STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400

July 10, 2019

Mark Johnson
Site Operations Manager
Vantage Data Centers
2101 M Street NE
Quincy, WA 98848

Re: Vantage Data Centers - Approval Order No. 19AQ-E026

Dear Mark Johnson:

The Department of Ecology's Air Quality Program has approved construction, and operation of the change from 17 MTU 3-MW engine generators to 5 MTU 3-MW engine/generators and 10 Cat 2.75 MW engine/generators and 2 Cat 0.5 MW life safety engine/generators at the Vantage Data Centers Quincy Campus located at 2101 M Street NE, Quincy, Washington, in Grant County. Ecology's approval is based on the Notice of Construction application and supplemental information submitted on March 28, 2019.

The 30-day public comment period required upon a request from the community, per Washington Administrative Code (WAC) 173-400-171, has been completed. No changes were made to the preliminary determination in response to the comments. Most comments were supportive of the project.

Enclosed is Approval Order No. 19AQ-E026.

Due to modifications required in the previous approval, and the need to revisit previous, and future emission estimates for this project, there are charges above the $200 Vantage paid for this amendment. Below is a brief summary of the additional charges. This is only for your information and not an invoice. You will receive an invoice from our Fiscal Office; please correspond directly with them regarding the billing.

New Source Review Fees Summary		
Hours Above Base	Hourly Overage Rate	Additional Hours Fee
30	$95.00	$2,850.00

These hours may include time spent on:

- Review of the permit application for completeness.
- Review of actual and potential facility emissions.
- Review of proposed control technologies.

- Modeling performed to determine if impacts meet ambient air quality standards.
- Drafting the permit.
- Communications with the source.
- Coordination with other regulatory agencies.
- Posting for public comment.
- Responding to received comments.

If you have questions regarding this final billing, please contact the Air Quality Program manager of the office you were permitted through.

Thank you for your patience while we processed your application. If you have any questions, please contact me at rkos461@ecy.wa.gov or 509-329-3493.

Sincerely,

Robert Koster
Commercial/Industrial Unit
Regional Air Quality Program

RK:jab

Enclosure: Approval Order No. 19AQ-E02643

Certified Mail: 7016 1970 0000 9925 6590

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF APPROVING A NEW AIR CONTAMINANT SOURCE FOR **VANTAGE DATA CENTERS VANTAGE-QUINCY DATA CENTER**) **Approval Order No. 19AQ-E026**

TO: Mark Johnson
Vantage Data Centers
2101 M Street NE
Quincy, WA 98848

EQUIPMENT

The list of equipment that was evaluated for this order of approval consists of seven MTU Model 20V4000 diesel engines used to power emergency electrical generators, Model MTU 3000, and eight Caterpillar Model 3516E diesel engines powering Caterpillar SR5 electrical generators.

The five MTU 3.0 megawatt (MWe) generators will have a combined capacity of 15 MWe. The ten Caterpillar 2.75 MW engine generators and two 500kW Caterpillar life-safety generators will have a combined capacity of 28.5 MW for a facility total of 49.5 MW. The generators will be installed in two phases. Phase 1 is in place and consists of five 3.0 MWe generators that were installed within 18 months of initial approval. Phase 2 will consist of a total of the 10 additional 2.75 MWe generators and 2 500 kW life-safety generators to be installed in one additional building by January 1, 2020.

Table 1.1: Engine & Generator Serial Numbers

Project Phase	DC BLDG	Unit ID	Capacity MWe	Engine SN	Generator SN	Build date
1	DC1	1 MTU	3.0	34487-1-1	28420-01	9/1/2013
"	DC1	2 MTU	3.0	34487-1-2	28420-0	9/1/2013
"	DC1	3MTU	3.0	34487-1-3	28420-0	9/1/2013
"	DC1	4 MTU	3.0	34487-1-4	34571-01	9/1/2014
"	DC1	5 MTU	3.0	34487-1-5	34707-01	9/1/2014
2	DC2	6 CAT	0.5			
"	DC2	7 CAT	0.5			
"	DC2	8 CAT	2.75			
"	DC2	9 CAT	2.75			
"	DC2	10 CAT	2.75			
"	DC2	11 CAT	2.75			
"	DC2	12 CAT	2.75			
"	DC2	13 CAT	2.75			
"	DC2	14 CAT	2.75			
"	DC2	15 CAT	2.75			
"	DC2	16 CAT	2.75			
"	DC2	17 CAT	2.75			

The Vantage Data Center will utilize indirect evaporative cooling units to dissipate heat from electronic equipment at the facility, thus eliminating evaporative cooling tower emissions from the project.

PROJECT SUMMARY

The Vantage Data Center Phase 1 construction will consist of Building 1 with the five engine-generators already in place. Phase 2 construction will consist of Building 2 with 12 smaller engine generators for a total of 17 facility engine generators. The data center will be leased for occupancy by companies that require a fully supported data storage and processing facility. Vantage will own and operate the engine/generators.

DETERMINATIONS

In relation to this project, the State of Washington Department of Ecology (Ecology), pursuant to Revised Code of Washington (RCW) 70.94.152, Washington Administrative Code (WAC) 173-460-040, and WAC 173-400-110, makes the following determinations:

1. The project, if constructed and operated as herein required, will be in accordance with applicable rules and regulations, as set forth in Chapter 173-400 WAC, and Chapter 173-460 WAC, and the operation thereof, at the location proposed, will not emit pollutants in concentrations that will endanger public health or interfere with attainment of the national ambient air quality standards.
2. The proposed project, if constructed and operated as herein required, will utilize best available control technology (BACT) as defined in Approval Conditions below.
3. The proposed project, if constructed and operated as herein required, will utilize best available control technology for toxic air pollutants (tBACT).

THEREFORE, IT IS ORDERED that the project as described in the Notice of Construction application and more specifically detailed in plans, specifications, and other information submitted to Ecology is approved for construction and operation, provided the following are met:

APPROVAL CONDITIONS

1. ADMINISTRATIVE CONDITIONS

1.1. The engine generators approved for operation by this order are to be used solely for those purposes described in application materials as further limited by the conditions of this Order. There shall be no operation of this equipment to produce power for demand-response arrangements, peak shaving arrangements, nor to provide power as part of a financial arrangement with another entity, nor to supply power to the grid.

1.2. Upon issuance of this Approval Order, Approval Orders No. 18AQ-E043 and 16AQ-E026 are rescinded and replaced entirely by the evaluations and conditions of this approval.

2. EQUIPMENT RESTRICTIONS

2.1. Any engine used to power the electrical generators shall be certified by the manufacturer to meet 40 CFR 60 Tier II emission levels or other more restrictive specifications required by the EPA at the time the engines are installed. Each engine to be installed must be permanently labeled by the manufacturer as an emergency engine in accordance

with 40 CFR § 60.4210(f). Each engine approved in this Order must operate as an emergency engine as defined at 40 CFR 60, Subpart IIII or 40 CFR 63, Subpart ZZZZ, and as limited by the other conditions of this approval.

2.2. The only engines and electrical generating units approved for operation at the Vantage Data Center are those listed by serial number in Table 1.

2.3. Replacement of failed engines with identical engines (same manufacturer and model) requires notification prior to installation, but will not require new source review unless there is an increase in emission rates or ambient impacts.

2.4. The installation of any new engines after January 1, 2020, will require notification to Ecology that includes engine manufacturer's specification sheets. Ecology will determine whether new source review is required based on various factors including whether the new engines will have either an increased emission rate or result in an emission concentration that may increase impacts over those evaluated for this approval Order, or if an update to the current BACT analysis is necessary.

2.5. The five existing MTU Model 20V4000 engines and 10 CAT 2.75 MW engines will have exhaust stack heights that shall be greater than or equal to 43 feet above ground level. The stacks shall be no more than 26 inches in diameter. Additionally, the two 500 kW CAT life-safety generators shall have exhaust stack heights no less than 15 feet above ground level. Vantage Data Centers shall verify that, for the phases of the Quincy project, exhaust stack parameters such as diameter, height, and exhaust rate and velocity do not result in ambient impacts greater than what was evaluated for this project.

2.6. The manufacture and installation of the 17 engine/generator sets proposed for Buildings 1 and 2 of the project shall occur by January 1, 2020. If the manufacture and installation of the engines has not been completed by the above date, new source review may be required prior to continued installation, and ambient air quality impacts will be re-evaluated if new source review is required. Vantage may request an extension of this time schedule, and Ecology may approve an extension without revision to this Order.

2.7. This Order only applies to the five MTU Model 20V4000 engines, each with a rated full standby capacity of 4678 hp, the 10 Caterpillar Model 3516E engines with a rated full standby capacity of 4043 hp, and the two CAT Model C15 engines with a rated full standby capacity of of 762 hp that were proposed in the Notice of Construction application for this amendment of the facility approval. On a case-by-case basis, Ecology may require additional ambient impacts analyses prior to installation of engines not listed in Table 1.

3. OPERATING LIMITATIONS

3.1. The fuel consumption at the Vantage Data Center facility at build-out (two buildings with a total of 17 engines) shall be limited to a total of 137,268 gallons per year of diesel fuel equivalent to on-road specification No. 2 distillate fuel oil (less than 0.00150 weight percent sulfur). Total annual fuel consumption by the facility may be averaged over a three-year period using monthly rolling totals.

3.2. Except as provided in Approval Condition 3.5, the 15 Vantage Data Center engines are limited to the following average hours of operation, and averaging periods:

3.2.1. Each engine shall not exceed 45 hours of operation (at any load, for any purpose, including commissioning) per year, on a rolling monthly three-year average, and averaged over all engines in service.

3.2.2. Each MTU engine shall not exceed an annual fuel consumption of 9,315 gallons, averaged over a three-year period using monthly rolling totals, and averaged over all MTU engines in service.

3.2.3. Each Cat 3516E engine shall not exceed an annual fuel consumption of 8,744 gallons, averaged over a three-year period using monthly rolling totals, and averaged over all 2.75 MW Cat engines in service.

3.2.4. Each Cat C15 engine shall not exceed an annual fuel consumption of 1,629 gallons, averaged over a three-year period using monthly rolling totals, and averaged over 0.5 MW Cat engines in service.

3.3. For each MTU engine, a load bank will be used for electrical energy dissipation whenever prescheduled monthly maintenance testing, corrective testing or annual load bank testing occurs above idle, and the engine shall be run for these purposes at 50 percent operating load or greater.

3.4. The 17 engines, five MTU Model 20V4000 engines, 10 Cat 3516E engines, and two CAT C15 life-safety engines at the Vantage Data Center require periodic scheduled operation. To mitigate engine emission impacts, Vantage Data Center will perform all scheduled engine maintenance testing, bypass operations, and load testing during daylight hours. The Vantage Data Center shall develop an operating schedule that shall be available for review by Ecology upon request. Changes to the operating schedule will not trigger revision or amendment of this Order if approved in advance by Ecology.

3.5. During a site integration test, no more than eight generator engines may operate concurrently for no more than 10 continuous hours.

3.6. All startup and commissioning testing shall be conducted during daylight hours.

3.7. Following start-up, commissioning testing, and the initial certification testing of one engine of each batch of similar size engines installed, the number of hours each engine has run, the fuel consumed during the testing, and the date shall be recorded. Data shall be provided to Ecology on request.

4. GENERAL TESTING AND MAINTENANCE REQUIREMENTS

4.1. The Vantage Data Center will follow engine-manufacturer's recommended diagnostic testing and maintenance procedures to ensure that each engine will conform to the emission limits in Condition 5 of this approval throughout the life of each engine.

4.2. Following installation and commissioning, but prior to the transfer of a batch of engines to Vantage ownership, to demonstrate the engines are commissioned and programmed to run within the Tier 2 emission limits in Condition 5.2, for PM (filterable only), NO, NO_2, NMHC, and CO emissions measurement shall be conducted for one engine from each batch of similar size engines installed (e.g. one CAT 3516 and one Cat C15). Testing shall be conducted at the loads of 100 percent, 75 percent, 50 percent, 25 percent and 10 percent using weighted averaging according to Table 2 of Appendix B to Subpart E of 40 CFR 89. Testing may be conducted using 40 CFR 1065.

4.3. Within 60 months of the first engine installation of each phase of installation, and every 60 months thereafter, the Vantage Data Center shall measure emissions of particulate matter (PM), Volatile Organic Compounds (VOC), nitric oxide (NO), nitrogen dioxide (NO_2), carbon monoxide (CO), and oxygen (O_2) from at least one representative engine from each batch of engines installed, in accordance with Approval Condition 4.4.2 and 4.4.3. This testing will serve to demonstrate compliance with the emission limits

contained in Condition 5.2; confirm that the engine's emissions remain within the EPA Tier 2 certification specifications, and as an indicator of proper operation of the engines. The selection of the engine(s) to be tested shall be subject to prior approval by Ecology and shall be defined in the source test protocol submitted to Ecology no less than 30 days in advance of any compliance- related stack sampling conducted by Vantage. Each engine tested shall be the engine from each batch of engines installed with the most operating hours since an engine of that batch was last tested.

4.4. The following procedures shall be used for each test for the engines required by Approval Condition 4.3 unless an alternate method is proposed by the Vantage Data Center and approved in writing by Ecology prior to the test:

4.4.1. Periodic emissions testing should be combined with other pre-scheduled maintenance testing and annual load bank engine testing. Additional operation of the engines for the purpose of emissions testing beyond the operating hours allowed in this Order must be approved by Ecology in writing.

4.4.2. To demonstrate that the engines satisfy the engine manufacturer's not to exceed emissions rates, PM (filterable and condensable), non-methane hydrocarbons (NMHC), NO, NO2, and CO emission measurement shall be conducted on a representative engine(s) from each phase of installation. This testing shall utilize EPA Reference Methods from 40 CFR 60, 40 CFR 51, and /or 40 CFR 1065, and shall be conducted at the single load point the engines have operated at during the preceding five year period (e.g. for first five engines of Phase 1, 33 percent), and at the highest load the engines have supported or at 100 percent electrical output, if the highest load is less than 90 percent. Emission limits are contained in Condition 5.3.

4.4.3. The F-factor method, as described in EPA Method 19, may be used to calculate exhaust flow rate through the exhaust stack. The fuel meter data, as measured according to Approval Condition 4.6, shall be included in the test report, along with the emissions calculations.

4.4.4. In the event that any stack test indicates non-compliance with the emission limits in Condition 5, Vantage shall repair or replace the engine and repeat the test on the same engine plus two additional engines from the same phase of installation as the engine showing non-compliance. Test reports shall be submitted to Ecology within 60 days of the final day of testing. Test reports shall be submitted to the address in Condition 7.

4.5. Each engine shall be equipped with a properly installed and maintained non-resettable meter that records total operating hours.

4.6. Each engine shall be connected to a properly installed and maintained fuel flow monitoring system that records the amount of fuel consumed by that engine.

4.7. Concurrent operation of all generators in service for more than three hours shall not exceed one day per calendar year, averaged over three years. Additionally, concurrent operation of all generators in service for three hours or less shall not exceed three days per calendar year.

4.8. In addition to operation in accordance with Condition 4.7, concurrent operation of generators shall be limited to a maximum of eight generators located in a single building. These engines may be operated no more than four hours per day and for no more than

six days per calendar year. Concurrent operation of generators physically located in two or more buildings is not allowed under this condition.

5. EMISSION LIMITS

5.1. The 15 engines shall meet the emission rate limitations contained in this section. The limits are for an engine operating in a steady-state mode (warm) and do not include emission rates during initial commissioning testing of the engines. The annual limits may be averaged over a rolling monthly three-year period. Unless otherwise approved by Ecology in writing, compliance with emission limits for those pollutants that are required to be tested under Approval Conditions 4.2 and 4.3 shall be based on emissions test data determined according to those approval conditions.

5.2. To demonstrate compliance with the g/kW-hr EPA Tier II average emission limits through stack testing, the Vantage Data Center shall conduct exhaust stack testing and averaging of emission rates for five individual operating loads (10 percent, 25 percent, 50 percent, 75 percent, and 100 percent) according to 40 CFR §89.410, Table 2 of Appendix B, 40 CFR Part 89, Subpart E, and/or 40 CFR Part 60, Subpart IIII, or any other applicable EPA requirement in effect at the time the engines are installed. The Tier 2 emission limits for the 15 engine generators (both MTU and Cat):

5.2.1. NMHC and NOx: 6.4 g/kW-hr

5.2.2. CO: 3.5 g/kW-hr

5.2.3. PM (filterable): 0.20 g/kw-hr

5.3. Emissions from each of the seven MTU Model 20V4000 engines rated at 4678 brake horse power shall not exceed the following emission rates at the stated loads, based on not-to-exceed emission rates stated in application materials:

MTU Model 20V4000 Emission Rates					
Fraction of Full Engine Power	1	0.75	0.50	0.25	0.10
Engine Power [kWm]	3490	2618	1745	872	349
Nox - g/kWh	8	6.5	5.6	4.9	9
NO2 - g/kWh	0.9	0.8	0.6	0.6	1.1
CO - g/kWh	1.4	1.3	1.6	3.4	6.6
HC - g/kWh	0.2	0.29	0.44	0.68	2.48
PM (f) - g/kWh	0.06	0.08	0.19	0.41	1.03

5.4. Emissions from each of the eight Cat Model 3516E engines rated at 4043 brake horse power shall not exceed the following emission rates at the stated loads, based on not-to-exceed emission rates stated in application materials:

Cat Model 3516E Emission Rates					
Fraction of Full Engine Power	1	0.75	0.50	0.25	0.10
Engine Power [BHP]	4043	3072	2102	1131	549
Nox - g/HP-HR	6.14	5.03	3.70	3.48	8.68
NO2 - g/HP-HR	0.614	0.503	0.370	0.348	0.868
CO - g/HP-HR	1.16	0.78	0.69	2.17	3.74
HC – g/HP-HR	0.14	0.18	0.26	0.38	0.56
PM (f) - g/HP-HR	0.09	0.06	0.08	0.25	0.24

5.5. Diesel Engine Exhaust Particulate (DEEP: filterable only) emissions from all 15 engines shall not exceed 0.189 tons per year averaged over a rolling monthly three-year period.

5.5.1. Total Particulate Matter (PM=PM2.5) emissions from all 15 engines combined shall not exceed 0.8 tons/yr averaged over a rolling monthly three-year period.

5.5.2. Nitrogen Oxides emissions from all 15 engines combined shall not exceed 24 tons per year averaged over a rolling monthly three-year period.

5.5.3. Nitrogen dioxide (NO2) emissions from all 15 engines combined shall not exceed 2.0 tons/yr averaged over a rolling monthly three-year period.

5.5.4. Volatile organic compound (VOC) emissions from all 15 engines combined shall not exceed 0.0.5 tons/yr averaged over a rolling monthly three-year period.

5.5.5. Carbon Monoxide (CO) emissions from all 15 engines combined shall not exceed 3.6 tons/yr averaged over a rolling monthly three-year period.

5.5.6. Sulfur dioxide emissions from all 15 engines combined shall not exceed 0.014 tons/yr averaged over a rolling monthly three-year period.

5.5.7. Visual emissions from each diesel electric generator exhaust stack shall be no more than five percent, with the exception of a five-minute period after unit start-up. Visual emissions shall be measured by using the procedures contained in 40 CFR 60, Appendix A, Method 9.

6. OPERATION AND MAINTENANCE MANUALS

6.1. A site-specific O&M manual for the Vantage Data Center facility equipment shall be developed and followed. Manufacturers' operating instructions and design specifications for the engines, generators, and associated equipment shall be included in the manual. The O&M manual shall be updated to reflect any modifications of the equipment or its operating procedures. Emissions that result from failure to follow the operating procedures contained in the O&M manual or manufacturer's operating instructions may be considered proof that the equipment was not properly installed, operated, and/or maintained. The O&M manual for the diesel engines and associated equipment shall at a minimum include:

6.1.1. Manufacturer's testing and maintenance procedures that will ensure that each individual engine will conform to the EPA Tier Emission Standards appropriate for that engine throughout the life of the engine.

6.1.2. Normal operating parameters and design specifications.

6.1.3. Operating and maintenance schedules.

7. SUBMITTALS

All notifications, reports, and other submittals shall be sent to:

Washington State Department of Ecology
Air Quality Program
4601 N. Monroe Street
Spokane, WA 99205-1295

8. RECORDKEEPING

8.1. All records, Operations and Maintenance Manual, and procedures developed under this Order shall be organized in a readily accessible manner and cover a minimum of the

most recent 60-month period. Any records required to be kept under the provisions of this Order shall be provided within 30 days to Ecology upon request. The following records are required to be collected and maintained:

8.1.1. Fuel receipts with amount of diesel and sulfur content for each delivery to the facility.

8.1.2. Monthly and annual hours of operation for each diesel engine.

8.1.3. Purpose, electrical load, and duration of runtime for each diesel engine during any periods of operation.

8.1.4. Annual gross power generated by or for each independent tenant at the facility and total annual gross power generated by the facility.

8.1.5. Upset condition log for each engine and generator that includes date, time, duration of upset, cause, and corrective action.

8.1.6. Air quality complaints received from the public or other entity, and the affected emissions units.

9. REPORTING

9.1. Within 10 business days after entering into a binding agreement with a new tenant, Vantage shall notify Ecology of such agreement. The serial number, manufacturer make and model, standby capacity, and date of manufacture of engines proposed will be submitted prior to installation of engines in any of the phases of this project.

9.2. The following information will be submitted to the AQP at the address in Condition 7 above by January 31 of each calendar year. This information may be submitted with annual emissions information requested by the AQP.

9.2.1. Monthly rolling annual total summary of air contaminant emissions.

9.2.2. Monthly rolling hours of operation for each engine with annual total.

9.2.3. Monthly rolling gross power generation with annual total as specified in Approval Condition 8.1.4.

9.2.4. A log of each start-up of each diesel engine that shows the date, the purpose, fuel usage, and duration of each period of operation.

9.3. Any air quality complaints resulting from operation of the emissions units or activities shall be promptly assessed and addressed. Vantage shall maintain a record of the action taken to investigate the validity of the complaint and what, if any, corrective action was taken in response to the complaint. Ecology shall be notified within three days of receipt of any such complaint.

9.4. Vantage shall notify Ecology by e-mail or in writing within 24 hours of any engine operation of greater than 60 minutes if such engine operation occurs as the result of a power outage or other unscheduled operation. This notification does not alleviate Vantage from annual reporting of operations contained in any section of Approval Condition 9.

10. GENERAL CONDITIONS

10.1. **Commencing/Discontinuing Construction and/or Operations:** The portion(s) of this approval regulating future phases of construction shall become void if construction of the planned phase of the facility is not begun within 18 months of permit issuance or if facility operation is discontinued for a period of 18 months or more. In accordance with

WAC 173-400-111(7)(c), each phase of construction must commence within 18 months of the projected and approved construction dates in this Order.

10.2. **Compliance Assurance Access:** Access to the source by representatives of Ecology or the EPA shall be permitted upon request. Failure to allow such access is grounds for enforcement action under the federal Clean Air Act or the Washington State Clean Air Act, and may result in revocation of this Approval Order.

10.3. **Availability of Order and O&M Manual:** Legible copies of this Order and the O&M manual shall be available to employees in direct operation of the diesel electric generation station, and be available for review upon request by Ecology.

10.4. **Equipment Operation:** Operation of the 15 engine generators (Seven MTU Model 20V4000, Eight Cat Model 3516E) diesel engines used to power emergency electrical generators and related equipment shall be conducted in compliance with all data and specifications submitted as part of the NOC application and in accordance with the O&M manual, unless otherwise approved in writing by Ecology.

10.5. **Modifications:** Any modification to the generators or engines, and their related equipment operating or maintenance procedures, contrary to information in the NOC application, shall be reported to Ecology at least 60 days before such modification. Such modification may require a new or amended NOC Approval Order.

10.6. **Activities Inconsistent with the NOC Application and this Approval Order:** Any activity undertaken by the permittee or others, in a manner that is inconsistent with the NOC application and this determination, shall be subject to Ecology enforcement under applicable regulations.

10.7. **Obligations under Other Laws or Regulations:** Nothing in this Approval Order shall be construed to relieve the permittee of its obligations under any local, state or federal laws or regulations.

All plans, specifications, and other information submitted to this project, and further documents, and any authorizations or approvals or denials in relation the Department of Ecology relative thereto shall be kept at Ecology's Eastern Regional Office in the "Air Quality Controlled Sources" files, and by such action shall be incorporated herein and made a part thereof.

Nothing in this approval shall be construed as obviating compliance with any requirement of law other than those imposed pursuant to the Washington Clean Air Act and rules and regulations thereunder.

Authorization may be modified, suspended or revoked in whole or part for cause including, but not limited to the following:

a. Violation of any terms or conditions of this authorization.

b. Obtaining this authorization by misrepresentation or failure to disclose fully all relevant fact.

The provisions of this authorization are severable, and if any provision of this authorization, or application of any provision to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this authorization, shall not be affected thereby.

YOUR RIGHT TO APPEAL

You have a right to appeal this Approval Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Approval Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of this Approval Order:

- File your appeal and a copy of this Approval Order with the PCHB. Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Approval Order on Ecology in paper form - by mail or in person. E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW, STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

For additional information, visit the Environmental Hearings Office Website: http://www.eho.wa.gov
To find laws and agency rules visit the Washington State Legislature Website: http://www1.leg.wa.gov/CodeRevise

DATED this 10th day of July 2019, at Spokane, Washington.

PREPARED BY:

Robert Koster, P.E.
Commercial/Industrial Unit
Air Quality Program
Eastern Regional Office

ROBERT W. KOSTER
STATE OF WASHINGTON
42995
REGISTERED
PROFESSIONAL ENGINEER

APPROVED BY:

David T. Knight
Section Manager
Air Quality Program
Eastern Regional Office

TECHNICAL SUPPORT DOCUMENT (TSD)
NOTICE OF CONSTRUCTION APPROVAL ORDER NO. 18AQ-E043
VANTAGE DATA CENTERS MANAGEMENT COMPANY, LLC
VANTAGE-QUINCY DATA CENTER
2019

1. EXECUTIVE SUMMARY

On March 28, 2019, Vantage Data Centers (VDC) applied to make some administrative changes to the data center approval order. VDC proposed to reduce the number of approved engine/generators from 7 to 5 MTU 3-MW engines in building 1 (renamed to WA-11, and to reduce the phases of construction from four to two, with phase 2 engines reduced from 12-3 MW to 10-2.75 MW and 2-0.5 MW 'life safety' engines made by CAT. The proposed data center, then, in 2018 would have consisted of the 7- Phase 1, 3 MW MTU engines, and a second building (Phase 2) with 8- 2.75 MW engines. Construction of this project was never initiated, instead in March of 2019, a different buildout was applied for (WA-12). The current project being compared to the 2016 project is the 5 existing MTU engines (only) in Building 1, and 10 CAT 2.75 MW engines and 2 CAT 0.5 MW engines in a second building in the NE quadrant of the Vantage property. Total power production capacity will be 43.5 MW (compared to 51 in the 2016 approval order or 45 MW in the abandoned 2018 order). There will be an emission decrease from currently approved (2016) emissions and a decrease in the impacts due to the project. In addition, by moving the majority of the engines to the NE quadrant of the facility, the maximally impacted receptor (the residential property next to the SW corner of the facility will experience reduced impacts. By subtracting the right-hand column from tables 2a or 2b the difference in emissions can be determined by pollutant. This is also shown in attachment 3-2 of the application materials.

2. PROJECT DESCRIPTION

Through design and operational experience gained at Quincy and other sites, VDC has developed data center plans that use energy more efficiently so that the size and number of engines required for a given backup demand can be reduced. VDC proposes to implement those changes at its Quincy facility. Phase 1 is complete, with five of the seven MTU 3-MW engines proposed for Phase 1 in place. VDC plans no more engines for the first building (phase 1). Then, instead of three more buildings (phases) with 10 additional 3-MW engines, VDC has proposed ten 2.75-MW CAT engines and two 0.5 MW 'life safety' CAT engines in a single building (one more phase of construction). In 2018, Vantage was issued an approval for a build-out facility with 15 3 MW MTU engines. That project was never initiated, instead the buildout is expected to be 5 MTU 3 MW engines (existing, installed) and 12 CAT engines, 10 at 2.75 MW and 2 at 0.5 MW. The 5 MTU engines already installed will be part of this project and the previous one, so their emissions are not included in the tables below. VDC proposes to complete all phases (17 engines total) by January 1, 2020 which is one year later than the schedule in the existing approval. These changes (emission reductions, impacts reductions, construction schedule extensions) are allowed without amending the approvals in most of the data center approvals. The VDC approval was written with enough specific details that it had to be modified through this administrative amendment process. The following tables can be used to compare the total annual emissions from the current approval (16AQ-E026) to the total annual emissions for the proposed operation

at full buildout operation. For all pollutants, both short term and long term, the change associated with this proposal is an emission reduction of roughly 15 percent.

Table 2a: Criteria Pollutant Maximum Year Potential to Emit for Vantage-Quincy Data Center		
Pollutant	**16AQ-E026: 12 Engines, Total Emissions**	**Proposed: 12 CAT Engines, Total Emissions**
Criteria Pollutant	tons/yr	tons/yr
2.1.1 NOx Total	16.51	12.59
2.1.2 CO	3.1	2.6
2.1.3 SO_2	0.0119	0.0096
2.1.4 $PM_{2.5}$	0.7	0.49
2.1.5 VOC	0.53	0.29
2.1.6 Primary NO_2	1.65	1.26

Table 2b: Toxic Air Pollutant Maximum Year Potential to Emit for Vantage-Quincy Data Center		
Pollutant	**16AQ-E026: 12 MTU Engines, Total Emissions**	**Proposed: 12 CAT Engines, Total Emissions**
Organic Toxic Air Pollutants	tons/yr	tons/yr
2.1.7 Propylene	2.19E-02	1.781E-02
2.1.8 Acrolein	6.19E-05	5.02E-05
2.1.9 Benzene	6.09E-03	4.94E-03
2.1.10 Toluene	2.21E-03	1.792E-03
2.1.11 Xylenes	1.52E-03	1.23E-03
2.1.12 Napthalene	1.02E-03	8.28E-04
2.1.13 1,3 Butadiene	3.07E-04	2.49E-04
2.1.14 Formaldehyde	6.2E-04	5.03E-04
2.1.15 Acetaldehyde	1.98E-04	1.61E-04
Poly Aromatic Hydrocarbons (PAH)		
2.1.16 Benzo(a)Pyrene	2.02E-06	1.64E-06
2.1.17 Benzo(a)anthracene	4.88E-06	3.96E-06
2.1.18 Chrysene	1.2E-05	9.75E-06
2.1.19 Benzo(b)fluoranthene	8.72E-6	7.07E-06
2.1.20 Benzo(k)fluoranthene	1.71E-06	1.39E-06
2.1.21 Dibenz(a,h)anthracene	3.9E-06	2.20E-06
2.1.22 Ideno(1,2,3-cd)pyrene	3.25E-06	2.64E-06
State Criteria Pollutant Air Toxics		

2.1.25 DEEP/$PM_{2.5}$	0.22	0.20
2.1.26 Carbon monoxide	3.1	2.6
2.1.27 Sulfur dioxide	0.012	0.0096
2.1.28 Primary NO_2	1.65	1.26

3. BEST AVAILABLE CONTROL TECHNOLOGY and BEST AVAILABLE CONTROL TECHNOLOGY FOR TOXICS

For both BACT and t-BACT the costs for controls beyond Tier 2 designed engines remain prohibitive. A more thorough evaluation of the cost-effectiveness of Tier 4 level controls was conducted for the earlier approval for VDC (16AQ-E026). Even using the 'Hanford' t-BACT cost estimations, the Tier 4 cost per ton of pollutant controlled are much higher than Ecology can justify requiring as t-BACT. This has not changed in the 2-3 years since that evaluation was conducted.

4. AMBIENT IMPACTS ANALYSIS

This project is an emission reduction from approved project emissions. Ecology already approved the project with emissions and impacts approximately 15% greater than those resulting from the proposed project. The reduced emission rates proposed are expected to result in similar reductions in concentrations (impacts) at the maximally exposed receptor. Ecology previously approved the project with higher impacts, thus also approves this proposal.

5. CONCLUSION

Based on the above analysis, Ecology concludes that operation of the 17 generators at Vantage will not have an adverse impact on local air quality. Ecology finds that Vantage has satisfied all requirements for NOC approval.

6. COMMENTS and RESPONSES

Vantage Data Centers – Quincy Campus
Air Quality Approval Order 19AQ-E026

Ecology Response to Public Comments

From May 22, 2019 through June 21, 2019, Ecology accepted public comments on the draft air quality approval order for the Vantage Data Centers-Quincy Campus amendment request. Ecology received 12 sets of comments, 11 in support of the project and one questioning the evaluations and analyses performed by Ecology. The following is Ecology's response to the comments received.

We thank the commenters for their participation.

Comment 1: Josh Schwint

I would like to show my support to the permit modification at vantage data centers. This modification decreases the size of the gens, doesn't increase in total gens, and allows them to be placed further away from a residential area. I believed all three of these are positive things for the

community. Data centers have helped grow this community substantially. As a lifetime resident of Quincy, I have seen the positive changes firsthand.

Ecology Response: Thank you for your interest in this project and your participation in the public process.

Comments 2-11: Commenters 2 through 11 submitted copies of a form letter in support of the project. These commenters were Joanie Schwint, Mick Qualls, Chris Plass, Guy Bertilson, Vadim Shipovskiy, Dan Jacobson, Travis Lewis, Mike Hamilton, David Martens, and Wayland Potter. An unsigned copy of the form letter follows:

May XX, 2019
To: **Washington State Department of Ecology**
Attn: Robert Koster, Air Quality Program, robert.koster@ecy.wa.gov
From: Name and Company or Organization
RE: **SUPPORT OF VANTAGE DATA CENTERS EXPANSION OF ITS DATA CENTER CAMPUS IN QUINCY, WA**
Dear Robert Koster,
I am writing in support of Vantage Data Centers' expansion of its data center campus in Quincy, WA, and Vantage's request to install additional backup diesel generators for use during very infrequent and brief power failures to support the expanded campus' computer servers.
According to Grant County PUD, Quincy has a high level of electrical power redundancy because it is drawing electrical power from two different sets of the transmission lines. In addition to the power redundancy in Quincy, Grant County PUD has some of the lowest rates of power outages and shortest down times in the Pacific Northwest.
Furthermore, the development, expansion and/or construction of data centers such as Vantage Data Centers campus in Quincy, WA provide the following positive benefits to the economy:

- Data Centers contribute millions of dollars of real & personal property tax, payroll tax, and public utility tax, and privilege tax revenues that help to provide funding for schools and other local units of government (City of Quincy, Grant County, Quincy Fire District, Quincy Hospital District, etc.).
- Data centers in rural areas of Washington State create high-paying, long-term family wage jobs which provide economic diversity and stability to rural communities in Washington State. For every 2 people that a data center hires, approximately 5 more people in the local economy go to work.
- The development of data centers in rural areas of Washington has also created hundreds of construction-related jobs which have increased retail sales taxes revenues in our local counties. On average, the construction employment to build one data center is approximately 500 people working nearly 300,000 man-hours. In addition, the total wages paid for the construction of various data centers in Central Washington between 2006 to present has nearly several hundred million dollars.
- The total value of data center investment in rural Washington State since 2006 has been nearly $5 billion.

In conclusion and for the reasons above, I am writing in support of Vantage Data Centers' request expand its data center campus in Quincy, as it will create new economic development, new jobs, and greatly increase our rural property tax base.
Sincerely,
Signature
Name
Title
Company or Organization
Address

City, State, Zip Code
Ecology Response: Thank you for your interest in this project and your participation in the public process.

Comment 12: Patricia Martin
The following comments were received from Patricia Martin (numbering added to facilitate response).

Kari,

Please accept my briefs comments below.

1) I noticed that the MTU provided engine emission rates are only for the new engines that will be added, and there is nothing for a person to compare them against to confirm that these smaller engines actually result in a reduction in emissions. Sometimes that is not the case. Please provide the engine emission rates for the currently installed engines so that assurances can be made that there are reductions in emissions.

2) The use of the fence or property line is not consistant with state and federal definitions of ambient air. Ambient means surrounding and the federal definition requires each state to insure air quality through the entire state, not just on property outside a fence or property line.

3) I can't find any support for averaging emission rates in the state or federal statutes. Please cite the source of the authority for the use of averaging for emission limits.

4) NSR requires that condensable particulate be included in performance tests. Why isn't this being done?

5) Some of the things I object to in the permit include: the use of 36-month rolling averages; 6) stack testing using a 5-weighed average to demonstrate compliance with emission standards; 7) exempting emissions during initial commissioning testing and 8)demonstration that engines meet the NTE by testing them at only one load.

9) Because it looks like Riker may have tenants, if so, will the tenants be permitted as a single source under common control?

Thank you for responding to my comments.

Ecology Response:

1) The project evaluated for this approval is to add 12 CAT engines to the 5 MTU engines already operated at the site where 17 MTU engines are approved. Replacing the 12 3-MW MTU engines not yet installed with 10-2.75 MW CAT engines and 2-0.5 MW CAT engines will reduce emissions and total installed MW from 51 to 43.5[RC(1)]. Engine specification sheets for the new (CAT) engines may be found in Attachment 1 of the Approval Order Amendment Request submitted by Landau Associates for this project. MTU engine specification sheets have been provided for previous permitting (2016, 2018) and are also in Attachment 1 of the Amendment request.

2) Ambient air is considered to begin at the points of closest public access to a facility. Data centers (particularly Vantage) are very security-conscious and Vantage has redundant access restrictions. Ambient does mean surrounding, not interior of the property boundary if public access is restricted.

3) Each of the most important National Ambient Air Quality Standards for data center permitting are expressed as 3 year averages as shown in the following table. *See https://www.epa.gov/criteria-air-pollutants/naaqs-table*[RC(2)] , and federal rules referenced therein. For impacts analyses, use of the averaging forces data centers to consider all 3 years of activity as if it occurs in one year and is a very conservative (over-) estimate of emissions and impacts.

Pollutant [links to historical tables of NAAQS reviews]	**Primary/ Secondary**	**Averaging Time**	**Level**	**Form**
Carbon Monoxide (CO)	primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Lead (Pb)	primary and secondary	Rolling 3 month average	0.15 $\mu g/m^3$ (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)	primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)	primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12.0 $\mu g/m^3$	annual mean, averaged over 3 years
		secondary	1 year	15.0 $\mu g/m^3$	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb [(4)]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

https://www.epa.gov/criteria-air-pollutants/naaqs-table

4) It is not clear where minor NSR requires that condensable particulate be included in performance tests. In accordance with WAC 173-400-110, this project will reduce emissions from permitted levels, and so, is not subject even to minor NSR. For these Tier 2 engines at the Vantage Data Center, we have made the conservative assumption that the condensable fraction can be represented by the hydrocarbons added to the filterable particulate matter in the exhaust. This overestimates condensables by adding volatile material (not condensable) to the condensables.[RC(3)] Emission tests required by this permit are intended to

demonstrate continued compliance with NSPS and to evaluate the performance of the engines. Cold start and condensable emissions were factored into emissions estimates used in dispersion modeling and demonstrated that emissions from engines meeting the NSPS requirements would comply with the NAAQS. Ecology has explored the utility of condensable testing of data center engines using EPA Method 202. The results of Method 202 testing appeared to contain unexplained variation such that the value of the data is limited.

5) Ecology is one of the few (maybe only) places in the nation requiring emissions during power outages be included in the evaluation of data centers' back-up engines. Applicants' concern with the compliance consequences if they underestimated those hours led to the use of the 3-year average. Then, with 3-year averages allowed by the approval, in a power outage, all three years of run time hours could be used without violating the terms of the approval. This type of permit condition means we evaluate impacts as if all three years of activity occur during one outage.

6) The emission limits contained in the NSPS for these engines are based on a 5-mode weighted average. The certifications the manufacturers provide (Tier2, Tier 4) are all based on the 5-mode weighted average. To ensure the engines will operate as certified, Ecology requires an initial test using the data in the 5-mode weighted average. After five years, we require another test of a representative engine for compliance and to evaluate any decline in engine performance. The 5-mode weighted average allows us to evaluate emissions for compliance over the entire range of loads the engines will run and compare them to the certifications required by the NSPS.

7) The initial commissioning testing takes around 40 hours, is done before ownership of the engines is transferred to the data center, and is done with a sole priority of synchronized and reliable power output from the engine generator. The emissions from this activity (and the run-time hours) are included in the analyses required in our data center applications: they have not been exempted. These hours and emissions are one of the reasons applicants have requested high annual operating hours and the three year averaging.

8) Testing at one load and comparing it to the engine manufacturer's Not to Exceed (NTE)[RC(4] emission rates
is a testing and data evaluation procedure we evaluated to reduce the hours an engine runs just for testing. If the NTE is reasonably close to the nominal emission rate, testing at the load the engines has run most in the preceding 5 years and comparing it to the NTE at that load can accomplish everything necessary (is the engine still operating as certified and has there been a decline in performance). Due to issues with the NTE values provided by some manufacturers, testing at one load is not part of the Vantage Draft Approval that was posted for this public comment period.

9) Vantage Data Centers (formerly known as Riker), when originally permitted for this site, wanted the 'tenant' model as an option. That model has not been used at Vantage, but it remains in this approval as an acceptable option. This model would likely move the The Vantage Data Center at this site has always been permitted as a single source. That determination is made on a case-by-case basis and it is possible that it could change in the future. Note that the tenant model, if used by Vantage, would likely move the 'ambient air boundary' from the property line to the point of any tenant access to the Vantage property.

All information following is a copy of the technical support document that accompanied Approval Order 16AQ-E026, for reference.

TECHNICAL SUPPORT DOCUMENT (TSD)
NOTICE OF CONSTRUCTION APPROVAL ORDER NO. 16AQ-E026
VANTAGE DATA CENTERS MANAGEMENT COMPANY, LLC
VANTAGE-QUINCY DATA CENTER
2017

1. BACKGROUND

Starting in about 2006, internet technology companies became interested in the City of Quincy in Grant County as a good place to build data centers. Data centers house the servers that provide e-mail, manage instant messages, and run applications for our computers. Grant County has a low-cost, dependable power supply and an area-wide fiber optic system. During 2007 and 2008, the Ecology Air Quality Program (AQP) issued approval orders to Microsoft Corporation, Sabey Intergate Inc., and Intuit Inc. that allowed them to construct and operate data centers.

In 2010, the Washington State Legislature approved a temporary sales tax exemption for data centers building in Grant County and other rural areas. To qualify for the tax exemption, the data center must have at least 20,000 square feet dedicated to servers and must have started construction before July 1, 2011. The AQP has received and approved permit applications from Microsoft Corporation and Sabey Intergate Inc. for expansion of their existing data centers in Quincy. Dell Marketing, LP and Sabey Intergate Quincy, LLC have also submitted applications for new data centers in Quincy that have been approved for construction and operation.

To build or expand, a data center company must first apply to the Washington Department of Ecology (Ecology) for a permit called a "notice of construction approval order" (NOC). Its purpose is to protect air quality. The NOC is needed because data centers use large, diesel-powered backup generators to supply electricity to the servers during power failures. Diesel engine exhaust contains both criteria and toxic air pollutants. As part of the permit review process, Ecology carefully evaluates whether the diesel exhaust from a data center's backup generators cause health problems or contribute to national ambient air quality standard exceedances.

2. EXECUTIVE SUMMARY

Vantage Data Centers Management Company, LLC submitted a Notice of Construction (NOC) application received by Ecology on August 10, 2016, for the phased installation of the Vantage-Quincy Data Center, to be sited North West of the junction of Road 11 NW and Road O NW, Quincy, in Grant County. A legal description of the parcel is the SE 1/16 of Section 4 and the SW 1/16 of Section 3, Township 20 North, Range 24 East, Willamette Meridian. The Vantage-Quincy Data Center will be leased to independent tenants. The primary air contaminant sources at the facility consist of 17-3000 kilowatt (kWe) electric generators powered by diesel engines. The generators will have a power capacity of up to 51 MWe, and will provide emergency backup power to the facility during infrequent disruption of Grant County PUD electrical power service. The project construction will be phased (up to 4 phases, phase 1 with 7 generators) over several years depending on customer demand.

Review of the August 10, 2016 NOC application began in August and continued through December, when the toxics Tier 2 review was completed. Before the Ecology toxicologists can

issue their recommendation, a preliminary determination of approval must be prepared and provided to them. Upon their agreement that BACT and t-BACT and the conditions of approval that confirm emission estimates used for the toxics and NAAQS modeling are in place, their recommendation is added to this TSD and the documents placed out for public comment. It is expected that a public hearing will be held on data center approvals in Quincy. The final draft Preliminary Determination (i.e., Proposed Decision) was forwarded to Ecology HQ for review and to facilitate completion of the second tier review. Public review began on June 8, 2017, and ended on July 17, 2017. A public hearing was held at the Quincy Community Center on July 12, 2017.

3. PROJECT DESCRIPTION

The Ecology Air Quality Program (AQP) received a Notice of Construction (NOC) application for the Vantage-Quincy Data Center on August 10, 2016. The Vantage-Quincy Data Center, hereafter referred to as Vantage, consists of phased construction of 4 data center buildings, 3 smaller structures housing generators, and a future substation. Construction will occur in phases with the first phase to be construction of a center with 5 primary generators and 2 originally described as 'reserve'. The project was previously approved with Tier 4 emission limits and five of the seven engines of phase 1 were installed with third party (i.e. not built by the engine manufacturer) tail-pipe emission controls. Vantage found that the engines with the ELM controls could not be operated in compliance with the Tier 4 emission limits and has submitted this application to evaluate the 17 engines without the Tier 4 controls. During the original permitting, Ecology agreed that the only control that did not significantly exceed Ecology thresholds for t-BACT cost-effectiveness for these engines was an engine that satisfied Tier 2 emission limits. The cost of controlling emissions with add-on controls exceeded (and still does exceed) any cost-effectiveness criteria we have used even for t-BACT and even using the Hanford approach to estimating cost effectiveness. The cost of control beyond Tier 2 engines is prohibitive for the short run times required for power outages and maintenance and reliability testing at data centers. In addition, Vantage found their system could not meet the Tier 4 emission limits in their permit. Operating hours increased in order to test the exhaust of engines which were not achieving the limits established in the approval conditions. The timing of installation of Phases 2-4 of this data center depends on customer demand and is not yet determined. Phase 1 was operational around the end of 2013 and includes the 5 MTU 3000, three 3.0 Megawatt (MWe) electric generators powered by 4678 brake horse power MTU Model 20V4000 diesel engines. Phase 2, 3, and 4 construction are identified as Data Center 2 (phase 2 - 4 primary engine generators), Data Center 3 (phase 3 - 4 primary engine generators), and a Building described as 'ETC' (phase 4 - 2 engine generators). The sequence of expected construction has not been provided to Ecology. The Vantage-Quincy generators will have a total combined capacity of approximately 51 MWe upon final build out of the four Phases. The Vantage-Quincy Data Center will be leased for occupancy by independent tenant companies that require fully supported data storage and processing space although all engine/generators are expected to be owned and operated by Vantage.

Vantage has requested operational limitations on the Vantage-Quincy facility to reduce emissions below major source thresholds and to minimize air contaminant impacts to the community. Vantage has indicated that diesel fuel usage at Vantage-Quincy will be less than 158,355 gallons of ultra-low sulfur diesel fuel. Individual engine operating limits of 45 hours per year for the engines serving Building 1 are also implied in the application materials.

Air contaminant emissions from the Vantage-Quincy Data Center project have been calculated based entirely on operation of the emergency generators. Table 1a contains criteria pollutant potential to emit for all phases of the Vantage-Quincy Data Center project. Table 1b contains toxic air pollutant potential to emit for all phases of the Vantage-Quincy Data Center project.

Table 1a: Criteria Pollutant Maximum Year Potential to Emit for Vantage-Quincy Data Center (excluding commissioning as modeled by applicant)

Pollutant	Emission Factor (EF) Reference	Facility Emissions 17 Engines Total
Criteria Pollutant		tons/yr
2.1.1 NOx Total	Landau Calculation	24
2.1.2 CO	Engine Not to Exceed	1.46
2.1.3 SO_2	Mass Balance	0.017
2.1.4 $PM_{2.5}$	Landau Calculation	1.06
2.1.5 VOC	Engine Not to Exceed	0.73
2.1.6 Primary NO_2	Engine Not to Exceed	2.4

Table 1b: Toxic Air Pollutant Maximum Year Potential to Emit for Vantage-Quincy Data Center

Pollutant	1. AP-42 Section 3.4 EF	Facility Emissions 17 Engines Total
Organic Toxic Air Pollutants	Lbs/MMbtu	tons/yr
2.1.7 Propylene	2.79E-03	3.1E-02
2.1.8 Acrolein	7.88E-06	8.7E-05
2.1.9 Benzene	7.76E-04	8.6E-03
2.1.10 Toluene	2.81E-04	3.1E-03
2.1.11 Xylenes	1.93E-04	2.1E-03
2.1.12 Napthalene	1.30E-04	1.4E-04
2.1.13 1,3 Butadiene	3.91E-05	4.4E-04
2.1.14 Formaldehyde	7.89E-05	8.7E-04
2.1.15 Acetaldehyde	2.52E-05	2.8E-04
Poly Aromatic Hydrocarbons (PAH)		
2.1.16 Benzo(a)Pyrene	2.57E-07	2.9E-06
2.1.17 Benzo(a)anthracene	6.22E-07	6.9E-06
2.1.18 Chrysene	1.53E-06	1.7E-05
2.1.19 Benzo(b)fluoranthene	1.11E-06	1.2E-05
2.1.20 Benzo(k)fluoranthene	2.18E-07	2.4E-06
2.1.21 Dibenz(a,h)anthracene	3.46E-07	3.9E-06
2.1.22 Ideno(1,2,3-cd)pyrene	4.14E-07	4.6E-06
2.1.23 PAH (no TEF)	3.88E-06	4.3E-05
2.1.24 PAH (apply TEF)	4.98E-07	5.5E-06

Table 1b: Toxic Air Pollutant Maximum Year Potential to Emit for Vantage-Quincy Data Center		
Pollutant	**1. AP-42 Section 3.4 EF**	**Facility Emissions 17 Engines Total**
State Criteria Pollutant Air Toxics		
2.1.25 DEEP/$PM_{2.5}$	Landau Calculation	0.229
2.1.26 Carbon monoxide	Landau Calculation	3.4
2.1.27 Sulfur dioxide	Mass Balance	0.02
2.1.28 Primary NO_2*	10% total NOx	2.4

*Assumed to be equal to 10% of the total NOx emitted.

The Vantage Center will rely on cooling systems to dissipate heat from electronic equipment at the facility. Cooling systems will be limited by conditions of approval to those emitting no air contaminants (indirect evaporative).

4. APPLICABLE REQUIREMENTS

The proposal by Vantage Data Center qualifies as a new source of air contaminants as defined in Washington Administrative Code (WAC) 173-400-110 and WAC 173-460-040, and requires Ecology approval. The installation and operation of the Vantage-Quincy Data Center is regulated by the requirements specified in:

4.1 Chapter 70.94 Revised Code of Washington (RCW), Washington Clean Air Act,
4.2 Chapter 173-400 Washington Administrative Code (WAC), General Regulations for Air Pollution Sources,
4.3 Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollutants, and
4.4 Title 40 CFR Part 60 Subpart IIII

All state and federal laws, statutes, and regulations cited in this approval shall be the versions that are current on the date the final approval order is signed and issued.

5. BEST AVAILABLE CONTROL TECHNOLOGY

Best Available Control Technology (BACT) is defined[1] as "*an emission limitation based on the maximum degree of reduction for each air pollutant subject to regulation under chapter 70.94 RCW emitted from or which results from any new or modified stationary source, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of the "best available control technology" result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard under 40 CFR Part 60 and Part 61....*"

For the first approval, Vantage proposed installation of engines with diesel particulate filters (DEEP Control) treated to also serve as oxidation catalysts (VOC and CO control) and selective

[1] RCW 70.94.030(7) and WAC 173-400-030(12)

catalytic reduction (NOx Control). With these proposed controls, Vantage avoided the formal process of a "top-down" approach for determining BACT for the proposed diesel engines. After having found the filter and catalytic controls could not be made to work as advertised, Vantage is requesting that Ecology review the project again with the 17 engines with just Tier 2 controls.

The proposed diesel engines will emit the following regulated pollutants which are subject to BACT review: nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOCs), particulate matter (PM, PM_{10} and $PM_{2.5}$) and sulfur dioxide.

5.1 BACT ANALYSIS FOR NOx

5.1.1 ***Selective Catalytic Reduction.*** The SCR system functions by injecting a liquid reducing agent, such as urea, through a catalyst into the exhaust stream of the diesel engine. The urea reacts with the exhaust stream converting nitrogen oxides into nitrogen and water. The use of ultra-low sulfur (10-15 ppmw S) fuel is required to achieve good NOx destruction efficiencies. SCR can reduce NOx emissions by up to 90-95 percent.

For SCR systems to function effectively, exhaust temperatures must be high enough (about 200 to 500°C) to enable catalyst activation. For this reason, SCR control efficiencies are expected to be relatively low during the first 20 to 30 minutes after engine start up, especially during maintenance, and testing loads. There are also complications of managing and controlling the excess ammonia (ammonia slip) from SCR use.

This application suggests a cost per ton of $370,000 for SCR, which is considerably higher than the $12,000 cost per ton that would allow Ecology to require it as BACT.

5.1.6 **BACT determination for NOx**

Ecology determines that BACT for NOx is:

a. Use of EPA Tier 2 certified engines, if the engines are installed and operated as emergency engines, as defined at 40 CFR§60.4219; and
b. Compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII.

5.2 BACT ANALYSIS FOR PARTICULATE MATTER, CARBON MONOXIDE AND VOLATILE ORGANIC COMPOUNDS

5.2.1 ***Diesel particulate filters (DPFs).*** These add-on devices include passive and active DPFs, depending on the method used to clean the filters (i.e., regeneration). Passive filters rely on a catalyst while active filters typically use continuous heating with a fuel burner to clean the filters. The use of DPFs to control diesel engine exhaust particulate emissions has been demonstrated in multiple engine installations worldwide. Particulate matter reductions of up to 85% or more have been reported. Therefore, this technology was identified as the top case control option for diesel engine exhaust particulate emissions from the proposed engines.

Vantage initially proposed installation and operation of DPFs on each of the proposed diesel engines as BACT. The July 16, 2012 supplemental analysis of BACT retracted this proposal, and instead proposed that Tier 2 engines should be considered BACT for these engines. Ecology accepts this option as BACT for these engines.

5.2.2 ***Diesel oxidation catalysts***. This method utilizes metal catalysts to oxidize carbon monoxide, particulate matter, and hydrocarbons in the diesel exhaust. Diesel oxidation catalysts (DOCs) are commercially available and reliable for controlling particulate matter, carbon monoxide and hydrocarbon emissions from diesel engines. While the primary pollutant controlled by DOCs is carbon monoxide (approximately 90% reduction), DOCs have also been demonstrated to reduce up to 30% of diesel engine exhaust particulate emissions, and more than 50% of hydrocarbon emissions.

5.2.4 **BACT Determination for Particulate Matter, Carbon Monoxide and Volatile Organic Compounds**

Ecology determines BACT for particulate matter, carbon monoxide and volatile organic compounds is:

a. Use of EPA Tier 2 certified engines if the engines are installed and operated as emergency engines, as defined at 40 CFR§60.4219; and
b. Compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII.

5.3 BACT ANALYSIS FOR SULFUR DIOXIDE

5.3.1 Vantage/Landau did not find any add-on control options commercially available and feasible for controlling sulfur dioxide emissions from diesel engines. Vantage Quincy's proposed BACT for sulfur dioxide is the use of ultra-low sulfur diesel fuel (maximum of 15 ppm by weight of sulfur). Using this control measure, sulfur dioxide emissions would be limited to 0.020 tons per year.

5.3.2 **BACT Determination for Sulfur Dioxide**

Ecology determines that BACT for sulfur dioxide is the use of ultra-low sulfur diesel fuel containing no more than 15 parts per million by weight of sulfur.

5.4 BEST AVAILABLE CONTROL TECHNOLOGY FOR TOXICS

Best Available Control Technology for Toxics (tBACT) means BACT, as applied to toxic air pollutants.[2] The procedure for determining tBACT follows the same procedure used above for determining BACT. Under state rules, tBACT is required for all toxic air pollutants for which the increase in emissions will exceed de minimis emission values as found in WAC 173-460-150.

For the proposed project, tBACT must be determined for each of the toxic air pollutants listed in Table 2 below. As indicated in Table 2, Ecology has determined that compliance with BACT, as determined above, satisfies the tBACT requirement.

[2] WAC 173-460-020

Table 2. tBACT Determination

Toxic Air Pollutant	tBACT
Acetaldehyde	Compliance with the VOC BACT requirement
Acrolein	Compliance with the VOC BACT requirement
Benzene	Compliance with the VOC BACT requirement
Benzo(a)pyrene	Compliance with the VOC and PM BACT requirement
1,3-Butadiene	Compliance with the VOC BACT requirement
Carbon monoxide	Compliance with the CO BACT requirement
Diesel engine exhaust particulate	Compliance with the PM BACT requirement
Formaldehyde	Compliance with the VOC BACT requirement
Nitrogen dioxide	Compliance with the NOx BACT requirement
Sulfur dioxide	Compliance with the SO_2 BACT requirement
Toluene	Compliance with the VOC BACT requirement
Total PAHs	Compliance with the VOC an PM BACT requirement
Xylenes	Compliance with the VOC BACT requirement

6. AMBIENT IMPACTS ANALYSIS

Vantage obtained the services of Landau Consultants to conduct air dispersion modeling for Vantage Data Center's generators to demonstrate compliance with ambient air quality standards and acceptable source impact levels. Each generator was modeled as a point source. Landau used EPA's AERMOD dispersion model to determine ambient air quality impacts caused by emissions from the proposed generators at the property line and beyond, and at the rooftops of the proposed data center buildings to be occupied by tenants. The ambient impacts analysis indicates that no National Ambient Air Quality Standards (NAAQS) are likely to be exceeded.

6.1 AERMOD Dispersion Modeling Methodology

AERMOD is an EPA "preferred" model (40 CFR Part 51, Appendix W, Guideline on Air Quality Models) for simulating local-scale dispersion of pollutants from low-level or elevated sources in simple or complex terrain.

The following data and assumptions were used in the application of AERMOD:

- Input data for for the AERMET meteorological processor included five years of sequential hourly surface meteorological data (2004–2008) from Moses Lake, WA and twice-daily upper air data from Spokane.

- Digital topographical data for the vicinity were obtained from the Micropath Corporation.

- The five existing generator stacks were set at a height of 43 feet above local finished grade. The remaining Building 1 generator stacks (two) and the ten additional engines generator stacks (Buildings 2, 3, and ETC) were set at a height of 48 feet above local finished grade.

- The planned data center buildings were included to account for building downwash. EPA's PRIME algorithm was used for simulating building downwash.

- For this application, Ecology required that emissions be estimated using worst-case conditions for each pollutant, so that the engine load during any hour need not be known and so that compliance could be determined from the hours operated. An exception was made for DEEP which has highest emissions at loads lower than Vantage will run (below 30%). For purposes of modeling compliance with the NAAQS and to conservatively model for the ASILs, it was assumed the entire three year amount of worst case emissions occurred in a single year.

- 1-hour NO2 concentrations were modeled using the Plume Volume Molar Reaction Model (PVMRM) module, with the following default concentrations: 40 parts per billion (ppb) of ozone, and a NO2/NOX ambient ratio of 90%. For purposes of modeling NO2 impacts, the primary NOX emissions were assumed to be 10% NO2 and 90% nitric oxide (NO) by mass.

- Emissions from commissioning testing and stack emission testing are equal to 27% of the emissions from full-buildout routine testing plus power outages. The worst-year annual-average impacts were estimated by manually scaling the previous annual-average AERMOD results by a factor of 1.27.

- For the Health Impacts Assessment modeling conducted for DEEP, the emissions from all modes of operation other than power outages were assumed to occur between 7 am to 7 pm.

- A Cartesian, rectangular receptor grid whose density diminished with distance, was used to model the property line and beyond for all AERMOD applications. In addition, fenceline receptors (10-meter spacing) and discrete receptors where rooftop air intakes are located, were also used. The receptor categories and number of receptors for each category are as follows:

Fenceline receptors in 10 meter (m) spacing	237
Receptors in 10 m spacing out to 350 m from the sources	6,765
Receptors in 25 m spacing out to 800 m from the sources	4,176
Receptors in 50 m spacing out to 2000 m from the sources	5,952
Rooftop receptors	25
Total number of the receptors	17,155

6.2 Assumed Background Concentrations

Background concentrations for all species were obtained from Ecology's Air Monitoring Network website (WSU website 2015). These
are:

PM10 (24-hour average)	62 $\mu g/m^3$
PM2.5 (98th percentile 24-hour average)	21 $\mu g/m^3$
NO2 (98th percentile 1-hour value)	16 $\mu g/m^3$

These regional values do not include "local background" caused by industrial facilities near the
proposed Vantage data center, namely the existing Sabey, Yahoo, and Intuit data centers and the Imrys manufacturing plant. The local background impacts were modeled separately, assuming a mixture of permit limits, a full area-wide power outage or maximum emitting test modes. The predicted total ambient impact at the receptor that is maximally impacted by Vantage-only emissions are:

PM10 (24-hour average)	139 $\mu g/m^3$	National Ambient Air Quality Standard: 150 $\mu g/m^3$
PM2.5 (24-hour average)	33 $\mu g/m^3$	National Ambient Air Quality Standard: 35 $\mu g/m^3$
NO2 (1-hour average)	149 $\mu g/m^3$	National Ambient Air Quality Standard: 188 $\mu g/m^3$

The Vantage engines in Building 1 are certified to a very high reliability standard (Tier 3 Uptime Certificate). To achieve this reliability rating, the initial commissioning testing includes significant and enhanced testing not necessary at less critical data centers. Table 3 lists the run-time required for this level of reliability. It is unknown if this certification will be desired for Buildings after Building 1, and because Building 1 has only two more engines (6 of 7 and 7 of 7) the 40 hours of commissioning are included in the 45 hours allowed per engine generator per year. Future phases of the Vantage project will likely require new source review to examine emissions and necessary runtime for the desired level of reliability.

Table 3. Runtime Scenario for Initial Startup and Commissioning Tests

Day of Test	Test Description	No. of Typical Hours	Average Load
Manufacturer Tests			
Day 1	8 hours at full load, 1 generator any given day	8	100%
Day 2	12 hours at 75%, 1 generator any given day	12	75
Functional Performance Tests			
Day 3	20 hours, Full (100%) Load, 1 generator any given day	20	100%
Summary of Per-Engine Startup Quantities			
Calendar Days of Testing (Each Generator)			3-4
Runtime Hours Each Generator			40
kWm-hrs During Testing (Each Generator)			111,000
Fuel Usage During Testing (Each Generator- gals)			8,692
NOx Emissions Each Generator			614 lbs
DPM Emissions During Testing (Each Generator)			18.6 lbs

Table 4:
Modeled Concentrations of Criteria Pollutants (with background) and comparison to Ambient Air Quality Standards

Pollutant and Time Frame	Background plus Modeled Concentration – ug/m^3	National Ambient Air Quality Standard - ug/m^3	Percent of Standard
PM_{10} 24 Hour	139	150	93%
PM_{10} Annual	1.3	50	3%
$PM_{2.5}$ 24 Hour	33	35	94%
$PM_{2.5}$ Annual	8	15	53%
NO_2 1- Hour	149	188	79.3%
CO 1-Hour	7,775	40,000	19.4%
CO 8-Hour	4,381	10,000	43.8%
SO_2 1-Hour	18.8	200	9.4%
SO_2 3-Hour	14.3	1310	1.1%
SO_2 24 Hour	7.5	-	-
SO_2 Annual	0.27	-	-

Table 5: Modeled Concentrations of Toxic Air Pollutants and Comparison to Acceptable Source Impact Levels (ASILs)

Pollutant and Time Frame	Modeled Concentration – ug/m3	Acceptable Source Impact Level – ASIL ug/m^3	Comparison of Modeled to ASIL
DEEP Annual	0.24	0.0033	7272%
NO_2 1-Hour	1,410	470	300%

As is indicated in Tables 4 and 5, Diesel Engine Exhaust Particulate (DEEP) and NO_2 exceeded the regulatory trigger level (the ASIL) for that pollutant. At these concentrations, DEEP and NO_2 are required to be further evaluated in a Second Tier Toxics Review in accordance with WAC 173-460-90.

8. SECOND TIER REVIEW FOR DIESEL ENGINE EXHAUST PARTICULATE AND NITROGEN DIOXIDE EMISSIONS

Proposed emissions of diesel engine exhaust particulate (DEEP) and nitrogen dioxide (NO_2) from the 17 Vantage engines exceed the regulatory trigger level for toxic air pollutants (also called an Acceptable Source Impact Level, (ASIL)). A second tier review is required for DEEP and NO_2 in accordance with WAC 173-460-090.

Large diesel-powered backup engines emit DEEP, which is a high priority toxic air pollutant in the state of Washington. In light of the potential rapid development of other data centers in the Quincy

area, and recognizing the potency of DEEP emissions, Ecology evaluated Vantage's proposal on a community-wide basis. The community-wide evaluation approach considers the cumulative impacts of DEEP emissions resulting from Vantage's project, and includes consideration of prevailing background emissions from existing permitted data centers and other DEEP sources in Quincy. This evaluation was conducted under the second tier review requirements of WAC 173-460-090.

Under WAC 173-460-090, Vantage was required to prepare a health impact assessment. The HIA presents an evaluation of both non-cancer hazards and increased cancer risk attributable to Vantage's increased emissions of DEEP and NO_2. Vantage also reported the cumulative risks associated with Vantage and prevailing sources in their HIA document. This cumulative DEEP related risk estimate was based on the latest cumulative air dispersion modeling work performed by Ecology. The Vantage HIA document along with a brief summary of Ecology's review will be available on Ecology's website.

9. CONCLUSION

Based on the above analysis, Ecology concludes that operation of the 17 generators at Vantage will not have an adverse impact on local air quality. Ecology finds that Vantage has satisfied all requirements for NOC approval.