

STATE OF MISSOURI



DEPARTMENT OF NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: 092016-012 Project Number: 2015-09-043
Installation Number: 510-0204

Parent Company: BJC Healthcare

Parent Company Address: 8300 Eager Road, Mailstop 90-75-582, St. Louis, MO 63144

Installation Name: Barnes-Jewish Hospital, St. Louis

Installation Address: One Barnes-Jewish Hospital Plaza, St. Louis, MO 63110

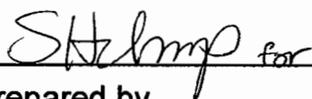
Location Information: City of St. Louis

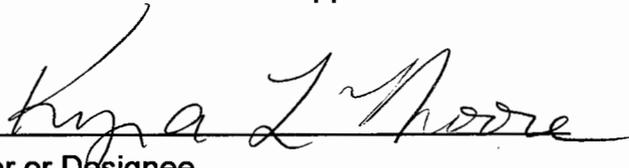
Application for Authority to Construct was made for:

The installation of dual-fired boilers, diesel emergency generators, fuel storage tanks, ethylene oxide sterilizers, cooling towers, and miscellaneous natural gas combustion equipment. This review was conducted in accordance with Section (6) of Missouri State Rule 10 CSR 10-6.060 *Construction Permits Required*.

Standard Conditions (on reverse) are applicable to this permit.

Standard Conditions (on reverse) and Special Conditions are applicable to this permit.


Prepared by
Alana Hess
New Source Review Unit


Director or Designee
Department of Natural Resources
SEP 21 2016

Effective Date

STANDARD CONDITIONS:

Permission to construct may be revoked if you fail to begin construction or modification within two years from the effective date of this permit. Permittee should notify the Enforcement and Compliance Section of the Air Pollution Control Program if construction or modification is not started within two years after the effective date of this permit, or if construction or modification is suspended for one year or more.

You will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devices shall be operated and maintained as specified in the application, associated plans and specifications.

You must notify the Enforcement and Compliance Section of the Department's Air Pollution Control Program of the anticipated date of start up of this (these) air contaminant source(s). The information must be made available within 30 days of actual startup. Also, you must notify the Department's St. Louis Regional Office within 15 days after the actual start up of this (these) air contaminant source(s).

A copy of the permit application and this permit and permit review shall be kept at the installation address and shall be made available to Department's personnel upon request.

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If you choose to appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If you choose not to appeal, this certificate, the project review and your application and associated correspondence constitutes your permit to construct. The permit allows you to construct and operate your air contaminant source(s), but in no way relieves you of your obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources and other applicable federal, state and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit using the contact information below.

Contact Information:
Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102-0176
(573) 751-4817

The regional office information can be found at the following website:
<http://dnr.mo.gov/regions/>

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060(12)(A)10. "Conditions required by permitting authority."

Barnes-Jewish Hospital, St. Louis
City of St. Louis

1. Superseding Condition
 - A. The conditions of this permit supersede all special conditions found in Construction Permits 98-07-044T, 99-11-076, 00-04-020, 01-02-006, 01-05-008, 01-02-006A, 01-12-038, and 01-12-038A previously issued by the City of St. Louis' Division of Air Pollution Control.
 - B. The conditions of this permit supersede all special conditions found in Construction Permit 022013-004 previously issued by the Air Pollution Control Program.

2. NO_x Emission Limitation #1
 - A. Barnes-Jewish Hospital, St. Louis shall emit less than 40.0 tons of NO_x in any consecutive 12-month rolling period from the emission sources identified in Table 1.

Table 1: Project #5 NO_x Emission Sources

Emission Source	Description	Location
EP-11A	Boiler #7 – 44 MMBtu/hr natural gas or fuel oil #2	Power Plant
EP-11B	Boiler #8 – 44 MMBtu/hr natural gas or fuel oil #2	
EP-11C	Boiler #9 – 44 MMBtu/hr natural gas or fuel oil #2	
EP-10	Emergency Generator #2 – 1550 HP diesel	Clayton Avenue Building
EP-13C	Emergency Generator #3 – 940 HP diesel	St. Louis Children's Hospital

- B. Barnes-Jewish Hospital, St. Louis shall maintain records of monthly and 12-month rolling total NO_x emissions from the emission sources identified in Table 1 using Attachment A or an equivalent form, such as an electronic form, approved by the Air Pollution Control Program.

3. NO_x Emission Limitation #2
 - A. Barnes-Jewish Hospital, St. Louis shall emit less than 40.0 tons of NO_x in any consecutive 12-month rolling period from the emission sources identified in Table 2.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

Table 2: Project #7 NO_x Emission Sources

Emission Source	Description	Location
EP-12	Boiler #10 – 72.98 MMBtu/hr natural gas or fuel oil #2	Power Plant
EP-05	Emergency Generator #20 – 749 HP diesel	Queeney Tower
EP-14A	Emergency Generator #1 – 1662 HP diesel	Southwest Tower
EP-14B	Emergency Generator #2 – 1662 HP diesel	
EP-14C	Emergency Generator #3 – 1662 HP diesel	
EP-08A	Emergency Generator #1 – 1482 HP diesel	Center for Advanced Medicine
EP-08B	Emergency Generator #2 – 1482 HP diesel	
EP-08C	Emergency Generator #3 – 1482 HP diesel	
EP-08D	Emergency Generator #4 – 1482 HP diesel	
EP-02A	Emergency Generator #1 – 764 HP diesel	East Pavilion
EP-02B	Emergency Generator #2 – 764 HP diesel	
EP-02C	Emergency Generator #3 – 764 HP diesel	
EP-02D	Emergency Generator #4 – 764 HP diesel	
EP-27	Boiler – 1 MMBtu/hr natural gas	Barnes Lodge
EP-28B	Water Heater #2 – 0.2 MMBtu/hr natural gas	
EP-15	Emergency Generator – 480 HP diesel	Goldfarb College of Nursing
EP-19A	Boiler #1 – 2 MMBtu/hr natural gas	
EP-19B	Boiler #2 – 2 MMBtu/hr natural gas	
EP-19C	Boiler #3 – 2 MMBtu/hr natural gas	
EP-20A	Water Heater – 0.2 MMBtu/hr natural gas	
EP-20B	Water Heater – 0.2 MMBtu/hr natural gas	

- B. Barnes-Jewish Hospital, St. Louis shall maintain records of monthly and 12-month rolling total NO_x emissions from the emission sources identified in Table 2 using Attachment B or an equivalent form, such as an electronic form, approved by the Air Pollution Control Program.
- 4. Ethylene Oxide (CAS #75-21-8) Emission Limitation #1
 - A. Barnes-Jewish Hospital, St. Louis shall emit less than 0.1 tons of Ethylene Oxide (75-21-8) emissions from EP-17A and EP-17B Ethylene Oxide Sterilizers in any consecutive 12-month rolling period.
 - B. Barnes-Jewish Hospital, St. Louis shall maintain records of monthly and 12-month rolling total Ethylene Oxide emissions from EP-17A and EP-17B using Attachment C or an equivalent form, such as an electronic form, approved by the Air Pollution Control Program.
- 5. Ethylene Oxide (CAS #75-21-8) Emission Limitation #2
 - A. Barnes-Jewish Hospital, St. Louis shall emit less than 0.1 tons of Ethylene Oxide (75-21-8) emissions from EP-17C and EP-17D Ethylene Oxide Sterilizers in any consecutive 12-month rolling period.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

- B. Barnes-Jewish Hospital, St. Louis shall maintain records of monthly and 12-month rolling total Ethylene Oxide emissions from EP-17C and EP-17D using Attachment D or an equivalent form, such as an electronic form, approved by the Air Pollution Control Program.
6. Emergency Generator Requirements
- A. The engines identified in Table 3 shall meet the definition of *emergency stationary RICE* at §63.6675.

Table 3: Engines required to meet the definition of *emergency stationary RICE* in 40 CFR Part 63, Subpart ZZZZ

Emission Source	Description	Location
EP-03A	Emergency Generator #7 – 760 HP diesel	West Pavilion
EP-03B	Emergency Generator #8 – 760 HP diesel	
EP-03C	Emergency Generator #9 – 760 HP diesel	
EP-03D	Emergency Generator #10 – 760 HP diesel	
EP-03E	Emergency Generator #11 – 760 HP diesel	
EP-13A	Emergency Generator #1 – 1,135 HP diesel	St. Louis Children's Hospital
EP-13B	Emergency Generator #2 – 1,135 HP diesel	
EP-13C	Emergency Generator #3 – 940 HP diesel	
EP-13D	Emergency Generator #4 – 1,135 HP diesel	
EP-13E	Emergency Generator #5 – 1,135 HP diesel	
EP-13F	Emergency Generator #6 – 1,135 HP diesel	Queeny Tower
EP-04	Emergency Generator #12 – 685 HP diesel	
EP-05	Emergency Generator #20 – 749 HP diesel	
EP-06	Emergency Generator #13 – 600 HP diesel	South Parking Garage
EP-09	Emergency Generator #1 – 890 HP diesel	Clayton Avenue Building
EP-10	Emergency Generator #2 – 1,550 HP diesel	
EP-14A	Emergency Generator #1 – 1,662 HP diesel	Southwest Tower
EP-14B	Emergency Generator #2 – 1,662 HP diesel	
EP-14C	Emergency Generator #3 – 1,662 HP diesel	
EP-08A	Emergency Generator #1 – 1,482 HP diesel	Center for Advanced Medicine
EP-08B	Emergency Generator #2 – 1,482 HP diesel	
EP-08C	Emergency Generator #3 – 1,482 HP diesel	
EP-08D	Emergency Generator #4 – 1,482 HP diesel	
EP-02A	Emergency Generator #1 – 764 HP diesel	East Pavilion
EP-02B	Emergency Generator #2 – 764 HP diesel	
EP-02C	Emergency Generator #3 – 764 HP diesel	
EP-02D	Emergency Generator #4 – 764 HP diesel	

- B. The engines identified in Table 4 shall meet the definition of *emergency stationary internal combustion engine* at §60.4219.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

Table 4: Engines required to meet the definition of *emergency stationary internal combustion engine* in 40 CFR Part 60, Subpart IIII

Emission Source	Description	Location
EP-15	Emergency Generator – 300 kW diesel	Goldfarb College of Nursing
EP-34	Emergency Generator – 2,710 kW diesel	IOH
EP-16	Emergency Generator – 516 kW diesel	Center for Outpatient Health
EP-31	Emergency Generator #1 – 177 kW diesel	Duncan Central Garage

7. Boiler Requirements

A. The existing dual-fuel fired boilers identified in Table 5 shall meet the definition of *gas-fired boiler* at §63.11237.

Table 5: Existing dual-fuel fired boilers required to meet the definition of *gas-fired boiler* in 40 CFR Part 63, Subpart JJJJJJ

Emission Source	Description	Location
EP-01A	Boiler #2 – 25.106 MMBtu/hr natural gas or fuel oil #2	East Pavilion
EP-01B	Boiler #3 – 25.106 MMBtu/hr natural gas or fuel oil #2	
EP-01C	Boiler #4 – 25.106 MMBtu/hr natural gas or fuel oil #2	
EP-11A	Boiler #7 – 44 MMBtu/hr natural gas or fuel oil #2	Power Plant
EP-11B	Boiler #8 – 44 MMBtu/hr natural gas or fuel oil #2	
EP-11C	Boiler #9 – 44 MMBtu/hr natural gas or fuel oil #2	
EP-12	Boiler #10 – 72.98 MMBtu/hr natural gas or 70.11 MMBtu/hr fuel oil #2	

- B. The boilers identified in Table 6 shall be equipped with low NO_x burners.
- 1) The low NO_x burners shall be operated and maintained in accordance with the manufacturer’s specifications.
 - 2) Barnes-Jewish Hospital, St. Louis shall maintain a copy of the manufacturer’s specifications for the low NO_x burners on site.
 - 3) Barnes-Jewish Hospital, St. Louis shall maintain an operating and maintenance log for the low NO_x burner which shall include the following:
 - a) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
 - b) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

Table 6: Boilers required to be equipped with low NO_x burners

Emission Source	Description	Location
EP-12	Boiler #10 – 72.98 MMBtu/hr natural gas or 70.11 MMBtu/hr fuel oil #2	Power Plant
EP-29A	Boiler #1 – 3 MMBtu/hr natural gas	Center for Outpatient Health
EP-29B	Boiler #2 – 3 MMBtu/hr natural gas	
EP-29C	Boiler #3 – 3 MMBtu/hr natural gas	
EP-29D	Boiler #4 – 3 MMBtu/hr natural gas	
EP-29E	Boiler #5 – 3 MMBtu/hr natural gas	

8. Record Keeping and Reporting Requirements
 - A. Barnes-Jewish Hospital, St. Louis shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.
 - B. Barnes-Jewish Hospital, St. Louis shall report to the Air Pollution Control Program's Compliance/Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than ten days after the end of the month during which records indicate an exceedance of any of the emission limitations in this permit.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (6) REVIEW

Project Number: 2015-09-043
Installation ID Number: 510-0204
Permit Number:

Installation Address:

Barnes-Jewish Hospital, St. Louis
One Barnes-Jewish Hospital Plaza
St. Louis, MO 63110

Parent Company:

BJC Healthcare
8300 Eager Rd, Mailstop 90-75-582
St. Louis, MO 63144

City of St. Louis

REVIEW SUMMARY

- This permit does not allow for the installation of any new equipment. This review is a remedial action to correct errors within previously issued construction permits and to permit equipment that was installed without properly obtaining a construction permit(s).
- The application was deemed complete on June 8, 2016.
- Ethylene Oxide (75-21-8) will be emitted from the Ethylene Oxide Sterilizers at the installation. Additional HAPs will be emitted from fuel combustion.
- 40 CFR Part 60, Subpart Dc – *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units* is applicable to EP-11A Boiler #7, EP-11B Boiler #8, EP-11C Boiler #9, and EP-12 Boiler #10.
- 40 CFR Part 60, Subpart IIII – *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* is applicable to EP-15 Emergency Generator, EP-16 Emergency Generator, EP-31 Emergency Generator #1, and EP-34 Emergency Generator.
- 40 CFR Part 63, Subpart ZZZZ – *National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines* is applicable to EP-15 Emergency Generator, EP-16 Emergency Generator, EP-31 Emergency Generator #1, and EP-34 Emergency Generator compliance is demonstrated by complying with NSPS IIII per §63.6590(c). The other generators located at the installation are not subject per §63.6585(f)(3) as they are existing institutional emergency stationary RICE located at an area source.
- 40 CFR Part 63, Subpart WWWW – *National Emission Standards for Hospital Ethylene Oxide Sterilizers* is applicable to EP-17A Ethylene Oxide Sterilizer #1, EP-17B Ethylene Oxide Sterilizer #2, EP-17C Ethylene Oxide Sterilizer #3, and EP-17D

Ethylene Oxide Sterilizer #4.

- 40 CFR Part 63, Subpart JJJJJJ – *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources* is not applicable to EP-01A Boiler #2, EP-01B Boiler #3, EP-01C Boiler #4, EP-11A Boiler #7, EP-11B Boiler #8, EP-11C Boiler #9, and EP-12 Boiler #10 per §63.11195(e) as they will be operated such that they meet the definition of gas-fired boiler at §63.11237.
- Low NO_x burners are used to reduce NO_x emissions from EP-12, EP-29A, EP-29B, EP-29C, EP-29D, and EP-29E Boilers.
- This review was conducted in accordance with Section (6) of Missouri State Rule 10 CSR 10-6.060 *Construction Permits Required*. Potential emissions of PM exceed the *de minimis* level. Potential emissions of NO_x are conditioned below *de minimis* level. Potential emissions of Ethylene Oxide (75-21-8) are conditioned below the SMAL.
- This installation is located in St. Louis City, a moderate nonattainment area for the 8-hour ozone standard, a nonattainment area for the 1997 PM_{2.5} standard, and an attainment area for all other criteria pollutants.
- This installation is not on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2. The installation's major source level is 100 tons per year for VOC, NO_x, and PM_{2.5} (as it is located in a non-attainment area) and 250 tons per year for all other criteria pollutants. Fugitive emissions are not counted toward major source applicability.
- Ambient air quality modeling was not performed since potential emissions of NO_x are conditioned below the *de minimis* level, potential emissions of ethylene oxide are conditioned below the SMAL, and there is currently no NAAQS for PM.
- Emission testing is not required for the equipment.
- After the issuance of this permit, the installation will be a major source of NO_x for Title V permitting purposes. The installation is required to submit an Intermediate Operating Permit application no later than 90 days after the issuance date of this permit or a Part 70 Operating Permit application no later than one year after the issuance date of this permit.
- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

Barnes-Jewish Hospital is an existing medical campus, established as two separate

hospitals in the early 1900s. The modern medical campus consists of Center for Advanced Medicine (CAM), Center for Outpatient Health (COH), St. Louis Children's

Hospital (SLCH), Goldfarb College of Nursing (CON), Clayton Avenue Building (CAB), Barnes Lodge, Peters, North Parking Garage, Power Plant, Schoenberg Pavilion, East Pavilion, Queeny Tower, Southwest Tower, West Pavilion, Duncan Central Garage, IOH, and South Parking Garage. Altogether the medical campus contains 1,666 licensed beds (1,386 at Barnes-Jewish Hospital and 280 at St. Louis Children's Hospital).

The installation has received a number of construction permits from the City of St. Louis' Division of Air Pollution Control; however, due to miscommunication between the City of St. Louis and the Missouri Department of Natural Resources these construction permits contain errors.

Table 7: City of St. Louis Permit History

Permit Number	Description
98-07-044T	Expired temporary construction permit.
99-11-076	Installation of EP-12 – a 72.7 MMBtu/hr dual-fired boiler
00-04-020	Installation of EP-11A, EP-11B, and EP-11C – three 44 MMBtu/hr dual-fired boilers.
01-02-006	Increased fuel oil usage in EP-11A, EP-11B, and EP-11C.
01-05-008	Installation of EP-05 – a 500 kW diesel emergency generator.
01-05-008A	Administrative amendment.
01-02-006A	Administrative amendment.
01-12-038	Installation of EP-08A, EP-08B, EP-08C, EP-08D, EP-14A, EP-14B, and EP-14C – four 1,000 kW diesel emergency generators and three 1,250 kW diesel emergency generators.
01-12-038A	Administrative amendment.

The following new source review permits have been issued to the installation by the Air Pollution Control Program:

Table 8: Air Pollution Control Program Permit History

Permit Number	Description
022013-004	Clean-up of City of St. Louis Projects

PROJECT DESCRIPTION

This construction permit is being issued as a remedial action to correct errors within previously issued construction permits and to permit equipment that was installed without properly obtaining a construction permit.

In Construction Permit 022013-004, the installation took a de minimis NO_x limit (40 tons per year) on all existing emission sources to ensure that NO_x modeling was not required for the installation. The installation continues to pursue compliance with the 40 tons per

year NO_x limit and as such, has requested that not all existing equipment be aggregated into one project. In order to split the existing emission sources into separate projects, the construction date of each emission source was obtained. Any equipment

constructed within the same two-year time span was assumed to be one project as insufficient historical information is currently available to allow for any further project splitting. Each project is identified below.

Table 9A: Grandfathered Equipment List

Emission Source	Description	Construction Date	Location
CWT-1	(2) Cooling Towers – 4,800 gpm total, 0.01% drift loss	1963	Queeney Tower
EP-01A	Boiler #2 – natural gas or fuel oil #2 25.106 MMBtu/hr	1971	East Pavilion
EP-03A	Emergency Generator #7 – diesel 760 HP	1979	West Pavilion
EP-03B	Emergency Generator #8 – diesel 760 HP	1979	
EP-03C	Emergency Generator #9 – diesel 760 HP	1979	
EP-03D	Emergency Generator #10 – diesel 760 HP	1979	
EP-03E	Emergency Generator #11 – diesel 760 HP	1979	
-	Day Tank – diesel 500 gallons	1979	

Table 9B: Grandfathered Equipment Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
NO _x	33.61
CO	14.28
SO ₂	9.28
PM	8.73
PM ₁₀	2.94
PM _{2.5}	1.21
VOC	1.20
HAP	0.21
Hexane (110-54-3)	0.19
Formaldehyde (50-00-0)	0.01
Benzene (71-43-2)	0.01
Other individual HAPs	<0.01 each

This equipment would not have required a permit as it was installed prior to minor NSR permitting requirements in Missouri and emissions were not larger enough to trigger a major NSR permit.

Table 10A: Project #1 Equipment List

Emission Source	Description	Construction Date	Location
EP-13A	Emergency Generator #1 – diesel 1,135 HP	1981	St. Louis Children's Hospital
EP-13B	Emergency Generator #2 – diesel 1,135 HP	1981	

Table 10B: Project #1 Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
NO _x	13.62
SO ₂	4.05
CO	3.12
VOC	0.36
PM	0.24
PM ₁₀	0.22
PM _{2.5}	0.21
HAP	0.01
Individual HAPs	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required; however, the only requirements would have been to ensure that the engines are indeed operated in an emergency capacity (see Special Condition 6.A) so that the project would not trigger modeling requirements.

Table 11A: Project #2 Equipment List

Emission Source	Description	Construction Date	Location
EP-01B	Boiler #3 – natural gas or fuel oil #2 25.106 MMBtu/hr	1984	East Pavilion
EP-01C	Boiler #4 – natural gas or fuel oil #2 25.106 MMBtu/hr	1984	
EP-04	Emergency Generator #12 – diesel 685 HP	1984	Queeny Tower
EP-06	Emergency Generator #13 – diesel 600 HP	1984	South Parking Garage
CWT-2	(2) Cooling Towers – 5,585 gpm total, 0.005% drift loss	1985	Peters

Table 11B: Project #2 Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
NO _x	30.38
CO	20.06
PM	5.54
PM ₁₀	3.05
PM _{2.5}	2.05
SO ₂	6.55
VOC	1.67
HAP	0.41
Hexane (110-54-3)	0.39
Formaldehyde (50-00-0)	0.02
Other Individual HAPs	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required; however, the only requirements would have been to ensure that the engines are indeed operated in an emergency capacity (see Special Condition 6.A) and that the boilers operated on fuel oil only during natural gas shortages (see Special Condition 7.A) so that the project would not trigger modeling requirements.

Table 12A: Project #3 Equipment List

Emission Source	Description	Construction Date	Location
EP-09	Emergency Generator #1 – diesel 890 HP	1987	Clayton Avenue Building (CAB)
EP-21A	Boiler #1 – natural gas 2.049 MMBtu/hr	1987	
EP-21B	Boiler #2 – natural gas 2.049 MMBtu/hr	1987	
EP-22A	Dock Heater #1 – natural gas 0.4 MMBtu/hr	1987	
EP-22B	Dock Heater #2 – natural gas 0.4 MMBtu/hr	1987	
-	Storage Tank T-1 South – diesel 6,000 gallons	1987	
-	Storage Tank T-2 North – diesel 6,000 gallons	1987	
-	Day Tank #1 – diesel 500 gallons	1987	
-	Day Tank #2 – diesel 500 gallons	1987	

Table 12B: Project #3 Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
NO _x	7.44
CO	2.99
SO ₂	1.60
VOC	0.26
PM ₁₀	0.25
PM _{2.5}	0.24
PM	0.13
HAP	0.04
Hexane (110-54-3)	0.04
Other Individual HAPs	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required; however, the only requirements would have been to ensure that the engine is indeed operated in an emergency capacity (see Special Condition 6.A) so that the project would not trigger modeling requirements.

Table 13A: Project #4 Equipment List

Emission Source	Description	Construction Date	Location
EP-13D	Emergency Generator #4 – diesel 1,135 HP	1990	St. Louis Children's Hospital
EP-13E	Emergency Generator #5 – diesel 1,135 HP	1990	
EP-13F	Emergency Generator #6 – diesel 1,135 HP	1990	
-	Storage Tank – fuel oil #2 20,000 gallons	1990	

Table 13B: Project #4 Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
NO _x	20.43
SO ₂	6.07
CO	4.68
VOC	0.55
PM	0.36
PM ₁₀	0.33
PM _{2.5}	0.32
HAP	0.01
Individual HAPs	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required; however, the only requirements would have been to ensure that the engines are indeed operated in an emergency capacity (see Special Condition 6.A) so that the project would not trigger modeling requirements.

Table 14A: Project #5 Equipment List

Emission Source	Description	Construction Date	Location
EP-11A	Boiler #7 – natural gas or fuel oil #2 44 MMBtu/hr	1992	Power Plant
EP-11B	Boiler #8 – natural gas or fuel oil #2 44 MMBtu/hr	1992	
EP-11C	Boiler #9 – natural gas or fuel oil #2 44 MMBtu/hr	1992	
EP-13C	Emergency Generator #3 – diesel 940 HP	1992	St. Louis Children's Hospital
EP-17A	Ethylene Oxide Sterilizer #1 – 170 g/cycle	1993	Shoenberg Pavilion
EP-17B	Ethylene Oxide Sterilizer #2 – 170 g/cycle	1993	
EP-10	Emergency Generator #2 – diesel 1,550 HP	1993	Clayton Avenue Building (CAB)

Table 14B: Project #5 Potential to Emit (tons per year)

Pollutant	Unconditioned Potential to Emit (tons per year)	Conditioned Potential to Emit (tons per year)
NO _x	71.76	<40.00
CO	51.04	24.42
SO ₂	6.38	5.30
PM ₁₀	4.62	2.20
PM _{2.5}	4.61	2.18
VOC	3.74	1.88
PM	1.42	0.80
HAP	1.30	0.58
Hexane (110-54-3)	1.02	0.45
Ethylene Oxide (75-21-8)	0.22	<0.1
Formaldehyde (50-00-0)	0.04	0.02
Benzene (71-43-2)	0.01	0.004
Other Individual HAPs	<0.01 each	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required. In order to avoid NO_x modeling the installation would have been required to take a 12-month rolling total de minimis limit (40 tons per year) on the project (see Special Condition 2). In order to avoid ethylene oxide modeling the installation would have been required to take a 12-month rolling total SMAL limit (0.1 tons per year) on the project (see Special Condition 4).

Table 15A: Project #6 Equipment List

Emission Source	Description	Construction Date	Location
-	Storage Tank – fuel oil #2 1,500 gallons	1997	South Parking Garage
-	Day Tank – diesel 50 gallons	1997	

Table 15B: Project #6 Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
VOC	<0.01

Given the regulations in place at the time this equipment was installed, a permit would have been required; however, the permit would have contained no requirements.

Table 16A: Project #7 Equipment List

Emission Source	Description	Construction Date	Location
EP-12	Boiler #10 – natural gas or fuel oil #2 72.98 MMBtu/hr	2000	Power Plant
EP-05	Emergency Generator #20 – diesel 749 HP	2001	Queeny Tower
-	South Storage Tank – fuel oil #2 1,500 gallons	2001	
-	North Storage Tank – fuel oil #2 1,500 gallons	2001	
-	Day Tank #1 – diesel 750 gallons	2001	
-	Day Tank #2 – diesel 750 gallons	2001	
EP-27	Boiler – natural gas 1 MMBtu/hr	2001	Barnes Lodge
CWT-5	(3) Cooling Towers – 7,500 gpm total, 0.005% drift loss	2001	Center for Advanced Medicine (CAM)
EP-14A	Emergency Generator #1 – diesel 1,662 HP	2002	Southwest Tower
EP-14B	Emergency Generator #2 – diesel 1,662 HP	2002	
EP-14C	Emergency Generator #3 – diesel 1,662 HP	2002	
-	Storage Tank #1 – fuel oil #2 11,400 gallons	2002	
-	Storage Tank #2 – fuel oil #2 11,400 gallons	2002	
-	Day Tank #1 – diesel 200 gallons	2002	
-	Day Tank #2 – diesel 200 gallons	2002	
-	Day Tank #3 – diesel 200 gallons	2002	
CWT-4	(3) Cooling Towers – 6,330 gpm total, 0.005% drift loss	2002	
EP-08A	Emergency Generator #1 – diesel 1,482 HP	2002	Center for Advanced Medicine (CAM)
EP-08B	Emergency Generator #2 – diesel 1,482 HP	2002	
EP-08C	Emergency Generator #3 – diesel 1,482 HP	2002	
EP-08D	Emergency Generator #4 – diesel 1,482 HP	2002	
-	Day Tank #1 – diesel 100 gallons	2002	

Emission Source	Description	Construction Date	Location
-	Day Tank #2 – diesel 100 gallons	2002	
-	Day Tank #3 – diesel 100 gallons	2002	
-	Day Tank #4 – diesel 100 gallons	2002	
-	Storage Tank #1 – fuel oil #2 12,000 gallons	2002	North Parking Garage
-	Storage Tank #2 – fuel oil #2 12,000 gallons	2002	
-	Storage Tank #3 – fuel oil #2 23,750 gallons	2002	
-	Storage Tank #4 – fuel oil #2 23,750 gallons	2002	
-	Storage Tank #5 – fuel oil #2 23,750 gallons	2002	
-	Storage Tank #6 – fuel oil #2 23,750 gallons	2002	
-	East Underground Storage Tank – fuel oil #2 15,000 gallons	2003	East Pavilion
-	West Underground Storage Tank – fuel oil #2 15,000 gallons	2003	
-	Day Tank #1 – diesel 300 gallons	2003	
-	Day Tank #2 – diesel 300 gallons	2003	
-	Day Tank #3 – diesel 300 gallons	2003	
-	Day Tank #4 – diesel 300 gallons	2003	
EP-17C	Ethylene Oxide Sterilizer #3 – 100 g/cycle	2004	Shoenberg Pavilion
EP-17D	Ethylene Oxide Sterilizer #4 – 100 g/cycle	2004	
EP-02A	Emergency Generator #1 – diesel 764 HP	2005	East Pavilion
EP-02B	Emergency Generator #2 – diesel 764 HP	2005	
EP-02C	Emergency Generator #3 – diesel 764 HP	2005	
EP-02D	Emergency Generator #4 – diesel 764 HP	2005	
CWT-6	(3) Cooling Towers – 6,620 gpm total, 0.005% drift loss	2005	
CWT-3	(4) Cooling Towers – 11,100 gpm total, 0.005% drift loss	2005	St. Louis Children's Hospital
CWT-7	(3) Cooling Towers – 6,890 gpm total, 0.005% drift loss	2006	West Pavilion
EP-19A	Boiler (BLR-1) – natural gas 2 MMBtu/hr	2007	Goldfarb College of Nursing (CON)
EP-19B	Boiler (BLR-2) – natural gas 2 MMBtu/hr	2007	
EP-19C	Boiler (BLR-3) – natural gas 2 MMBtu/hr	2007	
EP-20A	Water Heater – natural gas 0.2 MMBtu/hr	2007	
EP-20B	Water Heater – natural gas 0.2 MMBtu/hr	2007	
EP-15	Emergency Generator – diesel 300 kW	2008	
CWT-8	(2) Cooling Towers – 1,200 gpm total, 0.005% drift loss	2009	
CWT-9	(3) Cooling Towers – 8,805 gpm total, 0.005% drift loss	2009	Shoenberg Pavilion
EP-28B	Water Heater #2 – natural gas 0.2 MMBtu/hr	2009	Barnes Lodge

Table 16B: Project #7 Potential to Emit (tons per year)

Pollutant	Unconditioned Potential to Emit (tons per year)	Conditioned Potential to Emit (tons per year)
NO _x	108.34	<40.00
CO	49.88	18.42
PM	43.10	41.70
PM ₁₀	12.80	10.23
PM _{2.5}	4.11	1.57
SO ₂	27.54	10.17
VOC	5.08	1.95
HAP	0.82	0.36
Ethylene Oxide (75-21-8)	0.13	<0.1
Hexane (110-54-3)	0.62	0.23
Formaldehyde (50-00-0)	0.16	0.06
Benzene (71-43-2)	0.02	0.01
Toluene (108-88-3)	0.01	<0.01
Other Individual HAPs	<0.01 each	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required. In order to avoid NO_x modeling the installation would have been required to take a 12-month rolling total de minimis limit (40 tons per year) on the project (see Special Condition 3). A permit condition would have been necessary to make the low NO_x burners on EP-12 enforceable as a practical matter for emissions tracking purposes (see Special Condition 7.B). In order to avoid ethylene oxide modeling the installation would have been required to take a 12-month rolling total SMAL limit (0.1 tons per year) on the project (see Special Condition 5).

Table 17A: Project #8 Equipment List

Emission Source	Description	Construction Date	Location
EP-29A	Boiler #1 (B-1) - natural gas 3 MMBtu/hr	2011	Center for Outpatient Health (COH)
EP-29B	Boiler #2 (B-2) - natural gas 3 MMBtu/hr	2011	
EP-29C	Boiler #3 (B-3) - natural gas 3 MMBtu/hr	2011	
EP-29D	Boiler #4 (B-4) - natural gas 3 MMBtu/hr	2011	
EP-29E	Boiler #5 (B-5) - natural gas 3 MMBtu/hr	2011	
EP-30A	Hot Water Heater #1 (GWH-1) - natural gas 0.2 MMBtu/hr	2011	
EP-30B	Hot Water Heater #2 (GWH-2) - natural gas 0.2 MMBtu/hr	2011	
EP-30C	Hot Water Heater #3 (GWH-3) - natural gas 0.2 MMBtu/hr	2011	
CWT-10	(2) Cooling Towers – 3,000 gpm total, 0.001% drift loss	2011	
EP-16	Emergency Generator – diesel 516 kW	2012	

Table 17B: Project #8 Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
NO _x	3.89
CO	6.62
PM	0.69
PM ₁₀	0.68
PM _{2.5}	0.58
VOC	1.51
SO ₂	0.04
HAP	0.13
Hexane (110-54-3)	0.12
Formaldehyde (50-00-0)	0.01
Other Individual HAPs	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required; however, the only requirements would have been to ensure that the engine is indeed operated in an emergency capacity (see Special Condition 6.A) so that the project would not trigger modeling requirements. The installation has requested a requirement for the use of low NO_x burners on EP-29A through EP-29E to make them enforceable as a practical matter (see Special Condition 7.B).

Table 18A: Project #9 Equipment List

Emission Source	Description	Construction Date	Location
EP-28A	Water Heater #1 – natural gas 0.2 MMBtu/hr	2014	Barnes Lodge
EP-31	Emergency Generator #1 - diesel 237 HP	2015	Duncan Central Garage
EP-34	Emergency Generator - diesel 2,710 kW	2015	IOH

Table 18B: Project #9 Potential to Emit (tons per year)

Pollutant	Potential to Emit (tons per year)
NO _x	10.04
VOC	9.96
CO	5.64
PM ₁₀	0.37
PM _{2.5}	0.36
PM	0.32
SO ₂	0.13
HAP	0.01
Individual HAPs	<0.01 each

Given the regulations in place at the time this equipment was installed, a permit would have been required; however, the only requirements would have been to ensure that the engines are indeed operated in an emergency capacity (see Special Condition 6.A) so that the project would not trigger modeling requirements.

EMISSIONS/CONTROLS EVALUATION

Natural gas combustion emission factors were obtained from EPA document AP-42, *Compilation of Air Pollution Emission Factors*, Fifth Edition, Section 1.4 “Natural Gas Combustion” (July 1998). Fuel oil #2 combustion emission factors were obtained from AP-42’s Section 1.3 “Fuel Oil Combustion” (May 2010). The installation has stated that all dual-fired boilers will meet the definition of gas-fired boiler at §63.11237; therefore, for the pollutants that have a higher hourly emission rate from fuel oil combustion project emissions were evaluated based on 48 hours of fuel oil combustion and 8,712 hours of natural gas combustion. To ensure that a permitting requirement is triggered prior to conversion back to fuel oil, Special Condition 7.A has been included in the permit.

Emission factors for the smaller emergency generators (less than or equal to 600 HP) were obtained from AP-42’s Section 3.3 “Gasoline and Diesel Industrial Engines” (October 1996). Emission factors for the larger emergency generators (greater than 600 HP) were obtained from AP-42’s Section 3.4 “Large Stationary Diesel and All Stationary Dual-fuel Engines” (October 1996). Potential emissions from the emergency generators were evaluated at 500 hours of annual operation per EPA’s guidance document *Calculating Potential to Emit (PTE) for Emergency Generators* (September 6, 1995). To ensure that a permitting requirement is triggered prior to conversion to non-emergency operation, Special Condition 6 has been included in the permit.

Potential emissions of Ethylene Oxide (75-21-8) from the Ethylene Oxide Sterilizers were calculated using a mass balance approach assuming 100% emission. The applicant provided manufacturer data for each Ethylene Oxide Sterilizers:

Table 19: Ethylene Oxide Sterilizers - Manufacturer Data

Emission Unit	Description	Manufacturer	Operational Temperature (°C)	Cycle Time (hours)	Ethylene Oxide Usage (g/cycle)	Calculated Emission Rate	
						(lb/hr)	(ton/yr)
EP-17A	Ethylene Oxide Sterilizer #1	3M	37 or 55	15	170	0.02	0.11
EP-17B	Ethylene Oxide Sterilizer #2	3M	37 or 55	15	170	0.02	0.11
EP-17C	Ethylene Oxide Sterilizer #3	Amsco	37 or 55	15	100	0.01	0.06
EP-17D	Ethylene Oxide Sterilizer #4	Amsco	37 or 55	15	100	0.01	0.06

Potential emissions from the above ground storage tanks were calculated using VOC emission factors obtained from EPA's Factor Information Retrieval System (WebFIRE) for Process SCCs 40301019 (breathing loss) and 40301021 (working loss).

Potential emissions from the cooling towers were calculated using a PM emission factor established based on the manufacturer's drift loss and a maximum TDS content of 7,700 ppm. PM₁₀ and PM_{2.5} emissions were determined using the maximum PM₁₀ to PM ratio of 21.348% and the maximum PM_{2.5} to PM ratio of 0.196% in "Calculating Realistic PM₁₀ Emissions from Cooling Towers" (Joel Reisman and Gordon Frisbie).

The following table provides an emissions summary for the entire installation. Potential emissions from the installation were evaluated at continuous operation (8,760 hours per year) unless otherwise noted above.

Table 20: Installation Emissions Summary (tpy)

Pollutant	Grandfathered Equipment	Project									Installation PTE
		#1	#2	#3	#4	#5	#6	#7	#8	#9	
NO _x	33.61	13.62	30.38	7.44	20.43	<40.00	-	<40.00	3.89	10.04	199.40
CO	14.28	3.12	20.06	2.99	4.68	24.42	-	18.42	6.62	5.64	100.23
SO ₂	9.28	4.05	6.55	1.60	6.07	5.30	-	10.17	0.04	0.13	43.18
PM	8.73	0.24	5.54	0.13	0.36	0.80	-	41.70	0.69	0.32	58.50
PM ₁₀	2.94	0.22	3.05	0.25	0.33	2.20	-	10.23	0.68	0.37	20.26
PM _{2.5}	1.21	0.21	2.05	0.24	0.32	2.18	-	1.57	0.58	0.36	8.72
VOC	1.20	0.36	1.67	0.26	0.55	1.88	<0.01	1.95	1.51	9.96	19.34
HAP	0.21	0.01	0.41	0.04	0.01	0.58	-	0.36	0.13	0.01	1.76
Hexane (110-54-3)	0.19	-	0.39	0.04	-	0.45	-	0.23	0.12	<0.01	1.42

Pollutant	Grandfathered Equipment	Project									Installation PTE
		#1	#2	#3	#4	#5	#6	#7	#8	#9	
Formaldehyde (50-00-0)	0.01	<0.01	0.02	<0.01	<0.01	0.02	-	0.06	0.01	<0.01	0.11
Ethylene Oxide (75-21-8)	-	-	-	-	-	<0.1	-	<0.1	-	-	<0.2
Benzene (71-43-2)	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.01	<0.01	<0.01	0.03
Toluene (108-88-3)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.01
Xylene (1330-20-7)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.01
Naphthalene (91-20-3)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.01
Other Individual HAPs	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (6) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of NO_x are conditioned below *de minimis* levels. Potential emissions of Ethylene Oxide (75-21-8) are conditioned below the SMAL.

APPLICABLE REQUIREMENTS

Barnes-Jewish Hospital, St. Louis shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

GENERAL REQUIREMENTS

- 10 CSR 10-6.065 *Operating Permits*
 - The installation is required to apply for an Intermediate Operating Permit no later than 90 days after the issuance date of this permit or a Part 70 Operating Permit no later than one year after the issuance date of this permit.
- 10 CSR 10-6.110 *Submission of Emission Data, Emission Fees and Process Information*
 - The installation is required to submit a full EIQ for the 2016 calendar year.

- 10 CSR 10-6.165 *Restriction of Emission of Odors*
- 10 CSR 10-6.170 *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*
- 10 CSR 10-6.220 *Restriction of Emission of Visible Air Contaminants*

SPECIFIC REQUIREMENTS

- 10 CSR 10-6.070 *New Source Performance Regulations*
 - 40 CFR Part 60, Subpart Dc – *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units*
 - This regulation applies to EP-11A Boiler #7, EP-11B Boiler #8, EP-11C Boiler #9, and EP-12 Boiler #10.
 - 40 CFR Part 60, Subpart IIII – *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*
 - This regulation applies to EP-15 Emergency Generator, EP-16 Emergency Generator, EP-31 Emergency Generator, and EP-34 Emergency Generator.
- 10 CSR 10-6.075 *Maximum Achievable Control Technology Regulations*
 - 40 CFR Part 63, Subpart ZZZZ – *National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*
 - This regulation is applicable to EP-15 Emergency Generator, EP-16 Emergency Generator, EP-31 Emergency Generator, and EP-34 Emergency Generator. Compliance is demonstrated by complying with NSPS IIII per §63.6590(c).
 - The other generators in this permit are conditionally exempt from this regulation per §63.6585(f)(3) provided the installation remains an area source and the generators meet the definition of emergency stationary RICE at §63.6675.
 - 40 CFR Part 63, Subpart WWWW – *National Emission Standards for Hospital Ethylene Oxide Sterilizers*
 - This regulation applies to EP-17A Ethylene Oxide Sterilizer #1, EP-17B Ethylene Oxide Sterilizer #2, EP-17C Ethylene Oxide Sterilizer #3, and EP-17D Ethylene Oxide Sterilizer #4.
 - 40 CFR Part 63, Subpart JJJJJ – *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources.*
 - EP-01A Boiler #2, EP-01B Boiler #3, EP-01C Boiler #4, EP-11A Boiler #7, EP-11B Boiler #8, EP-11C Boiler #9, and EP-12 Boiler #10 are conditionally exempt from this regulation per §63.11195(e) provided they meet the definition of gas-fired boiler at §63.11237.
- 10 CSR 10-6.260 *Restriction of Emission of Sulfur Compounds*
 - This regulation was rescinded by the State of Missouri on November 30, 2015, but remains federally enforceable as it is still contained in Missouri's State Implementation Plan.

- 10 CSR 10-6.261 Control of Sulfur Dioxide Emissions
 - This regulation applies to all fuel oil fired equipment (dual-fired boilers and emergency generators).

- 10 CSR 10-5.510 Control of Emissions of Nitrogen Oxides
 - If the installation chooses to obtain an Intermediate Operating Permit, this regulation will not apply.
 - If the installation chooses to obtain a Part 70, fails to apply for an Intermediate Operating Permit within 90 days after the issuance date of this permit, or fails to comply with a 100 tons per 12-month rolling total NO_x limit, this regulation will apply.

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (6) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, it is recommended that this permit be granted with special conditions.

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated September 16, 2015, received September 21, 2015, designating Barnes-Jewish Hospital, St. Louis as the owner and operator of the installation.

Attachment A - NO_x Compliance Worksheet

Barnes-Jewish Hospital
 St. Louis City
 Project Number: 2015-09-043
 Installation ID Number: 510-0204
 Permit Number:

This sheet covers the period from _____ to _____
 (month, year) (month, year)

Boilers					
Emission Source	Monthly Fuel Usage	NO _x Emission Factor	Emission Factor Source	Monthly NO _x Emissions ¹ (tons)	
EP-11A Boiler #7	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
	Mgal fuel oil #2	20 lb/Mgal	AP-42 Table 1.3-1		
EP-11B Boiler #8	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
	Mgal fuel oil #2	20 lb/Mgal	AP-42 Table 1.3-1		
EP-11C Boiler #9	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
	Mgal fuel oil #2	20 lb/Mgal	AP-42 Table 1.3-1		
Emergency Generator					
Emission Source	Current Month's Hourly Meter Reading	Previous Month's Hourly Meter Reading	Monthly Usage ² (hours)	NO _x Emission Factor (lb/hr)	Monthly NO _x Emissions ³ (tons)
EP-10 Emergency Generator #2				37.200 ⁴	
EP-13C Emergency Generator #3				22.560 ⁵	
SSM Emissions					
Emission Sources					Monthly NO _x Emissions ⁶ (tons)
EP-11A Boiler #7, EP-11B Boiler #8, EP-11C Boiler #9, EP-10 Emergency Generator #2, and EP-13C Emergency Generator #3					
Monthly Project #5 NO_x Emissions⁷ (tons):					
12-Month Rolling Total Project #5 NO_x Emissions⁸ (tons):					

¹ Monthly NO_x Emissions (tons) = Monthly Fuel Usage x NO_x Emission Factor x 0.0005 (ton/lb).

² Monthly Usage (hours) = Current Month's Hourly Meter Reading – Previous Month's Hourly Meter Reading

³ Monthly NO_x Emission (tons) = Monthly Usage (hours) x NO_x Emission Factor (lb/hr) x 0.0005 (ton/lb)

⁴ AP-42 Table 3.4-1 listed the NO_x Emission Factor as 0.024 lb/hp-hr. The emission factor was multiplied by the engines' horsepower rating of 1550 HP to obtain the lb/hr NO_x Emission Factor.

⁵ AP-42 Table 3.4-1 listed the NO_x Emission Factor as 0.024 lb/hp-hr. The emission factor was multiplied by the engines' horsepower rating of 940 HP to obtain the lb/hr NO_x Emission Factor.

⁶ As reported to the Air Pollution Control Program's Compliance/Enforcement Section according to the provisions of 10 CSR 10-6.050.

⁷ Monthly Project #5 NO_x Emissions (tons) = The sum of each emission source's Monthly NO_x Emissions (tons).

⁸ 12-Month Rolling Total Project #5 NO_x Emissions (tons) = the sum of the 12 most recent Monthly Project #5 NO_x Emissions (tons). **The permittee is in compliance with Special Condition 2 if 12-Month Rolling Total Project #5 NO_x Emissions are less than 40.0 tons.**

Attachment B - NO_x Compliance Worksheet

Barnes-Jewish Hospital
 St. Louis City
 Project Number: 2015-09-043
 Installation ID Number: 510-0204
 Permit Number:

This sheet covers the period from _____ to _____
 (month, year) (month, year)

Boilers & Water Heaters					
Emission Source	Monthly Fuel Usage	NO _x Emission Factor	Emission Factor Source	Monthly NO _x Emissions ⁹ (tons)	
EP-12 Boiler #10	MMscf natural gas	51 lb/MMscf	Manufacturer's Guarantee		
	Mgal fuel oil #2	20 lb/Mgal	AP-42 Table 1.3-1		
EP-27 Boiler	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
EP-28B Water Heater #2	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
EP-19A Boiler #1	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
EP-19B Boiler #2	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
EP-19C Boiler #3	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
EP-20A Water Heater	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
EP-20B Water Heater	MMscf natural gas	100 lb/MMscf	AP-42 Table 1.4-1		
Emergency Generators					
Emission Source	Current Month's Hourly Meter Reading	Previous Month's Hourly Meter Reading	Monthly Usage ¹⁰ (hours)	NO _x Emission Factor (lb/hr)	Monthly NO _x Emissions ¹¹ (tons)
EP-05 Emergency Generator #20				17.976 ¹²	
EP-14A Emergency Generator #1				39.888 ¹²	
EP-14B Emergency Generator #2				39.888 ¹²	

⁹ Monthly NO_x Emissions (tons) = Monthly Fuel Usage x NO_x Emission Factor x 0.0005 (ton/lb).

¹⁰ Monthly Usage (hours) = Current Month's Hourly Meter Reading – Previous Month's Hourly Meter Reading

¹¹ Monthly NO_x Emission (tons) = Monthly Usage (hours) x NO_x Emission Factor (lb/hr) x 0.0005 (ton/lb)

¹² AP-42 Table 3.4-1 listed the NO_x Emission Factor as 0.024 lb/hp-hr. The emission factor was multiplied by the engine's horsepower rating to obtain the lb/hr NO_x Emission Factor.

EP-14C Emergency Generator #3				39.888 ¹²	
EP-08A Emergency Generator #1				35.568 ¹²	
EP-08B Emergency Generator #2				35.568 ¹²	
EP-08C Emergency Generator #3				35.568 ¹²	
EP-08D Emergency Generator #4				35.568 ¹²	
EP-02A Emergency Generator #1				18.336 ¹²	
EP-02B Emergency Generator #2				18.336 ¹²	
EP-02C Emergency Generator #3				18.336 ¹²	
EP-02D Emergency Generator #4				18.336 ¹²	
EP-15 Emergency Generator				2.646 ¹³	
SSM Emissions					
Emission Sources					Monthly NO_x Emissions¹⁴ (tons)
Boilers (EP-12, EP-27, EP-19A, EP-19B, EP-19C), Water Heaters (EP-20A, EP-20B, and EP-28B), and Emergency Generators (EP-05, EP-14A, EP-14B, EP-14C, EP-08A, EP-08B, EP-08C, EP-08D, EP-02A, EP-02B, EP-02C, EP-02D, and EP-15)					
Monthly Project #7 NO_x Emissions¹⁵ (tons):					
12-Month Rolling Total Project #7 NO_x Emissions¹⁶ (tons):					

¹³ This generator is subject to a NO_x limit of 4.0 g/kW-hr by NSPS IIII. The engine has a rating of 300 kW. A conversion factor of 0.0022046 lb/g was used.

¹⁴ As reported to the Air Pollution Control Program's Compliance/Enforcement Section according to the provisions of 10 CSR 10-6.050.

¹⁵ Monthly Project #7 NO_x Emissions (tons) = The sum of each emission source's Monthly NO_x Emissions (tons).

¹⁶ 12-Month Rolling Total Project #7 NO_x Emissions (tons) = the sum of the 12 most recent Monthly Project #7 NO_x Emissions (tons). **The permittee is in compliance with Special Condition 3 if 12-Month Rolling Total Project #7 NO_x Emissions are less than 40.0 tons.**

Attachment C – Ethylene Oxide (75-21-8) Compliance Worksheet

Barnes-Jewish Hospital
 St. Louis City
 Project Number: 2015-09-043
 Installation ID Number: 510-0204
 Permit Number:

This sheet covers the period from _____ to _____
 (month, year) (month, year)

Emission Source	Monthly Ethylene Oxide Usage (grams)	Conversion Factor (ton/gram)	Monthly Ethylene Oxide Emissions ¹⁷ (tons)
EP-17A Ethylene Oxide Sterilizer		1.1023×10^{-6}	
EP-17B Ethylene Oxide Sterilizer		1.1023×10^{-6}	
SSM Emissions			
Emission Sources			Monthly Ethylene Oxide Emissions¹⁸ (tons)
Ethylene Oxide Sterilizers (EP-17A and EP-17B)			
Monthly Project #5 Ethylene Oxide Emissions¹⁹ (tons):			
12-Month Rolling Total Project #5 Ethylene Oxide Emissions²⁰ (tons):			

¹⁷ Monthly Ethylene Oxide Emissions (tons) = Monthly Ethylene Oxide Usage (grams) x Conversion Factor (ton/gram).

¹⁸ As reported to the Air Pollution Control Program's Compliance/Enforcement Section according to the provisions of 10 CSR 10-6.050.

¹⁹ Monthly Project #5 Ethylene Oxide Emissions (tons) = The sum of each emission source's Monthly Ethylene Oxide Emissions (tons).

²⁰ 12-Month Rolling Total Project #5 Ethylene Oxide Emissions (tons) = the sum of the 12 most recent Monthly Project #5 Ethylene Oxide Emissions (tons). **The permittee is in compliance with Special Condition 4 if 12-Month Rolling Total Project #5 Ethylene Oxide Emissions are less than 0.1 tons.**

Attachment D – Ethylene Oxide (75-21-8) Compliance Worksheet

Barnes-Jewish Hospital
 St. Louis City
 Project Number: 2015-09-043
 Installation ID Number: 510-0204
 Permit Number:

This sheet covers the period from _____ to _____
 (month, year) (month, year)

Emission Source	Monthly Ethylene Oxide Usage (grams)	Conversion Factor (ton/gram)	Monthly Ethylene Oxide Emissions ²¹ (tons)
EP-17C Ethylene Oxide Sterilizer		1.1023×10^{-6}	
EP-17D Ethylene Oxide Sterilizer		1.1023×10^{-6}	
SSM Emissions			
Emission Sources			Monthly Ethylene Oxide Emissions²² (tons)
Ethylene Oxide Sterilizers (EP-17C and EP-17D)			
Monthly Project #7 Ethylene Oxide Emissions²³ (tons):			
12-Month Rolling Total Project #7 Ethylene Oxide Emissions²⁴ (tons):			

²¹ Monthly Ethylene Oxide Emissions (tons) = Monthly Ethylene Oxide Usage (grams) x Conversion Factor (ton/gram).

²² As reported to the Air Pollution Control Program's Compliance/Enforcement Section according to the provisions of 10 CSR 10-6.050.

²³ Monthly Project #7 Ethylene Oxide Emissions (tons) = The sum of each emission source's Monthly Ethylene Oxide Emissions (tons).

²⁴ 12-Month Rolling Total Project #7 Ethylene Oxide Emissions (tons) = the sum of the 12 most recent Monthly Project #7 Ethylene Oxide Emissions (tons). **The permittee is in compliance with Special Condition 5 if 12-Month Rolling Total Project #7 Ethylene Oxide Emissions are less than 0.1 tons.**

APPENDIX A

Abbreviations and Acronyms

%	percent	m/s	meters per second
°F	degrees Fahrenheit	Mgal	1,000 gallons
acfm	actual cubic feet per minute	MW	megawatt
BACT	Best Available Control Technology	MHDR	maximum hourly design rate
BMPs	Best Management Practices	MMBtu	Million British thermal units
Btu	British thermal unit	MMCF	million cubic feet
CAM	Compliance Assurance Monitoring	MSDS	Material Safety Data Sheet
CAS	Chemical Abstracts Service	NAAQS ...	National Ambient Air Quality Standards
CEMS	Continuous Emission Monitor System	NESHAPs	National Emissions Standards for Hazardous Air Pollutants
CFR	Code of Federal Regulations	NO_x	nitrogen oxides
CO	carbon monoxide	NSPS	New Source Performance Standards
CO₂	carbon dioxide	NSR	New Source Review
CO_{2e}	carbon dioxide equivalent	PM	particulate matter
COMS	Continuous Opacity Monitoring System	PM_{2.5}	particulate matter less than 2.5 microns in aerodynamic diameter
CSR	Code of State Regulations	PM₁₀	particulate matter less than 10 microns in aerodynamic diameter
dscf	dry standard cubic feet	ppm	parts per million
EQ	Emission Inventory Questionnaire	PSD	Prevention of Significant Deterioration
EP	Emission Point	PTE	potential to emit
EPA	Environmental Protection Agency	RACT	Reasonable Available Control Technology
EU	Emission Unit	RAL	Risk Assessment Level
fps	feet per second	SCC	Source Classification Code
ft	feet	scfm	standard cubic feet per minute
GACT	Generally Available Control Technology	SDS	Safety Data Sheet
GHG	Greenhouse Gas	SIC	Standard Industrial Classification
gpm	gallons per minute	SIP	State Implementation Plan
gr	grains	SMAL	Screening Model Action Levels
GWP	Global Warming Potential	SO_x	sulfur oxides
HAP	Hazardous Air Pollutant	SO₂	sulfur dioxide
hr	hour	tph	tons per hour
hp	horsepower	tpy	tons per year
lb	pound	VMT	vehicle miles traveled
lbs/hr	pounds per hour	VOC	Volatile Organic Compound
MACT	Maximum Achievable Control Technology		
µg/m³	micrograms per cubic meter		



Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director

DEPARTMENT OF NATURAL RESOURCES

www.dnr.mo.gov

SEP 21 2016

**Ms. Emma Hooks
Director, EH&S Regulatory Compliance
Barnes-Jewish Hospital, St. Louis
4901 Forest Park Ave.
St. Louis, MO 63110**

RE: New Source Review Permit - Project Number: 2015-09-043

Dear Ms. Hooks:

Enclosed with this letter is your permit to construct. Please study it carefully and refer to Appendix A for a list of common abbreviations and acronyms used in the permit. Also, note the special conditions on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files. Operation in accordance with these conditions, your new source review permit application, and submittal of an Intermediate or Part 70 operating permit is necessary for continued compliance. The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

This permit may include requirements with which you may not be familiar. If you would like the department to meet with you to discuss how to understand and satisfy the requirements contained in this permit, an appointment referred to as a Compliance Assistance Visit (CAV) can be set up with you. To request a CAV, please contact your local regional office or fill out an online request. The regional office contact information can be found at the following website: <http://dnr.mo.gov/regions/>. The online CAV request can be found at <http://dnr.mo.gov/cav/compliance.htm>.

If you were adversely affected by this permit decision, you may be entitled to pursue an appeal before the administrative hearing commission pursuant to §§621.250 and 643.075.6 RSMo. To appeal, you must file a petition with the administrative hearing commission within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the administrative hearing commission, whose contact information

Ms. Emma Hooks
Page Two

is: Administrative Hearing Commission, United States Post Office Building, 131 West High Street, Third Floor, P.O. Box 1557, Jefferson City, Missouri 65102, phone: 573-751-2422, fax: 573-751-5018, website: www.oa.mo.gov/ahc.

If you have any questions regarding this permit, please do not hesitate to contact Alana Hess, at the Department of Natural Resources' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or at (573) 751-4817. Thank you for your attention to this matter.

Sincerely,

AIR POLLUTION CONTROL PROGRAM



Susan Heckenkamp
New Source Review Unit Chief

SH:ahj

Enclosures

c: St. Louis Regional Office
PAMS File: 2015-09-043

Permit Number: 092016 - 012