ADDENDUM 4
To the
SITE SPECIFIC WORK PLAN (SSWP)

BUSH RIVER STUDY AREA
RADIOACTIVE WASTE MANAGEMENT FACILITY
NON-TIME CRITICAL REMOVAL ACTION

Edgewood Area, Aberdeen Proving Ground, MD
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APPROVALS

By their specific signature, the undersigned certify that this Site Specific Work Plan is approved for utilization during field activities described herein. These activities are being performed in support of the Base Environmental Support (BEST) Contract located at the U.S. Army Garrison, Aberdeen Proving Ground, Maryland.

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1. SUMP WATER REMOVAL AND DISPOSAL

Subsection 2.9.4.1 (Wastewater Removal) of the Site-Specific Work Plan for the Bush River Rad Yard project states that according to the EE/CA, the wastewater and sludge in the concrete sumps of Building E2364 are contaminated with Cs-137 and Co-60, and small amounts of Sr-90 and Tc-99. The purpose of this addendum is to provide recent sample results of the sump water and present a plan to dispose of the water while satisfying both MDE and NRC.

There are three sumps located in former Building E2364 that are filled completely with water, plus a valve pit partially filled with water. They have the following characteristics:

- Sump 1.
  Approximate dimensions: 9' x 16' x 4'.
  Approximate water volume: 4,700 gallons.
- Sump 2.
  Approximate dimensions: 20' x 15.4' x 5.7'.
  Approximate water volume: 13,100 gallons
- Sump 3.
  Approximate dimensions: 20' x 15.4' x 5.7'.
  Approximate water volume: 13,100 gallons
- Valve Pit
  Approximate dimensions: 6.5' x 6.7' x 2.7'
  Approximate water volume: 900 gallons

The EE/CA states that this water has been pumped out before and that the water that is currently in the sumps may be storm water runoff. WESTON collected two rounds of composite samples from each of the three sumps on 4 and 14 October 2004 and compared the results against the most recent Numerical Criteria for Toxic Substances in Surface Waters (COMAR 26.08.02.03-2), the National Recommended Water Quality Criteria (EPA-822-R-02-047, 2002), and the limits on Effluent Release Concentrations (NRC 10 CFR 20, Appendix B, Table 2). If sample results are below these action levels, the water can be discharged to a nearby surface water body in accordance with MDE and NRC requirements.

On 4 October, representative samples of water from each sump was filtered through a 10 micron bag filter to remove leaves, debris, fines, sediment, etc. and analyzed for various parameters. Sample results showed elevated readings just above the action levels (regulatory discharge limits as presented in Table 1) for one or more of the following parameters in all three sumps: cadmium, lead, and zinc. No radionuclides were detected in the filtered water from Sump 1. Filtered water from Sumps 2 and 3 contained levels of Cs-137 at about 70% of the NRC action level. All other parameters were below action levels. To assess the parameters in unfiltered water, samples from Sumps 2 and 3 were collected on 14 October without bag filtration. Again, sample results showed one or more of the same three metals in all three sumps above action levels, and Cs-137 at about 70% of the action level. WESTON concluded that filtering the water did not appreciably reduce the concentrations of the parameters of concern to below action levels. Analytical results for filtered and unfiltered samples from all three sumps are provided in Table 1.

However, as will be discussed in Section 2, sediment from Sumps 2 and 3 was sampled in March, 2005. Analysis of the sediments identified concentrations of Cs-137 well above the 5-pCi/g cleanup level for soils at the site. While the water analysis described above concluded that filtering did not significantly reduce the concentration of contaminants in the water, it is assumed that the water samples described above did not contain sediments from the bottoms of the sumps. Additionally, a small area of contamination was detected when instrument surveys were conducted beneath the water in Sump 1. It will not be known if the source of contamination is sediment or fixed contamination until the water in Sump 1 is removed. Therefore, while the analysis of the filtered and unfiltered water from Sump 1 did not detect activity in the water, this sump will be considered to potentially contain radioactive contamination and the water in Sump 1 will be handled and disposed in the same manner as the water from Sumps 2 and 3. The relatively small amount of water in the valve pit was not sampled and analyzed. Consequently, this water will be handled in the same manner as the water in the three sumps.

Water will be pumped first from the valve pit and then from Sumps 1, 2, and 3, respectively, and filtered through a 50 micron bag filter system. The filtered water will be discharged into a tanker

TABLE 1. ANALYTICAL RESULTS FOR FILTERED AND UNFILTERED SUMP WATER SAMPLES

Parameter	Units	Reporting Limit	Action Level	Sump 1 (10/04/04)	Sump 1 (10/14/04)	Sump 2 (10/04/04)	Sump 2 (10/14/04)	Sump 3 (10/04/04)	Sump 3 (10/14/04)
				Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered
Organic Compounds (BTEX)									
Benzene	ug/L	5	510	ND	ND	ND	ND	ND	ND
Toluene	ug/L	5	200,000	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/L	5	29,000	ND	ND	ND	ND	ND	ND
Xzylene	ug/L	5	---	ND	ND	ND	ND	ND	ND
Inorganic Compounds (TAL Metals)									
Aluminum	ug/L	200	---	91.7B	187B	32.7B	91.8B	56.7B	102B
Antimony	ug/L	10	---	ND	ND	ND	ND	ND	ND
Arsenic	ug/L	10	150	ND	2.8B	ND	ND	ND	3.1B
Barium	ug/L	200	---	43.7B	46.5B	79.1B	84.0B	89.0B	90.1B
Beryllium	ug/L	5	---	ND	ND	ND	ND	ND	ND
Cadmium	ug/L	5 (0.0183)	0.25	**4.4BE**	**9.5**	ND E	0.27B	ND E	**0.25B**
Calcium	ug/L	5000	---	67900	75100	46900	50700	42600	45000
Chromium (total)	ug/L	10	---	ND	ND	ND	ND	ND	ND
Cobalt	ug/L	50	---	ND	ND	ND	ND	ND	ND
Copper	ug/L	25 (4.333)	9	5.9B	ND	ND	ND	ND	ND
Iron	ug/L	100	---	2970	2770	2210	2040	2120	1660
Lead	ug/L	5 (1.884)	2.5	**5.7**	**11.4**	2.4B	ND	**4.5B**	2.1B
Magnesium	ug/L	5000	---	1720B	1620B	3770B	3760B	3980B	3830B
Manganese	ug/L	15	---	324	294	332	106	428	159
Mercury	ug/L	0.2	0.77	ND	ND	ND	ND	ND	ND
Nickel	ug/L	40	52	ND	ND	ND	ND	ND	ND
Potassium	ug/L	5000	---	14700	13700	14600	15700	16200	14600
Selenium	ug/L	5	5	ND	ND	ND	ND	ND	ND
Silver	ug/L	10	---	ND	ND	ND	ND	ND	ND
Sodium	ug/L	5000	---	11900	11800	9570	9390	9250	9350
Thallium	ug/L	10	---	ND	3.7B	ND	4.6B	ND	ND
Vanadium	ug/L	50	---	ND	ND	ND	ND	ND	ND
Zinc	ug/L	20	120	**453**	**312**	**161**	**133**	97.6	108

Solids									
Total Suspended Solids (TSS)	mg/L	1	15	1	14	4	5	6	9
Radionuclides									
Gross Alpha	pCi/mL	0.003	See Note 5	ND	ND	0.0028J±0.0012	ND	0.0038±0.0015	ND
Gross Beta	pCi/mL	0.004	See Note 5	0.0107+0.0018	0.004J±0.0012	0.345±0.035	0.199±0.021	0.387±0.040	0.245±0.025
Cesium-137	pCi/mL	0.02	1.0	ND	ND	0.716±0.063	0.674±0.061	0.757±0.066	0.762±0.076
Cobalt-60	pCi/mL	0.04	3.0	ND	ND	ND	ND	ND	ND
Strontium-90	pCi/mL	0.003	0.5	ND	ND	0.00657±0.00079	0.00606±0.00070	0.00695±0.00085	0.00356±0.00054
Bismuth-214	pCi/mL			ND	ND	ND	38±23	ND	ND

NOTES:

(1) BTEX parameters are in accordance with "aquatic life - fresh water - chronic" criterion under COMAR 26.08.02.03-2 (Numerical Criteria for Toxic Substances in Surface Waters), Table 2.

(2) TAL Metals parameters are in accordance with "human health for consumption - organism only" criterion under COMAR 26.08.02.03-2, Table 1.

(3) TSS parameter is in accordance with the discharge criteria used at the Old O-Field Groundwater Treatment Plant as outlined in Section 3.3 of the Old O-Field GWTF Sampling and Analysis Plan (dated April 2004).

(4) Radionuclides (Cesium, Cobalt, Strontium) parameters are in accordance with NRC criterion as outlined in Section 2.9.4.1 of the Bush River Rad Yard Site-Specific Work Plan (dated September 2004).

(5) Any Gross Alpha/Beta result significantly in excess of expected site background levels will be further investigated.

(6) Bismuth was an aditional radionuclide detected in Sump 2 during analysis.

J = Result is greater than sample detection limit but less than stated reporting limit

B = Estimated result. Result is less than reporting limit

E = Matrix interference

truck, probably with a capacity of 7,000 gallons. A representative composite sample will be collected from each batch of filtered water by collecting aliquots from the feed hose at a frequency of at least 1 per 15 minutes to fill a minimum of a 2-liter volume. Analysis will be by gamma spectroscopy for Cs-137, Co-60 and any other gamma emitters. This process will be repeated for successive tanker loads until the valve pit and sumps are emptied. If the filtered water does not meet 10CFR20, Appendix B criteria for discharge, the batched water will be returned to one of the sumps, and an alternate plan will be established. If the filtered water meets 10CFR20, Appendix B criteria, the water will be transported to an existing APG permitted outfall.

WESTON consulted with DSHE regarding the most feasible outfall to use for water discharge. A decision was made to use the existing permitted outfall for the Edgewood Area Sewage Treatment Plant located at the east end of Beach Point Road. Figure 1 provides a map of the area indicating the location of the Rad Yard site, the outfall location, and the route between the two. The NPDES Permit Number for this outfall is MD0021229 and the State Discharge Permit Number is 02-DP-2531. The treatment plant discharges approximately one million gallons per day of treated water to the Bush River via the outfall. This will allow the sump water discharge to mix with the pre-existing outfall discharge, diluting the levels of zinc, lead, and cadmium, as well as allowing the water to leave APG via a permitted outfall. MDE was consulted regarding the sump water results from each of these sumps. Per agreement with MDE, the expected maximum diluted concentrations of the metals were calculated and the following results provide adequate justification that the action levels will be met.

- Cadmium:
  Diluted Concentration = 0.19 ug/L
  Action Level = 0.25 ug/L
- Lead:
  Diluted Concentration = 1.3 ug/L
  Action Level = 2.5 ug/L
- Zinc:
  Diluted Concentration = 63 ug/L
  Action Level = 120 ug/L

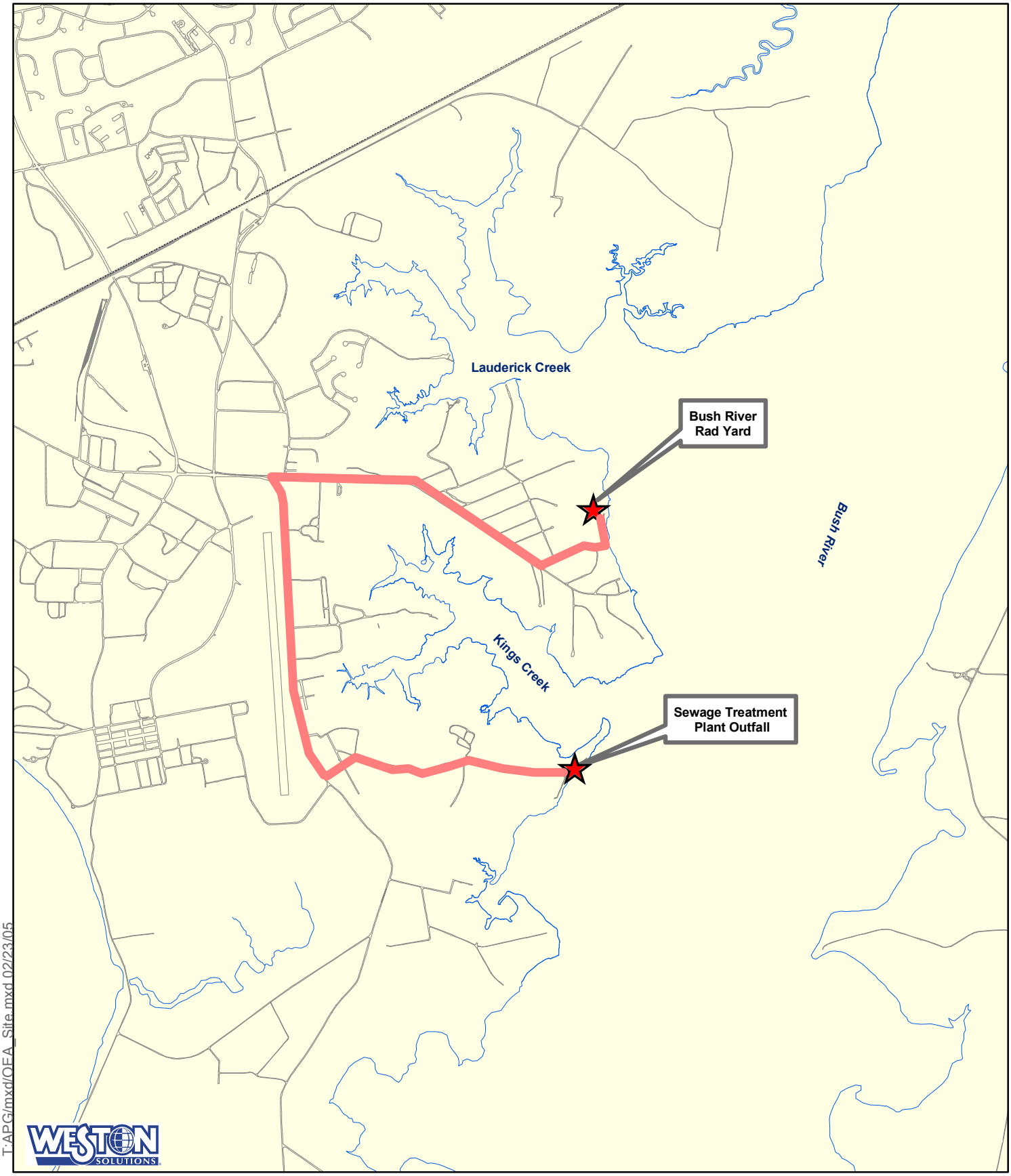


Figure 1. Route from Rad Yard to Outfall Discharge Point
Aberdeen Proving Ground

The truck will transport the water from the Bush River Rad Yard to the Sewage Treatment Plant discharge point and released into the outfall stream. There will be no access to the actual outfall since it is located in a restricted area. Therefore, the discharge point for the sump water will be just after the weir and just before the discharge pipe that leads to the outfall at the Bush River as indicated in Figure 2.

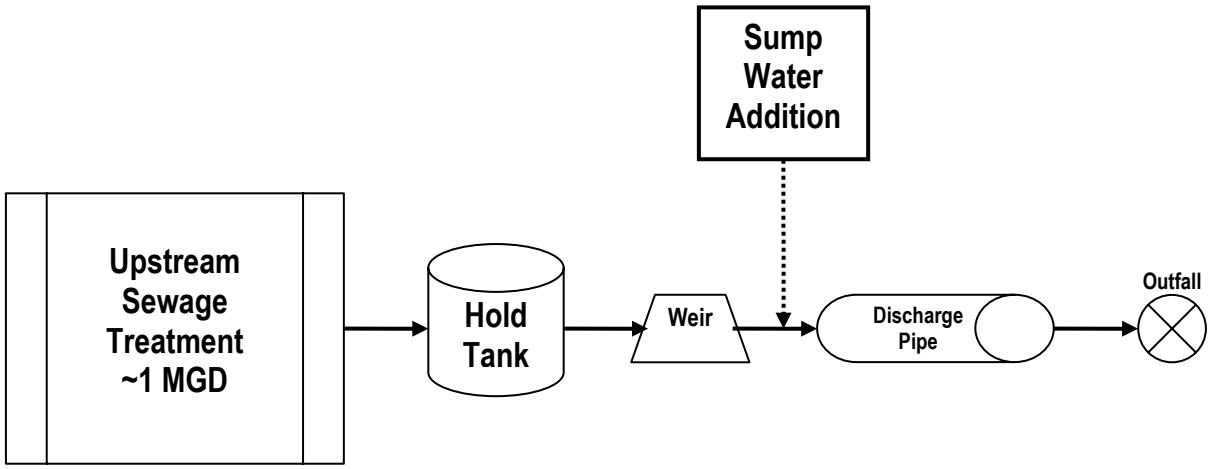


Figure 2. Sump Pit Water Discharge Flow Diagram

2. RADIOLOGICAL MONITORING & DISPOSITION OF EMPTY CONCRETE SUMPS

2.1 PRIOR RADIOLOGICAL SURVEYS OF CONCRETE SUMPS

On 23 February, 2005, surveys were conducted to characterize the valve pit and Sumps 1, 2, and 3 in their current water-filled condition. A valve pit that is approximately 6 feet deep and about 6 feet by 6 feet in cross section sits adjacent to the sumps. It encloses several sections of 12-inch diameter metal pipe that appear to lead into and away from the sumps. Surveys were performed above the water in the valve pits and the sumps while they contained the 31,800 gallons of water that will be discharged at an APG-permitted outfall. Comprehensive measurements were not performed in some areas of the sumps due to restricted access caused by debris and wooden planks placed across the top of the sump. Measurements were performed using a 2-inch by 2-inch NaI gamma detector, a microR meter, and a pancake G-M detector. Additionally, it should be noted that instrument scans of surface soils around the perimeter of sump areas have indicated contamination levels that approach 20 pCi/g in areas that had not been identified in the prior study by General Physics.

The background count rate for the NaI detector was about 5000 counts per minute (CPM). Count rates taken near uncontaminated concrete structures may be slightly elevated above background due to geometry factors, but typically the maximum levels would not exceed 7000 cpm. The highest reading in the valve pit was taken at the elbow of one of the metal pipes that was about 3 feet below the top edge of the pit, where a count rate of 200,000 cpm was recorded. Other readings inside the valve pit ranged from 30,000 to 115,000 cpm. Readings ranged from 3000 to 4000 cpm around the inside edge just above the waterline of Sump 1, 18,000 to 34,000 cpm around Sump 2, and 8,000 to 16,000 cpm around Sump 3. Levels were typically most elevated near the walls, and were significantly lower when measured directly over the water toward the middle of the sumps (away from the sump walls).

On 1 March, a 2x2 NaI detector coupled to a 10 foot cable and scaler was emplaced within a water-tight 3 inch diameter PVC pipe to perform an underwater survey of Sumps 1, 2, and 3. Significant count rates ranging from 100,000 to 1,000,000 cpm were recorded along the walls and floor of Sump 3. Lesser, but still significant readings were recorded in Sump 2. Readings within Sump 1 were generally background with the exception of one location where a reading of

80,000 cpm was observed. Based upon this data, it is assumed that contamination in excess of 5000 dpm/100 cm^2 on the concrete walls and floors of Sumps 2 and 3 is present. It also appears that Sump 1 may have a small area of contamination.

On 3 March sediment samples were collected from Sumps 2 and 3. The sediment layer appears to be about 3 inches thick on the floors of Sumps 2 and 3. The analytical results of these two samples revealed primarily Cs-137 contamination in the sediment, with the concentrations in Sump 2 and 3 being 300 and 5700 pCi/g, respectively. Elevated levels of uranium and Co-60 were also detected in the sediment. However, these radionuclides were not detected in sump water in concentrations that exceed 10CFR20 Appendix B discharge criteria.

2.1.1 Radiological Monitoring and Disposition of Empty Concrete Sumps

After filtering, sampling and properly disposing of the water in the valve pit and in Sumps 1, 2, and 3 (in that order), the following process will be applied to characterize radioactive contamination on the concrete surfaces of the sumps and in surrounding soils. Based on prior surveys, it appears there may be piping near the bottoms of the sumps. This will be verified after the water has been removed.

Any remaining sediment will be removed from Sumps 2 and 3 and treated as radioactive waste. A small area of Sump 1 may have some residual contaminated sediment that will also be removed as radioactive waste. Measurements will be taken of sump walls using the pancake G-M detectors or large area beta detectors. A quick assessment of the likelihood of successfully decontaminating the walls and floor of Sumps 2 and 3 will be performed. WESTON anticipates that the surface contamination on the walls and floor of Sumps 2 and 3 will be significantly above the 5000 dpm/100cm^2 release criteria, and that reasonable decontamination efforts will not be successful. Consequently, these structures, and any piping therein, will likely be demolished and treated as radioactive waste. Soil beneath those sumps will be radiologically surveyed and sampled to determine if surface soil criteria are exceeded. Soil containing radionuclides above surface soil criteria will be excavated and treated as radioactive waste.

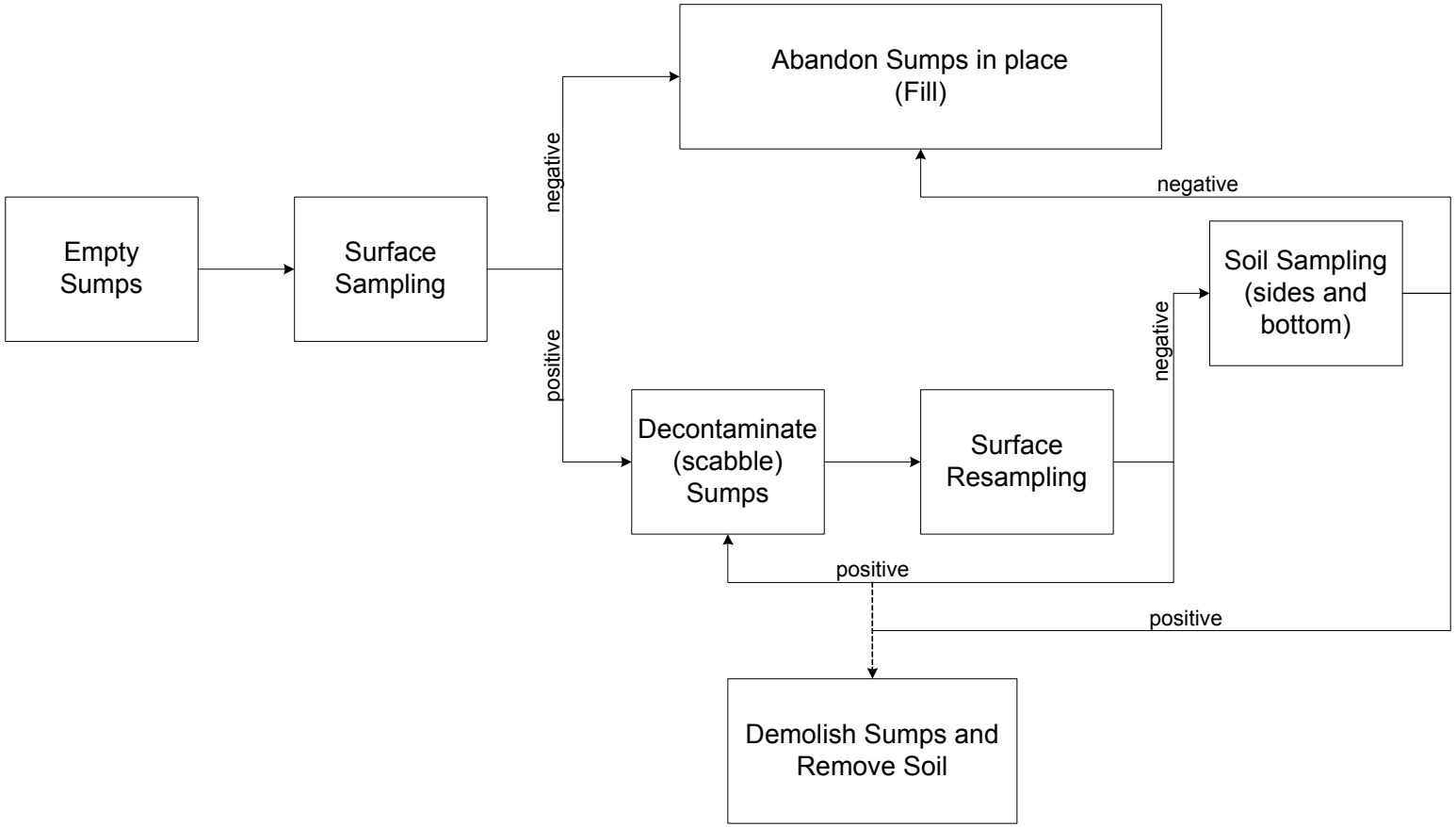
If Sumps 2 and 3 require demolition and removal it is likely that Sump 1 will not remain structurally able to stand and will be demolished at the same time. However, if Sump 1 remains standing, the following process will be applied. The walls and floors of Sump 1, and the valve pit

will be monitored and the results compared to surface contamination criteria. Measurements will be taken over 100% of the walls and floor of these areas and results compared to the release criteria for unrestricted use. If surface contamination exceeds the release criteria, reasonable surface decontamination efforts may be employed such as scabbling, scaling, or washing. Cleaned areas will be re-surveyed, and released if clean. Assuming these surfaces meet release criteria, at least two holes will be bored in the floor of Sump 1 and the valve pit at approximately equal distances from the walls and from each other. Two samples will be taken from each borehole, one from 0 – 6 inches beneath the floor and one from 6 – 12 inches beneath the floor. In addition, one borehole will be augered alongside each of the exterior walls. The borehole will be logged with a NaI detector and a sample collected from the 6" core where the highest reading was observed. The samples will be sent for analysis by gamma spectroscopy to quantify concentrations of Co-60, Cs-137, and any other isotope identified in the sample spectrum.

If either surface or subsurface sample results exceed the surface soil criteria of 5.5 pCi/g Cs-137 or 0.5 pCi/g Co-60, the contaminated soil will be excavated, segregated, and handled as radioactive waste. If the contaminated soil is below the valve pit or Sump 1, and the walls and floors must be demolished to access the contaminated soil, the concrete debris will be handled as radioactive waste. If the contaminated soil can be removed without demolishing the vessel, and upon confirmation through sampling and direct measurements that the criteria for surface soil was attained, the sump or valve pit will be collapsed in upon themselves and backfilled with soil or flowable fill, and abandoned in place.

Figure 3 provides a decision tree that depicts the process described above.

The Lead Health Physicist at the site will maintain a log of notes describing daily activities to document the changing conditions and support his or her decisions regarding the surveys being performed and the materials being released from the site.



Key:
positive ≡ sampling results ≥ action levels (Co-60 = .5, Cs-137 = 5.5)
negative ≡ sampling results < action levels (Co-60 = .5, Cs-137 = 5.5)

Figure 3. Bush River Rad Yard Sump Disposition Decision Tree