Exhibit G

Materials Analysis

Wheatridge Renewable Energy Facility East
December 2022

Prepared for
Wheatridge East Wind, LLC

Prepared by

TETRA TECH

This page intentionally left blank

Table of Contents

List of Tables

Acronyms and Abbreviations

ASC	Application for Site Certificate
BESS	battery energy storage system
Certificate Holder	Wheatridge East Wind, LLC
EPA	U.S. Environmental Protection Agency
Facility	Wheatridge Renewable Energy Facility East
MW	megawatt
O&M	operations and maintenance
OAR	Oregon Administrative Rule
RFA 1	Request for Amendment 1
SPCC	Spill Prevention Control and Countermeasures

1.0 Introduction

The Wheatridge Renewable Energy Facility East (Facility) is an approved, but not yet constructed, wind energy generation facility consisting of up to 66 turbines and related or supporting facilities with a peak generating capacity of up to 200 megawatts (MW), to be located in an Approved Site Boundary of approximately 4,582 acres on over 42,000 acres of leased land in Morrow and Umatilla counties, Oregon. As part of Request for Amendment (RFA) 1 to the Facility Site Certificate, Wheatridge East Wind, LLC (Certificate Holder) is proposing to expand wind power generation at the Facility to provide the opportunity for increased power capacity and availability. This includes expanding the Site Boundary and micrositing corridors, increasing the peak generating capacity by adding more and newer turbines, changing the intraconnection routes, and extending the construction date. See the RFA 1's Division 27 document (*Request for Amendment #1 for the Wheatridge Renewable Energy Facility East*) for a more detailed summary of the proposed changes.

This Exhibit G was prepared to meet the submittal requirements in Oregon Administrative Rules (OAR) 345-021-0010(1)(g). Analysis in this exhibit incorporates and/or relies on reference information, analysis, and findings found in the Application for Site Certificate (ASC), previous RFAs, and Oregon Department of Energy Final Orders to demonstrate that the Facility, as modified by RFA 1, continues to comply with applicable Site Certificate conditions and the standard in OAR 345-021-0010(1)(g). OAR 345 Division 22 does not provide an approval standard specific to Exhibit G.

2.0 Materials Inventory – OAR 345-021-0010(1)(g)(A)

OAR 345-021-0010(1)(g) A materials analysis including:

OAR 345-021-0010(1)(g)(A) An inventory of substantial quantities of industrial materials flowing into and out of the proposed facility during construction and operation;

2.1 Construction

The Certificate Holder seeks to permit a range of technology in order to preserve permitting flexibility, and will stipulate the precise details of the Facility's wind energy generation and its related and supporting facilities prior to construction, during final design and engineering. Therefore, this exhibit analyzes the maximum amount of materials anticipated within the Amended Site Boundary to address the maximum Facility impact.

In addition to the construction materials previously approved by the Energy Facility Siting Council in prior iterations of the Facility, this section describes the cumulative materials needed to support the Facility and up to 47 additional wind turbines, the Intraconnection Line, and associated infrastructure within the Amended Site Boundary. The additional wind turbines will be composed of steel, iron, fiberglass or carbon fiber, and other materials. They will require concrete foundations

made of steel reinforcing bars and concrete (gravel, sand, cement, and water), as well as additional collector line to connect to the substation. The proposed Intraconnection Line will require line, pole foundations, and support poles. Rock and aggregate materials will also be needed to construct access roads connecting the additional wind turbines, micrositing corridors, and Intraconnection Line to the approved wind turbines and micrositing corridors. Consequently, the primary raw materials needed for the Facility's construction within the Amended Site Boundary are rock, gravel, sand, water, cement, and steel rebar.

The materials used to construct the additional turbines, turbine and Intraconnection Line pole foundations, concrete, roads, the Intraconnection Line and collector lines, and other associated infrastructure are typical construction materials used for the construction of wind facilities and are materials that the Energy Facility Siting Council has already approved. As required by Condition PRE-OE-05, the Certificate Holder will provide proof of the aggregate source and county permits. The amount of cement and water used for concrete mixing will vary depending on the design of the turbine layout. Concrete foundations will be needed for the additional wind turbines and Intraconnection Line poles; no other foundations that have not been addressed in previous RFAs are proposed at this time.

Table G-1 provides a list of industrial materials that would be used during Facility construction (cumulative, including previously approved Facility infrastructure), based on current engineering estimates. The amount of water used for concrete is discussed in Exhibit O. Solid wastes generated and flowing out of the Facility during construction are outlined in Exhibit W.

Table G-1. Inventory of Construction Materials

Material	Quantity/Units	Ultimate Disposition
Wind Turbine Components	Up to 106 turbines, each comprising of approximately: 196 tons of steel; 196 tons of iron; 33 tons of fiberglass/carbon fiber; and 46 tons of other material.	Incorporated into turbine towers, nacelles and other internal components.
Concrete	300 to 320 cubic yards per turbine foundation (33,920 cubic yards max), plus foundations for the Intraconnection Line poles (0.067 cubic yards for Transmission Line A and 0.099 cubic yards for Transmission Line B), battery energy storage system (BESS; 200 cubic yards), and substations (340 cubic yards).	Incorporated into the turbine pads, Intraconnection Line pole sites, BESS foundation, and substation equipment foundations.
Aggregate	263,014 to 306,850 tons for up to 64 miles of new, private access roads. 41,111 tons for approximately 114 acres of graveled areas associated with the substations, BESS, and temporary construction yard[1].	Maintained as an onsite roadbed or graveled area associated with the collector substations, BESS, or temporary construction yard.

Material	Quantity/Units	Ultimate Disposition
Generator Step-Up Electrical Transformers	Up to 106 Generator step-up transformers.	Mounted on a concrete pad adjacent to the turbine tower.
Met Towers	Up to 5 units; approximately 8 tons of steel per met tower.	Aboveground structures.
230-kilovolt Intraconnection Line	52 miles (approximately 26 miles long per line, two lines for either the Transmission Line A or B routes).	Aboveground structures.
Intraconnection Line Support Poles	Up to approximately 192 poles for Transmission Line A and 283 poles for Transmission Line B, either H-frames or monopoles, likely of wood or steel (assuming a minimum of 400-foot spans, two lines per route).	Aboveground structures.
34.5-kilovolt Collection System	94.7 miles underground.	Underground.
Communications/Shield Wire Lines	Up to approximately 200 miles of fiber optic cable.	Strung with the Intraconnection Line or collector lines.
Substation Transformers	Up to four transformers, the largest of which would be a 300-megavolt amp.	Within substation footprint.
Steel Battery Containers	13 containers.	Within BESS footprint.
Lithium-ion battery racks	78 racks (6 racks per container).	Within BESS footprint.
1. One temporary construction yard is proposed at this time and thus is all that is included in impact analyses; however, the four previously approved temporary construction yards are to be retained as potential areas that could be sited during preconstruction.		

2.2 Operations

No substantial quantities of industrial materials will be brought onto or removed from the Facility site during the additional wind turbine or associated infrastructure operation. The materials that will be brought onto or removed from the site during operations are those needed for maintenance or replacement of damaged equipment (e.g., wind turbine components, electrical equipment). Operations materials would be delivered to the required location as needed.

Up to two 55-gallon drums each of hydraulic oil and gearbox oil may be kept onsite for routine maintenance activities. These oil drums will be stored within the shared/existing operations and maintenance (O&M) building at the Wheatridge Renewable Energy Facility II. Lubricating and dielectric mineral oils and antifreeze solutions will also be present at the Facility but will be fully contained within the turbines and electrical transformers. Transformer (dielectric) oils are generally not replaced. Lubricating oils and antifreeze are drained and replaced periodically. New

oil will be brought in as needed and the old oil will be removed and recycled. Specialized vehicles and equipment designed to prevent spills will be used for maintenance activities. If heavy equipment is necessary for major maintenance issues, such as the replacement of a turbine gearbox or generator, its use would be similar to the construction stage. Fuel or oils needed for maintenance would be delivered by a licensed maintenance contractor on an as-needed basis, and no substantial quantities would be stored on-site.

During the Facility's lifetime, major maintenance issues may necessitate the replacement of significant turbine or electrical components, such as turbine gearboxes, generators, blades, or other components; however, due to the unpredictable nature of major maintenance problems, no estimate has been provided for the amount of major components that may be needed. Minor maintenance may also require the removal and replacement of smaller parts that do not constitute a substantial amount of industrial materials. Maintenance may result in minor and potentially hazardous materials which could include oily rags or similar materials related to turbine lubrication and other maintenance.

Small quantities of lubricating and dielectric oils, cleaners, antifreeze, or herbicides and pesticides may be stored in the shared/existing O&M building for use during Facility operations. None would be present in substantial reportable quantities; the amounts present (if any) would be no greater than household quantities.

Lithium-ion system batteries will be replenished at a rate depending on usage. For example, a battery that is cycled more often will degrade faster than one that is used less frequently. For this analysis, it is assumed that the battery will be fully discharged each day and that all battery racks will need to be replaced every 10 years over the life of the Facility (50 years). This assumption likely overestimates the number of batteries that will flow into and out of the Facility, because not all batteries will be replaced during each replenishment cycle (e.g., fewer batteries will need replacing early in the Facility lifecycle). A group of lithium-ion battery cells will comprise a "rack." Approximately 78 battery racks will be needed for the proposed 30-MW storage system, 390 battery racks will be used over the operation term of the battery energy storage system.

Table G-2 lists the cumulative materials and amounts used for operations and maintenance of the Facility.

Table G-2. Inventory of Operations Materials

Material	Quantity	Ultimate Disposition
Lithium-ion Battery Racks	390 racks	Inside steel battery containers.
Mineral oils (turbine lubricant and transformer coolant)	318 gallons (3 gallons per turbine) per year	Up to 110 gallons (two 55-gal drums) stored in shared/existing O&M building for minor maintenance; full oil change done as needed by a specialized contractor, and used oils removed for recycling.

Material	Quantity	Ultimate Disposition
Synthetic oils (turbine lubricant, gear oil)	1,060 gallons (10 gallons per turbine) per year	Up to 110 gallons (two 55-gal drums) stored in shared/existing O&M building for minor maintenance; full oil change done as needed by a specialized contractor, and used oils removed for recycling.
Simple Green (general cleaner)	318 gallons (3 gallons per turbine) per year	Up to 5 gallons stored in shared/existing O&M building for minor maintenance.
WD-40; grease (general lubricant)	530 gallons (5 gallons per turbine) per two years	Up to 55 gallons stored in shared/existing O&M building for minor maintenance.
Ethylene glycol (anti-freeze)	318 gallons (3 gallons per turbine) per year	Up to 55 gallons stored in shared/existing O&M building for minor maintenance.
Round-up and 2,4-D (weed control)	2 gallons for spot weed control; subcontract out for major weed control per year	Up to 2 gallons stored in shared/existing O&M building.

3.0 Hazardous Materials Handling and Management – OAR 345-021-0010(1)(g)(B)

OAR 345-021-0010(1)(g)(B) The applicant's plans to manage hazardous substances during construction and operation, including measures to prevent and contain spills; and

During the construction or operations phases of the Facility, it may be necessary to use minor quantities of hazardous substances (materials requiring Safety Data Sheets). These materials would include small, but necessary, quantities of herbicide for weed control. All potentially hazardous substances will be used in a manner that is protective of human health and the environment, and will be compliant with all local, state, and federal environmental laws and regulations. Safety Data Sheets will be available at the temporary construction yard(s) or the relevant Facility component for any necessary, potentially hazardous materials used.

The battery energy storage system may contain hazardous substances within the internal battery components. Batteries are considered non-hazardous equipment when used according to the manufacturer's recommendations and as long as their integrity is maintained (not damaged and the internal seal is intact). Lithium-ion batteries are flammable and require cooling systems to prevent overheating. The battery energy storage system will use integrated safety systems to monitor battery performance, detect malfunctions, and implement response measures (such as notifying operators, depowering the system, or deploying fire suppression devices). Batteries will be housed in leak-proof containers to prevent unintentional releases of hazardous materials. O&M staff will conduct inspections of the battery cells for damage. Note that the U.S. Environmental Protection Agency (EPA) does not consider lithium-ion batteries hazardous waste; however, there are optional

EPA guidelines (EPA's Universal Waste Regulations) that address the responsible disposal and recycling of these batteries.

Extremely Hazardous Substances in excess of threshold planning quantities, highly toxic substances, or explosive materials would not be necessary to support either the construction or the operations phase of the Facility. Additionally, materials used during the construction and operations of the Facility would be selected so that they minimize the potential for producing "hazardous waste," as defined by the Resource Conservation and Recovery Act.

3.1 Construction

During construction of the Facility, small quantities of a few hazardous materials may be utilized or stored in the temporary construction yard(s). Such materials may include cleaners, insecticides or herbicides, paint, or solvents, as identified in the ASC. None would be present in substantial, reportable quantities. When not in use these would be stored in a secure location within the temporary construction yard(s). Fuels would be the only hazardous material that may be stored in substantial quantities on-site during construction. Potentially hazardous substances will not be permanently present within the temporary construction yard(s) in quantities that exceed Oregon State Fire Marshall Reportable Quantities. Additionally, all hazardous and universal wastes such as used oil, oily rags, mercury-containing lights, and lead-acid and nickel-cadmium batteries will be segregated for disposal by a licensed firm that specializes in their proper recycling/disposal (Condition CON-PS-01).

As identified for the approved wind energy Facility, fuel for construction equipment would be delivered to the site via a specialized mobile vehicle by a licensed service contractor on an as-needed basis. Following the completion of fueling activities, these vehicles would not remain at the on-site longer than necessary to complete their fueling tasks. Construction-based equipment would be regularly inspected to detect potential leaks or other issues that may require maintenance. Potentially hazardous substances related to the maintenance of the construction equipment would only be brought to the construction site by a maintenance technician on an as-needed basis, and any unused or waste substances would be removed during the same service call. Similarly, construction battery waste will be removed from the site following Condition GEN-OE-04.

An Oregon Department of Environmental Quality-approved Spill Prevention, Control, and Countermeasure (SPCC) Plan (Condition PRE-SP-01) would apply during construction and will outline preventative measures and practices to reduce the likelihood of an accidental release of a hazardous or regulated liquid and, in the event such a release occurs, to expedite the response to and remediation of the release.

The prevention and minimization of accidental releases would be accomplished through proper containment during use and transportation to the site, and the observance of appropriate handling procedures during the transfer of any fuels from the delivery vehicles to the construction equipment as described in the SPCC Plan. As identified in the ASC, will take place a substantial distance from waterways or wetlands to prevent water quality impacts in the event of an accidental release.

In the unlikely event that an accidental spill occurs, any spilled or released substances would be cleaned up, and any contaminated media impacted by the spill would be managed in accordance with all applicable regulations as described in the SPCC Plan. Larger spill kits with absorbents, absorbent pads, spill socks, and disposable bags would be maintained, in close proximity to construction activities. In addition, to reduce the response time to a spill, smaller spill kits containing absorbent pads would be located on key pieces of construction equipment. All employees would be instructed in the location, handling, and usage of the spill kits. Any reportable spills will be immediately called in to the Oregon Emergency Management Division's Oregon Emergency Response System, per OAR Chapter 340 Division 142. See Exhibit CC for a listing of applicable regulations.

3.2 Operations

As identified in the ASC and maintained for RFA 1, there will be no substantial quantities of fuels, lubricating oils, hydraulic fluid for construction equipment, or other hazardous materials maintained on-site during operations. Small quantities of a few hazardous materials may be utilized; such materials may include cleaners, insecticides or herbicides, paint, or solvents. The additional wind turbines and associated infrastructure will not require a significant increase in use of these items, and none would be present in substantial reportable quantities; the amounts present (if any) would be no greater than household quantities of no more than a few gallons each. When not in use these would be stored in a secure location within the shared/existing O&M building. Per Condition OPR-PS-03, an Operational Waste Management Plan will be implemented for management of both hazardous and non-hazardous waste during operations.

Operations battery waste will be disposed of following Condition GEN-OE-04. Per 49 Code of Federal Regulations 173.185 (and as referenced in Condition OPR-PS-03), the regulations include requirements for preventing a dangerous evolution of heat, short circuits, and damage to the terminals. They also require that batteries must not contact other batteries or conductive materials. Spent batteries will be disposed of at a permitted facility in compliance with the Resource Conservation and Recovery Act and Toxic Substances Control Act regulations administered by the EPA or Oregon Department of Environmental Quality. Licensed third-party battery suppliers will transport batteries to and from the Facility in accordance with applicable regulations and as required through their licensure. Adherence to the requirements and regulations (including personnel training, safe interim storage, and segregation from other potential waste streams) will minimize safety hazards related to transport, use, or disposal of batteries.

Additionally, as identified in Condition PRO-SP-01, an operational SPCC Plan may be required. It will depend on the quantity of mineral and synthetic oil maintained on site. In the unlikely event of an accidental hazardous materials release, any spill or release will be cleaned up and the contaminated soil or other materials disposed of and treated according to applicable regulations. Employees will be trained to be aware of the potential hazards of the contents of the module through the availability of Material Safety Data Sheets, and to handle such releases in accordance with applicable regulations. See Exhibit CC for a list of applicable regulations. Spill kits containing

items such as absorbent pads will be located on equipment and in onsite temporary storage facilities to respond to accidental spills, if any were to occur. Employees handling hazardous materials will be instructed in the proper handling and storage of these materials, as well as where spill kits are located. The Certificate Holder will report spills or releases of hazardous materials during construction or operation as noted above to the Oregon Emergency Response System, per reporting requirements detailed in OAR Chapter 340 Division 142.

Fire prevention and response training will be implemented (Condition GEN-PS-03) and the Facility site plan will be submitted to fire protection officials (Condition PRO-PS-02) to minimize the risk of fire and to respond appropriately to any fires that occur on the Facility site. An Emergency Management Plan will be prepared (Condition PRE-PS-05) and a Site Health and Safety Plan will be prepared (Condition PRE-PS-06). The plans will cover equipment located at the site, including the additional wind turbines and associated infrastructure. The Certificate Holder will meet annually with local fire protection agency personnel to discuss emergency planning and will invite local fire protection agency personnel to observe any emergency drills.

4.0 Non-Hazardous Waste Management – OAR 345-021-0010(1)(g)(C)

OAR 345-021-0010(1)(g)(C) The applicant's plans to manage non-hazardous waste materials during construction and operation.

4.1 Construction

Solid waste materials (e.g., excess construction materials or steel) generated during construction will be very similar to waste materials identified in the Site Certificate. The Construction Waste Management Plan (Condition PRE-WM-01) and Condition CON-PS-01 outline measures to minimize, recycle, and reuse construction waste and dispose of waste concrete.

Excess construction materials similar to those generated by construction of the previously approved wind turbines will be generated from construction of the additional wind turbines and associated infrastructure. These materials will include scrap steel, wood, concrete waste, and earth materials. Wastes will be managed according to the Construction Waste Management Plan (Condition PRE-WM-01). Condition CON-WM-01 requires consent from the party receiving the earth materials and confirmation of earth material disposal sites to ensure no impact to sensitive environmental resources. Condition PRE-WM-02 requires the investigation and confirmation that there will be no impact from concrete washout water. In addition, Condition GEN-GS-07 requires that upon completion, the Certificate Holder to remove all temporary structures not required for facility operation and dispose of all timber, brush, refuse and flammable or combustible material resulting from clearing land and the construction of the Facility.

Construction stormwater will be generated at the location of the additional turbine and associated infrastructure construction sites. Such stormwater will be covered under the Facility's National

Pollutant Discharge Elimination System 1200-C construction permit and its associated erosion and sediment control plan (Condition CON-SP-01; see Exhibit I for further information).

4.2 Operations

Condition OPR-PS-03 requires the Certificate Holder to prepare an Operational Waste Management Plan. Construction and operation of the additional turbines and associated infrastructure will generate the same types of nonhazardous solid and liquid waste as the previously approved Facility, which the Certificate Holder will manage according to the Operational Waste Management Plan (Condition OPR-PS-03). No additional sewage streams will be created. Administrative activities related to the additional wind turbines and associated infrastructure will be conducted at the shared/existing O&M building and will not generate additional office waste. See Exhibit W for additional information regarding waste minimization.

This page intentionally left blank