lowest Emission Rate" option for sources similar to the proposed source: Simple-Cycle Turbines (<25 MW) firing Natural Gas and No. 2 Fuel Oil and Simple-Cycle Turbines (>25 MW) firing Natural Gas and No. 2 Fuel Oil. The BACT analysis reviewed all turbines firing in the simple-cycle mode with power outputs less than 100 MW. The results needed to be edited since a number of the returned limits were actually combined-cycle sources.

The RBLC summarizes the source, the emission limit, and the type of emission limit. The results of these searches are summarized in Appendix D. Where applicable, the results of these searches were further verified at each individual air permitting agency to determine if the source was constructed, operating and meeting its permit limits. After this first step, the other sources used for research included:

- Recent permits issued by the DEP;
- South Coast Air Quality Management District BACT Determinations;[14] and
- California Air Resource Board's ("CARB") BACT Clearinghouse Database.[15]

4.2.3 Oxides of Nitrogen

NO_x is formed during the combustion process due to the reaction between nitrogen and oxygen in the combustion air at the high temperatures ("thermal NO_x") and the reaction of nitrogen bound in the fuel with oxygen ("fuel NO_x"). Fuel NO_x is minimal from the combustion of natural gas or ULSD. NO_x can be controlled by SCR, dry low-NO_x, and water injection. An evaluation of BACT for NO_x follows.

4.2.3.1 Selective Catalytic Reduction

SCR is an add-on pollution control technology that injects either anhydrous or aqueous ammonia into the flue gas over a vanadium pentoxide catalyst. The NO_x within the flue gas combines with the ammonia to form water and nitrogen. The general chemical reaction is:

$$4\,NO + 4\,NH_3 + O_2 \rightarrow 4\,N_2 + 6\,H_2O$$

The reaction has a relatively narrow flue gas temperature window; below approximately 650°F the reaction is too slow, while above 800°F the catalyst is progressively destroyed. New advances in high temperature catalysts allow exhaust temperatures up to 850-900°F using low-Vanadium catalysts and up to 1000°F using Vanadium-free catalysts. Typically, SCR units are installed with a tempering air system (*i.e.*, injection of ambient air to cool the flue gas temperature) to lower temperature to less than 850°F.

The SCR process begins with the injection of ammonia into the flue gas stream by means of an injection grid upstream of a SCR section. Typically, the reactor consists of honeycomb ceramic or metal based panels with a thin catalyst coating (2 mils). The injection grid and reactor is located prior to the exhaust stack, within the optimum temperature range for the reaction (650°F-850°F). The ammonia reagent for the SCR reaction is stored in an on-site tank. Aqueous ammonia was chosen for the Watson Station for safety reasons.

The use of water injection and SCR technology represents LAER for NO_x emissions. NO_x emissions from the facility will be controlled to 2.5 ppmvd when firing natural gas and 5.0

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14 http://www.aqmd.gov/bact/AQMDBactDeterminations.htm

15 http://www.arb.ca.gov/bact/bact.htm

ppmvd when firing ULSD. Ammonia emissions (slip) are guaranteed to be 5.0 ppmvd when firing natural gas and ULSD.

4.2.3.2 Gas-Fired Determinations

The most stringent level of NO_x control ("top level") that has been permitted for gas-fired simple-cycle turbines are listed in the following section.

Recent Massachusetts Determinations

There are three recent BACT determinations in Massachusetts for different types of simple-cycle facilities. Two of the facilities are permitted as baseload facilities, similar to the proposed Watson Station, while one was permitted to the equivalent of 4,840 hours per year of operation.

Peabody Power LLC ("Peabody Power") proposed a 99-MW facility consisting of one Alstom Model GT11N2 that was permitted in 2005. The turbine is limited to 3.5 ppm NO_x firing natural gas. This facility is permitted to operate 8,760 hours per year with up to 720 hours on back up oil. The emission limits and operating limitations result in annual emissions of 49 tons of NO_x per year, the maximum amount to avoid NSR requirements of applying LAER technology and purchasing emissions offsets. This facility has not been constructed.

Lowell Power LLC ("Lowell Power") proposed a 96-MW facility consisting of two GE LM6000 turbines that was permitted in 2001. The turbines are limited to 2.0 ppm NO_x firing natural gas. This facility is permitted to operate 7,300 hours per year. These emission limits and operating limitations result in an annual emissions increase of 24.1 tons of NO_x per year, avoiding the major modification threshold and the NSR requirements of applying LAER technology and purchasing emissions offsets. This facility has not been constructed.

Consolidated Edison proposed a 99-MW facility expansion of its West Springfield facility consisting of two GE LM6000 turbines that was permitted in 2001 for operation on gas and in 2003 for operation on oil. This facility was permitted for the equivalent of 4,840 hours per year of operation. The turbines are limited to 3.5 ppm NO_x firing natural gas. This facility is currently operating and meeting its emission limits.

Facilities Outside of Massachusetts Using SCR

The most stringent level of NO_x control ("top level") that has been permitted for gas-fired simple-cycle turbines in the RBLC is 2.5 ppm NO_x for several simple-cycle facilities including: the Lambie Energy Center ("Lambie") in California and PPL Wallingford Energy in Wallingford, Connecticut (CT) consisting of five simple-cycle units totaling 243 MW. Both of these facilities were permitted using SCR as the NO_x pollution control system.

In the BACT determination on the CARB website, the Lambie NO_x emission limit was volunteered by the applicant in order to minimize the amount of emissions offsets required. The facility met these emission levels during stack testing conducted in 2003. The BACT determination states that the CARB believes that a NO_x concentration of 5 ppm @ 15% O_2 is LAER for simple-cycle facilities. Lambie began operating in 2004.

According to the CT DEP, PPL Wallingford Energy limited its NO_x emission levels to 2.5 ppm NO_x and restricted its hours of operation to 4,000 hours per year in an effort to avoid NSR. According to EPA records, in calendar year 2005, each of the five PPL Wallingford Energy turbines operated approximately less than ten percent of their maximum annual allowable heat input. PPL Wallingford Energy began operating in 2001.

Other determinations not listed in the RBLC include the following facilities: The New York Power Authority ("NYPA") permitted 10 sites in New York City to provide peak capacity during the summer. These units were permitted at 2.5 ppm NO_x in order to avoid the requirements of NSR and purchase emissions offsets. According to the EPA, the NYPA facilities were permitted to operate continuously throughout the year. Additionally, Florida Power and Light ("FPL") permitted two simple-cycle peaking facilities in Queens, NY at 2.5 ppm NO_x to avoid NSR and purchase emissions offsets. The FPL facilities are currently permitted at baseload levels, similar to the proposed operations for Watson Station.

Other Determinations

There are a number of other natural gas-fired determinations with NO_x emission limits ranging from 3.5 ppm to 15 ppm NO_x. The majority of the 9 to 15 ppm NO_x determinations are from facilities that are greater than 50 MW that are achieving their NO_x limit using Dry Low-NO_x technology since no SCR units are listed as control devices. Dry Low-NO_x technology is not available for the proposed turbines for Watson Station. The remaining natural gas fired facilities use water injection to achieve 25 ppm NO_x when firing natural gas.

4.2.3.3 Oil-Fired Determinations

A description of the most stringent level of NO_x control ("top level") that has been permitted for No. 2 oil-fired simple-cycle turbines follows.

Massachusetts Facilities

There are two recent BACT determinations in Massachusetts for a simple-cycle facility permitted to fire on oil. The Consolidated Edison West Springfield facility is limited to 6 ppm NO_x firing No. 2 oil using SCR. As noted above, this facility is operating and is meeting its emission limits. The Peabody Power's project is limited to 9 ppm NO_x firing No. 2 oil using SCR. As noted above, this facility has not been constructed.

Facilities in Operation Outside of Massachusetts Using SCR

There is one facility listed in the RBLC that uses SCR to achieve its NO_x limit when firing oil. The Arvah B. Hopkins Generating Station in Tallahassee, FL installed a GE LM6000 with the identical emission limit of 5 ppm NO_x when firing either natural gas or No. 2 oil. The facility's annual emissions are calculated assuming 4,000 hours firing No. 2 oil and 1,840 hours firing natural gas.

Additionally, one of the FPL simple-cycle facilities was also permitted with a NO_x emission limit of 6 ppm using SCR, primarily to avoid NSR and the purchase of emissions offsets. The FPL facility is permitted to operate more than 3,000 hours per year firing No. 2 oil. As described previously, these operations profiles are similar to the proposed baseload profile for the Watson Station.

In the RBLC, the Duke Energy Sandersville LLC is listed as having an emissions limit of 10 ppm NO_x when firing No. 2 oil or natural gas. This facility consists of eight 80-MW GE 7EA turbines that use dry low-NO_x to meet these emission limits on gas and water injection when firing No. 2 oil. However, after reviewing the facility's actual permit online,[16] the permit indicates the oil limit is 42 ppm NO_x, consistent with BELD's uncontrolled oil-fired emissions. The remaining oil-fired RBLC determinations have NO_x emission limits of 42 ppm, with water injection listed as the control method.

4.2.3.4 LAER Determination

BELD is proposing to use SCR to control its NO_x emissions to 2.5 ppm when firing gas and 5 ppm when firing ULSD for the Watson Station. These emissions levels meet the most stringent permitted NO_x emission rates of simple-cycle gas turbines that are currently in operation.

4.3 Best Available Control Technology Analysis

BACT is defined in the 310 CMR 7.00 as,

. . . an emission limitation based on the maximum degree of reduction of any regulated air contaminant emitted from or which results from any regulated facility which the Department, on a case-by-case basis taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems and techniques for control of each such contaminant. The best available control technology determination

16 http://www.air.dnr.state.ga.us/airpermit/permits/APL12594/psd12594/apl12594fp.pdf

shall not allow emissions in excess of any emission standard established under the New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants or under any other applicable section of 310 CMR 7.00, and may include a design feature, equipment specification, work practice, operating standard, or combination thereof.

The DEP requires a "top-down" approach to a BACT analysis. The process begins with the identification of control technology alternatives for each pollutant.[17] Technically infeasible technologies are eliminated and the remaining technologies are ranked by control efficiency. These technologies are evaluated based on economic, energy and environmental impacts. If an alternative, starting with the most stringent, is eliminated based on these criteria, the next most stringent technology is evaluated until BACT is selected. BELD commits to controlling its project to BACT levels.

4.3.1 Sources Used to Evaluate BACT

The same sources of permitted emissions data used for the LAER analysis were also used in the BACT analysis.

4.3.2 Carbon Monoxide

CO emissions are formed during the incomplete combustion of any fuel in the combustion process. CO emissions are also elevated when turbines use water injection as the NO_x control method, and at lower ambient temperatures. CO increases at lower ambient temperatures since combustion is more inefficient due to lower air temperatures which produce additional incomplete combustion and consequently higher CO. An evaluation of BACT for CO is presented in the following section.

4.3.2.1 Oxidation Catalyst

For conventional low-NO_x burners or burners with water injection, the top level of CO control that can be achieved is with an oxidation catalyst. The flue gas exhaust from a turbine passes through a honeycomb catalyst which oxidizes the CO to form carbon dioxide. This type of emission control technology is considered a technically feasible method of reducing CO emissions. The proposed oxidation catalyst is designed to reduce CO emissions by approximately 85-96%, depending on the fuel, load and ambient temperature.

Recent Massachusetts Determinations

The Lowell Power facility is permitted with an oxidation catalyst to achieve its CO emissions limit of 5 ppm when the ambient temperature is greater than or equal to 42°F

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17 The DEP applies BACT to all pollutants, not just the PSD pollutants.

and 10 ppm when the ambient temperature is lower than 42°F. The permit states the oxidation catalyst has a control efficiency of 95 percent (*i.e.*, uncontrolled CO emissions are approximately 100-200 ppm, consistent with the proposed turbines).

The Consolidated Edison West Springfield facility is permitted with an oxidation catalyst CO emissions limit of 5 ppm when the ambient temperature is greater than or equal to 42°F and 10 ppm when the ambient temperature is lower than 42°F. The permit also states the oxidation catalyst has a control efficiency of 95 percent.

Peabody Power is not permitted with an oxidation catalyst to achieve its 5 ppm CO emission limit when firing natural gas or No. 2 oil. It is included here since its emission limit is identical to the controlled Lowell Power turbine. This facility would have inherently lower CO emissions since it does not use water injection to reduce NO_x emissions.

As stated previously, The Consolidated Edison facility in West Springfield is operating and meeting its emission limits while neither the Lowell Power nor the Peabody Power facility have been constructed.

RBLC Determinations

There are multiple determinations in the RBLC (provided in Appendix D) that use oxidation catalysts to control CO during natural gas firing. The emissions limits from these facilities range from 6 to 16 ppm CO. Only one facility firing oil was listed as using an oxidation catalyst, the Arvah B. Hopkins Generating Station with a CO limit of 6 ppm.

The vast majority of CO emission levels for low-NO_x burner turbine applications ranged from 20 to 25 ppm when firing natural gas. There were also several determinations for CO emissions greater than 100 ppm when firing natural gas or oil. Typically, these determinations were for turbines using water injection for NO_x controls.

4.3.2.2 BACT Determination

BELD is proposing to use an oxidation catalyst to control its CO emissions to 5 ppm when firing natural gas and ULSD for the Watson Station. These emissions levels meet the most stringent permitted CO emission rates of simple-cycle gas turbines that are currently in operation.

4.3.3 Volatile Organic Compounds

VOC emissions are formed during the incomplete combustion of any fuel in the combustion process. Like CO, VOC emissions increase when incomplete combustion increases (*e.g.*, increased water injection, lower ambient temperatures, and lower load levels). At 100% load at 59°F, the controlled VOC emission rates in the Rolls-Royce Trent 60 are 1 ppm when firing natural gas and 1.5 ppm when firing ULSD. At 100% load at 9°F, the controlled VOC emissions increase to 1.7 ppm when firing natural gas and to 1.6

ppm when firing ULSD. At 50% load, when incomplete combustion is greater, the controlled VOC emission rates range from 1.3 to 2.5 ppm when firing natural gas and 2.5 to 4.5 ppm when firing ULSD. VOC increases at lower ambient temperatures since combustion is more inefficient due to lower air temperatures which produce additional incomplete combustion and consequently higher VOC. An evaluation of BACT for VOCs is presented in the following section.

4.3.3.1 Oxidation Catalyst

The top level of VOC control that can be achieved is with an oxidation catalyst. The oxidation catalyst is the same as the oxidation catalyst described in Section 4.2.3.1. The flue gas exhaust from the turbine would pass through a honeycomb catalyst where the VOC would react with oxygen to form carbon dioxide and water. This type of emission control technology is considered a technically feasible method of reducing VOC emissions. The proposed oxidation catalyst is designed to reduce VOC emissions by approximately 50-57%, depending on the fuel, load and ambient temperature.

Massachusetts Determinations

Lowell Power is permitted to use an oxidation catalyst to achieve its VOC emissions of 3 ppm when firing natural gas. The air permit does not state the control efficiency of the oxidation catalyst.

The Consolidated Edison West Springfield facility is permitted to use an oxidation catalyst to achieve its VOC emissions of 3 ppm when firing natural gas or 12 ppm when firing No. 2 oil. The air permit does not state the control efficiency of the oxidation catalyst.

Peabody Power is not permitted to use an oxidation catalyst to achieve its 1 ppm VOC emission limit when firing natural gas or 3 ppm when firing No. 2 oil. It is included in this section since its emission limit is lower than the controlled Lowell Power permit.

As stated previously, the Consolidated Edison West Springfield facility is operating and meeting its emission limits while the Lowell Power and Peabody Power facilities have not been constructed.

RBLC Determinations

The determinations in the RBLC (Appendix D) that use oxidation catalysts presumably use the catalysts to also control VOC emissions. The emission limits from these facilities range from 1.4 to 8 ppm VOC. The Arvah B. Hopkins Generating station was the only facility listed as using an oxidation catalyst to control VOCs with an emission limit of 3 ppm.

For units not using oxidation catalysts, the majority of the VOC emission levels for low-NO_x turbine applications ranged from 1.2 to 10 ppm when firing natural gas. There were a number of other limitations that ranged as high as 20 ppm VOC when firing natural gas. The oil-fired determinations ranged from 1.6 to 12 ppm VOC.

4.3.3.2 BACT Determination

BELD is proposing to use an oxidation catalyst to control its VOC emissions for the Watson Station to 1.0-2.5 ppm when firing natural gas and 1.5-4.5 ppm when firing ULSD, depending on the load and ambient temperature. These emissions levels meet the most stringent permitted VOC emission rates of simple-cycle gas turbines that are currently in operation. Therefore, this emission rate is BACT for the proposed units.

4.3.4 Particulate Matter

Natural gas and ULSD have relatively low $PM_{10}/PM_{2.5}$ emission rates. $PM_{10}/PM_{2.5}$ emissions are typically generated from high molecular weight hydrocarbons that are not fully combusted. The turbine manufacturer, Rolls Royce, guarantees its $PM_{10}/PM_{2.5}$ emission rate firing on each fuel to a specific hourly emission limit over all loads and ambient temperatures. In this case, the $PM_{10}/PM_{2.5}$ emission rates are 5.0 lbs/hr when firing natural gas and 15.0 lbs/hr when firing ULSD based on EPA Test Methods 5 and 202 (*i.e.*, front and back half catch). At 100% load, the $PM_{10}/PM_{2.5}$ emission rates are approximately 0.01 lb/MMBtu firing natural gas and 0.03 lb/MMBtu when firing ULSD. At 50% load, the $PM_{10}/PM_{2.5}$ emission rates are approximately 0.02 lb/MMBtu firing natural gas and 0.05 lb/MMBtu when firing ULSD.

The emission rates at 100% load are consistent with the gas-fired rates permitted by Lowell Power and lower than the emission limits proposed for Peabody Power. Consolidated Edison's West Springfield facility's PM_{10} emissions are 0.008 lb/MMBtu when firing natural gas and 0.0307 lb/MMBtu when firing oil. However, the facility's PM emission rates are determined solely using Method 5 which would result in a lower emission rate.

Although fabric filters, Electrostatic Precipitators and cyclones can be used to reduce $PM_{10}/PM_{2.5}$ emissions, these methods are not technically feasible to further reduce $PM_{10}/PM_{2.5}$ emissions from the turbines. Therefore, the emission limits ranging from 0.01-0.02 lb/MMBtu when firing natural gas and from 0.03-0.05 lb/MMBtu when firing ULSD are considered BACT.

4.3.5 Sulfur Dioxide

BELD will fire only natural gas or ULSD in its turbines at the Watson Station, resulting in minimal SO_2 emissions. BELD has proposed SO_2 emission rates of 0.0024 lb/MMBtu when firing natural gas and 0.0016 lb/MMBtu when firing ULSD at the Watson Station. Although

Flue Gas Desulfurization (wet and dry) can be used to reduce SO_2 emissions, these methods are not technically feasible methods to further reduce SO_2 emissions from the turbines. Therefore, the proposed emission limits are considered BACT.

4.3.6 Oxides of Nitrogen

The NO_x determination for BACT for the Watson Station is the same as its LAER emission limit, 2.5 ppm when firing natural gas and 5.0 ppm when firing ULSD.

4.3.7 Non-Criteria Pollutants

The non-criteria pollutant emission rates are separated into two main categories: organic and metallic. The organic based non-criteria emissions are VOCs. BACT for these non-criteria emissions is equivalent to that for VOCs, an oxidation catalyst.

The metallic based non-criteria emissions are best characterized as Particulate Matter. Since there are no technically feasible methods to further control particulate from a gas turbine exhaust, the proposed BACT method is the clean burning fossil fuels (i.e., natural gas and ULSD).

4.4 BACT Summary for Turbines

The BACT emission limits for the turbines are summarized in Table 4-2.

Table 4-2 BACT Summary

		Fuel		
Pollutant	Units	Natural Gas	ULSD	Control Method
NO_x	ppm	2.5	5.0	Water injection and SCR
CO	ppm	5.0	5.0	Combustion Controls and Oxidation Catalyst
VOC	ppm	1.0-2.5	1.5-4.5	Combustion Controls and Oxidation Catalyst
PM_{10}/	lb/hr	5.0	15.0	Natural gas and ULSD as the permitted fuels
$PM_{2.5}$	lb/MMBtu	0.01-0.02	0.03-0.05	
SO_2	lb/MMBtu	0.0024	0.0015	Natural gas and ULSD as the permitted fuels

4.5 Alternate Fuel

Since the beginning of deregulation of the electricity markets, all new large power projects were permitted to fire either exclusively natural gas or with a maximum of 30 days of back-up fuel oil. Several of these gas turbine projects have recently applied to obtain increased fuel oil firing capabilities.

These applications to modify fuel limits were the result of recent dialogue between the Northeast Energy and Commerce Association, the New England Independent System Operator (ISO-NE) and the DEP to evaluate methods to avoid potential natural gas shortages during winter months. These shortages could be the result of increased natural gas demand from heating and power generation. While such shortages did not materialize in the winter of 2005-6 due to unseasonably warm temperatures, ISO-NE and the Massachusetts Division of Energy Resources continue to be concerned with this issue for next winter and beyond.

Due to these potential shortages, as well as having fuel diversity, BELD is seeking to permit ULSD as an alternate fuel for the equivalent of 120 days of full load operation for firing ULSD for the Watson Station. This fuel limit will provide significant operating flexibility for BELD. Since the Watson Station turbines are capable of switching the fuels "on the fly," BELD will also be able to respond instantaneously to requests to curtail gas use. BELD will have an optimal ULSD capacity situation since they will have a pipeline directly from the adjacent CITGO Oil Terminal to supply ULSD to the Watson Station. This operating flexibility will allow BELD to generate power at the Watson Station at the lowest possible cost for its customers. Therefore, BELD proposes a ULSD permit limit of 22.0 million gallons firing of ULSD per 12 consecutive month period for the Watson Station. Additionally, BELD proposes a monthly (i.e., 31-day) ULSD permit limit of 5.69 million gallons for both Watson Station turbines.

Section 5.0

Project Site Characteristics

5.0 PROJECT SITE CHARACTERISTICS

5.1 Land Use Analysis

The Project site is in the Town of Braintree, Massachusetts on the western bank of the Weymouth Fore River. The area surrounding the Project site includes a mix of industrial, commercial, urban and suburban residential land uses. Braintree is located in Norfolk County in the northeastern part of the Commonwealth of Massachusetts. The site lies approximately ten miles southeast of the City of Boston.

5.1.1 Urban/Rural Analysis

The USGS topographic quadrangle maps in the vicinity of the Project were initially used to determine whether the land-use pattern in the environs of the proposed plant is urban or rural for modeling purposes. The EPA recommended procedure in *The Guideline on Air Quality Models* (EPA, 1995a) was followed to determine urban/rural classification using the Auer (1977) land use technique. The land use within the total area circumscribed by a 3 km radius circle around the facility has been classified using the meteorological land use typing scheme shown in Table 5-1. If the land use types I1, I2, C1, R2 and R3 account for 50 percent or more of the area, then urban dispersion coefficients should be used. Otherwise, rural dispersion coefficients should be used in the modeling analysis.

Table 5-1 Identification and Classification of Land Use

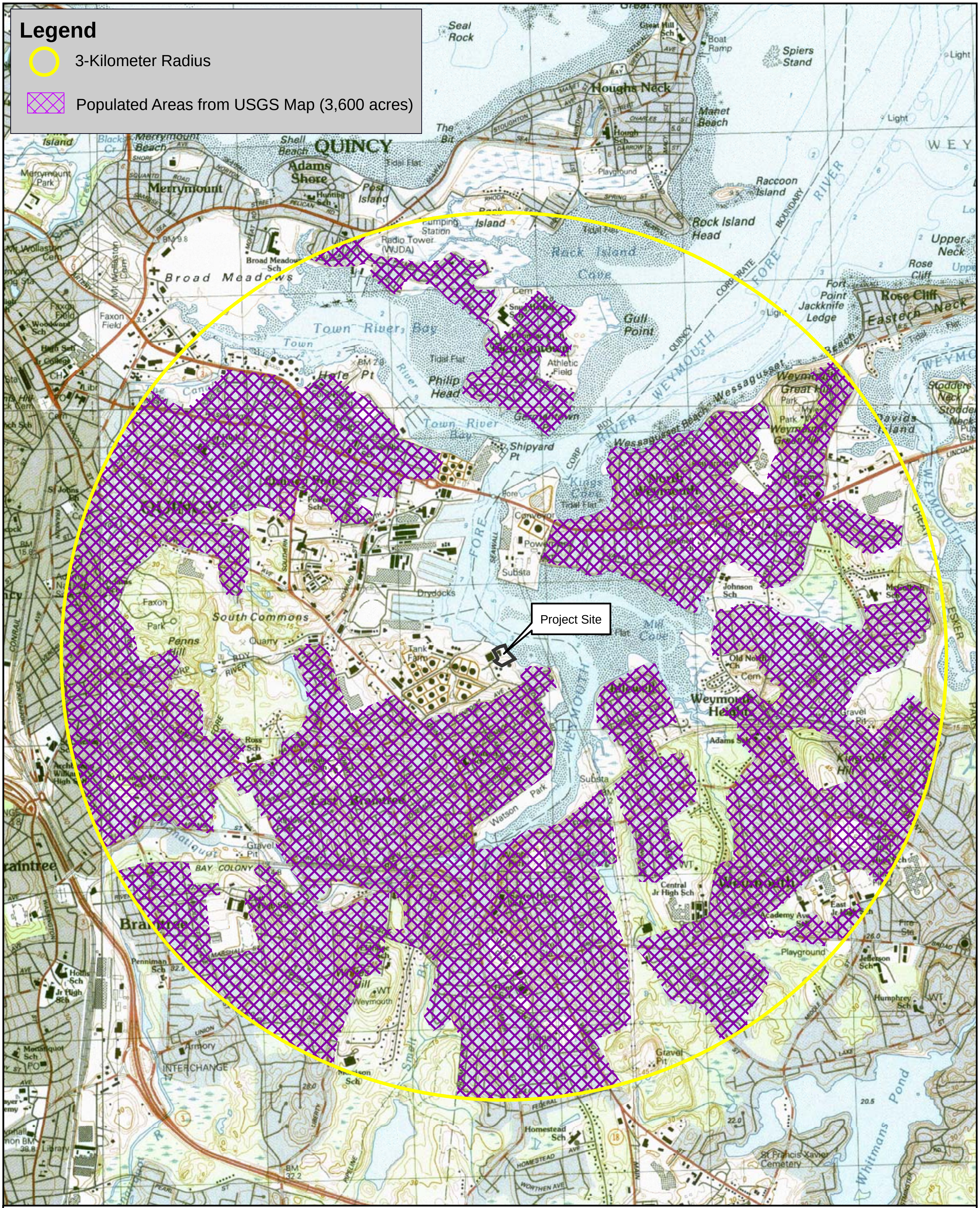
Type	Use and Structures	Vegetation
I1	Heavy Industrial Major chemical, steel and fabrication industries; generally 3-5 story buildings, flat roofs	Grass and tree growth extremely rare; $<5\%$ vegetation
I2	Light-Moderate Industrial Rail yards, truck depots, warehouses, industrial parks, minor fabrications; generally 1-3 story buildings, flat roofs	Very limited grass, trees almost absent; $<5\%$ vegetation
C1	Commercial Office and apartment buildings, hotels; >10 story heights, flat roofs	Limited grass and trees; $<15\%$ vegetation
R1	Common Residential Single family dwellings with normal easements; generally one story, pitched roof structures; frequent driveways	Abundant grass lawns and light-moderately wooded; $>70\%$ vegetation
R2	Compact Residential Single, some multiple, family dwellings with close spacing; generally <2 story, pitched roof structures; garages (via alley), no driveways	Limited lawn sizes and shade trees; $<30\%$ vegetation

Table 5-1 Identification and Classification of Land Use (Continued)

Type	Use and Structures	Vegetation
R3	Compact Residential Old multi-family dwellings with close (<2m) lateral separation; generally 2 story, flat roof structures; garages (via alley) and ashpits, no driveways	Limited lawn sizes, old established shade trees; < 35% vegetation
R4	Estate Residential Expansive family dwellings on multi-acre tracts	Abundant grass lawns and lightly wooded; > 95% vegetation
A1	Metropolitan Natural Major municipal, state or federal parks, golf courses, cemeteries, campuses, occasional single story structures	Nearly total grass and lightly wooded; > 95% vegetation
A2	Agricultural Rural	Local crops (e.g., corn, soybean); > 95% vegetation
A3	Undeveloped Uncultivated; wasteland	Mostly wild grasses and weeds, lightly wooded; > 90% vegetation
A4	Undeveloped Rural	Heavily wooded; > 95% vegetation
A5	Water Surfaces Rivers, lakes	

The initial land use analysis used the USGS map shading technique. Figure 5-1 shows the 3 kilometer radius around the Project and the grey shading designation on the USGS maps and identifies areas that have a building density that makes individual identification impractical. In the initial land use analysis, these shaded areas on the USGS map were designated as urban. The results of the initial analysis indicate that greater than 50 percent (51%) of the land classified around the facility is rural. The areas outlined in red hatch shading indicate urban classification based on the initial analysis using the USGS map shading technique. A large portion of the area around the proposed Project site is water (classified as "water surfaces", "A5"), while a significant portion is residential. USGS classification does not discriminate between R1, common residential, and R2 or R3, compact residential. Therefore, to further refine the assessment of the land use classification, the Massachusetts GIS orthophoto quads and land use classification were used. The GIS land use classification is similar to the Auer classification type where the land use is divided into separate use categories. The GIS land use categories are as follows:

Commercial	Pasture
Forest; Woody Perennial	RO; R1; R2; R3
Industrial; Mining; Waste Disposal	Salt Wetland; Wetland; Water
Open Land	Transportation
Recreation; Water Recreation	Urban Open
Water	



Scale 1:33,000
1 inch = 2,750 feet

0 1,500 3,000
Feet

Figure 5-1
Land Use Evaluation within 3 km of the Site

Thomas A. Watson Generating Station
Braintree, Massachusetts

Basemap: 1984 USGS Quadrangles

Epsilon ASSOCIATES INC.

\\Gis\system\Projects2\MA\Braintree\Braintree_Electric\Air\AirPlan_Figures\Fig5-1_land_use.mxd 5/3/07

Figure 5-2 shows the Massachusetts GIS land use designations for each category by color. By designating the Commercial, Industrial, and Urban Open categories as urban and the remaining categories as rural, similar to the Auer categories, the land use was recalculated. Figure 5-3 shows the resultant land use determination where pink denotes urban and green and blue denotes rural. Based on this designation, it is estimated that 86% of the land use within 3 kilometers of the facility should be classified as rural and the remaining 14% as urban for modeling purposes. Therefore, rural dispersion coefficients will be used in the air quality modeling analysis. This determination is also consistent with the urban rural determination conducted for the nearby Fore River Station located approximately 1,500 feet across the river to the north.

5.2 Topography

The topography at and immediately adjacent to the Project site is relatively flat, while the surrounding area, other than the water bodies is irregular. The base elevation of the stack will be approximately 14 feet (amsl), or 4.3 m.

To the west and south of the Project, the terrain rises irregularly away from the shoreline. West-southwest of the site in the Blue Hills Reservation, terrain elevations reach up to over 600 feet (amsl).

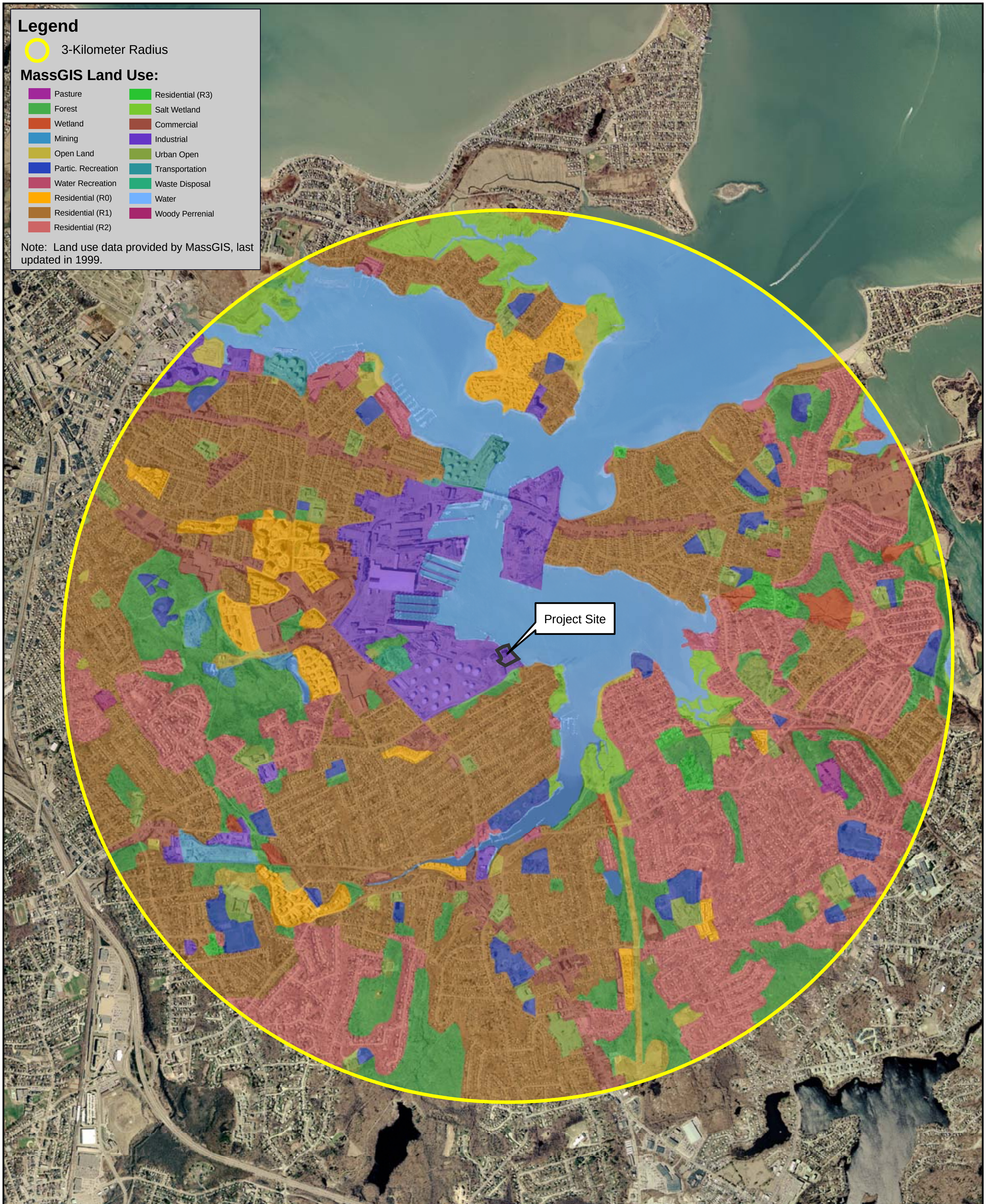
The nearest terrain above stack top (35m amsl) is located to the south-southwest of the site at a distance of approximately 400 meters from the Project site.

A portion of the USGS topographic map, including the site location depicting terrain in the vicinity of the proposed site, is shown in Figure 5-1.

5.3 Meteorological Data for Dispersion Modeling

The regional meteorology in Braintree is best approximated with meteorological data collected by the National Weather Service (NWS) station at Boston Logan Airport which is located approximately 10 miles to the north-northwest of the Project site at an elevation of 15 feet amsl (4.57 m). This NWS station is the closest site for which extensive meteorological data are available which are representative of similar topographic influences that affect the proposed site. Five years (2001-2005) of hourly surface data collected at the Logan Airport station include wind speed and direction, temperature, cloud cover and ceiling height.

A composite wind rose for the five years of meteorological data to be used in the modeling analysis is presented in Figure 5-4. The winds are measured at a height of 22 feet (6.7 m). The winds are predominantly from the southwest through north-westerly directions.



Scale 1:33,000
1 inch = 2,750 feet
0 1,500 3,000 Feet

Figure 5-2
MassGIS Land Use Classes

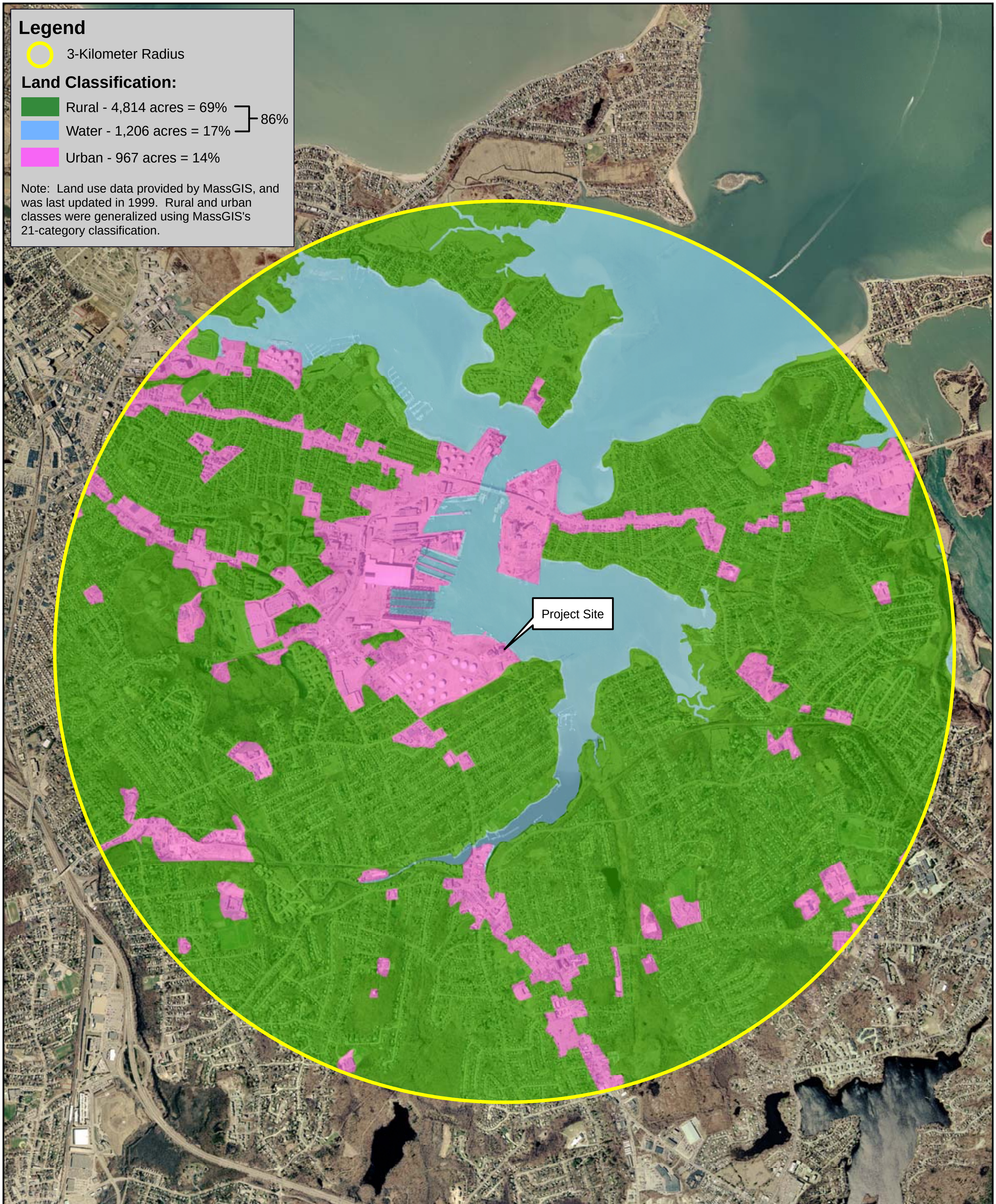
Thomas A. Watson Generating Station
Braintree, Massachusetts

Basemap: 2001 MassGIS Orthophotography

Epsilon ASSOCIATES INC.

\\Gis\system\Projects2\MA\Braintree\Braintree_Electric\Air\AirPlan_Figures\Fig5-2_land_use_MassGIS.mxd

5/3/07



Scale 1:33,000
1 inch = 2,750 feet

0 1,500 3,000 Feet

N W E S

Figure 5-3
Refined MassGIS Land Use Analysis within 3 km of the Site

Thomas A. Watson Generating Station
Braintree, Massachusetts

Basemap: 2001 MassGIS Orthophotography

Epsilon ASSOCIATES INC.

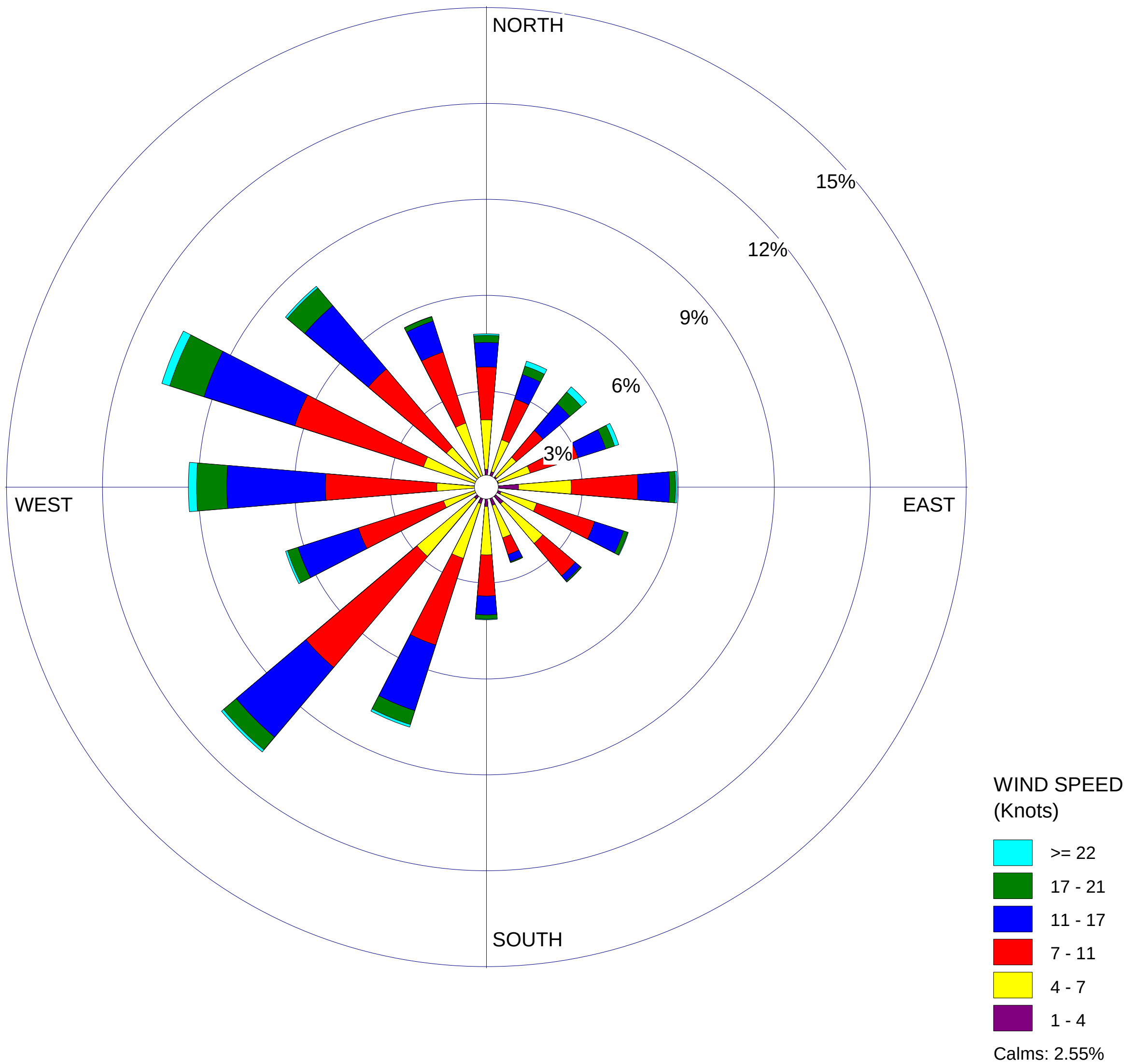
\\Gis\system\Projects2\MA\Braintree\Braintree_Electric\Air\AirPlan_Figures\Fig5-3_land_use_refined.mxd 5/3/07

WIND ROSE PLOT:

Five Year Composite Windrose (2001 to 2005)
Boston, MA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Composite Annual Windrose
from Boston, MA

Figure 5-4

COMPANY NAME:

MODELER:

CALM WINDS:

2.55%

TOTAL COUNT:

42586 hrs.

AVG. WIND SPEED:

9.70 Knots

DATE:

5/3/2007

PROJECT NO.:

1831 BELD

Epsilon ASSOCIATES INC.

WRPLOT View - Lakes Environmental Software

The surface data will be input along with five years of concurrent mixing height data from the NWS upper-air observations made in Gray, Maine. The Gray station is located approximately 20 miles NNE of Portland. The Portland surface temperature was used to initialize the soundings for all of the five years. These observation sites were chosen because they are the most representative stations to the Project site that has collected the necessary meteorological data of the required quality for modeling.

The AERMET (version 06431) was used to process the surface and upper air files. The upper air and surface files from the AERMET meteorological processing program will be input into AERMOD. Because of the uncertainty of whether the land use parameters (albedo, Bowen ratio, and roughness length) should be representative of the source site or the site of the meteorological data, both land assumptions were made. Two separate sets of AERMET and AERMOD runs were made for the five year data for each land use classification.

As discussed in Section 5.1, the land use around the BELD facility is considered rural, therefore one set of AERMET runs were made assuming rural or "cultivated land" assumptions. The land use at Boston's Logan Airport is a combination of water and grasslands (i.e., runways and grass) with some dense buildings located 2-3 km to the northeast and northwest of the anemometer location. The predominant land use affecting the anemometer location is grasslands and some water. Since the grassland and water coefficients are similar, grassland coefficients were chosen for use with Logan data.

Table 5-2 lists the assumptions made in the processing of the data in AERMET, including the Bowen ratio, surface roughness lengths, and albedo.

Table 5-2 AERMET Processing Assumptions

Parameter	Values Used			
QA Values (Surface and Upper Air)	Default			
Randomizing Parameter	Randomize Wind Directions			
Surface Characteristic Frequency	Seasonal			
Wind Sector	Single Wind Sector			
Land-Use	Cultivated Land			
Site Characteristics (Surface Albedo, Bowen Ratio, Surface Roughness)	Derived from AERMET Table 4-1 thru 4-3 using cultivated land use type			
Site Characteristics	Season	Surface Albedo[1]	Bowen Ratio[1]	Surface Roughness[1]
Cultivated Land (Grasslands)	Winter	0.6 (0.6)	1.5 (1.5)	0.01 (0.001)
Cultivated Land (Grasslands)	Spring	0.14 (0.18)	0.3 (0.4)	0.03 (0.05)
Cultivated Land (Grasslands)	Summer	0.2 (0.18)	0.5 (0.8)	0.2 (0.1)
Cultivated Land (Grasslands)	Autumn	0.18 (0.20)	0.7 (1.0)	0.05 (0.01)
Measurement Height	6.7 meters			

[1] Cultivated Land use values, Grassland values are in parenthesis

5.4 Background Air Quality Data

If the modeled concentrations due to emissions from the Project are above the SILs, then ambient background concentrations will be added to the plant impacts to obtain total concentrations, which, in turn, are compared to the NAAQS and MAAQS. To estimate background pollutant levels representative of the area, the most recent Air Quality Data Reports (Commonwealth of Massachusetts) prepared by the Massachusetts DEP, Division of Air Assessment Branch were reviewed. DEP guidance specifies the use of the latest three years of available monitoring data from within 10 km of the project site. Data for 2004 through 2006 were reviewed. For short-term averages (24 hours or less), the highest of the second-highest of the yearly observations will be estimated to be the background concentration, with the exception of $PM_{2.5}$ 24-hour where the 98th percentile concentration was used, consistent with the short-term ambient air quality standards. The short-term ambient air quality standards are not to be exceeded more than once per year. For long-term averages, the highest yearly observation will be used as the background concentration.

Background concentrations were determined from the closest available monitoring stations to the proposed facility in Boston, Lynn, and Milton. A summary of the background air quality concentrations are presented in Table 5-3.

Table 5-3 Observed Ambient Air Quality Concentrations and Selected Background Levels

	Averaging Period	Sta.	2004[1]	2005[1]	2006[1]	Background Level	NAAQS
SO_2 (μg/m^3)	3-Hour	BHAR	0.025	0.032	0.019	84	1,300
	24-Hour	BHAR	0.016	0.019	0.012	50	365
	Annual	BHAR	0.0038	0.0026	0.0028	10	80
CO (ppm)	1-Hour	BHAR	2.8	3.6	3.0	3.6	35
	8-Hour	BHAR	1.5	2.3	1.7	2.3	9
NO_2 (μg/m^3)	Annual	MILT	0.004	0.005	0.005	9.4	100
Ozone (ppm)	1-Hour	BLOI	0.098	0.110	0.092	0.110	0.12
	8-Hour	BLOI	0.081	0.091	0.083	0.091	0.08
PM_{10} (μg/m^3)	24-Hour	BHAR	42	39	33	42	150
	Annual	BHAR	20.1	20.1	18.3	20	50
$PM_{2.5}$ (μg/m^3)	24-Hour	LYNN	26	27	25	27	35
	Annual	LYNN	9.0	9.5	8.5	9.5	15

1. Background monitoring data for 2003, 2004, and 2005 are in ug/m^3 except for CO and Ozone which are in ppm.

Monitor locations: BHAR= Boston Harrison Ave, -11 miles to the northwest; MILT = 5.5 miles to the west; BLOI = Boston Long Island – 8 miles to the north, Lynn = Lynn 17 miles to the north, BKEN= Boston Kendall Square, 12 miles to the northwest, BNS = Boston 174 North Street- 12 miles to the north.

5.4.1 Sulfur Dioxide (SO_2)

The highest annual average SO_2 concentration measured from 2004 to 2006 was 10.0 μg/m^3 and was recorded at the Boston Harrison Avenue monitor. This concentration is 13% of the 80 μg/m^3 standard. The "highest of the second-highest" 24-hour and three-hour average SO_2 concentrations measured over the same three-year period were 84 μg/m^3 and 50 μg/m^3, respectively. These concentrations were also recorded at the Boston East First Street monitor. The 24-hour concentration is approximately 14% of the 365 μg/m^3 standard, while the three-hour concentration is approximately 6% of the 1,300 μg/m^3 standard.

5.4.2 Carbon Monoxide (CO)

The "highest of the second-highest" one-hour average CO concentrations measured from 2004 to 2006 was 3.6 ppm, which is 10% of the 35 ppm standard and was recorded at Boston's Harrison Avenue monitor. The "highest of the second-highest" eight-hour CO concentrations measured was 2.3 ppm, which is 26% of the 9 ppm standard.

5.4.3 Nitrogen Dioxide (NO_2)

The highest annual average NO_2 concentration measured from 2004 to 2006 was 9 μg/m^3 recorded at Milton's Blue Hill Observatory monitor. This concentration is 9% of the 100 μg/m^3 annual standard.

5.4.4 Ozone (O_3)

The EPA revoked the one-hour ozone standard on June 15, 2005, and the eight-hour ozone standard is currently in effect. All of Massachusetts is classified as "moderate" nonattainment for the eight-hour ozone standard. The "highest of the second-highest" eight-hour average ozone concentration measured from 2004 to 2006 was 0.091 ppm. This concentration is 113% of the 0.08 ppm standard and was measured at the Boston Long Island monitor. The "highest of the second-highest" one-hour concentrations measured over the same three-year period was 0.11 ppm. This concentration is 92% of the 0.12 ppm standard and was measured at the same monitor.

5.4.5 Particulates (PM_{10})

The highest annual average PM_{10} concentration measured from 2004 to 2006 was 20 μg/m^3 and was recorded Boston's Harrison Avenue monitor. This concentration is 40% of the 50 μg/m^3 standard. The "highest of the second-highest" 24-hour concentrations measured over the same three-year period was 42 μg/m^3. This concentration was also recorded at the Harrison Avenue monitor. The 24-hour concentration is approximately 28% of the 150 μg/m^3 standard.

5.4.6 Particulates ($PM_{2.5}$)

In 1998, DEP began monitoring particulate with diameters of 2.5 micrometers or less ($PM_{2.5}$). The highest annual average $PM_{2.5}$ concentration measured from 2004 to 2006 was 9.5 μg/m^3 at the Lynn monitor. The 98th percentile 24-hour average $PM_{2.5}$ concentration was 27 μg/m^3 at the Lynn monitor. The annual concentration is 63% of the 15 μg/m^3 standard, while the 24-hour concentration is 77% of the new 35 μg/m^3 standard.

5.5 Source Data

The Project will be fueled primarily by natural gas; however, ULSD will be used as an alternative fuel. BELD proposes to limit ULSD-firing to the equivalent of 120 days per year at full load (2,880 hours). Stack characteristics for the combustion unit is presented in Table 5-4 and worst case emissions and stack parameters used in the modeling are presented in Appendix C for each operating condition. These operating conditions were determined from the manufacturer's specifications and fuel characteristics. The distillate fuel used to calculate the SO_2 emissions is based on 0.0015 percent sulfur weight. For the purposes of modeling ambient impacts of the combustion turbine (CT), the worst case emission rates presented in Section 2.2 will be used. As discussed in Section 4, emissions will be controlled to BACT and /or LAER levels, as appropriate.

Table 5-4 Stack Characteristics for the BELD Watson Station Combustion Turbines

Units	UTM E (km)	UTM N (km)	Base Elevation (m)	Stack Height (m)	Stack Diameter (m)
CT Stack 1	337.709	4677.532	4.30	30.5	3.35
CT Stack 2	337.688	4677.551	4.30	30.5	3.35

In addition to the new Project, combined impacts with existing BELD Potter II station will also be evaluated for comparison to the NAAQS. Potter II is a combined-cycle facility with a nominal capacity of approximately 95 MW. The ABB 11D unit is a dual-fuel unit capable of firing natural gas and No.2 oil. In addition to the ABB combined-cycle unit there is a 24 MMBtu/hr Fairbanks Morse generator. The stack parameters and modeling emission rates for the BELD Potter II facility are presented in Table 5-5 and Table 5-6, respectively. The stack parameters and emission rates for each unit were derived from the most recent available Emission Statements (2004).

Table 5-5 Stack Characteristics for the BELD Potter II Station

Units	Base Elev. (m)	Stack Height (m)	Stack Temperature (K)	Stack Diameter (m)	Stack Exit Velocity (m/s)
Combustion Stack	4.7	39.6	477.7	5.2	19.5
Fairbanks Generator	4.7	12.19	699.7	0.5	18.3

Table 5-6 Emission Rates for the BELD Potter II Station

Source	Short-Term Emission Rates lb/hr on Gas and Oil (ULSD)			
	NO_x	CO	SO_2	$PM_{10}/PM_{2.5}$
Combustion Stack, natural gas firing	218.7	142.8	9.1[2]	115.7
Combustion Stack, oil firing[1]	453.9	146.8	1.51	118.9
Fairbanks Generator, oil firing	67.06	20.16	0.035	2.38

[1] The oil firing emission rate reflects Potter II firing ULSD.

[2] The natural gas SO2 emission rates assume a sulfur content of approximately 3 gr/ccf. This assumption is higher than that proposed for the Watson Station (0.8 gr/ccf). The Algonquin system has not reported sulfur contents greater than 0.5 gr/ccf resulting in a conservative estimate of SO2 emissions.

5.6 Good Engineering Practice Stack Height Determination

The GEP stack height evaluation of the facility has been conducted in accordance with the EPA revised *Guidelines for Determination of Good Engineering Practice Stack Height* (EPA, 1985). The formula, as defined by the EPA guidelines, for the GEP stack height is:

$H_{GEP} = H_b + 1.5L$

where H_{GEP} = GEP stack height,

H_b = Height of adjacent or nearby structures,

L = Lesser of height or maximum projected

width of adjacent or nearby building,

i.e., the critical dimension, and

Nearby = Within 5L of the stack from downwind (trailing edge) of the building.

There are two stacks proposed for the Project which will exhaust emissions from the combustion turbines; therefore, a GEP analysis was conducted to determine the GEP formula height for each stack to account for potential downwash from nearby structures.

A general arrangement elevation drawing of the major buildings associated with the proposed Project is presented in Appendix G. Facility grade is approximately 14 feet amsl

(4.3 m). Therefore, all heights shown in Appendix G for the Project are with respect to the stack base. The GEP formula was applied to each major structure associated with the Project and the nearby Potter II Station.

Application of the GEP formula to the proposed facility indicates a maximum GEP formula stack height of 61.57 m (202 feet). The 81 foot Potter II turbine building enclosure is found to be the controlling structure.

As the proposed stack height is less than the GEP formula height, building downwash effects will be considered in the air quality modeling. In addition, the EPA AERMOD PRIME downwash algorithm will be used to estimate cavity impacts which may extend beyond the facility fence-line.

Section 6.0

Air Quality Modeling

6.0 AIR QUALITY MODELING

The ambient pollutant concentrations associated with the Project will be addressed in the detailed air quality analysis discussed in this section. Impacts of criteria and toxic pollutant emissions will be modeled for comparison to ambient air quality standards and guidelines. Both screening level and refined modeling analyses are proposed.

The EPA *Guideline on Air Quality Models* (EPA, 2005) recommends that an air quality modeling analysis begin with the simplest, most conservative screening technique. If the screening analysis indicates that the ambient concentrations contributed by the source exceed the PSD increment or the NAAQS, then the analysis should proceed to more sophisticated techniques. This procedure eliminates the need for extensive, highly detailed modeling for those sources that clearly will not cause or contribute to violations of the NAAQS or the applicable PSD increment.

In the *New Source Review Workshop Manual* (EPA, 1990) the dispersion modeling analysis is separated into two distinct phases: 1) the preliminary analysis, and 2) a full impact analysis. In the preliminary analysis only the significant increase in potential emissions of a pollutant from a proposed new source or the significant net emissions increase of a pollutant from a proposed modification are modeled. The results of this analysis are used to determine:

- the worst-case stack parameters;
- which criteria pollutants require a full impact analysis; and
- the receptor locations to be used in the refined modeling analysis.

The EPA does not require a full impact analysis for a particular pollutant if the results of the preliminary analysis indicate the emissions from the proposed source or modification will not increase ambient concentrations by more than pollutant specific SILs (see Table 3-3).

6.1 Air Quality Model Selection

The EPA-approved air quality models proposed for this analysis are SCREEN3 (96043) and AERMOD (07026). The SCREEN3 model will be used under simple and complex terrain modes to identify maximum impact load conditions. The modeling of the maximum impact load condition for natural gas and ULSD firing for each pollutant and averaging period is based on expected operating scenarios supplied by the vendor. The AERMOD model will be used for a refined modeling analysis in simple and intermediate/complex terrain, respectively.

6.1.1 SCREEN3

The SCREEN3 model can perform single-source, short-term calculations to predict ground-level concentrations which can incorporate the effects of building downwash for both the near wake and far wake regions. The model can calculate impacts in simple and elevated terrain. For terrain elevations greater than stack-top, SCREEN3 estimates a 24-hour average concentration using the VALLEY model 24-hour screening procedure. This procedure involves the use of "worst-case" meteorological data: Pasqual Gifford stability class F for rural land use with a wind speed of 2.5 m/s. This reflects the assumption that maximum concentrations at elevated terrain will occur under stable conditions when minimal plume spread has occurred. For stable atmospheric conditions, the VALLEY model assumes that the plume height above stack base remains constant after final plume rise. It is further assumed that the plume centerline comes no closer than 10 meters to the elevated terrain. If the terrain extends above the original plume height, the plume height is adjusted so that it remains 10 meters above the ground. Also, the screening modeling procedure assumes that the wind direction is constant and encounters the terrain representing the highest elevation found in any direction from the source. For receptor elevations greater than stack top but below plume centerline height, the SCREEN3 model will calculate both a VALLEY 24-hour estimate and also estimate the maximum concentration across the full set of meteorological data using simple terrain procedures with terrain truncated to the stack top elevation. The higher of the two calculations for that distance and terrain height is used in the screening results. For receptor elevations greater than the plume centerline height, only a 24-hour VALLEY concentration estimate is made. To eliminate the six-hour persistence applied to the VALLEY 24-hour concentration estimates, the VALLEY computations are scaled by a factor of four to calculate one-hour estimates.

The SCREEN3 model uses a full range of meteorological conditions including all stability classes and a broad range of wind speeds to find maximum impacts. Table 5.1-1 presents the 54 meteorological conditions and associated mixing heights used by SCREEN3. Depending on the site location, the model can be run in rural or urban mode. The receptors are user-specified with distance and elevations input along one radial. With the exception of the 24-hour estimate for complex terrain impacts, the results from SCREEN3 are maximum 1-hour concentrations. To handle longer period averages, the Project will use DEP-approved adjustment factors to estimate concentrations from the maximum 1-hour values. For scaling to 3-hour, 8-hour, 24-hour and annual averages respectively, the following factors will be employed: 0.9, 0.7, 0.4, and 0.08. For scaling the VALLEY 24-hour concentrations to 1-hour, 3-hour, 8-hour, 24-hour and annual averages respectively, the following factors will be employed: 4, 4, 3, 1, and 0.4. A complete technical description of the SCREEN3 model may be found in the *User's Guide for SCREEN3* (EPA, 1995a).

Table 6-1 SCREEN3 Full Meteorological Conditions

(a) Wind Speed/Stability Class Combinations

Calm Hour Stability Class	Non-Calm Hour Stability Class	Wind Speed (m/s)
B	A	1, 1.5, 2, 2.5 ,3
C	B	1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5
D	C	1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 8, 10
E	D	1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 8, 10, 15, 20
F	E	1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5
F	F	1, 1.5, 2, 2.5, 3, 3.5, 4

(b) Wind Speed/Mixing Height Combinations For Unstable and Neutral Conditions (Stability Classes A through D)

Wind Speed (m/s)	Mixing Height (m)
1	320
1.5	480
2	640
2.5	800
3	960
3.5	1,120
4	1,280
4.5	1,440
5	1,600
8	2,560
10	3,200
15	4,800
20	6,400

6.1.2 AERMOD PRIME

The AERMOD model using the regulatory default options were used in simple and complex terrain mode to identify maximum impact concentrations. The AERMOD model is a steady state plume model using Gaussian distributions that calculates concentrations at each receptor for every hour in the year. The model is designed for rural or urban applications and can be used with a rectangular or polar system of receptors that are allowed to vary with terrain. AERMOD is designed to operate with two preprocessor codes: AERMET processes meteorological data for input to AERMOD, and AERMAP processes terrain elevation data and generates receptor information for input to AERMOD. The AERMOD model was selected for the air quality modeling analysis because of several model features that properly simulate the proposed facility environs, including the following:

- Concentration averaging time ranging from one hour to one year;
- Estimating cavity impacts; and
- Use of actual representative hourly average meteorological data; and

- Ability to calculate simple, complex, and intermediate terrain concentrations.

The AERMOD also has the latest EPA building downwash algorithm built into the program. The Plume Rise Model Enhancements (PRIME) is the latest algorithm for the improved treatment of building downwash. PRIME can also account for the stack placement relative to the building thereby allowing for the ability to impacts in the cavity region near the stack.

A complete technical description of the AERMOD model may be found in the *User's Guide for AERMOD* (EPA, 2004).

6.2 Screening Modeling Analysis

Screening modeling is used for three purposes in this application. First, screening is conducted to determine the operating load that results in the highest predicted ambient impacts. Second, screening is performed to assess whether or not significant impacts may exist. Finally, and if necessary, screening predictions are used to design a receptor grid for detailed or refined model simulations. The modeled stack parameters include: natural gas- and fuel oil-firing load conditions based on 100 percent and 50 percent load for ambient temperatures 9°F, 59°F, and 91°F. The operating scenarios that were modeled are presented in Appendix C.

6.2.1 Simple Terrain Screening

Simple terrain receptors for the screening modeling were located at 100 meter increments from 100 to 2,000 meters, at 200 meter increments from 2,000 to 4,000 meters, at 500 meter increments from 4,000 to 6,000 meters, and at 1,000 meter increments from 6,000 to 10,000 meters. The terrain elevation for each receptor was obtained electronically from USGS digital terrain data (30m DEM). The terrain processor within the BEE-Line software program (BEEST) was used to assign elevations to each receptor The SCREEN3 simple terrain receptor elevations are presented in Table 6-2. Modeled terrain heights were referenced to the stack base elevation of 2.8 meters.

Table 6-3 shows the SCREEN3 simple terrain predicted concentrations for NO_2, SO_2, PM_{10}, and CO for each of the appropriate averaging periods for each operating scenario (i.e. natural gas and ULSD).

Table 6-4 summarizes the SCREEN3 predicted maximum concentration for each pollutant and averaging time and compares these to the associated SILs. These screening results show that Project-related criteria pollutant concentrations of SO_2, and CO do not exceed the SILs. On the basis of this screening analysis, the 24-hour and annual PM_{10} along with the annual NO_2 scenarios are above the SILs of 1 $\mu g/m^3$ for annual and 5 $\mu g/m^3$ for the 24-hour averaging periods. In addition, the 1-hour NO_2 concentration is above the DEP policy SIL of 32 $\mu g/m^3$. As of this writing there is no EPA SIL for $PM_{2.5}$. Accordingly, refined simple terrain modeling using hourly meteorological data will be required for PM_{10} and NO_2 to demonstrate compliance with the MAAQS and NAAQS. For completeness, all the other pollutants (i.e. SO_2, and CO) will also be run using refined modeling for comparison to the SILs.

Table 6-2 SCREEN3 Simple Terrain Receptors and Elevations

	Receptor Elevations (m)	
Distance (m)	Above Mean Sea Level	Above Stack Base*
100	9.1	4.8
200	18	13.7
300	29.9	25.6
400	39	34.7
500	38.1	33.8
600	34.1	29.8
700	32.9	28.6
800	32	27.7
900	36	31.7
1000	36.9	32.6
1100	34.1	29.5
1200	39.9	35.6
1300	36	31.7
1400	35.1	30.8
1500	32	27.7
1600	36.9	32.6
1700	36.9	32.6
1800	36.9	32.6
1900	39.9	35.6
2000	39.9	35.6
2200	54.9	50.6
2400	57.9	53.6
2600	50	45.7
2800	45.1	40.8
3000	46.9	42.6
3200	43.9	39.6
3400	42.1	37.8
3600	42.1	37.8
3800	43	38.7
4000	60.7	56.4
4500	59.7	55.4
5000	67.7	63.4
5500	64	59.7
6000	79.6	75.3
7000	120.7	116.4
8000	119.2	114.9
9000	149.4	145.1
10000	119.5	115.2

* Stack base is 4.3 meters amsl.

Table 6-3
SCREEN3 Simple Terrain Modeling Results

BELD																				
Rolls Royce Simple Terrain		Stack Height 100 feet		Rural																
Fuel		natural gas	natural gas	natural gas	natural gas	natural gas	natural gas	natural gas	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD				
Load		50%	100%	50%	100%	100%	50%	100%	50%	100%	100%	50%	100%	100%	50%	100%				
Temperature	°F	59	59	91	91	91	9	9	59	59	59	91	91	91	9	9				
Inlet Conditioning		off	off	off	off	on	off	off	off	off	on	off	off	on	off	off				
Emissions (g/s)	Per Unit																			
NOx		0.37	0.62	0.33	0.52	0.59	0.37	0.61	0.76	1.27	1.30	0.69	1.08	1.19	0.76	1.28				
CO		0.45	0.76	0.40	0.63	0.71	0.44	0.74	0.46	0.77	0.79	0.42	0.66	0.72	0.46	0.78				
VOC		0.08	0.10	0.06	0.07	0.09	0.13	0.14	0.15	0.13	0.14	0.12	0.11	0.13	0.23	0.15				
PM		0.63	0.63	0.64	0.63	0.63	0.63	0.63	1.81	1.90	1.90	1.84	1.88	1.87	1.76	1.82				
SO2		0.10	0.17	0.09	0.14	0.16	0.10	0.16	0.06	0.10	0.10	0.05	0.09	0.09	0.06	0.10				
Simple Terrain		32.49	26.52	33.25	27.76	26.91	33.03	27.35	32.62	26.71	26.51	33.19	27.69	27.17	32.98	27.26			Max	Max
Complex Terrain		0.3586	0.2929	0.3646	0.3124	0.2984	0.3707	0.308	0.3595	0.2955	0.2928	0.3639	0.3113	0.3023	0.3691	0.3081			Annual	Annual
																	Max	SILs	Gas	Oil
NOx	1-Hour	24.17	33.10	22.01	28.87	31.48	24.11	33.42	49.39	67.79	68.98	45.74	59.87	64.50	50.26	69.57	69.57	32		
	Annual	1.298	1.777	1.182	1.550	1.691	1.295	1.795	1.299	1.783	1.814	1.203	1.575	1.696	1.322	1.830	3.62	1	1.795	1.830
SO2	3-Hour	5.73	7.88	5.21	6.85	7.51	5.71	7.93	3.46	4.81	4.87	3.23	4.24	4.55	3.56	4.91	7.93	25		
	24-Hour	2.55	3.50	2.31	3.04	3.34	2.54	3.52	1.54	2.14	2.16	1.43	1.88	2.02	1.58	2.18	3.52	5		
	Annual	0.342	0.470	0.311	0.408	0.448	0.341	0.473	0.101	0.141	0.142	0.094	0.124	0.133	0.104	0.143	0.62	1	0.473	0.143
PM	24-Hour	16.45	13.43	16.89	14.06	13.63	16.70	13.83	47.21	40.54	40.25	48.78	41.56	40.71	46.41	39.67	48.78	5		
	Annual	2.209	1.803	2.268	1.887	1.829	2.242	1.856	3.104	2.665	2.647	3.207	2.733	2.677	3.052	2.608	5.47	1	2.268	3.207
CO	1-Hour	29.24	40.26	26.80	35.14	38.32	29.33	40.64	30.01	41.24	41.99	27.81	36.44	39.23	30.54	42.36	42.36	2000		
	8-Hour	20.47	28.18	18.76	24.60	26.82	20.53	28.45	21.01	28.87	29.39	19.47	25.51	27.46	21.38	29.65	29.65	500		
Natural Gas hrs	5880																			
Distillate Oil hrs	2880																			

Table 6-4 Maximum Predicted SCREEN3 Concentrations for Simple Terrain Receptors Compared with Significant Impact Levels

Pollutant	Averaging Period	Project Maximum Concentration (μg/m³)[1]	Significant Impact Level (μg/m³)	Downwind Distance (m)	Load Condition
NO_2	1-Hour	**69.57**	32	300	ULSD 100%/9F
	Annual	**3.62**	1	300	ULSD 100%/9F and NG 100%/9F
SO_2	3-Hour	7.93	25	300	NG 100%/9F
	24-Hour	3.52	5	300	NG 100%/9F
	Annual	0.47	1	300	ULSD 100%/9F and NG 100%/9F
PM_{10}	24-Hour	**48.78**	5	300	ULSD 50%/91F
	Annual	**5.49**	1	300	NG 50%/91F and ULSD 50%/91F
CO	1-Hour	42.36	2,000	300	NG 100%/9F
	8-Hour	29.65	500	300	NG 100%/9F

Notes:

[1] Annual concentrations based on 5,880 hours firing natural gas and 2,880 hours firing ULSD.

[2] Bold values indicate concentrations above the SILs.

6.2.2 Intermediate/Complex Terrain Screening

The complex/intermediate terrain receptors were also evaluated for receptor elevations above stack top. The stack top elevation is 34.8 meters amsl or 30.5 meters above ground level (agl). The complex/intermediate terrain receptors extended from 400 meters out to 10,000 meters from the source. The complex/intermediate terrain receptors modeled with SCREEN3 are presented in Table 6-5. Modeled terrain heights were referenced to the stack base elevation.

Table 6-5 SCREEN3 Intermediate/Complex Terrain Receptors

Receptor Distance (m)	Receptor Elevations (m)	
	Above Mean Sea Level	Above Stack Base*
400	39	34.7
500	38.1	33.8
900	36	31.7
1000	36.9	32.6
1200	39.9	35.6
1300	36	31.7
1400	35.1	30.8
1600	36.9	32.6
1700	36.9	32.6
1800	36.9	32.6
1900	39.9	35.6
2000	39.9	35.6
2,100	48.5	45.7
2,200	54.9	52.1
2,400	57.9	55.1
2,600	50	47.2
2,800	45.1	42.3
3,000	46.9	44.1
3,200	43.9	41.1
3,400	42.1	39.3
3,600	42.1	39.3
3,800	43	40.2
4,000	60.7	57.9
4,500	59.7	56.9
5,000	67.7	64.9
5,500	64	61.2
6,000	79.6	76.8
7,000	120.7	117.9
8,000	119.2	116.4
9,000	149.4	146.6
10,000	119.5	116.7

* Stack base is 4.3 meters above mean sea level

Each operating scenario was modeled with SCREEN3 to determine the worst case scenario for intermediate/complex terrain conditions. SCREEN3 calculates both a VALLEY 24-hour concentration and a simple terrain calculation for receptors in intermediate terrain. Table 6-6 shows the SCREEN3 intermediate/complex terrain VALLEY predicted maximum concentrations while Table 6-7 shows the complex terrain maximum concentrations using simple terrain algorithms for each operating scenario.

Table 6-8 presents a summary of the SCREEN3 intermediate/complex terrain modeling results. The results show that all pollutants and averaging periods are below the SILs. Because the SCREEN3 intermediate/complex terrain predicted concentrations are below significance for all pollutants and averaging periods, no further refinement of the intermediate/complex terrain receptors is necessary. However, as stated in the simple terrain analysis, for conservatism, the AERMOD PRIME model will be run for all pollutants and averaging periods for intermediate and complex terrain receptors.

SCREEN3 input and output files are provided on a CD-ROM (Appendix I) as part of this application.

Table 6-6
SCREEN3 Modeling VALLEY Results - Complex Terrain

BELD
Rolls Royce VALLEY Complex Terrain Stack Height 100 feet Rural

Fuel		natural gas	natural gas	natural gas	natural gas	natural gas	natural gas	natural gas	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD				
Load		50%	100%	50%	100%	100%	50%	100%	50%	100%	100%	50%	100%	100%	50%	100%				
Temperature	°F	59	59	91	91	91	9	9	59	59	59	91	91	91	9	9				
Inlet Conditioning		off	off	off	off	on	off	off	off	off	on	off	off	on	off	off				
Emissions (g/s) Per Unit																				
NOx		0.37	0.62	0.33	0.52	0.59	0.37	0.61	0.76	1.27	1.30	0.69	1.08	1.19	0.76	1.28				
CO		0.45	0.76	0.40	0.63	0.71	0.44	0.74	0.46	0.77	0.79	0.42	0.66	0.72	0.46	0.78				
VOC		0.08	0.10	0.06	0.07	0.09	0.13	0.14	0.15	0.13	0.14	0.12	0.11	0.13	0.23	0.15				
PM		0.63	0.63	0.64	0.63	0.63	0.63	0.63	1.81	1.90	1.90	1.84	1.88	1.87	1.76	1.82				
SO2		0.10	0.17	0.09	0.14	0.16	0.10	0.16	0.06	0.10	0.10	0.05	0.09	0.09	0.06	0.10				
Simple Terrain		32.49	26.52	33.25	27.76	26.91	33.03	27.35	32.62	26.71	26.51	33.19	27.69	27.17	32.98	27.26			Max	Max
Complex Terrain	VALLEY	0.3586	0.2929	0.3646	0.3124	0.2984	0.3707	0.308	0.3595	0.2955	0.2928	0.3639	0.3113	0.3023	0.3691	0.3081			Annual	Annual
																	Max	SILs	Gas	Oil
NOx	1-Hour	1.07	1.46	0.97	1.30	1.40	1.08	1.51	2.18	3.00	3.05	2.01	2.69	2.87	2.25	3.15	**3.15**	**32**		
	Annual	0.072	0.098	0.065	0.087	0.094	0.073	0.101	0.072	0.099	0.100	0.066	0.089	0.094	0.074	0.103	**0.20**	**1**	0.101	0.103
SO2	3-Hour	0.28	0.39	0.25	0.34	0.37	0.28	0.40	0.17	0.24	0.24	0.16	0.21	0.22	0.18	0.25	**0.40**	**25**		
	24-Hour	0.07	0.10	0.06	0.09	0.09	0.07	0.10	0.04	0.06	0.06	0.04	0.05	0.06	0.04	0.06	**0.10**	**5**		
	Annual	0.019	0.026	0.017	0.023	0.025	0.019	0.027	0.006	0.008	0.008	0.005	0.007	0.007	0.006	0.008	**0.03**	**1**	0.027	0.008
PM	24-Hour	0.45	0.37	0.46	0.40	0.38	0.47	0.39	1.30	1.12	1.11	1.34	1.17	1.13	1.30	1.12	**1.34**	**5**		
	Annual	0.12	0.10	0.12	0.11	0.10	0.13	0.10	0.17	0.15	0.15	0.18	0.15	0.15	0.17	0.15	**0.30**	**1**	0.126	0.176
CO	1-Hour	1.29	1.78	1.18	1.58	1.70	1.32	1.83	1.32	1.83	1.86	1.22	1.64	1.75	1.37	1.92	**1.92**	**2000**		
	8-Hour	0.97	1.33	0.88	1.19	1.27	0.99	1.37	0.99	1.37	1.39	0.91	1.23	1.31	1.03	1.44	**1.44**	**500**		

Natural Gas hrs 5880
Distillate Oil hrs 2880

Table 6-7
SCREEN3 Complex Terrain Concentrations using Simple Terrain Algorythms

BELD
Rolls Royce ISC Complex Terrain   Stack Height 100 feet   Rural

Fuel		natural gas	natural gas	natural gas	natural gas	natural gas	natural gas	natural gas	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD				
Load		50%	100%	50%	100%	100%	50%	100%	50%	100%	100%	50%	100%	100%	50%	100%				
Temperature	°F	59	59	91	91	91	9	9	59	59	59	91	91	91	9	9				
Inlet Conditioning		off	off	off	off	on	off	off	off	off	on	off	off	on	off	off				
Emissions (g/s) Per Unit																				
NOx		0.37	0.62	0.33	0.52	0.59	0.37	0.61	0.76	1.27	1.30	0.69	1.08	1.19	0.76	1.28				
CO		0.45	0.76	0.40	0.63	0.71	0.44	0.74	0.46	0.77	0.79	0.42	0.66	0.72	0.46	0.78				
VOC		0.08	0.10	0.06	0.07	0.09	0.13	0.14	0.15	0.13	0.14	0.12	0.11	0.13	0.23	0.15				
PM		0.69	0.69	0.69	0.69	0.69	0.69	0.69	1.81	1.90	1.90	1.84	1.88	1.87	1.76	1.82				
SO2		0.10	0.17	0.09	0.14	0.16	0.10	0.16	0.06	0.10	0.10	0.05	0.09	0.09	0.06	0.10				
Simple Terrain		32.49	26.52	33.25	27.76	26.91	33.03	27.35	32.62	26.71	26.51	33.19	27.69	27.17	32.98	27.26			Max Annual	Max Annual
Complex Terrain	ISC-24HR	0.5494	0.2923	0.5973	0.3405	0.3044	0.6232	0.326	0.556	0.298	0.2921	0.5914	0.3367	0.313	0.6152	0.3216				
																	Max	SILs	Gas	Oil
NOx	1-Hour	1.02	0.91	0.99	0.89	0.89	1.14	1.00	2.10	1.89	1.90	2.04	1.82	1.86	2.34	2.05	2.34	32		
	Annual	0.055	0.049	0.053	0.048	0.048	0.061	0.053	0.055	0.050	0.050	0.054	0.048	0.049	0.062	0.054	0.12	1	0.061	0.062
SO2	3-Hour	0.24	0.22	0.23	0.21	0.21	0.27	0.24	0.15	0.13	0.13	0.14	0.13	0.13	0.17	0.14	0.27	25		
	24-Hour	0.11	0.10	0.10	0.09	0.09	0.12	0.10	0.07	0.06	0.06	0.06	0.06	0.06	0.07	0.06	0.12	5		
	Annual	0.014	0.013	0.014	0.013	0.013	0.016	0.014	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.004	0.02	1	0.016	0.005
PM	24-Hour	0.76	0.41	0.83	0.47	0.42	0.87	0.45	2.01	1.13	1.11	2.17	1.26	1.17	2.16	1.17	2.17	5		
	Annual	0.102	0.054	0.111	0.063	0.057	0.116	0.061	0.132	0.074	0.073	0.143	0.083	0.077	0.142	0.077	0.26	1	0.116	0.143
CO	1-Hour	1.24	1.11	1.20	1.08	1.08	1.38	1.21	1.28	1.15	1.16	1.24	1.11	1.13	1.42	1.25	1.42	2000		
	8-Hour	0.87	0.78	0.84	0.75	0.76	0.97	0.85	0.90	0.81	0.81	0.87	0.78	0.79	1.00	0.87	1.00	500		

Natural Gas hrs 5880
Distillate Oil hrs 2880

Table 6-8 Maximum Predicted SCREEN3 Concentrations for Intermediate/Complex Terrain Receptors

Pollutant	Averaging Period	Project Maximum Concentration (μg/m³)	Significant Impact Level (μg/m³)	Downwind Distance (m)	Load Condition
NO_2	1-Hour	3.15	32	2,100	ULSD 100% at 9F
	Annual	0.20	1	2,100	NG 100% at 9F and ULSD 100% at 9F
SO_2	3-Hour	0.40	25	2,100	NG 100% at 9F
	24-Hour	0.10	5	2,100	NG 100% at 9F
	Annual	0.027	1	2,100	NG 100% at 9F and ULSD 100% at 9F
PM_{10}	24-Hour	1.34	5	9,000	ULSD 50% at 91F
	Annual	0.30	1	2,100	NG 50% at 9F and ULSD 50% at 91F
CO	1-Hour	1.92	2000	2,100	ULSD 100% at 9F
	8-Hour	1.44	500	2,100	ULSD 100% at 9F

Notes: Annual concentrations based on 5,880 hours firing natural gas and 2,880 hours firing ULSD.

6.3 Refined Receptor Grid

A network of receptors consisting of a discrete receptor grid is proposed for the AERMOD modeling analysis. The receptors will commence at the property line out to 2 kilometers at 100 meter spacing, then 200 meter spacing out to 4 kilometers, 500 meter spacing out to 6 kilometers and 1,000 meter spacing out to 10 kilometers. The terrain elevation for each receptor will be obtained electronically from USGS digital terrain data (30m DEM) using the BEE-Line AERMET program. The terrain processor within the AERMAP software program was used to assign elevations to each receptor. The terrain option for choosing the receptor elevation will assume the highest elevation within a representative area. This is the most conservative terrain option for choosing elevations. A total of 3,548 receptors are proposed for the analysis which includes the Projects property boundary area. In addition, 281 discrete receptors at sensitive locations such as nursing homes, elderly housing, hospitals, health care centers, schools and churches were modeled.

6.4 Refined Modeling

6.4.1 AERMOD

The proposed facility will be modeled hour-by-hour using refined modeling techniques for the five years of hourly meteorological data from Logan Airport. The AERMOD model will be used for the refined modeling with the regulatory default option set. This will automatically select the EPA recommended options for stack tip downwash, final plume rise, buoyancy induced dispersion, vertical potential temperature gradients, wind profile exponents, decay, and treatment of calms. The refined receptor grid described in Section 6.3 will be used.

The predicted air quality levels of the criteria and non-criteria pollutants will be assessed through the initial refined modeling analysis. The criteria pollutant concentrations will be compared to the SILs presented earlier in Table 3-3. Only pollutants and averaging periods having concentrations greater than significance will be considered for NAAQS comparisons. If a NAAQS comparison is required, then the background concentrations listed in Table 5-3 will be added to the highest or highest second-highest predicted concentrations associated with the proposed facility. The non-criteria pollutants concentrations will be compared with the DEP TEL and AAL guidelines values.

In addition, a cumulative modeling analysis will be conducted for the Project plus the existing Potter II sources for comparison to the NAAQS. The sources described in Section 5.5 will be modeled over the five year meteorological data period. The cumulative concentrations will be added to monitored background levels and compared to the NAAQS.

6.5 Ambient Air Quality Modeling Results

Air quality modeling was conducted using the EPA models AERMOD and SCREEN3. The refined modeling used the latest five years of available NWS meteorological data (2001 to 2005) and assumed that the Project operates for 5,880 hr/yr on natural gas and 2,880 hr/yr on ULSD.

Table 6-9 presents modeling results for the Project as well as a comparison to the EPA SILs. The higher of the two meteorological data sets for land use depicting the BELD site and Boston's Logan Airport are presented for comparison to the SILs and the NAAQS. The results indicate that the **refined modeling concentrations are well below the SILs for all NAAQS pollutants and averaging periods** and below the 1-hour MAAQS NO_2 policy SIL of 32 $\mu g/m^3$. The predicted short-term (3-hour and 24-hour) SO_2 concentrations are 2.4% and 4.2% of the SILs, respectively, while the predicted annual concentration is only 0.4% of the SIL. The predicted 1-hour and 8-hour CO concentration are both 0.4% of the SILs, respectively. The predicted annual NO_2 and PM_{10} concentrations are 2% and 4% of the applicable federal SILs, respectively. The predicted 24-hour PM_{10} is 76% of the federal SIL. In addition, the predicted 1-hour NO_2 value is 44% of the MAAQS 1-hour policy SIL of 32 $\mu g/m^3$. There is currently no SIL for $PM_{2.5}$, however, impacts from the Project and the existing Potter II station demonstrate compliance with the NAAQS for $PM_{2.5}$ as shown in Table 6-10.

Table 6-9 Comparison of Maximum Predicted AERMOD PRIME Modeling Results with Significant Impact Levels

Pollutant	Averaging Period	AERMOD PRIME Maximum Concentration (μg/m^3)	Significant Impact Level (μg/m^3)	Delta (X) meters	Delta (Y) meters	Meteorological Year
NO_2	1-Hour	14.1	32	329676	4676523	(2002)
	Annual	0.02	1	337076	4677823	(2005)
SO_2	3-Hour	0.59	25	329676	4676523	(2002)
	24-Hour	0.21	5	337376	4677123	(2005)
	Annual	0.004	1	337076	4677823	(2005)
PM_{10}	24-Hour	3.82	5	337376	4677123	(2005)
	Annual	0.04	1	337076	4677423	(2003)
CO	1-Hour	8.6	2000	329676	4676523	(2002)
	8-Hour	1.75	500	337476	4677123	(2005)

Notes: Annual concentrations based on 5,880 hours firing natural gas and 2,880 hours firing ULSD.

For PSD purposes, modeling was conducted for the Project together with Potter II and BELD's 2.25 MW diesel engine. The combined results were added to background levels (Table 4.6-1) and then compared to the NAAQS. As shown in Table 6-10, the cumulative results are below the NAAQS for all pollutants and averaging periods.[18]

Since predicted impacts for the Project are below SILs and cumulative impacts with the existing Potter II station are below the NAAQS, no further cumulative impact analysis is required.

AERMOD input and output files are provided on a CD-ROM as part of this application.

[18] For short-term averaging periods (24-hour or less), the highest second highest (H2H) modeled concentration is presented. Annual concentrations represent the highest predicted value.

Table 6-10 Predicted Cumulative Impact Concentrations with Air Quality Standards

Pollutant	Averaging Period	Total Modeled Concentration (μg/m³)	Monitored Background (μg/m³)	Cumulative Impact (μg/m³)	NAAQS (μg/m³)	Delta (X) meters	Delta (Y) meters	Meteorological Year
NO_2	Annual	17.3	9	26.3	100	337576	4677523	2005
SO_2	3-H2H	3.6	84	87.6	1,300	337476	4677223	2005
	24-H2H	1.2	50	51.2	365	337376	4677123	2005
	Annual	0.03	10.0	10.0	80	337376	4677123	2005
PM_{10}	24-H2H	58.4	42	100.4	150	337617	4677543	2005
	Annual	0.62	20	20.6	50	337576	4677523	2005
$PM_{2.5}$[3]	24-H8H	0.76	27	27.8	35	337476	4677123	2005
	Annual	0.04	9.5	10.1	15	337076	4677423	2005
CO	1-H2H	1,230	4,176	5,406	40,000	337617	4677543	2004
	8-H2H	780	2,668	3,448	10,000	337617	4677543	2005

[1] Annual concentrations for the Project based on 5,880 hours firing natural gas and 2,880 hours firing ULSD for all pollutants.
[2] Annual concentrations for Potter II turbine based on worst case oil or natural gas firing 8,760 hours per year. Diesel engine limited to 1,000 hours per year.
[3] PM2.5 concentrations are for the new BELD facility only.

6.6 PSD Increment Consumption

A PSD increment analysis is required for NAAQS and PSD pollutants that result in a significant impact after a preliminary impact analysis is performed for emissions from the proposed facility. Based on modeling results for the Project, there are no impacts that result in a significant impact (i.e. above SILs) for any NAAQS or PSD pollutant. Therefore, a PSD increment consumption analysis is not required.

6.7 Visibility Analysis

Under the Clean Air Act through PSD program, visibility degradation in Class I areas (national parks and wilderness areas) must be addressed. These areas have been designated by the federal government as pristine natural environments, and as such have strict limits on increases in air pollution levels. Visibility is an Air Quality Related Value (AQRV) under the jurisdiction of the Federal Land Managers (FLM) of Class I areas. The FLMs of the Class I areas are representatives of the National Park Service (NPS) or the U.S. Forest Service (USFS), or the U.S. Fish and Wildlife Service (FWS) depending on the specific Class I are of interest.

A visibility analysis of the proposed project's plume was conducted using the EPA VISCREEN program (Version 1.01 dated 88341). The VISCREEN model (EPA, 1988b) provides the capability of assessing plume contrast (Cp) and plume perceptibility (Delta E) against two backgrounds, sky and terrain.

For the Project, visibility impacts are a function of particle and NO_2 emissions. Particles are capable of either scattering or absorbing light while NO_2 absorbs light. It should be noted that NO_2 absorbs light greater in the blue end of the spectrum. These constituents can either increase or decrease the light intensity (or contrast) of the plume against its background. VISCREEN plume contrast calculations are performed at three wavelengths within the visible spectrum (blue, green, and red). Plume perceptibility as determined by VISCREEN is determined from plume contrast at all visible wavelengths and "is a function of changes in both brightness and color" (EPA, 1992).

The VISCREEN model provides three levels of analysis; Level 1, Level 2, and Level 3. The first two Levels are screening approaches. The Level 1 assessment uses a series of conservative model-defined default values. If the source passes the criteria set forth by the Level 1 assessment (i.e., delta E ≤ 2.0 and Cp (L=0.55 micrometer, μm) ≤ 0.05), potential for visibility impairment is not expected and no further analysis is necessary. If the source fails the Level 1 criteria, then further refined analysis is required. However, based on the VISCREEN results, no further analysis of the BELD Project beyond Level 1 is required.

A VISCREEN analysis was performed on the nearest Class I area; Lye Brooke Wilderness area in southern Vermont. The Lye Brook area is located approximately 190 km to the northwest of the project. Model inputs for the Level 1 VISCREEN analysis for the stack are as follows:

Emissions	PM: 3.8 g/s
	NO_x: 2.6 g/s
Background Visual Range:	40 km
Source Observer Distance:	188 km
Minimum Source Distance:	188 km
Maximum Source Distance:	188 km
Default Acceptance Threshold: (Plume Contrast with Background)	Delta E ≤ 2.0 (Plume Perceptibility), Cp ≤ 0.05

Emission rates input into the VISCREEN model represent worst-case short-term emission rates for two turbines on oil at 100% load @ 59ºF. The background visual range of 40 km was obtained from the EPA VISCREEN workbook. For conservatism, the observer was place on the boundary of the Lye Brooke area closest to the proposed Project. The distance to Lye Brooke from the proposed Project was estimated at 188 km. Since the lines are drawn at 11.25° angle on both sides of the line between Lye Brooke and the proposed site are outside the Lye Brooke area, the closest boundary area was selected (188 km).

The VISCREEN model assesses two sun angles (scattering angles of 10° and 140°). Further, results are also provided for two tests:

The plume is located inside the boundary of the Class I or sensitive area; and

The plume is located outside the Class I or sensitive area boundary.

Tables 6-11 and 6-12 present the model results of the VISCREEN analysis which demonstrates that all visibility impacts at the Lye Brooke Wilderness area are acceptable, i.e. delta E is much less than 2.00, and Cp is much less than 0.05 μm.

Table 6-11 VISCREEN Model Results for Visual Impacts Inside the Lye Brook Class I Area

Background	Theta (°)	Azimuth (°)	Distance (km)	Alpha (°)	Delta E		Contrast (μm)	
					Criteria	Plume	Criteria	Plume
Sky	10	84	188	84	2.00	0.008	0.05	0.0
Sky	140	84	188	84	2.00	0.001	0.05	0.0
Terrain	10	84	188	84	2.00	0.0	0.05	0.0
Terrain	140	84	188	84	2.00	0.0	0.05	0.0

Table 6-12 VISCREEN Model Results for Visual Impacts Outside the Lye Brook Class I Area

Background	Theta (°)	Azimuth (°)	Distance (km)	Alpha (°)	Delta E		Contrast (μm)	
					Criteria	Plume	Criteria	Plume
Sky	10	75	182	94	2.00	0.009	0.05	0.0
Sky	140	75	182	94	2.00	0.001	0.05	0.0
Terrain	10	60	172	109	2.00	0.001	0.05	0.0
Terrain	140	60	172	109	2.00	0.0	0.05	0.0

Input and output files for the VISCREEN modeling analysis are presented in Appendix H.

6.8 Soils and Vegetation

PSD regulations require analysis of air quality impacts on sensitive vegetation types, with significant commercial or recreational value, or sensitive types of soil. Evaluation of impacts on sensitive vegetation was performed by comparison of predicted project impacts with screening levels presented in *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals* (EPA, 1980). These procedures specify that predicted impact concentrations used for comparison account for project impacts to ambient background concentrations.

Most of the designated vegetations screening levels are equivalent or exceed NAAQS and/or PSD increments. The 3-hour and annual average sensitive vegetation screening levels are more stringent than the comparable NAAQS. Additionally, there is a 1-hour screening level for SO_2, for which there is no NAAQS equivalent. Maximum 1-hour, 3-hour, and annual SO_2 concentrations were added to background levels and compared to vegetation sensitivity concentrations. The 1-hour, 3-hour, and annual vegetation sensitivity threshold values are 917 $\mu g/m^3$, 786 $\mu g/m^3$, and 18 $\mu g/m^3$, respectively.

The results of the soils and vegetation analysis presented in Table 6-13 show the maximum predicted concentrations plus background levels are well below the vegetation sensitivity thresholds.

Table 6-13 Vegetation Sensitivity Screening for SO_2 Concentrations

Averaging Period	Maximum Project Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Maximum Predicted Concentration Plus Background ($\mu g/m^3$)	Vegetation Sensitivity Concentration ($\mu g/m^3$)
1-Hour[1]	0.66	93	93.7	917
3-Hour	0.59	84	84.6	786
Annual[2]	.004	10	10.0	18

[1] 1-hour background SO2 concentration derived by dividing 3-hour concentration by 0.9 based on scale factors.
[2] Annual concentrations based on 5,880 hours firing natural gas and 2,880 hours firing ULSD.

6.9 Growth Analysis

The peak construction work force is estimated to be 125 persons. A very sizeable skilled construction force is available in the greater Boston area and eastern Massachusetts. Because the area can readily support the Project's construction labor needs, new housing, commercial and industrial construction will not be necessary to support the Project during the construction period.

Once the Project is ready for commissioning, BELD may add a few operators to its permanent staff. Should any new personnel move to the area, a significant housing market is already established and available. Therefore, no new housing is expected. Similarly, there is a significant level of existing commercial activity in the area, new commercial construction is not foreseen to be necessary to support the any new permanent operators.

Thus, no new significant emissions from secondary growth during either operations, or the construction phase, are anticipated.

6.10 Background Air Quality/Pre-construction Waiver

EPA has established PSD monitoring thresholds, which are presented in Table 6-14. If the Project impacts are below these de-minimus concentrations, then the Project is eligible for an exemption from pre-construction monitoring. Because maximum modeled concentrations are below all pollutant thresholds, BELD is requesting an exemption from the PSD monitoring requirements.

Table 6-14 PSD Monitor Thresholds

Pollutant	Averaging Period	Threshold Concentration (μg/m3)	BELD Maximum Modeled Concentration (μg/m3)
CO	8-Hour	575	8.6
NO2	Annual	14	0.02
SO2	24-Hour	13	0.21
PM/PM10	24-Hour	10	3.82
Ozone	NA	Exempt if VOC emissions $<$ 100 tpy	Exempt VOC emissions are 7.0 tpy
Lead	3-Month	0.1	1.3E-03
Beryllium	24-Hour	0.001	2.8 E-05
Mercury	24-Hour	0.25	1.09E-04
Vinyl Chloride	24-Hour	15	N/A
Fluorides	24-Hour	0.25	N/A
Total Reduced Sulfur	1-Hour	10	N/A
Reduce Sulfur Compounds	1-Hour	10	N/A
Hydrogen Sulfide	1-Hour	0.2	N/A

Note: N/A denotes not applicable. Facility will not emit compounds.

6.11 Non-Criteria Pollutant Modeling

The AERMOD maximum predicted concentrations for each toxic air contaminant are compared with the respective DEP "air toxics" policy 24-hour average TELs and/or AALs in

Table 6-15. Emission rates for each pollutant are presented in Table 2-3. Emission rates for non-criteria pollutants were estimated based largely on the latest EPA's AP-42 emission factors for turbines firing oil and natural gas. A more detailed description of the emission rates is presented in Section 2.2.2.

The results of the toxic impact assessment demonstrate compliance with the DEP applicable ambient air guidelines (both AALs and TELs).

Table 6-15 Non-Criteria Modeling Results

Pollutant	Period	AERMOD Concentration (ug/m3)	AAL/TEL	% of AAL/TEL
Acetaldehyde	24-hour	3.71E-03	2	0.19
	Annual	7.45E-05	0.5	0.01
Benzene	24-hour	5.01E-03	1.74	0.29
	Annual	4.80E-05	0.12	0.04
Ethylbenzene	24-hour	2.97E-03	300	0.001
	Annual	5.96E-05	300	0.00002
Formaldehyde	24-hour	6.59E-02	0.33	19.97
	Annual	1.32E-03	0.08	1.65
Naphthalene	24-hour	3.19E-03	14.25	0.02
	Annual	2.26E-05	14.25	0.0002
Toluene	24-hour	1.21E-02	80	0.02
	Annual	2.42E-04	20	0.001
Xylenes	24-hour	5.94E-03	11.8	0.05
	Annual	1.19E-04	11.8	0.001
Arsenic	24-hour	4.28E-06	0.0005	0.86
	Annual	2.82E-08	0.0002	0.01
Beryllium	24-hour	2.82E-05	0.001	2.82
	Annual	1.86E-07	0.0004	0.05
Cadmium	24-hour	4.37E-04	0.003	14.58
	Annual	2.88E-06	0.001	0.29
Chromium	24-hour	1.00E-03	1.36	0.07
	Annual	6.61E-06	0.68	0.001
Lead	24-hour	1.28E-03	0.14	0.91
	Annual	8.41E-06	0.07	0.01

Table 6-15 Non-Criteria Modeling Results (Continued)

Pollutant	Period	AERMOD Concentration (ug/m3)	AAL/TEL	% of AAL/TEL
Mercury	24-hour	1.09E-04	0.14	0.08
	Annual	7.21E-07	0.07	0.001
Nickel	24-hour	4.19E-04	0.27	0.16
	Annual	2.76E-06	0.18	0.002
Selenium	24-hour	2.28E-03	0.54	0.42
	Annual	1.50E-05	0.54	0.003
Ammonia	24-hour	6.50E-01	100	0.65
	Annual	1.27E-02	100	0.01
Sulfuric Acid	24-hour	1.48E-01	2.72	5.44
	Annual	4.19E-03	2.72	0.15

6.12 Accidental Release Modeling

Aqueous ammonia will be used in the facility's SCR system for controlling NO_x emissions from the turbines. Aqueous ammonia (a mixture of approximately 19% by weight ammonium hydroxide in water) will be stored on-site in a fully diked 15,000-gallon storage tank located adjacent to the main power block.

The consequence of spilling the entire volume (15,000 gallons) of the aqueous ammonia storage tank, which is considered the worst-case catastrophic accident, was evaluated. In the event of an accidental ammonia spill from the storage tank, the liquid will be retained within an impervious diked area.

The diked area will be covered with a floating layer of plastic baffles which reduces the liquid surface area by 90 percent, and thus, reduces the ammonia vaporization rate.

An off-site consequence analysis of ammonia under a worst-case catastrophic spill of the entire tank volume was conducted using the *Offsite Consequence Analysis Guidance* (EPA, 1996) developed by EPA as part of the 1990 CAAA Title III Risk Management Program. The guidance employs conservative assumptions to compensate for uncertainty. EPA reference tables and calculation methods were used for determining a worst-case consequence distance. The first step is to determine a release rate (QR) in pounds per minute.

Section 3.3 of the guidance specifies a method for spills of common water solutions such as aqueous ammonia. Passive mitigation factors (*i.e.*, dike and floating plastic baffles) are allowed and used in calculating QR.

The guidance treats water solutions at ambient temperatures as a liquid release (Section 3.2.3 for liquids) and first calculates a maximum pool without mitigation:

A = QS x DF

where:

A = Area (square feet (sq. ft.))

QS = Quantity Released (pounds)

DF = Density Factor (Exhibit B-3 of the Guidance, 20% ammonia).

QS is calculated using the data in Table 6-16. DF is 0.53 per Exhibit B-3 of the Guidance. Potential releases will be mitigated by both a containment dike surrounding the aqueous ammonia tank and floating plastic baffles which act to decrease the surface area of the aqueous ammonia pool.

The area contained by the dike is (19.3 ft. x 19.3 ft.) 372 sq. ft. The area of the tank is 78.5 sq. ft. based on a diameter of 10 ft. The open area around the tank is therefore the difference between the two, or 293 sq. ft. The diked area is calculated to be 293 sq. ft. without the floating plastic baffles and 29.3 sq. ft. with the plastic baffles. The smaller of the two areas is used in determining QR. The release rate is calculated as follows:

QR = 1.4 x LFA x A

where:

1.4 = Wind speed factor = $1.5^{0.78}$, (1.5 m/s is the worst-case wind speed)

LFA = Liquid Factor Ambient (Exhibit B-3, 20% ammonia)

A = Diked area with plastic baffles (sf)

LFA is 0.015 from Exhibit B-3 of the Guidance. Thus, the calculated QR is 0.616 pounds per minute.

Table 6-16 Offsite Consequence Analysis for Aqueous Ammonia

Parameters	Values	Reference
Volume (gallons)	15,000	BELD
Release (pounds)[1]	115,455	Calculated
Percent Ammonia in Solution	19	BELD
Area of Dike Surrounding Tank (sq. ft.)	293	BELD
Evaporation area (sq. ft.)[2]	29.3	Calculated
Density Factor	0.53	Exhibit B-3
Liquid Factor Ambient (LFA)	0.015	Exhibit B-3
Topography	Rural	USGS
Vapor Density	Buoyant	Exhibit B-3
Release Duration	10 minute	Guidance
Toxic Endpoint (milligrams per liter)	0.14	Exhibit B-3
Stability	F	Reference Table 1
Wind Speed (m/s)	1.5	Reference Table 1

[1] Release in pounds derived assuming density of 0.9229 g/cm^3 (20 percent ammonia solutions) and 8.34 pounds per gallon of water.

[2] Evaporation area is equal to 10% of dike area based on the floating plastic baffle reduction of 90%.

[3] Pooled area is equal to release in pounds multiplied by the density factor.

Next, the worst-case consequence distance is calculated. The Guidance provides worst-case distances for neutrally buoyant gases and vapors and for dense gases and vapors for both rural and urban areas (Section 6.2.3). The tables were developed assuming a wind speed of 1.5 m/s and F stability. Ammonia is considered neutrally buoyant with a toxic endpoint level of 0.14 milligrams per liter (mg/l), which is approximately equivalent to 200 parts per million. The toxic endpoint value is based on the existing short-term exposure value derived from the American Industrial Hygiene Association Emergency Response Planning Guidelines (EPRG). By dividing the calculated release rate (QR) by the toxic endpoint value (0.14 mg/l), the resulting calculated release rate/toxic endpoint value is 4.4. Using reference Table 1 in the Guidance for neutrally buoyant vapors, which assumes a 10 minute release duration and rural conditions, the resulting worst-case consequence distance corresponds to 0.06 miles (317 feet, or 96.5 meters).

For the majority of the area, the impacts would be limited to fenced-off BELD property. However, the distance to toxic endpoint also extends slightly offsite at two points. Figure 6-1 shows the extent of the distance to toxic endpoint from the ammonia tank, to the north onto empty property of the CITGO tank farm and offshore to the east. The distance does not extend to the BELD administration building or to the residences located further to the south. Both of these areas are not generally accessible to the public.

Scale 1:4,200
1 inch = 350 feet
0 175 350 Feet

Figure 6-1
Offsite Consequence Analysis

Thomas A. Watson Generating Station
Braintree Electric - Braintree, Massachusetts

Basemap: 2001 Orthophotography, MassGIS

Epsilon ASSOCIATES INC.

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Section 7.0

Sound Level Assessment (DEP Air Plan only)

7.0 SOUND LEVEL ASSESSMENT

The Watson Station has been designed to comply with all applicable state and local noise requirements and policies. This section provides a description of the applicable noise regulatory requirements, a brief explanation of noise terminology, a summary of the results of an ambient sound level monitoring program, and a discussion of the sound level modeling analysis for both operations and construction. A description of the proposed Watson Station, including a general arrangement drawing and elevations, is provided in Section 2. The principal noise sources are the turbine air intakes, the turbine exhaust stacks, the turbine generator housings and the SCR enclosures. A full report on the ambient sound level measurement program is provided as Appendix E.[19]

The BELD project team has worked closely with Rolls-Royce and supporting equipment vendors to develop a noise mitigation program that is fully responsive to DEP and EFSB noise policies for area residences. BELD's commitment to minimizing noise impacts includes approximately $1 million in incremental noise mitigation and controls for the proposed Watson Station.

7.1 Regulatory Requirements

7.1.1 Massachusetts State Regulations

The DEP has the authority to regulate noise under 310 CMR 7.10, which is part of the Commonwealth’s air pollution control regulations. Under the DEP regulations, noise is considered to be an air contaminant and, thus, 310 CMR 7.10 prohibits “unnecessary emissions” of noise.

DEP administers this regulation through Noise Policy DAQC 90-001 dated February 1, 1990. The policy limits a source to a 10-dBA increase in the ambient sound measured (L_{90}) at the property line for the Project and at the nearest residences. For developed areas, the DEP has utilized a “waiver provision” at the property line in certain cases. This is appropriate when are there are no noise-sensitive land uses at the property line and the adjacent property owner agrees to waive the 10-dBA limit.

The ambient level is defined as the background L_{90} measured when the facility is not operating, but during a time period when it would normally operate. For a source which

19 As described in Appendix E, Sound Level Measurement Report, a comprehensive community sound level measurement study was conducted in June of 2006. Short term and continuous measurements were taken from Friday, June 16 through Tuesday, June 20, 2006. Both short term and continuous measurements were taken at three representative residential locations with short term measurements taken at four additional community locations. In December of 2006, while studying various sound mitigation approaches, supplemental measurements were taken at the former Fore River Shipyard, with the permission of the current owner, Quirk Automotive Group. As discussed in Section 4.3.3 of the Petition, these supplemental measurements indicted that ambient sound levels on the Quirk parcel are generally comparable to ambient sound levels measured in the June 2006 survey.

will or could operate 24-hour per day, the ambient level typically occurs during the quietest nighttime period (midnight to 4 a.m.). The DEP policy further prohibits "pure tone" conditions where one octave band frequency is 3 dB or more greater than an adjacent frequency band. An example of a "pure tone" is a fan with a bad bearing that is producing an objectionable squealing sound.

7.1.2 Local Regulations

The Town of Braintree, in the Zoning Bylaws, Section 135-1105, prohibits noise emissions at the property boundary that exceed 70 dBA in commercial zones (all times), 60 dBA in residential zones (daytime) or 50 dBA (all other times) in lands zoned for Open Space.

7.2 General Sound Level Descriptors

There are several ways in which sound (noise) levels are measured and quantified, each of which uses the logarithmic decibel ("dB") scale. The sound level meters used to measure noise contain "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The network used for community noise surveys is the A-weighting network, because it most closely approximates how the human ear responds to sound at various frequencies. A-weighted sound levels emphasize the middle frequency (*i.e.*, middle pitched – around 1,000 Hertz sounds), and de-emphasize lower and higher frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA".

Because the sounds in the environment vary with time, they cannot simply be described with a single number. Two methods are used for describing variable sounds. These are "exceedance levels" and the "equivalent level", both of which are derived from a large number of moment-to-moment A-weighted sound level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where n can have a value of zero to 100%. Two descriptors that are commonly reported in community noise monitoring are described below.

L_{90} is the sound level in dBA exceeded 90% of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources. The L_{90} descriptor is used by the DEP.

The equivalent level is the level of a hypothetical steady sound that would have the same energy (*i.e.*, the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is also A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but, because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is most often determined by occasional loud, intrusive noises. The EPA considers the L_{eq} the best measure by which to evaluate long-term environmental noise.

7.3 Existing Condition Sound Level Measurements

A comprehensive sound level measurement study was conducted for the proposed Watson Station during June 16-20, 2006. A complete report on the June 2006 study is provided as Appendix E. As noise modeling work was underway and additional mitigation measures were being considered, supplemental measurements were taken at two locations within the former Fore River shipyard during December 8-13, 2006. In total, existing sound levels were measured at nine representative community locations. The selected locations generally correspond to the nearest sound-sensitive locations in various directions from the site, as well as elevated and over-water residential locations. Both short-term (ST) and continuous (CM) sound level measurements were made during 98 and 108 -hour periods. The results of the measurements indicate that the ambient background sound levels (L_{90}) ranged from 36 to 42 dBA in the community during the quietest part of the nighttime period.

Following a review of aerial photographs, a tour of the area around the BELD site was made to initially determine the community locations where sound may have the greatest potential to affect the community. From these, seven short-term measurement locations and three continuous measurement locations were selected to obtain a spatial representation of the ambient sound environment at the property boundary, and at representative community locations. As the Project design evolved with respect to noise control, two additional short term and two additional continuous monitoring locations were measured at the former shipyard, for a total of nine short-term measurement locations and five continuous monitoring locations.

The five continuous monitoring locations were co-located with five of the short term monitoring locations. Three of the continuous monitoring locations are in the Town of Braintree, while one is in the Town of Weymouth, across the Fore River from the Project site, and one is in the City of Quincy. (See Figure 7-1)

Continuous and short term monitoring was conducted at the five locations described below.

CM-1 (ST-1) is near the end of Glenrose Avenue in Braintree. It represents the nearest residential location to the east of the site (196 Glenrose Avenue). The meter was located on the shoreline edge near the woods on the east side of the site. This monitoring site is at the southeastern BELD property line.

CM-2 (ST-2) is near the corner of Glenrose Avenue and Ferncroft Road in Braintree. This represents the nearest residential locations south of the site. The meter was located in the woods about 100 feet northwest of Glenrose Avenue. This monitoring site is near the southwest BELD property line.

CM-3 (ST-7) is in Weymouth on 56 Bluff Road. It represents the nearest residential locations north of the site. The meter was located in the backyard of the residence, about 50 feet from the water's edge. This monitoring site is approximately 2300 feet north of the nearest BELD shoreline across the Fore River.

CM-4 (ST-8) is on the southeast corner (property line) of the Quirk Fore River lot near the Clean Harbors facility, in Braintree. The meter was located about 30 feet from the shoreline near an old parking lot.

CM-5 (ST-9) is on the Quirk Fore River lot in Quincy near the likely nearest location for future development, about 100 feet east of a large hanger-like building.

At the other four sound measurement locations, only short-term (20 minute) 1/3 octave band measurements were made. These include:

- ST-3 at the corner of Glenrose Avenue and Vinedale Road in Braintree, typical of the residences directly to the southeast;
- ST-4 at the corner of Ferncroft Road and Trefton Drive in Braintree, typical of the neighborhood to the southeast;
- ST-5 on Idlewell Boulevard in Weymouth, near a ballpark adjacent to the Fore River, typical of residences to the east across the Fore River; and,
- ST-6 on Marietta Avenue and Veranda Road in Braintree, typical of residences to the southwest of the BELD site.

In addition to identifying the nine monitoring locations, Figure 7-1 presents the lowest weekday and weekend nighttime L_{90} sound levels recorded at each location. BELD's Potter II station was not operating during the four day background monitoring program. Over the past several years, Potter II has run relatively infrequently although it is kept in good repair and has been available for dispatch more than 97% of the year.[20] Potter II is dispatched by ISO-NE.

Based on the existing condition data collected, quietest ambient background sound levels for each of the nine monitoring locations have been established as listed below. The quietest nighttime sound levels (L_{90}) across the 98 and 108-hour periods and a large study area were all within the range of 36 to 42 dBA.

City/Town	Location	Lowest L_{90} Measured
Braintree	ST-1 – End of Glenrose Ave.	40 dBA
Braintree	ST-2 – Near Glenrose Ave. and Ferncroft Rd.	36 dBA
Braintree	ST-3 – Glenrose Ave. and Vinedale Rd.	39 dBA
Braintree	ST-4 – Trefton Dr. and Ferncroft Rd.	37 dBA
Weymouth	ST-5 – Idlewell Blvd. near Ballfield	38 dBA
Braintree	ST-6 – Marietta Ave. and Veranda Rd.	40 dBA
Weymouth	ST-7 – 56 Bluff Rd. near Fore River	39 dBA
Braintree	ST-8 – Quirk Fore River Lot SE Property Line	42 dBA
Quincy	ST-9 – Quirk Fore River Lot near hanger.	40 dBA

7.4 Future Operational Sound Levels

7.4.1 Noise Sources and Reference Sound Data

This section provides a detailed discussion of the primary components of the BELD facility and their associated reference sound level data. The key components – gas turbine generator and SCR system – have been selected and manufacturer's sound level data for these primary components is used in the analysis. As is typical for a power project, certain components are selected and purchased by the EPC contractor later in the Project development effort. Accordingly, the reference sound level data used for the noise modeling includes the primary vendor data, as well as representative data from comparable projects (gas compressor), field measurements of similar equipment made at existing plants (ammonia injection skid), and values from the literature based on engineering parameters (main and auxiliary transformers).

Table 7-1 summarizes the sound level data for the equipment described in the following sections. These sound levels constitute the "Base Case" which represents a reasonably well-controlled package, including enclosures, rated at "85 dBA at 1 meter." The components requiring mitigation are also listed in Table 7-1 with their mitigated sound levels. The primary sources of noise from the Watson Plant are the gas turbine generator and associated air intake and exhaust, and the SCR walls. The remaining noise sources were not significant

[20] Availability factor over 97% since 2003. Recent work on gas turbine overhaul has reduced availability factor to approximately 90%.

with respect to predicted plant noise at off-site locations but were included in the modeling analysis for completeness.

7.4.2 Gas Turbine Generator Package

Two Rolls-Royce Industrial Trent 60 dual fuel WLE power generation packages are proposed. These packages will consist of both a gas turbine and an AC generator module. The gas turbine will be housed within a weatherproof, acoustical enclosure. The combustion air will be drawn in through an air inlet silencer. The gas turbine enclosure will include a ventilation system and an air handling system. This ventilation system will include intake and exhaust silencing. The AC generator will be housed within a weatherproof, acoustical enclosure.

Both near-field (1 meter) and far-field (100 meters) octave band sound level data have been provided by Rolls-Royce for this Trent 60 package. These data were converted to sound power level for use in the acoustical model. The acoustical model allowed for the directivity corrections shown in the Rolls-Royce data.

7.4.3 Gas Turbine Air Inlet

Each gas turbine generator package is equipped with an air inlet filter (refer to Section 2.1.1, Figure 2-8). The elevation of the air inlet filter ranges from approximately 25 feet above ground level (bottom of filter housing) to 50 feet above ground level (top of filter housing).

Table 7-1 Sound Power Level Input Data for BELD Noise Modeling – Base Case Except Where Noted (per unit) (dB)

Plant Component	No.	dBA	Octave Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
Rolls Royce Trent 60 CTG unit*	2	107	122	118	115	105	100	95	99	93	103
CTG Air Inlet Filter*	2	97	108	109	110	101	86	77	84	83	87
CTG Stack	2	112	130	128	123	115	108	97	85	98	100
CTG Stack – Mitigated Case*	2	96	122	118	108	94	84	82	82	77	75
SCR Duct Walls	2	105	135	127	117	99	83	65	66	70	61
SCR Duct Walls – Mitigated Case*	2	95	126	117	107	87	68	57	50	49	50
Main Step-up Transformer*	2	97	93	99	101	96	96	90	85	80	73
Auxiliary Transformer*	2	84	81	87	89	84	84	78	73	68	61
Gas Compressor Building*	1	88	96	96	97	95	84	72	69	68	60
Lube Oil Fin Fan Heat Exchanger*	1	93	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia Injection Skid*	2	92	96	95	93	87	86	84	85	83	81

NA = Octave band data not available.

*Inputs to noise modeling,

Therefore, the air inlet was modeled as an elevated area source. Each air inlet filter is fitted with an inlet silencer. In addition, each air inlet has an evaporative cooler unit to cool the intake air on warm days. These units are permanently mounted inside the air intake housing and provide additional sound reduction. Both near-field (1 meter) and far-field (100 meters) octave band sound level data have been provided by Rolls-Royce for the air inlet filter. These data were converted to sound power level for use in the acoustical model.

7.4.4 Gas Turbine SCR System

Each gas turbine generator package will exhaust into an SCR and CO catalyst system (refer to Section 2.1, Figure 2-9). The current Rolls-Royce SCR supplier is anticipated to be Turner Envirologic. The walls of the SCR and CO catalyst will radiate sound and thus are included as a sound source. There will be an inlet silencer as part of the SCR/CO catalyst system. Turner Envirologic provided sound power level data by octave band for the SCR walls.

7.4.5 Gas Turbine Stack Exhaust

Each gas turbine generator package will exhaust through the SCR and CO catalyst system, and then up an exhaust stack. Sound levels radiating out the top of the stack approximately 100 feet above ground level were included as an elevated sound source. Rolls-Royce provided sound power level data by octave band for the Trent 60 exhaust stack. The Base Case exhaust stack sound level data did not include the effects of a stack silencer.

7.4.6 Transformers

There will be one main step-up transformer and one auxiliary transformer serving each gas turbine package unit. No equipment-specific sound level data are currently available for the transformers. Reference sound levels for each transformer were calculated using the procedures found in the Electric Power Plant Environmental Noise Guide (Edison Electric Institute, Washington, DC, 1984). To be conservative, a standard (unquieted) unit was assumed with an MVA rating of 75 MVA for the main transformer and 10 MVA for the auxiliary transformer. The transformers are relatively insignificant noise sources.

7.4.7 Gas Compressors

Two natural gas compressors will be located at the site. These units will be located inside a building to reduce sound levels. No equipment-specific sound level data are currently available for the compressors. However, the building design will be such that the compressors will be more than 10 dBA quieter than the highest sound level source at the site. This will ensure that the sound level contribution from the gas compressors to community sound levels will be negligible. For this analysis, sound level data from another power plant project where gas compressors were housed within a building, were used in the BELD modeling. The enclosed gas compressors are relatively insignificant noise sources.

7.4.8 Lube Oil Cooling Skid

One air to water/glycol fin fan type heat exchanger system for cooling the water for both mineral and synthetic lube oil will be provided. The system will be mounted on a free-standing skid and will serve both gas turbine packages. Broadband sound level data has been provided by the expected vendor through Rolls-Royce. This system is a relatively insignificant noise source.

7.4.9 Ammonia Injection Skid

There will be one ammonia injection skid serving each SCR unit. The current design assumes that ammonia will be diluted with air and injected to the SCR using fans. No equipment-specific sound level data are currently available for the ammonia injection skid. For this analysis, sound level data measured at an existing power plant of comparable capacity were used in the BELD modeling. The ammonia injection skids are relatively insignificant noise sources.

7.5 Sound Model

A site-wide noise model was developed for the plant using the equipment described in Section 7.4.1 together with an equipment layout drawing and site area mapping. The noise impacts associated with proposed power plant sources were predicted using the Cadna/A noise calculation model (DataKustik Corporation, 2005). This model uses the ISO 9613-2 industrial standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The benefits of this modeling are a more refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections, drop-off with distance, and atmospheric absorption. Spreadsheet-based modeling is more of a screening-level approach as it does not typically include the effects of topography, various ground attenuations, and multiple building reflections.

The Cadna/A model allows for octave band calculation of noise from multiple noise sources, as well as computation of diffraction around building edges, and multiple reflections off parallel buildings and solid ground areas. The plant layout and terrain height contour elevations at the plant were also imported into Cadna/A; elevations in the surrounding area were obtained from USGS topographic maps. This allowed for consideration of terrain shielding where appropriate. In this manner, all significant noise sources and geometric propagation effects are accounted for in the noise modeling. The model was run with standard meteorology conditions of 20 degrees C (68 degrees F), 70% relative humidity, and no wind. Ground attenuation credit was taken by the model where appropriate in accordance with ISO 9613-2. For example, the paved parking lots and the entire area of water in the model domain (Fore River) were treated as 100% reflective surfaces (no absorption of sound energy).

The Cadna/A model was run to calculate sound levels at both separate discrete receptors and at a grid. The use of a grid allows for noise contours to be calculated. The 13 discrete receptors included the nearest property lines at locations where data was collected, and the nearest residences in several directions around the facility. The nearest residences to the southeast, south, and southwest of the new plant will range from approximately 600 feet to 1,000 feet. The more general neighborhood to the south is 1,500 feet or more away from the plant. The nearest neighborhood to the west (on the west side of Route 53) is 2,600 feet (0.5 mile) away, and the nearest residents to the north in Weymouth are 2,300 to 2,600 feet away.

The receptor grid was chosen to have grid points at a spacing of 25 meters, with the grid chosen to cover the area including all discrete receptors. This gave a grid of about 1700 meters x 1100 meters, with a total of nearly 3000 grid points. By examining noise contours plotted around noise values computed at these grid points, it was possible to examine the overall noise levels in the surrounding neighborhoods, as well as the manner in which the terrain and building shielding reduced the noise levels.

7.5.1 Predicted Operational Sound Levels - Base Case

The results of the Base Case sound level modeling for the proposed Thomas A. Watson Generating Station are presented in Table 7-2 for each discrete receptor location (A-weighted broadband). These results are for the proposed Watson Station only. The operational sound level modeling assumes all equipment, including both gas turbines, are operating simultaneously at full load. Base-case Project sound levels are expected to range from 41 to 58 dBA at the nearest residences. When combined with the quietest middle of the night background sound levels, the Base Case was predicted to increase sound levels by 4 to 18 dBA over nighttime background at the nearest residences. This was due primarily to sound from the stack exhaust and SCR walls. The quietest existing background sound levels are shown in Figure 7-1.

Background sound levels for the nearest residences to the southeast, southwest, and south (discrete modeling receptors R1A, R2A, and R3A respectively) were taken from the nearby monitoring sites CM-1, CM-2, and ST-3 respectively. These levels are higher than permitted by MA DEP at a residence (10 dBA) so additional mitigation was required.

Table 7-2 Sound Level Modeling Results – Thomas A. Watson Generating Station Plus Background – Base Case

Receptor	Land Use	T. A. Watson Plant (dBA)	Lowest L90 Background (dBA)	Total (dBA)	Increase Over Background (dBA)
R1 – woods SE of BELD	Residential PL	59	40	59	19
R1A – 196 Glenrose Ave. (near R1)	Residence	58	40	58	18
R2 – woods SW of BELD	Residential PL	53	36	53	17
R2A – 108 Glenrose Ave. (near R2)	Residence	53	36	53	17
R3 – Glenrose Ave/Vinedale Rd	Residence	55	39	55	16
R3A – 156 Glenrose Ave. (near R3)	Residence	53	39	53	14
R4 – Ferncroft Rd/Trefton Dr.	Residence	48	37	48	11
R5 – Newell Park	Recreational	43	38	44	6
R6 – Veranda Rd/Marietta Ave	Residence	41	40	44	4
R7 – 56 Bluff Rd	Residence	47	39	48	9
R8 – Quirk parcel PL	Commercial	53	42	53	11
R9 – Quirk parcel – mid-site	Commercial	45	40	46	6
R10 – Northern BELD PL with CITGO	Industrial PL	65	42(1)	65	23

PL = property line
NA = Not measured
(1) = Lowest value from R8 monitoring data (Quirk parcel PL) used as representative background.

7.5.2 Additional Mitigation Case

A variety of noise control options were evaluated and incorporated in the mitigation modeling case including:

- Increasing the length of the silencer within the SCR by 6 feet (14 feet total),
- Doubling the thickness of the SCR shell steel,
- Insertion of a 14-foot silencer in the stack,
- On-site sound barriers in strategic locations, and

- Reorienting the combustion turbine generator ("CTG") arrangement 180 degrees so the gas turbine air inlets face to the north, away from the residential area to the south.

Figure 7-2 shows the predicted plant sound levels in decibel contours down to 30 dBA as produced by the Cadna/A sound model. These results are for the proposed Watson Station only. The operational sound level modeling assumes all equipment, including both gas turbines, are operating simultaneously at full load. With the additional mitigation, Project sound levels are expected to be 45 dBA or below at all residential locations. The cost of the incremental noise control measures necessary to achieve this further noise reduction is in excess of one million dollars.

As summarized in Table 7-3a (Sound Level Evaluation, with additional mitigation and nighttime ambients) the expected sound levels for the Watson Station at full load, incorporating all recommended mitigation are 42 to 45 dBA at the closest residences to the southeast (receptor R1A), southwest (receptor R2A), and south (receptors R3 and R3A). Projected sound levels from the Watson Station are expected to be 39 dBA in the residential area to the south (receptor R4), 39 dBA across the water in the Bluff Road area of Weymouth (receptor R7), and 29 dBA at the nearest residences on the west side of Route 53 (receptor R6).

7.5.3 Regulatory Evaluation

For purposes of evaluating the DEP noise policy, future worst-case sound levels will arise by combining the contribution from the proposed Watson Station with the quietest middle-of-the-night background sound levels. These totals and their increase are shown in Table 7-3a. The increase over background at the nearest residences during these quietest middle-of-the-night conditions is expected to range from 0 dBA to 8 dBA; the relevant DEP policy limit is 10 dBA. It is important to keep in mind that these levels are for one or two hours around 3:00 AM. The increase in sound levels at the nearest property line is expected to be 20 dBA. However, this property line abuts a marine petroleum import terminal, and thus is not a noise-sensitive use. Therefore, BELD is requesting a waiver of the DEP Noise Policy at this property line.[21]

While the Watson Station may occasionally run during the nighttime hours, more typical operation will be expected during the peak electrical hours (weekday daytime and/or evening). Table 7-3b presents the same evaluation when using the lowest weekday daytime or evening background. For purposes of this evaluation, the US EPA definition of daytime was used (7 a.m. to 10 p.m.). The increase over background at the nearest residences

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[21] A letter formalizing discussions between BELD and CITGO is included as Appendix F. CITGO does not have a problem with expected noise levels from the Project at the BELD/CITGO property line.

during daytime/evening conditions is expected to range from 0 dBA to 4 dBA. Table 7-4 shows the modeled results by octave band for the mitigated case. There is no "pure tone" caused by the Project as defined by the DEP noise policy at the nearest residences.

The results of modeling show that all predicted sound levels at property boundaries that abut a residential zone (south of the BELD facility) do not exceed 60 dBA. In addition, the proposed Watson Station sound levels do not exceed 50 dBA in lands zoned for Open Space. Predicted sound levels in a commercial zone do not exceed 70 dBA. These satisfy the local noise criteria for the Town of Braintree Zoning Bylaws.

Table 7-3a Sound Level Evaluation – Thomas A. Watson Generating Station with additional mitigation– Nighttime Background

Receptor	T. A. Watson Plant (dBA)	Lowest L90 Background (dBA)	Total (dBA)	Increase Over Background (dBA)
R1 – woods SE of BELD	47	40	48	8
R1A – 196 Glenrose Ave. (near R1)	45	40	46	6
R2 – woods SW of BELD	44	36	45	9
R2A – 108 Glenrose Ave. (near R2)	43	36	44	8
R3 – Glenrose Ave/Vinedale Rd	42	39	44	5
R3A – 156 Glenrose Ave. (near R3)	44	39	45	6
R4 – Ferncroft Rd/Trefton Dr.	39	37	41	4
R5 – Newell Park	33	38	39	1
R6 – Veranda Rd/Marietta Ave	29	40	40	0
R7 – 56 Bluff Rd	39	39	42	3
R8 – Quirk parcel PL	45	42	47	5
R9 – Quirk parcel – mid-site	36	40	41	1
R10 – Northern BELD PL with CITGO	62	42	62	20

PL = property line
NA = Not measured
(1) = Lowest value from R8 monitoring data (Quirk parcel PL) used as representative background.

Table 7-3b Sound Level Evaluation – Thomas A. Watson Generating Station with additional mitigation – Weekday Daytime/Evening Background

Receptor	T. A. Watson Plant (dBA)	Lowest L90 Background (dBA)	Total (dBA)	Increase Over Background (dBA)
R1 – woods SE of BELD	47	44	49	5
R1A – 196 Glenrose Ave. (near R1)	45	44	48	4
R2 – woods SW of BELD	44	42	46	4
R2A – 108 Glenrose Ave. (near R2)	43	42	45	3
R3 – Glenrose Ave/Vinedale Rd	42	45	47	2
R3A – 156 Glenrose Ave. (near R3)	44	45	48	3
R4 – Ferncroft Rd/Trefton Dr.	39	44	45	1
R5 – Newell Park	33	44	44	0
R6 – Veranda Rd/Marietta Ave	29	48	48	0
R7 – 56 Bluff Rd	39	41	43	2
R8 – Quirk parcel PL	45	46	49	3
R9 – Quirk parcel – mid-site	36	42	43	1
R10 – Northern BELD PL with CITGO	62	46	62	16

PL = property line
NA = Not measured
(1) = Lowest value from R8 monitoring data (Quirk parcel PL) used as representative background.

Table 7-4 Sound Level Modeling Results by Octave Band – Thomas A. Watson Generating Station Only – With Additional Mitigation

Receptor	A-wtd	Octave Band (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
R1 – woods SE of BELD	47	75	67	58	41	39	34	35	24	10
R1A – 196 Glenrose Ave. (near R1)	45	74	66	56	40	38	32	34	22	7
R2 – Woods SW of BELD	44	74	67	54	37	36	32	33	20	3
R2A – 108 Glenrose Ave. (near R2)	43	72	65	53	35	34	32	33	20	1
R3 – Glenrose Ave/Vinedale Rd	42	71	64	54	38	33	27	27	16	-3
R3A – 156 Glenrose Ave. (near R3)	44	72	65	55	39	35	33	33	20	2
R4 – Ferncroft Rd/Trefton Dr.	39	66	60	50	34	31	27	27	11	-21
R5 – Newell Park	33	61	54	43	29	27	21	19	-5	-69
R6 – Veranda Rd/Marietta Ave	29	59	51	41	26	19	12	9	-15	-71
R7 – 56 Bluff Rd	39	68	62	47	33	31	30	29	8	-43
R8 – Quirk parcel PL	45	74	68	53	36	35	34	37	23	2
R9 – Quirk parcel – mid-site	36	65	59	45	31	29	24	24	4	-44
R10 – Northern BELD PL with CITGO	62	83	77	70	58	56	52	57	50	52

PL = property line

7.6 Noise Control Summary

A comprehensive noise control package has been included in the design of the Watson Station. Items 1 through 4 are standard features of the Rolls-Royce Trent 60 gas turbine package. Item 5 is part of the design for enhanced hot weather performance, but the coolers also provide collateral sound reduction. A full building enclosure for the gas compressors (Item 6) was also assumed in the base case.

Items 7 through 11 are specific additional sound level mitigation measures evaluated and recommended for the Watson Station.

1. Weatherproof, baseplate-mounted enclosure for housing the gas turbine, inlet plenum, fuel and oil systems, and enclosure ventilation air systems.

2. Combustion air inlet silencer and ducting.

3. Intake ducting and silencing for the gas turbine enclosure ventilation intake system, the gas turbine enclosure ventilation exhaust system, and the gas turbine bleed air exhaust.

4. Weatherproof, baseplate-mounted enclosure for housing the AC generator, exciter, line and neutral cubicles.

5. Evaporative coolers in the gas turbine air inlets.

6. Gas compressors housed within an enclosed building.

7. Increasing the length of the silencer within the SCR by 6 feet (14 feet total).

8. Doubling the thickness of the SCR shell steel (from 0.25-inch to 0.5-inch).

9. Gas turbine stack exhaust silencers.

10. Sound barrier walls along the south side of the Project site.

11. Reorienting the CTG arrangement 180 degrees so the gas turbine air inlets face north away from the residential area to the south.

7.7 Cumulative Sound Level Analysis – Potter II Station

While well maintained and fully dispatchable, the existing Potter II station operates relatively infrequently at the current time. For example, during 2004 and 2005 it ran 584 hours and 339 hours per year, respectively. Potter II is typically dispatched during system peaks (weekday daytime). Sound level measurements were conducted at several nearby locations in the community during a brief period of Potter II operation on June 1, 2006. These measurements also included other sources (background) in addition to Potter II. The estimated background contribution to the June 1, 2006, measurements was made based on the background sound measurement program of June 16-20, 2006. This sound level was subtracted to provide an estimate of the "Potter II only" sound levels at the nearest residential locations to the Project. These are the residences to the south on Glenrose Avenue.

The Potter II sound levels were added to the modeled Watson Station sound levels at the three closest residential locations to calculate a cumulative impact. The results are shown in Table 7-5a for daytime/evening impacts and Table 7-5b for nighttime impacts. The results in Table 7-4a show that worst-case increases over background at the three closest residences to the south are expected to range from 5 to 7 dBA. These values are well below the DEP Noise Policy of 10 dBA increase.

The results in Table 7-5b show that worst-case sound levels during the middle of the night could increase by 10-11 dBA at the closest residences on Glenrose Avenue. All other locations will be less than a 10 dBA increase. It must be stressed that if both Watson Station and Potter II are running during the middle of the night, there are likely significant problems in the regional power grid. It is much more likely that both Watson Station and Potter II will be running during the weekday daytime or evening hours.

Table 7-5a Sound Level Evaluation – Thomas A. Watson Generating Station plus Potter II – Daytime/Evening Background

Receptor	T. A. Watson Plant (dBA)	Measured Potter II (dBA)	Lowest L90 Background (dBA)	Total (dBA)	Increase Over Background (dBA)
R1 – woods SE of BELD	47	50	44	52	8
R1A – 196 Glenrose Ave.	45	48(1)	44	51	7
R2 – woods SW of BELD	44	45	42	49	7
R2A – 108 Glenrose Ave.	43	45	42	48	6
R3 – Glenrose Ave/Vinedale Rd	42	47	45	50	5
R3A – 156 Glenrose Ave.	44	47	45	50	5

(1) Reduce measured value by 2 dBA due to increased distance from measurement location (R1) to 196 Glenrose Ave. (R1A).

Table 7-5b Sound Level Evaluation – Thomas A. Watson Generating Station plus Potter II – Nighttime Background

Receptor	T. A. Watson Plant (dBA)	Measured Potter II (dBA)	Lowest L90 Background (dBA)	Total (dBA)	Increase Over Background (dBA)
R1 – woods SE of BELD	47	50	40	52	12
R1A – 196 Glenrose Ave.	45	48(1)	40	50	10
R2 – woods SW of BELD	44	45	36	48	12
R2A – 108 Glenrose Ave.	43	45	36	47	11
R3 – Glenrose Avenue/ Vinedale Rd	42	47	39	49	10
R3A – 156 Glenrose Ave.	44	47	39	49	10

(1)Reduce measured value by 2 dBA due to increased distance from measurement location (R1) to 196 Glenrose Ave. (R1A).

7.8 Noise BANCT Analysis

7.8.1 Introduction

The extensive noise mitigation measures proposed for this Project will comply with DEP's longstanding policy of a 10 dBA increase at noise-sensitive locations. The proposed increase over the existing quietest nighttime ambient sound levels is 8 dBA at the nearest residence, and 6 dBA or less at all other residences.

Recent power generation facility applications to DEP have been requested to conduct a Best Available Noise Control Technology or "BANCT" analysis. The purpose of this analysis is to examine noise control measures beyond the rigorous controls already proposed by the Project. The basic intent of the BANCT analysis is to ascertain whether the application of additional noise controls is feasible and/or cost effective. The following analysis compares other acoustical design options to the proposed design. The estimated cost of the sound level attenuation package for the Project as described in Section 2 is in excess of one million dollars in additional capital equipment costs. A significant part of the cost, which has not been included in the estimate, is the performance penalty that may be imposed as a result of the additional noise control measures. The estimation of performance costs is not practical at this early stage of facility design.

The analysis takes the "top down" approach, similar to the BACT analysis for air emissions. However, the control of noise is unlike the control of air emissions. A combustion gas turbine has a single control technology for each pollutant. The same turbine installation has many sound sources, which requires a systematic reduction of sound levels from individual contributing sources. Since total sound levels are combined logarithmically, any additional noise control must focus on the highest contributing sources first before moving to lesser contributing sources. For example, further controlling a component that is already 5 dBA quieter than the loudest source will have minimal impact on project sound levels.

The analysis of noise control cost effectiveness also involves an understanding of the sensitivity of various types of receiving locations. The design of the BELD facility has focused on the use of all cost-effective means to minimize the sound levels at the nearest residential properties. The proposed design represents a modest 6 to 8 dBA increase in the ambient baseline levels at a few residential locations at the quietest hours of the night. The plant will produce less than a 5 dBA increase at most residences. During daytime hours, the plant will be even less noticeable. An increase of less than 3 dBA is not noticeable to the average human ear.

7.8.2 Primary Noise Sources

The largest predicted increase in the ambient sound levels at a residence was modeled at receptor R2A – residence at 108 Glenrose Avenue. The expected project sound level at this location is 43 dBA. Table 7-6 provides some detail on the individual source contributions that make-up the total of 43 dBA. In addition, the percent of the sound energy each component contributes to the total is indicated. They are sorted from highest to lowest. CTG #1 is arbitrarily identified the farthest unit from the residences to the south, while CTG #2 is arbitrarily identified as the closest unit to the residences to the south. By examining these data, it can be seen that the CTG #2 is the largest component of the total and would be the first candidate for additional noise control. The CTG #2 contributes 39 dBA of the 43 dBA total, or 40 percent on an energy basis. By ranking from highest to lowest, additional controls on the primary noise sources can be evaluated.

7.8.3 Potential Additional Controls

There are essentially two possible methods to further reduce the sound level contribution of CTG #2. These involve either 1) an enhanced enclosure package around the CTG, or 2) some type of sound barrier wall between the CTG and receptor R2A to the southwest. Each of these is discussed below. No further noise control options on other components were investigated since they will be rendered negligible unless the primary source (CTG package) is further controlled.

1) Enhanced Enclosure Package

The CTG vendor (Rolls-Royce) offers a mitigation package with the following additional controls:

- Modified gas turbine enclosure,

- Increased ventilation exhaust duct thickness, cladding, and fan motor treatment,

- Increased ventilation intake duct thickness, cladding, and fan motor treatment,

- Add underbase acoustic skirt, and

- Add combustion exhaust duct blister cover.

- This is Rolls Royce's most radical departure from their standard enclosure package. This reduces the contribution of each CTG package by 5 dBA at a capital cost of $1.075 million dollars.

2) Sound Barrier Wall

A sound barrier wall needs to be near either the source or the receptor to be most effective. Due to space constraints around the site, locating a sound wall near the CTG is not technically possible. Therefore, a sound barrier wall along the south side of Potter Road (on BELD property nearest the residents to the southwest (receptor R2A) was modeled. For planning purposes, the barrier was approximately 100 meters long (330 feet), and varied in height from 5 meters (16 feet) high to 8 meters (26 feet) high from west to east. The height variation would follow the changing elevation of the road. A barrier of these dimensions will only protect the nearest 5 or 6 homes in this direction. For a sound barrier to be effective, it would need to be of solid construction with a surface weight of at least four pounds per square foot. A barrier of this size would range in cost from $175,000-$250,000 to build using the most recent Massachusetts Highway Department figure of $22.50 per square foot for the "Type II Noise Barrier Implementation Plan." One other feature of a noise barrier is that under temperature inversion conditions, or when the wind speed exceeds about 10-12 mph along the direction of the sound path from the source to the receptor (downwind), the sound waves bend over the top of the barrier as though it were not there. Therefore under certain conditions such a noise barrier would be ineffective.

7.8.4 Revised Operational Noise Modeling

1) Enhanced Enclosure Package

The Cadna/A sound model was rerun with the CTG enhanced enclosure mitigation package. This decreased the contribution of CTG #1 and CTG #2 by 5 dBA each while the remaining plant components were unchanged. This decreased total plant-only sound levels by 1-2 dBA at all receptors. When combined with the lowest nighttime background L_{90} sound levels, the overall sound levels were 0-2 dBA lower than the Base Case with Mitigation. While this is technically feasible, it is not cost-effective to spend over $1 million additional dollars to reduce middle of the night sound levels by 0-2 dBA. Sound level changes of 3 dBA or less are not noticeable in the community. Therefore, the enhanced enclosure package does not represent BANCT.

2) Sound Barrier Wall

The Cadna/A sound model was rerun with the sound barrier wall along Potter Road. This decreased the contribution of CTG #1 and CTG #2 by 4 dBA each, as well as providing varying degrees of shielding (1-5 dBA) for all other components as well. This decreased total plant-only sound levels by 4 dBA at the two receptors to the southwest. All other receptors were unchanged. When combined with the lowest nighttime background L_{90} sound levels, the overall sound levels were 3-4 dBA lower than the Base Case with Mitigation. Receptor R2A (108 Glenrose Avenue) would see a 5 dBA increase over nighttime background, instead of an 8 dBA increase. While a sound barrier wall is technically feasible, it is not cost effective. The Massachusetts Highway Department (MassHighway) uses a Cost Effectiveness Index (CEI) to determine a barrier's reasonableness by comparing the total cost of the barrier divided by the amount of noise reduction achieved and the number of homes protected. A house must receive a minimum of 5 dBA of noise reduction to be counted as 'protected' and included in the CEI calculation. None of the residences receive more than 4 dBA of noise reduction so in theory a barrier would not even be built here. However, for purposes of this discussion 4 dBA will be used. A review of the maps shows that approximately 6 homes may receive some benefit (4 dBA or less) from a barrier. Using the low end of construction costs ($200,000) yields a CEI of $8,333 ($200,000/(4 dBA * 6 homes). MassHighway has established a CEI of $2,700 in accordance with Federal Highway Administration (FHWA). Under these guidelines, the CEI for the Potter Road sound barrier is not cost-effective and thus does not represent BANCT.

7.8.5 Conclusion

Two additional noise control options were reviewed as part of the Best Available Noise Control Technology analysis. While both were technically feasible, neither one was cost-effective, and neither one will be pursued. Therefore, the comprehensive noise control package committed to by BELD and summarized in section 7.6 represents BANCT for this facility.

Table 7-6 Equipment-Specific Components of Total Sound Level at 108 Glenrose Ave. (R2A)

Plant Component	Sound Level (dBA)	Percent of Total
Rolls Royce Trent 60 CTG unit #2	39	40
SCR Duct Walls #2	34	13
SCR Duct Walls #1	34	13
Rolls Royce Trent 60 CTG unit #1	33	10
CTG Stack #2	33	10
CTG Stack #1	33	10
Main Step-up Transformer #2	30	5
Lube Oil Fin Fan Heat Exchanger	25	2
Ammonia Injection Skid #1	24	1
Gas Compressor	18	<1
Auxiliary Transformer #2	18	<1
CTG Air Inlet Filter #2	18	<1
Main Step-up Transformer #1	15	<1
Ammonia Injection Skid #2	15	<1
CTG Air Inlet Filter #1	11	<1
Auxiliary Transformer #1	4	<1
TOTAL	43	100

7.9 Construction Noise

The construction of the proposed Watson Station will take approximately 10 months. Noise associated with construction activities will be intermittent, as equipment is operated on an as-needed basis. The significant noise-producing construction activities associated with the proposed Watson Station will take place during daylight hours only. Neighbors in the vicinity may hear the construction noise, but the overall impact will be insignificant due to the considerable distance between the site and the residents.

Construction will not result in generation of or exposure of the community to excessive noise levels. Figure 7-3 is a chart from an EPA publication depicting typical construction equipment sound levels at 50 feet.[22] For perspective, the distance from the site to the nearest residences to the southeast, south, and southwest of the new plant is approximately 600 feet to 1,000 feet. The more general neighborhood to the south is 1,500 feet or more away from the plant. The nearest neighborhood to the west (on the west side of Route 53) is 2,600 feet (0.5 mile) away, and the nearest residents to the north in Weymouth are 2,300 to 2,600 feet away.

The most prevalent sound source during construction will be from internal combustion engines used to power the construction equipment. All internal combustion equipment will be fitted with appropriately-sized mufflers to reduce sound. The sound level impacts at the residences from construction equipment will depend on the type of equipment used, the mode of operation of the equipment, the duration of operation, the amount of equipment in use simultaneously, and the distance between the equipment and residence. These factors will be constantly changing throughout the construction period, making the calculation of an L_{dn} or L_{eq}, and therefore an accurate quantification of future sound levels quite difficult.

There is not expected to be any pile-driving as part of the site work. Based on the current geotechnical analysis, drilled caissons are expected to be used. These will be filled with concrete from a batch-mix truck. This technique will generate significantly less noise than pile-driving. No explosives or blasting will be used in connection with the Project.

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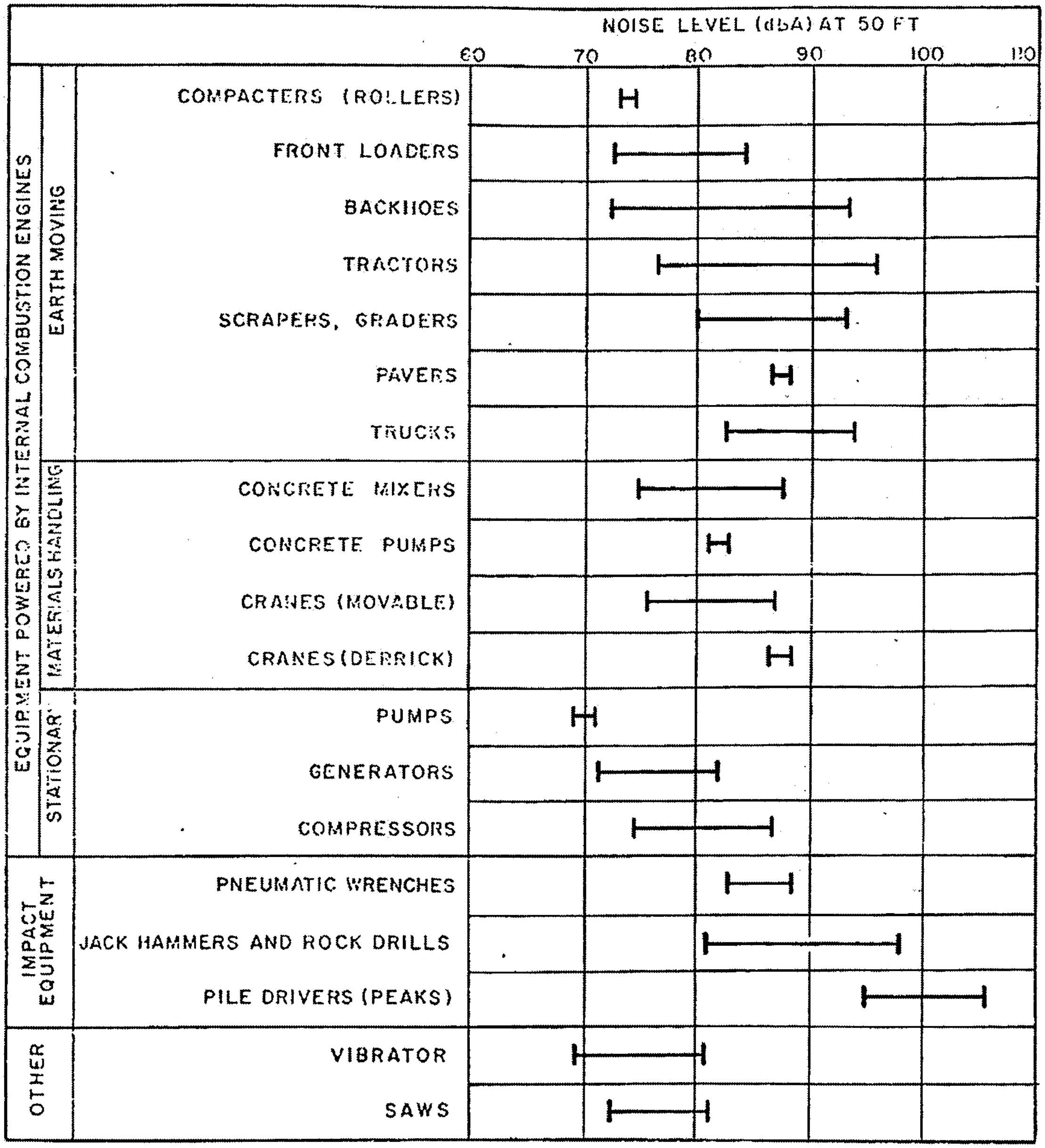
22 US EPA, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, NTID300.1, December 31, 1971.

Figure 7-3 Typical Construction Equipment Sound Levels – dBA at 50 feet



Note: Based on Limited Available Data Samples

Section 8.0

Proposed Permit Conditions

8.0 PROPOSED PERMIT CONDITIONS

The following enforceable permit conditions for the facility are proposed to meet the requirements of BWP AQ CPA-1.

8.1 Facility Description

Braintree Electric Light Department (BELD), a municipal utility serving the Town of Braintree, proposes to construct and operate an approximately 116 MW quick-start, simple-cycle, dual-fuel generating facility at its Potter Road facility in East Braintree. The new facility has been named the Thomas A. Watson Generating Station ("Watson Station" or the "Project") in honor of BELD's founder.

BELD's Potter Road facility has been used for power generation for nearly fifty years. The 23-acre site currently houses Potter II, an operating dual-fuel (natural gas or No. 2 distillate) combined-cycle power plant with a nominal rating of 95 MW, a 2.25 MW diesel generator set, and a 115 kV switchyard. BELD's administrative offices, the operations center, and equipment storage areas are also located at the Potter Road facility.

8.1.1 Site Description

BELD's existing 23-acre Potter Road utility operation is located on the western bank of the Weymouth Fore River in East Braintree. The proposed Watson Station site is an approximately two-acre portion on the northern side of the BELD property.

The proposed new Watson Station will be constructed on a portion of which is currently occupied by the decommissioned Potter I generating station. Potter I was retired in the mid-1970s and decommissioned in the early 1980s. Internal asbestos has been encapsulated and removed. BELD plans to complete removal of the remaining equipment, the building shell and stack by June of 2007.

8.1.2 Project Description

The Watson Station will consist of two quick-start, simple-cycle Rolls-Royce Trent 60 combustion turbines, and the necessary ancillary facilities, including interconnections of approximately 300 feet of 115 kV overhead transmission line, a short run of high pressure gas (to be installed by Algonquin Gas Transmission Company ("AGT"))[23] line and an upgrade of an existing oil pipeline that runs from the adjacent CITGO terminal to the Potter II station. The Watson Station will be rated at 116 MW and will have the ability to go from a cold start to full load in ten minutes or less on either natural gas or Ultra Low Sulfur Distillate (ULSD) oil.

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23 A Unit of Spectra Energy.

Natural gas is available via a high pressure 24-inch diameter AGT pipeline which traverses the Potter Road site, while ULSD will be provided via a terminaling agreement with the adjacent CITGO marine petroleum terminal. The newly available ULSD has an allowable sulfur content of only 15 ppm. In contrast, transportation grade distillate has an allowable sulfur content of 0.05% (500 ppm), while home heating oil (No. 2 fuel oil) has an allowable sulfur content of 0.3% (3,000 ppm). When the proposed Watson Station is placed in operation, BELD's existing Potter II generating facility will also begin using ULSD in lieu of No. 2 fuel oil.

The proposed Watson Station will employ state-of-the-art pollution control technology to meet Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) requirements. In addition to the use of very clean burning fuels (natural gas and ULSD) and sophisticated combustion controls, the new facility will use water injection and a Selective Catalytic Reduction (SCR) system to control nitrogen oxide (NO_x) emissions and an oxidation catalyst to limit carbon monoxide (CO) and Volatile Organic Compound (VOC) emissions. Emissions of Sulfur Dioxide (SO_2) and Particulate Matter (PM_{10}/$PM_{2.5}$) will be controlled via the use of the cleanest fossil fuels, natural gas and ULSD.

Each combustion turbine will have a heat input of 546 MMBtu/hr (HHV) while operating on natural gas at 100% rated capacity at 59°F and 522 MMBtu/hr (HHV) while operating on ULSD at 100% rated capacity at 59°F.

For each turbine, the SCR system and the oxidation catalyst are housed in an insulated steel enclosure expected to be approximately 30 feet in length and 22 feet in height. Exhaust gases from the gas turbine pass through the catalyst beds, and then exit via the exhaust stack. The Watson Station will have two steel stacks 100 feet above ground level. Each stack will have an exit diameter of 11 feet which will provide for a maximum exit velocity of 115 feet per second at a temperature of 800°F.

8.2 Emission Limits

8.2.1 Limits During Normal Operation

The Permittee shall comply with the proposed emissions rates and annual potential emissions from the Watson Station summarized in Table 8-1. The potential emissions are calculated based on 8,760 hours per year of full load operation, (5,880 hours on natural gas and 2,880 hours on ULSD). The conservatively assumed sulfur content of natural gas (0.8 gr/ccf) is higher than the sulfur content of ULSD (15 ppm), therefore potential annual SO_2 emissions are conservatively calculated assuming that natural gas is fired 8,760 hours per year.

Facility emissions will be controlled to BACT/LAER levels. The facility proposes to use water injection and SCR to minimize NO_x emissions. Combustion controls and an Oxidation Catalyst will be used to minimize CO and Volatile Organic Compound (VOC) emissions.

Sulfur Dioxide (SO_2) and Particulate Matter (PM_{10} and $PM_{2.5}$) emissions will be controlled via the use of the cleanest fossil fuels, natural gas and ULSD. The full air pollution control technology analysis is presented in Section 4, the BACT/LAER Analysis.

Table 8-1 Emissions Summary, Watson Station

Fuel	Natural Gas			ULSD				
Pollutant	lb/hr	ppm[24]	lb/MMBtu	lb/hr	ppm	lb/MMBtu	tpy	Method
NO_x	3.5	2.5	0.0091	6.9	5.0	0.019	58.8	Water injection and SCR
CO	6.5	5.0	0.011	6.6	5.0	0.012	53.5	Combustion Controls and Oxidation Catalyst
VOC	0.8	1.0-2.5	0.0013-0.0031	1.1	1.5-4.5	0.0020-0.0059	7.6	Combustion Controls and Oxidation Catalyst
PM_{10}/ $PM_{2.5}$	5	NA	0.01-0.02	15	NA	0.03-0.05	72.9	Use of natural gas and Ultra Low Sulfur Distillate (ULSD)
SO_2	0.02	NA	0.0024[25]	0.81	NA	0.0015[26]	11.5	Use of natural gas and ULSD.
NH_3	3.7	5	0.0067	3.7	5	0.0071	32.5	

In concert with the commissioning of the proposed Watson Station, BELD has committed to use ULSD at the existing 95 MW Potter II combined-cycle unit. ULSD has a sulfur content of 0.0015% (15 ppm) as opposed to the current 0.3% (3,000 ppm) distillate used at Potter II. Accordingly, the facility's potential and permitted SO_2 emissions will be reduced from 1,337 tpy to 40 tpy[27].

24 All turbine emissions reported in ppm are in units of ppmvd @ 15% O_2.

25 Emission rate conservatively assumes 0.8 gr/ccf sulfur content. The sulfur content in the Algonquin pipeline has never been greater than 0.5 gr/ccf resulting in a conservative estimate of SO_2 emissions for the proposed Watson Station.

26 Emission rate uses ULSD sulfur content of 15 ppm.

27 40 tpy potential/permitted SO2 emission rate based on 8,760 hours per year operation, conservatively firing natural gas with an assumed sulfur content of 3 gr/ccf (per BELD's current operating permit).

8.2.2 Limits During Emergency, Malfunction, Start-up/Shutdown, Fuel Transfers, Maintenance

1. The Permittee shall be shielded from enforcement action brought for noncompliance with emission limitations specified in this permit as a result of an "emergency" and/or "malfunction".

   "Malfunction" means any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely of in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions.

   "Emergency" means any situation arising from sudden and reasonably unforeseeable events beyond the control of this source, including acts of God, which would require immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based limitation under the Approval, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by improperly designed equipment, lack of preventive maintenance, careless or improper operations, operator error or decision to keep operating despite knowledge of these things.

2. An emergency and/or malfunction constitutes an affirmative defense to an action brought for noncompliance with emission limitations if the Permittee demonstrates the affirmative defense of emergency or malfunction through properly signed, contemporaneous operating logs and other relevant evidence that shows that:

   a) An emergency or malfunction occurred and that the cause(s) of the emergency or malfunction can be identified;

   b) The facility was at the time being properly operated;

   c) During the period of the emergency or malfunction, the Permittee took all reasonable steps as expeditiously as possible to minimize levels of emission standards, or other requirements in this permit; and

   d) The Permittee submitted notice of the emergency or malfunction to the Department in writing within two (2) business days of the emergency or malfunction, any steps taken to mitigate emissions, an estimate of the quantity of emissions released as a result of the emergency or malfunction.

   e) In any enforcement proceeding, the Permittee has the burden of proof in establishing the occurrence of an emergency or malfunction.

   f) If an emergency episode requires immediate notification to any government agencies, the Permittee shall make timely notification to the appropriate parties as required by law.

3. The Permittee shall not be shielded from enforcement for any emission exceedances which would result in a predicted exceedance of any health based air quality standards.

4. During startups, shutdowns and fuel transfers, the gas turbines will be operated at less than 50% load as required to safely ramp the plant up and down. Mass emissions for these periods will be established by data in the initial stack testing as described further in Section 8.13. Emissions from these periods will be logged and counted against the annual potential to emit for these pollutants.

5. The Permittee shall be shielded from enforcement action brought for noncompliance with hourly emission limitations specified in this permit if exceedances occur as a result of routine maintenance such as online compressor water washes and routine performance testing, or extended warmup. These periods will count against the annual emission limitations.

8.2.3 Annual Emissions

The Permittee shall comply with the annual emissions referenced in Table 8-1 based on a rolling 12-month total, calculated on a monthly basis.

8.2.4 Averaging Time

The Permittee shall comply with the "lb/MMBtu", "ppmdv", and "lb/hr" emission limits referenced in Table 8-1 based on a one hour block average with the exception of the ammonia limit. The ammonia limits are based on a 24-hour block average.

8.2.5 Fuel Sulfur Limits

The Permittee shall ensure that the natural gas sulfur content does not exceed 0.8 grains per 100 ft^3 by monitoring as required in Section 8.11 of this approval.

The Permittee shall ensure that the oil sulfur content does not exceed 0.0015% by weight by monitoring as required in Section 8.11 of this approval.

8.3 Modeling Analysis

The Permittee has performed air quality impact analyses to assess the impact of the proposed project on ambient air quality (criteria pollutants, non-criteria pollutants and ammonia).

8.3.1 Source Interactive Modeling Analysis

The final results of the source interactive modeling analysis indicated that under no condition will the Permittee, by itself or with existing sources, violate the Federal or State ambient air quality standards or cause a condition of air pollution.

8.3.2 Air Toxics Analysis

The non-criteria pollutants include both Hazardous Air Pollutants (HAPs) as defined in Title III of the Clean Air Act Amendments, and "air toxics" regulated by Department policy. For air toxics, the Department has developed Threshold Effects Exposure Limits (TEL) and annual average Allowable Ambient Limit (AAL) values.

Ambient air concentrations of air toxics were determined by modeling individual pollutants for the stack over the five year data set of meteorology. Worst case emissions were used to determine short-term impacts.

The annual air toxics concentrations were based on 8,760 hours of operation, including 2,880 hours per year of oil firing and 5,880 hours on natural gas. The predicted concentrations for air toxic materials from the facility stack are below TELs and AALs in all cases.

8.3.3 Accidental Release Modeling of Aqueous Ammonia

Using reference Table 1 in the guidance for neutrally buoyant vapors, which assumes a 10-minute release duration and rural conditions, the resulting worst-case consequence distance corresponds to 0.06 miles (317 feet, or 96.5 meters). For the majority of the area, the impacts would be limited to fenced-off BELD property. However, the distance also extends slightly offsite at two points, to the north onto empty property of the CITGO tank farm and offshore to the east. The distance does not extend to the BELD administration building or to the residences located further to the south. Both of these areas are not generally accessible to the public.

8.4 Emission Offsets and Non-Attainment

The Permittee has performed the following Non-Attainment Analysis.

8.4.1 Non-Attainment Review/LAER

Potter II is an existing facility with potential NO_x emissions which exceed 100 tpy, therefore, the existing Potter II facility is considered a "major" source of NO_x. (See Table 8-2) Potential VOC emissions for Potter II are less than 50 tpy (approximately 7.6 tpy of potential emissions), therefore, the facility is not a "major" source of VOC. Accordingly, the proposed plant is not subject to NSR for VOC.

In that Potter II is a "major" source of NO_x, the next step in the process is to examine the applicability of the "major modification" threshold. To make this determination, "past actual" emissions from Potter II are compared with "future potential" emissions from the proposed Watson Station. Future potential emissions are conservatively calculated based on the assumption that the Watson Station will operate at 100% capacity, 8,760 hours per year. The potential NO_x emissions for the proposed Watson Station are 58.8 tons per year (See Table 8-2, below).

The baseline NO_x emissions for the BELD's Potter II plant are 76 tons of NO_x, the average of the most representative emissions (2001 and 2002) from the last five years of available data. Potential emissions from the new Watson Station plus the baseline emissions are 134.4 tons per year (58.8 tpy + 75.6 tpy), an increase of 58.8 tons per year. Since the NO_x emissions increase is greater than 25 tons per year, the proposed Watson Station is subject to nonattainment NSR for NO_x.

Applicable NSR requirements for nonattainment include application of LAER technology and acquisition of emission offsets.

Table 8-2 Maximum Potential Annual Emissions for the Proposed Watson Station

Pollutant	Maximum Potential Annual Emission Rate (tpy)
NO_x	58.8
SO_2	11.5
$PM_{10}/PM_{2.5}$	72.9
CO	53.5
VOC	7.6

Notes: Assumes turbines operate 245 days per year on natural gas at 100% load (59°F), and 120 days on ULSD 100% load (59°F).
SO_2 emissions conservatively assume 365 days per year on natural gas at 100% load (59°F) as the sulfur content of natural gas is higher than ULSD, so potential SO_2 emissions would be greater on natural gas.

8.4.2 Offset Requirements

The Permittee acknowledges for major sources of NO_x in a moderate ozone nonattainment region, that offsets are required at a minimum ratio of 1.26 to 1.[28] Rules for obtaining offsets in Massachusetts are set forth in 310 CMR 7.00 Appendix A and B.

1. The Permittee will meet the offset requirement for this facility by withdrawing Massachusetts Department-certified Emission Reduction Credits (ERC's). ERC's can come from shutting down an existing source, or curtailing its operation, or by "over-controlling" an existing source. In all cases, offsets must be real, surplus, permanent, quantifiable, and federally enforceable.

28 5% over 1.2:1 ratio is required for the use of any offset per 310 CMR 7.00 Appendix B.

2. The Permittee will purchase the necessary NOx offsets for the new Watson Station (58.8 tpy x 1.26 = 74 tpy NOx offsets required). NOx offsets are available from the facilities that have generated real and quantifiable reductions in emissions by either shutting down equipment or over-controlling beyond the regulatory requirements.

3. The Permittee will not operate the facility until the offsets specified above have been obtained and fully certified under the Department's ERC regulations.

8.5 Prevention of Significant Deterioration (PSD)

The Permittee has compared Project emissions to the PSD significant emissions rates presented in Table 8-3. For all pollutants except SO2, the net emissions increases equal the proposed potential emissions from the proposed Watson Station (see Table 8-3). For SO2, Potter II station will be reducing its SO2 emissions by switching from conventional distillate fuel oil (0.3%S or 3,000 ppm) to ULSD (0.0015%S or 15 ppm). Therefore, when added to the potential, the Watson Station SO2 emissions will be 11.5 tons per year.

8.5.1 PSD Baseline Analysis

Potential emissions from the existing Potter II facility are above major source levels (i.e., 100 tpy) for NOx, CO, PM10 and SO2. The PSD baseline for the major sources is summarized in the Table 8-3.

Table 8-3 PSD Baseline, Potter II Past Actual vs. Watson Future Potential Emissions

Pollutant	Potter II Past Actual, (tpy)	Watson Station Maximum Potential Annual Emissions Rate (tpy)	Past Actual Plus Future Potential Increase (tpy)	PSD Significant Emission Rates (tpy)	Significant Modification
NO_x	93	58.8	152	40	Yes, >40
CO	88	53.5	142	100	No, <100
PM_{10}	5	72.9	77.9	15	Yes, >15
SO_2[1]	62	11.5	73.5	40	No, <40

[1] Past actual SO_2 emissions are based on current operations using 0.3% S oil and natural gas. BELD has committed to use ULSD for both Potter II and the proposed Watson Station. This change will reduce Potter II SO_2 emissions by approximately 99.5%, when firing ULSD. Consistent with its current permit, emissions calculations for Potter II are conservatively based a natural gas sulfur content of 3 gr/ccf.

Based on the past actual compared to future potential analysis, the proposed Watson Station is subject to PSD review for both NO_x and PM_{10}.

8.5.2 PSD Consumption Analysis

Based on the refined modeling results (See Table 6-10), modeled ground level concentrations are well below Significant Impact Levels (SILs) for all pollutants and averaging periods. Therefore, a PSD increment consumption analysis will not be required.

8.6 New Source Performance Standards (NSPS)

The Permittee has identified that the EPA NSPS requirement applicable to the new BELD Project is 40 CFR 60 Subpart KKKK for the gas turbine. This requirement applies to all stationary combustion turbines with a heat input greater than 10 MMBtu/hr constructed after February 18, 2005. Project emissions rates will be well below the NSPS.

8.6.1 NO_x Limits

The applicable NO_x standard for the proposed turbines is 2.3 lb/MW-hr (approximately 42 ppmvd) when firing natural gas and 5.5 lb/MW-hr (approximately 96 ppmvd) firing oil. Accordingly, project NO_x emissions, 0.085 lb/MW-hr (2.5 ppm) when firing natural gas and 0.18 lb/MW-hr (5 ppm) when firing ULSD) will be far below the NSPS limit.

8.6.2 SO_2 Limits

Under the Federal NSPS, SO_2 emissions are limited based on fuel sulfur content (20 grains per 100 cubic feet (gr/ccf) of natural gas or 0.05% (500 ppm) sulfur by weight in fuel oil). For the proposed Watson Station, the estimated sulfur content of natural gas is 0.8 gr/ccf while ULSD will have a 0.0015%(15 ppm) sulfur content. Both fuels are well below the NSPS limits.

8.7 Title IV Sulfur Dioxide Allowances and Monitoring

The Permittee has identified that pursuant to 40 CFR 72, the proposed Watson Station will be designated as a Phase II Acid Rain "New Affected Unit" on January 1, 2009, or 90 days after commencement of commercial activities, whichever comes later, but not after the date the facility declares itself commercial.

In accordance with these regulations, the Project will have a Designated Representative (DR) and install a Continuous Emissions Monitor System (CEMS). The DR is the facility representative responsible for submitting required permits, compliance plans, emission monitoring reports, offset plans, compliance certification, and is responsible for the trading of allowances. The CEMS will meet the requirements specified in EPA 40 CFR 75 for monitoring SO_2, NO_x, and CO_2 emissions (lb/MMBtu) as well as opacity and volumetric flow of the flue gas. EPA allows gas and oil-fired facilities to conduct fuel quality and fuel flow monitoring in place of SO_2 monitoring.

8.8 Noise

8.8.1 General Information

A comprehensive sound level measurement study was conducted for the proposed Watson Station during June 16-20, 2006. A complete report on the June 2006 study is provided as Appendix E. As noise modeling work was underway and additional mitigation measures were being considered, supplemental measurements were taken at two locations within the former Fore River shipyard during December 8-13, 2006. In total, existing sound levels were measured at nine representative community locations. The selected locations generally correspond to the nearest sound-sensitive locations in various directions from the site, as well as elevated and over-water residential locations. Both short-term (ST) and continuous (CM) sound level measurements were made during 98 and 108 -hour periods. The results of the measurements indicate that the ambient background sound levels (L_{90}) ranged from 36 to 42 dBA in the community during the quietest part of the nighttime period.

8.8.2 Department Noise Policy (90—001)

The Department Noise Policy limits a source to a 10-dBA increase in the ambient sound measured (L_{90}) at the property line for the Project and at the nearest residences. For developed areas, the DEP has utilized a "waiver provision" at the property line in certain cases. This is appropriate when are there are no noise-sensitive land uses at the property line and the adjacent property owner agrees to waive the 10-dBA limit. In this case, CITGO has agreed to such a waiver (See Appendix F).

Additionally, "pure tone" sounds, defined as any octave band level which exceeds the levels in adjacent octave bands by 3 dB ore more, are prohibited.

8.8.3 Noise Limits

1) The Permittee shall take necessary precautions to ensure that the facility complies with the Department noise guidelines and that the facility does not cause a condition of air pollution (noise) which interferes with the comfortable enjoyment of living on one's private property. Actions taken shall include but are not limited to:
    a) Identify source(s) causing the condition of air pollution (noise)
    b) Once identified, the source causing the condition will be addressed as follows:
        i. Repair
        ii. Replace or
        iii. Add additional mitigation
2) The Permittee shall identify and evaluate all plant equipment that may cause a noise condition. Sources of noise include but are not limited to: transformers, combustion turbines, gas compressors and,
3) The Permittee shall install and have the following noise mitigation:

a) Weatherproof, baseplate-mounted enclosure for housing the gas turbine, inlet plenum, fuel and oil systems, and enclosure ventilation air systems.

b) Combustion air inlet silencer and ducting.

c) Intake ducting and silencing for the gas turbine enclosure ventilation intake system, the gas turbine enclosure ventilation exhaust system, and the gas turbine bleed air exhaust.

d) Weatherproof, baseplate-mounted enclosure for housing the AC generator, exciter, line and neutral cubicles.

e) Evaporative coolers in the gas turbine air inlets.

f) Gas compressors housed within an enclosed building.

g) Increasing the length of the silencer within the SCR by 6 feet (14 feet total).

h) Doubling the thickness of the SCR shell steel (from 0.25-inch to 0.5-inch).

i) Gas turbine stack exhaust silencers.

j) Sound barrier walls along the south side of the Project site.

k) Reorienting the CTG arrangement 180 degrees so the gas turbine air inlets face north away from the residential area to the south.

4) The Permittee shall conduct a noise survey within 180 days of the startup of both turbines to verify compliance with the Department's Noise Policy.

8.9 Special Conditions

The Permittee shall adhere to the following Special Conditions:

1) Submit to the Department, in accordance with the provisions of Regulation 310 CMR 7.02(2)(a), plans and specifications for the exhaust stack, combustion turbine, the SCR control system (including ammonia handling and storage system), the CO catalyst system, facility plans, the CEMS once the specific information has been determined.

2) Obtain written Department approval prior to commencing installation of these system components.

3) In no case shall the facility exceed 10,992,471 gallons of ULSD oil firing per 12-month rolling total (equivalent to 120 days), on a monthly basis.

4) Operate each combustion turbine at less than approximately 50% power only during startups, shutdowns, and fuel transfers.

5) Ensure that the SCR control equipment for the turbine generator is operational whenever the turbine is operated at 50% power or greater.

6) Maintain in the facility control room, portable ammonia detectors available for use during a spill or atmospheric release.

7) Equip the aqueous ammonia storage tank with high and low level audible alarm monitors.

8) Maintain availability for the CEMS equipment, an adequate source of supply of spare parts to maintain the on-line availability and data capture requirements specified in the QA/QC program reference in 8.10-16.

9) File an application for a significant modification to the existing BELD Operating Permit (No. MBR-95-OPP-033) within nine months prior to the planned modification pursuant to Regulation 310 CMR 7.00, Appendix C (4)(b)1 The Project will need final approval of the modification to the Operating Permit prior to operation. The Department must take final action on the significant modification to the Operating Permit with nine months of the receipt of the application as per Appendix C(4)(c)2.

10) Not initiate startup of the combustion turbines until a minimum of 74 tons per year of NOx emission reduction credits, purchased by BELD for use as offsets for this project, have been fully certified by the Department under the Department's Emission Reduction Credit Regulations.

11) Comply with all applicable operational standards contained in 40 CFR Part 72 and 75, 40 CFR 60, and 310 CMR 7.27.

8.10 Monitoring Requirements

The Permittee shall adhere to the following monitoring requirements:

1) Install, calibrate, test and operate a stack CEMS/COMS incorporating a data acquisition and handling system (DAHS) to measure and record the following:

   a) Oxygen (O_2)

   b) Oxides of Nitrogen (NO_x)

   c) Carbon Monoxide (CO)

   d) Ammonia (NH_3)

e) Opacity

This will be in compliance with 40 CFR 60, Subpart KKKK, Section 60.4335, to determine the hourly NO_x emission rate in parts per million (ppm) or pounds per million British thermal units (lb/MMBtu).

2) Ensure that all stack monitors and recording equipment comply with Department approved performance and location specifications, and conform with the EPA monitoring specifications.

3) Comply with all the applicable monitoring requirements contained in 40 CFR 60 Subpart GG, 310 CMR 7.19 (NO_x RACT), and 310 CMR 7.27 (NO_x Budget Rules).

4) Equip the CEMS with audible and visible alarms to activate when emissions exceed the limits established in Table 8-1 of this Conditional Approval.

5) Obtain and record emission data from each CEMS for at least 75 percent of the emission unit operating hours per day (except for periods of CEMS calibration checks, zero and span adjustments, and preventive maintenance), for at least 75 percent of the of the emission unit operating hours per month, and for at least 95 percent of the emission unit operating hours per quarter.

6) Quantify all periods of excess emissions, even if attributable to an emergency/malfunction, startup/shutdown, or equipment cleaning, and include in the determination of annual emissions. Excess Emissions are defined as emissions that are greater than the emission limits specified in Tables 1 and 2. An exceedance of emission limits due to emergency or malfunction shall not be deemed a federally permitted release as that term is used in 42 U.S.C. Section 9601(10).

7) Use and maintain the CEMS as "direct-compliance" monitors to measure NOx, CO, O2, NH3, and opacity. "Direct-compliance" monitors generate data that legally document the compliance status of a source.

8) Demonstrate continuous compliance with the VOC emission limits (short-term and annual) contained herein by monitoring CO emissions.

   a) Any period of excess CO emissions shall be regarded as a period of excess VOC emissions, and the excess VOC emissions shall be accumulated towards the annual limit contained in Tables 1 and 2.

   b) When the combustion turbine is operating below 50 percent load during a transitional operating situation, the VOC emission rate shall be considered as occurring at the rate determined in the initial stack test program for start-up conditions.

c) When the combustion turbine is operating at 50 percent load or greater, and if CO emissions are less than or equal to the established emission limit at the specific load, the VOC emission rate shall be considered to be in compliance with the emission limit.

d) When the combustion turbine is operating at 50 percent load or greater, and if CO emissions are above the CO emission limit, VOC emissions shall be considered as occurring at a rate equal to that calculated by the following relationship:

VOCAcmal - VOCLimit(COActua]/COLimit)

9) Monitor and record the sulfur and nitrogen content in natural gas on a daily basis, or pursuant to any alternative fuel monitoring schedule issued for the facility, in accordance with 40 CFR Part 60, Subpart GG 60.334(b)(2).

10) Install continuous monitors fitted with alarms shall be installed to monitor the temperature at the inlet to the SCR system and CO catalyst.

11) Develop a quality control/quality assurance (QA/QC) program for the long-term operation of the CEMS and COMS which conforms to the requirements of 40 CFR Part 60, Appendix F, and all applicable portions of 40 CFR Parts 72 and 75, 310 CMR7.27, and 310 CMR 7.28. The QA/QC program must be submitted in writing, and reviewed and approved in writing by the Department at least 30 days prior to commencement of facility operation. The Department must approve any subsequent changes to the program.

12) Pursuant to 40 CFR 60, Subpart KKKK, Section and 40 CFR 75, monitor and record the sulfur content of distillate oil on each occasion that the oil is transferred to the bulk storage tank; or pursuant to any alternative fuel monitoring schedule issued for the subject facility in accordance with 40 CFR 60, Subpart KKKK, Section 60.4365.

8.11 Recordkeeping Requirements

The Permittee shall adhere to following recordkeeping requirements:

1) A recordkeeping system for the facility shall be established and maintained on-site by the Permittee. All such records shall be maintained up-to-date such that year-to-date information is readily available for Department examination upon request, and shall be kept on-site for a minimum of 5 years. Record keeping shall, at a minimum, include:

a) Compliance records sufficient to demonstrate that emissions from the facility have not exceeded what is allowed by this Conditional Approval and PSD Permit. Such records shall include, but are not limited to, fuel purchase receipts and usage rates, emissions test results, and monitoring equipment data and reports.

b) A record of routine maintenance activities performed on the emission unit, control equipment and monitoring equipment including, at a minimum, the type or a description of the maintenance performed and the date and time the work was completed.

c) A complete record of all malfunctions of the emission unit, its control devices and monitoring equipment; to include the date and time the malfunction occurred, a description of the malfunction and the corrective action taken, the date and time corrective actions were initiated, and the date and time corrective actions were completed and the equipment returned to compliance.

2) The Permittee shall maintain on-site for a period of 5 years all permanent records of output from the CEMS and COMS, the fuel consumption, water to fuel ratio (when firing oil), SCR and CO control system inlet temperatures, and turbine inlet and ambient temperatures, and shall make these records available to the Department for inspection upon request.

3) Records on natural gas consumed shall be maintained, recording the sulfur content daily or at the frequency required pursuant to any alternative fuel monitoring schedule issued for the facility by the Department in accordance with 40 CFR Part 60, Subpart KKKK.

4) A file shall be maintained for the Certification of Analysis of the sulfur content of each fuel oil delivery.

5) A log shall be maintained to record problems, upsets or failures associated with the emission control system, CEMS, COMS, DAHS, or the ammonia handling system.

6) The Permittee shall comply with all applicable record keeping requirements contained in 40 CFR Parts 72 and 75,40 CFR 60, and 310 CMR 7.27, and 310 CMR 7.28.

7) Records shall be maintained for all monitoring/testing required by Section 7.12 and 7.13. Such records shall be maintained for a minimum of 5 years after the date of each record. These records shall be made available to the Department upon request.

8.12 Reporting Requirements

The Permittee shall adhere to the following reporting requirements:

1) All notifications and reporting required by this Approval shall be made to the attention of:

Department of Environmental Protection
Bureau of Waste Prevention
20 Riverside Drive
Lakeville, MA 02347
ATTN: Gerald A. Monte, Chief
Compliance and Enforcement Section
Phone: (508) 946-2825
Fax: (508) 947-6557

2) The Permittee must notify the Department by telephone or fax as soon as possible, but in no case later than 3 business days after the occurrence of any upsets or malfunctions to the facility's equipment, air pollution control equipment, or monitoring equipment which result in an excess emission to the air and/or a condition of air pollution.

3) The Permittee shall notify the Department immediately by telephone or fax and within 3 working days, in writing, of any upset or malfunction to the ammonia handling or delivery systems. The Permittee must also comply with all notification procedures required under M.G.L. c. 2 IE for any release or threat of release of ammonia.

4) A quarterly report shall be submitted to the Department by the 30th of the month following the end of the quarter. The report shall contain, at a minimum, the following information:

   a) Facility CEMS and COMS excess emissions data, in a format acceptable to the Department.

   b) For each period of excess emissions or excursions from allowable operating conditions for the facility, the Permittee shall list the duration, cause, the response taken, and the amount of excess emissions. Periods of excess emissions shall include start-up, shutdown, malfunction, emergency, equipment cleaning, and upsets or failures associated with the emission control system or CEMS or COMS.

   c) For each period during which there was any firing of ULSD fuel oil (with a fuel sulfur content that does not exceed 15 ppm by weight), the information shall include the date of oil firing and the amount of oil fired. This report shall summarize the 12-month rolling period of ULSD fuel oil use.

5) The facility shall comply with all applicable reporting requirements contained in 40 CFR Parts 72 and 75, 40 CFR 60, 310 CMR 7.27 and 310 CMR 7.28.

6) Pursuant to 310 CMR 7.12(7), the facility will register on a form obtained from the Department and include such information as the Department may specify. This form shall be submitted annually. The information provided to the Department shall include:

   a) The nature and amounts of emissions from the facility.

   b) Information that may be needed to determine the nature and amounts of emissions from the facility.

   c) Any other information pertaining to the facility which the Department requires.

8.13 Testing Requirements

The Permittee shall adhere to the following Testing Requirements:

1) The Permittee shall ensure that the facility shall be constructed to accommodate the emissions (compliance) testing requirements contained herein. All emissions testing shall be conducted in accordance with the Department's Guidelines for Source Emissions Testing and in accordance with EPA reference test methods as specified in 40 CFR Part 60, Appendix A, 40 CFR Part 60 Subpart KKKK, and 40 CFR Parts 72 and 75, or by another method which has been correlated to the above methods to the satisfaction of the Department.

2) Initial compliance tests must be conducted within 180 days after initial start-up of each turbine of the facility.

3) Prior to emissions testing, a Test Protocol shall be submitted for Department review and approval. The Protocol shall include a detailed description of sampling port locations, sampling equipment, sampling and analytical procedures, and operating conditions for any such emissions testing. The Test Protocol must be submitted to the Department at least 90 days prior to the commencement of testing, and the Permittee must obtain written Department approval prior to testing.

4) For all emissions testing programs, the final test report must be submitted to the Department within 60 days of completion of the test program.

5) Initial compliance tests shall be conducted to demonstrate compliance with the emission limits (in lb/hr, lb/MMBtu, ppmvd as applicable, and opacity) of the combustion turbine for the pollutants listed below in Table 8.4. Testing must be conducted in keeping with Subpart KKKK requirements, but not less than 50 percent of rated base load.

6) The Permittee shall conduct emission optimization tests for startup and shutdown periods for the combustion turbine. Testing shall include the pollutants listed in

Table 8.4. Emission data generated from this testing shall be reviewed by the Department prior to determining and approving the maximum emission rate limits, including opacity limits, for these periods of time. The Department shall incorporate the emission limits into a Final Approval for this facility and shall consider such limits enforceable.

Table 8.4 Pollutant Compliance Test for Emission Limits*

Natural Gas Firing	ULSD Firing
Nitrogen Oxides	Nitrogen Oxides
Carbon Monoxide	Carbon Monoxide
Volatile Organic Compounds	Volatile Organic Compounds
Ammonia	Ammonia
Particulate Matter	Particulate Matter
Opacity	Opacity

* Represents testing at startup condition, 50% and 100% base load

7) Emissions testing for VOC and PM shall include testing during start-up and shutdown so that emission rates for these pollutants can be inferred at future transitional loads by correlation with measured CO levels.

8) Pursuant to 310 CMR 7.04(4)(a), the fuel utilization facility (combustion turbines) shall be inspected and maintained in accordance with the manufacturer's recommendations and tested for efficient operation at least once in each calendar year. The results of said inspection, maintenance, and testing and the date upon which it was performed shall be shall be recorded and posted conspicuously on or near the appropriate equipment.

9) Pursuant to 310 CMR 7.13, the Department may require additional emissions testing of the facility at any time in order to ascertain compliance with the Department's Regulations or any proviso(s) contained in this Approval.

10) The Permittee shall comply with all applicable testing requirements contained in 40 CFR Part 60, 40 CFR Parts 72 and 75, 310 CMR 7.27, and 310 CMR 7.28.

8.14 General Requirements

The Permittee will adhere with the following general requirements:

1) All requirements of this Conditional Approval that apply to the Permittee shall apply to all subsequent owners and/or operators of the facility.

2) The Permittee shall properly train all applicable personnel to operate the facility and control equipment in accordance with vendor specifications. All persons responsible for the operation of the ammonia handling and SCR control systems shall sign a statement affirming that they have read and understand the approved Standard Operating Procedures (SOPs) and Standard Maintenance Procedures (SMPs). Refresher training shall be provided to facility personnel at least once annually.

3) The SOPs and SMPs for the ammonia handling system shall be maintained in a convenient location (e.g., control room/technical library) and they shall be readily available to all employees.

4) The Permittee shall comply with all applicable provisions contained in 40 CFR Part 60, 40 CFR Parts 72 and 75, and 310 CMR 6.00-8.00.

5) The facility shall comply with the requirements of 310 CMR 7.27(7) and 310 CMR 7.28 in the NOx Allowance Program and NOx Allowance Trading Program by the submission of an Emission Control Plan within 6 months of the date of this Conditional Approval. In addition, the facility must submit a monitoring plan; and install, operate, and certify the emission monitoring systems required by 310 CMR 7.27(11) within 90 days after the date the unit commences operation. The NOx Allowance Trading Program in Section 7.28 will be superceded by the Clean Air Interstate Rule regulations at 310 CMR 7.32 in 2009.

6) Within 60 days of start-up, the roadways servicing the facility shall be an all-weather gravel road and maintained free of deposits that could result in excessive dust emissions.

7) Suspension - This Approval may be suspended, modified, or revoked by the Department if at any time the Department determines that the facility is violating any condition, proviso, or part of the Approval.

8) Other Regulations - This Approval does not negate the responsibility of the owner/-operator to comply with this or any other applicable federal, state, or local regulations now or in the future. Similarly, this Approval does not imply compliance with any other applicable federal, state, or local regulations now or in the future.

9) Dust and Odor - The facility shall be operated in a manner to prevent the occurrence of dust or odor conditions that could cause or contribute to a condition of air pollution as defined in 310 CMR 7.01 and 7.09.

10) Asbestos - Should asbestos remediation/removal be required as a result of this Approval, such remediation/removal shall be done in accordance with the requirements of 310 CMR 7.15 and 310 CMR 4.00.

11) Modifications - Any proposed increase in emissions above the limits contained in this Approval and PSD Permit must first be approved in writing by the Department pursuant to 310 CMR 7.02. In addition, any emissions increase may subject the facility to additional regulatory requirements.

12) Removal of Air Pollution Control Equipment - No person shall cause, suffer, allow, or permit the removal, alteration, or shall otherwise render inoperative any air pollution control equipment or equipment used to monitor emissions which has been installed as a requirement of 310 CMR 7.00, other than for reasonable maintenance periods or unexpected and unavoidable failure of the equipment, provided that the Department has been notified of such failure, or in accordance with specific written approval of the Department.

13) The proposed facility shall be constructed and operated in strict accordance with this Approval. Should there be any differences between the Applicant's Major Comprehensive Plan Application (Transmittal No. W120701) and this Approval, this Approval shall govern.

8.15 Construction Requirements

The Permittee shall ensure that during the construction phase, facility personnel take all reasonable precautions (noted below) to minimize air pollution episodes (dust, odor, noise, etc.).

1) Facility personnel shall exercise care in operating any noise generating equipment (mobile power equipment, power tools, etc.) at all time to minimize noise.

2) Construction vehicles transporting loose aggregate to or from the facility shall be covered and shall use leak tight containers.

3) The construction open storage areas, piles of soil, loose aggregate, etc., shall be covered or watered down as necessary to minimize dust emissions.

4) Any spillage of loose aggregate and dirt deposits on the public roadway, leading to or from the facility shall be removed by the next business day or sooner, if necessary. (A mobile mechanical sweeper equipped with a water spray is an acceptable method to minimize dust emissions).

5) On-site unpaved roadways/excavation areas subject to vehicular traffic shall be watered down as necessary or treated with the application of a dust suppressant to minimize the generation of dust.

6) BELD proposes that all contractors associated with the construction of the Project meet the DEP's Clean Air Construction Initiative.[29] The main aspects of this program include:

   a) All contractors shall use ULSD fuel in diesel-powered non-road vehicles.

   b) All non-road engines used on the construction site shall meet the applicable non-road engine standard limitations per 40 CFR 89.112.

   c) All contractors shall utilize the best available technology for reducing the emission of particulate matter and nitrogen oxides for diesel-powered non-road vehicles. The best available technology for reducing the emission of pollutants is that which has been verified by the EPA or the California Air Resources Board for use in non-road vehicles or on-road vehicles where such technology may also be used in non-road vehicles.

   d) All contractors shall turn off diesel combustion engines on construction equipment not in active use and on dump trucks that are idling while waiting to load or unload material for five minutes or more.

   e) All contractors shall establish a staging zone for trucks that are waiting to load or unload material at the work zone in a location where diesel emissions from the trucks will not be noticeable to the public, and;

   f) All contractors shall locate construction equipment away from sensitive receptors such as fresh air intakes to buildings, air conditioners, and windows.

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[29] On November 10, 1998 the Clean Air Construction Initiative was announced in Massachusetts to reduce air emissions generated by heavy-duty construction equipment used in the Central Artery/Tunnel Project. The Clean Air Construction Initiative was sponsored by the Massachusetts Turnpike Authority, the Central Artery/Tunnel Project, EPA-Region I New England, Massachusetts Executive Office of Environmental Affairs, Massachusetts Department of Environmental Protection, Manufacturers of Emissions Control Association and NESCAUM.

Enter your transmittal number → W120701
Transmittal Number

Your unique Transmittal Number can be accessed online: http://mass.gov/dep/service/online/trasmfrm.shtml or call MassDEP's InfoLine at 617-338-2255 or 800-462-0444 (from 508, 781, and 978 area codes).

Massachusetts Department of Environmental Protection

Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: DEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

Copy 1 - the original must accompany your permit application. **Copy 2** must accompany your fee payment. **Copy 3** should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP
P.O. Box 4062
Boston, MA
02211

*** Note:** For BWSC Permits, enter the LSP.

A. Permit Information

BWP AQ 03
1. Permit Code: 7 or 8 character code from permit instructions

Major Comprehensive Plan Approval
2. Name of Permit Category

New Turbines
3. Type of Project or Activity

B. Applicant Information – Firm or Individual

Braintree Electric Light Department
1. Name of Firm - Or, if party needing this approval is an individual enter name below:

2. **Last Name** of Individual | 3. **First Name** of Individual | 4. MI

150 Potter Road
5. Street Address

Braintree	MA	02184		
6. City/Town	7. State	8. Zip Code	9. Telephone #	10. Ext. #

11. Contact Person | 12. e-mail address (optional)

C. Facility, Site or Individual Requiring Approval

Thomas A. Watson Generating Station
1. Name of Facility, Site Or Individual

150 Potter Road
2. Street Address

Braintree	MA	02184		
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

133487		
8. DEP Facility Number (if Known)	9. Federal I.D. Number (if Known)	10. BWSC Tracking # (if Known)

D. Application Prepared by (if different from Section B)*

Epsilon Associates, Inc.
1. Name of Firm Or Individual

3 Clock Tower Place, Suite 250
2. Address

Maynard	MA	01754	978-897-7100	
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

Steve Slocomb
8. Contact Person

9. LSP Number (BWSC Permits only)

E. Permit - Project Coordination

1. Is this project subject to MEPA review? ☒ yes ☐ no
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit: 13830
EOEA File Number

F. Amount Due

DEP Use Only

Permit No:

Rec'd Date:

Reviewer:

Special Provisions:

1. ☐ **Fee** Exempt (city, town or municipal housing authority)(state agency if fee is $100 or less).
There are no fee exemptions for BWSC permits, regardless of applicant status.
2. ☐ Hardship Request - payment extensions according to 310 CMR 4.04(3)(c).
3. ☐ Alternative Schedule Project (according to 310 CMR 4.05 and 4.10).
4. ☐ Homeowner (according to 310 CMR 4.02).

404374	$19,780.00	5/8/07
Check Number	Dollar Amount	Date

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention – Air Quality
BWP AQ 02 Non-Major Comprehensive Plan Approval
BWP AQ 03 Major Comprehensive Plan Approval
Comprehensive Plan Approval Project Summary Application

W120701
Transmittal Number

133487
Facility ID (if known)

A. Facility Data

INSTRUCTIONS

This form is to be completed when filing for a comprehensive Plan Approval (CPA). A CPA is required for projects exceeding the thresholds for that of a Limited Plan Approval (LPA) and in other cases as determined by the Department. When filing a CPA, one or more of the following forms is also required according to the type of project:
BWP AQ CPA-1 to BWP AQ CPA-5 for equipment;
BWP AQ SFP-1 to BWP AQ SFP-5 for VOC application and noise;
BWP AQ SFC-1 to BWP AQ SFC-6 for pollution control equipment.

1. Braintree Electric Light Department
Facility Name
Braintree
Location

2. Is the project for a new facility? ☐ Yes ☒ No

3. Previously approved? ☒ Yes ☐ No

If yes, list the previously issued air quality approval(s) for this process and associated emission limits in the table provided.

Application Number	Approval Date
MBR-95-OPP-033	July 20, 1998

4. Which permit category are you applying for? ☐ BPW AQ 02 ☒ BWP AQ O3

B. Applicability

1. POTENTIAL EMISSIONS are to be calculated from the maximum capacity of the equipment to emit pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the equipment to emit a pollutant, including air pollution control equipment, restriction on hours of operation, or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design only if the limitation is specifically stated in (a) plan approval(s) or if the facility proposes to incorporate such a restriction into this current plan approval. Fugitive emissions, to the extent quantifiable, are included in determining the potential emissions. Unless otherwise documented, potential emissions shall be based on 8,760 hours per year operation of source.

Current Potential Emissions means the potential emissions for the entire facility as it currently exists. If this is for a new facility, then enter N/A in this column.

Actual Baseline Emissions means the highest actual emissions for the facility in either of the previous two years. If this is for a new facility, then enter N/A in this column.

Proposed Potential Emissions means the potential emissions for this proposed project alone.

B. Applicability (cont.)

Air Containment*	Current Potential Emissions (TPY)** (after control)	Actual Baseline Emissions (TPY)	Proposed Potential Emissions (TPY) for Expansion (after control)
Particulate	48	5	72.9
SO_x	1,337	62	11.5
NO_x	2,029	93	58.8
VOC	10	1	7.6
HOC	NA	NA	NA
Lead	0.06	0.0002 (2002 data)	0.022
CO	655	88	53.5
HAP	5.6	0.43 (2002 data)	6.42
Other	NA	NA	NA

*Complete only for air quality contaminants that will be affected by this project.
**TPY = tons per year

2. Is this project subject to:

- 310 CMR 7.00 Appendix A- Nonattainment Review? ☒ Yes ☐ No

  If yes, also complete section C- Nonattainment Review.

- Was netting used to avoid applicability? ☐ Yes ☒ No

  If yes, also complete Section III – Nonattainment Review

- Prevention of Significant Deterioration Permit (PSD) 40 CFR 52.21? ☒ Yes ☐ No
  Note: PSD applications are filed with the U.S. Environmental Protection Agency (EPA).
  If yes, also complete section D – PSD.

- Was netting used to prevent PSD? ☐ Yes ☒ No
  Note: PSD questions should be directed to EPA.
  If yes, also complete section D – PSD.

- New Source Performance Standards (40 CFR 60)? ☒ Yes ☐ No

  KKKK
  If yes, which subpart?

B. Applicability (cont.)

- National Emissions Standards for Hazardous Air Pollutants (NESHAPS) – 40 CFR 61:

☐ Yes ☒ No ______________ If yes, which subpart?

- Maximum Achievable Control Technology (MACT), 40 CFR 63?

☐ Yes ☒ No ______________ If yes, which subpart?

C. Nonattainment Review

This section must be completed only if the construction or modification occurring at the facility is subject to 310 CMR 7.00 Appendix A (Nonatttainment Review) ***or*** would be subject to Nonatttainment Review if netting did not occur.

Offsets and **Netting**

1. If the proposed project would be subject to 310 CMR 7.0 Appendix A - Nonattainment Review in the absence of netting, or if emission reduction credits are used as offsets as part of the application, what is being shutdown, curtailed or further controlled to obtain the emission reduction credit (netting is not allowed to avoid review under 310 CMR 7.02):

   Emission reduction credits must be part of an enforceable plan approval to be used for either "netting out" or "offsetting emission increases".

   NA

2. For the source of emission credits, complete the following table:

Air Containment	Actual Baseline Emissions (TPY)	New Potential Emissions (TPY) (after control)	Emission Reduction Credit (TPY)

Actual Baseline Emissions means the average actual emissions for the source of emission credits in the previous two years.

New Potential Emissions means the potential emissions for the source of emission credits after project completion.

Emission Reduction Credit means the difference of Actual Baseline and New Potential Emissions.

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C. Nonattainment Review (cont.)

3. If emission reduction credits come from a facility other than where the construction or modification occurs, provide the name and location of the facility:

TBD

D. Affirmative Demonstration of Compliance

The signature below provides the affirmative demonstration pursuant to 310 CMR 7.02 (3) that any facility (ies) in Massachusetts, owned or operated by the proponent for this project (or by an entity controlling, controlled by or under common control with such proponent) that is subject to 310 CMR 7.00, et seq., is in compliance with, or on a Department approved compliance schedule to meet, all provisions of 310 CMR 7.00, et seq., and any plan approval, order, notice of noncompliance or permit issued thereunder. This form must be signed by a responsible official working at the location of the proposed new or modified facility. Even if an agent has been designated to fill out this form, the responsible official must sign it. (Refer to the definition given in 310 CMR 7.00.)

Certification: I certify that I have examined the responses provided herein and that to the best of my knowledge they are true and complete.

William Bottiggi
Print name

Signature of responsible official

General Manager
Position / title

BELD
Representing

Date

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention – Air Quality

BWP AQ CPA-1 (for use with BWP AQ 02, 03)

Comprehensive Plan Approval Application for Fuel Utilization Facilities

W120701
Transmittal Number

133487
Facility ID (if known)

A. Applicability

This form is to be used to apply for approval to construct, substantially reconstruct or alter a fuel utilization facility, such as but not limited to a boiler, oven, space heaters, fuel-burning engines, turbines, or other stationary fuel burning devices, subject to 310 CMR 7.02 (3).

Please refer to 310 CMR 7.02 (5)(a). Simple burner replacement on existing units having an energy input capacity less than 100,000,000 Btu per hour may submit form BWP-AQ CPA-2, Comprehensive Plan Application for Burner Replacement.

B. Materials that Constitute a Comprehensive Plan Approval Application

Proposed projects that are subject to the Comprehensive Plan Approval Application requirements for fuel utilization facilities must submit the following items to the appropriate Regional Office for review and approval.

☒ **Manufacturer's Specifications** and Brochures

The Following Item Must be Submitted in Duplicate and Must Bear the Seal And Signature of a Massachusetts Registered Professional Engineer

☒ **CPA forms** should reflect both existing units and the new or modified units at the facility.

☒ **Supplemental forms** for associated air pollution control equipment – If such equipment is present, the appropriate form must be included.

☐ **Standard Operating Procedure** – Clear, logical, sequential itemization of the manner in which the equipment is to be operated (normal and upset modes). ***(to be provided)***

☐ **Standard Maintenance Procedure** – Must describe the scheduling of routine maintenance and equipment adjustments. ***(to be provided)***

☒ **Plot Plan** – Scaled drawing indicating the outlines of the structures owned by the landlord of the building containing this project, as well as the locations of significant nearby structures and terrain features. Indicate the heights of the structures and the location and height of the stack(s) above ground level.

☒ **Topographic Map** – United States Geodetic Survey (USGS) map, or equivalent, showing the topographic contours for a distance of 1500 feet beyond the boundary lines in every direction.

☒ **Roof Plan** – Scaled drawing indicating the locations of the stack(s) and all fresh air intakes, windows, and doors. (This can be part of **Plot Plan**.)

☒ **Elevation Plan** – Scaled drawing locating the stack(s), fresh air intakes, windows, and doors.

☒ **Breech/Stack Plan** – Scaled drawing to show the location of sampling ports, barometric dampers, and opacity monitor(s).

☒ **Calculations** – Detailed calculation sheets showing the manner in which the pertinent quantitative data was determined.

☒ **Potential Emissions** – Detailed listing of proposed restrictions limiting potential emissions (see section E).

☒ **Miscellaneous** – The Department may require other materials if it considers them necessary to the plan's review. For example, modeling studies may be required, or monitoring data, or a noise survey. These special items are requested on the more complex or larger applications.

☒ **BACT Analysis**

W120701
Transmittal Number

133487
Facility ID (if known)

C. Existing and Modified or New Combustion Unit(s) Data

Include all fuel utilization facilities at this address; attach another sheet when necessary. In this and subsequent sections, "Existing" refers to those combustion units that will remain in use at the facility, but will be unchanged by this project.

	Unit 1	Unit 2	Units 3/4		
1. Is Unit Existing, to be Modified, or New?	Existing	Existing	New		
2. Description (boiler, oven, space heater, diesel, etc.)	Turbine	Diesel Engine	Turbines		
3. Manufacturer*	ABB	Fairbanks Morse	Rolls Royce		
4. Model number*	11D	38TD8	Trent 60 WLE		
5. Output rating (at 212° F) (indicate if Btu/hr or lbs. of steam/hr)	76 MW	2.25 MW	58 MW each		
6. Input rating (in Btu per hour)	975,500,000	24,000,000	546,000,000 each		
7. For boilers, indicate the steam usage breakdown					
a. % of steam for space heating use	NA	NA	NA		
b. % of steam for air conditioning use	NA	NA	NA		
c. % of steam for hot water or process use	NA	NA	NA		
8. For boilers, indicate if WT, FT, CIS, HRT	NA	NA	NA		
9. Boiler operating pressure [psigl]	NA	NA	NA		
10. Thermal efficiency at 100% rating	28	30	36		
11. Maximum breaching temperature (°F)	1000	800	820		
12. Furnace volume (if applicable)	NA	NA	NA		
13. Grate area (if applicable)	NA	NA	NA		
14. Indicate how combustion air is supplied to the boiler room	2 stage inlet air filters	air filters	inlet air filters and evap coolerss		

*If undetermined at time of application, indicate probable unit "or equivalent". Specific make and model must be provided prior to final approval.

C. Existing and Modified or New Combustion Unit(s) Data (cont.)

15. Describe combustion unit cleaning method	Unit 1	Unit 2	Unit 3/4		
a. Air blown (yes or no)	no	no	no		
b. Steam blown (yes or no)	no	no	no		
c. Brushed and vacuumed (yes or no)	no	no	no		
d. Other (describe)	water wash	regular maintenace	off line water wash		
e. Frequency of cleaning	every 100 hrs @ full load	annual	every 100 hrs @ full load		

D. Fuel Data

1. Primary fuel	Unit 1	Unit 2	Units 3/4		
a. Type and grade	Natural Gas	ULSD	Natural Gas		
b. Sulfur content	3 gr/100 cf*	15 ppm	0.8 gr/100 cf*	* same gas supply, assumed S content	
c. Gross heating value (give units)	1032 Btu/cf	136,872 Btu/gal	1032 Btu/cf		
d. Ash content (% by dry weight)	NA	NA	NA		
e. Proposed fuel supplier	Keyspan/ Duke	Citgo	Keyspan/ Duke		
2. Standby or auxiliary fuel	Oil	NA	Oil		
a. Type and grade	ULSD	NA	ULSD		
b. Sulfur content	15 ppm	NA	15 ppm		
c. Gross heating value (give units)	136,872 Btu/gal	NA	136,872 Btu/gal		
d. Ash content (% by dry weight)	NA	NA	NA		
e. Proposed fuel supplier:	Citgo	NA	Citgo		
3. Fuel additive	NA	NA	NA		
a. Manufacturer	NA	NA	NA		
b. Additive name	NA	NA	NA		
c. Purpose of additive	NA	NA	NA		

E. Potential Emissions

POTENTIAL EMISSIONS are used to determine applicability to air pollution control regulations and compliance fees. Unless otherwise restricted, potential emissions are calculated from the maximum operational capacity of the equipment as described in section C operated 8,760 hours per year. If you wish to limit potential emissions you must complete this section; this will be treated as part of the facility design and the limitation will be specifically stated in this Plan Approval.

1. In order to issue a permit limiting the facility's potential emissions, the Department must have a method to monitor compliance with the restriction. In other words, an enforceable permit condition must be available to the Department. The following questions require the facility to set a limit on the maximum amount of fuel combusted (per month and per year) and therefore, the maximum amount of emissions possible. This will become the means to monitor and enforce the restriction. Alternative methods of restricting potential emissions will be evaluated on a case-by-case basis and the applicant should contact the Department before proposing such alternatives. Any such alternative method must be consistent with the U.S. EPA's June 13, 1989 guidance entitled, "Guidance on Limiting Potential to Emit in New Source Permitting" (Copies of this guidance are available from DEP offices)

Proposed Fuel Restriction

Enter amount and units (gallons, cubic feet, etc.)

	Unit 1	Unit 2	Units 3/4			Total
a. Maximum per month:						
primary fuel						
alternate fuel			5.69 MMGal			
b. Maximum per year:						
primary fuel						
alternate fuel			22.0 MMGal			

2. Describe any other physical or operational limitation on the capacity of the equipment to emit a pollutant, including air pollution control equipment, restriction on hours of operation, etc., that will be used to restrict emissions:

F. Oil Viscosity Control Data

1. For #4, #5, or #6 fuel oil, indicate below the method used to maintain proper atomizing viscosity [e.g., oil tank heater, oil line heater, pre-heater type, or other (such as room heat)]:

   NA

2. Description of Oil Viscosity Controller (if applicable):

   NA
   a. Manufacturer

   NA
   b. Model number

   NA
   c. Recorder?

G. Burner Data

For fuel dependant parameters, assume primary fuel is being used.

	Unit 1	Unit 2	Units 3/4		
1. Burner manufacturer	NA	NA	NA		
2. Burner model number	NA	NA	NA		
3. Type of atomization (steam, air, press, mesh, rotary cup)	press	NA	air		
4. Number of burners in each	1	NA	NA		
5. Max fuel firing rate (all burners firing) (Gal/hr, lbs./hr, cubic ft per hr, etc.)	940 MCF/hr	173 gal/hr	526 MCF/hr		
6. If oil, temperature and viscosity at max rating	NA	NA	NA		
7. Normal fuel firing rate (indicate units)	940 MCF/hr	173 gal/hr	526 MCF/hr		
8. Max theoretical air requirement (scfm)	150,400	487	87,281		
9. Percent excess air at 100% rating	225%	NA	238%		
10. Turndown ratio	NA	NA	NA		

11. full automatic governor control
    Burner modulation control (on/off, low/high fire, full automatic, manual)
12. electric spark
    Main burner flame ignition method (electric spark, auto gas pilot, hand held torch, other)

H. Combustion Unit Operating Schedule

			Unit 1	Unit 2	Units 3/4		
1. Winter schedule	hrs/days	days/week	24/7	3/2	24/7		
2. Spring schedule	hrs/days	days/week	24/7	3/2	24/7		
3. Summer schedule	hrs/days	days/week	24/7	3/2	24/7		
4. Autumn schedule	hrs/days	days/week	24/7	3/2	24/7		

I. Noise Suppression Equipment

The installation of some fuel burning units can cause a noise nuisance if precautions are not taken. This is especially true for diesel or turbine generators. Form BWP AQ SFP-3 must accompany the Plan Application for those units requiring noise suppression.

	Unit 1	Unit 2	Units 3/4		
1. Manufacturer of silencer	American Air Filters	American Air Filters	TBD		
2. Model Number	NA	NA	TBD		

J. Auxiliary Equipment

1. Opacity Monitoring Equipment	Unit 1	Unit 2	Units 3/4		
a. Manufacturer	Lear Siegler	NA	TBD		
b. Model number	1100 PM	NA	TBD		
c. Lens cleaning method	Air	NA	TBD		
d. Alarm type	Audible	NA	NA		
e. Recorder manufacturer	ABB Kent	NA	TBD		
f. Recorder model number	P70M	NA	TBD		

The above device is required on all stacks serving equipment rated at an energy input capacity of 40,000,000 Btu per hour or greater which burn liquid or solid fuel. Other facilities, may also be required to install such equipment if the Department determines that it is necessary (310 CMR 7.04 (2)).

2. Boiler Draft

a. Type (forced, included, or natural)	NA	NA	NA		
b. Method used to control draft	NA	NA	NA		

J. Auxiliary Equipment (cont.)

3. **Air Pollution Control Equipment**

(Applicable supplemental forms must be submitted for these, see instructions)

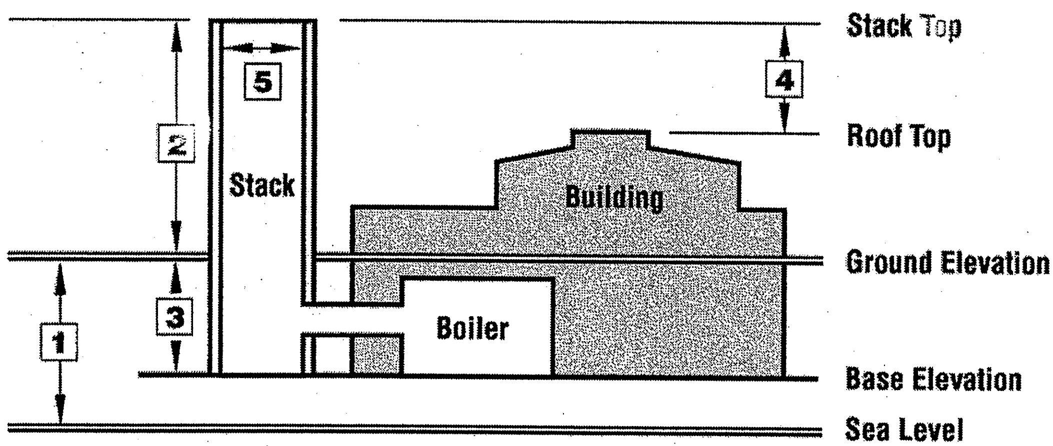
a. Type (scrubber, ESP, cyclone, etc.)	NA	NA	SCR/Oxidation Catalyst		
b. Manufacturer	NA	NA	Haldor Topsoe/ Johnson Matthey or equivalent		
c. Model number	NA	NA	TBD		

4. Does this application represent Best Available Control Technology (BACT) as required in Regulation 310 CMR 7.02(3)(j) 6?

a. ☒ Yes ☐ No

See Section 4.0
b. Describe

K. Existing and New or Modified Stack Data



Questions for the above diagram

	Stack 1	Stack 2	Stacks 3/4		
1. Ht. of ground above sea level (arrow 1)	14 ft	14 ft	14 ft		
2. Ht. of stack top above ground (arrow 2)	130 ft	40 ft	100 ft		
3. Ht. of ground above stack base (arrow 3)	0 ft	0 ft	0 ft		

4. Ht. of stack top above roof (arrow 4)	49.2	18.1	19.2		

K. Existing and New or Modified Stack Data (cont.)

	Stack 1	Stack 2	Stacks 3/4		
5. Stack exit size (inside) (arrow 5)	204 in	21.6 in	132 in		
6. Is stack existing, new, or modified?	existing	existing	new		
7. Which combustion units on which stacks?	1	2	3/4		
8. Inside shell material	Steel	Steel	Steel		
9. Outside shell material	Steel	Steel	Steel		
10. Max gas exit velocity (ft/sec)	64	60	115		
11. Min gas exit velocity (ft/sec)	49	30	82		
12. Maximum stack gas exit temperature (^{0}F)	450	800	810		
13. Maximum stack gas volume (acfm)	871,603	7,854	725,000		
14. Type of rain protection	None	None	None		

NOTE: The rain protection device should be of such a design as to allow the unimpeded escape of the stack gases. "Rain Hats" are prohibited.

L. Energy Conservation Devices

	Unit 1	Unit 2	Unit 3/4
1. Feed water economizer (yes or no)	☒ Y ☐ N	☐ Y ☒ N	☐ Y ☒ N
2. Combustion air preheater (yes or no)	☐ Y ☒ N	☐ Y ☒ N	☐ Y ☒ N
3. Blowdown heat recovery (yes or no)	☐ Y ☒ N	☐ Y ☒ N	☐ Y ☒ N
4. Oxygen trim control (yes or no)	☐ Y ☒ N	☐ Y ☒ N	☐ Y ☒ N
5. Other (describe)	☐ Y ☒ N	☐ Y ☒ N	☐ Y ☒ N

M. Miscellaneous

1. 4911
Standard Industrial Classification (SIC) code(s) for this facility?
2. 30
Number of employees at this facility?
3. No
Is waste or recycled oil burned at this facility?

W120701
Transmittal Number

133487
Facility ID (if known)

4. NA
If numbers 4, 5, 6, fuel oil is used, identify who removes and disposes of the fuel oil sludge.

N. CPA Preparer

1. Stephen H. Slocomb, P.E.
Person who complied the plans applications materials
2. Epsilon Associates, Inc.
Representing
3. 3 Clock Tower Place, Suite 250
Address
4. 978-461-6214
Telephone number
5.
Date completed

O. Certifications

The seal and signature of a Massachusetts Registered Professional Engineer must be entered at right, and they must be the original seal impression or stamp and the original signature of the engineer. This is to certify that the information contained in this form has been checked for accuracy, and that the design represents good air pollution control engineering practice.

Stephen H. Slocomb, P.E.
Print name

[signature]
Authorized signature

Senior Engineer
Position/title

Epsilon Associates, Inc.
Representing

5/8/07
Date

41355
PE number

COMMONWEALTH OF MASSACHUSETTS
STEPHEN H. SLOCOMB
CHEMICAL
No. 41355
REGISTERED PROFESSIONAL ENGINEER

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention – Air Quality

BWP AQ SFP-3 (for use with BWP AQ 02, 03)

Supplemental Form for Survey of Noise Potential

W120701
Transmittal Number

133487
Facility

A. Plans Application Requirements

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

This form is to be submitted together with BWP AQ CPA 03 and BWP AQ CPA 01, *prior* to the modification or the installation of equipment (such as diesel engines, electric generators, or turbines) which has the potential to cause a noise nuisance condition, or a submittal in response to a Department **Notice of Noncompliance** citing a noise nuisance condition.

B. Noise Source

1. Description:

   Two Rolls-Royce Industrial Trent 60 gas turbines and supporting equipment.

2. Indicate operating schedule:

   24 — a. hours/day
   7 — b. days/week
   52 — c. weeks/year

3. Comments:

C. Noise Abatement Equipment

1. TBD — Manufacturer
   TBD — Model number

2. Describe type, location, performance characteristics:

   SCR silencer = 14 feet; Heavier SCR steel wall plate; Stack silencer = 14 feet;

   Enclosures for gas turbines; Enclosures for generators; Combustion air inlet silencer

BWP AQ SFP-3 (for use with BWP AQ 02, 03)

Supplemental Form for Survey of Noise Potential

W120701
Transmittal Number

133487
Facility

D. Full Octave Band Analysis

The following community noise profiles will require the use of sound pressure level measuring equipment in the neighborhood of the installation.

1. Lowest **Ambient** Sound Pressure Levels During Operating Hours of Noise Source.

a. At property line:

	"A" Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
ST-1 (SE PL)	40	54	53	50	43	38	36	31	28	21	15
ST-8 (N of PL)	42	56	53	49	45	41	37	29	20	17	16

b. At the nearest inhabited building:

	"A" Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
ST-2 (Glenrose)	36	50	49	43	41	36	31	27	28	21	16
ST-3 (Glenrose/Vineda	39	51	51	45	42	37	32	26	21	15	15
ST-4 (Ferncroft/Trefto	37	44	47	42	35	32	31	29	26	23	16

The following noise profiles are required only for a submittal in response to a department **Notice of Noncompliance** citing a noise nuisance condition. Applications for new equipment can skip this section and go ahead to section D3.

2. Neighborhood Sound Pressure Levels with Source Operating without Abatement Equipment.

a. At property line:

"A" Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K

D. Full Octave Band Analysis (cont.)

b. At the nearest inhabited building:

"A" Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K

3. **Expected** Neighborhood Sound Pressure Levels after Installation of Noise Abatement Equipment.

a. At property line:

	"A" Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
R1 (SE PL)	47	75	67	58	41	39	34	35	24	10	10
R8 (N of PL)	45	74	68	53	36	35	34	36	23	2	2

b. At nearest inhabited building:

	"A" Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
R2A (Glenrose)	43	72	65	53	35	34	32	33	20	1	1
R3A (Glenrose/Vineda	44	72	65	55	39	35	33	33	20	2	2
R4 (Ferncroft/Trefto	39	66	60	50	34	31	27	27	11	0	0

Note: The Department may request that actual measurements be taken after the installation of the noise abatement equipment to verify compliance.

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention – Air Quality

BWP AQ SFP-3 (for use with BWP AQ 02, 03)

Supplemental Form for Survey of Noise Potential

W120701
Transmittal Number

133487
Facility

E. Manufacturer's Noise Profile on New Equipment

The applicant must attach the manufacturer's noise generation data for the equipment being proposed for installation. This data must specify the sound pressure levels for a complete 360° turn around the equipment, and at various distances from the equipment. **(see attached data)**

F. Plot Plan

The plot plan required in form BWP AQ CPA 01 and BWP AQ CPA 03 must include location of the noise source(s) and the distances from the source(s) to the property lines and the nearest inhabited residences, as well as indications of possible future construction areas. **(see attached arrangement drawing)**

G. Community Sound Level Criteria

Approval of the proposed new equipment or proposed corrective measures will not be granted if the installation:

1. Increases broadband sound level by more than 10dB (A).
2. Produces a "pure tone" condition – when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.
3. Creates a potential condition of air pollution as defined in 310 CMR 7.01.

Note: These criteria are measured both at the property line and at the nearest inhabited residence. Ambient is defined as the background A-Weighted sound pressure level that is exceeded 90% of the time measured during equipment operating hours. The ambient may also be established by other means with the consent of the department.

H. Certification

The seal and signature of a Massachusetts Registered Professional Engineer must be entered below. This certifies that the information contained in this form has been checked for accuracy, and that the design represents good air pollution control engineering practice. (These must be originals. No photocopies, etc., of the seal and signature will be accepted.)

Stephen H Slocomb
Print name

[signature]
Authorized signature

Senior
Position/title

Epsilon Assoc
Representing

5/8/07
Date

41355
P.E.#

COMMONWEALTH OF MASSACHUSETTS
STEPHEN H. SLOCOMB
CHEMICAL
No. 41355
REGISTERED PROFESSIONAL ENGINEER

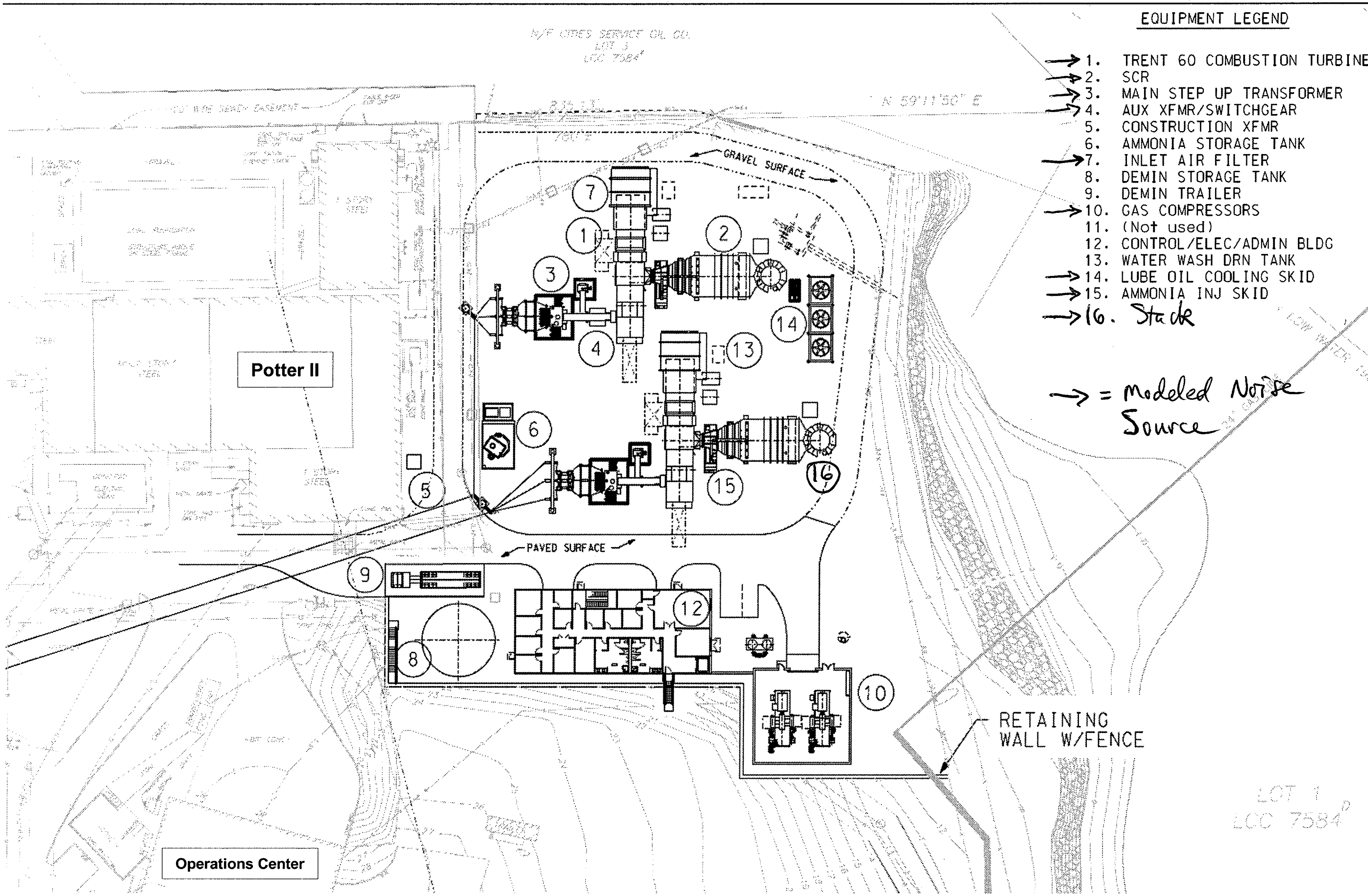


Figure 2.2-2
General Equipment Arrangement

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: C2HMHill

Epsilon Associates Inc.

MEMORANDUM

Date: February 9, 2007

To: BELD Team

From: Rob O'Neal, Epsilon Associates, Inc.

Subject: **Sources of Sound Level Data used for Noise Modeling, Thomas A. Watson Generating Station, Braintree, MA**

Attached are two tables of sound level data used in the noise modeling for the Thomas A. Watson Generating Station. These data were used for the environmental permitting of the plant. Some of the data were from the actual equipment vendor known to be supplying the data, while other components were best engineering estimates or from other projects in our consulting files. Table 1 lists the sound power level data for the plant components as it was input to the Cadna/A sound propagation model. Table 2 provides the data in its "raw" form. This is how we received it from the vendors, the literature, or our consulting files before it was converted to sound power level.

Table 1 Sound Power Level Data for BELD Noise Modeling (per unit) (dB)

Plant Component	No.	Note	dBA	Octave Band Center Frequency (Hz)								
				31.5	63	125	250	500	1k	2k	4k	8k
Rolls Royce Trent 60 CTG unit	2	(1)	107	122	118	115	105	100	95	99	93	103
CTG Air Inlet Filter	2	(1)	97	108	109	110	101	86	77	84	83	87
CTG Stack	2	(2)	96	122	118	108	94	84	82	82	77	75
SCR Duct Walls	2	(3)	95	126	117	107	87	68	57	50	49	50
Main Step-up Transformer	2	(4)	97	93	99	101	96	96	90	85	80	73
Auxiliary Transformer	2	(5)	84	81	87	89	84	84	78	73	68	61
Gas Compressor Building	1	(6)	88	96	96	97	95	84	72	69	68	60
Lube Oil Fin Fan Heat Exchanger	1	(7)	93	No octave band data provided.								
Ammonia Injection Skid	2	(8)	92	96	95	93	87	86	84	85	83	81

Notes:

(1) Rolls-Royce and Cullum Detuners Limited (CDL) Standard 85 dBA package, including evaporative cooler, position 2. Received 12/21/06.

(2) Rolls-Royce and Turner EnviroLogic ("Option 1D"). Received January 8, 2007. Assumes 14-ft silencer in stack.

(3) Rolls-Royce and Turner EnviroLogic ("Option 1D"). Received January 8, 2007. Assumes 14-ft silencer in SCR duct, and thicker steel walls (up to 0.5-inch)

(4) Electric Power Plant Environmental Noise Guide, EEI, Table 4.5. Assumes 75 MVA standard (unquieted) transformer, and no walls.

(5) Electric Power Plant Environmental Noise Guide, EEI, Table 4.5. Assumes 10 MVA standard (unquieted) transformer, and no walls.

(6) Data from gas compressor on another Epsilon Associates, Inc. power project. Assumes compressor is in a building with Transmission Loss values equivalent to masonry, and air openings contain acoustic louvers.

(7) Rolls-Royce data for free-standing skid.

(8) Data from ammonia injection skid on another Epsilon Associates, Inc. power project.

Table 2 **"Raw" Sound Pressure Level (Lp) or Sound Power Level (Lw) Data for BELD Noise Modeling (per unit) (dB)**

Plant Component	No.	Lp or Lw?	Ref. Distance	Note	dBA	Octave Band Center Frequency (Hz)								
						31.5	63	125	250	500	1k	2k	4k	8k
Rolls Royce Trent 60 CTG unit	2	Lp	100 m	(1)	58	73	69	66	56	51	47	50	44	54
CTG Air Inlet Filter	2	Lp	100 m	(1)	49	60	61	62	52	38	29	36	34	39
CTG Stack	2	Lw	NA	(2)	96	122	118	108	94	84	82	82	77	75
SCR Duct Walls	2	Lw	NA	(3)	95	126	117	107	87	68	57	50	49	50
Main Step-up Transformer	2	Lw	NA	(4)	97	93	99	101	96	96	90	85	80	73
Auxiliary Transformer	2	Lw	NA	(5)	84	81	87	89	84	84	78	73	68	61
Gas Compressor	1	Lp	3 feet	(6)	104	–	96	101	106	103	96	95	93	86
Lube Oil Fin Fan Heat Exchanger	1	Lp	3 feet	(7)	85	No octave band data provided.								
Ammonia Injection Skid	2	Lp	3 feet	(8)	84	88	87	85	79	78	76	77	75	73

NA = Not applicable to sound power level.

(1) Rolls-Royce and Cullum Detuners Limited (CDL) Standard 85 dBA package, including evaporative cooler, position 2. Received 12/21/06.

(2) Rolls-Royce and Turner EnviroLogic ("Option 1D"). Received January 8, 2007. Assumes 14-ft silencer in stack.

(3) Rolls-Royce and Turner EnviroLogic ("Option 1D"). Received January 8, 2007. Assumes 14-ft silencer in SCR duct, and thicker steel walls (up to 0.5-inch)

(4) Electric Power Plant Environmental Noise Guide, EEI, Table 4.5. Assumes 75 MVA standard (unquieted) transformer, and no walls.

(5) Electric Power Plant Environmental Noise Guide, EEI, Table 4.5. Assumes 10 MVA standard (unquieted) transformer, and no walls.

(6) Data from gas compressor on another Epsilon Associates, Inc. power project. Assumes compressor is in a building with Transmission Loss values equivalent to masonry, and air openings contain acoustic louvers.

(7) Rolls-Royce data for free-standing skid.

(8) Data from ammonia injection skid on another Epsilon Associates, Inc. power project.

AAF_CDL_Locations.pdf

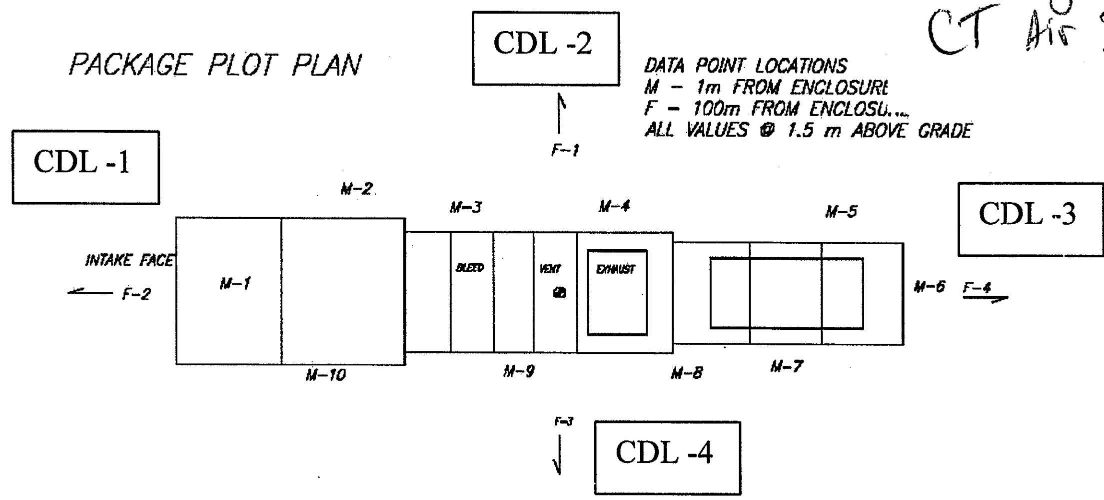
Rcvd. 12/21/06

Acoustic Calculations: (65 dB(A) @ 100 m (330 ft) Package)

RRI p. 184

AAF INTERNATIONAL	Acoustic Calculations	Document No.	GB-00017134	Sheet 1
	Project	TRENT 65 PACKAGE	Contract No.	MF04001
	Client	ROLLS-ROYCE	Quote Ref.	41.03.065
	Rev.	Made by	Date	Checked by / Date
	1	BW	15-Oct-03	

Trent 60 Package + CT Air Inlet



Octave Band Levels are 'A' weighted and EXCLUDE exhaust noise

		31	63	125	250	500	1K	2K	4K	8K	dB(Lin)	dB(A)
	NEARFIELD (3ft)											
M-1	GT Intake end	49	61	73	72	72	69	76	80	74	94	83
M-2	RHS of Inlet Plenum	49	62	75	73	74	74	78	80	76	95	84
M-3	RHS Turbine enclosure	50	63	75	73	76	76	79	80	76	95	85
M-4	RHS of Generator by exhaust	50	62	75	73	73	74	78	78	75	95	84
M-5	RHS of Generator by exciter	49	60	74	69	68	69	73	73	71	94	79
M-6	Generator end	49	60	73	67	67	67	72	71	67	93	77
M-7	LHS Generator - midway	50	62	76	70	69	69	74	73	69	95	79
M-8	LHS Turbine-Generator coupling	50	62	75	71	71	72	76	76	71	95	81
M-9	LHS Turbine enclosure	50	63	75	73	76	76	79	79	76	95	85
M-10	LHS of Inlet plenum	48	60	71	69	71	71	76	77	74	92	82
	SPACE AVERAGE	49	62	74	71	73	73	77	78	74	94	83
	COMPOSITE MAX	50	63	76	73	76	76	79	80	76	96	85
	CALCULATED MAX	50	63	75	73	76	76	79	80	76	95	85
	FARFIELD (328ft)											
F-1	RHS of package	28	40	50	47	49	48	51	52	51	72	58
F-2	Turbine end	29	41	52	53	52	46	55	59	51	73	62
F-3	LHS of package	28	39	50	47	49	48	51	52	51	71	58
F-4	Generator end	28	38	48	45	46	46	50	49	44	70	55
	AVERAGE	28	40	50	49	50	47	52	55	50	72	59
	COMPOSITE MAX	29	41	52	53	52	48	55	59	51	73	62

RRI p. 284

Baseline_Std_Pkg_Trent-Acoustic Calcs - Far Field. PDF Rcvd. 12/21/06

Predicted Noise Levels at 100m (328 ft) Base Case

Standard 85 dBA Package (includes effect of Evap. cooler)

CULLUM DETUNERS LIMITED

CDL Scope of Supply Only - With one/two GT sets running + Brush Generator Acoustics (CDL Prediction)

Lp SUMMARY MEASUREMENT POSITION 1	O.B.C.F. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
Enclosure Breakout	43.8	48.2	53.6	47.4	41.5	37.6	44.5	33.9	24.4	48.2
Combustion Intake & Vent Intake Aperture	64.8	65.9	67.1	57.3	43.1	33.6	41.0	39.4	44.1	54.3
Compressor Bleed Aperture A	62.4	60.9	49.5	35.9	25.8	19.4	14.4	11.8	28.4	38.3
Compressor Bleed Aperture B	62.4	60.9	49.5	35.9	25.8	19.4	14.4	11.8	28.4	38.3
Vent Exhaust Aperture A	61.3	60.9	42.7	30.3	21.5	16.1	16.9	18.2	29.7	36.7
Vent Exhaust Aperture B	61.3	60.9	42.7	30.3	21.5	16.1	16.9	18.2	29.7	36.7
Ventilation Intake Duct Breakout	62.2	59.5	56.6	43.5	34.6	28.9	29.2	28.5	22.9	43.2
Combustion Intake Duct Breakout	49.0	44.7	44.0	32.8	19.8	16.9	27.9	17.1	-0.6	32.9
Compressor Bleed Duct Breakout	63.2	56.0	45.5	34.3	29.8	29.2	28.2	27.9	13.9	37.3
Ventilation Exhaust Duct Breakout	66.7	60.6	52.4	44.3	36.7	31.5	29.1	28.7	23.4	42.3
Ventilation Exhaust Fan Breakout	65.0	59.3	53.7	49.0	43.8	40.4	43.5	32.4	17.6	48.7
Generator Enclosure & Ventilation System	51.9	52.2	59.4	44.4	37.2	30.1	29.6	23.1	9.8	44.9
TOTAL Lp at Measurement Position 1 - One set running	73.2	70.9	68.7	58.8	48.7	43.7	48.3	41.9	44.7	57.1
TOTAL Lp at Measurement Position 1 - Two sets running	76.2	73.9	71.7	61.8	51.7	46.7	51.3	44.9	47.7	60.1

Lp SUMMARY MEASUREMENT POSITION 2	O.B.C.F. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
Enclosure Breakout	44.4	48.8	54.2	47.9	42.0	38.2	45.1	34.5	25.0	48.8
Combustion Intake & Vent Intake Aperture	59.8	60.9	62.1	52.3	38.1	28.6	36.0	34.4	39.1	49.3
Compressor Bleed Aperture A	62.4	59.6	46.6	30.9	19.2	11.8	9.6	10.3	28.4	36.3
Compressor Bleed Aperture B	62.4	61.7	53.2	42.8	36.0	33.0	31.6	32.3	50.4	50.2
Vent Exhaust Aperture A	61.3	59.6	39.8	25.3	14.9	8.5	12.1	16.7	29.7	35.4
Vent Exhaust Aperture B	61.3	61.7	46.4	37.2	31.7	29.7	34.1	38.7	51.7	51.3
Ventilation Intake Duct Breakout	62.2	59.5	56.6	43.5	34.6	28.9	29.2	28.5	22.9	43.2
Combustion Intake Duct Breakout	49.0	44.7	44.0	32.8	19.8	16.9	27.9	17.1	-0.6	32.9
Compressor Bleed Duct Breakout	63.2	56.0	45.5	34.3	29.8	29.2	28.2	27.9	13.9	37.3
Ventilation Exhaust Duct Breakout	66.7	60.6	52.4	44.3	36.7	31.5	29.1	28.7	23.4	42.3
Ventilation Exhaust Fan Breakout	65.0	59.3	53.7	49.0	43.8	40.4	43.5	32.4	17.6	48.7
Generator Enclosure & Ventilation System	50.1	54.0	64.0	51.9	47.7	43.4	44.5	38.4	24.6	52.6
TOTAL Lp at Measurement Position 2 - One set running	72.8	69.9	67.5	57.4	50.8	46.6	49.8	44.1	54.2	58.5
TOTAL Lp at Measurement Position 2 - Two sets running	75.8	72.9	70.5	60.4	53.8	49.6	52.8	47.1	57.2	61.5

Lp SUMMARY MEASUREMENT POSITION 3	O.B.C.F. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
Enclosure Breakout	42.2	46.7	52.1	45.8	39.9	36.1	43.0	32.3	22.9	46.7
Combustion Intake & Vent Intake Aperture	44.8	45.9	47.1	37.3	23.1	13.6	21.0	19.4	24.1	34.3
Compressor Bleed Aperture A	62.4	60.9	49.5	35.9	25.8	19.4	14.4	11.8	28.4	38.3
Compressor Bleed Aperture B	62.4	60.9	49.5	35.9	25.8	19.4	14.4	11.8	28.4	38.3
Vent Exhaust Aperture A	61.3	60.9	42.7	30.3	21.5	16.1	16.9	18.2	29.7	36.7
Vent Exhaust Aperture B	61.3	60.9	42.7	30.3	21.5	16.1	16.9	18.2	29.7	36.7
Ventilation Intake Duct Breakout	62.2	59.5	56.6	43.5	34.6	28.9	29.2	28.5	22.9	43.2
Combustion Intake Duct Breakout	49.0	44.7	44.0	32.8	19.8	16.9	27.9	17.1	-0.6	32.9
Compressor Bleed Duct Breakout	63.2	56.0	45.5	34.3	29.8	29.2	28.2	27.9	13.9	37.3
Ventilation Exhaust Duct Breakout	66.7	60.6	52.4	44.3	36.7	31.5	29.1	28.7	23.4	42.3
Ventilation Exhaust Fan Breakout	65.0	59.3	53.7	49.0	43.8	40.4	43.5	32.4	17.6	48.7
Generator Enclosure & Ventilation System	52.1	52.8	60.4	46.2	40.3	34.7	35.4	29.2	15.5	46.7
TOTAL Lp at Measurement Position 3 - One set running	72.6	69.3	63.9	53.6	47.4	43.3	46.9	38.2	36.2	53.8
TOTAL Lp at Measurement Position 3 - Two sets running	75.6	72.3	66.9	56.6	50.4	46.3	49.9	41.2	39.2	56.8

Lp SUMMARY MEASUREMENT POSITION 4	O.B.C.F. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
Enclosure Breakout	44.4	48.8	54.2	47.9	42.0	38.2	45.1	34.5	25.0	48.8
Combustion Intake & Vent Intake Aperture	59.8	60.9	62.1	52.3	38.1	28.6	36.0	34.4	39.1	49.3
Compressor Bleed Aperture A	62.4	61.7	53.2	42.8	36.0	33.0	31.6	32.3	50.4	50.2
Compressor Bleed Aperture B	62.4	59.6	46.6	30.9	19.2	11.8	9.6	10.3	28.4	36.3
Vent Exhaust Aperture A	61.3	61.7	46.4	37.2	31.7	29.7	34.1	38.7	51.7	51.3
Vent Exhaust Aperture B	61.3	59.6	39.8	25.3	14.9	8.5	12.1	16.7	29.7	35.4
Ventilation Intake Duct Breakout	62.2	59.5	56.6	43.5	34.6	28.9	29.2	28.5	22.9	43.2
Combustion Intake Duct Breakout	49.0	44.7	44.0	32.8	19.8	16.9	27.9	17.1	-0.6	32.9
Compressor Bleed Duct Breakout	63.2	56.0	45.5	34.3	29.8	29.2	28.2	27.9	13.9	37.3
Ventilation Exhaust Duct Breakout	66.7	60.6	52.4	44.3	36.7	31.5	29.1	28.7	23.4	42.3
Ventilation Exhaust Fan Breakout	65.0	59.3	53.7	49.0	43.8	40.4	43.5	32.4	17.6	48.7
Generator Enclosure & Ventilation System	50.1	54.0	64.0	51.9	47.7	43.4	44.5	38.4	24.6	52.6
TOTAL Lp at Measurement Position 4 - One set running	72.8	69.9	67.5	57.4	50.8	46.6	49.8	44.1	54.2	58.5
TOTAL Lp at Measurement Position 4 - Two sets running	75.8	72.9	70.5	60.4	53.8	49.6	52.8	47.1	57.2	61.5

From: jeffery.peelman@rolls-royce.com
Sent: Thursday, December 21, 2006 1:43 PM
To: O'Neal, Rob
Subject: Key info on Trent Package

Attachments: Baseline_Std_Phg_Trent - Acoustic Calcs - Far Field.pdf; AAF_CDL_Locations.pdf

Baseline_Std_Phg_ Trent - Acous... AAF_CDL_Locations .pdf (257 KB)...

Robert,

Regarding the locations of Cullum's predictions as they correlate to the AAF locations that you have, there is a disconnect. I apologize for not understanding that in today's conversation.
I missed that from the earlier Dec. meeting.

To help clear some of that confusion, I have marked up the AAF drawing that you have to include the corresponding Cullum's measurement points where the predictions are made.

Also attached is Cullum's prediction that they used to establish a "baseline" signature that includes a prediction for our supplier's (Brush) AC generator package. They needed to make a prediction for the AC generator section because they will not be the supplier of that part of the enclosure. Brush will provide this section as part of their packaged solution to Rolls-Royce.
However, they worked in conjunction
with Brush to ensure that the data the started with, was indeed, good.

Definitely give me a call to discuss any of this. I will be here until 5 pm today and ALL day tomorrow (Friday, 22 Dec 06).

Best Regards,

Jeff Peelman
CPI-IPTL
Rolls-Royce, Mt. Vernon
jpeelma@rolls-royce.com
Ph: 740-393-8246
> Fax: (740) 393-8796
2nd Floor Tech Center - Rm. 273
<<Baseline_Std_Phg_Trent - Acoustic Calcs - Far Field.pdf>> <<AAF_CDL_Locations.pdf>>

O'Neal, Rob

RR1 p. 4 of 4

From: jeffery.peelman@rolls-royce.com
Sent: Thursday, December 21, 2006 3:27 PM
To: O'Neal, Rob
Subject: 21 Dec 06 ~ Clarification on AAF data predictions

21 Dec 06

Robert,

The 5 dbA discrepancy that you and I discussed in the data presented in file "AAF_CDL_Locations.pdf"
and the Cullum's data file "Baseline_Std_Phg_Trent - Acoustic Calcs - Far Field.pdf" is attributed to our Rolls-Royce Evaporative Cooler Unit.

These two Trent Power Generation Units will each have one of these systems to cool the intake air on warm days. The units are mounted permanently inside of the Intake Air Housing and provide the nice benefit of a 5 dbA sound drop as a result of slowing the air flow down (lower velocity).

The AAF predictions that are listed on that data sheet are from a Trent Unit that DID NOT have the Rolls-Royce Evaporative Cooler installed. This is why the values at "F-2" are 5 dbA higher than the Cullum's prediction at the same location.

Hopefully, this has cleared up a number of questions from our telephone call from this morning.

Best Regards,

Jeff Peelman
CPI-IPTL
Rolls-Royce, Mt. Vernon
jpeelma@rolls-royce.com
Ph: 740-393-8246
> Fax: (740) 393-8796
2nd Floor Tech Center - Rm. 273

Base Case RR Trent 60 Combustion Intake Vent Source Calculations

Measurement Position
(Cullum) (AAF)

From: "Predicted Noise Levels at 100 m (328 ft): Standard 85 dBA Package",
Cullum Detuners, 12-20-2006

			A-wgted	32	63	125	250	500	1000	2000	4000	8000
1	F2	Combustion Intake and Vent Intake	54.3	64.8	65.9	67.1	57.3	43.1	33.6	41.0	39.4	44.1
		Distance/Power Adjustment 84 m.	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
		Comparison Sound Power Level*	100.8	111.3	112.4	113.6	103.8	89.6	80.1	87.5	85.9	90.6
2	F1	Combustion Intake and Vent Intake	49.3	59.8	60.9	62.1	52.3	38.1	28.6	36.0	34.4	39.1
		Distance/Power Adjustment 102 m.	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2
		Computed Sound Power Level	**97.5**	**108.0**	**109.1**	**110.3**	**100.5**	**86.3**	**76.8**	**84.2**	**82.6**	**87.3**
				Used in model								
3	F4	Combustion Intake and Vent Intake	34.3	59.8	60.9	62.1	52.3	38.1	28.6	36.0	34.4	39.1
		Distance/Power Adjustment 116 m.	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3
		Comparison Sound Power Level*	83.6	109.1	110.2	111.4	101.6	87.4	77.9	85.3	83.7	88.4
4	F3	Combustion Intake and Vent Intake	49.3	59.8	60.9	62.1	52.3	38.1	28.6	36.0	34.4	39.1
		Distance/Power Adjustment 102 m.	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2
		Computed Sound Power Level	97.5	108.0	109.1	110.3	100.5	86.3	76.8	84.2	82.6	87.3
	*	Computed assuming all sound radiated spherically at this level										

Note: Model corrects for sound power level radiation pattern by the geometry of a wall source; no radiation pattern computed for vents.

Measurement Position
(Cullum) (AAF)

Base Case RR Trent 60 Package Less Combustion Intake

From: "Predicted Noise Levels at 100 m (328 ft): Standard 85 dBA Package", Cullum Detuners, 12-21-2006

Note: This configuration includes evaporative cooling.

Data consists of Total Lp, one set running with combustion intake subtracted out

			A-wgted	32	63	125	250	500	1000	2000	4000	8000
1	F2	Total Lp,- One set running	57.1	73.2	70.9	68.7	58.8	48.7	43.7	48.3	41.9	44.7
		Combustion Intake and Vent Intake	54.3	64.8	65.9	67.1	57.3	43.1	33.6	41.0	39.4	44.1
		difference	53.9	72.5	69.2	63.6	53.5	47.3	43.3	47.4	38.3	35.8
		Distance/power adjust. 100 m.	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
		Comparison Sound Power Level*	101.9	120.5	117.2	111.6	101.5	95.3	91.3	95.4	86.3	83.8
		Radiation pattern adjustment		-0.1	-0.1	-2.4	-2.3	-3.3	-3.3	-2.2	-5.3	-18.3
2	F1	Total Lp,- One set running	58.5	72.8	69.9	67.5	57.4	50.8	46.6	49.8	44.1	54.2
		Combustion Intake and Vent Intake	49.3	59.8	60.9	62.1	52.3	38.1	28.6	36.0	34.4	39.1
		difference	57.9	72.6	69.3	66.0	55.8	50.6	46.5	49.6	43.6	54.1
		Distance/power adjust. 100 m.	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
		Sound Power Level	**105.9**	**120.6**	**117.3**	**114.0**	**103.8**	**98.6**	**94.5**	**97.6**	**91.6**	**102.1**
				Used in model; corrected by one decibel to match modeled data from line source								
3	F4	Total Lp,- One set running	53.8	72.6	69.3	63.9	53.6	47.4	43.3	46.9	38.2	36.2
		Combustion Intake and Vent Intake	34.3	44.8	45.9	47.1	37.3	23.1	13.6	21.0	19.4	24.1
		difference	53.8	72.6	69.3	63.8	53.5	47.4	43.3	46.9	38.1	35.9
		Distance/power adjust. 100 m.	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
		Comparison Sound Power Level*	101.8	120.6	117.3	111.8	101.5	95.4	91.3	94.9	86.1	83.9
		Radiation pattern adjustment		0.0	0.0	-2.2	-2.3	-3.2	-3.2	-2.7	-5.5	-18.1
4	F3	Total Lp,- One set running	58.5	72.8	69.9	67.5	57.4	50.8	46.6	49.8	44.1	54.2
		Combustion Intake and Vent Intake	49.3	59.8	60.9	62.1	52.3	38.1	28.6	36.0	34.4	39.1
		difference	57.9	72.6	69.3	66.0	55.8	50.6	46.5	49.6	43.6	54.1
		Distance/power adjust. 100 m.	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
		Sound Power Level	105.9	120.6	117.3	114.0	103.8	98.6	94.5	97.6	91.6	102.1
		(no radiation adjustment-		same angle as position 2)								

* Computed assuming all sound radiated spherically at this level; subtracted from F1, F3, to get radiation pattern

Option #1D

Revd 1/5/07

Sound Power Levels from Stack Exit and Walls

	Octave Bands	0	1	2	3	4	5	6	7	8	OA
	Hz	32	63	125	250	500	1000	2000	4000	8000	dB
	Lw - ENGINE	140	143	144	140	136	131	130	134	132	148
Stack	from exit - Option#4, 14ft silencer in duct and 14ft silencer in stack*	122	118	108	94	80	43	17	56	72	123
SCR	from walls - Option#4, 14ft silencer in duct and 14ft silencer in stack*	126	117	107	87	68	57	50	49	50	127

		0	1	2	3	4	5	6	7	8	OA	
	A-weight	*-39*	*-26*	*-16*	*-9*	*-3*	*0*	*1*	*1*	*-1*		
	A-weighted Sound Power Level											
Stack	from exit - Option#4, 14ft silencer in duct and 14ft silencer in stack*	83	92	92	85	77	43	18	57	71	96	dBA
SCR	from walls - Option#4, 14ft silencer in duct and 14ft silencer in stack*	87	91	91	78	65	57	51	50	49	95	dBA

* Note: the difference between Option #3 and #4:

Option #3: All 1/4" thick.

Option #4: All horizontal duct walls: 1/2"; from there to 50 feet above ground: 3/8" thick; all above: 1/4" or thicker.

Option #1D

Predicted Noise Levels at 600ft (182.88m)

CULLUM DETUNERS LIMITED

Standard 85 dBA Package + Filter Louvres & 10 dBA Improved Silencers - CI, VI only

Option #2

CDL Scope of Supply Only - With one/two GT sets running

Lp SUMMARY	O.B.C.F. (Hz)									
MEASUREMENT POSITION 1	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
Enclosure Breakout	38.5	42.9	48.3	42.0	36.0	32.0	38.6	27.0	14.9	42.4
Combustion Intake & Vent Intake Aperture	57.8	55.2	48.1	31.2	18.2	2.8	-2.3	4.0	25.1	34.6
Compressor Bleed Aperture A	57.2	55.6	44.2	30.6	20.4	13.9	8.4	4.9	18.8	32.8
Compressor Bleed Aperture B	57.2	55.6	44.2	30.6	20.4	13.9	8.4	4.9	18.8	32.8
Vent Exhaust Aperture A	56.1	55.6	37.4	25.0	16.1	10.6	10.9	11.3	20.1	31.0
Vent Exhaust Aperture B	56.1	55.6	37.4	25.0	16.1	10.6	10.9	11.3	20.1	31.0
Ventilation Intake Duct Breakout	56.4	53.0	48.0	33.8	25.3	19.6	19.6	20.2	13.3	34.7
Combustion Intake Duct Breakout	43.4	38.7	36.0	23.6	11.6	7.8	15.7	5.4	-10.6	23.3
Compressor Bleed Duct Breakout	57.9	50.7	40.2	29.0	24.4	23.6	22.2	21.0	4.3	31.6
Ventilation Exhaust Duct Breakout.	61.4	55.3	47.1	38.9	31.3	25.9	23.1	21.7	13.8	36.8
Ventilation Exhaust Fan Breakout	59.7	54.0	48.4	43.7	38.4	34.8	37.6	25.5	8.1	43.0
TOTAL Lp at Measurement Position 1 - One set running	67.7	64.4	55.9	47.4	41.2	37.3	41.3	31.0	28.8	47.5
TOTAL Lp at Measurement Position 2 - Two sets running	70.7	67.4	58.9	50.4	44.2	40.3	44.3	34.0	31.8	50.5

Lp SUMMARY	O.B.C.F. (Hz)									
MEASUREMENT POSITION 2	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
Enclosure Breakout	39.1	43.5	48.9	42.6	36.6	32.6	39.2	27.5	15.4	43.0
Combustion Intake & Vent Intake Aperture	52.8	50.2	43.1	26.2	13.2	-2.2	-7.3	-1.0	20.1	29.6
Compressor Bleed Aperture A	57.2	54.3	41.3	25.6	13.8	6.3	3.6	3.4	18.8	30.7
Compressor Bleed Aperture B	57.2	56.4	47.9	37.5	30.6	27.5	25.6	25.4	40.8	41.7
Vent Exhaust Aperture A	56.1	54.3	34.5	20.0	9.5	3.0	6.1	9.8	20.1	29.5
Vent Exhaust Aperture B	56.1	56.4	41.1	31.9	26.3	24.2	28.1	31.8	42.1	42.4
Ventilation Intake Duct Breakout	56.4	53.0	48.0	33.8	25.3	19.6	19.6	20.2	13.3	34.7
Combustion Intake Duct Breakout	43.4	38.7	36.0	23.6	11.6	7.8	15.7	5.4	-10.6	23.3
Compressor Bleed Duct Breakout	57.9	50.7	40.2	29.0	24.4	23.6	22.2	21.0	4.3	31.6
Ventilation Exhaust Duct Breakout	61.4	55.3	47.1	38.9	31.3	25.9	23.1	21.7	13.8	36.8
Ventilation Exhaust Fan Breakout	59.7	54.0	48.4	43.7	38.4	34.8	37.6	25.5	8.1	43.0
TOTAL Lp at Measurement Position 2 - One set running	67.4	63.9	55.9	47.8	41.8	38.1	41.9	35.0	44.6	49.3
TOTAL Lp with two sets running- Two sets running	70.4	66.9	58.9	50.8	44.8	41.1	44.9	38.0	47.6	52.3

Lp SUMMARY	O.B.C.F. (Hz)									
MEASUREMENT POSITION 3	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
Enclosure Breakout	37.0	41.4	46.8	40.5	34.5	30.5	37.0	25.4	13.3	40.9
Combustion Intake & Vent Intake Aperture	37.8	35.2	28.1	11.2	-1.8	-17.2	-22.3	-16.0	5.1	14.6
Compressor Bleed Aperture A	57.2	55.6	44.2	30.6	20.4	13.9	8.4	4.9	18.8	32.8
Compressor Bleed Aperture B	57.2	55.6	44.2	30.6	20.4	13.9	8.4	4.9	18.8	32.8
Vent Exhaust Aperture A	56.1	55.6	37.4	25.0	16.1	10.6	10.9	11.3	20.1	31.0
Vent Exhaust Aperture B	56.1	55.6	37.4	25.0	16.1	10.6	10.9	11.3	20.1	31.0
Ventilation Intake Duct Breakout	56.4	53.0	48.0	33.8	25.3	19.6	19.6	20.2	13.3	34.7
Combustion Intake Duct Breakout	43.4	38.7	36.0	23.6	11.6	7.8	15.7	5.4	-10.6	23.3
Compressor Bleed Duct Breakout	57.9	50.7	40.2	29.0	24.4	23.6	22.2	21.0	4.3	31.6
Ventilation Exhaust Duct Breakout	61.4	55.3	47.1	38.9	31.3	25.9	23.1	21.7	13.8	36.8
Ventilation Exhaust Fan Breakout	59.7	54.0	48.4	43.7	38.4	34.8	37.6	25.5	8.1	43.0
TOTAL Lp at Measurement Position 3 - One set running	67.2	63.8	54.9	46.9	40.8	36.9	40.5	30.5	26.4	46.8
TOTAL Lp with two sets running- Two sets running	70.2	66.8	57.9	49.9	43.8	39.9	43.5	33.5	29.4	49.8

Lp SUMMARY	O.B.C.F. (Hz)									
MEASUREMENT POSITION 4	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
Enclosure Breakout	39.1	43.5	48.9	42.6	36.6	32.6	39.2	27.5	15.4	43.0
Combustion Intake & Vent Intake Aperture	52.8	50.2	43.1	26.2	13.2	-2.2	-7.3	-1.0	20.1	29.6
Compressor Bleed Aperture A	57.2	56.4	47.9	37.5	30.6	27.5	25.6	25.4	40.8	41.7
Compressor Bleed Aperture B	57.2	54.3	41.3	25.6	13.8	6.3	3.6	3.4	18.8	30.7
Vent Exhaust Aperture A	56.1	56.4	41.1	31.9	26.3	24.2	28.1	31.8	42.1	42.4
Vent Exhaust Aperture B	56.1	54.3	34.5	20.0	9.5	3.0	6.1	9.8	20.1	29.5
Ventilation Intake Duct Breakout	56.4	53.0	48.0	33.8	25.3	19.6	19.6	20.2	13.3	34.7
Combustion Intake Duct Breakout	43.4	38.7	36.0	23.6	11.6	7.8	15.7	5.4	-10.6	23.3
Compressor Bleed Duct Breakout	57.9	50.7	40.2	29.0	24.4	23.6	22.2	21.0	4.3	31.6
Ventilation Exhaust Duct Breakout	61.4	55.3	47.1	38.9	31.3	25.9	23.1	21.7	13.8	36.8
Ventilation Exhaust Fan Breakout	59.7	54.0	48.4	43.7	38.4	34.8	37.6	25.5	8.1	43.0
TOTAL Lp at Measurement Position 4 - One set running	67.4	63.9	55.9	47.8	41.8	38.1	41.9	35.0	44.6	49.3
TOTAL Lp with two sets running- Two sets running	70.4	66.9	58.9	50.8	44.8	41.1	44.9	38.0	47.6	52.3

O'Neal, Rob

Exhaust Stack + SCR Walls

From: nick.caruso@rolls-royce.com
Sent: Monday, January 08, 2007 2:03 PM
To: jnelson@beld.com; fred.curren@rolls-royce.com; rjjoseph@
Cc: carl.tallmadge@rolls-royce.com; michael.barrett@rolls-royce royce.com; brian.a.lloyd@rolls-royce.com; O'Neal, Rob; Mar
Subject: RE: M.A168.01-0008 BELD - Noise Abatement Options Pro

Attachments: TRENT-PWL-OPT1D-ver1.pdf; SCR Option 1C sound levelsQT-4826-PWL-OPT3A1.pdf

TRENT-PWL-OPT1D -ver1.pdf (8 KB... SCR Option 1C sound levelsQT-4...

John-Erik,

I have attached the two spectrums again. Referencing Options 1C and 1D. Please note that the stack exit noise are consist between the two options. However, the decrease of 6 dBA is achieved due to an increased wall thickness in the horizontal ducting.

The below is a quote from Turner:
"There is no sound level change on noise from the stack exit when the wall thickness is increased. The numbers mentioned below are levels not including noise break-in and flow generated noise. They actually should be the same as levels of #1C for stack exit. The difference between #1C and #1D (thicker wall option, =our OPT4) is the sound power levels from the walls.

We revised the levels for #1D from stack exit to include the flow generated noise and noise break-in in the attached EXCEL sheet although the level changes above 500Hz do not affect the total level at all."

Trust this helps in answering your inquiry.

Regards,

Nicholas Caruso
IPTL / CAM - Program Manager
nick.caruso@rolls-royce.com
office: 740-393-8881
cellular 740-398-8231
fax: 740-393-8859

-----Original Message-----
From: Nelson, John-Erik [mailto:jnelson@beld.com]
Sent: Monday, January 08, 2007 10:36 AM
To: Caruso, Nick (RR Energy Systems); Curren, Fred (RR Energy Systems); Joseph, Robert J.
Cc: Tallmadge, Carl (RR Energy Systems); Barrett, Michael (RR Energy Systems); Peelman, Jeffery (RR Energy Systems); Lloyd, Brian (RR Energy Systems); O'Neal, Rob; Markowitz, Cindy; Barten, Ted
Subject: RE: M.A168.01-0008 BELD - Noise Abatement Options Proposal, revision 3

Fred, Nick and Rolls-Royce team,

Epsilon has had a chance to review the information and has some questions with the new data provided.

Please look to the top chart on each of #1C and #1D Sound power levels for the unweighted power levels and the change that #1D provides.

Hz	500	1000	2000	4000	8000
#1D	80	43	17	56	72
#1C	84	82	82	77	75

Please review and confirm this information and help us understand the reason for the difference??

Sincerely...John-Erik Nelson

Town of Braintree Electric Light Department

Potter II and Thomas A. Watson Generating Station

John-Erik Nelson

Principal Mechanical Engineer

150 Potter Road

Braintree, MA 02184

Phone: (781)348-1164

Cell: (617)719-1297

-----Original Message-----
From: nick.caruso@rolls-royce.com [mailto:nick.caruso@rolls-royce.com]
Sent: Friday, January 05, 2007 5:24 PM
To: fred.curren@rolls-royce.com; Nelson, John-Erik; Joseph, Robert J.
Cc: carl.tallmadge@rolls-royce.com; michael.barrett@rolls-royce.com; jeffery.peelman@rolls-royce.com; brian.a.lloyd@rolls-royce.com
Subject: M.A168.01-0008 BELD - Noise Abatement Options Proposal, revision 3

John - Erik,

Please see attached revision to the noise abatement options. In particular,
we revised the option for the SCR noise abatement.

Further, since RR has not seen a formal written response on 22 December, we
have extended the bid validity, unfortunately, this has also had an impact
to the SDRL deliverables. Your prompt response is greatly appreciated.

<<Rev3_BELD_Coorespondence_Sound_Abatement.doc>>

Best Regards,
Nicholas Caruso
IPTL / CAM - Program Manager
nick.caruso@rolls-royce.com
office: 740-393-8881
cellular 740-398-8231
fax: 740-393-8859

> -----Original Message-----
> From: Caruso, Nick (RR Energy Systems)
> Sent: Wednesday, December 20, 2006 5:16 PM
> To: Curren, Fred (RR Energy Systems); 'Jnelson (E-mail); Robert J.
> Joseph (E-mail)
> Cc: Tallmadge, Carl (RR Energy Systems); Barrett, Michael (RR Energy
> Systems); Peelman, Jeffery (RR Energy Systems); Lloyd, Brian (RR Energy
> Systems)
> Subject: RE: M.A168.01-0006 BELD - Noise Abatement Options Proposal,
> revision 2
> Importance: High
>
> Gentlemen,
>
> Please forgive me, the price option in 1C was in error.

>
> Please see attached
>
> << File: Rev2_BELD_Coorespondence_Sound_Abatement.doc >>
>
> Nicholas Caruso
> IPTL / CAM - Program Manager
> nick.caruso@rolls-royce.com
> office: 740-393-8881
> cellular 740-398-8231
> fax: 740-393-8859
>
> -----Original Message-----
> From: Caruso, Nick (RR Energy Systems)
> Sent: Wednesday, December 20, 2006 4:24 PM
> To: Curren, Fred (RR Energy Systems); 'Jnelson (E-mail);
Robert
> J. Joseph (E-mail)
> Cc: Tallmadge, Carl (RR Energy Systems); Barrett, Michael
(RR
> Energy Systems); Peelman, Jeffery (RR Energy Systems); Lloyd, Brian
(RR
> Energy Systems)
> Subject: RE: M.A168.01-0006 BELD - Noise Abatement
Options
> Proposal, revision 2
>
> Re: Braintree Electric Light Department - Watson
Station
> Contract PO No. (to be determined)
> RRESI Project M.A168.01
> 2 - Rolls-Royce Industrial Trent 60 Dual-Fuel WLE
Turbine
> Power Generation Sets
>
> Gentlemen,
>
> Please find attached revision 2 of the sound abatement proposal.
> Within, you will find changes in red.
>
> Please advise how you wish to proceed.
> << File: Rev2_BELD_Coorespondence_Sound_Abatement.doc >>
> Best Regards,
>
> Nicholas Caruso
> IPTL / CAM - Program Manager
> nick.caruso@rolls-royce.com
> office: 740-393-8881
> cellular 740-398-8231
> fax: 740-393-8859
>
> -----Original Message-----
> From: Curren, Fred (RR Energy Systems)
> Sent: Wednesday, December 13, 2006 6:29 PM
> To: 'Jnelson (E-mail); Robert J. Joseph (E-mail)
> Cc: Caruso, Nick (RR Energy Systems); Tallmadge,
Carl
> (RR Energy Systems); Barrett, Michael (RR Energy Systems); Peelman,
> Jeffery (RR Energy Systems); Lloyd, Brian (RR Energy Systems)
> Subject: M.A168.01-0002 BELD - Noise Abatement
> Options Proposal
>
> Re: Braintree Electric Light Department - Watson
Station
> Contract PO No. (to be determined)
> RRESI Project M.A168.01
> 2 - Rolls-Royce Industrial Trent 60 Dual-Fuel
WLE
> Turbine Power Generation Sets
>

> Gentlemen,
> Please find attached description and budgetary proposal
for
> the various noise abatement options and advise how you wish to
proceed.
>
> Thanks,
>
> Fred Curren, P.E.
> Senior Project Manager
> Rolls-Royce Energy Systems Inc
> Mount Vernon, Ohio 43050
> Phone: 740-393-8438
> Fax: 740-393-8859
> Cell: 740-501-1463
>
> << File: Rev1_BELD_Cooorespondence_Sound_Abatement.doc
>>

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Option #1C

Rcvd. 1/8/07

Sound Power Levels from Stack Exit and Walls

Octave Bands	0	1	2	3	4	5	6	7	8	OA
Hz	32	63	125	250	500	1000	2000	4000	8000	dB
Lw - ENGINE	140	143	144	140	136	131	130	134	132	148
from exit - Option#3, 14ft silencer in duct and 14ft silencer in stack	122	118	108	94	84	82	82	77	75	123
from walls - Option#3, 14ft silencer in duct and 14ft silencer in stack	132	123	113	93	74	59	56	55	56	133

A-weight	*-39*	*-26*	*-16*	*-9*	*-3*	*0*	*1*	*1*	*-1*		
A-weighted Sound Power Level											
from exit - Option#3, 14ft silencer in duct and 14ft silencer in stack	83	92	92	85	81	82	83	78	74	96	dBA
from walls - Option#3, 14ft silencer in duct and 14ft silencer in stack	93	97	97	84	71	59	57	56	55	101	dBA

Option #1D   Rcvd. 1/8/07

Sound Power Levels from Stack Exit and Walls (Rev.1)

	Octave Bands	0	1	2	3	4	5	6	7	8	OA	
	Hz	32	63	125	250	500	1000	2000	4000	8000	dB	
	Lw - ENGINE	140	143	144	140	136	131	130	134	132	148	
Stack	from exit - Option#1D, 14ft silencer in duct and 14ft silencer ~~in~~ stack *	122	118	108	94	84	82	82	77	75	123	
SCR	from walls - Option#1D, 14ft silencer in duct and 14ft silencer in stack*	126	117	107	87	68	57	50	49	50	127	
	A-weight	*-39*	*-26*	*-16*	*-9*	*-3*	*0*	*1*	*1*	*-1*		
	A-weighted ~~Sound~~ Power Level											
Stack	from exit - Option#1D, 14ft silencer in duct and 14ft si~~lencer in st~~ack*	83	92	92	85	81	82	83	78	74	96	dBA
SCR	from walls - Option#1D, 14ft silencer in duct and ~~14ft silencer~~ in stack*	87	91	91	78	65	57	51	50	49	95	dBA

* Note: the difference between Option #3 and #4:

Option #1C: All 1/4" thick.

Option #1D: All horizontal duct walls: 1/2"; from there to 50 feet above ground: 3/8" thick; all above: 1/4" or thicker.

CALCULATION OF REFERENCE SOUND LEVELS -- THOMAS A. WATSON GENERATING STATION

Source -- Main Step-up Transformer

Assumptions:				**Reference**						
1) Standard (unquieted) transformer				Assumed						
2) Rating of transformer (MVA)	75	MVA		BELD						
3) NEMA sound rating (Lp) =	55+12LOG(MVA)			Electric Power Plant Environmental Noise Guide Edison Electric Institute, Table 4.5						
4) Surface area of transformer (10LOG(S)) =	14+2.5LOG(MVA)			Electric Power Plant Environmental Noise Guide Edison Electric Institute, Table 4.5						
5) Overall Lw = Lp + 10LOG(S)				Electric Power Plant Environmental Noise Guide Edison Electric Institute, Table 4.5						
Calculated Overall Lw =	96	dB								
	L_w per unit		**Octave Band Center Frequency (Hz) -- dB per unit**							
	(dBA)	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Subtract following dB from Lw:		-3	3	5	0	0	-6	-11	-16	-23
Resultant spectrum:	**97**	**93**	**99**	**101**	**96**	**96**	**90**	**85**	**80**	**73**

Source -- Auxiliary Transformer

Assumptions:				**Reference**						
1) Standard (unquieted) transformer				Assumed						
2) Rating of transformer (MVA)	10	MVA		Estimated (likely lower)						
3) NEMA sound rating (Lp) =	55+12LOG(MVA)			Electric Power Plant Environmental Noise Guide Edison Electric Institute, Table 4.5						
4) Surface area of transformer (10LOG(S)) =	14+2.5LOG(MVA)			Electric Power Plant Environmental Noise Guide Edison Electric Institute, Table 4.5						
5) Overall Lw = Lp + 10LOG(S)				Electric Power Plant Environmental Noise Guide Edison Electric Institute, Table 4.5						
Calculated Overall Lw =	84	dB								
	L_w per unit		**Octave Band Center Frequency (Hz) -- dB per unit**							
	(dBA)	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Subtract following dB from Lw:		-3	3	5	0	0	-6	-11	-16	-23
Resultant spectrum:	**84**	**81**	**87**	**89**	**84**	**84**	**78**	**73**	**68**	**61**

Gas Compressor Bldg -- Besicorp Cogen Project

Legend #10

Building Sound Source Analysis (SS4)

Assumptions
Unless otherwise specified, assumes non directional radiation of sound power levels at ground level.
Building 4 Gas Compressor Building mitigated sound levels. Mitigated areas highlighted in yellow.

Building 4 - Gas Compressor Building

Indoor Sound Levels (from SS1)	Source ID/Eqn.	Unit PWL	31.5	63	125	250	500	1000	2000	4000	8000	A-wtd.	Comments
Gas Compressor	I-31	112	3	107	112	117	114	107	106	104	97	115	Dfrom SS1 2 units
Total Interior PWLs	R-16		10	107	112	117	114	107	106	104	97	115	Decibel sum of indoor sources

Building Interior SPLs	Ref/Eqn	Vd(ft³) /Dist(ft)	31.5	63	125	250	500	1000	2000	4000	8000	A-wtd.	Comments
Room Constant (WWxDDxHH)	R-4	16000	908	1285	1779	2273	2283	1971	1702	1394	1685		
Rel. SPL corr. for Avg Wall Dist.	R-5	10	-14	-14	-16	-17	-17	-17	-16	-15	-15		
Inside SPL along walls and ceiling	E-2		-4	93	96	100	97	90	90	89	82	99	

Wall Transmission Loss (TL) in dB	Ref/Eqn	~~Dist (ft)~~ Area (ft²)	31.5	63	125	250	500	1000	2000	4000	8000	Comments
North Wall Masonry	R-1	560	32	36	36	37	43	47	51	55	59	Building is 40'x20' & 20' high with 12-inch concrete walls
North Windows		0										
North Louvers		240	3	6	8	14	22	27	30	30	31	Mitigation: Louver openings (Vibron VAL22, 12)
North Doors		0										
North Openings		0	0	0	0	0	0	0	0	0	0	Mitigation: Louver wall openings
North Wall - Total Composite TL (TLc)	E-1	800	8	11	13	19	27	32	35	35	36	
East Wall Masonry	R-1	280	32	36	36	37	43	47	51	55	59	
East Windows		0	0	0	0	0	0	0	0	0	0	
East Louvers		120	3	6	8	14	22	27	30	30	31	Mitigation: Louver openings (Vibron VAL22, 12)
East Doors		0	0	0	0	0	0	0	0	0	0	
East Openings		0	0	0	0	0	0	0	0	0	0	Mitigation: Louver wall openings
East Wall TLc	E-1	400	8	11	13	19	27	32	35	35	36	
South Wall Masonry	R-1	560	32	36	36	37	43	47	51	55	59	
Windows		0	0	0	0	0	0	0	0	0	0	
Louvers		240	3	6	8	14	22	27	30	30	31	Mitigation: Louver openings (Vibron VAL22, 12)
South Doors		0	0	0	0	0	0	0	0	0	0	
South Openings		0	0	0	0	0	0	0	0	0	0	Mitigation: Louver wall openings
South Wall TLc	E-1	800	8	11	13	19	27	32	35	35	36	
West Wall Masonry	R-1	280	32	36	36	37	43	47	51	55	59	
West Windows		0	0	0	0	0	0	0	0	0	0	
West Louvers		120	3	6	8	14	22	27	30	30	31	Mitigation: Louver openings (Vibron VAL22, 12)
West Doors		0	0	0	0	0	0	0	0	0	0	
West Openings		0	0	0	0	0	0	0	0	0	0	Mitigation: Louver wall openings
West Wall TLc	E-1	400	8	11	13	19	27	32	35	35	36	
Roof Material	R-1	800	0	16	16	19	25	27	32	39	39	Roof: 20 guage corrugated uninsulated steel
Roof Windows		0										
Roof Louvers		0										
Roof Doors		0										
Roof Openings		0	0	0	0	0	0	0	0	0	0	
Roof TLc	E-1	800	0	16	16	19	25	27	32	39	39	

Outside SPLs	Ref/Eqn	31.5	63	125	250	500	1000	2000	4000	8000	A-wtd.	Comments
North Wall	E-3	-19	76	77	75	64	52	49	48	40	68	
East Wall	E-3	-19	76	77	75	64	52	49	48	40	68	
South Wall	E-3	-19	76	77	75	64	52	49	48	40	68	
West Wall	E-3	-19	76	77	75	64	52	49	48	40	68	
Roof	E-3	-10	71	74	75	66	57	52	44	37	69	

Outside PWL	Ref/Eqn	Area (ft²)	31.5	63	125	250	500	1000	2000	4000	8000	A-wtd	Comments
North Wall	E-4	800	0	95	96	94	83	71	68	67	59	87	Our bldg is ~
2/3 North Wall + 1/3 East Wall	E-4		-1	94	95	93	82	70	67	66	58	86	~50' L x ~20' H = 1000 ft²
1/3 North Wall + 2/3 East Wall	E-4		-2	93	94	92	81	69	66	65	57	85	(93 m²)
East Wall	E-4	400	-3	92	93	91	80	68	65	64	56	84	$10\log(93\,m^2) \approx$ 20 dB
2/3 East Wall + 1/3 South Wall	E-4		-2	93	94	92	81	69	66	65	57	85	
1/3 East Wall + 2/3 South Wall	E-4		-1	94	95	93	82	70	67	66	58	86	
South Wall	E-4	800	0	95	96	94	83	71	68	67	59	87	
2/3 South Wall + 1/3 West Wall	E-4		-1	94	95	93	82	70	67	66	58	86	
1/3 South Wall + 2/3 West Wall	E-4		-2	93	94	92	81	69	66	65	57	85	
West Wall	E-4	400	-3	92	93	91	80	68	65	64	56	84	
2/3 West Wall + 1/3 North Wall	E-4		-2	93	94	92	81	69	66	65	57	85	
1/3 West Wall + 2/3 North Wall	E-4		-1	94	95	93	82	70	67	66	58	86	
Roof	E-4	800	9	90	93	94	85	76	71	63	56	88	
→ Wall L_w				96	97	95	84	72	69	68	60	88 ←	

2. Gas Turbine Transition Exhaust Duct (based on previous project data for 501F turbine, not GE 7FA data)

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Sound Power Level, dB ref. 1pW :	127	119	115	108	100	96	106	109

3. Gas Compressor Building Material Data

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Wall Transmission Loss for 12" concrete	-36.0	-36.0	-37.0	-43.0	-47.0	-51.0	-55.0	-59.0
Roof Trans. Loss	-17.0	-23.0	-29.0	-35.0	-40.0	-40.0	-40.0	-41.0

4. Gas Compressor data - fax dated 9/6/00 1 unit

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dBA
SPL 3" from unit	96	101	106	103	96	95	93	86	104.2
Est. SWL of gas compressor	104	109	114	111	104	103	101	94	112.2

5. The Water Treatment Area is ventilated by louvers or small vent fans located on the side wall.

Washington

R-1
R-14

INTER-OFFICE CORRESPONDENCE

To: Scott Manchester (ENSR)

DATE: November 12, 2001

From: Stefanie Rath Schwarz

Ltr #

cc: Mike Radovich, Mark Distler (ENSR)

Subject: ESNP Besicorp – Additional Data for the Acoustical Model

Scott,

Here are additional data for the Besicorp ENSP acoustical model. Please call me if you have any questions, my phone number is 609-720-2221.

1. HVAC equipment

The following are the projected main HVAC noise generating equipment and projected wall louver areas to consider in the plant noise model assessment.

A- Fourteen (14) upblast exhaust fans will be mounted on the building high roof in a fairly uniform pattern. The noise power level for each fan is as follow:

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Sound Power Level, dB ref. 1pW :	101	89	90	92	90	89	82	80

B- Twenty-four (24) louvers, each has 120 sq.ft of face area will be mounted uniformly on the building outside wall perimeter.

From: Markowitz, Cindy
Sent: Monday, September 25, 2006 10:29 AM
To: Slocomb, Steve; Quin, Howard; O'Neal, Rob; DeVita, Phil
Subject: FW: BELD, Watson, RR Intercooler 203.2.4 BD-EP-613 Keyword: Heat Exchanger
Attachments: BELD Whitby Visit September 2006 027.jpg; BELD Whitby Visit September 2006 003.jpg; BELD Whitby Visit September 2006 011.jpg

FYI--please let me know if you need more info from BELD on this.

Cindy

Cindy Jacobson Markowitz
Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754
(978) 461-6250 tel.
(978) 897-0099 fax
cmarkowitz@epsilonassociates.com

From: Nelson, John-Erik [mailto:jnelson@beld.com]
Sent: Monday, September 25, 2006 8:32 AM
To: Barten, Ted
Cc: Markowitz, Cindy; Joseph, Robert J.; Steele, Kathy; Hetherington, Donald
Subject: RE: BELD, Watson, RR Intercooler 203.2.4 BD-EP-613 Keyword: Heat Exchanger

Ted,

RR does not have the GE intercooler - it is a heat exchanger for the oil systems. I have attached some pictures from BELD's visit to RR's Trent 60 installation in Whitby (Toronto) Canada. #027 is the heat exchanger - # 003 is the air inlet filter housing - #011 is a side profile of the Trent 60.

John-Erik

Air Water/Glycol Heat Exchanger Scope Data Tab

Legend #14

Off-Skid Air Water/Glycol Heat Exchanger

- Air to Water/Glycol Fin Fan type heat exchanger system for cooling the water for both Mineral and Synthetic lube oil. The system is mounted on a freestanding skid to be located adjacent to the gas turbine module.

Vendor:	Ecodyne, Air Exchanger or Equal
Cooling:	Air to Water/Glycol Mix (40%/60%)
Fouling Factor	0.001 ft2hr f / btu
Fans	2 x 100% Fans for 2 machines
Tube	Welded Carbon Steel

Tube Material	SA214 Carbon Steel
Fin Type	L-Tension or L-Footed
Fin Material	Aluminum
Nozzle Material	SA105 Carbon Steel
Header Material	SA-516 GR. 70
Cooler Motor Driver	V-Belt Type 1800 RPM 460VAC/3Ph/60Hz TEFC Electric Motor Murphy Vibration Switch
Support Structure	Header Access Fin Guard or fall-off Guard
Code	ASME
Estimated Size	~12 x 34 ft (approx)
Estimated Weight	~26000 lbs (approx)
Fin Fan Cooler Mount:	Foot Mounted – free standing
Noise Level of the Cooler:	85 dB(A) at 3 ft distance and 5.5 ft above the cooler
Water Pump Skid supplying 2 machines Including: o 2 x 100% Pumps o 15 Hp Electric Motor Driver per Pump o Expansion Tank o Interconnecting piping and wiring to Junction Box o Skid mounted to be placed under the air fan cooler	

Town of Braintree Electric Light Department
Potter II Generating Station
John-Erik Nelson
Principal Mechanical Engineer
150 Potter Road
Braintree, MA 02184
Phone: (781)348-1164
Cell: (617)719-1297

From: Barten, Ted [mailto:tbarten@Epsilonassociates.com]
Sent: Friday, September 22, 2006 4:54 PM
To: Nelson, John-Erik
Cc: Markowitz, Cindy
Subject: BELD, Watson, RR Intercooler

John, at an internal meeting today, Steve Slocomb mentioned that the RR turbine has an intercooler option which you are looking at......is this correct? If so, does the intercooler involve a large air cooling unit ala GE? How soon will you be making a decision on this? Pls advise at your earliest convenience, regards, Ted B

CALCULATION OF REFERENCE SOUND LEVELS -- THOMAS A. WATSON GENERATING STATION

Source -- SCR Ammonia Dilution Fans

Assumptions:

1. A weighted Sound Pressure Recorded at 1 meter distance, 1 fan

Reference: Epsilon Measurements at FPL Jamaica Bay Facility, September, 2003

Lp per unit									
(dBA)	31.5	63	125	250	500	1000	2000	4000	8000
84	88	87	85	79	78	76	77	75	73

2. Convert Sound Pressure Level to Sound Power Level - 20*LOG(1 meter) + 8

Reference: Hoover and Keith, "Noise Control for Buildings and Manufacturing Plants". Sec.4-5. Eqn. 4-3

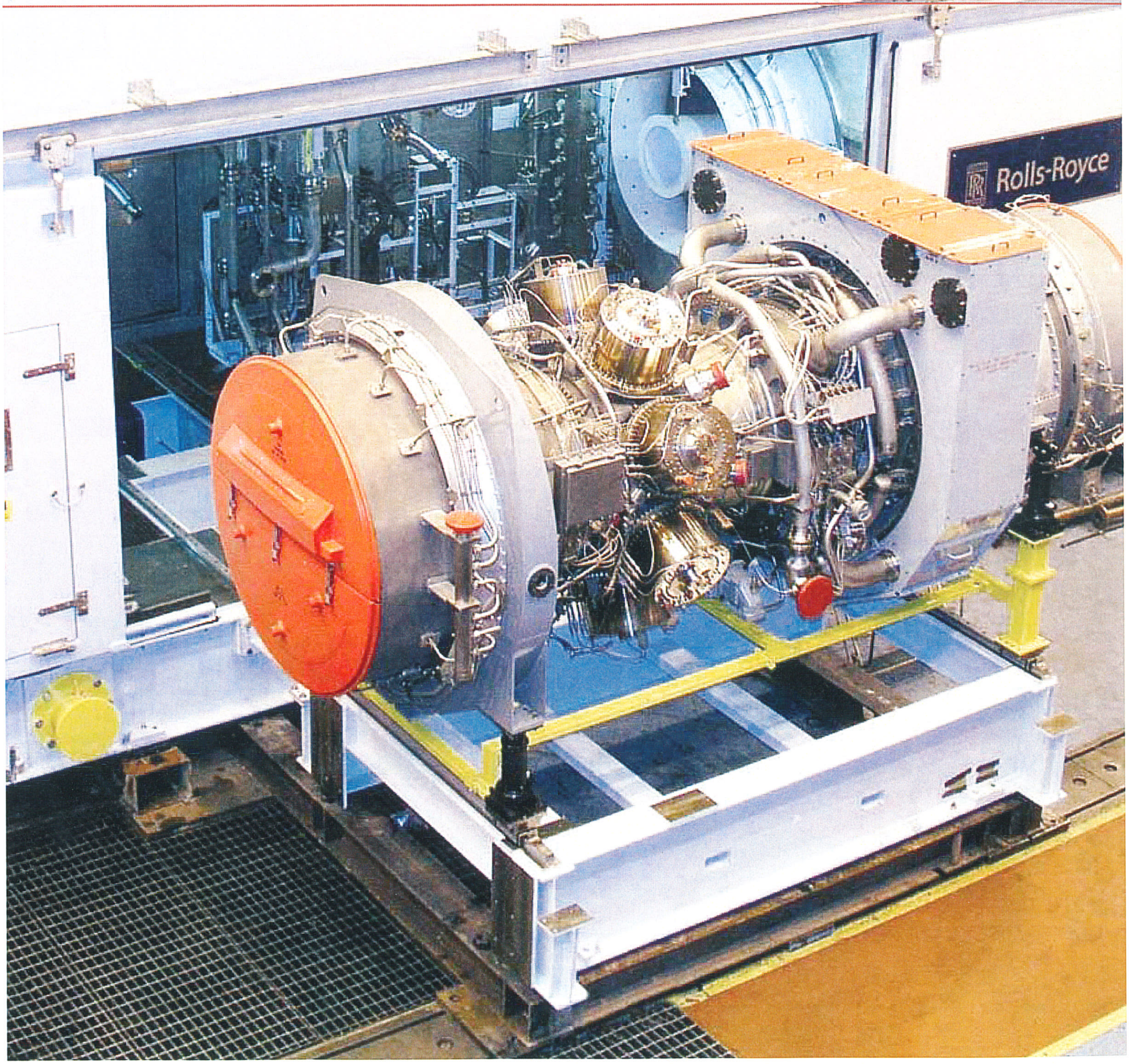
	L_w per unit			Octave Band Center Frequency (Hz) -- dB per unit						
	(dBA)	31.5	63	125	250	500	1000	2000	4000	8000
Resultant spectrum	92	96	95	93	87	86	84	85	83	81

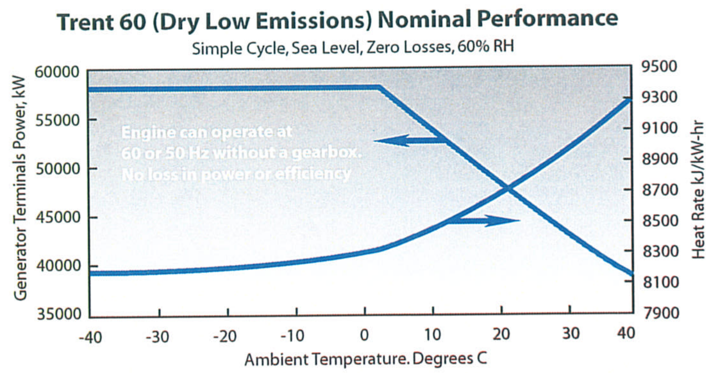
NH_3 Injection Skid

Rolls-Royce

The Trent 60 Gas Turbine

For power generation and mechanical drives





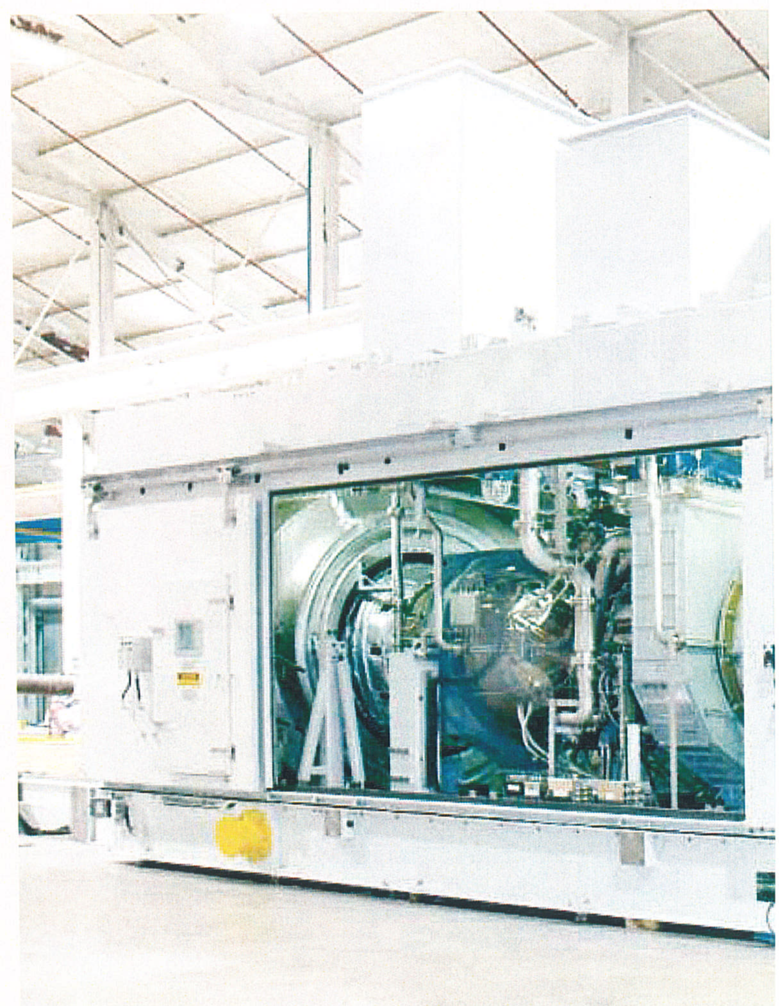
Power generation

T R E N T

The Rolls-Royce Trent 60 is the most advanced aeroderivative gas turbine available today. Delivering up to 58MW of electric power in simple cycle service, at 42 per cent efficiency, the Trent 60 has established a new benchmark for fuel economy and cost savings. It also offers operators fast delivery and installation times and beneficial environmental performance.

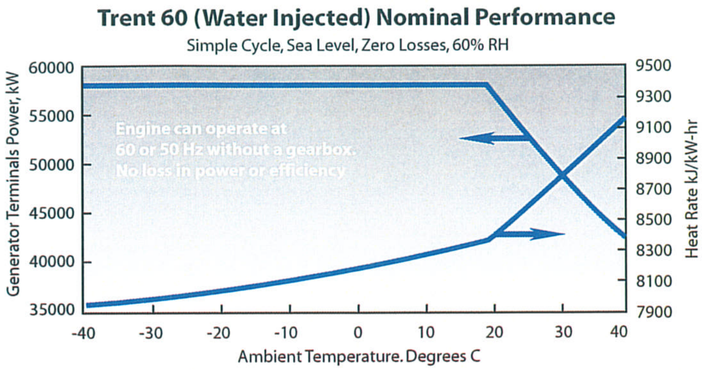
Key features

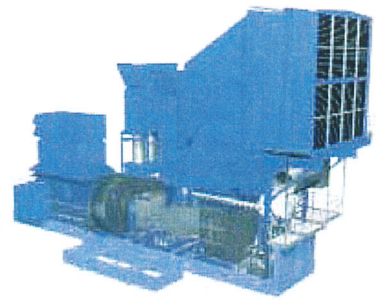
- Highest power aero derivative gas turbine
- Highest simple cycle efficiency gas turbine
- Efficient package for installation and maintenance
- Power generation at 50 or 60 Hz without a gear
- DLE or WLE systems available for 25 ppm NOx
- Small footprint and low weight
- Proven history from aircraft engine lineage
- Full load train starting with only 250 kW motor
- High cyclic life meets daily peaking market
- Cold start to full power in under 10 minutes



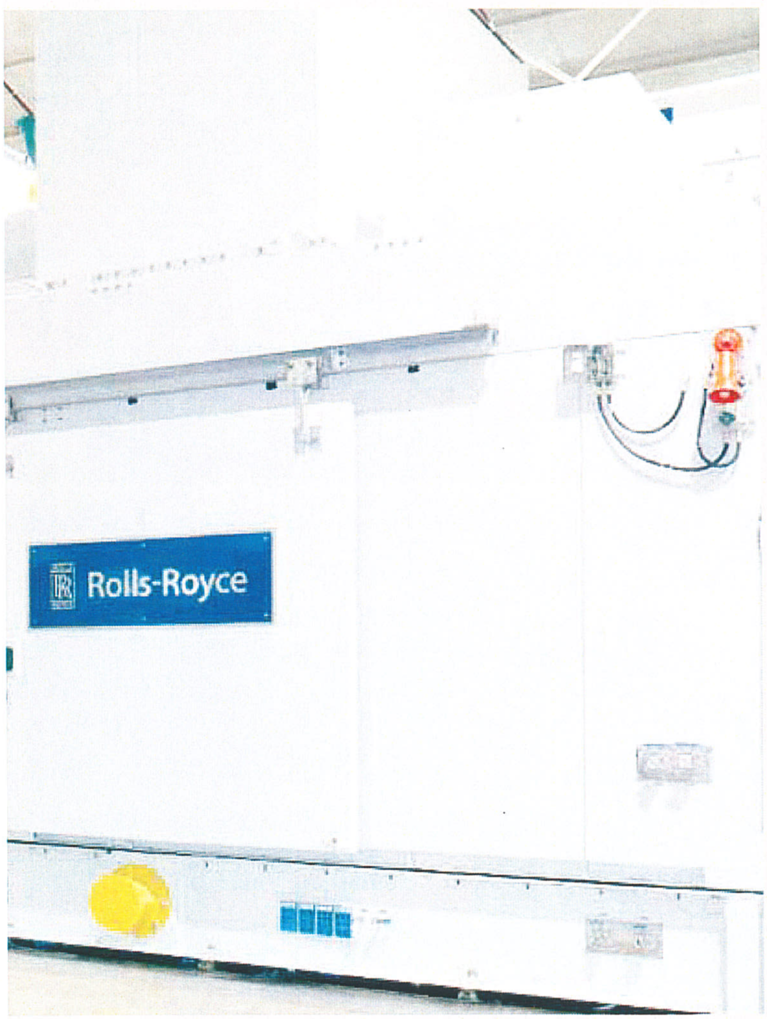
The Trent 60 package

Rolls-Royce





T R E N T

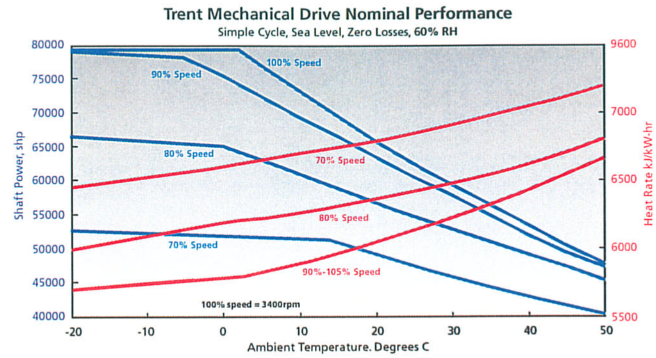


Trent 60 – Dry Low Emissions (DLE)

The Trent 60 DLE engine is designed to meet stringent environmental requirements. The use of an eight canular staged combustion system allows the successful operation of the engine in part load operation while still maintaining NOx and CO compliance. The engine is designed to produce 52MW of power at ISO conditions and is flat rated at 58MW power at temperatures below approximatley 2°C.

Trent 60 – Wet Low Emissions (WLE)

The Trent 60 WLE uses the annular combustor system from the Trent aero engine with the introduction of water to reduce emissions and boost performance. Since the Trent 60 engine only uses water in the combustion chamber, water usage is kept to a minimum. At temperatures below 19°C. (varies due to site conditions) the engine is flat rated at 58MW. An online monitoring system allows for the reduction of water usage due to changes in power demand and ambient conditions while still maintaining compliant emission levels.



Mechanical drive

T R E N T

Onshore or offshore

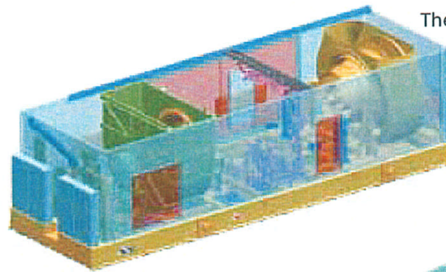
The Trent 60 is ideally suited to meet the higher power, variable speed demands required by applications like natural gas liquefaction, gas transportation and gas Injection for oil recovery. The design flexibility of the Trent allows the same engine that serves the power generation market to meet the needs of mechanical drive service with no design changes. The Trent, due to its three independent shaft design, is capable of meeting driven equipment power demand at reduced speeds with a minimal drop off in efficiency. The Trent design also allows the starting of large trains with the same standard, low power, starting system that is employed for power generation.

Key features

- The engine is designed for a 100% speed of 3400 RPM
- Can be direct connected to driven equipment or use a gear
- Engine control system can be modified to support a variety of driven equipment
- Speed range of 70-105%.
- Low starting power requirement for large trains
- Identical engine and package for power. generation and mechanical drive.
- Multiple daily starts with no extended wait time between starts.

Trent 60 engine on test, driving a centrifugal compressor at full load.

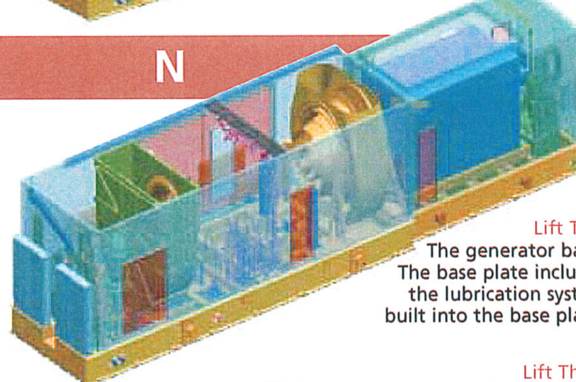
Rolls-Royce



Lift One
The main gas turbine skid base plate. This base includes all required engine lubrication systems, fuel systems and the control panels.

The Trent 60 package

T R E N



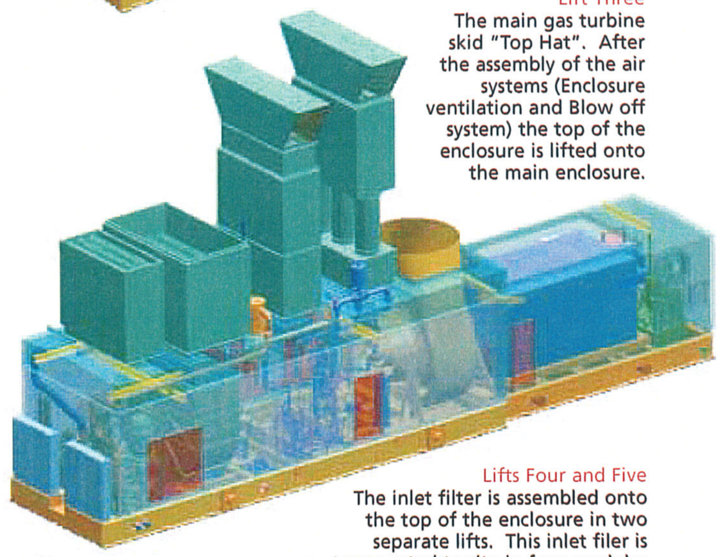
Lift Two
The generator base. The base plate includes the lubrication system built into the base plate.

Modular concept

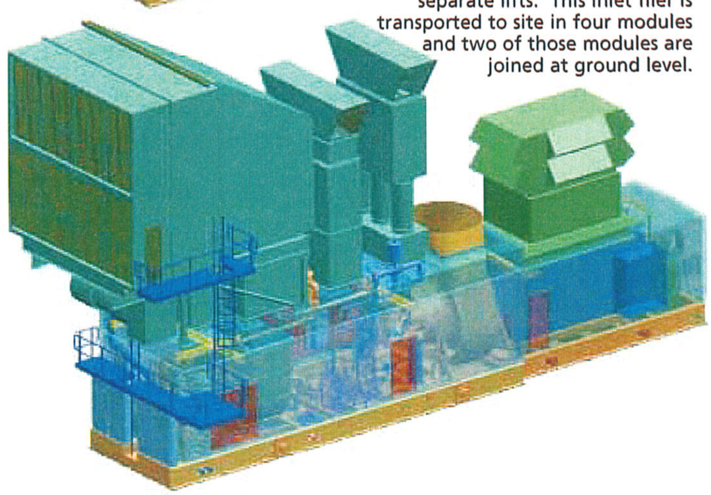
The Trent 60 package is designed with a modular concept to not only allow for quick installation but also for ease of maintenance in the field.

Each of the modules is fully assembled and tested before shipment to the field. Both the gas turbine and the generator base plates hold the required oil systems thus allowing installation, testing and flushing in a shop environment. This greatly reduces site installation time.

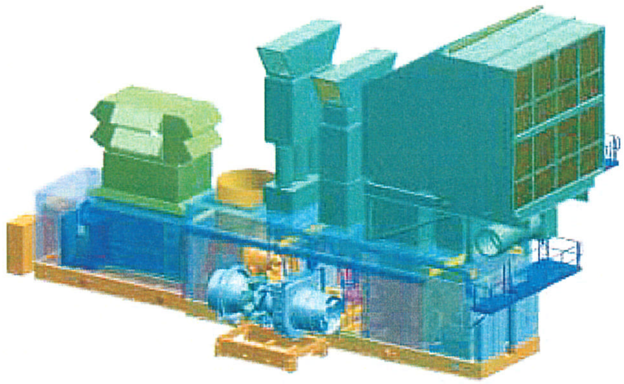
Not only are the mechanical systems located on the base plate but the control systems are located there as well. The control systems required for the operation of the Trent engine whether in mechanical drive or power generation service are pre-assembled and tested on the base plate before the unit ships to the field. All train control systems are then accessed by a Human Machine Interface (HMI) which can be located in the main control room.



Lift Three
The main gas turbine skid "Top Hat". After the assembly of the air systems (Enclosure ventilation and Blow off system) the top of the enclosure is lifted onto the main enclosure.



Lifts Four and Five
The inlet filter is assembled onto the top of the enclosure in two separate lifts. This inlet filer is transported to site in four modules and two of those modules are joined at ground level.



Trent maintenance

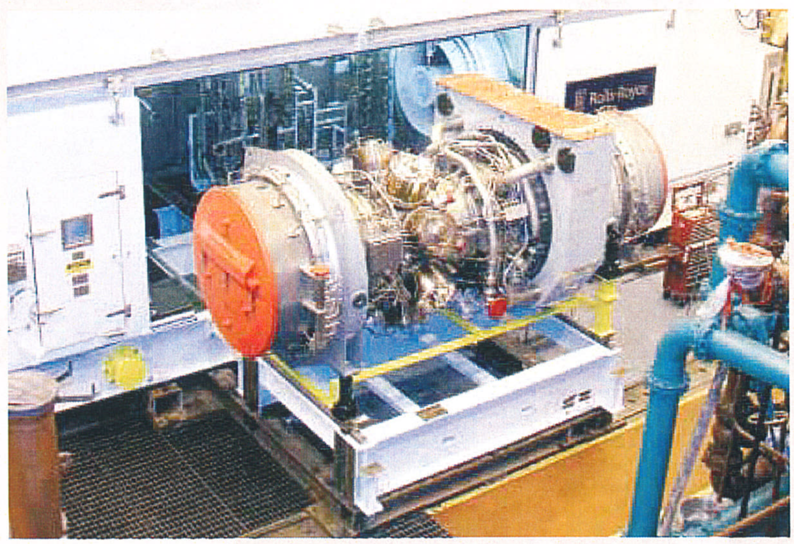
T R E N T

Flexible design

Due to the Trent's aircraft engine lineage, maintenance of the engine can be accomplished quickly and easily. The Trent package is designed to facilitate engine change out in under 24 hours of working time.
Complete engine servicing can take place in a Rolls-Royce facility.
The Trent engine is also capable of being split into three interchangeable modules:

1. Low pressure compressor
2. Intermediate and high pressure compressors and turbines
3. Low pressure turbine

It is possible to swap these engine modules at the site in under 72 working hours. This reduces overall transport and costs associated with inventory of a spare engine. Rolls-Royce can also offer access to a lease engine or module program.
This program reduces the need for a spare engine and allows significant flexibility in maintenance.



The engine is installed and removed from the side of the package. The use of sliding doors allows full access to the engine and is designed for a complete engine change out in 24 working hours.

Rolls-Royce

- Long Term Service Agreements
- Engineered products
- Refurbished power systems
- Repair and overhaul
- Control system upgrades
- Service exchange and lease engines
- Spare parts
- Technical support
- Field service
- Customer training
- Complete installation and commisioning service

Customer service business

T R E N T

Experience holds the key to success

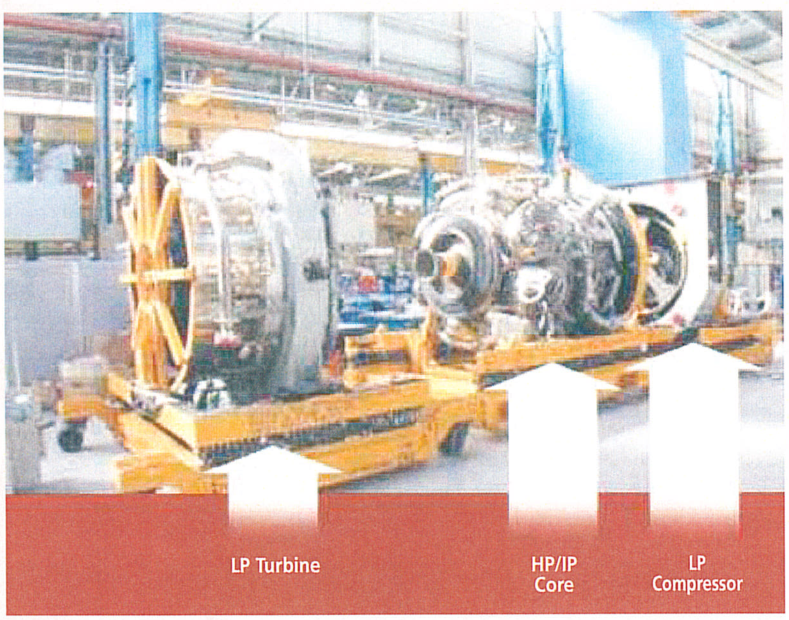
In today's evolving and demanding energy market, Trent gas turbine based packages offer distinct advantages to the power generation and oil and gas industries. This competitive advantage is complemented by an innovative and diverse suite of service solutions tailored to customers' specific needs.

Our ability to keep you operational where others might fail is a direct result of our policy to develop integrated solutions. Our Long Term Service Agreements (LTSAs) create partnerships designed to control operators' maintenance budget while increasing the availability of the equipment.

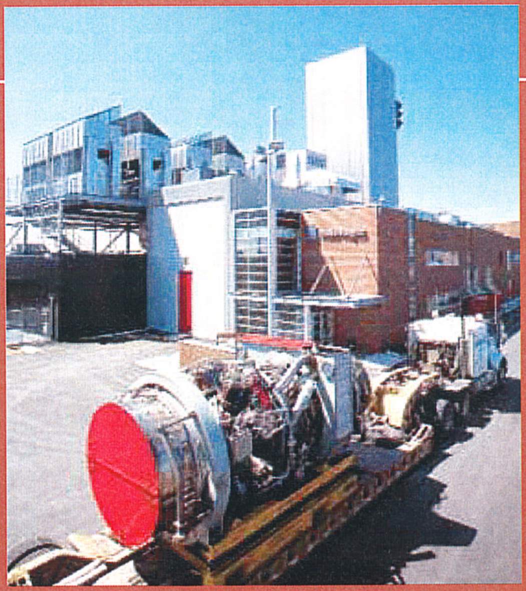
The equipment upgrades we provide as part of our suite of engineered products rely on the comprehensive system history and key performance indicators established in our technical support networks.

By diligently monitoring the performance of your installed plant we can plan when major components will need to be removed for repair or overhaul.

We are continually increasing the range and scope of our customer service solutions. Our own online community at www.enegymanager-online.com provides Rolls-Royce users with quick, up to date, easy to access information.



Engine Handling
Due to the Trent's aircraft lineage it is possible for the engine to be split into three modules at the site. This reduces transportation costs and saves on inventory requirements.



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www.rolls-royce.com

Rolls Royce Emissions Data - 2006-10-26 datasheet																
Fuel	Units	nat gas	nat gas	nat gas	nat gas	nat gas	nat gas	nat gas	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD
Load	%	50%	100%	50%	100%	100%	50%	100%	50%	100%	100%	50%	100%	100%	50%	100%
Temperature	°F	59	59	91	91	91	9	9	59	59	59	91	91	91	9	9
Inlet Conditioning	on/off	off	off	off	off	on	off	off	off	off	on	off	off	on	off	off
RH	%	60%	60%	42.6%	42.6%	42.6%	65%	65%	60%	60%	60.0%	42.6%	42.6%	42.6%	65%	65%
Gross Power Output	kW	28,999	58,000	22,880	45,759	53,188	28,999	58,000	28,083	56,166	58,000	22,730	45,461	51,347	28,999	58,000
Auxiliary Loads	kW	600	600	600	600	600	600	600	710	710	710	710	710	710	710	710
Net Power Output	kW	28,399	57,400	22,280	45,159	52,588	28,399	57,400	27,373	55,456	57,290	22,020	44,751	50,637	28,289	57,290
Fuel Flow	lb/hr	14,168	23,972	12,682	19,956	22,464	13,961	23,447	15,746	26,481	27,141	14,335	22,534	24,750	15,831	26,607
Heat Input	MMBtu/hr	322	**546**	289	454	511	318	534	311	522	**535**	283	445	488	312	525
Gross Heat Rate	Btu/kW-hr	11,109	9,519	12,603	10,045	9,728	10,947	9,312	11,117	9,469	9,399	12,504	9,955	9,681	10,824	9,214
Net Heat Rate	Btu/kW-hr	11,344	9,619	12,943	10,179	9,839	11,178	9,410	11,405	9,591	9,516	12,907	10,113	9,816	11,095	9,328
Water Requirements	lb/hr	14,569	30,471	13,157	25,030	28,599	12,470	26,260	14,606	30,153	30,725	13,479	25,496	28,119	12,968	27,160
Water (Evap Cooling)	lb/hr	0	0	0	0	7,056	0	0	0	0	4,839	0	0	6,918	0	0
Emissions																
NOx - uncontrolled	ppm @15%O2	25	25	25	25	25	25	25	42	42	42	42	42	42	42	42
NOx - uncontrolled	lb/hr	29.69	50.24	26.58	41.82	47.08	29.26	49.14	50.71	85.29	87.41	46.17	72.57	79.71	50.99	85.69
NOx - uncontrolled	lb/MMBtu	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.163	0.163	0.163	0.163	0.163	0.163	0.163	0.163
NOx - controlled	ppm @15%O2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
NOx - controlled	lb/hr	2.93	**4.95**	2.62	4.12	4.64	2.89	4.84	6.00	10.06	**10.32**	5.46	8.57	9.41	6.04	10.12
NOx - controlled	lb/MMBtu	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0193	0.0193	0.0193	0.0193	0.0193	0.0193	0.0193	0.0193
CO - uncontrolled	ppm @15%O2	85.4	59.1	76.2	54.6	56.3	123.7	84.3	61.1	33.0	33.0	57.5	33.0	33.0	87.7	33
CO - uncontrolled	lb/hr	61.74	72.29	49.31	55.60	64.54	88.12	100.86	44.91	40.79	41.81	38.47	34.71	38.12	64.80	40.98
CO - uncontrolled	lb/MMBtu	0.192	0.133	0.171	0.122	0.126	0.277	0.189	0.145	0.078	0.078	0.136	0.078	0.078	0.207	0.078
CO - controlled	ppm @15%O2	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
CO - controlled	lb/hr	3.57	**6.02**	3.19	5.02	5.64	3.52	5.89	3.65	6.13	**6.28**	3.32	5.22	5.73	3.67	6.16
CO - controlled	lb/MMBtu	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
VOC - uncontrolled	ppm @15%O2	3.4	2.4	3.0	2.2	2.3	4.9	3.4	6.1	3.3	3.3	5.8	3.3	3.3	8.8	3.3
VOC - uncontrolled	lb/hr	1.41	1.65	1.13	1.27	1.48	2.01	2.31	2.57	2.33	2.39	2.20	1.98	2.18	3.70	2.34
VOC - uncontrolled	lb/MMBtu	0.0044	0.0030	0.0039	0.0028	0.0029	0.0063	0.0043	0.0083	0.0045	0.0045	0.0078	0.0045	0.0045	0.0119	0.0045
VOC - controlled	ppm @15%O2	1.6	**1.1**	1.3	1.0	1.1	2.5	1.7	2.9	1.5	1.5	2.5	1.5	1.6	4.5	1.6
VOC - controlled	lb/hr	0.67	0.77	0.49	0.58	0.70	1.00	**1.14**	1.20	1.07	1.09	0.94	0.91	1.02	**1.85**	1.16
VOC - controlled	lb/MMBtu	0.0021	0.0014	0.0017	0.0013	0.0014	0.0031	0.0021	0.0039	0.0020	0.0020	0.0033	0.0020	0.0021	0.0059	0.0022
PM - prior to SCR	lb/hr	4.5	4.5	4.5	4.5	4.5	4.5	4.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
PM - prior to SCR	lb/MMBtu	0.014	0.008	0.016	0.010	0.009	0.014	0.008	0.040	0.024	0.023	0.044	0.028	0.026	0.040	0.024
PM - after SCR&CO	lb/hr	5.02	5.02	**5.03**	5.02	5.02	5.01	5.01	14.34	15.04	**15.05**	14.56	14.88	14.85	13.95	14.42
PM - after SCR&CO	lb/MMBtu	0.016	0.009	0.017	0.011	0.010	0.016	0.009	0.046	0.029	0.028	0.051	0.033	0.030	0.045	0.027
SO2	lb/hr	0.77	**1.31**	0.69	1.09	1.23	0.76	1.28	0.47	0.79	**0.81**	0.43	0.67	0.74	0.47	0.80
SO2	lb/MMBtu	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
NH3	ppm @15%O2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
NH3	lb/hr	2.17	3.66	1.94	3.05	3.43	2.14	3.59	2.22	3.73	**3.82**	2.02	3.17	3.48	2.24	3.75
NH3	lb/MMBtu	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0072	0.0071
Operations	hr/yr		5,880								2,880					

Rolls Royce Emissions Data - 2006-10-26 datasheet																
Fuel	Units	nat gas	nat gas	nat gas	nat gas	nat gas	nat gas	nat gas	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD	ULSD
Load	%	50%	100%	50%	100%	100%	50%	100%	50%	100%	100%	50%	100%	100%	50%	100%
Temperature	°F	59	59	91	91	91	9	9	59	59	59	91	91	91	9	9
Inlet Conditioning	on/off	off	off	off	off	on	off	off	off	off	on	off	off	on	off	off
Operations	hr/yr		8,760													
Total Emissions (2 Units) - tpy																
NOx	58.8		14.5								14.9					
CO	53.5		17.7								9.0					
VOC	7.6		2.3								1.6					
PM	72.9		14.8								21.7					
SO2	11.5		5.7								0.0					
NH3	32.5		10.8								5.5					
Modeling Parameters (per stack)																
Exhaust Temperature	°F	744.4	800.0	800.0	800.0	800.0	644.4	715.6	754.2	800.0	800.0	800.0	800.0	806.2	654.4	728.9
Exhaust Temperature	K	668.9	699.8	699.8	699.8	699.8	613.4	652.9	674.4	699.8	699.8	699.8	699.8	703.3	618.9	660.3
Exhaust Flow Rate	lb/hr	977,004	1,326,240	861,189	1,186,500	1,279,284	1,060,164	1,389,600	967,464	1,326,240	1,345,127	875,076	1,209,858	1,276,275	1,061,280	1,393,344
Avg MW	lb/lbmol	28.30	28.07	28.17	27.98	27.91	28.47	28.28	28.61	28.47	28.45	28.48	28.36	28.30	28.75	28.63
Exhaust Flow	ACFM	506,016	724,493	468,777	650,241	702,848	500,490	702,998	499,679	714,314	724,996	471,151	654,158	694,931	500,630	704,152
Stack Diameter	ft	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Exhaust Flow	ft/s	88.74	127.06	82.21	114.04	123.26	87.77	123.29	87.63	125.27	127.15	82.63	114.72	121.88	87.80	123.49
Exhaust Flow	m/s	27.05	38.73	25.06	34.76	37.57	26.75	37.58	26.71	38.18	38.75	25.19	34.97	37.15	26.76	37.64
Emissions (g/s) (per unit basis)																
NOx	g/s	0.370	0.624	0.331	0.520	0.585	0.365	0.611	0.757	1.269	1.301	0.689	1.081	1.187	0.762	1.276
CO	g/s	0.450	0.759	0.403	0.633	0.712	0.444	0.743	0.460	0.772	0.792	0.419	0.658	0.722	0.463	0.777
VOC	g/s	0.084	0.097	0.062	0.073	0.088	0.126	0.144	0.151	0.134	0.138	0.119	0.114	0.128	0.233	0.147
PM	g/s	0.633	0.633	0.635	0.633	0.633	0.632	0.632	1.809	1.897	1.898	1.837	1.876	1.873	1.759	1.819
SO2	g/s	0.098	0.165	0.087	0.137	0.155	0.096	0.161	0.059	0.100	0.102	0.054	0.085	0.093	0.060	0.100

AP-42 Emission Factors (April 2000 Edition)									
	Natural Gas			ULSD					
Heat Input	1,091.0	MMBtu/hr (2 units)		1,070.9	MMBtu/hr				
Max Operations	5,880			2,880	hr/yr				
Split Operations	8,760				hr/yr				
Heat Content	1,020	Btu/scf		139,000	Btu/gal				
Emissions							Maximum	Long Term	
Units	lb/MMBtu	lb/hr	tpy	lb/MMBtu	lb/hr	tpy	tpy	g/s	
1,3-butadiene	*4.3E-07*	*4.7E-04*	*0.002*	*1.6E-05*	*1.7E-02*	*0.025*	*0.026*	7.5E-04	
acetaldehyde	4.0E-05	4.4E-02	0.19				0.19	5.5E-03	
acrolein	6.4E-06	7.0E-03	0.03				0.03	8.8E-04	
benzene	1.2E-05	1.3E-02	0.057	5.5E-05	5.9E-02	0.085	0.12	3.6E-03	
ethylbenzene	3.2E-05	3.5E-02	0.15				0.15	4.4E-03	
formaldehyde	7.1E-04	7.7E-01	3.39	2.8E-04	3.0E-01	0.432	3.39	9.8E-02	
naphthalene	1.3E-06	1.4E-03	0.0062	3.5E-05	3.7E-02	0.054	0.058	1.7E-03	
PAH	2.2E-06	2.4E-03	0.01	4.0E-05	4.3E-02	0.062	0.07	2.0E-03	
propylene oxide	*2.9E-05*	3.2E-02	0.14				0.14	4.0E-03	
toluene	1.3E-04	1.4E-01	0.62				0.62	1.8E-02	
xylenes	6.4E-05	7.0E-02	0.31				0.31	8.8E-03	
arsenic				4.7E-08	5.0E-05	0.00007	0.00007	2.1E-06	
beryllium				3.1E-07	3.3E-04	0.0005	0.0005	1.4E-05	
cadmium				4.8E-06	5.1E-03	0.007	0.007	2.1E-04	
chromium				1.1E-05	1.2E-02	0.017	0.017	4.9E-04	
lead				1.4E-05	1.5E-02	0.022	0.022	6.2E-04	
manganese				7.9E-04	8.5E-01	1.218	1.22	3.5E-02	
mercury				1.2E-06	1.3E-03	0.002	0.002	5.3E-05	
nickel				4.6E-06	4.9E-03	0.007	0.007	2.0E-04	
selenium				2.5E-05	2.7E-02	0.039	0.04	1.1E-03	
Total HAPs							6.42		
Maximum HAP							3.39	formaldehyde	
Other Emissions									
Ammonia slip	6.7E-03	7.32	32.08	7.1E-03	7.64	10.996	32.53	9.4E-01	
H2SO4	2.6E-03	2.81	12.29	1.6E-03	1.74	2.504	12.29	3.5E-01	
H2SO4 assumes 70% conversion of SO2 to SO3 and 100% conversion of SO3 to H2SO4 over the SCR/oxidation catalysts									
Italics indicate emission value is based on 1/2 the detection limit of the test									

Appendix D RACT/BACT/LAER Clearinghouse Summaries

RBLC Summary – Natural Gas Fired >50 MW – Simple-Cycle

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	SO_2	Type	Controls
FL-0261	ARVAH B. HOPKINS GENERATING STATION	CITY OF TALLAHASSEE	FL	50	5	6	3.0	0.005		BACT-PSD	SCR, water inj., Ox Cat
TX-0405	WESTVACO TEXAS LP	WESTVACO TEXAS LP	TX	42	5	22				BACT-PSD	SCR, LNB
TX-0390	EAST REFINERY	FLINT HILLS RESOURCES LP	TX	87	8.6	25	1.6	0.006		Other Case-by-Case	SCR
CO-0053	PLATTE RIVER POWER AUTHORITY-RAWHIDE STATION	PLATTE RIVER POWER AUTHORITY	CO	82	9	29		0.021		BACT-PSD	DLN
FL-0222	TECO/HARDEE POWER SERVICES - HARDEE POWER STATION	TECO/HARDEE POWER SERVICES	FL	75	9	20	1.2			BACT-PSD	DLN
FL-0242	FPC - INTERCESSION CITY	FLORIDA POWER CORPORATION (FPC)	FL	87	9	20				BACT-PSD	DLN
IA-0063	WISDOM GENERATION STATION	CORN BELT POWER COOPERATIVE	IA	80	9					Other Case-by-Case	DLN
IL-0086	KENDALL NEW CENTURY DEVELOPMENT LLC	KENDALL NEW CENTURY DEVELOPMENT LLC	IL	100.05	9	25		0.014		BACT-PSD	DLN
IN-0088	DUKE ENERGY KNOX LLC	DUKE ENERGY KNOX LLC	IN	115.8	9	25	1.4	0.010		BACT-PSD	DLN
IN-0096	SOUTHERN INDIANA- AB BROWN GENERATING STATION	SOUTHERN INDIANA GAS & ELECTRIC COMPANY	IN	114.58	9	25		0.005		BACT-PSD	DLN
IN-0117	SIGECO A.B. BROWN STATION	SIGECO A.B. BROWN STATION	IN	111.09	9	25		0.005		BACT-PSD	DLN
MI-0295	DTE ENERGY SERVICES	DTE ENERGY SERVICES	MI	82.4	9	25		0.011		BACT-PSD	DLN
MI-0296	FIRST ENERGY CORPORATION - SUMPTER PLANT	FIRST ENERGY CORPORATION - SUMPTER PLANT	MI	83	9	25				N/A	DLN
MI-0319	DETROIT EDISON- GREENWOOD ENERGY CENTER	DETROIT EDISON- GREENWOOD ENERGY CENTER	MI	82.4	9	25		0.011		BACT-PSD	DLN, Ox Cat >$4500/ton
MI-0321	DETROIT EDISON- BELLE RIVER PLANT	DETROIT EDISON- BELLE RIVER PLANT	MI	82.4	9	25		0.011		BACT-PSD	DLN
MN-0050	LAKEFIELD JUNCTION LP GENERATING STATION	LAKEFIELD JUNCTION LP	MN	92	9	25	4.0	0.011		BACT-PSD	DLN
MN-0051	LAKEFIELD JUNCTION L.P.	LAKEFIELD JUNCTION L.P.	MN	92	9	25	4.0	0.011		BACT-PSD	DLN
MS-0067	WARREN PEAKING POWER FACILITY	WARREN POWER LLC	MS	95.98	9	25		0.007		BACT-PSD	DLN
MS-0074	MOSELLE PLANT	SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	MS	114.33	9	20		0.009		BACT-PSD	DLN
NM-0048	CAMBRAY ENERGY CENTER	DEMING ENERGY LLC	NM	80	9	25		0.013		BACT-PSD	DLN
OH-0291	OHIO EDISON CO.-WEST LORAIN PLANT	FIRST ENERGY	OH	85	9			0.006		BACT-PSD	DLN
TX-0276	RAY OLINGER POWER PLANT	CITY OF GARLAND	TX	85	9	25	4.8	0.010		Other Case-by-Case	DLN

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	SO_2	Type	Controls
VA-0269	CINCAP MARTINSVILLE	Cinergy Capital & Trading	VA	82	9	25	4.4	0.012		Other Case-by-Case	DLN
VA-0279	CINCAP - MARTINSVILLE	Cinergy Capital & Trading	VA	82	9	25	4.4	0.012		BACT-PSD	DLN
VA-0282	ODEC - LOUISA	Old Dominion Electric Coop - Louisa	VA	90.1	9	25		0.011		BACT-PSD	DLN
WI-0185	WEPCO - GERMANTOWN	WEPCO - GERMANTOWN	WI	50	9	25	1.4	0.020		BACT-PSD	
GA-0099	SANDERSVILLE GENERATING STATION	DUKE ENERGY SANDERSVILLE LLC	GA	80	10	25		0.011		BACT-PSD	DLN
GA-0108	SANDERSVILLE GENERATING STATION	DUKE ENERGY SANDERSVILLE LLC	GA	80	10	25		0.011		BACT-PSD	DLN
FL-0249	DUKE ENERGY/FORT PIERCE	DUKE ENERGY FORT PIERCE LLC	FL	80	10.5	20				BACT-PSD	DLN
NC-0087	DUKE ENERGY - BUCK COMBUSTION TURBINE FACILITY	DUKE ENERGY CORPORATION	NC	80	10.5	25		0.012		BACT-PSD	DLN
SC-0069	DUKE ENERGY MILL CREEK COMBUSTION TURBINE STATION	DUKE ENERGY COMPANY	SC	81.7	10.5	25		0.006		BACT-PSD	DLN
VA-0263	ODEC - LOUISA FACILITY	OLD DOMINION ELECTRIC COOPERATIVE	VA	90.1	10.5	25		0.011		N/A	DLN
FL-0250	DUKE ENERGY/LAKE	DUKE LAKE ENERGY LLC	FL	80	12	20				BACT-PSD	DLN
GA-0079	GEORGIA POWER CO.- JACKSON COUNTY	GEORGIA POWER- JACKSON CNTY COMBUSTION TURBINE PLT	GA	97.83	12	45	2.3	0.010		BACT-PSD	DLN
IN-0083	VERMILLION GENERATING STATION	DUKE ENERGY	IN	80	12	25		0.006		BACT-PSD	DLN
MO-0058	DUKE ENERGY - AUDRAIN GENERATING STATION	DUKE ENERGY	MO	80	12	25		0.016		BACT-PSD	DLN
MS-0043	SOUTHAVEN ENERGY FACILITY		MS	80	12	25	4.7	0.013		BACT-PSD	DLN
MS-0063	WARREN PEAKING POWER FACILITY	WARREN POWER LLC	MS	95.98	12	25		0.007		BACT-PSD	DLN
OH-0239	DUKE ENERGY MADISON STATION	DUKE ENERGY	OH	80	12	31	4.0			BACT-PSD	DLN
OK-0047	ONEOK POWER PLT	ONEOK INC	OK	80	12	25		0.006		BACT-PSD	DLN
MS-0079	WARREN PEAKING POWER FACILITY (WARREN POWER LLC)	WARREN PEAKING POWER FACILITY (WARREN POWER LLC)	MS	95.98	13.17	27		0.007		BACT-PSD	DLN
FL-0078	KISSIMMEE UTILITY AUTHORITY	KISSIMMEE UTILITY AUTHORITY	FL	86.9	15	20	1.8	0.008		BACT-PSD	DLN
GA-0069	TENUSKA GEORGIA PARTNERS L.P.	TENUSKA GEORGIA PARTNERS L.P.	GA	160	15	15	23.4	0.010		BACT-PSD	DLN
IN-0111	DUKE ENERGY VERMILLION STATION	DUKE ENERGY VERMILLION STATION	IN	80	15	25				BACT-PSD	DLN
KS-0021	WESTERN RESOURCES' GORDON EVANS ENERGY CENTER		KS	83.89	15		1.9	0.012		BACT-PSD	DLN
NE-0022	C. W. BURDICK GENERATING STATION	Grand Island Utilities	NE	100	15			0.010		Other Case-by-Case	DLN
OH-0253	DAYTON POWER AND LIGHT COMPANY	DAYTON POWER AND LIGHT COMPANY	OH	111.5	15					BACT-PSD	water inj.
OH-0274	DPLE TAIT PEAKING STATION	DAYTON POWER AND LIGHT ENERGY	OH	80	15					BACT-PSD	water inj.
TN-0148	TVA - GALLATIN FOSSIL PLANT	TENNESSEE VALLEY AUTHORITY	TN	85	15	25	7.8			BACT-PSD	LNB
PA-0205	DUKE YUKON ENERGY LLC	DUKE ENERGY	PA	84	24	8				LAER	water inj.

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	SO_2	Type	Controls
IN-0095	ALLEGHENY ENERGY SUPPLY CO. LLC	ALLEGHENY ENERGY SUPPLY CO. LLC (ACADIA BAY ENERGY	IN	46.9	25	25	15.6	0.007		BACT-PSD	water inj.
NE-0010	LINCOLN ELECTRIC SYSTEM	LINCOLN ELECTRIC SYSTEM	NE	91.1925	25			0.006		BACT-PSD	water inj.
OH-0253	DAYTON POWER AND LIGHT COMPANY	DAYTON POWER AND LIGHT COMPANY	OH	111.5	25	120	7.0	0.007		BACT-PSD	water inj.
OH-0274	DPLE TAIT PEAKING STATION	DAYTON POWER AND LIGHT ENERGY	OH	80	25		9.8	0.007		BACT-PSD	water inj.
PA-0159	HANDSOME LAKE ENERGY	HANDSOME LAKE ENERGY L.L.C.	PA	50	25	25	5.0			Other Case-by-Case	water inj.
WI-0180	WEPCO - PARIS GENERATING STATION	WEPCO - PARIS GENERATING STATION	WI	124	25	37	22.7	0.126		BACT-PSD	DLN
FL-0163	FLORIDA POWER CORPORATION/SUWANNEE	FLORIDA POWER CORPORATION	FL	63	68			0.060		BACT-PSD	

RBLC Summary - Gas Fired - Units <50 MW – Simple-Cycle

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	SO_2	Type	Controls
CA-1098	LAMBIE ENERGY CENTER	LAMBIE ENERGY CENTER	CA	49.9	2.5	6	2			BACT-PSD	SCR, ox cat
CT-0143	PPL WALLINGFORD ENERGY LLC	PPL WALLINGFORD ENERGY LLC	CT	46.12	2.5	16	8.38			BACT-PSD	SCR, ox cat
CA-0954	CALPEAK POWER --PANOCHE	CALPEAK POWER --PANOCHE	CA	24.7	3.4		2			LAER	SCR, ox cat
CA-1095	EI COLTON LLC	EI COLTON LLC	CA	48.7	3.5	6	2			BACT-PSD	SCR, ox cat
WA-0306	CLIFFS ENERGY PROJECT	GNA ENERGY INC.	WA	45	4.5	10	1.5			BACT-PSD	SCR
CA-0951	INDIGO ENERGY FACILITY	INDIGO ENERGY FACILITY	CA	45	5	6	2			LAER	SCR, ox cat
CA-0952	LA DEPT OF WATER & POWER	LA DEPT OF WATER & POWER	CA	47.4	5	6	2			LAER	SCR, ox cat
CA-0953	ALLIANCE COLTON--CENTURY	ALLIANCE COLTON--CENTURY	CA	40	5	6	2			LAER	SCR, ox cat
CA-1026	SILICON VALLEY POWER	SILICON VALLEY POWER	CA	1.5	5	5				BACT-PSD	SCR
LA-0146	SHELL CHEMICAL COMPANY - GEISMAR PLANT	SHELL CHEMICAL COMPANY - GEISMAR PLANT	LA	39.73	9	25				BACT-PSD	
WA-0304	FREDERICKSON PLANT	PIERCE POWER LLC	WA	22	9	10		0.046		Other Case-by-Case	
WI-0177	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WI	37.1	9	25	1.4			BACT-PSD	LAER for VOC
WI-0177	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WI	37.1	9	25	1.4			BACT-PSD	LAER for VOC
WI-0185	WEPCO - GERMANTOWN	WEPCO - GERMANTOWN	WI	50	9	25	1.4	0.020		BACT-PSD	SCR
AR-0075	DELTIC TIMBER CORPORATION	DELTIC TIMBER CORPORATION	AR	6.432	14	50		0.007		BACT-PSD	
FL-0068	ORANGE COGENERATION LP	ORANGE COGENERATION LP	FL	36.83	15	30	10			BACT-PSD	
FL-0078	KISSIMMEE UTILITY AUTHORITY	KISSIMMEE UTILITY AUTHORITY	FL	36.7	15	30	2.98			BACT-PSD	
IN-0071	PORTSIDE ENERGY CORP.	PORTSIDE ENERGY CORP.	IN	49.8	15	10				BACT-PSD	
ME-0032	MARITIMES & NORTHWEST PIPELINE LLC	MARITIMES & NORTHWEST PIPELINE LLC	ME	13.8	15					Other Case-by-Case	
ME-0033	MARITIMES & NORTHWEST PIPELINE LLC	MARITIMES & NORTHWEST PIPELINE LLC	ME	13.9	15					Other Case-by-Case	
ME-0034	MARITIMES & NORTHWEST PIPELINE LLC	MARITIMES & NORTHWEST PIPELINE LLC	ME	13.9	15					Other Case-by-Case	

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	SO_2	Type	Controls
ME-0035	MARITIMES & NORTHWEST PIPELINE LLC	MARITIMES & NORTHWEST PIPELINE LLC	ME	13.9	15					Other Case-by-Case	
NJ-0041	ROCHE VITAMINS	ROCHE VITAMINS INC	NJ	45.65	15	15	7.2			BACT-PSD	
IA-0064	ROQUETTE AMERICA	ROQUETTE AMERICA	IA	49.5	17.0					BACT-PSD	
*FL-0266	PAYNE CREEK GENERATING STATION/SEMINOLE ELECTRIC	SEMINOLE ELECTRIC COMPANY	FL	30	20					Other Case-by-Case	
CO-0045	COLORADO ENERGY MANAGEMENT - BRUSH CO-GEN	COLORADO ENERGY MANAGEMENT - BRUSH CO-GEN	CO	38.5	24					BACT-PSD	
NJ-0055	ALGONQUIN GAS	ALGONQUIN GAS TRANSMISSION COMPANY	NJ	6.784	24.5	49				BACT-PSD	
CA-0768	NORTHERN CALIFORNIA POWER AGENCY	NORTHERN CALIFORNIA POWER AGENCY	CA	32.5	25		19.21			LAER	
CA-0774	SOUTHERN CALIFORNIA GAS COMPANY	SOUTHERN CALIFORNIA GAS COMPANY	CA	5.01	25					LAER	
CO-0045	COLORADO ENERGY MANAGEMENT - BRUSH CO-GEN	COLORADO ENERGY MANAGEMENT - BRUSH CO-GEN	CO	34	25	77	5.88			BACT-PSD	
IL-0076	NATURAL GAS PIPELINE COMPANY OF AMERICA (STA 113)	NATURAL GAS PIPELINE COMPANY OF AMERICA	IL	7.27	25	50				BACT-PSD	
LA-0122	MANSFIELD MILL	INTERNATIONAL PAPER - MANSFIELD MILL	LA	36.8	25					BACT-PSD	
NE-0012	OMAHA PUBLIC POWER DISTRICT	OMAHA PUBLIC POWER DISTRICT	NE	100	25	139				BACT-PSD	
NE-0012	OMAHA PUBLIC POWER DISTRICT	OMAHA PUBLIC POWER DISTRICT	NE	25	25					BACT-PSD	
OK-0042	ANADARKO	WESTER FARMERS ELEC COOP	OK	47	25					BACT-PSD	
OR-0030	KLAMATH FALLS FACILITY	PACIFICORP POWER MARKETING INC.	OR	26.3	25	16				BACT-PSD	ox cat
PA-0171	ALLEGHENY ENERGY SUPPLY COMPANY LLC/HARRISON CITY	ALLEGHENY ENERGY SUPPLY COMPANY LLC	PA	44	25	25				Other Case-by-Case	ox cat
WI-0133	WI ELECTRIC POWER COMPANY - GERMANTOWN	WI ELECTRIC POWER COMPANY - GERMANTOWN	WI	32.5	25	75	10			BACT-PSD	LAER for VOC
WI-0177	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WI	37.1	25	75	14.72			BACT-PSD	LAER for VOC
WI-0177	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WISCONSIN ELECTRIC COMPANY - GERMANTOWN	WI	37.1	25	96	14.72			BACT-PSD	LAER for VOC
WI-0185	WEPCO - GERMANTOWN	WEPCO - GERMANTOWN	WI	14	25	75				BACT-PSD	
WY-0039	TWO ELK GENERATION PARTNERS LIMITED PARTNERSHIP	TWO ELK GENERATION PARTNERS LIMITED PARTNERSHIP	WY	33.3	25	25				BACT-PSD	
WY-0053	WILLIAMS FIELD SERVICES - OPAL GAS PLANT	WILLIAMS FIELD SERVICES	WY	3.97	25	50				BACT-PSD	

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	SO_2	Type	Controls
WY-0053	WILLIAMS FIELD SERVICES - OPAL GAS PLANT	WILLIAMS FIELD SERVICES	WY	4.71	25	50				BACT-PSD	
WY-0054	BLACK HILLS POWER & LIGHT	NEIL SIMPSON II	WY	30.7	25	25				BACT-PSD	
AK-0036	KUPARUK CENTRAL PRODUCTION FACILITY	ARCO ALASKA INC.	AK	38.9	27.2					BACT-PSD	
OH-0262	ANR	ANR PIPELINE COMPANY	OH	12.2	35	76	56.93			BACT-PSD	
AK-0038	NORTHSTAR DEVELOPMENT PROJECT	BP EXPLORATION INC.	AK	11.892	42	50				Other Case-by-Case	
MI-0283	WESTERN MICHIGAN UNIVERSITY	WESTERN MICHIGAN UNIVERSITY	MI	4	42	50				BACT-PSD	
PA-0195	ALLEGHENY ENERGY SUPPLY GANS CT POWER STATION	ALLEGHENY ENERGY SUPPLY CO. LLC	PA	44	73.9	166	8.87			Other Case-by-Case	
AK-0053	KENAI REFINERY	TESORO ALASKA COMPANY	AK	11.183	75	20				BACT-PSD	
IL-0076	NATURAL GAS PIPELINE COMPANY OF AMERICA (STA 113)	NATURAL GAS PIPELINE COMPANY OF AMERICA	IL	1.675	110	186				BACT-PSD	
AK-0053	KENAI REFINERY	TESORO ALASKA COMPANY	AK	25.8	120	20				BACT-PSD	
AK-0053	KENAI REFINERY	TESORO ALASKA COMPANY	AK	25.8	120					BACT-PSD	
MI-0283	WESTERN MICHIGAN UNIVERSITY	WESTERN MICHIGAN UNIVERSITY	MI	4						BACT-PSD	
TX-0405	WESTVACO TEXAS LP	WESTVACO TEXAS LP	TX	42			2.75			RACT	ox cat

Oil Fired Determinations – Simple-Cycle

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	S %	Type	Controls
FL-0261	ARVAH B. HOPKINS GENERATING STATION	CITY OF TALLAHASSEE	FL	50	5	6	3.0	0.03	0.05%	BACT-PSD, Other	SCR, ox cat
GA-0099	SANDERSVILLE GENERATING STATION	DUKE ENERGY SANDERSVILLE LLC	GA	80	42	25		0.011		BACT-PSD	water inj.
FL-0078	KISSIMMEE UTILITY AUTHORITY	KISSIMMEE UTILITY AUTHORITY	FL	92.8	42	30	1.6	0.016	0.05%	BACT-PSD	water inj.
FL-0222	TECO/HARDEE POWER SERVICES - HARDEE POWER STATION	TECO/HARDEE POWER SERVICES	FL	75	42	20				BACT-PSD	water inj.
FL-0242	FPC - INTERCESSION CITY	FLORIDA POWER CORPORATION (FPC)	FL	87	42	20			0.05%	BACT-PSD	water inj.
GA-0069	TENUSKA GEORGIA PARTNERS L.P.	TENUSKA GEORGIA PARTNERS L.P.	GA	160	42	33	3.7	0.017	0.05%	BACT-PSD	water inj.
GA-0079	GEORGIA POWER CO.- JACKSON COUNTY	GEORGIA POWER- JACKSON CNTY COMBUSTION TURBINE PLT	GA	97.83	42	21	2.4	0.018		BACT-PSD	water inj.
GA-0108	SANDERSVILLE GENERATING STATION	DUKE ENERGY SANDERSVILLE LLC	GA	80	42	20		0.013		BACT-PSD	water inj.
IN-0088	DUKE ENERGY KNOX LLC	DUKE ENERGY KNOX LLC	IN	115.8	42	25	12.6	0.022	0.05%	BACT-PSD	water inj.
IN-0111	DUKE ENERGY VERMILLION STATION	DUKE ENERGY VERMILLION STATION	IN	80	42	20			0.05%	BACT-PSD	water inj.
KS-0021	WESTERN RESOURCES' GORDON EVANS ENERGY CENTER	0	KS	83.89	42	24	4.4	0.024		BACT-PSD	water inj.
MN-0050	LAKEFIELD JUNCTION LP GENERATING STATION	LAKEFIELD JUNCTION LP	MN	92	42	20	6.0	0.028	0.05%	BACT-PSD	water inj.
MS-0043	SOUTHAVEN ENERGY FACILITY	0	MS	80	42	20	5.1	0.025	0.00%	BACT-PSD	water inj.
NC-0087	DUKE ENERGY - BUCK COMBUSTION TURBINE FACILITY	DUKE ENERGY CORPORATION	NC	80	42	20		0.027	0.05%	BACT-PSD	water inj.
NE-0010	LINCOLN ELECTRIC SYSTEM	LINCOLN ELECTRIC SYSTEM	NE	91.1925	42					BACT-PSD	water inj.
NM-0048	CAMBRAY ENERGY CENTER	DEMING ENERGY LLC	NM	80	42	19		0.031		BACT-PSD	water inj.
OH-0253	DAYTON POWER AND LIGHT COMPANY	DAYTON POWER AND LIGHT COMPANY	OH	111.5	42	123	6.6	0.013	0.05%	BACT-PSD	water inj.
OH-0253	DAYTON POWER AND LIGHT COMPANY	DAYTON POWER AND LIGHT COMPANY	OH	111.5	42					BACT-PSD	water inj.
OH-0274	DPLE TAIT PEAKING STATION	DAYTON POWER AND LIGHT ENERGY	OH	80	42	423	9.2	0.013	0.05%	BACT-PSD	water inj.
OH-0291	OHIO EDISON CO.-WEST LORAIN PLANT	FIRST ENERGY	OH	85	42	41	9.6	0.012	0.30%	BACT-PSD	water inj.
SC-0069	DUKE ENERGY MILL CREEK COMBUSTION TURBINE STATION	DUKE ENERGY COMPANY	SC	81.7	42	20		0.012	0.05%	BACT-PSD	water inj.
TN-	TVA - GALLATIN FOSSIL PLANT	TENNESSEE VALLEY AUTHORITY	TN	85	42	20	7.4	0.018		BACT-PSD	water

RBLC-ID	Facility	Company Name / Location	State	MW	NO_x	CO	VOC	PM_{10}	S %	Type	Controls
0148											inj.
VA-0263	ODEC - LOUISA FACILITY	OLD DOMINION ELECTRIC COOPERATIVE	VA	96.7	42	20		0.022		N/A	water inj.
VA-0282	ODEC - LOUISA	LOUSIA	VA	96.7	42	20		0.022	0.05%	BACT-PSD	water inj.
FL-0078	KISSIMMEE UTILITY AUTHORITY	OSCEOLA	FL	37.1	42	86.6	2.79	0.027	0.05%	BACT-PSD	water inj.
NE-0012	OMAHA PUBLIC POWER DISTRICT	SARPY	NE	100	42	139			0.05%	BACT-PSD	water inj.
NE-0012	OMAHA PUBLIC POWER DISTRICT	SARPY	NE	25	42	139			0.05%	BACT-PSD	water inj.
NE-0012	OMAHA PUBLIC POWER DISTRICT	SARPY	NE	100	42	139			0.05%	BACT-PSD	water inj.
NE-0012	OMAHA PUBLIC POWER DISTRICT	SARPY	NE	25	42	139			0.05%	BACT-PSD	water inj.
VI-0008	KRUM BAY ST. THOMAS GENERATING STATION		VI	24	42	10	8.0		0.20%	BACT-PSD	water inj.
PA-0195	ALLEGHENY ENERGY SUPPLY GANS CT POWER STATION	FAYETTE	PA	44	74	166	8.4	0.03	0.05%	Other Case-by-Case	
VA-0271	HARRISONBURG RESOURCE RECOVER FACILITY	CITY OF HARRISONBURG	VA	0.108	1193	417			0.30%	N/A	

SOUND LEVEL MEASUREMENT REPORT

Braintree Electric Light Department
Thomas A. Watson Generating Station
Braintree, MA

Prepared for:

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October 13, 2006

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Note: This Appendix is a report on the comprehensive community sound level measurement study conducted in June of 2006. As described herein, short term and continuous measurements were taken from Friday, June 16 through Tuesday, June 20, 2006. Both short term and continuous measurements were taken at three representative residential locations with short term measurements taken at four additional community locations. In December of 2006, while studying various sound mitigation approaches, supplemental measurements were taken at the former Fore River Shipyard, with the permission of the current owner, Quirk Automotive Group. As discussed in Section 4.3.3 of the Energy Facilities Siting Board Petition, these supplemental measurements indicted that ambient sound levels on the Quirk parcel are generally comparable to ambient sound levels measured in the June 2006 survey described herein.

This sound level measurement study for the Braintree Electric Light Department's ("BELD") proposed Thomas A. Watson Generating Station ("Watson Station" or the "Project") is designed to be used with subsequent modeling to ensure that sound levels from the station will comply with state and local regulations. Measurements of existing sound levels around the site will provide a baseline for comparison to predicted levels from the proposed project.

1.0 GENERAL ENVIRONMENTAL NOISE METRICS

There are several ways in which sound (noise) levels are measured and quantified, each of which uses the logarithmic decibel ("dB") scale. The noise measurement terminology used in this analysis is briefly described in the next two pages.

The sound level meter used to measure noise is a standardized instrument. It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The network used for community noise surveys is the A-weighting network, because it most closely approximates how the human ear responds to sound at various frequencies. Sounds are reported as detected with the A-weighting network of the sound level meter. A-weighted sound levels emphasize the middle frequency (*i.e.*, middle pitched – around 1,000 Hertz sounds), and de-emphasize lower and higher frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA."

Because the sounds in the environment vary with time, they cannot simply be described with a single number. Typical environmental noise sources are shown in Figure 1. Two methods are used for describing variable sounds. These are "exceedance levels" and the "equivalent level", both of which are derived from a large number of moment-to-moment A-weighted sound level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where n can have a value of zero to 100%.

Several "exceedance levels" that are commonly reported in community noise monitoring are described below.

- L_{90} is the sound level in dBA exceeded 90% of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources. The L_{90} descriptor is used by the Massachusetts Department of Environmental Protection (DEP).
- L_{50} is the median sound level, which is the sound level in dBA exceeded 50% of the time during the measurement period.

Figure 1: Insert Noise Thermometer.

- L_{10} is the sound level in dBA exceeded only 10% of the time. The L_{10} is sometimes called the intrusive sound level, because it is caused by occasional louder noises like those from passing motor vehicles.
- L_1 is the sound level in dBA exceeded only 1% of the time. It is close to the maximum level observed during the measurement period.
- L_{eq} is the equivalent level of a hypothetical steady sound that would have the same energy (*i.e.*, the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is also A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but, because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is most often determined by occasional loud, intrusive noises. The USEPA considers the L_{eq} the best measure by which to evaluate long-term environmental noise.
- L_{min} (the minimum sound level) is the lowest sound level measured within a stated time interval.
- L_{max} (the maximum sound level) is the highest sound level measured within a stated time interval.

In addition to A-weighted sound level data, octave band frequency data can provide useful information. In the design of noise control treatments it is essential to know something about the frequency spectrum of the noise of interest. Noise control treatments do not function like the human ear, so A-weighted levels by themselves are not adequate for noise-control design. The spectra of noises are usually stated in terms of octave or 1/3 octave band sound-pressure levels, in dB, with the octave frequency bands being those established by standard (ANSI S1.11, 1986). Therefore, as part of the Project, existing condition 1/3 octave band sound levels have been measured and will be used in the noise quality analysis. The 1/3 octave band data were converted to octave band data for purposes of evaluating the "pure tone" component of the DEP Noise Policy (see section 2.1).

2.0 REGULATORY REQUIREMENTS

2.1 Massachusetts State Regulations

The DEP regulates noise under 310 CMR 7.10, which is part of the air pollution control regulations. Noise is considered an air contaminant and Section 7.10 prohibits "unnecessary emissions" of noise. DEP administers this regulation through Noise Policy DAQC 90-001 dated February 1, 1990. The policy limits a source to a 10-dBA increase in the ambient sound measured (L_{90}) at the property line for the Project and at the nearest residences. For developed areas, the DEP has utilized a "waiver provision" at the property line in certain cases. This is appropriate when are there are no noise-sensitive land uses at the property line and the adjacent landowner agrees to waive the 10-dBA limit.

The ambient level is defined as the background L_{90} measured when the facility is not operating, but during a time period when it would normally operate. For 24-hour per day sources, the ambient level typically occurs during the quietest nighttime period (midnight to 4 a.m.). The policy further prohibits "pure tone" conditions where one octave band frequency is 3 dB or more greater than an adjacent frequency band. An example of a "pure tone" is a fan with a bad bearing that may produce an objectionable squealing sound.

2.2 Local Regulations

The Town of Braintree, in the Zoning Bylaws, Section 135-1105, prohibits noise emissions at the property boundary that exceed 60 dBA in residential zones or 50 dBA in lands zoned for Open Space. The Braintree Bylaw permits noise emissions at the property boundary in commercial zones to be up to 70 dBA at all times. Although not directly applicable since the Project is not located in Weymouth, the Weymouth noise criteria are provided for informational purposes. The Weymouth Zoning Code (Chapter 120) prohibits nuisance conditions, and the Health Code (section 86-2) stipulates that a noise over 20 dB over ambient background is a nuisance.

3.0 SOUND MEASUREMENT PROGRAM

3.1 Sound Level Measurement Summary

A sound level measurement study was conducted for the Project during the summer of 2006. The sound level measurement study measured existing sound levels at seven representative community locations. The selected locations generally correspond to the nearest sound-sensitive locations in various directions from the site, as well as elevated and over-water residential locations. Both short-term and continuous sound level measurements were made during a 98 hour period. The results of the study indicate that the ambient sound levels (L_{90}) ranged from 36 to 40 dBA in the community during the quietest part of the nighttime period.

3.2 Sound Level Measurement Program

Short-term measurements were taken at seven locations and continuous sound level measurements were made at three of the seven locations from Friday, June 16, to Tuesday, June 20, 2006. Measurements were made during both weekday and weekend periods. Since noise impacts are greatest when existing noise levels are lowest, the study was designed to measure nighttime community noise levels under conditions typical of a "quiet period" for the area. The duration of monitoring and location of representative locations represent best acoustical practice in accordance with current DEP community noise guidance.

Short-term measurements included both broadband (A-weighted) and one-third octave band frequency data, and were made for approximately 20 minutes per location.

Weekday daytime sound level measurements on Monday, June 19 were made from approximately 11:30 a.m. to 3:00 p.m. Weekend daytime measurements were made on Saturday, June 17, from approximately 10:30 a.m. to 2:00 p.m. Weekday nighttime sound level measurements were made on Tuesday, June 20, from approximately 12:00 a.m. to 3:00 a.m. Weekend nighttime sound level measurements were made on Saturday-Sunday, June 18, from approximately 11:30 p.m. to 3:00 a.m.

In addition to the short-term sampling data, the three continuous programmable sound level meters were placed at Locations CM-1, CM-2, and CM-3 (see below). These monitors continuously measured and stored hourly sound level statistics for 98 consecutive hours in order to determine the temporal variation of the background noise levels, and to confirm that the short-term sampling was indeed representative of the lowest sound levels. These monitors ran from 1:00 P.M. Friday, June 16, 2006, until 3 PM on Tuesday, June 20, 2006. Field personnel periodically checked on the integrity of the continuous equipment, and observed and recorded the noise sources at the monitoring locations.

Both the continuous and short-term sound levels were measured at a height of five feet above the ground and at locations where there were no large reflective surfaces to affect the measured levels. The measurements were generally made under low wind conditions and with dry roadway surfaces. Wind measurements were made at the various sound level measurement locations with a handheld Dwyer wind meter, and temperature and humidity measurements were obtained using a Wexsler sling psychrometer. Continuous meteorological data were also archived from the nearest National Weather Service (NWS) station at Boston's Logan Airport.

3.3 Sound Measurement Locations

Following a review of aerial photographs, a tour of the area around the Braintree Electric site was made to determine the community locations where sound may have the greatest potential to affect the community. Seven total measurement locations were chosen, as shown in Figure 2. From these, seven short-term measurement locations and three continuous measurement locations were selected to obtain a spatial representation of the ambient sound environment at the property boundary, and at representative community locations. Two of the continuous locations are in the Town of Braintree, while one of the continuous locations was in the Town of Weymouth. The Continuous Measurement Locations ("CMs") are shown in Figure 2 and are described below.[1]

[1] The numbering scheme for ST-7 differs from its continuous counterpart (CM-3) since the number of continuous and short-term locations was different, and it is a considerable distance away from the other short-term locations.

Figure 2: Color GIS – Sound Level Measurement Locations.

- CM-1 (ST-1) is near the end of Glenrose Avenue. It represents the nearest residential location to the east of the site (196 Glenrose Avenue). The meter was located on the shoreline edge near the woods on the east side of the site. This was also the first Continuous Measurement Location ("CM") CM-1. This monitoring site is at the southeastern BELD property line.

- CM-2 (ST-2) is near the corner of Glenrose Avenue and Ferncroft Road. This represents the nearest residential locations south of the site. The meter was located in the woods about 100 feet northwest of Glenrose Avenue. This was also the second CM (CM-2). This monitoring site is near the southwest BELD property line.

- CM-3 (ST-7) is in Weymouth on 56 Bluff Road. It represents the nearest residential locations north of the site. The meter was located in the backyard of the residence, about 50 feet from the water's edge. This was also the third CM (CM-3). This monitoring site is approximately 2300 feet north of the nearest BELD shoreline across the Fore River.

At the other four sound measurement locations, short-term (20 minute) 1/3 octave band measurements were made. These include:

- ST-3 at the corner of Glenrose Avenue and Vinedale Road, typical of the residences directly to the southeast;
- ST-4 at the corner of Ferncroft Road and Trefton Drive, typical of the neighborhood to the southeast;
- ST-5 on Idlewell Boulevard in Weymouth, near a ballpark adjacent to the Fore River, typical of residences to the east across the Fore River; and,
- ST-6 on Marietta Avenue and Veranda Road, typical of residences to the southwest of the BELD site.

3.4 Sound Measurement Equipment

Short-term measurements were taken with a CEL Instruments Model 593.C1 Precision Sound Level Analyzer equipped with a CEL-257 Type 1 Preamplifier, a CEL-250 half-inch electret microphone, and a four-inch foam windscreen. Both short-term broadband and one-third octave band ambient sound pressure level data were collected. This instrument meets the "Type 1 - Precision" requirements set forth in American National Standards Institute (ANSI) S1.4 for acoustical measuring devices. The meter was equipped with an internal octave band filter set along with data logging capabilities. The meter was set for the "fast" response (0.125 second), and the data were logged over 20 minute intervals. One-third octave band levels for this study correspond to the same data set processed for the broadband levels.

The measurement equipment was calibrated in the field before and after the surveys with a CEL-284/2 acoustical calibrator, which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984.

Three Larson Davis model 812 Sound Level Meters were used for the continuous monitoring. These meters meet Type 1 ANSI S1.4-1983 standards for sound level meters. Each model 812 has been calibrated and certified as accurate to standards set by the National Institute of Standards and Technology by an independent laboratory within the past 12 months, as shown in Appendix 1 to this Report. The model 812 has data logging capability and was programmed to log statistical data every hour for the following parameters: L_1, L_{10}, L_{50}, L_{90}, L_{max}, L_{min}, and L_{eq}.

3.5 Survey Results – Short-term Measurements

Existing sound levels in the Project area are dominated by sounds from traffic on local roadways, noise from the Fore River plant, air conditioning units, sirens, insect activity, and some plane overflights. The lowest ambient short-term steady-state (L_{90}) sound levels measured in the community around the site were between 37 and 45 dBA. In general, the daytime L_{90} sound levels were 0-10 dBA higher than the nighttime L_{90} sound levels. Table 1 provides a summary of the L_{90} sound levels for all short-term measurement periods at each location.

Figure 3 presents the lowest weekday and weekend nighttime L_{90} sound levels recorded during the project at any time by location overlain on an aerial photo. The detailed results of the ambient sound measurements for the seven short-term monitoring locations are found in Appendix 2 to this Report.

The one-third octave band sound level data have been combined into the appropriate octave bands for purposes of evaluating the DEP "pure tone" noise criteria. The octave band background data in Appendix 2 show a slight low frequency "pure tone" at Location 4 at 63 Hz during both day and night during the week. The source of this "pure tone" could not be determined during the field program.

Table 1 - Summary of Ambient Short-term Sound Level Measurement Data (dBA)

Location	Daytime				Nighttime			
	Monday 6/19/06		Saturday 6/17/06		Tuesday 6/20/06		Sunday 6/18/06	
	Time	L_{90}	Time	L_{90}	Time	L_{90}	Time	L_{90}
ST-1: Glenrose (east end, on the Fore River)	12:40	46	10:50	45	00:27	42	00:01	42
ST-2: Near Glenrose Ave. and Ferncroft Rd.	13:27	44	11:51	41	01:11	39	00:23	42
ST-3: Corner of Glenrose Ave. and Vinedale Rd.	13:04	45	11:18	45	00:49	41	00:44	**39**
ST-4: Corner of Trefton Dr. and Ferncroft Rd.	13:57	44	12:24	41	01:42	**37**	01:06	39
ST-5: Idlewell Blvd. near Ballfield	15:02	44	13:14	48	02:18	**38**	01:53	38
ST-6: Marietta Ave. and Veranda Rd.	14:25	48	14:29	48	02:47	**40**	01:27	43
ST-7: 56 Bluff St. near Fore River	11:43	44	13:58	48	23:54[1]	45	23:25[2]	47

[1] Made on Monday, 6/19/06.

[2] Made on Saturday, 6/17/06.

Bold indicates sound level used to establish ambient background from ST measurements. ST-1, ST-2, and ST-7 measurements used to establish ambient background are from CM Data).

3.6 Survey Results – Continuous Measurements

The sound level data for the 98-hour continuous monitoring period are presented graphically for CM-1, CM-2, and CM-3, using the metrics L_1, L_{eq}, and L_{90} and included as Figures 4, 5, and 6 respectively. The L_{eq} and L_1 metrics are included for informational purposes only to demonstrate the current variability of sound levels in the community due to intermittent or occasional events. The results are also presented for these three locations in Appendix 3 to this Report in Tables A3-1 through A3-3, respectively.

The sound level measurement equipment operated properly during the entire monitoring period. Field personnel visited the three instruments periodically throughout the monitoring period to check on the integrity of the equipment and to observe and record the noise sources during the middle of the day and the middle of the night. The weather was dry and warm (70s at night, upper 80s - low 90s during the day) with light winds throughout the 98-hour period. The nearest NWS station with similar conditions reporting hourly weather conditions is at Logan Airport, (BOS). The weather observations in June during the measurement period as recorded at the Logan Airport station are summarized in Appendix 4 to this Report.

At CM-1 the noise environment was dominated by background from the nearby Fore River power plant. These data demonstrate a day/night variation of 19 dBA in the L_{90} metric due primarily to the cyclical nature of traffic and power plant noise. CM-2 exhibits less variation due to the fact that much of the time-varying sound sources are screened and buffered by the woods. CM-3 shows higher background levels, due to closer traffic and nearby residential air conditioning noise. In addition, CM-3 was most affected by several windy periods which occurred during a few afternoons during the measurement program. These winds increased the daytime background sound levels but diminished sufficiently at night to allow for a reasonable nighttime background condition.

Figure 7 presents an overlay of the hourly L_{90} sound level data from all three continuous sound level monitors. The hourly wind speed data from Boston's Logan Airport is included. This illustrates that the time periods of lowest sound levels (early Sunday morning from 3:00-5:00 a.m.) also had relatively low wind speeds of 5-8 mph. It should be noted that wind speeds at locations around the BELD site are lower than those at Boston's Logan Airport which is directly on the ocean.

BELD's Potter II station was not operational during the background testing. BELD's diesel engine did run Monday, June 19 from 16:11 to 20:51 as required by ISO New England. No deliveries to the CITGO terminal occurred during the testing.

A review of the continuous monitoring data reveals the following:

- The hourly L_{90} (steady-state) measurements at CM-1 ranged from 40 to 57 dBA. The lowest L_{90} sound level of 40 dBA was measured from 3:00 a.m. to 4:00 a.m. on Sunday morning, June 18. The highest L_{90} sound level of 57 dBA was measured from 6:00 p.m. to 7:00 p.m. on Monday afternoon, June 19.

- The hourly L_{90} (steady-state) measurements at CM-2 ranged from 36 to 47 dBA. The lowest L_{90} sound level of 36 dBA was measured from 3:00 a.m. to 4:00 a.m. on Sunday morning, June 18. The highest L_{90} sound level of 47 dBA was measured from 5:00 p.m. to 6:00 p.m., and from 8:00 p.m. to 9:00 p.m. on Monday evening, June 19.

- The hourly L_{90} (steady-state) measurements at CM-3 ranged from 39 to 57 dBA. The lowest L_{90} sound level of 39 dBA was measured from 4:00 a.m. to 5:00 a.m. on Sunday morning, June 18. The highest L_{90} sound level of 57 dBA was measured from 4:00 p.m. to 5:00 p.m. on Monday afternoon, June 19.

Figure 3: Color GIS – Sound Level Measurement Data.

3.7 *Comparison of Short-Term and Continuous Measurement Data*

The lowest ambient background L_{90} sound level collected under the short-term measurement program (see Table 2) was compared to the lowest L_{90} under the 98-hour continuous program to evaluate whether or not the short-term sampling program accurately characterized the ambient background. The comparison below shows that the short-term data is within 5 dBA of the continuous data at the Weymouth site, and within 3 dBA at the Braintree sites. The continuous data logging period of 60 minutes may be thought of as three consecutive 20-minute periods. If more activity occurs during one 20-minute period that coincides with the short-term measurement, then the short-term background will be higher than the continuous background. At location CM-3, the nighttime measurements were made around midnight; residential air conditioners were still running and might have been off an hour or two later when the continuous meter recorded the lower L_{90}. At the other locations, the short term measurements give an accurate nighttime background level.

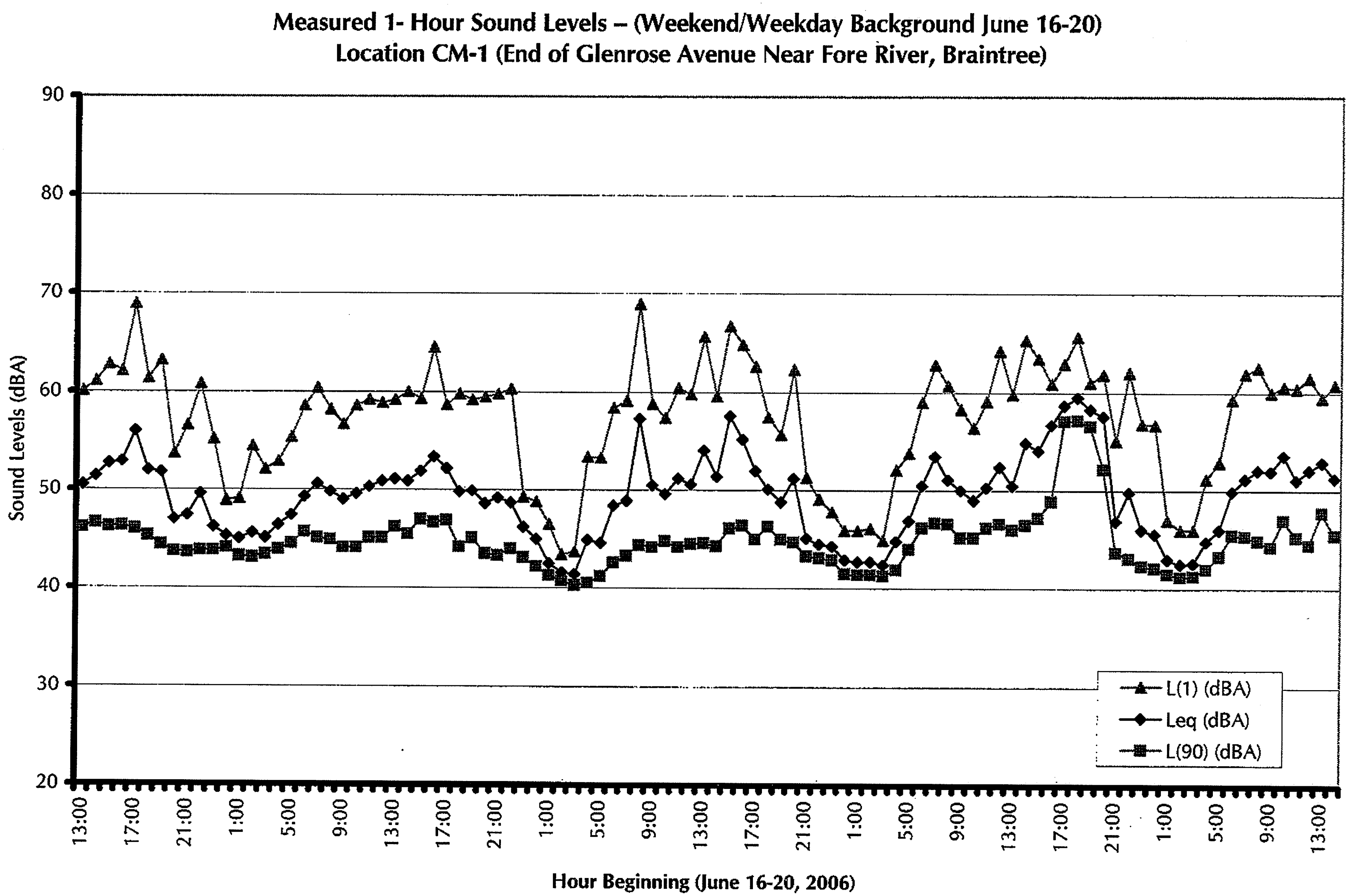
Location	Short-term L_{90}	Continuous L_{90}
# CM-1	42 dBA	40 dBA
# CM-2	39 dBA	36 dBA
# CM-3	44 dBA	39 dBA

3.8 *Establishment of Background for MA DEP*

Based on the data presented in this report, quietest ambient background sound levels for each of the seven monitoring locations have been established as listed below. The DEP noise policy allows a new source up to a 10-dBA increase in these sound levels. The quietest nighttime sound levels (L_{90}) across a 98-hour period and a large study area were all within a 4-dBA range (36-40 dBA).

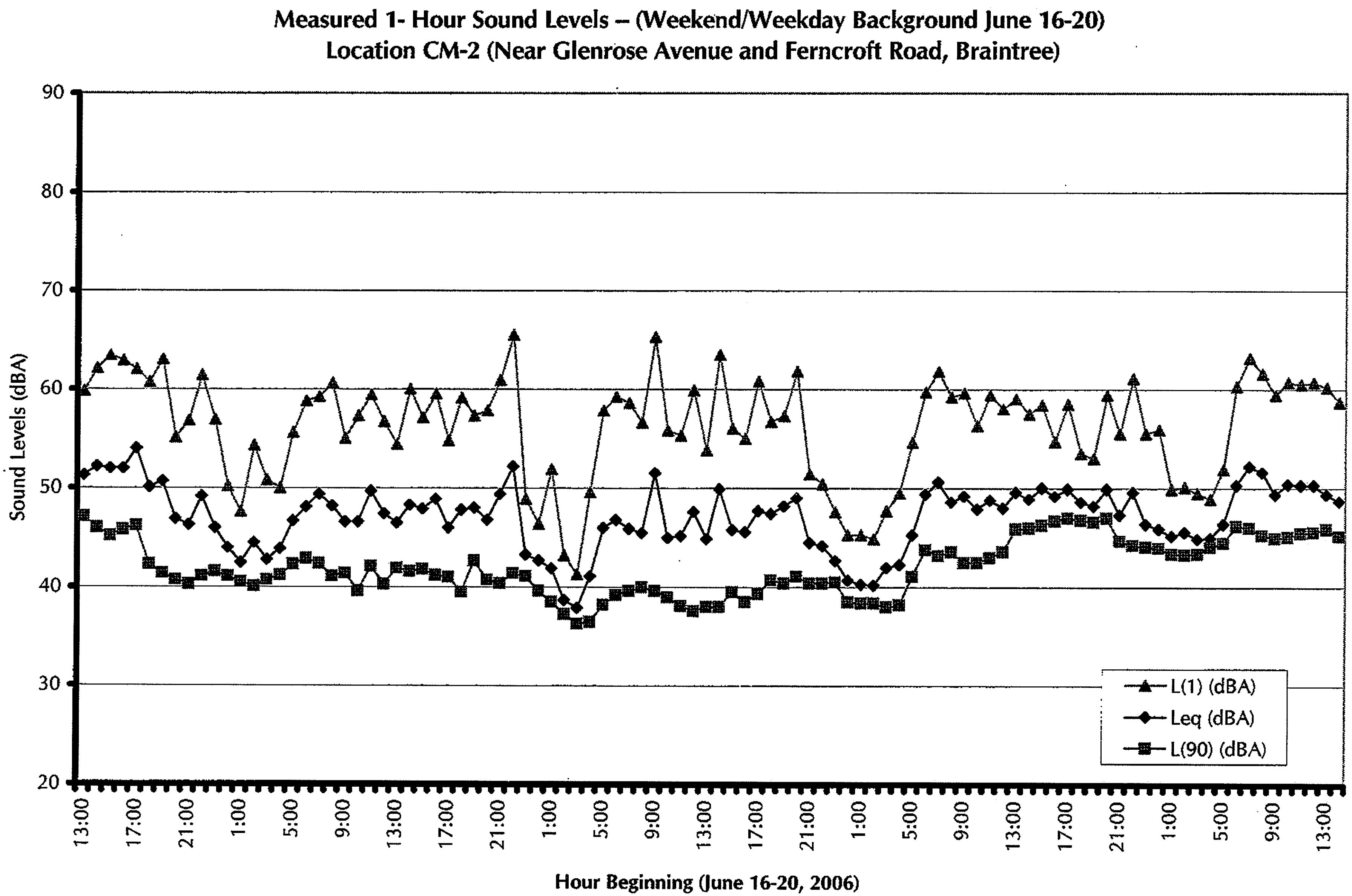
City/Town	Location	Lowest L_{90} Measured
Braintree	ST-1 – End of Glenrose Ave.	40 dBA
Braintree	ST-2 – Near Glenrose Ave. and Ferncroft Rd.	36 dBA
Braintree	ST-3 – Glenrose Ave. and Vinedale Rd.	39 dBA
Braintree	ST-4 – Trefton Dr. and Ferncroft Rd.	37 dBA
Weymouth	ST-5 – Idlewell Blvd. near Ballfield	38 dBA
Braintree	ST-6 – Marietta Ave. and Veranda Rd.	40 dBA
Weymouth	ST-7 – 56 Bluff Rd. near Fore River	39 dBA

Figure 4



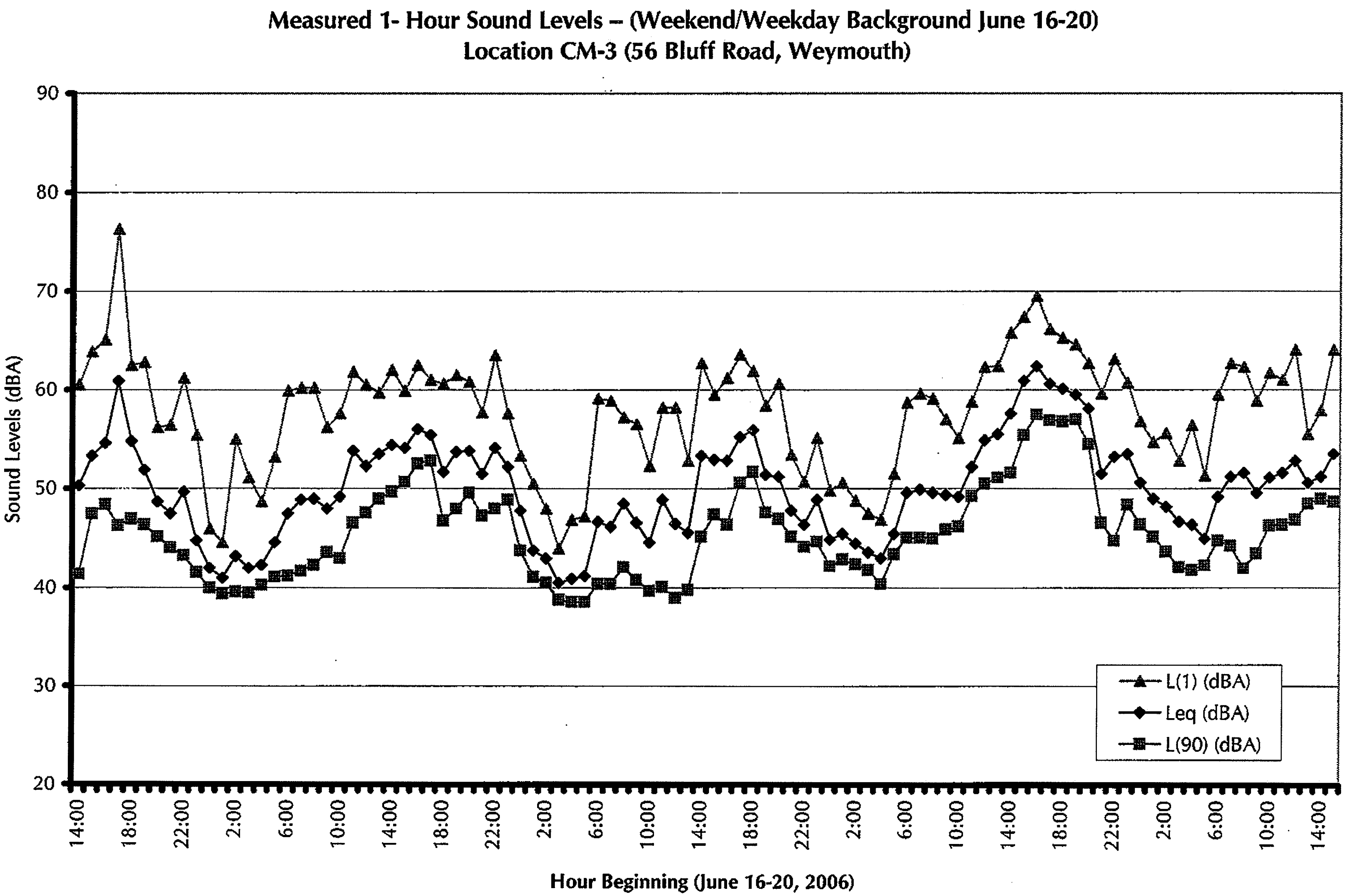
\S:/1831 Braintree Electric\noise\CM1plot.xls Loc1C

Figure 5



S:/1831 Braintree Electric/noise\CM2plot.xls Loc2G

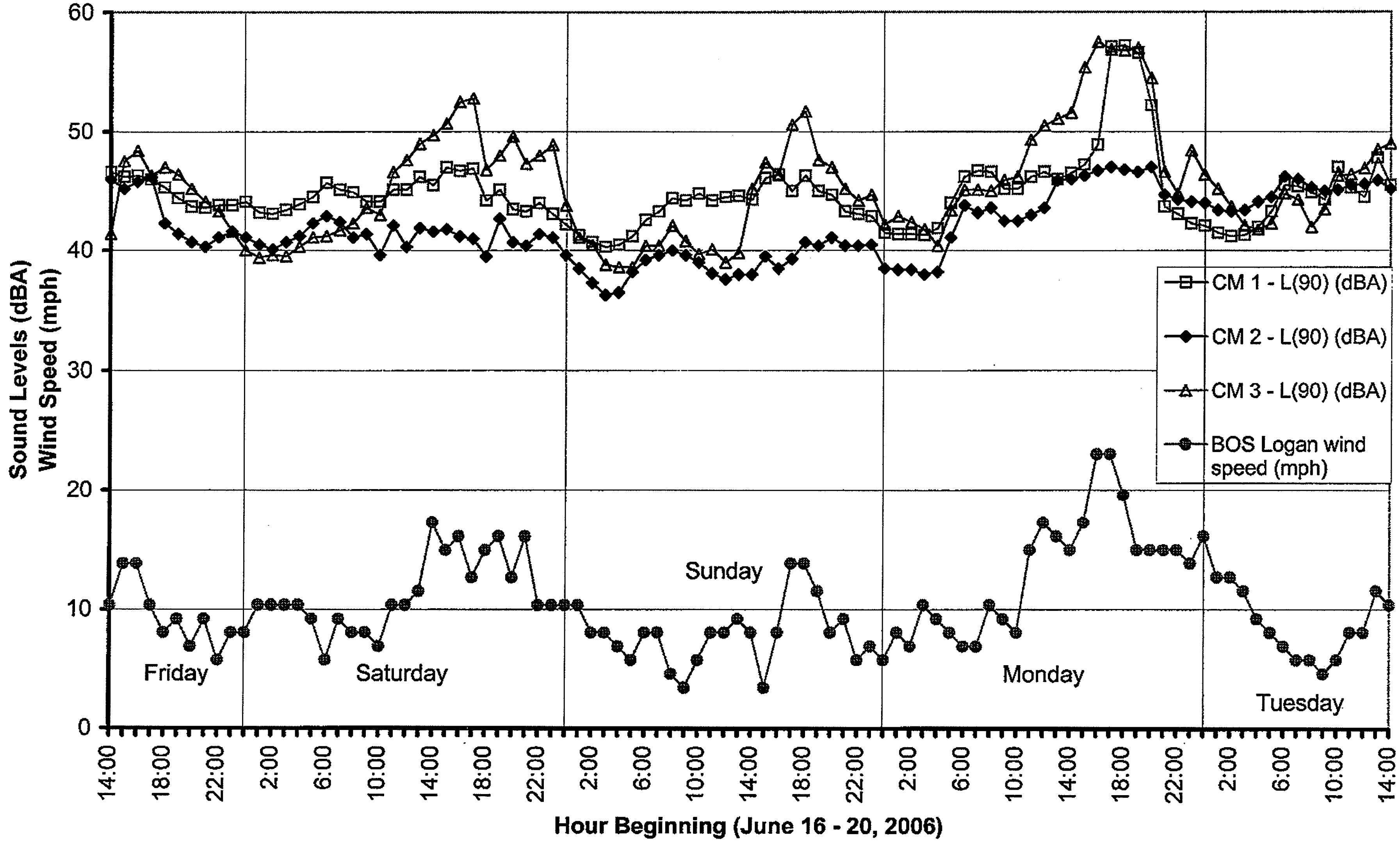
Figure 6



\S:/1831 Braintree Electric/noise\CM3plot.xls Loc3G

Figure 7

Comparison of Measured Hourly L90 Background Sound Levels with Hourly Wind Speeds



1831\Noise\Background\BE-LD-FigsAndTables.xls, L90vsWS

Appendix 1

Certificates of Calibration

Certificate of Calibration and Conformance

Certificate Number 2005-71946

Instrument Model 812, Serial Number 0625, was calibrated on 03SEP2005. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 03SEP2005
Calibration due: 03SEP2006

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	2900 / 2209	0666 / 0123	12 Months	30NOV2005	2004-63989

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 27 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with the requirements of ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.

Signed: *[signature]*
Technician: Keith Driskill

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Certificate of Calibration and Conformance

Certificate Number 2005-71945

Instrument Model 812, Serial Number 0627, was calibrated on 03SEP2005. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 03SEP2005
Calibration due: 03SEP2006

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	06APR2006	2005-67631

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 27 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with the requirements of ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

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Certificate of Calibration and Conformance

Certificate Number 2005-71634

Microphone Model 2540, Serial Number 4450, was calibrated on 29AUG2005. The microphone meets current factory specifications per Test Procedure D0001.8167.

Instrument found to be in calibration as received: YES
Date Calibrated: 29AUG2005
Calibration due: 29AUG2006

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	PRM902	0529	12 Months	13SEP2005	2004-61796
Larson Davis	PRM902	0528	12 Months	13SEP2005	2004-61794
Larson Davis	MTS1000 / 2201	1000 / 0100	12 Months	16SEP2005	09162-2004
Larson Davis	2559	3034LE	12 Months	16SEP2005	2004-61919
Larson Davis	PRM915	0102	12 Months	05NOV2005	2004-63367
Larson Davis	PRM902	0206	12 Months	05NOV2005	2004-63365
Larson Davis	PRM916	0102	12 Months	05NOV2005	2004-63369
Hewlett Packard	34401A	3146A62099	12 Months	10NOV2005	275384
Larson Davis	CAL250	0102	12 Months	26MAY2006	2005-69011
Larson Davis	2900	0575	12 Months	28JUN2006	2005-69833
Larson Davis	2559	2504	12 Months	30JUN2006	13372

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with the requirements of ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

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Technician: Abraham Ortega

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Certificate of Calibration and Conformance

Certificate Number 2005-71944

Instrument Model 828, Serial Number 2120, was calibrated on 03SEP2005. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 03SEP2005
Calibration due: 03SEP2006

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	2900 / 2209	0666 / 0123	12 Months	30NOV2005	2004-63989
Hewlett Packard	34401A	US36015216	16 Months	30APR2006	276884

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade   Relative Humidity: 27 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Certificate of Calibration and Conformance

Certificate Number 2005-71635

Microphone Model 2540, Serial Number 4451, was calibrated on 29AUG2005. The microphone meets current factory specifications per Test Procedure D0001.8167.

Instrument found to be in calibration as received: YES
Date Calibrated: 29AUG2005
Calibration due: 29AUG2006

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	PRM902	0529	12 Months	13SEP2005	2004-61796
Larson Davis	PRM902	0528	12 Months	13SEP2005	2004-61794
Larson Davis	MTS1000 / 2201	1000 / 0100	12 Months	16SEP2005	09162-2004
Larson Davis	2559	3034LE	12 Months	16SEP2005	2004-61919
Larson Davis	PRM915	0102	12 Months	05NOV2005	2004-63367
Larson Davis	PRM902	0206	12 Months	05NOV2005	2004-63365
Larson Davis	PRM916	0102	12 Months	05NOV2005	2004-63369
Hewlett Packard	34401A	3146A62099	12 Months	10NOV2005	275384
Larson Davis	CAL250	0102	12 Months	26MAY2006	2005-69011
Larson Davis	2900	0575	12 Months	28JUN2006	2005-69833
Larson Davis	2559	2504	12 Months	30JUN2006	13372

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with the requirements of ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

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Technician: Abraham Ortega

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Certificate of Calibration and Conformance

Certificate Number 2005-71943

Instrument Model 828, Serial Number 1857, was calibrated on 03SEP2005. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 03SEP2005
Calibration due: 03SEP2006

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	2900 / 2209	0666 / 0123	12 Months	30NOV2005	2004-63989
Hewlett Packard	34401A	US36015216	16 Months	30APR2006	276884

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 27 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 1999, ANSI/NCSL Z540:1994 Part 1 and relevant requirements of ISO 9002:1994 ACCREDITED by NVLAP (a NACLA approved body)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.14091

Instrument:	**Sound Level Meter**	*Date Calibrated:*	**1/5/2006**	
Model:	**812**	*Status*	**Received**	**Sent**
Manufacturer:	**Larson Davis**	*In tolerance*	X	X
Serial number:	**0632**	*Out of tolerance*		
Tested with:	**Microphone 2540 s/n 4452** **Preamplifier PRM828 s/n 1853**	*See comments*		
		Contains non-accredited tests: __Yes X No		
Type (class):	**1**	*Calibration service:* __ Basic X Standard		
Customer:	**Epsilon Associates, Inc.**	*Address:*	**3 Clock Tower Place, Suite 250** **Maynard, MA 01754**	
Tel/Fax:	**978-897-7100/-0099**			

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal date	Traceability evidence Cal. Lab / Accreditation
483B-Norsonic	SME Cal Unit	25747	Nov 26, 2004	Scantek, Inc.
DS-360-SRS	Function Generator	33584	Dec.6, 2005	Transcat / A2LA
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov.16, 2005	Transcat / A2LA
DPI140-Druck	Pressure Indicator	790/00	Oct.14, 2004	Transcat / A2LA
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Nov.30, 2005	Transcat / A2LA
PC Program 1019 Norsonic	Calibration software	v.4.24g	Validated Jan 2004	-
1253-Norsonic	Calibrator	25726	June 4, 2005	Scantek, Inc.

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.9 ±1.1°C	100.229 ±0.006kPa	38.3 ±2.2%RH

Calibrated by	Marc Nguessan	**Checked by**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	01/05/06	Date	1/5/06

Scantek, Inc.

CALIBRATION LABORATORY

ISO 17025: 1999, ANSI/NCSL Z540:1994 Part I and relevant requirements of ISO 9002:1994 ACCREDITED by NVLAP (a NACLA approved body)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.14096

Instrument: **Microphone**
Model: **2540**
Manufacturer: **Larson Davis**
Serial number: **4452**

Date Calibrated: **1/4/2006**

Status	**Received**	**Sent**
In tolerance	X	X
Out of tolerance		
See comments		

Contains non-accredited tests: X **Yes** __ **No**

Customer: **Epsilon Associates, Inc.**
Tel/Fax: **978-897-7100/-0099**

Address: **3 Clock Tower Place, Suite 250**
Maynard, MA 01754

Tested in accordance with the following procedures and standards:
Procedure for Calibration of Measurement Microphones, Scantek Inc., 06/15/2005

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal date	Traceability evidence Cal. Lab / Accreditation
483B-Norsonic	SME Cal Unit	25747	Nov 26, 2004	Scantek, Inc.
DS-360-SRS	Function Generator	33584	Dec.6, 2005	Transcat / A2LA
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov.16, 2005	Transcat / A2LA
DPI140-Druck	Pressure Indicator	790/00	Oct.14, 2004	Transcat / A2LA
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Nov.30, 2005	Transcat / A2LA
PC Program 1017 Norsonic	Calibration software	v.4.24g	Validated Jan 2004	-
1253-Norsonic	Calibrator	22909	May 23, 2005	NPL (UK)
1203-Norsonic	Preamplifier	14059	April 28, 2005	Scantek, Inc./NVLAP
4180-Bruel&Kjaer	Microphone	2246115	May 19, 2005	NPL (UK)

Instrumentation and test results are traceable to SI - BIPM through NPL (UK) and NIST (USA)

Calibrated by	Marc Nguessan	**Checked by**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	01/04/06	Date	1/5/06

Document stored as: C:\Nor1504\MicCal\2006\LND2540_4452_M1.doc

Certificate of Calibration and Conformance

Certificate Number 2005-71620

Instrument Model CAL200, Serial Number 2853, was calibrated on 29AUG2005. The instrument meets factory specifications per Procedure D0001.8190.

Instrument found to be in calibration as received: YES
Date Calibrated: 29AUG2005
Calibration due: 29AUG2006

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	PRM915	0112	12 Months	14SEP2005	2004-61841
Larson Davis	PRM902	0480	12 Months	14SEP2005	2004-61840
Larson Davis	MTS1000/2201	0111	12 Months	16SEP2005	09161-2004
Schaevitz	P3061-15PSIA	4987	12 Months	01MAR2006	278474
Larson Davis	2559	2506	12 Months	29MAR2006	13118-1
Larson Davis	2900	0661	12 Months	06APR2006	2005-67617
Hewlett Packard	34401A	US36033460	16 Months	27MAY2006	277736
Hewlett Packard	34401A	3146A10352	12 Months	24JUN2006	281920

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as shown on calibration report.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with the requirements of ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As Received" data is the same as shipped data.

Signed: Scott Montgomery
Technician: Scott Montgomery

Larson Davis A PCB GROUP CO.

Larson Davis, Inc. is an ISO 9001-2000 Registered Company

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Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 1999, ANSI/NCSL Z540:1994 Part 1 and relevant requirements of ISO 9002:1994 ACCREDITED by NVLAP (a NACLA approved body)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.14112

Instrument:	**Sound Analyzer**	*Date Calibrated:*	**1/10/2006**
Model:	**593**	*Status*	**Received** / **Sent**
Manufacturer:	**CEL**	*In tolerance*	X / X
Serial number:	**3-0401722**	*Out of tolerance*	
Tested with:	**Microphone 250 s/n 5683**	*See comments*	
	Preamplifier 527 s/n 3-0301634	*Contains non-accredited tests:*	__Yes _X_ No
Type (class):	**1**	*Calibration service:*	__ Basic _X_ Standard
Customer:	**Epsilon Associates, Inc.**	*Address:*	**3 Clock Tower Place, Suite 250**
Tel/Fax:	**978-897-7100/-0099**		**Maynard, MA 01754**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal date	Traceability evidence Cal. Lab / Accreditation
483B-Norsonic	SME Cal Unit	25747	Nov 26, 2004	Scantek, Inc.
DS-360-SRS	Function Generator	33584	Dec.6, 2005	Transcat / A2LA
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov.16, 2005	Transcat / A2LA
DPI140-Druck	Pressure Indicator	790/00	Oct.14, 2004	Transcat / A2LA
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Nov.30, 2005	Transcat / A2LA
PC Program 1019 Norsonic	Calibration software	v.4.24g	Validated Jan 2004	-
1253-Norsonic	Calibrator	25726	June 4, 2005	Scantek, Inc.

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.2 ±1°C	101.86 ±0.001kPa	48.9 ±2%RH

Calibrated by	Marc Nguessan	**Checked by**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	1/11/06	Date	1/11/06

Document stored as: C:\Nor1504\SlmCal\2006\CEL593_3-0401722_M1.doc

Scantek, Inc.

CALIBRATION LABORATORY

ISO 17025: 1999, ANSI/NCSL Z540:1994 Part 1 and relevant requirements of ISO 9002:1994 ACCREDITED by NVLAP (a NACLA approved body)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.14110

Instrument:	**Microphone**	*Date Calibrated:*	**1/9/2006**	
Model:	**250**	*Status*	**Received**	**Sent**
Manufacturer:	**CEL**	*In tolerance*	X	X
Serial number:	**5683**	*Out of tolerance*		
		See comments		

Contains non-accredited tests: X Yes __ No

Customer: **Epsilon Associates, Inc.**
Tel/Fax: **978-897-7100/-0099**

Address: **3 Clock tower Place, Suite 250**
Maynard, MA 01754

Tested in accordance with the following procedures and standards:

Procedure for Calibration of Measurement Microphones, Scantek Inc., 06/15/2005

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal date	Traceability evidence Cal. Lab / Accreditation
483B-Norsonic	SME Cal Unit	25747	Nov 26, 2004	Scantek, Inc.
DS-360-SRS	Function Generator	33584	Dec.6, 2005	Transcat / A2LA
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov.16, 2005	Transcat / A2LA
DPI140-Druck	Pressure Indicator	790/00	Oct.14, 2004	Transcat / A2LA
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Nov.30, 2005	Transcat / A2LA
PC Program 1017 Norsonic	Calibration software	v.4.24g	Validated Jan 2004	-
1253-Norsonic	Calibrator	22909	May 23, 2005	NPL (UK)
1203-Norsonic	Preamplifier	14059	April 28, 2005	Scantek, Inc./NVLAP
4180-Bruel&Kjaer	Microphone	2246115	May 19, 2005	NPL (UK)

Instrumentation and test results are traceable to SI - BIPM through NPL (UK) and NIST (USA)

Calibrated by	Marc Nguessan	**Checked by**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	1/9/2006	Date	1/11/06

Document stored as: C:\Nor1504\MicCal\2006\CEL250_5683_M1.doc

Appendix 2

Short-Term Ambient 1/3 Octave Band Measurements

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~1\BELD0003.DTA

- Cumulative period results -

Weekday Day
Location ST-1

Number of records	20	
Run start	6/19/2006	12:39:41 PM
Run duration	0:20:02	
Overload occurred	Yes	
Overload %time	0.05	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0%(dB)	LN95.0%(dB)
Broadband	L	67	69	66	64	64
Broadband	A	49	51	48	46	46
12	L	53	56	51	46	45
16	L	52	55	51	47	45
20	L	52	55	51	47	46
25	L	53	56	52	49	48
32	L	61	64	60	55	54
40	L	54	56	53	50	49
50	L	56	58	55	52	51
63	L	56	58	55	52	52
80	L	54	57	54	51	50
100	L	54	56	54	51	51
125	L	51	53	51	48	48
160	L	47	49	46	44	43
200	L	44	46	42	40	39
250	L	42	44	40	38	37
315	L	42	44	40	38	38
400	L	44	46	43	41	40
500	L	43	44	41	39	39
630	L	39	41	38	36	36
800	L	37	39	36	34	34
1k	L	36	38	35	33	33
1k25	L	35	37	34	31	31
1k6	L	34	36	32	29	29
2k	L	34	37	33	29	28
2k5	L	37	39	34	29	28
3k15	L	38	40	35	30	28
4k	L	37	38	33	28	27
5k	L	35	37	31	25	23
6k3	L	33	35	28	22	20
8k	L	30	32	25	18	17
10k	L	27	28	21	15	14
12k5	L	25	25	18	12	12
16k	L	24	22	14	11	11
20k	L	21	18	12	11	11

:\1831BR~1\NOISE\BACKGR~1\WEEKDA~1\BELD0005.DTA

- Cumulative period results -

Weekday Day
Location ST-2

Number of records	20	
Run start	6/19/2006	1:27:42 PM
Run duration	0:20:02	
Overload occurred	Yes	
Overload %time	0	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	64	66	63	61	60
Broadband	A	48	50	46	44	43
12	L	51	54	49	44	43
16	L	50	53	48	44	43
20	L	50	53	49	44	43
25	L	51	53	49	45	44
32	L	55	57	53	49	48
40	L	52	55	51	48	47
50	L	52	54	51	47	46
63	L	52	54	50	47	46
80	L	50	51	47	44	44
100	L	48	50	46	43	42
125	L	51	50	43	40	39
160	L	45	47	42	39	38
200	L	44	46	41	39	38
250	L	45	47	42	40	39
315	L	44	45	42	40	39
400	L	44	45	41	39	38
500	L	42	42	39	37	36
630	L	40	41	37	34	34
800	L	38	40	35	33	32
1k	L	37	39	34	32	31
1k25	L	36	37	32	30	29
1k6	L	34	36	30	27	27
2k	L	33	35	29	25	25
2k5	L	33	35	28	24	24
3k15	L	33	37	30	25	24
4k	L	33	37	30	24	23
5k	L	31	34	27	21	20
6k3	L	30	33	23	18	17
8k	L	28	31	21	15	13
10k	L	27	29	19	13	12
12k5	L	25	27	16	11	11
16k	L	23	24	14	11	11
20k	L	20	19	12	11	10

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~1\BELD0004.DTA

- Cumulative period results -

Weekday Day
Location ST-3

Number of records	20	
Run start	6/19/2006	1:04:19 PM
Run duration	0:20:02	
Overload occurred	Yes	
Overload %time	0.15	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	67	69	65	63	63
Broadband	A	49	50	47	45	45
12	L	52	55	50	45	43
16	L	52	55	50	45	44
20	L	52	54	50	46	45
25	L	52	55	51	47	46
32	L	60	63	59	53	51
40	L	53	56	52	49	48
50	L	53	55	52	49	48
63	L	56	57	54	51	50
80	L	53	55	51	48	47
100	L	53	54	51	49	48
125	L	50	52	49	46	45
160	L	48	50	47	44	44
200	L	46	47	44	42	42
250	L	44	45	41	40	39
315	L	41	42	38	36	35
400	L	40	42	38	36	35
500	L	40	41	38	36	35
630	L	39	40	37	36	35
800	L	38	39	37	36	35
1k	L	38	39	36	34	34
1k25	L	37	41	35	33	32
1k6	L	36	37	33	32	31
2k	L	36	37	32	31	30
2k5	L	36	37	33	30	30
3k15	L	37	39	33	30	29
4k	L	36	39	32	28	27
5k	L	34	36	29	25	24
6k3	L	33	33	26	21	20
8k	L	31	30	22	17	16
10k	L	29	28	19	14	13
12k5	L	27	25	16	12	11
16k	L	24	21	13	11	11
20k	L	25	22	18	14	13

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~1\BELD0006.DTA

- Cumulative period results -

Weekday Day
Location ST-4

Number of records	20	
Run start	6/19/2006	1:57:01 PM
Run duration	0:20:03	
Overload occurred	Yes	
Overload %time	0.15	
Low battery	No	
Pause was used	Yes	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	66	70	63	60	59
Broadband	A	51	52	46	44	43
12	L	52	55	48	43	41
16	L	50	53	46	41	40
20	L	49	52	47	42	41
25	L	49	52	47	43	42
32	L	50	53	49	45	44
40	L	50	53	48	44	43
50	L	52	55	50	46	45
63	L	53	55	51	48	47
80	L	52	54	50	46	45
100	L	52	54	49	45	44
125	L	51	53	47	44	43
160	L	50	52	44	41	40
200	L	47	49	42	38	38
250	L	48	49	41	37	36
315	L	47	48	39	36	35
400	L	45	47	38	35	35
500	L	44	45	37	34	34
630	L	42	42	36	34	33
800	L	42	40	36	34	33
1k	L	42	38	35	33	32
1k25	L	41	37	33	31	30
1k6	L	39	36	31	29	28
2k	L	37	36	31	27	26
2k5	L	36	36	31	27	26
3k15	L	35	37	33	27	26
4k	L	35	37	32	26	25
5k	L	33	35	30	24	23
6k3	L	31	33	27	20	19
8k	L	29	32	25	17	15
10k	L	29	30	23	14	13
12k5	L	26	28	20	13	11
16k	L	25	25	17	11	11
20k	L	23	22	14	11	11

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~1\BELD0009.DTA

- Cumulative period results -

Weekday Day
Location ST-5

Number of records	20	
Run start	6/19/2006	3:02:07 PM
Run duration	0:20:03	
Overload occurred	Yes	
Overload %time	0.25	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	68	71	66	62	62
Broadband	A	51	54	49	44	43
12	L	54	57	50	45	43
16	L	53	56	51	46	44
20	L	52	55	50	46	44
25	L	52	55	51	47	46
32	L	57	60	56	51	50
40	L	54	56	53	49	48
50	L	54	56	52	48	47
63	L	54	56	52	49	48
80	L	53	55	51	48	47
100	L	51	54	49	46	45
125	L	56	56	48	44	43
160	L	50	52	45	41	40
200	L	46	49	42	38	37
250	L	48	49	41	37	36
315	L	44	47	40	36	36
400	L	43	46	39	36	35
500	L	42	45	38	35	34
630	L	41	43	37	35	34
800	L	40	42	36	34	33
1k	L	39	41	36	32	31
1k25	L	39	41	35	31	30
1k6	L	38	40	34	30	29
2k	L	37	40	34	29	28
2k5	L	38	41	34	29	28
3k15	L	40	43	36	30	29
4k	L	40	44	37	29	28
5k	L	38	42	34	27	25
6k3	L	36	40	32	24	21
8k	L	35	38	30	21	17
10k	L	34	36	27	18	14
12k5	L	32	34	25	15	12
16k	L	29	30	21	12	11
20k	L	27	26	17	11	11

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~1\BELD0007.DTA

- Cumulative period results -

Weekday Day
Location ST-6

Number of records	20	
Run start	6/19/2006	2:25:30 PM
Run duration	0:20:29	
Overload occurred	Yes	
Overload %time	2.05	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	72	76	71	65	64
Broadband	A	53	55	51	48	47
12	L	62	66	57	47	45
16	L	61	65	56	47	45
20	L	59	64	54	46	44
25	L	59	63	54	48	47
32	L	57	61	54	49	48
40	L	58	61	54	49	48
50	L	58	61	54	49	48
63	L	58	61	55	51	50
80	L	57	60	52	48	47
100	L	55	58	50	46	45
125	L	55	58	50	46	45
160	L	53	55	47	44	43
200	L	50	52	45	42	41
250	L	50	53	44	40	39
315	L	48	51	43	39	39
400	L	47	50	42	39	38
500	L	47	49	42	39	38
630	L	46	48	41	38	38
800	L	45	47	41	38	38
1k	L	45	47	41	38	37
1k25	L	44	46	40	37	36
1k6	L	43	45	39	36	35
2k	L	42	44	38	34	33
2k5	L	41	43	37	34	33
3k15	L	42	45	38	34	32
4k	L	43	47	38	33	32
5k	L	42	45	36	31	30
6k3	L	39	41	33	29	27
8k	L	39	40	30	25	24
10k	L	40	40	27	22	21
12k5	L	38	38	24	18	17
16k	L	36	36	19	14	13
20k	L	36	36	14	11	11

:\1831BR~1\NOISE\BACKGR~1\WEEKDA~1\BELD0002.DTA

- Cumulative period results -

Weekday Day
Location ST- 7

Number of records	20	
Run start	6/19/2006	11:43:27 AM
Run duration	0:20:05	
Overload occurred	Yes	
Overload %time	2.6	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	73	76	72	68	67
Broadband	A	50	52	47	44	42
12	L	61	65	59	53	51
16	L	60	64	58	52	50
20	L	59	62	57	52	50
25	L	57	61	55	49	48
32	L	57	60	55	50	49
40	L	56	59	53	49	48
50	L	55	58	52	48	47
63	L	55	58	53	48	47
80	L	54	57	50	46	45
100	L	53	56	48	44	43
125	L	53	56	48	43	41
160	L	52	55	46	41	40
200	L	50	53	43	39	37
250	L	49	53	43	38	37
315	L	48	52	42	38	36
400	L	47	51	42	38	36
500	L	46	50	40	36	35
630	L	45	48	39	35	34
800	L	43	46	37	33	32
1k	L	42	45	36	32	31
1k25	L	40	43	35	31	30
1k6	L	40	41	34	31	29
2k	L	38	40	34	30	29
2k5	L	38	39	33	30	28
3k15	L	37	39	33	30	29
4k	L	38	39	33	29	28
5k	L	37	39	32	28	27
6k3	L	37	38	31	27	26
8k	L	38	39	30	26	25
10k	L	39	39	28	24	23
12k5	L	37	38	26	22	21
16k	L	36	37	23	19	17
20k	L	35	36	19	15	14

S:\1831BR~1\NOISE\BACKGR~1\WEEKEN~1\B001.DTA

- Cumulative period results -

Weekend Day
Location ST-1

Number of records	20
Run start	6/17/2006 10:50:44 AM
Run duration	00:20:53.55
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	No

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	65	67	65	64	63
Broadband	A	49	51	47	45	40
12	L	51	52	50	48	46
16	L	52	53	51	49	45
20	L	52	53	51	49	44
25	L	55	56	54	52	44
32	L	58	60	57	55	43
40	L	52	53	51	50	42
50	L	52	54	52	51	42
63	L	55	56	54	53	41
80	L	53	55	53	51	40
100	L	52	53	52	50	39
125	L	52	53	51	49	36
160	L	47	49	45	43	34
200	L	43	45	41	39	32
250	L	42	44	39	37	30
315	L	40	43	39	36	30
400	L	40	42	39	37	30
500	L	39	40	38	36	30
630	L	37	38	36	35	31
800	L	36	38	35	33	29
1k	L	35	37	34	32	30
1k25	L	34	36	33	30	27
1k6	L	34	37	33	29	27
2k	L	34	37	33	28	27
2k5	L	37	39	34	29	28
3k15	L	39	41	35	30	28
4k	L	37	40	35	29	28
5k	L	38	39	33	27	27
6k3	L	36	38	31	25	27
8k	L	31	34	28	22	26
10k	L	26	29	24	19	24
12k5	L	23	25	20	15	22
16k	L	19	21	16	13	18
20k	L	16	16	13	12	12

S:\1831BR~1\NOISE\BACKGR~1\WEEKEN~1\B003.DTA

- Cumulative period results -

Weekend Day
Location ST-2

Number of records	20
Run start	6/17/2006 11:51:35 AM
Run duration	00:20:05.56
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	No

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	63	65	62	60	63
Broadband	A	48	51	45	41	40
12	L	48	50	48	46	46
16	L	51	53	50	48	45
20	L	49	52	48	46	44
25	L	52	55	51	47	44
32	L	52	54	51	49	43
40	L	51	53	49	47	42
50	L	52	55	49	47	42
63	L	51	52	49	47	41
80	L	50	51	48	45	40
100	L	52	55	47	44	39
125	L	49	52	45	42	36
160	L	47	50	40	36	34
200	L	44	48	38	34	32
250	L	41	45	37	33	30
315	L	41	44	37	33	30
400	L	42	43	37	33	30
500	L	43	42	36	34	30
630	L	39	41	35	32	31
800	L	37	41	35	31	29
1k	L	37	40	34	31	30
1k25	L	36	39	32	29	27
1k6	L	34	38	32	27	27
2k	L	34	37	32	27	27
2k5	L	34	37	32	27	28
3k15	L	33	36	32	27	28
4k	L	32	35	31	27	28
5k	L	31	34	29	24	27
6k3	L	30	33	27	22	27
8k	L	29	32	25	20	26
10k	L	27	30	23	17	24
12k5	L	25	27	19	14	22
16k	L	21	24	16	12	18
20k	L	18	20	13	12	12

:\1831BR~1\NOISE\BACKGR~1\WEEKEN~1\B002.DTA

Weekend Day
Location ST-3

- Cumulative period results -

Number of records	20
Run start	6/17/2006 11:18:47 AM
Run duration	00:20:17.74
Overload occurred	Yes
Overload %time	0.3
Low battery	No
Pause was used	No

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	68	70	66	64	63
Broadband	A	51	52	48	45	40
12	L	52	55	49	47	46
16	L	53	55	52	49	45
20	L	53	55	52	49	44
25	L	56	58	55	53	44
32	L	59	61	59	56	43
40	L	56	57	52	49	42
50	L	58	58	53	51	42
63	L	56	58	54	52	41
80	L	54	56	52	50	40
100	L	53	56	52	48	39
125	L	52	53	51	49	36
160	L	50	50	46	44	34
200	L	48	49	45	43	32
250	L	46	48	43	40	30
315	L	45	46	40	37	30
400	L	43	44	38	35	30
500	L	42	43	38	34	30
630	L	42	43	37	34	31
800	L	42	42	37	34	29
1k	L	40	41	37	34	30
1k25	L	39	40	35	33	27
1k6	L	38	39	35	32	27
2k	L	38	40	34	31	27
2k5	L	38	40	35	31	28
3k15	L	38	40	35	30	28
4k	L	37	40	33	28	28
5k	L	35	38	31	25	27
6k3	L	33	36	29	22	27
8k	L	31	34	26	19	26
10k	L	31	31	23	15	24
12k5	L	28	27	20	12	22
16k	L	26	23	16	11	18
20k	L	25	19	13	12	12

:\1831BR~1\NOISE\BACKGR~1\WEEKEN~1\B004.DTA

- Cumulative period results -

Weekend Day
Location ST-4

Number of records	20	
Run start	6/17/2006	12:24:28 PM
Run duration	0:20:10	
Overload occurred	Yes	
Overload %time	0.1	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	64	67	61	59	63
Broadband	A	49	50	43	41	40
12	L	50	53	48	46	46
16	L	49	51	47	45	45
20	L	48	50	47	45	44
25	L	48	50	47	45	44
32	L	48	50	47	44	43
40	L	49	49	46	43	42
50	L	49	50	46	44	42
63	L	53	57	47	45	41
80	L	54	55	46	43	40
100	L	50	50	46	43	39
125	L	51	51	44	41	36
160	L	46	47	40	37	34
200	L	45	44	37	35	32
250	L	45	45	36	33	30
315	L	42	44	34	31	30
400	L	42	43	33	30	30
500	L	41	42	33	30	30
630	L	40	41	33	30	31
800	L	39	40	33	31	29
1k	L	38	39	33	31	30
1k25	L	37	39	31	29	27
1k6	L	36	37	30	27	27
2k	L	35	36	28	25	27
2k5	L	34	36	29	25	28
3k15	L	35	38	31	27	28
4k	L	35	39	31	27	28
5k	L	32	34	27	23	27
6k3	L	27	29	23	19	27
8k	L	25	26	20	16	26
10k	L	24	23	17	13	24
12k5	L	21	19	14	12	22
16k	L	20	15	12	11	18
20k	L	19	13	12	12	12

:\1831BR~1\NOISE\BACKGR~1\WEEKEN~1\B005.DTA

- Cumulative period results -

Weekend Day
Location ST-5

Number of records	20	
Run start	06/17/06	1:14:10 PM
Run duration	0:20:50	
Overload occurred	Yes	
Overload %time	0.75	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	70	73	69	65	63
Broadband	A	53	56	51	48	40
12	L	57	61	55	50	46
16	L	56	59	54	51	45
20	L	55	58	54	51	44
25	L	54	57	54	52	44
32	L	56	57	55	53	43
40	L	54	55	53	51	42
50	L	55	57	54	52	42
63	L	55	57	53	50	41
80	L	55	58	52	49	40
100	L	55	58	54	50	39
125	L	54	56	51	48	36
160	L	53	54	47	44	34
200	L	48	52	44	40	32
250	L	47	50	43	38	30
315	L	45	48	41	37	30
400	L	44	47	41	37	30
500	L	43	46	40	36	30
630	L	45	47	40	36	31
800	L	44	46	39	35	29
1k	L	44	45	38	34	30
1k25	L	42	44	37	33	27
1k6	L	41	44	37	32	27
2k	L	40	43	36	31	27
2k5	L	40	42	37	33	28
3k15	L	42	45	40	36	28
4k	L	42	46	40	36	28
5k	L	40	43	38	34	27
6k3	L	37	40	35	31	27
8k	L	36	39	33	27	26
10k	L	35	38	30	25	24
12k5	L	33	36	27	22	22
16k	L	32	34	23	18	18
20k	L	30	33	19	15	12

:\1831BR~1\NOISE\BACKGR~1\WEEKEN~1\B007.DTA

- Cumulative period results -

Weekend Day
Location ST-6

Number of records	20	
Run start	06/17/06	2:29:32 PM
Run duration	0:20:03	
Overload occurred	Yes	
Overload %time	1.35	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	71	74	70	65	63
Broadband	A	53	56	50	48	40
12	L	59	63	56	49	46
16	L	57	61	54	48	45
20	L	55	59	52	48	44
25	L	54	57	52	49	44
32	L	55	58	53	50	43
40	L	55	58	53	49	42
50	L	55	58	52	49	42
63	L	57	59	53	51	41
80	L	56	59	52	49	40
100	L	55	58	51	47	39
125	L	55	57	50	47	36
160	L	51	56	47	44	34
200	L	50	54	45	43	32
250	L	49	53	43	41	30
315	L	47	51	42	39	30
400	L	47	51	40	38	30
500	L	46	49	40	38	30
630	L	46	49	40	38	31
800	L	46	48	41	39	29
1k	L	45	47	41	38	30
1k25	L	43	46	39	37	27
1k6	L	42	44	38	36	27
2k	L	40	42	37	34	27
2k5	L	39	42	37	33	28
3k15	L	41	44	38	33	28
4k	L	43	47	39	33	28
5k	L	38	41	36	30	27
6k3	L	36	39	32	27	27
8k	L	36	39	30	25	26
10k	L	36	40	27	21	24
12k5	L	34	37	23	18	22
16k	L	33	36	19	14	18
20k	L	32	35	15	12	12

\1831BR~1\NOISE\BACKGR~1\WEEKEN~1\B006.DTA

- Cumulative period results -

Weekend Day
Location ST-7

Number of records	20	
Run start	06/17/06	1:58:54 PM
Run duration	0:20:22	
Overload occurred	Yes	
Overload %time	3.6	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	73	76	72	68	63
Broadband	A	53	56	51	48	40
12	L	61	65	60	54	46
16	L	60	64	58	54	45
20	L	59	63	57	54	44
25	L	58	62	54	51	44
32	L	57	61	54	51	43
40	L	58	61	54	51	42
50	L	57	61	54	51	42
63	L	57	60	53	50	41
80	L	56	61	52	49	40
100	L	55	60	50	47	39
125	L	54	57	50	47	36
160	L	52	56	48	45	34
200	L	51	55	45	42	32
250	L	50	54	45	41	30
315	L	49	53	45	42	30
400	L	48	52	43	40	30
500	L	47	51	42	39	30
630	L	47	51	42	39	31
800	L	46	50	41	38	29
1k	L	46	50	41	38	30
1k25	L	46	50	41	37	27
1k6	L	45	49	40	37	27
2k	L	45	49	40	36	27
2k5	L	44	49	39	36	28
3k15	L	44	48	39	35	28
4k	L	44	48	39	34	28
5k	L	43	47	38	33	27
6k3	L	43	47	37	32	27
8k	L	43	48	36	30	26
10k	L	44	49	34	28	24
12k5	L	43	48	32	25	22
16k	L	42	47	29	22	18
20k	L	41	46	25	17	12

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~2\BELD0001.DTA

- Cumulative period results -

Weekday Night
Location ST-1

Number of records	20
Run start	6/20/2006 12:27:13 AM
Run duration	00:20:02.06
Overload occurred	Yes
Overload %time	.0
Low battery	No
Pause was used	No

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	64	65	64	62	62
Broadband	A	44	44	43	42	41
12	L	50	53	49	44	43
16	L	51	54	50	46	44
20	L	51	54	50	46	45
25	L	54	56	53	49	48
32	L	56	59	55	51	50
40	L	53	55	52	49	48
50	L	53	55	52	50	49
63	L	54	56	53	51	50
80	L	53	55	52	50	49
100	L	51	53	50	48	47
125	L	48	50	48	46	45
160	L	43	45	43	41	40
200	L	39	41	39	37	37
250	L	37	38	37	35	35
315	L	37	38	36	35	34
400	L	37	39	37	34	34
500	L	35	36	34	32	32
630	L	33	34	32	30	30
800	L	32	32	30	29	28
1k	L	30	31	29	27	27
1k25	L	30	29	27	25	25
1k6	L	29	29	26	25	24
2k	L	29	29	26	24	23
2k5	L	29	30	25	22	22
3k15	L	31	31	27	23	22
4k	L	31	30	25	22	21
5k	L	33	35	32	28	28
6k3	L	27	27	23	19	17
8k	L	26	24	18	13	12
10k	L	26	23	16	13	12
12k5	L	25	20	13	11	11
16k	L	26	18	12	10	10
20k	L	23	14	10	10	10

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~2\BELD0003.DTA

- Cumulative period results -

Weekday Night
Location ST-2

Number of records	20
Run start	6/20/2006 1:11:50 AM
Run duration	0:20:13
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	No

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	61	62	60	59	58
Broadband	A	41	43	41	39	39
12	L	49	52	47	43	41
16	L	49	52	48	43	42
20	L	49	52	48	44	43
25	L	48	51	47	44	43
32	L	50	52	49	45	44
40	L	50	52	49	46	45
50	L	49	51	48	45	45
63	L	49	51	48	45	44
80	L	45	48	45	42	42
100	L	41	43	41	38	38
125	L	40	42	40	38	37
160	L	40	42	40	38	37
200	L	40	41	39	37	36
250	L	38	39	37	36	35
315	L	38	41	37	35	35
400	L	37	39	36	33	33
500	L	33	34	32	30	30
630	L	31	32	30	28	28
800	L	29	30	28	27	26
1k	L	28	29	27	26	25
1k25	L	27	28	25	24	23
1k6	L	26	28	25	23	22
2k	L	27	29	26	24	23
2k5	L	26	28	24	20	20
3k15	L	26	28	24	20	19
4k	L	26	29	25	22	21
5k	L	32	36	30	25	22
6k3	L	24	26	22	17	16
8k	L	22	25	19	15	14
10k	L	21	23	18	14	13
12k5	L	20	20	15	12	11
16k	L	20	17	13	11	11
20k	L	17	12	10	10	10

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~2\BELD0002.DTA

- Cumulative period results -

Weekday Night
Location ST-3

Number of records	20
Run start	6/20/2006 12:49:49 AM
Run duration	00:20:01.92
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	No

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	65	67	63	61	61
Broadband	A	44	44	42	41	38
12	L	50	53	48	43	42
16	L	51	54	50	45	44
20	L	51	54	50	46	44
25	L	53	56	52	47	45
32	L	55	58	54	48	45
40	L	52	54	51	46	44
50	L	51	54	51	47	45
63	L	52	54	51	47	45
80	L	50	52	49	45	43
100	L	48	50	47	44	41
125	L	46	47	44	41	39
160	L	45	45	43	40	36
200	L	42	43	41	37	34
250	L	41	40	38	34	32
315	L	38	37	35	33	31
400	L	38	37	35	32	31
500	L	37	36	34	32	30
630	L	36	35	33	31	29
800	L	34	33	31	30	28
1k	L	32	32	30	29	27
1k25	L	30	30	29	28	26
1k6	L	29	30	28	27	25
2k	L	28	30	28	26	25
2k5	L	27	29	26	24	23
3k15	L	28	30	27	24	23
4k	L	27	28	25	23	21
5k	L	26	28	25	23	21
6k3	L	24	26	21	17	16
8k	L	25	25	19	15	13
10k	L	22	22	17	12	12
12k5	L	19	20	14	11	10
16k	L	17	16	12	10	9
20k	L	27	30	26	11	7

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~2\BELD0004.DTA

- Cumulative period results -

Weekday Night
Location ST-4

Number of records	20	
Run start	6/20/2006	1:42:02 AM
Run duration	0:20:18	
Overload occurred	Yes	
Overload %time	0	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	62	65	58	55	55
Broadband	A	44	42	39	37	37
12	L	48	50	44	39	37
16	L	47	49	44	40	39
20	L	46	48	43	39	38
25	L	45	47	43	39	38
32	L	44	46	43	39	38
40	L	45	47	43	40	39
50	L	45	47	44	41	41
63	L	47	49	46	43	42
80	L	46	48	45	42	41
100	L	46	45	42	39	39
125	L	47	44	41	38	38
160	L	41	40	36	34	34
200	L	38	37	33	31	31
250	L	37	36	32	31	30
315	L	38	35	31	29	29
400	L	37	33	30	28	27
500	L	37	32	29	27	27
630	L	36	32	28	27	26
800	L	35	31	28	27	26
1k	L	33	31	28	27	27
1k25	L	32	29	27	25	25
1k6	L	31	29	27	25	25
2k	L	31	30	28	25	25
2k5	L	29	29	26	23	23
3k15	L	29	30	26	23	23
4k	L	28	29	25	21	21
5k	L	26	28	24	20	19
6k3	L	25	27	22	19	18
8k	L	25	25	20	16	15
10k	L	23	23	17	14	13
12k5	L	20	20	15	12	11
16k	L	18	16	12	10	10
20k	L	17	12	10	9	9

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~2\BELD0006.DTA

- Cumulative period results -

Weekday Night
Location ST-5

Number of records	20	
Run start	6/20/2006	2:18:55 AM
Run duration	00:20:02.26	
Overload occurred	Yes	
Overload %time	0	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	62	64	62	61	60
Broadband	A	40	40	39	38	38
12	L	49	52	48	43	42
16	L	49	52	48	43	42
20	L	50	53	49	45	44
25	L	51	53	50	47	45
32	L	53	55	52	48	47
40	L	53	55	52	49	48
50	L	53	55	52	49	48
63	L	53	55	52	49	49
80	L	52	54	51	49	48
100	L	49	51	48	46	45
125	L	45	47	45	42	42
160	L	40	42	40	38	37
200	L	36	37	35	33	33
250	L	33	34	33	31	31
315	L	33	34	32	31	30
400	L	33	34	32	31	30
500	L	32	32	31	30	29
630	L	31	32	30	29	29
800	L	28	28	27	26	25
1k	L	26	26	25	23	23
1k25	L	24	25	23	21	21
1k6	L	24	25	21	20	19
2k	L	23	25	20	18	18
2k5	L	23	26	20	17	16
3k15	L	23	26	20	16	16
4k	L	25	26	20	16	16
5k	L	24	26	22	19	18
6k3	L	22	25	18	14	13
8k	L	22	23	16	12	11
10k	L	20	21	14	11	10
12k5	L	17	19	12	10	10
16k	L	15	16	11	9	9
20k	L	14	12	9	9	9

S:\1831BR~1\NOISE\BACKGR~1\WEEKDA~2\BELD0007.DTA

- Cumulative period results -

Weekday Night
Location ST-6

Number of records	20	
Run start	6/20/2006	2:47:00 AM
Run duration	00:20:02.62	
Overload occurred	Yes	
Overload %time	0.05	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	65	69	62	57	57
Broadband	A	43	44	42	40	40
12	L	52	55	47	40	38
16	L	50	54	46	40	38
20	L	49	52	45	40	39
25	L	48	51	46	42	41
32	L	47	50	46	42	41
40	L	47	49	45	41	40
50	L	48	50	45	42	41
63	L	50	52	48	44	43
80	L	48	50	46	43	42
100	L	45	47	44	40	39
125	L	45	47	44	40	39
160	L	40	42	40	37	36
200	L	39	41	38	35	34
250	L	38	40	37	34	34
315	L	37	38	36	34	33
400	L	38	39	37	35	34
500	L	35	36	34	33	32
630	L	34	35	33	30	30
800	L	32	34	31	29	28
1k	L	32	33	30	28	28
1k25	L	31	32	29	27	26
1k6	L	30	31	28	26	25
2k	L	29	31	28	26	25
2k5	L	30	31	29	27	26
3k15	L	29	30	28	25	25
4k	L	29	30	27	24	24
5k	L	27	29	26	24	24
6k3	L	26	27	24	21	21
8k	L	24	25	22	19	19
10k	L	23	23	20	17	16
12k5	L	19	20	17	14	14
16k	L	17	16	13	11	11
20k	L	15	11	10	9	9

\1831BR~1\NOISE\BACKGR~1\WEEKDA~2\BELD0008.DTA

- Cumulative period results -

Weekday Night
Location ST-7

Number of records	20	
Run start	6/19/2006	11:54:32 PM
Run duration	0:20:02	
Overload occurred	Yes	
Overload %time	0.45	
Low battery	No	
Pause was used	No	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	70	73	69	66	65
Broadband	A	48	50	47	45	43
12	L	58	61	56	51	49
16	L	56	59	54	49	48
20	L	54	57	52	48	47
25	L	53	56	52	48	46
32	L	52	55	51	47	46
40	L	51	53	50	46	45
50	L	51	53	50	46	44
63	L	51	53	50	46	44
80	L	49	51	48	45	43
100	L	48	50	47	43	42
125	L	46	47	45	41	40
160	L	43	44	42	39	37
200	L	41	42	39	36	35
250	L	40	40	38	35	34
315	L	40	40	38	35	34
400	L	39	40	38	35	33
500	L	38	39	37	34	33
630	L	39	40	39	36	34
800	L	38	39	37	34	33
1k	L	38	39	37	35	33
1k25	L	36	38	35	32	31
1k6	L	36	37	34	32	30
2k	L	35	37	34	32	30
2k5	L	36	37	35	32	31
3k15	L	36	38	35	32	31
4k	L	36	38	35	32	31
5k	L	36	37	35	32	31
6k3	L	35	37	34	31	30
8k	L	34	36	33	30	29
10k	L	33	34	31	28	27
12k5	L	32	32	29	26	25
16k	L	29	28	25	22	21
20k	L	26	22	19	16	15

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- Cumulative period results -

Weekend Night
Location ST-1

Number of records	1	
Run start	06/18/06	12:01:49 AM
Run duration	0:20:02	
Overload occurred	Yes	
Overload %time	0	
Low battery	No	
Pause was used	Yes	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	64	65	63	61	61
Broadband	A	47	45	43	42	42
12	L	50	53	48	43	42
16	L	52	54	50	45	44
20	L	51	53	49	45	43
25	L	54	56	52	49	47
32	L	54	57	53	50	49
40	L	52	55	51	48	47
50	L	52	54	51	48	47
63	L	52	54	51	49	48
80	L	51	53	50	48	47
100	L	50	52	49	47	46
125	L	48	49	47	45	44
160	L	45	46	44	42	42
200	L	43	44	42	41	40
250	L	41	41	39	37	37
315	L	39	39	37	35	35
400	L	38	37	35	34	33
500	L	38	36	34	33	32
630	L	37	36	34	33	32
800	L	36	35	33	32	32
1k	L	35	34	32	31	31
1k25	L	34	32	30	29	28
1k6	L	34	31	28	27	27
2k	L	35	31	27	26	25
2k5	L	35	31	27	24	24
3k15	L	34	31	27	24	24
4k	L	33	31	26	24	23
5k	L	33	30	25	22	21
6k3	L	37	29	23	18	17
8k	L	34	27	20	15	---.-
10k	L	32	25	18	---.-	---.-
12k5	L	30	21	---.-	---.-	---.-
16k	L	29	17	---.-	---.-	---.-
20k	L	29	20	16	---.-	---.-

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- Cumulative period results -

Weekend Night
Location ST-2

Number of records	1
Run start	06/18/06 12:23:24 AM
Run duration	00:20:25.92
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	Yes

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	64	65	63	62	62
Broadband	A	43	44	43	42	42
12	L	50	53	48	43	42
16	L	50	53	49	45	44
20	L	52	55	51	46	45
25	L	53	56	52	48	47
32	L	54	56	53	49	48
40	L	53	55	52	49	48
50	L	53	55	52	49	49
63	L	54	56	53	51	50
80	L	52	54	52	49	49
100	L	51	53	51	48	48
125	L	49	51	49	47	46
160	L	43	45	43	41	40
200	L	41	42	40	38	38
250	L	39	41	39	37	36
315	L	38	39	37	36	35
400	L	38	40	37	35	34
500	L	35	36	34	33	32
630	L	33	35	33	32	31
800	L	33	34	32	31	31
1k	L	31	32	31	29	29
1k25	L	29	30	29	27	27
1k6	L	28	29	26	25	25
2k	L	27	29	25	24	23
2k5	L	27	30	24	22	21
3k15	L	28	30	26	23	22
4k	L	28	30	26	23	23
5k	L	29	30	28	26	25
6k3	L	23	26	19	16	15
8k	L	22	23	16	---.-	---.-
10k	L	19	20	---.-	---.-	---.-
12k5	L	16	17	---.-	---.-	---.-
16k	L	---.-	---.-	---.-	---.-	---.-
20k	L	---.-	---.-	---.-	---.-	---.-

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- Cumulative period results -

Weekend Night
Location ST-3

Number of records	1
Run start	06/18/06 12:44:28 AM
Run duration	00:21:50.32
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	Yes

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	61	62	60	59	59
Broadband	A	41	42	40	39	39
12	L	48	51	47	42	41
16	L	48	51	47	43	42
20	L	49	51	48	43	42
25	L	48	51	47	44	43
32	L	50	52	49	46	45
40	L	51	53	50	47	46
50	L	51	53	50	47	46
63	L	49	52	49	46	45
80	L	46	48	46	44	43
100	L	43	45	43	41	40
125	L	43	45	43	40	40
160	L	42	44	41	39	38
200	L	40	42	40	38	37
250	L	39	41	39	37	36
315	L	37	38	36	35	35
400	L	35	37	35	33	33
500	L	33	35	33	32	31
630	L	32	33	31	30	29
800	L	31	32	30	29	29
1k	L	30	31	30	28	28
1k25	L	28	28	26	25	25
1k6	L	26	27	24	23	22
2k	L	24	25	22	20	19
2k5	L	24	25	21	18	17
3k15	L	23	25	20	17	16
4k	L	24	25	20	17	16
5k	L	23	24	19	15	---.-
6k3	L	23	23	17	---.-	---.-
8k	L	22	21	15	---.-	---.-
10k	L	19	19	---.-	---.-	---.-
12k5	L	16	16	---.-	---.-	---.-
16k	L	---.-	---.-	---.-	---.-	---.-
20k	L	---.-	---.-	---.-	---.-	---.-

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- Cumulative period results -

Weekend Night
Location ST-4

Number of records	1
Run start	06/18/06 1:06:32 AM
Run duration	00:21:00.16
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	Yes

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	65	67	59	57	57
Broadband	A	48	44	41	39	39
12	L	49	51	45	40	38
16	L	48	50	45	40	39
20	L	47	49	44	40	39
25	L	47	49	45	41	39
32	L	47	49	45	42	41
40	L	49	52	48	45	43
50	L	52	52	48	45	44
63	L	54	53	49	46	45
80	L	56	51	47	45	44
100	L	54	49	45	43	42
125	L	47	45	43	40	40
160	L	46	42	39	37	36
200	L	46	40	36	34	33
250	L	46	38	34	32	32
315	L	43	37	33	31	31
400	L	41	36	32	30	30
500	L	40	36	32	30	29
630	L	39	36	32	30	29
800	L	39	36	32	30	30
1k	L	38	34	30	28	28
1k25	L	37	33	28	26	25
1k6	L	36	32	27	24	24
2k	L	35	31	26	23	22
2k5	L	34	30	26	22	21
3k15	L	33	30	25	21	21
4k	L	32	29	24	20	19
5k	L	30	27	22	18	17
6k3	L	29	26	21	16	15
8k	L	27	24	18	---.-	---.-
10k	L	25	22	16	---.-	---.-
12k5	L	23	19	---.-	---.-	---.-
16k	L	19	16	---.-	---.-	---.-
20k	L	---.-	---.-	---.-	---.-	---.-

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- Cumulative period results -

Weekend Night
Location ST-5

Number of records	1	
Run start	06/18/06	1:53:43 AM
Run duration	00:20:12.68	
Overload occurred	Yes	
Overload %time	0	
Low battery	No	
Pause was used	Yes	

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	61	63	61	60	60
Broadband	A	39	40	39	38	38
12	L	48	51	47	42	41
16	L	50	53	49	44	43
20	L	50	53	49	45	43
25	L	50	53	50	46	45
32	L	51	54	51	47	46
40	L	53	55	52	49	48
50	L	52	54	51	48	48
63	L	51	53	51	48	48
80	L	50	52	49	47	46
100	L	47	49	47	45	44
125	L	44	45	43	41	40
160	L	38	40	38	36	36
200	L	36	38	36	34	34
250	L	35	37	35	34	33
315	L	34	36	34	32	32
400	L	33	34	32	31	31
500	L	31	32	31	29	29
630	L	30	32	30	29	29
800	L	28	30	28	27	27
1k	L	27	28	27	26	25
1k25	L	24	25	23	22	22
1k6	L	22	24	21	20	19
2k	L	21	23	19	17	17
2k5	L	20	22	18	15	15
3k15	L	21	23	18	15	---.-
4k	L	23	24	21	18	18
5k	L	24	26	24	21	20
6k3	L	19	22	16	---.-	---.-
8k	L	18	20	---.-	---.-	---.-
10k	L	15	18	---.-	---.-	---.-
12k5	L	---.-	15	---.-	---.-	---.-
16k	L	---.-	---.-	---.-	---.-	---.-
20k	L	---.-	---.-	---.-	---.-	---.-

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- Cumulative period results -

Weekend Night
Location ST-6

Number of records	1
Run start	06/18/06 1:27:47 AM
Run duration	00:20:47.32
Overload occurred	Yes
Overload %time	0
Low battery	No
Pause was used	Yes

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	71	75	66	60	59
Broadband	A	46	47	45	43	43
12	L	58	62	51	42	40
16	L	56	60	49	41	39
20	L	54	57	48	42	40
25	L	52	55	47	42	41
32	L	51	52	47	44	42
40	L	50	52	48	45	44
50	L	51	53	49	46	45
63	L	51	52	49	46	46
80	L	49	51	48	46	45
100	L	48	49	46	44	43
125	L	46	48	45	42	42
160	L	42	44	41	39	38
200	L	40	41	38	36	36
250	L	39	40	38	36	36
315	L	39	39	37	35	35
400	L	38	38	36	35	34
500	L	37	37	35	33	33
630	L	36	37	34	33	32
800	L	36	37	34	33	32
1k	L	35	37	34	32	32
1k25	L	34	36	33	31	30
1k6	L	33	35	32	30	29
2k	L	33	35	32	29	29
2k5	L	34	36	32	29	29
3k15	L	34	36	32	29	29
4k	L	34	36	32	29	28
5k	L	33	35	31	28	27
6k3	L	32	34	30	26	26
8k	L	30	31	27	24	23
10k	L	28	29	24	21	20
12k5	L	26	25	20	17	16
16k	L	25	20	15	---.-	---.-
20k	L	24	---.-	---.-	---.-	---.-

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- Cumulative period results -

Weekend Night
Location ST-7

Number of records	1
Run start	06/17/06 11:25:43 PM
Run duration	00:20:02.94
Overload occurred	No
Overload %time	0
Low battery	No
Pause was used	No

Band (Hz)	Fw	Leq (dB)	LN10.0%(dB)	LN50.0%(dB)	LN90.0 (dB)	LN95.0%(dB)
Broadband	L	66	67	65	63	63
Broadband	A	49	50	48	47	47
12	L	55	58	54	49	48
16	L	54	57	53	48	47
20	L	54	57	53	49	48
25	L	52	55	51	48	47
32	L	53	55	52	48	47
40	L	51	54	51	48	47
50	L	51	53	50	47	47
63	L	52	54	51	49	48
80	L	51	53	51	48	47
100	L	49	51	48	46	45
125	L	47	49	46	44	44
160	L	44	45	43	41	41
200	L	41	43	41	39	38
250	L	40	42	40	38	37
315	L	40	41	39	38	37
400	L	39	40	39	37	37
500	L	40	41	40	38	38
630	L	41	42	41	40	39
800	L	39	40	39	37	37
1k	L	38	40	38	36	36
1k25	L	37	39	37	35	35
1k6	L	36	38	36	34	34
2k	L	36	38	36	34	34
2k5	L	36	38	36	34	34
3k15	L	36	38	36	34	34
4k	L	36	37	35	33	33
5k	L	35	36	35	33	32
6k3	L	34	36	34	32	32
8k	L	33	34	32	30	30
10k	L	31	33	30	28	28
12k5	L	28	30	28	26	25
16k	L	24	26	24	22	21
20k	L	20	22	19	17	16

Appendix 3

Continuous Noise Level Hourly Measurements

Table A3-1
Background Study
Measured Sound Levels -- Location CM-1
(End of Glenrose Avenue Near Fore River, Braintree)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time (start)	Leq (dBA)	Lmax (dBA)	Lmin (dBA)	L(1) (dBA)	L(10) (dBA)	L(50) (dBA)	L(90) (dBA)
1	Friday	16-Jun-06	13:00	50.5	66.6	43.9	60.1	52.7	47.9	46.1
2	Friday	16-Jun-06	14:00	51.4	69.7	45.0	61.1	53.7	48.6	46.6
3	Friday	16-Jun-06	15:00	52.7	70.2	44.8	62.8	54.9	49.5	46.2
4	Friday	16-Jun-06	16:00	52.9	70.2	44.0	62.1	55.7	49.7	46.3
5	Friday	16-Jun-06	17:00	56.0	76.8	43.7	68.9	56.2	48.4	46.0
6	Friday	16-Jun-06	18:00	52.0	72.4	43.3	61.4	53.3	47.9	45.3
7	Friday	16-Jun-06	19:00	51.8	70.5	43.2	63.2	53.5	46.8	44.4
8	Friday	16-Jun-06	20:00	47.0	57.5	42.5	53.7	49.4	45.8	43.7
9	Friday	16-Jun-06	21:00	47.4	66.3	42.7	56.6	47.8	44.9	43.6
10	Friday	16-Jun-06	22:00	49.6	67.2	42.8	60.8	50.4	45.1	43.8
11	Friday	17-Jun-06	23:00	46.2	59.6	42.8	55.2	47.2	44.9	43.8
12	Saturday	17-Jun-06	0:00	45.3	57.2	43.1	48.9	46.4	44.9	44.1
13	Saturday	17-Jun-06	1:00	45.0	52.3	42.4	49.1	46.5	44.6	43.2
14	Saturday	17-Jun-06	2:00	45.6	64.2	42.4	54.5	45.4	44.0	43.1
15	Saturday	17-Jun-06	3:00	45.1	53.7	42.8	52.1	45.9	44.6	43.4
16	Saturday	17-Jun-06	4:00	46.4	59.9	42.9	52.9	48.5	45.2	43.9
17	Saturday	17-Jun-06	5:00	47.4	61.5	43.4	55.4	49.1	46.0	44.5
18	Saturday	17-Jun-06	6:00	49.3	64.8	44.0	58.6	51.1	47.5	45.7
19	Saturday	17-Jun-06	7:00	50.6	66.6	43.5	60.4	53.5	47.7	45.1
20	Saturday	17-Jun-06	8:00	49.8	64.2	42.6	58.2	52.7	47.6	44.9
21	Saturday	17-Jun-06	9:00	49.0	63.1	42.4	56.7	52.6	46.5	44.1
22	Saturday	17-Jun-06	10:00	49.6	67.1	41.9	58.6	52.4	46.9	44.1
23	Saturday	17-Jun-06	11:00	50.3	70.0	42.9	59.2	52.9	47.8	45.1
24	Saturday	17-Jun-06	12:00	50.9	72.5	41.8	58.9	53.7	48.1	45.1
25	Saturday	17-Jun-06	13:00	51.1	67.8	43.4	59.2	53.7	49.0	46.2
26	Saturday	17-Jun-06	14:00	50.9	67.6	42.4	60.0	53.1	48.6	45.5
27	Saturday	17-Jun-06	15:00	51.9	65.9	44.2	59.3	54.7	50.1	47.0
28	Saturday	17-Jun-06	16:00	53.4	69.1	44.2	64.5	54.6	50.4	46.7
29	Saturday	17-Jun-06	17:00	52.2	78.0	44.3	58.7	53.3	49.8	46.9
30	Saturday	17-Jun-06	18:00	49.8	68.4	42.4	59.8	52.2	46.6	44.2
31	Saturday	17-Jun-06	19:00	49.9	66.3	43.3	59.2	52.4	47.5	45.1
32	Saturday	17-Jun-06	20:00	48.6	63.4	42.0	59.5	50.1	45.8	43.5
33	Saturday	17-Jun-06	21:00	49.2	69.7	42.4	59.8	51.5	44.7	43.3
34	Saturday	17-Jun-06	22:00	48.7	63.9	42.8	60.3	48.4	45.2	44.0
35	Saturday	18-Jun-06	23:00	46.2	77.3	41.8	49.3	45.8	44.1	43.1
36	Sunday	18-Jun-06	0:00	45.0	73.5	41.4	48.8	44.8	43.3	42.2
37	Sunday	18-Jun-06	1:00	42.5	52.6	40.3	46.5	43.3	42.3	41.3
38	Sunday	18-Jun-06	2:00	41.6	45.2	39.7	43.4	42.6	41.6	40.7
39	Sunday	18-Jun-06	3:00	41.4	45.9	39.7	43.7	42.4	41.3	40.3
40	Sunday	18-Jun-06	4:00	44.9	68.4	39.4	53.4	46.8	42.0	40.5
41	Sunday	18-Jun-06	5:00	44.6	60.5	39.5	53.3	46.6	42.6	41.2
42	Sunday	18-Jun-06	6:00	48.4	68.8	41.4	58.4	50.6	45.1	42.6
43	Sunday	18-Jun-06	7:00	48.9	65.9	41.8	59.1	51.3	45.5	43.3
44	Sunday	18-Jun-06	8:00	57.3	82.9	42.1	68.9	56.5	47.9	44.4
45	Sunday	18-Jun-06	9:00	50.5	63.2	42.4	58.8	54.2	47.7	44.2

Table A3-1
Background Study
Measured Sound Levels -- Location CM-1
(End of Glenrose Avenue Near Fore River, Braintree)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time	Leq	Lmax	Lmin	L(1)	L(10)	L(50)	L(90)
			(start)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
46	Sunday	18-Jun-06	10:00	49.6	63.8	42.7	57.4	52.5	47.7	44.8
47	Sunday	18-Jun-06	11:00	51.2	68.2	41.3	60.4	54.2	48.3	44.2
48	Sunday	18-Jun-06	12:00	50.6	64.8	41.2	59.8	53.8	47.9	44.5
49	Sunday	18-Jun-06	13:00	54.1	77.5	41.7	65.6	55.8	48.6	44.6
50	Sunday	18-Jun-06	14:00	51.4	65.9	40.5	59.6	54.7	49.0	44.3
51	Sunday	18-Jun-06	15:00	57.6	71.2	42.8	66.7	62.6	51.3	46.1
52	Sunday	18-Jun-06	16:00	55.2	71.0	43.0	64.8	58.8	51.5	46.4
53	Sunday	18-Jun-06	17:00	52.0	80.5	42.2	62.6	52.9	48.0	45.0
54	Sunday	18-Jun-06	18:00	50.1	61.5	44.3	57.5	52.9	48.5	46.3
55	Sunday	18-Jun-06	19:00	48.8	60.5	42.8	55.7	51.3	47.5	45.0
56	Sunday	18-Jun-06	20:00	51.2	71.3	42.9	62.3	52.9	46.9	44.7
57	Sunday	18-Jun-06	21:00	45.1	53.8	42.4	51.3	46.4	44.5	43.3
58	Sunday	18-Jun-06	22:00	44.5	53.1	42.1	49.1	45.7	44.0	43.1
59	Sunday	19-Jun-06	23:00	44.3	51.1	41.8	47.8	45.7	43.9	42.9
60	Monday	19-Jun-06	0:00	42.9	47.7	40.8	45.9	44.1	42.7	41.5
61	Monday	19-Jun-06	1:00	42.7	49.3	40.6	45.9	43.8	42.5	41.4
62	Monday	19-Jun-06	2:00	42.7	50.7	40.3	46.1	43.7	42.5	41.4
63	Monday	19-Jun-06	3:00	42.4	48.5	40.5	44.9	43.4	42.3	41.3
64	Monday	19-Jun-06	4:00	44.8	56.2	41.0	52.1	46.9	43.4	41.9
65	Monday	19-Jun-06	5:00	46.9	60.5	42.7	53.8	49.0	45.6	44.0
66	Monday	19-Jun-06	6:00	50.5	67.2	45.0	59.0	53.3	48.1	46.2
67	Monday	19-Jun-06	7:00	53.5	76.2	44.7	62.8	56.5	50.0	46.7
68	Monday	19-Jun-06	8:00	51.1	66.9	45.1	60.7	53.3	48.6	46.6
69	Monday	19-Jun-06	9:00	50.0	65.5	43.6	58.3	53.0	47.6	45.2
70	Monday	19-Jun-06	10:00	49.0	65.8	43.0	56.4	51.6	47.3	45.2
71	Monday	19-Jun-06	11:00	50.3	62.7	44.8	59.1	53.0	47.9	46.2
72	Monday	19-Jun-06	12:00	52.4	72.1	44.6	64.2	53.8	48.5	46.6
73	Monday	19-Jun-06	13:00	50.5	69.8	43.7	59.8	52.8	47.9	46.0
74	Monday	19-Jun-06	14:00	54.9	72.7	45.0	65.3	58.3	49.8	46.5
75	Monday	19-Jun-06	15:00	54.1	76.6	44.8	63.4	56.4	49.9	47.2
76	Monday	19-Jun-06	16:00	56.7	63.9	44.6	60.9	59.2	56.7	48.9
77	Monday	19-Jun-06	17:00	58.7	65.4	54.8	62.9	60.1	58.4	57.1
78	Monday	19-Jun-06	18:00	59.5	70.0	54.3	65.6	60.9	58.8	57.2
79	Monday	19-Jun-06	19:00	58.3	65.4	53.8	61.0	59.7	58.2	56.6
80	Monday	19-Jun-06	20:00	57.6	64.9	46.2	61.8	59.5	57.6	52.2
81	Monday	19-Jun-06	21:00	46.9	59.1	42.4	55.1	49.3	45.2	43.7
82	Monday	19-Jun-06	22:00	49.8	67.1	41.7	62.0	50.7	44.4	43.1
83	Monday	20-Jun-06	23:00	46.0	60.8	40.9	56.8	46.3	43.5	42.3
84	Tuesday	20-Jun-06	0:00	45.6	68.4	41.1	56.7	45.0	42.9	42.1
85	Tuesday	20-Jun-06	1:00	43.0	54.9	40.7	47.0	43.9	42.6	41.5
86	Tuesday	20-Jun-06	2:00	42.5	47.0	40.4	46.0	43.8	42.2	41.2
87	Tuesday	20-Jun-06	3:00	42.6	50.4	40.5	46.0	43.8	42.4	41.3
88	Tuesday	20-Jun-06	4:00	44.8	53.8	40.1	51.2	47.3	43.4	42.0
89	Tuesday	20-Jun-06	5:00	46.0	58.5	42.0	52.9	48.0	44.8	43.3
90	Tuesday	20-Jun-06	6:00	49.9	70.5	43.9	59.3	51.8	47.5	45.5

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Table A3-1
Background Study
Measured Sound Levels -- Location CM-1
(End of Glenrose Avenue Near Fore River, Braintree)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time	Leq	Lmax	Lmin	L(1)	L(10)	L(50)	L(90)
			(start)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
91	Tuesday	20-Jun-06	7:00	51.2	65.0	43.4	61.9	53.9	47.8	45.4
92	Tuesday	20-Jun-06	8:00	52.1	67.2	43.1	62.5	55.2	47.9	44.9
93	Tuesday	20-Jun-06	9:00	52.0	61.5	42.0	60.0	56.6	48.4	44.3
94	Tuesday	20-Jun-06	10:00	53.6	76.8	42.3	60.6	56.6	51.4	47.0
95	Tuesday	20-Jun-06	11:00	51.1	66.3	43.0	60.4	53.8	48.6	45.3
96	Tuesday	20-Jun-06	12:00	52.1	66.7	42.7	61.5	55.5	47.9	44.5
97	Tuesday	20-Jun-06	13:00	52.9	67.0	46.1	59.5	56.0	51.3	47.8
98	Tuesday	20-Jun-06	14:00	51.3	67.1	43.6	60.8	54.3	48.4	45.5

Table A3-2
Background Study
Measured Sound Levels -- Location CM-2
(Near Glenrose Avenue and Ferncroft Road, Braintree)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time	Leq	Lmax	Lmin	L(1)	L(10)	L(50)	L(90)
			(start)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)
1	Friday	16-Jun-06	13:00	51.3	65.1	45.6	59.8	53.8	49.4	47.1
2	Friday	16-Jun-06	14:00	52.2	71.7	43.9	62.1	54.6	48.8	46.0
3	Friday	16-Jun-06	15:00	52.0	71.3	43.0	63.4	54.6	47.3	45.2
4	Friday	16-Jun-06	16:00	52.0	67.6	43.3	62.9	54.6	48.1	45.8
5	Friday	16-Jun-06	17:00	54.0	70.3	43.1	62.0	57.5	51.3	46.2
6	Friday	16-Jun-06	18:00	50.1	64.9	40.4	60.7	53.7	45.6	42.3
7	Friday	16-Jun-06	19:00	50.7	72.3	39.8	63.0	51.9	43.5	41.4
8	Friday	16-Jun-06	20:00	46.9	59.0	39.1	55.1	50.6	44.1	40.7
9	Friday	16-Jun-06	21:00	46.3	67.9	39.1	56.8	46.1	41.7	40.3
10	Friday	16-Jun-06	22:00	49.2	68.5	39.6	61.4	49.8	42.8	41.1
11	Friday	16-Jun-06	23:00	46.0	66.9	40.2	56.9	46.5	43.3	41.6
12	Saturday	17-Jun-06	0:00	44.0	56.4	39.7	50.2	45.8	43.3	41.1
13	Saturday	17-Jun-06	1:00	42.5	59.7	39.4	47.6	43.6	41.9	40.5
14	Saturday	17-Jun-06	2:00	44.5	65.3	39.1	54.3	42.8	40.9	40.1
15	Saturday	17-Jun-06	3:00	42.8	54.0	39.3	50.8	43.8	41.9	40.7
16	Saturday	17-Jun-06	4:00	43.9	58.2	39.0	50.0	45.8	42.9	41.2
17	Saturday	17-Jun-06	5:00	46.7	63.4	40.1	55.6	48.8	44.5	42.3
18	Saturday	17-Jun-06	6:00	48.1	64.5	41.1	58.8	49.9	44.7	42.9
19	Saturday	17-Jun-06	7:00	49.4	63.5	40.7	59.2	53.1	45.5	42.4
20	Saturday	17-Jun-06	8:00	48.2	65.5	39.3	60.6	50.0	43.3	41.1
21	Saturday	17-Jun-06	9:00	46.6	60.8	39.7	55.0	49.9	43.9	41.4
22	Saturday	17-Jun-06	10:00	46.6	68.9	38.2	57.3	47.7	42.0	39.6
23	Saturday	17-Jun-06	11:00	49.7	65.8	38.4	59.4	52.3	47.1	42.1
24	Saturday	17-Jun-06	12:00	47.4	69.4	38.7	56.7	48.6	43.9	40.3
25	Saturday	17-Jun-06	13:00	46.5	59.2	39.0	54.4	49.4	44.7	41.9
26	Saturday	17-Jun-06	14:00	48.3	69.7	40.1	60.0	48.7	43.7	41.6
27	Saturday	17-Jun-06	15:00	47.9	63.9	40.0	57.1	50.6	45.2	41.8
28	Saturday	17-Jun-06	16:00	48.9	67.9	39.1	59.5	50.7	44.5	41.2
29	Saturday	17-Jun-06	17:00	46.0	64.9	39.3	54.8	47.8	43.4	41.0
30	Saturday	17-Jun-06	18:00	47.8	64.2	37.7	59.1	50.5	42.9	39.5
31	Saturday	17-Jun-06	19:00	48.0	63.1	39.8	57.3	50.3	45.9	42.7
32	Saturday	17-Jun-06	20:00	46.8	65.1	39.1	57.8	48.3	43.8	40.7
33	Saturday	17-Jun-06	21:00	49.4	69.1	39.1	60.9	52.0	42.3	40.4
34	Saturday	17-Jun-06	22:00	52.2	66.7	40.1	65.5	52.5	43.7	41.4
35	Saturday	17-Jun-06	23:00	43.3	64.6	39.8	48.9	45.0	42.3	41.1
36	Sunday	18-Jun-06	0:00	42.7	69.7	38.6	46.4	43.0	41.0	39.6
37	Sunday	18-Jun-06	1:00	41.9	64.6	37.8	51.9	41.5	39.7	38.5
38	Sunday	18-Jun-06	2:00	38.7	51.2	36.4	43.2	39.6	38.4	37.3
39	Sunday	18-Jun-06	3:00	37.9	60.6	35.4	41.3	38.8	37.4	36.3
40	Sunday	18-Jun-06	4:00	41.1	57.1	35.4	49.6	43.7	39.2	36.5
41	Sunday	18-Jun-06	5:00	46.0	61.9	36.4	57.8	48.5	40.7	38.2
42	Sunday	18-Jun-06	6:00	46.8	63.8	37.7	59.2	49.0	41.3	39.2
43	Sunday	18-Jun-06	7:00	45.9	63.9	38.3	58.6	45.8	41.3	39.6
44	Sunday	18-Jun-06	8:00	45.5	63.6	38.3	56.6	46.9	41.8	40.0
45	Sunday	18-Jun-06	9:00	51.5	74.3	38.2	65.3	49.0	42.3	39.6

Table A3-2
Background Study
Measured Sound Levels -- Location CM-2
(Near Glenrose Avenue and Ferncroft Road, Braintree)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time (start)	Leq (dBA)	Lmax (dBA)	Lmin (dBA)	L(1) (dBA)	L(10) (dBA)	L(50) (dBA)	L(90) (dBA)
46	Sunday	18-Jun-06	10:00	45.0	64.0	37.6	55.8	46.5	41.1	39.0
47	Sunday	18-Jun-06	11:00	45.2	66.6	36.3	55.3	47.3	40.0	38.1
48	Sunday	18-Jun-06	12:00	47.6	64.6	35.7	59.9	49.4	42.1	37.6
49	Sunday	18-Jun-06	13:00	44.9	61.7	35.1	53.8	48.7	41.3	38.0
50	Sunday	18-Jun-06	14:00	49.9	67.4	35.8	63.5	49.5	40.7	38.0
51	Sunday	18-Jun-06	15:00	45.8	64.6	37.0	56.0	48.8	42.0	39.5
52	Sunday	18-Jun-06	16:00	45.6	59.4	36.5	55.0	49.4	41.4	38.5
53	Sunday	18-Jun-06	17:00	47.7	67.9	36.6	60.8	47.9	42.0	39.3
54	Sunday	18-Jun-06	18:00	47.4	61.2	38.9	56.7	51.1	43.6	40.7
55	Sunday	18-Jun-06	19:00	48.2	74.5	38.7	57.3	48.4	43.4	40.4
56	Sunday	18-Jun-06	20:00	49.0	69.4	39.9	61.8	50.8	43.2	41.1
57	Sunday	18-Jun-06	21:00	44.5	69.4	39.5	51.4	44.3	41.7	40.4
58	Sunday	18-Jun-06	22:00	44.2	71.0	39.5	50.4	43.9	41.8	40.4
59	Sunday	18-Jun-06	23:00	42.7	51.5	39.4	47.6	44.6	42.0	40.5
60	Monday	19-Jun-06	0:00	40.7	49.5	37.2	45.3	42.4	40.2	38.5
61	Monday	19-Jun-06	1:00	40.3	51.1	37.6	45.3	41.7	39.7	38.4
62	Monday	19-Jun-06	2:00	40.2	50.4	37.6	44.9	41.6	39.7	38.4
63	Monday	19-Jun-06	3:00	42.0	64.0	37.2	47.7	41.2	39.2	38.0
64	Monday	19-Jun-06	4:00	42.3	55.2	37.2	49.5	45.0	40.6	38.2
65	Monday	19-Jun-06	5:00	45.3	60.1	39.9	54.6	47.4	43.1	41.1
66	Monday	19-Jun-06	6:00	49.4	63.0	42.5	59.7	52.6	45.6	43.8
67	Monday	19-Jun-06	7:00	50.6	67.2	41.9	61.8	53.4	45.5	43.2
68	Monday	19-Jun-06	8:00	48.6	66.2	42.2	59.2	51.2	45.3	43.6
69	Monday	19-Jun-06	9:00	49.2	73.8	41.0	59.6	51.2	44.7	42.5
70	Monday	19-Jun-06	10:00	47.9	66.9	39.8	56.3	50.6	46.0	42.5
71	Monday	19-Jun-06	11:00	48.8	64.9	40.7	59.4	51.0	45.2	43.0
72	Monday	19-Jun-06	12:00	48.0	64.9	41.5	58.0	49.4	45.8	43.6
73	Monday	19-Jun-06	13:00	49.6	69.4	45.0	59.0	50.8	47.3	45.9
74	Monday	19-Jun-06	14:00	48.9	63.8	45.2	57.5	50.1	47.2	46.0
75	Monday	19-Jun-06	15:00	50.0	63.2	45.2	58.4	52.1	48.4	46.3
76	Monday	19-Jun-06	16:00	49.2	64.7	45.3	54.7	51.3	48.3	46.7
77	Monday	19-Jun-06	17:00	49.9	62.9	45.9	58.5	51.6	48.3	47.0
78	Monday	19-Jun-06	18:00	48.6	59.4	46.1	53.5	50.1	47.9	46.8
79	Monday	19-Jun-06	19:00	48.2	57.2	45.8	53.0	49.2	47.7	46.6
80	Monday	19-Jun-06	20:00	49.9	65.3	45.7	59.4	51.4	47.9	47.0
81	Monday	19-Jun-06	21:00	47.3	59.5	44.2	55.5	49.1	45.8	44.7
82	Monday	19-Jun-06	22:00	49.6	65.5	44.0	61.1	50.6	45.4	44.3
83	Monday	19-Jun-06	23:00	46.4	60.5	43.7	55.5	47.1	44.7	44.1
84	Tuesday	20-Jun-06	0:00	45.9	62.6	43.6	55.9	45.0	44.5	44.0
85	Tuesday	20-Jun-06	1:00	45.2	69.9	43.4	49.9	45.0	44.4	43.4
86	Tuesday	20-Jun-06	2:00	45.6	64.1	43.3	50.1	45.3	44.2	43.3
87	Tuesday	20-Jun-06	3:00	44.9	60.0	43.4	49.5	44.9	44.3	43.4
88	Tuesday	20-Jun-06	4:00	45.0	52.2	43.5	48.9	46.2	44.7	44.1
89	Tuesday	20-Jun-06	5:00	46.4	61.5	44.0	51.9	47.4	45.6	44.5
90	Tuesday	20-Jun-06	6:00	50.3	66.8	45.3	60.3	52.0	47.4	46.2

Table A3-2
Background Study
Measured Sound Levels -- Location CM-2
(Near Glenrose Avenue and Ferncroft Road, Braintree)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time (start)	Leq (dBA)	Lmax (dBA)	Lmin (dBA)	L(1) (dBA)	L(10) (dBA)	L(50) (dBA)	L(90) (dBA)
91	Tuesday	20-Jun-06	7:00	52.2	73.3	45.0	63.2	54.9	47.6	46.0
92	Tuesday	20-Jun-06	8:00	51.6	66.8	44.3	61.6	54.5	47.9	45.3
93	Tuesday	20-Jun-06	9:00	49.4	63.1	43.9	59.4	51.6	46.9	45.0
94	Tuesday	20-Jun-06	10:00	50.4	67.1	44.2	60.7	52.5	47.3	45.1
95	Tuesday	20-Jun-06	11:00	50.3	68.3	44.4	60.5	52.2	47.5	45.5
96	Tuesday	20-Jun-06	12:00	50.3	63.9	44.6	60.7	52.1	47.3	45.6
97	Tuesday	20-Jun-06	13:00	49.4	66.0	44.9	60.2	50.4	47.4	45.9
98	Tuesday	20-Jun-06	14:00	48.7	65.5	44.4	58.7	49.9	46.3	45.2

Table A3-3
Background Study
Measured Sound Levels -- Location CM-3
(56 Bluff Road, Weymouth)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time (start)	Leq (dBA)	Lmax (dBA)	Lmin (dBA)	L(1) (dBA)	L(10) (dBA)	L(50) (dBA)	L(90) (dBA)
1	Friday	16-Jun-06	14:00	50.3	73.8	37.1	60.5	52.2	47.2	41.4
2	Friday	16-Jun-06	15:00	53.3	71.8	46.7	63.9	55.5	49.7	47.5
3	Friday	16-Jun-06	16:00	54.6	74.5	46.3	65.1	56.1	50.8	48.4
4	Friday	16-Jun-06	17:00	60.9	80.6	41.8	76.3	57.9	50.3	46.3
5	Friday	16-Jun-06	18:00	54.8	77.5	44.9	62.5	55.0	50.2	47.0
6	Friday	16-Jun-06	19:00	51.9	67.5	45.0	62.8	53.8	48.7	46.4
7	Friday	16-Jun-06	20:00	48.7	60.7	42.7	56.2	50.8	47.6	45.2
8	Friday	16-Jun-06	21:00	47.5	61.8	42.5	56.4	49.1	45.8	44.1
9	Friday	16-Jun-06	22:00	49.7	73.6	41.5	61.2	50.0	45.0	43.3
10	Friday	16-Jun-06	23:00	44.8	59.0	40.7	55.4	45.8	43.0	41.6
11	Saturday	16-Jun-06	0:00	42.0	58.3	39.2	46.0	43.5	41.3	40.0
12	Saturday	17-Jun-06	1:00	41.0	49.9	38.7	44.6	42.3	40.6	39.4
13	Saturday	17-Jun-06	2:00	43.2	61.8	38.8	55.0	41.9	40.6	39.6
14	Saturday	17-Jun-06	3:00	42.0	57.8	38.3	51.1	42.8	40.7	39.5
15	Saturday	17-Jun-06	4:00	42.3	60.6	39.2	48.7	43.4	41.5	40.3
16	Saturday	17-Jun-06	5:00	44.6	64.0	39.5	53.2	46.6	42.5	41.1
17	Saturday	17-Jun-06	6:00	47.5	65.5	39.7	59.9	49.1	43.4	41.2
18	Saturday	17-Jun-06	7:00	48.9	63.1	40.1	60.2	51.7	44.0	41.7
19	Saturday	17-Jun-06	8:00	49.0	65.3	40.5	60.2	51.4	45.3	42.3
20	Saturday	17-Jun-06	9:00	48.0	68.7	42.4	56.2	50.8	45.7	43.6
21	Saturday	17-Jun-06	10:00	49.2	64.6	41.7	57.6	52.6	46.2	43.0
22	Saturday	17-Jun-06	11:00	53.8	72.5	44.3	61.8	57.0	51.0	46.6
23	Saturday	17-Jun-06	12:00	52.3	65.4	44.4	60.5	54.9	50.7	47.6
24	Saturday	17-Jun-06	13:00	53.5	68.0	46.1	59.7	56.3	52.2	49.0
25	Saturday	17-Jun-06	14:00	54.4	64.2	46.8	62.0	56.9	53.0	49.7
26	Saturday	17-Jun-06	15:00	54.1	65.7	49.5	59.9	56.4	53.2	50.7
27	Saturday	17-Jun-06	16:00	56.0	66.9	49.8	62.5	58.2	55.1	52.5
28	Saturday	17-Jun-06	17:00	55.4	65.1	50.2	61.0	57.6	54.7	52.8
29	Saturday	17-Jun-06	18:00	51.7	67.2	44.7	60.6	54.1	49.6	46.8
30	Saturday	17-Jun-06	19:00	53.7	66.4	44.8	61.5	56.9	51.6	48.0
31	Saturday	17-Jun-06	20:00	53.8	66.0	46.9	60.8	56.9	52.3	49.6
32	Saturday	17-Jun-06	21:00	51.5	63.0	44.9	57.7	54.2	50.5	47.3
33	Saturday	17-Jun-06	22:00	54.1	65.8	45.0	63.5	57.0	51.6	48.0
34	Saturday	17-Jun-06	23:00	52.2	71.3	46.3	57.6	54.3	51.4	48.9
35	Sunday	17-Jun-06	0:00	47.8	56.0	41.6	53.3	50.6	46.7	43.8
36	Sunday	18-Jun-06	1:00	43.8	54.6	39.6	50.5	46.0	42.8	41.1
37	Sunday	18-Jun-06	2:00	43.0	50.6	39.0	48.0	45.1	42.2	40.5
38	Sunday	18-Jun-06	3:00	40.5	50.0	38.0	44.0	41.9	40.1	38.8
39	Sunday	18-Jun-06	4:00	40.9	51.3	37.8	46.9	42.8	39.9	38.6
40	Sunday	18-Jun-06	5:00	41.2	61.4	37.8	47.2	43.0	40.0	38.6
41	Sunday	18-Jun-06	6:00	46.7	65.2	38.4	59.1	47.9	42.6	40.4
42	Sunday	18-Jun-06	7:00	46.2	63.1	39.0	58.9	46.3	42.2	40.4
43	Sunday	18-Jun-06	8:00	48.5	64.1	40.1	57.2	50.7	46.5	42.1
44	Sunday	18-Jun-06	9:00	46.6	62.6	38.3	56.5	49.0	44.3	40.8
45	Sunday	18-Jun-06	10:00	44.6	61.3	38.2	52.3	47.5	42.5	39.7

\R:/1831 Braintree Electric Noise\CM3plot, Loc3T

Table A3-3
Background Study
Measured Sound Levels -- Location CM-3
(56 Bluff Road, Weymouth)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time (start)	Leq (dBA)	Lmax (dBA)	Lmin (dBA)	L(1) (dBA)	L(10) (dBA)	L(50) (dBA)	L(90) (dBA)
46	Sunday	18-Jun-06	11:00	48.9	60.5	38.5	58.2	53.9	43.3	40.1
47	Sunday	18-Jun-06	12:00	46.5	63.3	37.6	58.2	49.0	41.8	39.0
48	Sunday	18-Jun-06	13:00	45.6	62.7	38.2	52.8	49.2	43.0	39.8
49	Sunday	18-Jun-06	14:00	53.3	68.5	42.5	62.7	56.7	49.9	45.2
50	Sunday	18-Jun-06	15:00	52.9	64.5	44.5	59.5	56.0	51.8	47.4
51	Sunday	18-Jun-06	16:00	52.8	64.5	43.9	61.2	55.7	51.1	46.4
52	Sunday	18-Jun-06	17:00	55.2	68.7	47.2	63.6	57.3	53.9	50.6
53	Sunday	18-Jun-06	18:00	55.9	70.2	48.7	61.9	58.4	54.9	51.7
54	Sunday	18-Jun-06	19:00	51.4	67.0	45.1	58.4	53.7	50.3	47.6
55	Sunday	18-Jun-06	20:00	51.2	64.6	45.1	60.6	53.5	49.3	47.0
56	Sunday	18-Jun-06	21:00	47.8	59.9	43.7	53.4	49.7	46.9	45.2
57	Sunday	18-Jun-06	22:00	46.4	59.2	42.5	50.7	48.1	45.8	44.2
58	Sunday	18-Jun-06	23:00	48.9	57.7	42.7	55.1	51.8	47.6	44.7
59	Monday	18-Jun-06	0:00	44.9	54.0	41.0	49.8	47.1	44.0	42.2
60	Monday	19-Jun-06	1:00	45.5	57.3	41.5	50.6	47.6	44.9	42.9
61	Monday	19-Jun-06	2:00	44.5	52.4	41.2	48.8	46.3	43.9	42.4
62	Monday	19-Jun-06	3:00	43.6	51.3	40.3	47.5	45.1	43.2	41.8
63	Monday	19-Jun-06	4:00	43.0	59.8	39.6	46.9	44.7	42.4	40.4
64	Monday	19-Jun-06	5:00	45.5	61.9	41.9	51.5	46.8	44.8	43.4
65	Monday	19-Jun-06	6:00	49.6	63.1	43.7	58.7	53.1	46.4	45.1
66	Monday	19-Jun-06	7:00	49.9	66.8	43.9	59.6	53.1	46.7	45.1
67	Monday	19-Jun-06	8:00	49.6	66.3	43.5	59.1	52.4	46.5	45.0
68	Monday	19-Jun-06	9:00	49.4	61.4	44.1	57.0	51.7	47.8	45.9
69	Monday	19-Jun-06	10:00	49.2	59.0	45.0	55.1	51.5	48.4	46.2
70	Monday	19-Jun-06	11:00	52.2	67.5	46.3	58.8	54.3	50.9	49.3
71	Monday	19-Jun-06	12:00	54.9	66.7	45.1	62.3	57.8	53.2	50.5
72	Monday	19-Jun-06	13:00	55.5	66.0	49.0	62.4	58.5	54.1	51.1
73	Monday	19-Jun-06	14:00	57.6	69.1	49.1	65.8	61.2	54.9	51.6
74	Monday	19-Jun-06	15:00	60.9	70.8	52.5	67.4	64.2	59.3	55.4
75	Monday	19-Jun-06	16:00	62.4	73.7	53.5	69.5	65.4	61.0	57.5
76	Monday	19-Jun-06	17:00	60.6	69.8	53.5	66.2	63.2	59.5	56.9
77	Monday	19-Jun-06	18:00	60.1	67.5	54.6	65.3	62.7	59.2	56.8
78	Monday	19-Jun-06	19:00	59.5	69.3	54.0	64.6	61.7	58.9	57.0
79	Monday	19-Jun-06	20:00	58.1	65.8	50.1	62.7	60.4	57.6	54.5
80	Monday	19-Jun-06	21:00	51.5	65.2	44.2	59.6	54.5	49.4	46.6
81	Monday	19-Jun-06	22:00	53.2	66.7	42.7	63.1	57.1	48.0	44.8
82	Monday	19-Jun-06	23:00	53.5	66.0	45.2	60.7	56.6	51.8	48.4
83	Tuesday	19-Jun-06	0:00	50.6	61.1	43.4	56.8	53.1	49.7	46.4
84	Tuesday	20-Jun-06	1:00	49.0	58.5	41.7	54.7	51.7	48.0	45.2
85	Tuesday	20-Jun-06	2:00	48.2	58.7	41.8	55.6	50.9	46.8	43.7
86	Tuesday	20-Jun-06	3:00	46.7	54.4	40.5	52.8	49.8	45.5	42.1
87	Tuesday	20-Jun-06	4:00	46.4	63.7	40.7	56.4	48.1	44.0	41.8
88	Tuesday	20-Jun-06	5:00	45.0	59.4	40.8	51.3	47.0	44.0	42.3
89	Tuesday	20-Jun-06	6:00	49.2	63.4	43.7	59.5	51.5	46.5	44.8
90	Tuesday	20-Jun-06	7:00	51.2	67.3	42.8	62.7	54.1	46.2	44.3

\R:/1831 Braintree Electric Noise\CM3plot, Loc3T

Table A3-3
Background Study
Measured Sound Levels -- Location CM-3
(56 Bluff Road, Weymouth)

Braintree Electric, Braintree, MA
June 16-20, 2006

Hour	Day	Date	Time (start)	Leq (dBA)	Lmax (dBA)	Lmin (dBA)	L(1) (dBA)	L(10) (dBA)	L(50) (dBA)	L(90) (dBA)
91	Tuesday	20-Jun-06	8:00	51.6	66.9	40.0	62.3	55.6	45.3	42.0
92	Tuesday	20-Jun-06	9:00	49.6	66.2	40.6	58.9	52.4	46.2	43.5
93	Tuesday	20-Jun-06	10:00	51.1	66.0	43.9	61.7	53.0	48.4	46.3
94	Tuesday	20-Jun-06	11:00	51.6	67.5	45.4	61.0	53.8	49.1	46.4
95	Tuesday	20-Jun-06	12:00	52.8	72.9	45.5	64.1	53.2	48.6	46.9
96	Tuesday	20-Jun-06	13:00	50.6	64.1	47.5	55.5	51.9	49.9	48.5
97	Tuesday	20-Jun-06	14:00	51.2	65.4	47.8	57.9	52.8	50.3	49.0
98	Tuesday	20-Jun-06	15:00	53.5	66.1	47.7	64.1	56.1	50.2	48.7

\R:/1831 Braintree Electric
Noise\CM3plot, Loc3T

Appendix 4

Meteorological Data at Logan Airport (Station BOS)

TIME	PMSL	ALTM	TMP	DEW	RH	DIR	SPD	CLOUDS
=======	======	======	===	===	===	===	===	=======
DD/HHMM	hPa	inHg	F	F	%	deg	kt	
16/1654	1017.7	30.05	79	55	44	130	7	FEW060
16/1754	1017.4	30.05	78	56	46	130	9	SCT075
16/1854	1017.1	30.04	77	57	50	120	12	SCT075
16/1954	1017	30.03	75	56	51	110	12	SCT075
16/2054	1016.8	30.03	75	58	55	130	9	SCT080
16/2154	1016.7	30.03	73	59	61	130	7	SCT080
16/2254	1016.8	30.03	76	58	54	170	8	FEW080
16/2354	1016.9	30.03	75	58	55	160	6	BKN110
17/0054	1017.1	30.04	74	59	60	180	8	BKN110
17/0154	1017.4	30.05	71	59	66	190	5	FEW110
17/0254	1017.4	30.05	72	58	61	240	7	FEW250
17/0354	1017.4	30.05	74	56	53	270	7	SCT250
17/0454	1017.6	30.05	72	55	55	280	9	FEW250
17/0554	1017.6	30.05	71	54	55	280	9	FEW250
17/0654	1017.6	30.05	70	53	55	290	9	FEW250
17/0754	1017.7	30.06	69	53	57	290	9	FEW250
17/0854	1018.4	30.08	68	52	57	270	8	FEW250
17/0954	1018.7	30.09	69	51	53	260	5	BKN250
17/1054	1019.1	30.1	72	50	46	280	8	BKN250
17/1154	1019.3	30.1	73	52	48	280	7	SCT200
17/1254	1019.3	30.1	75	51	43	270	7	SCT200
17/1354	1019	30.09	78	55	45	170	6	SCT250
17/1454	1018.6	30.08	82	55	40	270	9	FEW180
17/1554	1018	30.06	84	54	36	260	9	SCT250
17/1654	1017.5	30.05	84	53	34	240	10	BKN090
17/1754	1017.3	30.04	84	54	36	240	15	FEW030
17/1854	1017	30.04	83	59	44	260	13	FEW030
17/1954	1017	30.04	83	60	46	230	14	FEW030
17/2054	1016.9	30.03	82	62	51	250	11	FEW050
17/2254		30.04	77	57	50	240	13	BKN065
17/2354	1017.6	30.05	73	54	51	250	14	BKN110
18/0054	1017.5	30.05	71	56	59	240	11	BKN100
18/0154	1017.7	30.06	69	59	70	230	14	BKN070
18/0254	1017.4	30.05	67	61	81	220	9	BKN075
18/0354	1017.2	30.04	67	61	81	230	9	FEW080
18/0454	1016.7	30.03	66	60	81	220	9	SCT200
18/0554	1016.7	30.03	65	60	84	210	9	BKN250
18/0654	1016.5	30.02	64	60	87	200	7	BKN100
18/0754	1016.5	30.02	64	59	84	220	7	FEW065
18/0854	1016.8	30.03	65	59	81	210	6	SCT070
18/0954	1017.1	30.04	64	60	87	190	5	SCT120
18/1054	1017.2	30.04	66	60	81	190	7	FEW150
18/1154	1017.3	30.04	69	61	75	230	7	FEW150
18/1254	1016.9	30.03	74	63	69	220	4	FEW120
18/1354	1016.5	30.02	79	64	60		3	BKN250
18/1454	1016.3	30.01	80	67	64	180	5	SCT250
18/1554	1015.7	29.99	83	68	61	140	7	FEW120
18/1654	1015.1	29.98	85	68	57	130	7	FEW250
18/1754	1014.5	29.96	83	68	61	130	8	FEW050

18/1854	1014	29.95	83	69	63	140	7 FEW050
18/1954	1013.7	29.94	87	69	55		3 FEW060
18/2054	1013.6	29.93	91	69	49	270	7 FEW060
18/2154	1013.1	29.92	87	70	57	200	12 FEW055
18/2254	1013.1	29.92	85	68	57	210	12 FEW055
18/2354	1013.1	29.92	83	68	61	210	10 FEW055
19/0054	1013.2	29.92	80	67	64	190	7 FEW250
19/0154	1013.6	29.93	78	66	66	210	8 FEW250
19/0254	1013.3	29.93	75	66	74	180	5 FEW250
19/0354	1013.2	29.92	75	66	74	230	6 FEW250
19/0454	1013	29.92	74	66	76	220	5 FEW250
19/0554	1012.8	29.91	74	65	73	220	7 CLR
19/0654	1012.6	29.91	72	65	79	200	6 FEW250
19/0754	1012.6	29.9	73	65	76	230	9 FEW250
19/0854	1012.7	29.91	73	65	76	230	8 FEW250
19/0954	1012.8	29.91	74	65	73	240	7 FEW250
19/1054	1012.8	29.91	76	66	71	250	6 FEW250
19/1154	1012.7	29.91	79	66	65	240	6 FEW250
19/1254	1012.4	29.9	82	67	60	230	9 FEW250
19/1354	1011.7	29.88	86	68	55	250	8 SCT250
19/1454	1011.2	29.86	89	68	50	210	7 SCT250
19/1554	1010.9	29.85	91	67	45	240	13 FEW050
19/1654	1010.2	29.83	91	67	45	210	15 FEW050
19/1754	1009.7	29.82	92	65	41	220	14 FEW050
19/1854	1009.2	29.8	90	63	41	210	13 FEW050
19/1954	1008.6	29.79	90	64	42	220	15 BKN250
19/2054	1008.3	29.78	88	61	40	210	20 BKN220
19/2054	1008.3	29.78	88	61	40	210	20 BKN220
19/2154	1008.2	29.78	85	61	45	210	17 BKN220
19/2254	1008.6	29.79	83	64	53	220	13 SCT150
19/2354	1009	29.8	80	65	60	210	13 FEW090
20/0054	1009.7	29.82	79	64	60	230	13 SCT120
20/0154	1010	29.83	78	64	62	230	13 BKN065
20/0254	1009.9	29.82	76	64	67	220	12 SCT070
20/0354	1009.6	29.82	75	63	66	220	14 SCT070
20/0454	1009.5	29.81	73	63	71	230	11 BKN110
20/0554	1009.5	29.81	73	63	71	230	11 BKN080
20/0654	1009.4	29.81	71	64	78	220	10 BKN075
20/0754	1009.6	29.82	71	63	76	240	8 BKN090
20/0854	1009.7	29.82	70	63	78	230	7 OVC100
20/0954	1010.1	29.83	70	64	81	220	6 FEW070
20/1054	1010.4	29.84	70	64	81	220	5 SCT110
20/1154		29.84	73	64	73	270	5 FEW110
20/1254	1010.1	29.83	75	65	71	230	4 FEW200
20/1354	1010	29.83	77	63	62	220	5 FEW250
20/1454	1009.9	29.82	79	65	62	130	7 FEW250
20/1554	1009.8	29.82	80	65	60	130	7 FEW035
20/1654	1009.1	29.8	80	67	64	120	10 FEW040
20/1754	1008.6	29.79	80	66	62	130	9 SCT060
20/1854		29.77	81	66	62	100	7 SCT070

GEP Building Dimensions
Thomas Watson Generating Station

Building	BPIP Model	Building Height (ft)	Building Width (ft)	Building Length (ft)
Boiler Building	Tier A	22	46	82
Boiler Building	Tier B	22	82	118
Boiler Building	Tier C	81	79	82
Boiler Building	Tier D	58	52	79
Boiler Building	Tier E	22	56	82
Admin Building	Tier G	15	98	164
ACC	Tier F	37	52	105
Air Intake	North Intake	50	20	21
Air Intake	South Intake	50	20	21

Visual Effects Screening Analysis for
Source: BELD
Class I Area: Lye Brook

*** Level-1 Screening ***

Input Emissions for

Particulates	3.80	G /S
NOx (as NO2)	2.60	G /S
Primary NO2	.00	G /S
Soot	.00	G /S
Primary SO4	.00	G /S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	40.00 km
Source-Observer Distance:	188.00 km
Min. Source-Class I Distance:	188.00 km
Max. Source-Class I Distance:	188.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	84.	188.0	84.	2.00	.008	.05	.000
SKY	140.	84.	188.0	84.	2.00	.001	.05	.000
TERRAIN	10.	84.	188.0	84.	2.00	.000	.05	.000
TERRAIN	140.	84.	188.0	84.	2.00	.000	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	75.	182.0	94.	2.00	.009	.05	.000
SKY	140.	75.	182.0	94.	2.00	.001	.05	.000
TERRAIN	10.	60.	171.9	109.	2.00	.001	.05	.000
TERRAIN	140.	60.	171.9	109.	2.00	.000	.05	.000

```
"BELD                          "
"Lye Brook                     "
    1    1
     3.800     2.600      .000      .000      .000
   188.000   188.000   188.000    40.000
    1     1.500    3
    1     2.500    8
    1     2.500    6
    1     2.000    1
    1     1.500    4
    1      .040     1.000    6
    1    11.250
 34
  1 0     5.0  163.8   58.6  131.1  155.8  .16   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
  2 0    10.0  158.8   90.1  101.2  133.9  .22   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
  3 0    15.0  153.8  110.0   82.9  118.2  .28   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
  4 0    20.0  148.8  123.9   70.7  106.5  .33   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
  5 0    25.0  143.8  134.4   62.0   97.6  .39   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
  6 0    30.0  138.8  142.6   55.6   90.7  .43   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
  7 0    35.0  133.8  149.3   50.8   85.3  .48   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
  8 0    40.0  128.8  155.0   47.0   81.1  .52   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
  9 0    45.0  123.8  159.9   44.1   77.9  .56   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 10 0    50.0  118.8  164.3   41.8   75.4  .59   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 11 0    55.0  113.8  168.2   40.1   73.7  .62   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 12 0    60.0  108.8  171.9   38.7   72.6  .64   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 13 0    65.0  103.8  175.4   37.8   72.0  .66   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 14 0    70.0   98.8  178.7   37.1   72.0  .67   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 15 0    75.0   93.8  182.0   36.8   72.6  .68   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 16 0    80.0   88.8  185.2   36.7   73.7  .68   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 17 0    85.0   83.8  188.4   36.9   75.4  .68   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 18 0    90.0   78.8  191.7   37.4   77.9  .67   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 19 0    95.0   73.8  195.1   38.2   81.1  .66   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 20 0   100.0   68.8  198.7   39.4   85.3  .64   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 21 0   105.0   63.8  202.5   40.9   90.7  .62   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 22 0   110.0   58.8  206.6   42.9   97.6  .59   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
```

```
 23 0   115.0   53.8  211.3   45.5  106.5  .56   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 24 0   120.0   48.8  216.6   48.8  118.2  .52   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 25 0   125.0   43.8  222.7   53.0  133.9  .48   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 26 0   130.0   38.8  230.1   58.6  155.8  .44   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 27 0   135.0   33.8  239.3   66.0  188.0  .39   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 28 0   140.0   28.8  251.2   76.3  239.3  .34   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 29 0   145.0   23.8  267.7   91.1  332.4  .29   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 30 0   150.0   18.8  292.4  114.1  551.2  .23   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 31 0   155.0   13.8  334.3  154.3  999.0  .17   .050   2.00    .00   2.00
.00   2.00    .00   2.00    .00
 32 0      .1  168.7    1.0  187.0  187.5  .02  2.529  97.42    .00  31.85
.00  97.42    .00  31.85    .00
 33 1    84.4   84.4  188.0   36.9   75.2  .68   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 34 1    84.4   84.4  188.0   36.9   75.2  .68   .050   2.00    .01   2.00
.00   2.00    .00   2.00    .00
 34
  1 0   5.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  2 0  10.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  3 0  15.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  4 0  20.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  5 0  25.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  6 0  30.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  7 0  35.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  8 0  40.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
  9 0  45.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
 10 0  50.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
 11 0  55.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
 12 0  60.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
 13 0  65.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
 14 0  70.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
 15 0  75.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
 16 0  80.000   .050   .000   .000   .000   .000   .000   .000   .000   .000
.000   .000   .000   .000
```

17	0	85.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
18	0	90.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
19	0	95.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
20	0	100.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
21	0	105.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
22	0	110.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
23	0	115.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
24	0	120.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
25	0	125.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
26	0	130.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
27	0	135.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
28	0	140.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
29	0	145.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
30	0	150.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
31	0	155.000	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
32	0	.060	2.529	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
33	1	84.375	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
34	1	84.375	.050	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Figure 1-1
Project Site Area

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: Windows Live Local, 2006

Epsilon Associates Inc.

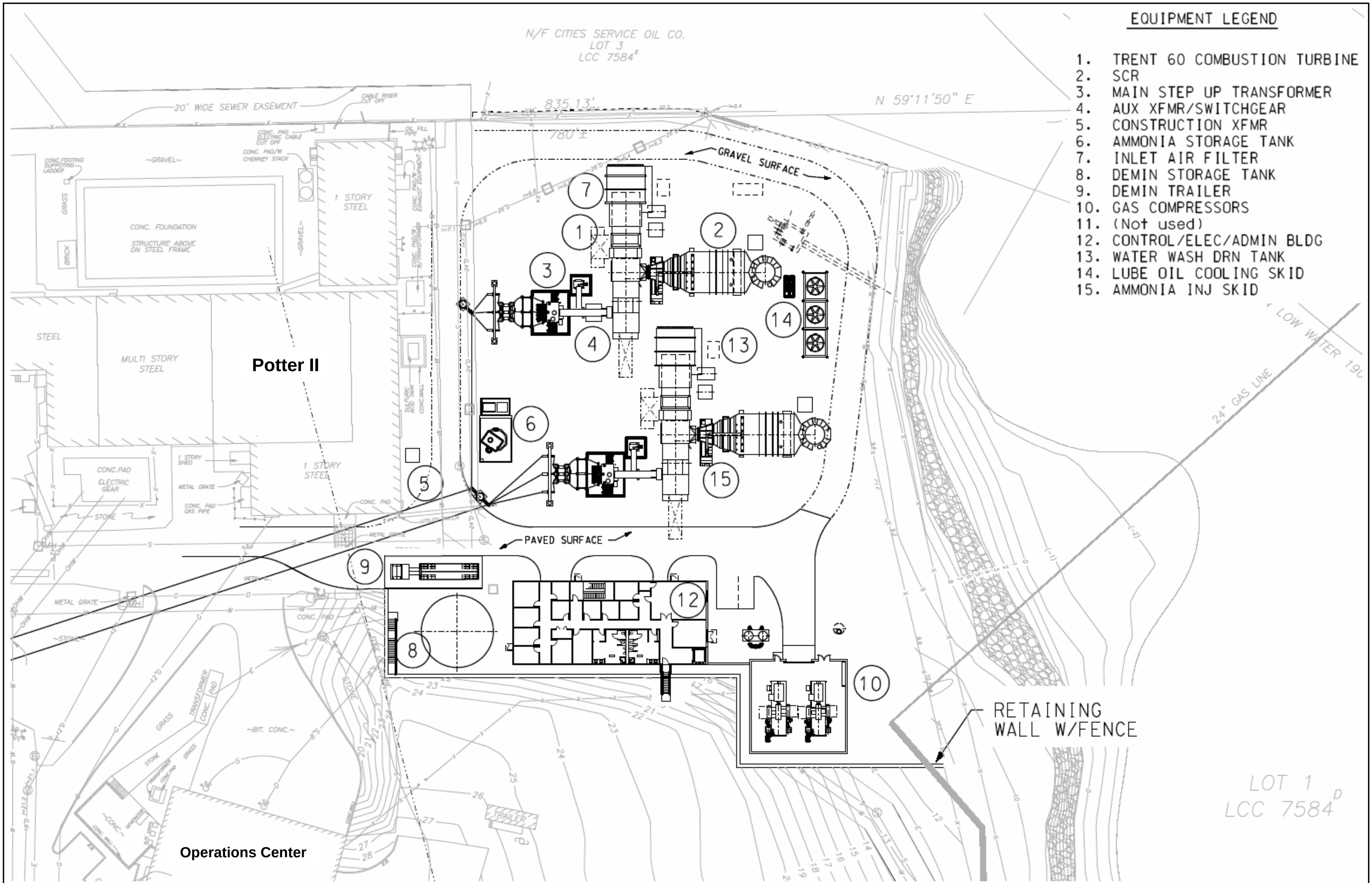


Figure 2-1
General Equipment Arrangement

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: C2HMHill

Epsilon Associates Inc.

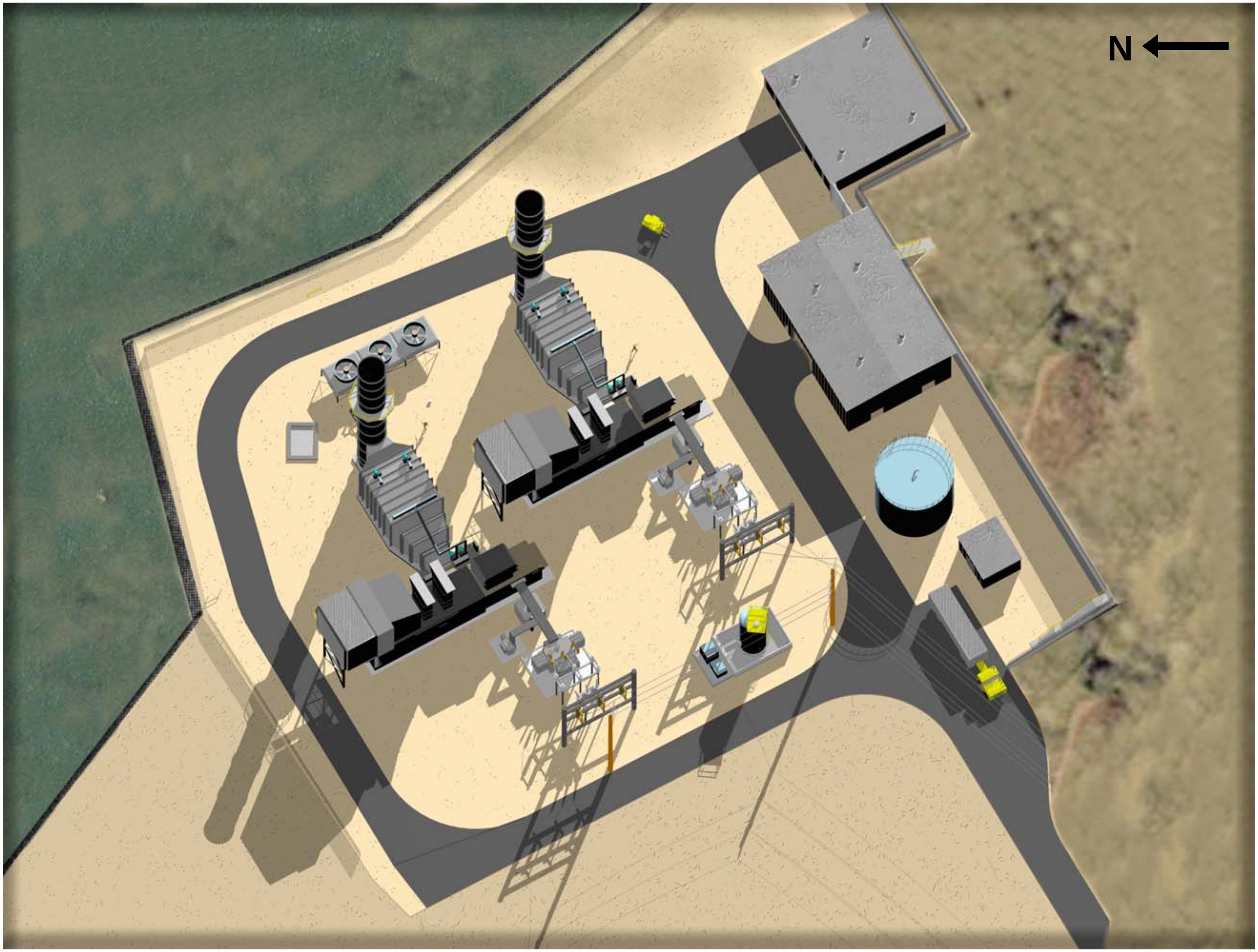


Figure 2-2
Rolls Royce Trent 60 WLE Rendering

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: C2HMHill

Epsilon ASSOCIATES INC.

Figure 2-3
Rolls Royce Trent 60 WLE Rendering – View from BELD Offices/Parking Lot
Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: C2HMHill

Epsilon ASSOCIATES INC.

Figure 2-4

Rolls Royce Trent 60 WLE Rendering – View from Weymouth

Source: C2HMHill

Thomas A. Watson Generating Station

Braintree, Massachusetts

Epsilon ASSOCIATES INC.

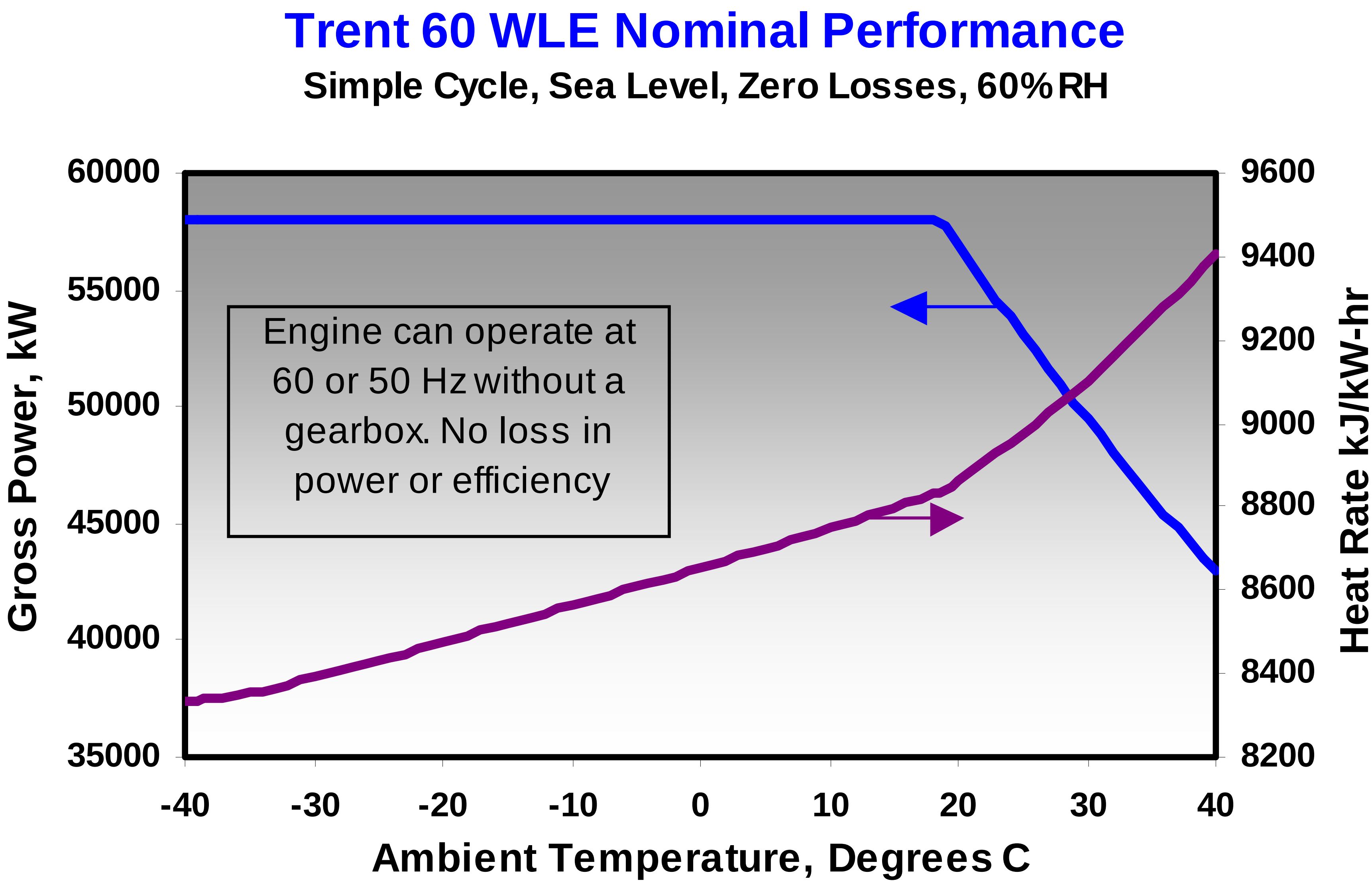


Figure 2-5
Performance Curve Trent 60 (Gas and Oil)
Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: Rolls-Royce

Epsilon ASSOCIATES INC.

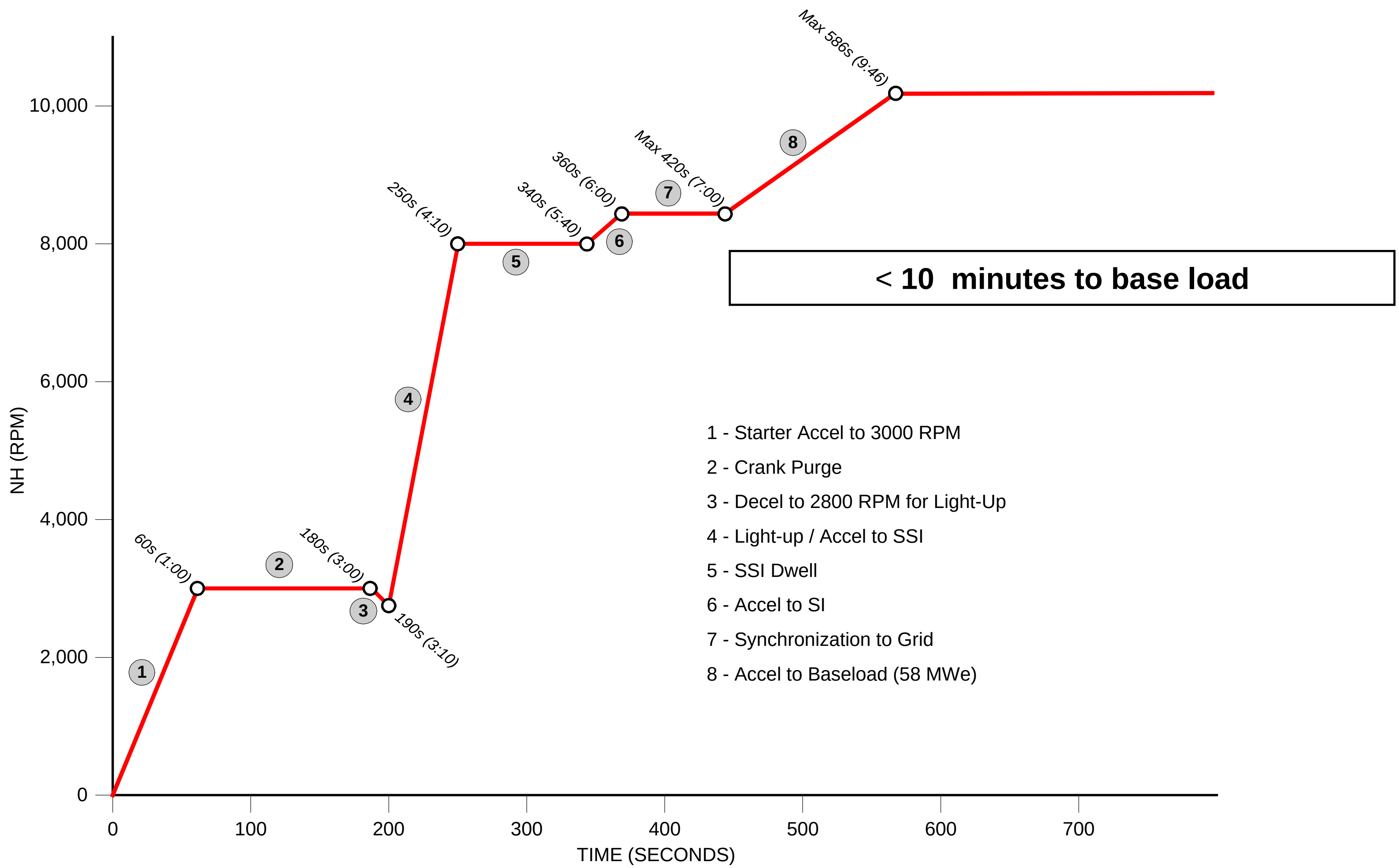


Figure 2-6
Start-up Sequence

Source: Rolls-Royce

Thomas A. Watson Generating Station
Braintree, Massachusetts

Epsilon Associates Inc.

Figure 2-7
Photo of Gas Turbine Enclosure

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: Rolls-Royce

Epsilon
ASSOCIATES INC.

Trent 60 GenSet - Package

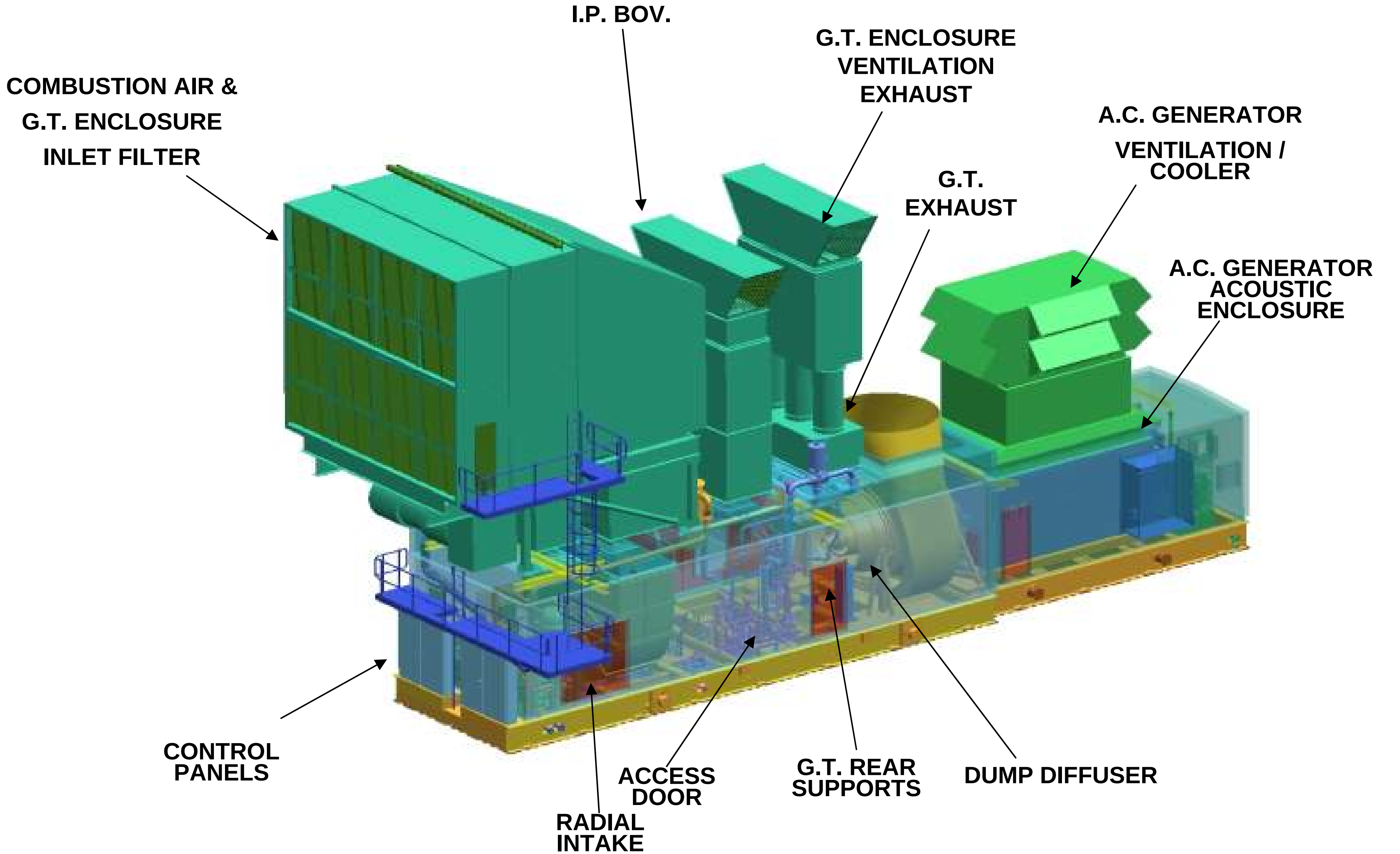


Figure 2-8
Inlet Filter

Source: Rolls-Royce

Thomas A. Watson Generating Station
Braintree, Massachusetts

Epsilon ASSOCIATES INC.

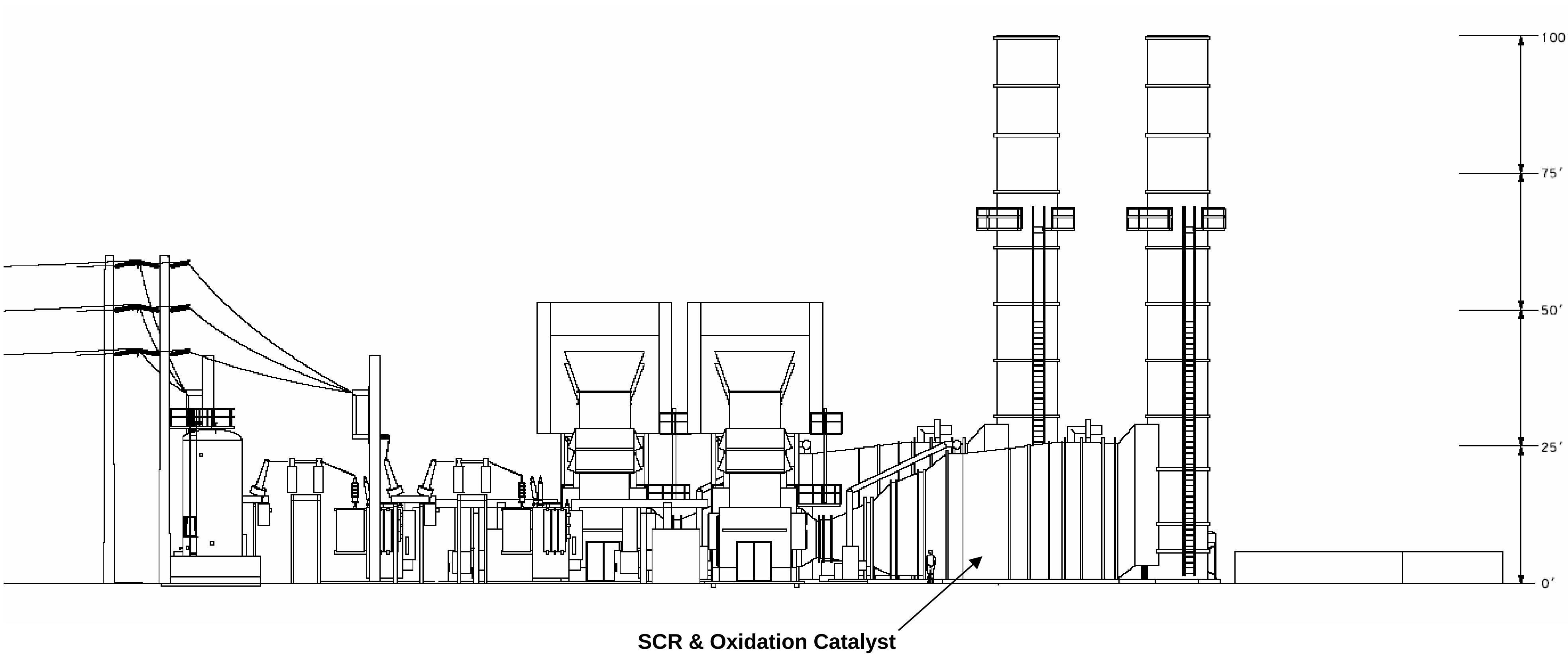
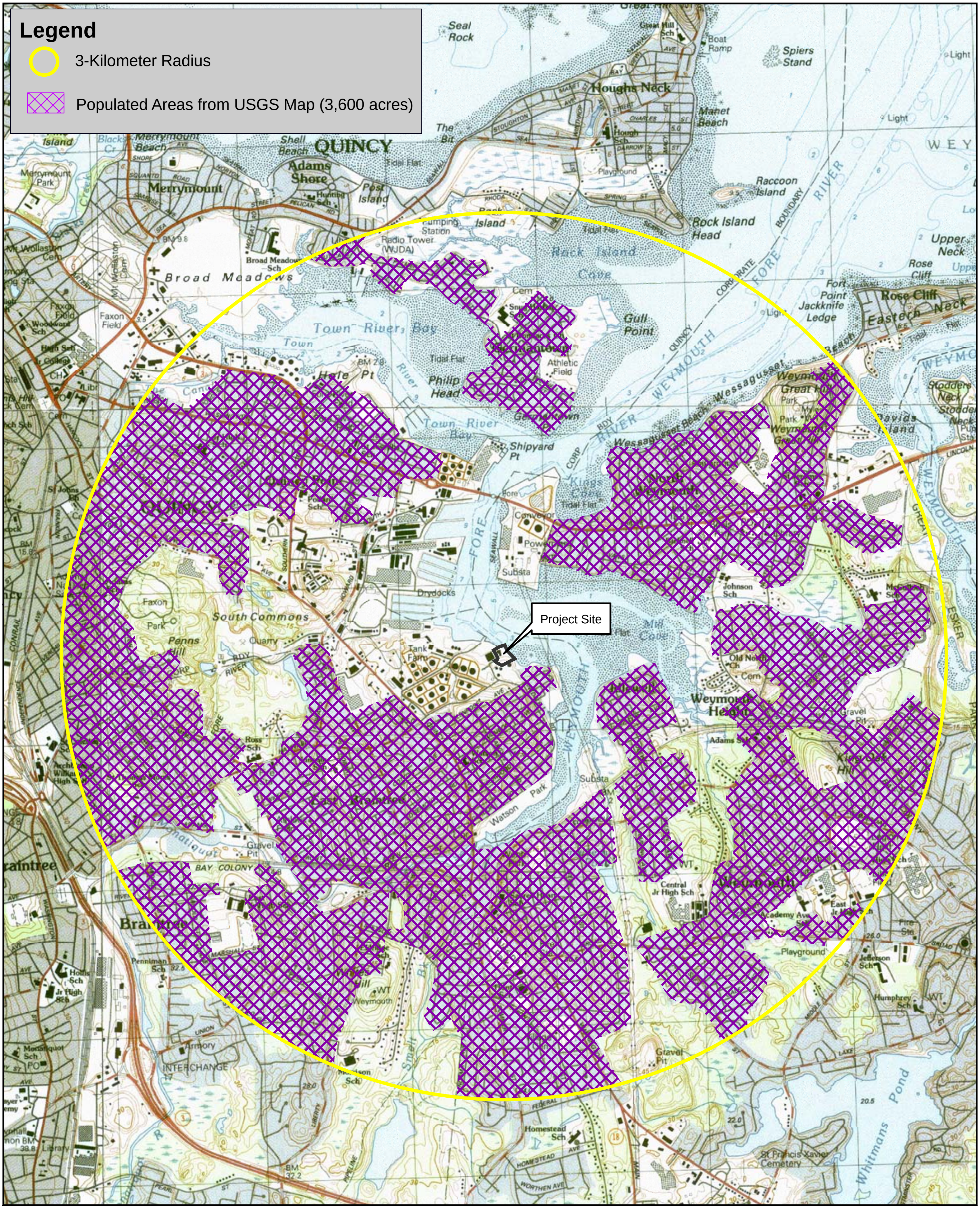


Figure 2-9
SCR System and Oxidation Catalyst

Thomas A. Watson Generating Station
Braintree, Massachusetts

Source: CH2MHILL

Epsilon ASSOCIATES INC.



Scale 1:33,000
1 inch = 2,750 feet
0 1,500 3,000
Feet

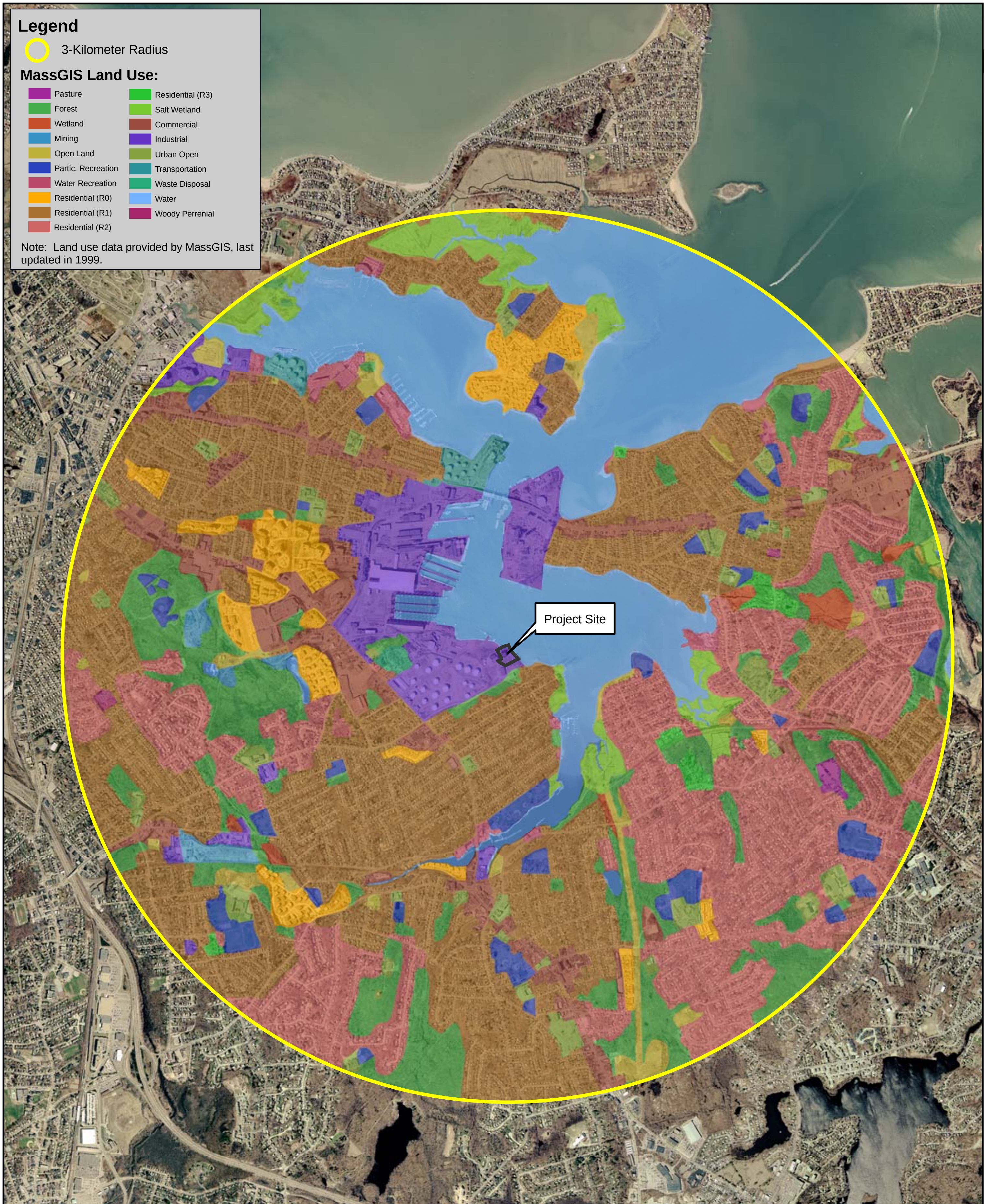
Figure 5-1
Land Use Evaluation within 3 km of the Site
Thomas A. Watson Generating Station
Braintree, Massachusetts

Basemap: 1984 USGS Quadrangles

Epsilon
ASSOCIATES INC.

\\Gis\system\Projects2\MA\Braintree\Braintree_Electric\Air\AirPlan_Figures\Fig5-1_land_use.mxd

5/3/07



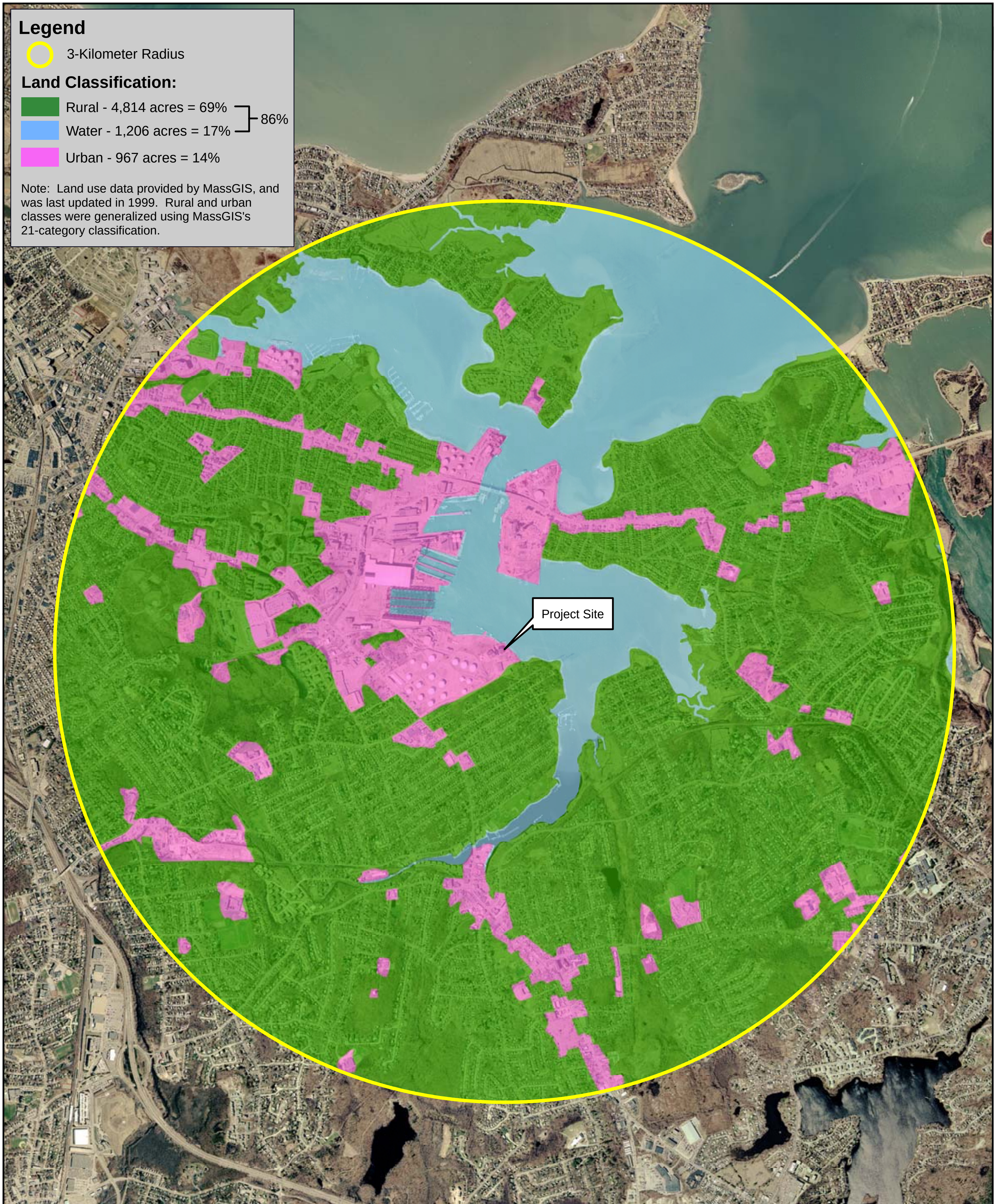
Scale 1:33,000
1 inch = 2,750 feet
0 1,500 3,000 Feet

Figure 5-2
MassGIS Land Use Classes

Thomas A. Watson Generating Station
Braintree, Massachusetts

Basemap: 2001 MassGIS Orthophotography

Epsilon ASSOCIATES INC.



Scale 1:33,000
1 inch = 2,750 feet

0 1,500 3,000 Feet

N W E S

Figure 5-3
Refined MassGIS Land Use Analysis within 3 km of the Site

Thomas A. Watson Generating Station
Braintree, Massachusetts

Basemap: 2001 MassGIS Orthophotography

Epsilon ASSOCIATES INC.

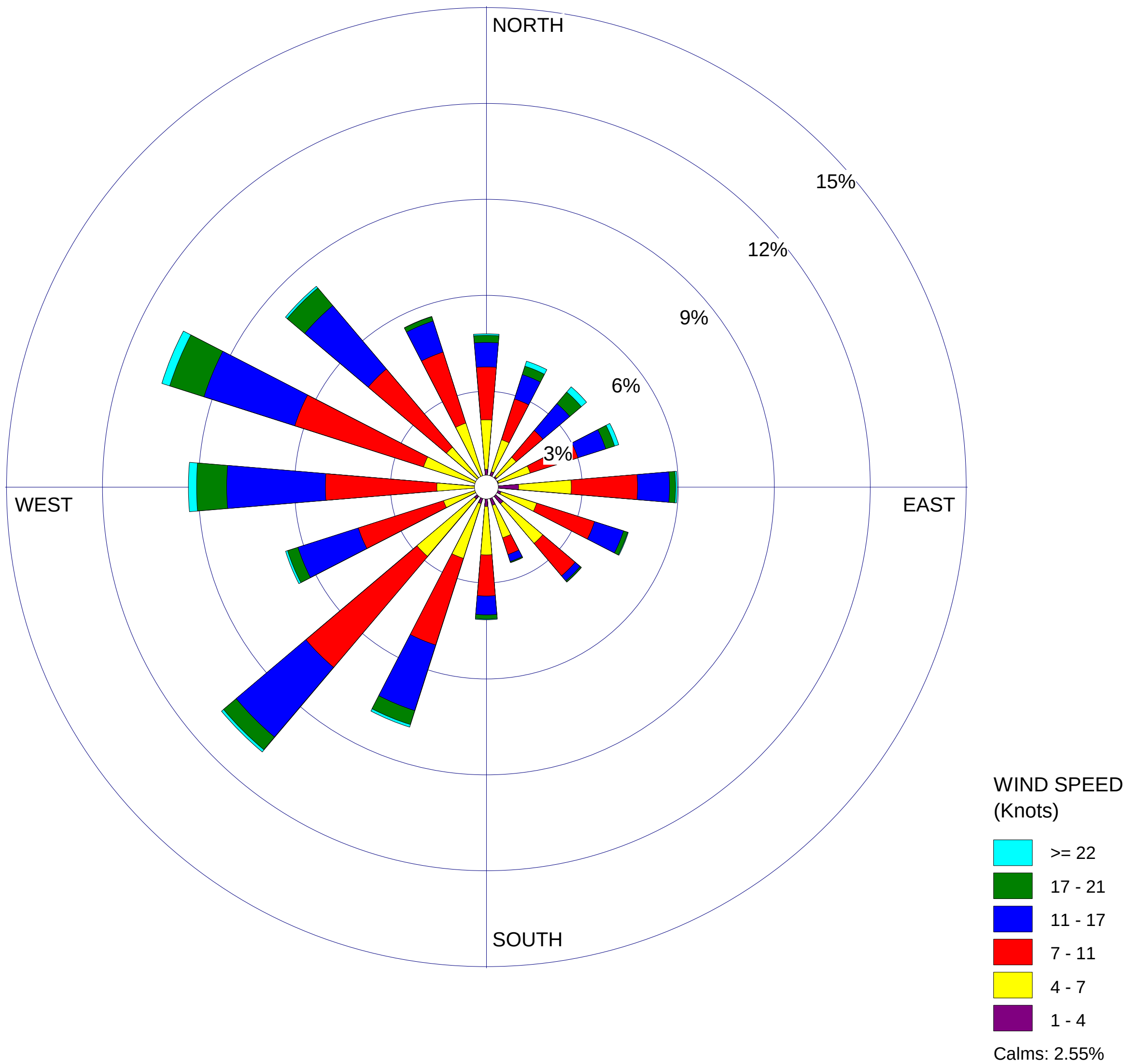
\\Gis\system\Projects2\MA\Braintree\Braintree_Electric\Air\AirPlan_Figures\Fig5-3_land_use_refined.mxd 5/3/07

WIND ROSE PLOT:

Five Year Composite Windrose (2001 to 2005)
Boston, MA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Composite Annual Windrose
from Boston, MA

Figure 5-4

COMPANY NAME:

MODELER:

Epsilon ASSOCIATES INC.

CALM WINDS:

2.55%

TOTAL COUNT:

42586 hrs.

AVG. WIND SPEED:

9.70 Knots

DATE:

5/3/2007

PROJECT NO.:

1831 BELD

Scale 1:4,200
1 inch = 350 feet
0 175 350 Feet

Figure 6-1
Offsite Consequence Analysis

Thomas A. Watson Generating Station
Braintree Electric - Braintree, Massachusetts

Basemap: 2001 Orthophotography, MassGIS

Epsilon ASSOCIATES INC.

\\Gis\system\Projects2\MA\Braintree\Braintree_Electric\Air\AirPlan_Figures\Fig6-1_offsite_analysis.mxd 2/5/07