



US Army Corps of Engineers
BUILDING STRONG

McNary Lock and Dam

Annual Oil Accountability Report

For August 1, 2015 to December 31, 2015

1. **PURPOSE:** To provide results of monitoring and assessment for McNary 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.

2. **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.

<u>MCNARY OIL ACCOUNTABILITY PROGRAM PREVENTIVE MAINTENANCE SCHEDULE</u>	
EQUIPMENT	FREQUENCY
MAIN UNIT GENERATORS - OPERATOR'S MONTHLY CHECK - Operations	
Main Unit #1 – 14 Governor System	
Sump (14 each)	Monthly
Actuator (14 each)	Monthly
Piping (14 each)	Monthly
Main Unit #1 - 14 Bearings and Levels	
Thrust (14 each)	Monthly
Upper Guide (14 each)	Monthly
Lower Guide (14 each)	Monthly
Turbine (14 each)	Monthly
Main Unit Lube Oil Tanks	
Main Lube Storage Tanks (6 each)	Monthly
Gravity Feed Tank	Monthly
Station Service Units 01 & 02 Governor System	
Sump (2 each)	Monthly
Actuator (2 each)	Monthly
Piping (2 each)	Monthly
Station Service Units 01 & 02 Bearings and Levels	
Thrust/Upper Guide (2 each)	Monthly
Lower Guide (2 each)	Monthly

NAVLOCK - OPERATOR'S MONTHLY CHECKS	
Bascule Bridge North Leaf	Monthly
Bascule Bridge South Leaf	Monthly
Bascule Bridge South Roadway Gate	Monthly
Bascule Bridge North Roadway Gate	Monthly
Miter Gate Land Side	Monthly
Miter Gate River Side	Monthly
Tainter valve #1	Monthly
Tainter valve #2	Monthly
Tainter valve #3	Monthly
Tainter valve #4	Monthly
Navlock Downstream	Monthly
Mitre Gate Land Side	Monthly
Mitre Gate River Side	
JUVENILE COLLECTION CHANNEL - OPERATOR'S MONTHLY CHECKS	
Rectangular Screen Compressor	
Flammable Liquid Storage	Monthly
Trans. Screen Brush Oiler	Monthly
Middle Waterman Oiler	Monthly
South Sluice Gate Valve	Monthly
Milwaukee Bridge Crane	Monthly
Side Dewatering Brush	Monthly
Rectangular Brush	Monthly
JCC Orifice Actuator Oilers (84 each)	Monthly
North Sluice Gate Valve	Monthly
Ingersoll Rand Air Cable Hoist	Monthly
OREGON FISH LADDER – OPS MONTHLY CHECK	
SFWE (2 each)	
NFEW (3 each)	Monthly
Fish Pump (3 each)	Monthly
Actuator Sump	Monthly
Actuator Tank	Monthly
Upper Guide/Thrust Bearing	Monthly
Lower Guide Bearing	Monthly
FCC Wing Gate (3 each)	Monthly
Fish Ladder Exit	Monthly
Screen Wash Water Pump	Monthly
Traveling Screen	Monthly
Dewatering Pump	Monthly
Irrigation Supply Chapman Valve	Monthly
Regulating Exit Weir	Monthly
Tilting Weir (7 each)	Monthly

WASHINGTON FISH LADDER– OPS MONTHLY CHECK	
NFEW (3 each)	Monthly
Unwatering Pump #1, #2	Monthly
Crowder Slot Gate Hoist	Monthly
Regulating Exit Weir	Monthly
Tilting Weirs #335 - #340 (7 each)	Monthly
Washington Fish Ladder Unwatering Pumps #1-#3	Monthly
INTAKE GATE (HEADGATE) HYDRAULICS – OPS MONTHLY CHECK	
Oil Hld Storage El. 346	
Tank	Monthly
Piping	Monthly
Head Gate Hydraulics El. 346	Monthly
Pre-charge Tanks SS01 – SS02 (2 each)	Monthly
Pre-charge Tanks MU #1 - #14 (14 each)	Monthly
HG Storage Tanks #1 - #4 (4 each)	Monthly
TRANSFORMERS & Spillway Bays– OPS MONTHLY CHECK	
Transformer SS01 – SS02	Monthly
Transformers	
Transformers T1 (3 each)	Monthly
Transformers T2 (3 each)	Monthly
Transformers T3 (3 each)	Monthly
Transformers T4 (3 each)	Monthly
Transformers T5 (3 each)	Monthly
Transformers T6 (3 each)	Monthly
Transformers T7 (3 each)	Monthly
Town side Sub and Ware house sub Transformers (5 each)	Monthly
Spillway Hoists #1 thru #22 gearbox (22 each)	Monthly
NAVLOCK CRANES - GEN MAINTENANCE MONTHLY CHECKS	
Navlock Cranes (2 each)	
Gearbox	Monthly
Brake and Pedal Linkage Pins	Monthly
Shaft Roto-seals	Monthly
Mast Step Bearing	Monthly
Swinger Gear Case	Monthly
Reduction Gear oil Bath	Monthly
Compressor Gearbox	Monthly
SPILLWAY CRANES - GEN MAINTENANCE MONTHLY CHECKS	
Spillway Gantry Crane #6 - #7 (2 each)	
Main Hoist Drive Gear Case	Monthly
Upstream Aux Hoist Gear Case	Monthly
Downstream Aux Hoist Gear Case	Monthly
Upstream Gantry Travel Gear Case	Monthly
Downstream Gantry Travel Gear Case	Monthly
Main Hoist Trolley Gear Case	Monthly
Auxiliary Hoist Trolley Gear Case	Monthly
Main Hoist Brake Reservoir	Monthly

POWERHOUSE CRANES - GEN MAINTENANCE MONTHLY CHECKS	
Tailrace Gantry Crane #4	
Upstream Gantry Travel Gear Case	Monthly
Auxiliary Hoist gearbox	Monthly
Auxiliary Hoist Trolley	Monthly
Main Hoist Gear Case	Monthly
Downstream Gantry Travel Gear Box	Monthly
Intake Gantry Crane #5	
Upstream North Gantry Travel Gear Reducer	Monthly
Downstream North Gantry Travel Gear Reducer	Monthly
Upstream South Gantry Travel Gear Reducer	Monthly
Downstream South Gantry Travel Gear Reducer	Monthly
Main Hoist Trolley Travel Gear Reducer	Monthly
Main Hoist Gear Reducer	Monthly
Auxiliary Hoist Trolley Drive Reducer	Monthly
Upstream Auxiliary Hoist Gear Reducer	Monthly
Downstream Auxiliary Hoist Gear Reducer	Monthly
U/S Front & Rear Hammerhead Cone Reduction Unit	Monthly
D/S Front & Rear Hammerhead Cone Reduction Unit	Monthly
Hammerhead Trolley Gear Reducer	Monthly
Boom Rotation Gear Reducer	Monthly
Tugger Hoists – (4 Each)	Monthly
Upstream Auxiliary Hoist 90 Degree Gear Box	Monthly
Downstream Auxiliary Hoist 90 Degree Gear Box	Monthly
FISHWAY CRANES - GEN MAINTENANCE MONTHLY CHECKS	
Fish Pump Gantry Crane #3	
North Gantry Travel Gearbox	Monthly
Main Hoist Drum Gear Case	Monthly
Auxiliary Hoist Gearbox	Monthly
Auxiliary Travel Gearbox	Monthly
Power Cable Gearbox	Monthly
South Gantry Travel Gearbox	Monthly
Fish Ladder Gantry Crane #9 & 10 (2 each)	
Power Cord Reel Drive Gearbox	Monthly
Boom Hoist Gear Case	Monthly
Horizontal Swing Gear Case	Monthly
Hoist Gear Case	Monthly
North East Gantry Drive Gearbox	Monthly
North West Gantry Drive Gearbox	Monthly
South East Gantry Drive Gearbox	Monthly
South West Gantry Drive Gearbox	Monthly
Juvenile Collection Channel Overhead	Monthly
Gear Boxes	Monthly
Rectangular Brush Compressor	Monthly
Side Brush Compressor	Monthly
Overhead Hoist trolley Gear Case	Monthly

McNary Project conducted 70 oil accountability related inspections from 1 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 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.

These are usually oil sheens discovered on water.

- b. McNary Project conducted 384 assessments from 1 August, 2015 to 31 December, 2015.
 - i. 258 assessments were associated with class 2 or 3 leaks to areas inside the project but not to the environment. 37 assessments were repaired, 24 were in progress at time of this report and 197 are scheduled to be worked with the next equipment scheduled maintenance. Temporary measures such as drip pans were put in place to capture any oil. The remaining 126 assessments were determined to be class 1 leaks.
 - ii. One of these assessments was based on a release to the environment and was reported publicly to the NRC #1124893 on August 6, 2015.

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 outlined below.
- i. The oil system is a closed loop system which consists of oil storage tanks, piping, and several oil sumps for each main unit. There are level indicating devices on each tank, and the sumps, although they were not designed to determine exact amounts of oil in the equipment. 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.
- 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)
1 Aug, 2015 (initial)	167,834	N/A	N/A
31 Dec, 2015	168,822	0	+988

Note: No new oil was added to the system. However, the December 31st number shows an increase of 988 gallons of oil from the original August 1st estimate. The December 31st volume does not take into consideration analog oil level indication replacement, percentage of error in readings, oil transferred for disposal, and error caused by governor sump levels operating range.

- 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)
1 Aug, 2015 (initial)	131,041	N/A	N/A
31 Dec, 2015	131,041	0	0

Note: All the transformers oil levels are operating inside their normal range. It is not possible to determine the amount lost since the transformers remain inside their normal operating range and the leakage is cleaned up and disposed of with rags.

- 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)
1 Aug, 2015 (initial)	19,990	N/A	N/A
31 Dec, 2015	19,606	0	-384

Note: McNary is currently rebuilding the hydraulic cylinders on its headgates. When the initial readings was taken, a headgate was in the process of being drained. The headgates at McNary have two cylinders. It is believed that one of the cylinders was drained and the other was in the process. This could result in 180 to 360 gallons difference from the original reading. Another contributing factor to the difference in readings is the fact that the gauges were replaced with a digital readout. However, the most likely cause of difference from initial reading to final reading is the status of Unit 12 headgates. The initial reading was taken with Unit 12 headgates in the lowered positions and the final reading was taken with all of the units headgates raised. The Operations and Maintenance manuals indicate this can introduce as much as a 257 gallon margin of error per unit. No oil was added to the system nor did any spills take place during the rating cycle.

- 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 of Oil Stored (Oil Storage)	Gallons Purchased Since Initial	Difference Difference = -1*(initial – current – purchased)
1 Aug, 2015 (initial)	7,197	2,875	N/A	N/A
31 Dec, 2015	7,197	2,425	0	-450

Note: No new oil was placed in the oil storage during the period of review. 155 gallons of oil was disposed of and included in the 3,433 gallons below. The remaining 295 gallon difference is the result of measuring errors.

- 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. The same applies to grease; various types of grease are all combined into a single drum for disposal.

Date	Gallons of Oil Disposed of:
9/01/2015	3,433 Gallons
Date	Gallons of Grease Disposed of:
N/A	None

- 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:** McNary purchased 10 cartridges and 65 tubes 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. McNary has 18 Farval systems. During this period 220 Gallons of grease was checked out for use in the 18 different Farval systems. 275 Gallons of grease were removed during annual maintenance on Units 9-12 and are scheduled for disposal.