DEPARTMENT OF
ECOLOGY
State of Washington

Updated Second Tier Review Recommendation Document for

Vantage Data Center
Quincy, Washington

November 30, 2012

1. Summary and Purpose

Vantage Data Centers Management Company, LLC (Vantage) proposes to install and operate 17 diesel-powered generators, each rated at 3,000 kW electrical output,[1] to provide backup power to their servers. The proposed engines emit diesel engine exhaust particulate (DEEP) at an estimated rate that cause ambient impacts in excess of a regulatory trigger level called an acceptable source impact level (ASIL). Vantage was therefore required to submit a second tier petition under WAC 173-460-090. A second tier petition requires Vantage to prepare a health impact assessment (HIA) quantifying the health risks posed by their emissions of DEEP.

Vantage hired ICF International (ICF) to prepare a HIA (ICF, 2012a). In this assessment, ICF estimated lifetime increased cancer risks attributable to Vantage's DEEP emissions and found them to be approximately **nine in one million** at the maximally impacted residential receptor to the southeast of Vantage's property. This risk was quantified at the location where the residential parcel shares it property boundary with Vantage. A lower risk of about **five in one million** was estimated at the location of an existing structure on the same property. Chronic and acute non-cancer hazards attributable to Vantage's DEEP and NO_2 emissions respectively were lower than unity (one) indicating that Vantage's emissions by themselves were not likely to result in adverse non-cancer health effects.

ICF also assessed the cumulative health risk by adding estimated concentrations attributable to Vantage's emissions to an estimated background DEEP concentration. The cumulative risk of residents living in the vicinity of Vantage was approximately **19 and 30 in one million** for the residents living immediately to the southeast and southwest of Vantage, respectively. Chronic non-cancer hazard quotients were much lower than one indicating that long-term exposure to DEEP in the area is not likely to result in non-cancer health effects.[2] These DEEP related health risks in the vicinity of Vantage are generally much lower than those estimated in urban areas of Washington.

Because the increase in cancer risk attributable to the new data center alone is less than the maximum risk allowed by a second tier review, which is 10 in one million, and the non-cancer hazard is acceptable, the project could be approvable under WAC 173-460-090. Furthermore, the cumulative risks to residents living near Vantage are below the cumulative risk threshold established by Ecology for permitting data centers in Quincy (100 per million or 100×10^{-6}).

This summary document presents Ecology's review of the proposed Vantage Data Center's HIA and other requirements under WAC 173-460.

[1] MTU engine specifications maximum power of 3,490 kWm or 4,678 bhp.
[2] A recent Ecology analysis demonstrated that short-term NO_2 levels could reach or exceed a level of concern in many areas of Quincy during a system-wide outage, although this likelihood is very low.

2. Second Tier Review Processing and Approval Criteria

2.1. Second Tier Review Processing Requirements

In order for Ecology to review the second tier petition, each of the following regulatory requirements under Chapter 173-460-090 must be satisfied:

(a) The permitting authority has determined that other conditions for processing the NOC Order of Approval (NOC) have been met, and has issued a preliminary approval order.

(b) Emission controls contained in the preliminary NOC approval order represent at least tBACT.

(c) The applicant has developed a HIA protocol that has been approved by Ecology.

(d) The ambient impact of the emissions increase of each TAP that exceed ASILs has been quantified using refined air dispersion modeling techniques as approved in the HIA protocol.

(e) The second tier review petition contains a HIA conducted in accordance with the approved HIA protocol.

Ecology provided comments to ICF's HIA protocol (item (c)) on November 22, 2011. These comments were addressed as part of the submittal of draft and final health impact assessments (item (e)) received by Ecology on March 20, 2012, May 22, 2012, and May 25, 2012. Vantage later revised their health impact assessment to account for their requested emission limit increase in the draft NOC. The final updated health impact assessment was submitted by Vantage on November 28, 2012.

Acting as the "permitting authority" for this project, Ecology's Eastern Regional Office (ERO) satisfied items (a) and (b) above on November 14, 2012.[3] Therefore, all five processing requirements above are satisfied.

2.2. Second Tier Review Approval Criteria

As specified in WAC 173-460-090(7), Ecology may recommend approval of a project that is likely to cause an exceedance of ASILs for one or more TAPs only if it:

(a) Determines that the emission controls for the new and modified emission units represent tBACT.

(b) The applicant demonstrates that the increase in emissions of TAPs is not likely to result in an increased cancer risk of more than one in one hundred thousand.

(c) Ecology determines that the non-cancer hazard is acceptable.

[3] Robert Koster, "RE: Vantage-Quincy: track-changes versions of revised air quality application," e-mail message, addressed to Gary Palcisko, November 14, 2012.

2.2.1. tBACT Determination

Ecology's Eastern Regional Office Engineer determined that Vantage's proposed pollution control equipment (i.e., Tier 4 engines equipped with diesel particulate filters, diesel oxidation catalysts, and selective catalytic reduction) more than satisfies the BACT and t-BACT requirement for diesel engines powering backup generators at Vantage.[4]

2.2.2. HIA Review

As described above, the applicant is responsible for preparing the HIA under WAC 173-460-090. Ecology's project team consisting of an engineer, a toxicologist, and a modeler review the HIA to determine if the methods and assumptions are appropriate for assessing and quantifying surrounding community's risk from a new project.

The HIA focused mainly on health risks attributable to DEEP exposure as this was the only TAP with a modeled concentration in ambient air that exceeded an ASIL. ICF briefly described emissions and exposure to other TAPs (nitrogen dioxide, ammonia,[5] and acrolein) because these pollutants exceeded a small quantity emission rate (SQER), and Ecology requested that acute health hazards from exposure to these pollutants be quantified.

While Vantage is located in an industrially zoned area, air dispersion modeling indicated that Vantage's DEEP emissions resulted in concentrations in excess of the ASIL at approximately three residences. Two residences, one located to the southwest and the other to the southeast, are located very near the Vantage facility. Another residential parcel is located about ½ mile south near the BNSF railroad tracks, but ICF reports that the site is occupied by a company, and therefore, the site could be considered commercial. Regardless, estimated Vantage-related DEEP concentrations at this location are much lower than the other two properties adjacent to Vantage. Other nearby land use includes other data centers (Intuit and Sabey) and agricultural properties.

For the purposes of assessing increased cancer risk and non-cancer hazards, ICF identified receptor locations where the highest exposure to project-related air pollutants could occur: at the project boundary, nearby residences, and on-site and off-site commercial areas.[6] ICF calculated both non-cancer hazards and cancer risks for each of these receptors, and they also estimated long-term cumulative risks attributable to and other known sources of DEEP.[7] Vantage's risk assessment also evaluated the combined cancer risk caused by numerous other carcinogens

[4] BACT was determined to be met through the use of EPA Tier 2 certified engines if the engines are installed and operated as emergency engines, as defined at 40 CFR§60.4219; or applicable emission standards found in 40 CFR Part 89.112 Table 1 and 40 CFR Part 1039.102 Tables 6 and 7 if Model Year 2011 or later engines are installed and operated as non-emergency engines; Compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII; and Use of ultra-low sulfur diesel fuel containing no more than 15 parts per million by weight of sulfur.
[5] Some ammonia is released from the selective catalytic reduction equipment designed to reduce NO_X emissions.
[6] ICF also identified sensitive receptor areas, but these were located outside the area of impact (i.e., ASIL was not exceeded in these locations).
[7] Ecology modeled cumulative emissions from existing data centers, railway, and highways. Results were provided to ICF to include in their HIA.

known to be emitted from diesel generators, and their analysis concluded that the vast majority of the cancer risk was caused by DEEP.

Ecology's review of the HIA found that ICF identified appropriate receptors to capture the highest exposures for residential, commercial, and fence line receptors. ICF also identified other potential sensitive receptor areas, but these areas were well outside the area impacted at levels above the ASIL, so Ecology did not require risks to be quantified at these locations.

Ecology's review also found that ICF used appropriate exposure assumptions and toxicity values to quantify and characterize non-cancer hazards and cancer risks. ICF also identified key areas of uncertainty regarding exposure assumptions, emissions estimates, modeling, and the chronic toxicity of DEEP. These uncertainties combined may result in an over—or under—estimate of actual health risk. For the purpose of protecting public health while making decisions, overestimates of risk are preferred over underestimates. Generally, the assumptions used in the HIA probably overestimate risk more than underestimate risk. One exception is that the non-cancer hazards of DEEP may be underestimated primarily due to the uncertainty surrounding the non-cancer toxicity of DEEP for sensitive individuals.

2.2.3. Increased Cancer Risk

Table 4-10 below, copied from the HIA, shows the estimated Vantage-specific and cumulative cancer risk per million at each of the receptors evaluated. The highest increase in risks attributable to Vantage's emissions of DEEP is 9.3 per million and occurs at the southwest residential property boundary. This property is directly adjacent to Vantage's southwest property boundary. The land use at that location consists of commercial farm outbuildings. The property is currently planned as industrial zoning, so it is unlikely that a residential structure will be built at this location in the future. Therefore, the risk reported for a residential receptor at this location represents a conservatively high estimate of risk. The estimated risk at the current house on the same parcel is approximately 5.4 per million. For non-residential exposure scenarios, tenants of the Vantage Data Center may have increased risks of about 1.8 per million and workers at the nearby Sabey Data Center may have increased risks of about 1.0 per million. Increased cancer risks to potential bystanders exposed near the point of maximum impact (i.e., fence line receptor) may be about 0.3 per million.

The cumulative risk of all known sources of DEEP emissions in the vicinity of Vantage (listed in Table 4-10) is highest for the two nearby residences. The cumulative DEEP risk at these two homes is about 30 per million at the southwest residence and 19 per million for the residence to the southeast of Vantage.[8]

[8] Note that residential receptors tend to be the most exposed (e.g., longest exposure duration and exposure frequency). Therefore, their risks tend to be higher than other types of receptors. For regulatory decision making purposes, Ecology assumes that a resident is continuously exposed at their residence for their entire lifetime.

Table 4-10. Estimated Increased Cancer Risk for Residential, Occupations, and Student Scenarios						
Attributable To:	Risk Per Million From DEEP Exposure at Various Receptor Locations					
	Fence Line Receptor[a]	Current Home (SW) at Structure[b]	Current Home (SW) at Property Boundary[b]	Current Home (SE)[b]	Off-Site Workplace[c]	Vantage Tenants Within Vantage Facility[c]
Vantage	0.3	5.4	9.3	2.7	1.0	1.8
Railroads, highways, and existing data centers (Sabey, Yahoo!, Intuit, Dell, Microsoft)	0.6	23.7	21.0	16.5	3.0	2.5
Cumulative (Post-project)	**0.9**	**29.1**	**30.3**	**19.2**	**4.0**	**4.3**
a – assumes intermittent exposure 250 days per year, 2 hours per day for 30 years b – residential scenarios assume continuous lifetime exposure c – workplace scenarios assume exposure occurs 250 days per year, 8 hours per day for 40 years Note: ICF also calculated risks posed by other carcinogenic TAPs (i.e., acetaldehyde, benzene, formaldehyde, 1,3-butadiene, and carcinogenic polycyclic aromatic hydrocarbons). They estimated a negligible increased risk attributable to these TAPs of about 0.008 per million at the SW property boundary.						

2.2.4. Non-Cancer Hazard

ICF evaluated chronic hazards associated with long-term exposure to DEEP emitted from Vantage and other local sources. Hazard quotients were much lower than one for all receptors' exposure to Vantage-related and cumulative DEEP.[9] This indicates that chronic non-cancer hazards are not likely to occur as a result of exposure to DEEP in the vicinity of Vantage.

ICF also evaluated acute hazards associated with short-term exposure to NO_2, ammonia, and acrolein. ICF evaluated scenarios where Vantage was operating under full power outage mode because this is the time period when their emissions would be greatest. Hazard quotients and hazard indices for all receptors' exposures were below one indicating that acute adverse effects are not likely to be caused solely by Vantage's emissions during a power outage.[10]

3. Other Considerations

3.1. Cumulative Short-Term NO_2 hazard

While Vantage's emissions by themselves were not likely to result in adverse non-cancer health effects, Ecology recognizes that it is possible that the cumulative impacts of multiple data

[9] The highest chronic hazard quotient attributed to cumulative exposure to DEEP (0.03) occurred at the fence line receptor location (i.e., maximum impacted boundary receptor).
[10] The highest acute hazard quotient of 0.7 occurred at the fence line receptor location (i.e., maximum impacted boundary receptor).

center's emissions during a system-wide outage could potentially cause NO_2 levels to be a health concern. In a separate analysis, Ecology evaluated the short-term NO_2 impacts that could result from emergency engine operation during a system-wide power outage. While NO_2 levels could indeed rise to levels of concern[11] at various locations across town, the outage would have to occur at a time when the dispersion conditions were optimal for concentrating NO_2 at a given location. Ecology found that the likelihood of this occurrence is relatively low throughout Quincy.

4. Conclusions and Recommendation

The project review team has reviewed the HIA and determined that:

a) The TAP emissions estimates presented by ICF represent a reasonable estimate of the project's future emissions.

b) Emission controls for the new and modified emission units meet or exceed the tBACT requirement.

c) The ambient impact of the emissions increase of each TAP that exceeds acceptable source impact levels has been quantified using refined air dispersion modeling techniques as approved in the HIA protocol.

d) The HIA submitted by ICF on behalf of Vantage adequately assesses project-related increased health risk attributable to TAP emissions.

The project review team concludes that the HIA to represent an appropriate estimate of potential increased health risks posed by Vantage's TAP emissions. The risk manager may recommend approval of the proposed project because project-related health risks are permissible under WAC 173-460-090 and the cumulative risk from DEEP emissions in Quincy is less than the cumulative additional cancer risk threshold established by Ecology for permitting data centers in Quincy (100 per million or 100×10^{-6}).

The project review team also recommends that Vantage be required to communicate any health risks posed by their emissions to current residents near the Vantage Data Center, and potential buyers of undeveloped parcels adjacent to the data center, or to the local regulatory agency responsible for zoning and development in the affected area. This recommendation is also stated in Vantage's HIA.

[11] The level of concern in this case is 441 $\mu g/m^3$. This represents California OEHHA's acute reference exposure level of 470 $\mu g/m^3$ minus an estimated regional background concentration of 29 $\mu g/m^3$.

5. References

ICF, (2012a), ICF International, Revised-Final Second Tier Risk Analysis Technical Support Document (Increased DEEP Emission Limit at 10% Load): Vantage Data Center Quincy, WA, November 28, 2012

ICF, (2012b), ICF International, Revised-Final Notice of Construction Support Document for Second Tier Review (Increased Emission Limits): Vantage Data Center Quincy, WA, November 28, 2012