



US Army Corps of Engineers
BUILDING STRONG

Lower Granite Lock and Dam
Annual Oil Accountability Report
For August 14, 2015 to December 31, 2015

- PURPOSE:** To provide results of monitoring and assessment for Lower Granite Lock and Dam (“Project”) pursuant to the Oil Accountability Program (OAP) that was adopted pursuant to the Settlement Agreement between USACE and Columbia Riverkeeper, that was attached to the Order of Dismissal (E.D. Wash. No. 2:13-md-2494-LRS) dated August 14 2014.

This Oil Accountability Report is provided for informational purposes only, and is not final agency action within the meaning of the Administrative Procedure Act or any other applicable provision of law. Oil Accountability Reports are not intended to, and do not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.

- INSPECTIONS (MONITORING):** All oil-filled operating equipment (55 gallons or greater), bulk oil storage containers, and high-risk equipment at the Project shall be periodically inspected for leaks and to ensure the oil level is in the normal operating range, as outlined in the below table.

Equipment	Frequency
POWER HOUSE	
Turbine Guide Bearings (6 each)	Monthly
Lower Guide Bearings (6 each)	Monthly
Upper Guide Bearings (6 each)	Monthly
Thrust Bearing (6 each)	Monthly
Governor System (Sump tank, Accumulator, blade & gate servos, oil head and piping) (6 each)	Monthly
Wicket Gate Lubrication (Farval 6 each)	Bi-Weekly
Transformers, Main and Station Service (8 each)	Monthly
Head Gate Hydraulic Oil Tank (1 tank)	Monthly
Head Gate Cylinders (5 each)	Monthly
Turbine Oil Dirty Tank (1 tank)	Monthly
Turbine Oil Clean Tank (1 tank)	Monthly
Turbine Dirty Oil Transfer Tank (1 tank)	Monthly
Turbine Oil Gravity Fill Tank (1 tank)	Monthly
Transformer Oil Clean tank (1 tank)	Monthly
Transformer Oil Dirty tank (1 tank)	Monthly
Oil Skimmer Transfer Tank (1 tank)	Monthly
Waste Oil Tank (1 tank)	Monthly
Powerhouse Emergency Diesel Generator (1 total)	Monthly
Misc. Above Ground Storage Tanks (diesel, gas) (2 tanks)	Monthly
Tail Race Crane (1 each)	Monthly
Intake Crane (1 each)	Monthly
Trash Rack Crane (1 each)	Monthly

Equipment	Frequency
Visitor Entrance Elevator (1 each)	Monthly
SPILLWAY	
Spillway Main Gearboxes (8 each)	Monthly
Spillway 90 degree Gearboxes (8 each)	Monthly
Spillway Emergency Diesel Generator (1 total)	Monthly
CNO pump motor and shaft oiler (2 total)	Monthly
FISH SYSTEMS (SCREENS, PUMPS, FISH FACILITY)	
ESBS Screen Gearboxes (18 each)	Monthly
Fish Pump Gearboxes (3 each)	Monthly
Raceway Fish Crowder	Monthly
Fish Ladder Entrance Weir Gates (4 total)	Monthly
Sluice Gate Operator (6 total)	Monthly
Chain Hoist gearboxes (4 total)	Monthly
Barge Loading Dock hydraulic lift (2 total)	Monthly
Auxiliary Fish Pumps (3 total)	Monthly
NAVIGATION LOCK	
Navlock Downstream Miter Gate HPU's (2 each)	Monthly
Navlock Downstream Miter Gate bearing Farval (2 each)	Bi-Weekly
Navlock Upstream Tainter Gate gearbox (2 each)	Monthly
Upstream Tainter Gate seal heater (2 each)	Monthly
Navlock Drain Tainter Valve HPU (2 each)	Monthly
Navlock Drain Tainter Valve Farval Grease System (2 each)	Bi-Weekly
Navlock Fill Tainter Valve HPU (2 each)	Monthly
Navlock Fill Tainter Valve Farval Grease System (2 each)	Bi-Weekly
Navlock unwatering pump motor and shaft oiler (6 total)	Monthly

Lower Granite Project conducted 10 oil accountability related inspections from 14 August, 2015 to 31 December, 2015. Each inspection encompasses numerous pieces of equipment (for example, all equipment that is located in the powerhouse is included in one monthly inspection) listed in the above table based on location of the equipment; there is not a separate inspection for each individual piece of equipment. If an inspection indicates that there may be a discernible loss of oil, then the inspection is followed-up with an assessment as outlined below.

3. **ASSESSMENTS:** Leaks or observable changes in oil level that indicate a discernible loss of oil that is not associated with normal operations (not within the normal operating range) require an assessment. Oil levels on some equipment fluctuate within the normal operating range depending on oil temperatures and position of the equipment. When a leak is reported, maintenance staff will assess it to determine the severity. Any potential leak to the environment (i.e. to waterways) will be dealt with immediately. Other leaks that are not to the environment will be repaired as soon as possible. Small leaks are often deferred until the next time the equipment is scheduled to be out of service; however, steps are taken to capture any leaking oil such as placing drip pans or absorbent pads. These assessments are documented by utilizing Facilities Equipment Maintenance (FEM) work orders.

- a. Assessment Criteria. A work order is generated on the following:
- i. Any equipment with high or low levels or alarms.
 - ii. Malfunctioning automated grease systems.
 - iii. All class 2 and 3 leaks on identified equipment. Leaks are classified as follows:

Leak Severity

Class 1 – Wet, seepage of fluid, but not enough to form drops.

Class 2 – Seepage of fluid that forms drops.

Class 3 – Actively dripping.

Note: Spills or releases to the environment are assessed immediately via a Project Spill Prevention Controls and Countermeasures (SPCC) plan.

- b. Lower Granite Project conducted 4 assessments from 14 August, 2015 to 31 December, 2015.
- i. One assessment was due to equipment with high/low level alarm. The alarm sensor had failed and was replaced. The oil stayed within normal operating levels and no oil was released to environment.
 - ii. One assessment was due to malfunctioning automated grease systems. The system got air in the pump and lost suction. Pump was re-primed and put back in operation. No grease was lost to environment.
 - iii. Two assessments were associated with class 2 or 3 leaks to areas inside the project but not to the environment. Both repairs are in progress at time of this report. Temporary measures, such as drip pans, are in place to capture any oil leaking on this equipment.
4. **INVENTORY:** There are design limitations within the oil systems internal to the dam (turbine, transformer, head gate oil systems) that prevent the assessment of exact oil quantity data as described below:
- i. The oil systems are closed loop systems which consists of oil storage tanks, piping, and several oil sumps for each main unit generator. There are level indicating devices on each tank, and the sumps, although the devices were not designed to determine exact amounts of oil in the equipment. Rather, they were only intended to tell if the level was within normal safe operating levels. There is no method to determine how much oil is in the piping.
 - ii. Rags and absorbents are routinely used during maintenance to clean up oil. These rags and absorbents are disposed of but the amount of oil/grease cannot be determined. See ‘Disposed of oil/grease’ section below for explanation of waste oil disposal practices.

- a. **Turbine Oil:** The numbers provided below for turbine oil inventory that is utilized in the main units (generators) are a best estimate based on the data available and within the limitations discussed above.

Date	Gallons of Oil In System	Gallons Purchased Since Initial	Difference Difference = -1*(initial - current - purchased)
14 Aug, 2015 (initial)	48,258	N/A	N/A
31 Dec, 2015	48,258	0	0

Note: There are no known leaks in the Turbine Oil System for this period.

- b. **Transformer Oil:** The numbers provided below for transformer oil inventory are a best estimate based on the data available and within the limitations discussed above.

Date	Gallons of Oil In System	Gallons Purchased Since Initial	Difference Difference = -1*(initial - current - purchased)
14 Aug, 2015 (initial)	95,160	N/A	N/A
31 Dec, 2015	95,160	0	0

Note: There are no known leaks in any transformer for this period. All level indications started and ended on the 'Full' mark.

- c. **Head Gate Hydraulic Oil:** The numbers provided below for head gate hydraulic oil inventory are a best estimate based on the data available and within the limitations discussed above.

Date	Gallons of Oil In System	Gallons Purchased Since Initial	Difference Difference = -1*(initial - current - purchased)
14 Aug, 2015 (initial)	2,524	N/A	N/A
31 Dec, 2015	2,524	275	275

Note: The 275 gallon difference is due to a head gate cylinder that was rebuilt where the old oil was replaced with new. The old oil was disposed of and included in the disposal value below. There are no known leaks in the Head Gate Hydraulic system in this period.

- d. **Oil Used in Other Equipment:** This is the equipment listed under the Inspection section above that is not part of the turbine, transformer or head gate systems and the total amount of oil in those systems.

Date	Gallons of Oil In System	Gallons Purchased Since Initial	Difference Difference = -1*(initial – current – purchased)
14 Aug, 2015 (initial)	4000*	N/A	N/A
31 Dec, 2015	4040.7	385	425.7

Note: * Initial value is based on a draft inventory taken Aug 2015. “Gallons of oil in System” value changed over time as processes matured and oil quantities were verified through OM manual research and physical measurements.

- e. **Disposed of oil/grease:** Oil disposed of is not segregated by types of oil or its origin. All oil is combined into waste oil drums and then disposed of through a recycling company. Various types of grease are also combined into a single drum and also disposed of through a recycling company.

Date	Gallons of Oil Disposed of:
10/22/2015	1395 Gallons
Date	Gallons of Grease Disposed of:
	None

Note: Total disposed of oil includes some quantity that was collected prior to the reporting period.

- f. **Grease:** Grease beginning and ending inventories remain constant because of established warehouse min/max levels. Therefore, the amount purchased is typically the amount used. Grease is used to lubricate critical bearings/bushings and other equipment. It is either lost in rags during maintenance, disposed of as outlined in ‘Disposed of oil/grease’ section above, or, for certain in-water equipment, considered non-recoverable.
- i. **Amount Purchased/Used:** Lower Granite purchased 69 gallons of grease during this period.
 - ii. **Automatic lubrication systems (Farvals):** Grease for automatic lube systems (Farvals) is tracked by amount added to the system. These systems automatically lubricate various pieces of equipment. Lower Granite has 11 Farval systems. During this period, 57 Gallons of grease were added to the various systems.