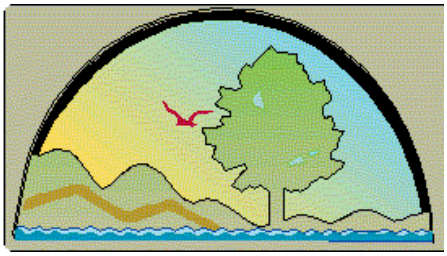
MAXEY FLATS DISPOSAL SITE
ANNUAL REPORT
2016

March 28, 2017



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List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
ATL	Advanced Technologies and Laboratories
AW	Alluvial Wells
BoRP	Balance of Remedial Phase
Commonwealth	Commonwealth of Kentucky
DOE	U.S. Department of Energy
DCW	Drainage Channels Water
EDB	East Detention Basin
EPA	U.S. Environmental Protection Agency
FCP	Final Closure Period
ICP	Institutional Control Period
IRP	Initial Remedial Phase
IMP	Interim Maintenance Period
MFDS	Maxey Flats Disposal Site
O&M	Operation and Maintenance Requirement Summary
NOAA	National Oceanographic Atmospheric Administration
PSVP	Performance Standards Verification Plan
PSW	Perennial Surface Water
RECON	Remedial Construction Services, LP
REI	Reasonably maximally Exposed Individual
RML	Radioactive Material License
SOW	Statement of Work
SWMF	Stormwater Management Feature
TEDE	Total Effective Dose Equivalent
TWC	The Walker Company
USGS	U.S. Geological Survey

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List of eAppendices
Included electronically

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1.0 Introduction

The Commonwealth is submitting this annual report for the Maxey Flats Disposal Site (MFDS) in accordance with Section 4.0 of the Performance Standards Verification Plan (PSVP) (Appendix C of the Interim Maintenance Period (IMP) Work Plan). This report summarizes the sampling and maintenance activities listed in the 2003 IMP Work Plan, PSVP, and the Operations and Maintenance (O&M) Requirement Summary (Appendix D of the IMP Work Plan).

2.0 Scope of Work

The Final Closure Period (FCP) is ongoing pursuant to the Consent Decree (Civil Action Number 95-58) signed by the United States Environmental Protection Agency (EPA), the Settling Private Parties (represented by the Maxey Flats Steering Committee), and the Commonwealth. The Maxey Flats Steering Committee disbanded in September 2014 as the Settling Private Parties had fulfilled the responsibilities defined in the Consent Decree. With the dissolution of the Maxey Flats Steering Committee, the Balance of Remedial Phase (BoRP) became the full responsibility of the Commonwealth. This includes tasks outlined in the IMP Work Plan and FCP development as described in the Record of Decision (ROD). Relevant IMP monitoring activities will continue until they are no longer applicable or interfere with FCP remediation and will ultimately conclude upon the EPA's approval of an Institutional Control Period (ICP) Work Plan, which is currently under development.

The following IMP Work Plan obligations will continue through FCP until no longer applicable:

- Surface water monitoring
- Groundwater monitoring
- Data management
- IMP inspections
- Contaminated liquid and solid waste handling
- Erosion monitoring
- Custodial care activities

The following IMP Work Plan obligations have been suspended:

- Initial Remedial Phase (IRP) cap maintenance
- Subsidence monitoring and surveying

3.0 Surface Water Monitoring

Tritium is the indicator isotope used to evaluate the spread of contamination at the MFDS. No surface water annual average activity exceeded specified screening levels for 2016. Tritium activity levels for all surface water samples appear in Appendix A: *2016 MFDS Tritium Data.xlsx*

3.1 East Detention Basin

A sequential sampler connected to a rain gauge is programmed to collect samples at 0.11 inches per hour rainfall rate, which is the divided hourly equivalent of a two-year storm event (2.8 inches of rainfall in 24 hours). In 2016, 29 rain event samples were collected for analysis; the activity ranged from -0.31 to 0.76 pCi/mL. Figure 3-1 provides the annual average for tritium concentrations for 2011-2016.

As a result of Final Cap construction, rainfall runoff is no longer channeled primarily to the EDB. The resultant post-precipitation detention and discharge volume at the EDB has been dramatically reduced. No pre-FCP storm event resulted in discharge rates that exceeded predevelopment flow, therefore, IMP mandated two-year storm event flow rate comparison calculations will no longer be performed for EDB discharge.

The East Drain rain gauge recorded a two year storm event on August 2nd. A total of 3.17 inches of rain fell in a 24 hour period starting at 1 pm on August 1st. A comparison of the discharge flow at the East Detention Basin (EDB) flume to the predevelopment flow rate was not possible because the EDB flume was undergoing demolition and renovation at the time the storm event occurred. The FCP constructed EDB flume was designed with a discharge rate below that of the IMP flume.

3.2 Perennial Surface Water

Perennial Surface Water (PSW) is monitored at five locations in three streams influenced by surface water runoff from the MFDS. These locations are monitored using sequential samplers that collect a four aliquot daily composite. The PSW samples are compared to an action level of 20 pCi/mL and a screening level of 10 pCi/mL. During 2016, 1,718 PSW samples were collected for analysis with no anomalous data reported. All PSW location averages were below the screening level of 10 pCi/mL. Figure 3-1 provides the IMP Annual Average Tritium Activity for 2011-2016.

Sample location 122A serves as the source for background samples. It is located on Rock Lick Creek, free from site influence. During 2016, 349 samples were collected at this location for analysis. The activity ranged from -0.47 to 0.72 pCi/mL.

Sample location 106 is located on No Name Branch, a tributary of Rock Lick Creek. Location 106 receives runoff from Drain 144 and exhibits seasonal activity fluctuation consistent with location 144. During 2016, 300 samples were collected from this location for analysis. The activity ranged from 0.29 to 12.30 pCi/mL.

Sample location 122C is located on Rock Lick Creek, downstream of locations 106 and 143. During 2016, 350 samples were collected from this location for analysis. The activity ranged from -0.20 to 2.00 pCi/mL.

Sample location 103E is located on Drip Springs Creek downstream of Drain 107. During 2016, 359 samples were collected from this location for analysis. The activity ranged from -0.18 to 2.81 pCi/mL.

Sample location 102D is the only sampling station outside the established buffer zone at the MFDS. It is located downstream of all surface water runoff from the MFDS and is the designated EPA compliance point. During 2016, 360 samples were collected from this location for analysis. The activity ranged from -0.35 to 1.50 pCi/mL. The 2016 annual average at 102D was 0.39 pCi/ml. In accordance with the IMP Work Plan, the Reasonably maximally Exposed Individual (REI) comparison indicated that the annual average did not exceed the 4 mrem/year dose limit (equivalent to 20 pCi/mL).

3.3 Drainage Channel Water

Drainage Channel Water (DCW) is monitored at the west, south, and east drains that receive intermittent flow from the FCP cap. These locations are monitored using automated samplers that collect a four aliquot daily composite. The activity at these monitoring locations is compared to a 25 mrem/year Total Effective Dose Equivalent (TEDE) standard, an annual average action level of 100 pCi/mL, and an additional screening level of 50 pCi/mL. In 2016, 825 samples were collected at the DCW locations for analysis. No location exceeded the 50 pCi/mL screening level. No additional investigation was required. Figure 3-1 provides the IMP Annual Average Tritium Concentrations for 2011-2016.

Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. During 2016, 219 samples were collected from this location for analysis. Activity ranged from 0.37 pCi/mL to 44.28 pCi/mL.

Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. During 2016, 277 samples were collected from this location for analysis. Activity ranged from -0.38 pCi/mL to 4.29 pCi/mL.

Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. During 2016, 329 samples were collected from this location for analysis. Activity ranged from 0.29 pCi/mL to 163.08 pCi/mL.

Maxey Flats Disposal Site
Annual Average Tritium Activity (pCi/mL)
2011-2016

		Perennial Surface Water					Drainage Channel Water		
	EDB	**122A**	**106**	**122C**	**103E**	**102D**	**C107**	**143**	**144**
2011	0.38	0.06	3.21	0.91	0.37	0.61	8.63	0.03	56.43
2012	0.72	0.05	3.88	1.19	0.51	0.82	12.96	0.06	67.85
2013	0.94	0.05	3.61	1.00	0.44	0.67	10.42	0.07	59.34
2014	0.59	0.07	3.80	1.12	0.43	0.80	11.01	0.06	46.01
2015	0.37	0.07	2.79	0.77	0.39	0.52	8.81	0.03	46.49
2016	**0.18**	**-0.02**	**4.05**	**0.61**	**0.50**	**0.39**	**15.86**	**0.10**	**55.73**

Figure 3-1

3.4 Sampling Equipment Status

A reliable ISCO sampler is in operation at each sampling location. Sampler performance is in accordance with the PSVP, except during events beyond control such as freezing lines, washouts, equipment failure, lack of flow, or power outages. Replacement units and spares were purchased and received at the end of 2016. These samplers will be installed in early 2017 according to a USEPA approved Institutional Control Period (ICP) Field Sampling and Analysis Plan.

4.0 Groundwater Monitoring Wells

Groundwater monitoring at the MFDS is conducted via alluvial and perimeter monitoring wells. The alluvial wells, located in the buffer zone, were installed during the IRP to satisfy the requirements of the Statement of Work (SOW). The perimeter monitoring wells located along the west perimeter of the restricted area were installed as investigative monitoring points prior to the Consent Decree. The perimeter wells are maintained for water level monitoring which satisfies an IMP Work Plan requirement and sampled to satisfy the tritium monitoring requirements in the RML. Analytical results for all groundwater samples are contained in Appendix A: *2016 MFDS Tritium Data.xlsx.* Water level monitoring tables for both alluvial and perimeter wells are contained in Appendix B: *2016 MFDS Alluvial Well Levels* and *2016 MFDS Perimeter Well Levels.xlsx.*

4.1 Alluvial Wells

Alluvial well (AW) samples were collected for analysis as outlined in the PSVP and the 2007 EPA Five Year Review. Four wells were sampled in 2016. Annual samples

were collected from AW-6, 10 and 12, and quarterly samples were collected from AW-7, resulting in 7 alluvial well samples collected for analysis. Results were typical of historical ranges. The maximum activity at AW-7 was 5.71 pCi/mL. Comparison of this value to 50 percent of the 20 pCi/mL applicable or relevant and appropriate (ARAR) requirement indicated additional analysis was not necessary.

Access to the alluvium within the buffer zone is controlled by the Commonwealth, therefore the alluvial wells are not considered a drinking water source and do not represent a potential radiological dose to the public. The county road extending through the buffer zone is restricted from public use and a gate was installed to further limit access.

4.2 Perimeter Monitoring Wells

Perimeter monitoring well water levels were measured and recorded in February before FCP cap construction activities along the west side necessitated the closure of 12 of the 16 wells. Water levels were measured in the four remaining wells on a quarterly basis and samples were collected for tritium analysis from N2B and UK-1 on a semi-annual basis, as required by the RML. Only three samples were collected during 2016; N2B was dry during the 4th quarter sampling event. The tritium analyses for the perimeter well locations in 2016 were typical of historical data and seasonal trends.

5.0 Data Management

Data packages are prepared for all samples collected and analyzed at the MFDS. Data packages contain the instrument quality control (QC) charts, chain of custody forms, raw data sheets, and data reduction sheets. Advanced Technologies and Laboratories (ATL), is contracted for third party data validation. Following validation, data is entered into the MFDS electronic database and transmitted to EPA, United States Department of Energy (DOE), and multiple groups within the Commonwealth. These packets are available on site for review.

6.0 Rainfall Data

Presently, there are three rain gauge locations associated with the MFDS: the East Detention Basin (EDB), sampling location 102D, and the main office. The official annual rainfall data for the MFDS is collected at the EDB rain gauge. The main office rain gauge can be used for official rainfall totals in the event of an EDB rain gauge malfunction. The measured rainfall at the EDB gauge during 2016 was 41.14 inches. This can be compared to the annual average precipitation of 47.33 inches (NOAA, National Climatic Data Center; Farmers, KY). Annual precipitation data appears in Appendix C: *2016 MFDS Daily Rainfall.xlsx.*

7.0 IMP Inspections

There were 95 modified inspections performed in 2016 to the areas unaffected by FCP construction.

8.0 Contaminated Liquid and Solid Waste

Contaminated liquid and waste generated on site will be disposed of in accordance with the IMP Work Plan, Section 3.2: Treatment of Other Contaminated Liquids, and Section 3.3: Waste Burial.

Solid and liquid waste generated from laboratory, radiological, and maintenance activities is stored in a secured area in the on-site Radiological Laboratory. All radiological waste is transferred to 55 gallon drums and will accumulate until space restraints require contracted, off-site disposal. Approximately one 55 gallon drum of accumulated waste was collected during 2016.

The Annual Low Level Radioactive Waste Report is included in Appendix D: *2016 MFDS LLRW Report.pdf*.

9.0 Erosion Monitoring

Curd Surveying & Land Consulting was contracted to complete erosion monitoring and produce a cross-sectional profile of the East Drain using IMP (Shaw) methodology. The spring survey was not completed. The fall survey was completed in December of 2016. The 2016 East Drain erosion measurements are presented in Appendix E: *2016 MFDS East Drain Erosion Shaw Monuments.pdf.*

The fall erosion screening conducted by the MFDS staff using the USGS methodology was not performed in 2016. New erosion monuments and monitoring criteria for the three drains receiving surface water flow from the Final Cap are being developed for the ICP Work Plan.

Seasonal visual erosion monitoring of the east, south, and west drainage channels was completed in compliance with IMP Work Plan requirements. These inspections revealed no erosion concerns in the East and South Drains. The FCP construction activities and the new storm water management functions of the cap have resulted in notable erosion in the West Drain. This erosion data will be evaluated in the 2017 Five Year Review.

Following a 4.2 inch, 24 hour storm event or greater, the Commonwealth must conduct visual inspections of east drainage channel and report findings. No 4.2 inch, 24 hour storm event inspections were performed in 2016.

10.0 IMP Work Plan Revisions, Changes, and Correspondence

Revisions and changes to the IMP Work Plan are required to be submitted in writing to EPA for approval. No revisions were submitted in 2016. The ICP Work Plan is currently under joint development by AECOM and the Commonwealth.

11.0 Custodial Care Activities

11.1 Vegetation

All vegetation was maintained at required height limits in accordance with IMP Work Plan requirements.

11.2 Building and Grounds Maintenance

All routine building and grounds maintenance was performed according to IMP Work Plan requirements.

11.3 Security Fence

The temporary rope and signage for cap construction was replaced with six foot aluminized chain link fencing in December. The office complex and disposal area are now enclosed in the same fenced area with gates at the main entrance, West and East sides and a cap access gate at the South. New signage was posted every 200 feet.

11.4 Roadway Maintenance

Tasks pertaining to routine road maintenance were minimized because of the cap construction. The road around the disposal area was improved to asphalt and concrete as part of the FCP cap perimeter drainage system. The entry road and parking lot were also resurfaced after construction of the FCP cap was complete. The Walker Company (TWC) built, improved, and maintained all roads in the buffer zone for borrow hauling. All access roads in the buffer zone were graded and graveled before TWC demobilized for the winter.

12.0 Other Activities and Developments

The main purpose of this document is to summarize the requirements of the IMP Work Plan being performed until the ICP Workplan is approved. Other activities and developments in 2016 include:

- The Walker Company filed and achieved Substantial Completion in December 2016. A vegetative cover across the cap was established before the growing season ended resulting in minimal erosion on the cap surface.

- The landslides above Borrow Area 4 are being monitored visually until a comprehensive monitoring plan can be developed. Movement in the slide area has slowed dramatically since the last repair.

13.0 Conclusion

This concludes the textual outlining of the IMP activities at the MFDS for 2016. If copies of inspections or deliverables not included in this report are required, please contact the MFDS office.