ROLLING KNOLLS LANDFILL SUPERFUND SITE

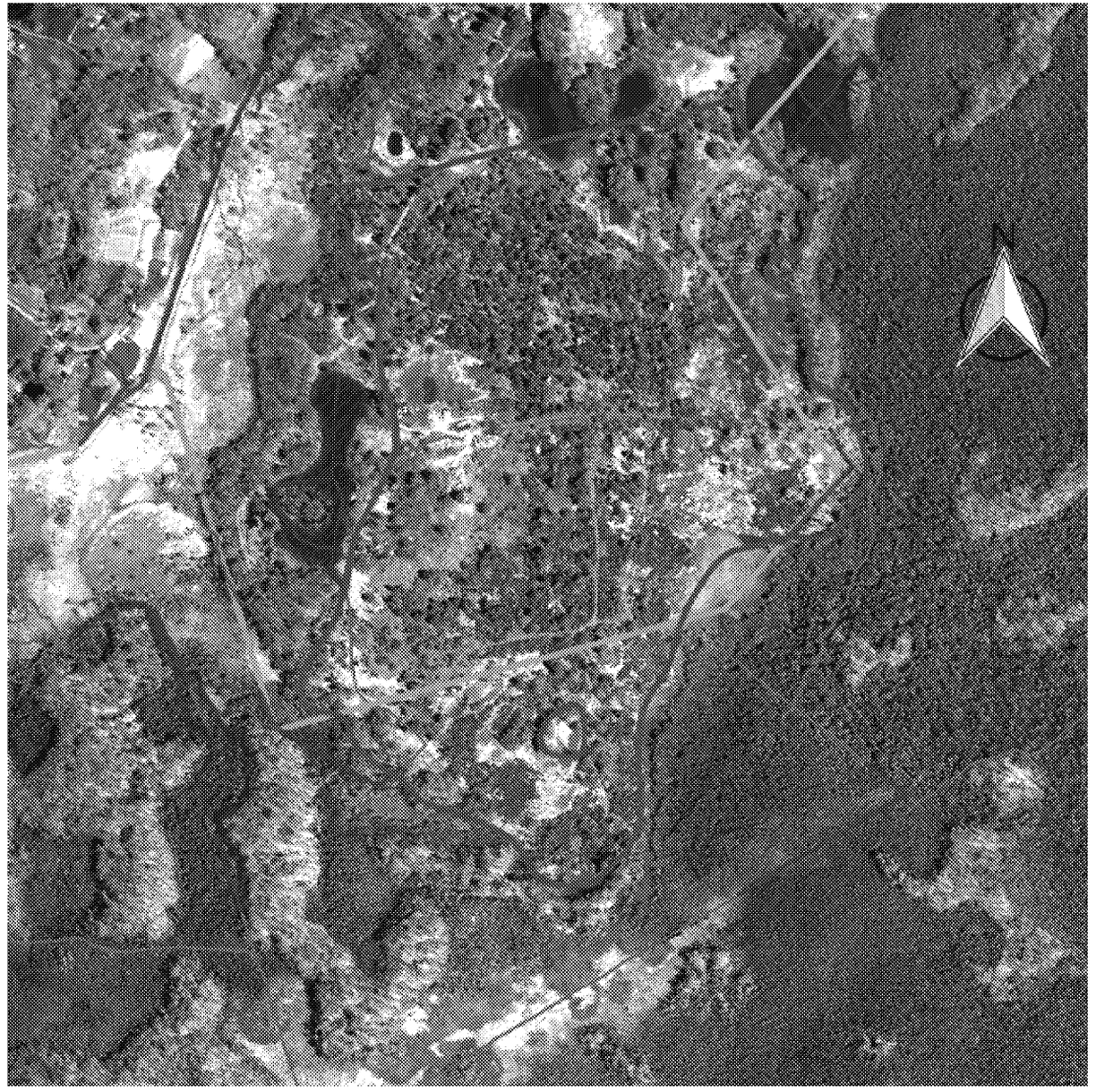
CHATHAM, NJ

Feasibility Study Assessment

U.S. Department of the Interior

Site Background

- Former landfill that operated from the 1930s to approximately 1968
- Approximately 170 acres
- Approximately 35 acres of the landfill are on the Great Swamp National Wildlife Refuge, owned by the United States and managed by the United States Fish and Wildlife Service (USFWS)



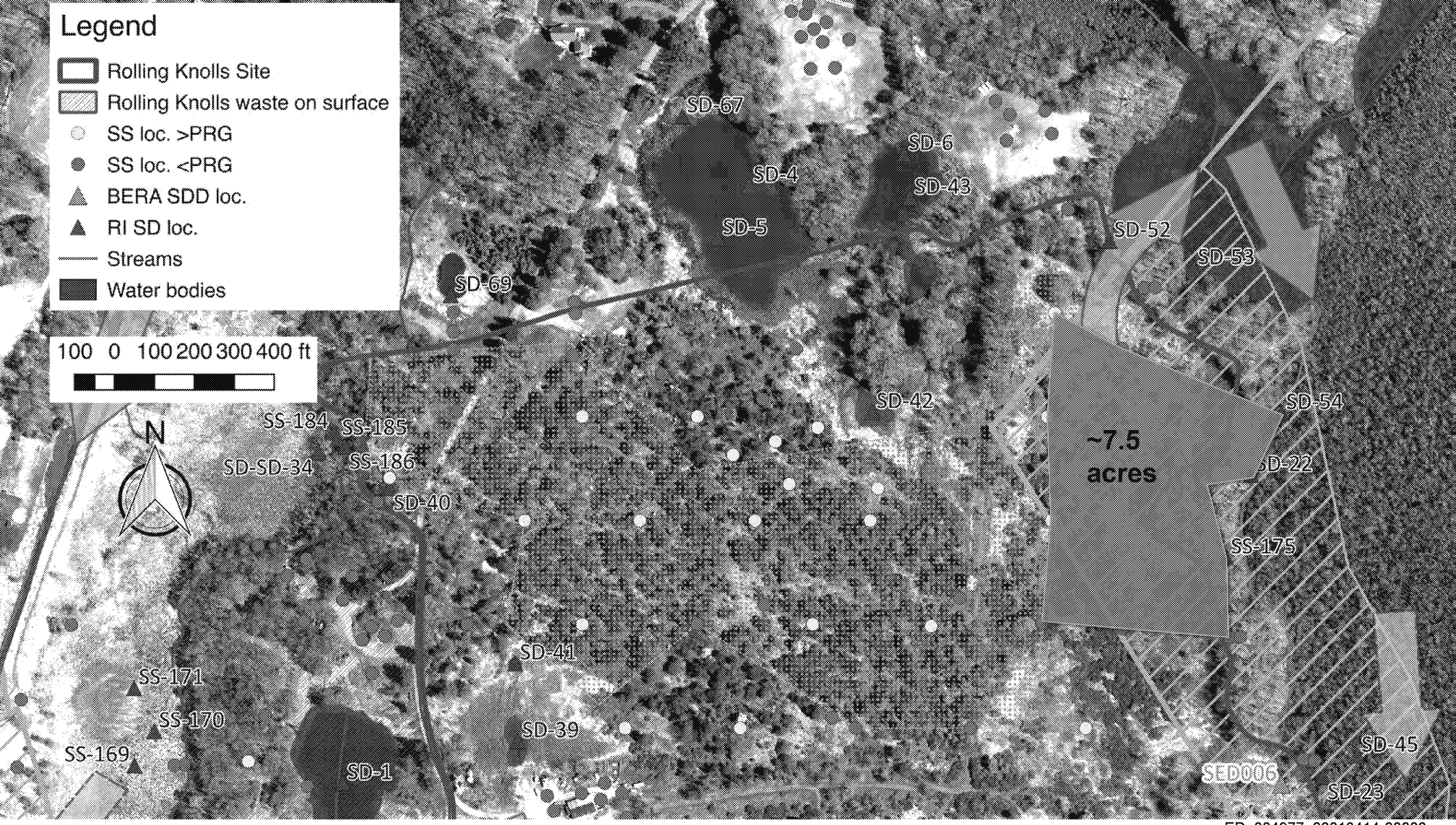
Document Review

- 2018 Draft Feasibility Study (FS)
- 2018 Remedial Investigation (RI)
- 2016 Baseline Ecological Risk Assessment (BERA)
- 2014 Baseline Human Health Risk Assessment (BHHRA)

Uncertainties

- RI conclusions / logic unclear. e.g.:
  - "[M]any" SW/SD COCs detected up-gradient, therefore, contamination "….partially due to up-gradient sources." But, no discussion of pathway characterization/CSM
- Soil characterization insufficient for hotspot delineation / eco risk assessment
- BERA only used subset of RI SD samples
  - RA rationale unclear
- 2018 RI and draft FS lack details
  - Details provided in series of technical memos
  - RI and FS incomplete
  - Critical evaluation incomplete


Legend
Rolling Knolls Site
Rolling Knolls waste on surface
BERA SDD loc.
RI SD loc.
Streams
Water bodies
CSM flow
Surface water
Sheet Flow
500 0 500 1000 1500 2000 ft
N
3600 ft.
5220 ft.
SED017
SED016
SED006
SED007
SD-8
SD-34
SD-35
SD-36
SD-10
SD-9
SD-11
SD-12
SD-67
SD-6
SD-66
SD-5
SD-4
SD-43
SD-53
SD-65
SD-69
SD-52
SD-42
SD-54
SS-184
SS-185
SD-22
SD-SD-34
SD-40
SS-175
SD-41
SS-171
SS-170
SD-14
SD-1
SD-39
SD-45
SS-169
SD-2
SD-38
SD-15
SD-64
SD-16
SD-3
SD-44
SD-55
SD-24
SD-63
SD-56
SD-62
SD-57
SD-SD-36
SD-58
SD-SD-35
SS-173
SD-46
SD-21



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Draft Feasibility Study
Landfill Alternatives

1) No Action

2) Site Controls

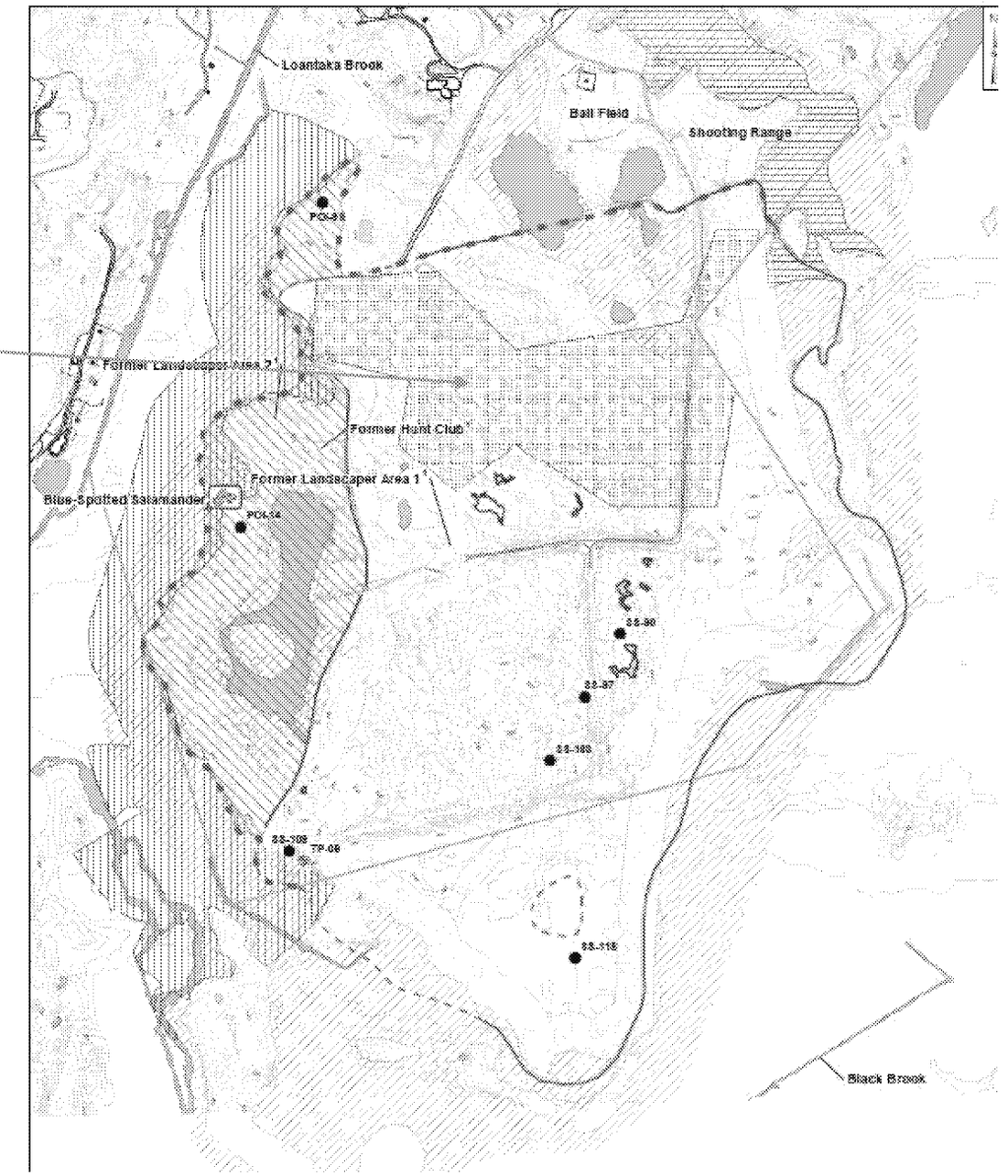
3) Cap approx. 25 acres of the 140-acre landfill (none in Refuge) to reduce the "average" PCB level in soil across the site to less than the NJ alternative remediation standard (ARS) of 5 mg/kg, which is calculated to be an acceptable human health risk based on 84 days/year of exposure

   Excavate or cap approx. 7 additional acres at 7 sample locations (black dots) that are three times the PCB soil ARS (only one sample location (SS-118) on the Refuge)

   Cover approx. 2 acres of non-vegetated areas (purple areas) exceeding the PCB ARS (none in the Refuge).

4) Same as 3 above except approx. 2-4 feet of soil/waste would be excavated from approx. 25 acres of the 140-acre landfill and disposed off-site rather than capped; excavated area would be backfilled and revegetated

5) Capping of all landfill with offsite material

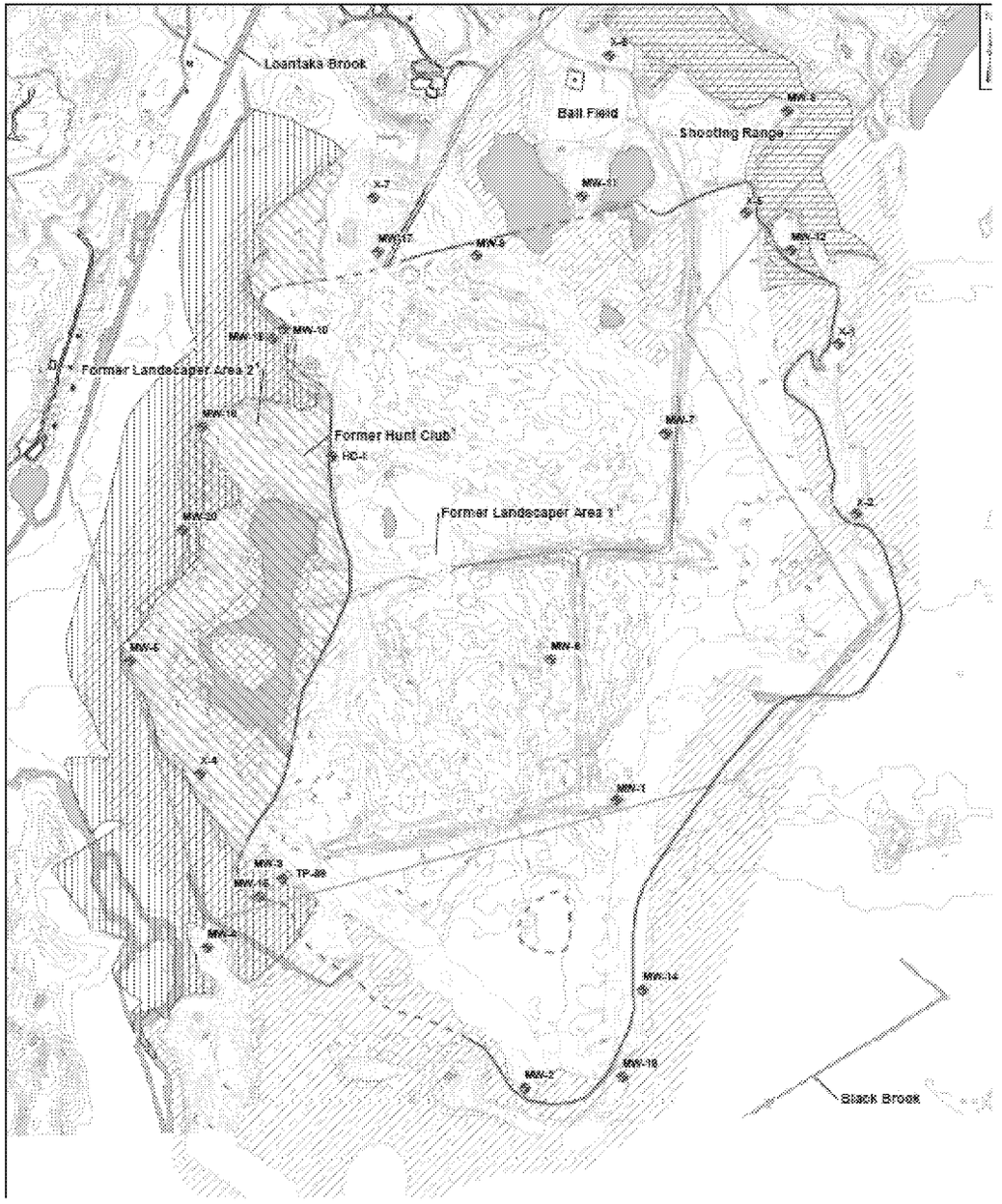


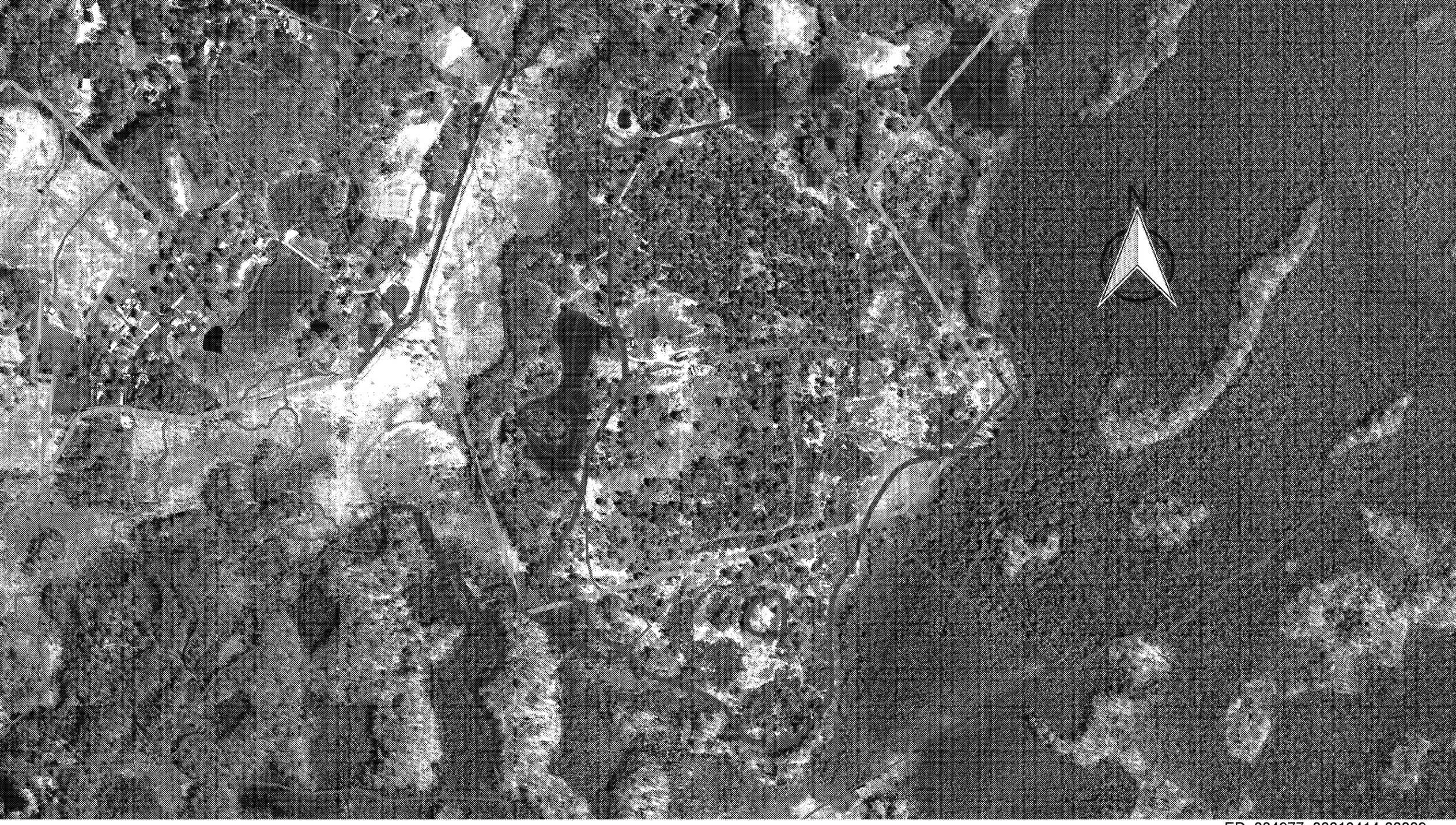
Draft Feasibility Study Groundwater Alternatives

1) No Action/natural attenuation of "Constituent of Concern (COC)" reductions

2) Source control, institutional controls, COC reduction by natural attenuation, long term monitoring with potential need to make adjustments to the remedy in the future

3) Source control, institutional controls, COC reduction by natural attenuation, long term monitoring with implementation of a contingent remedy

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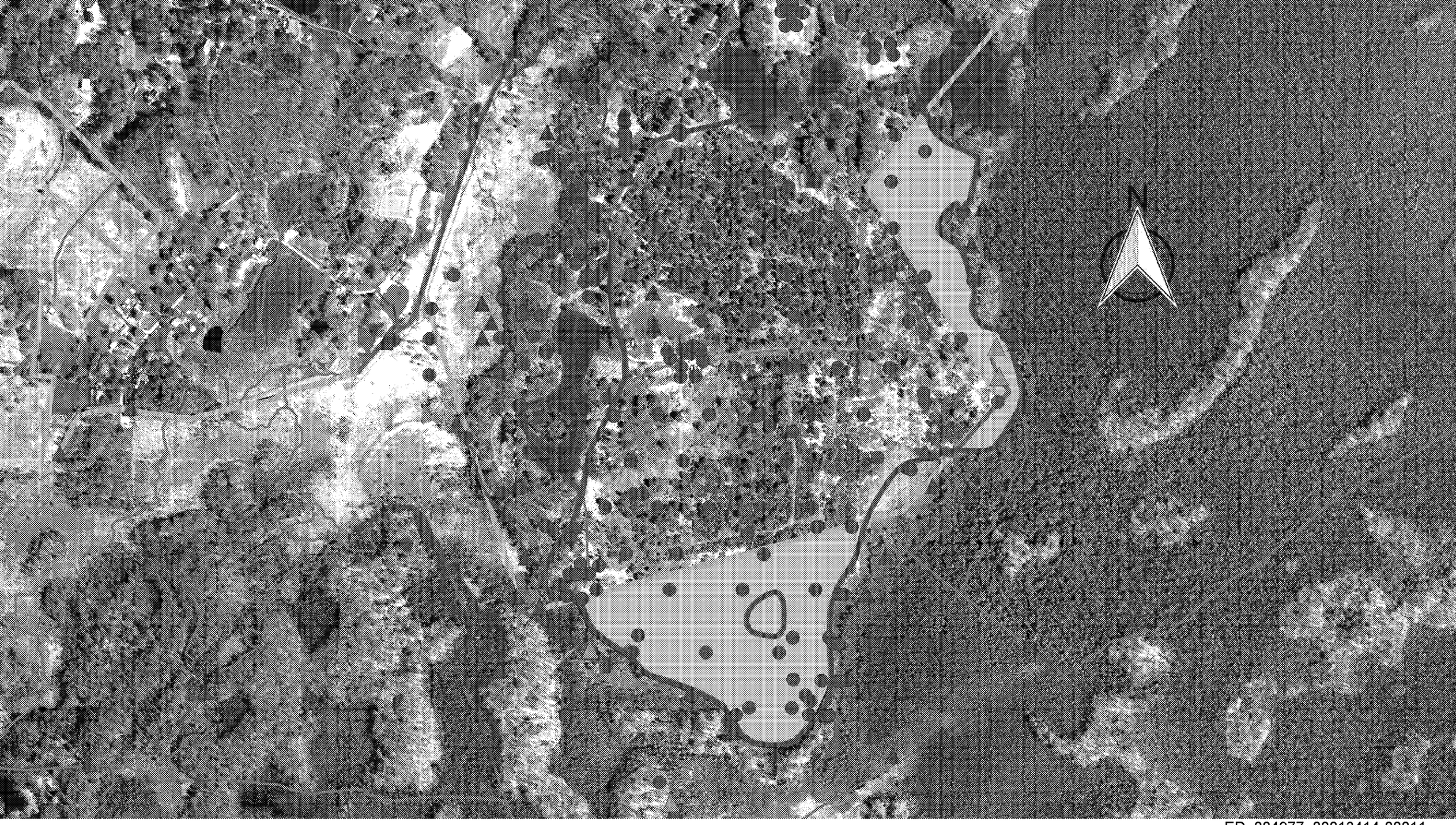
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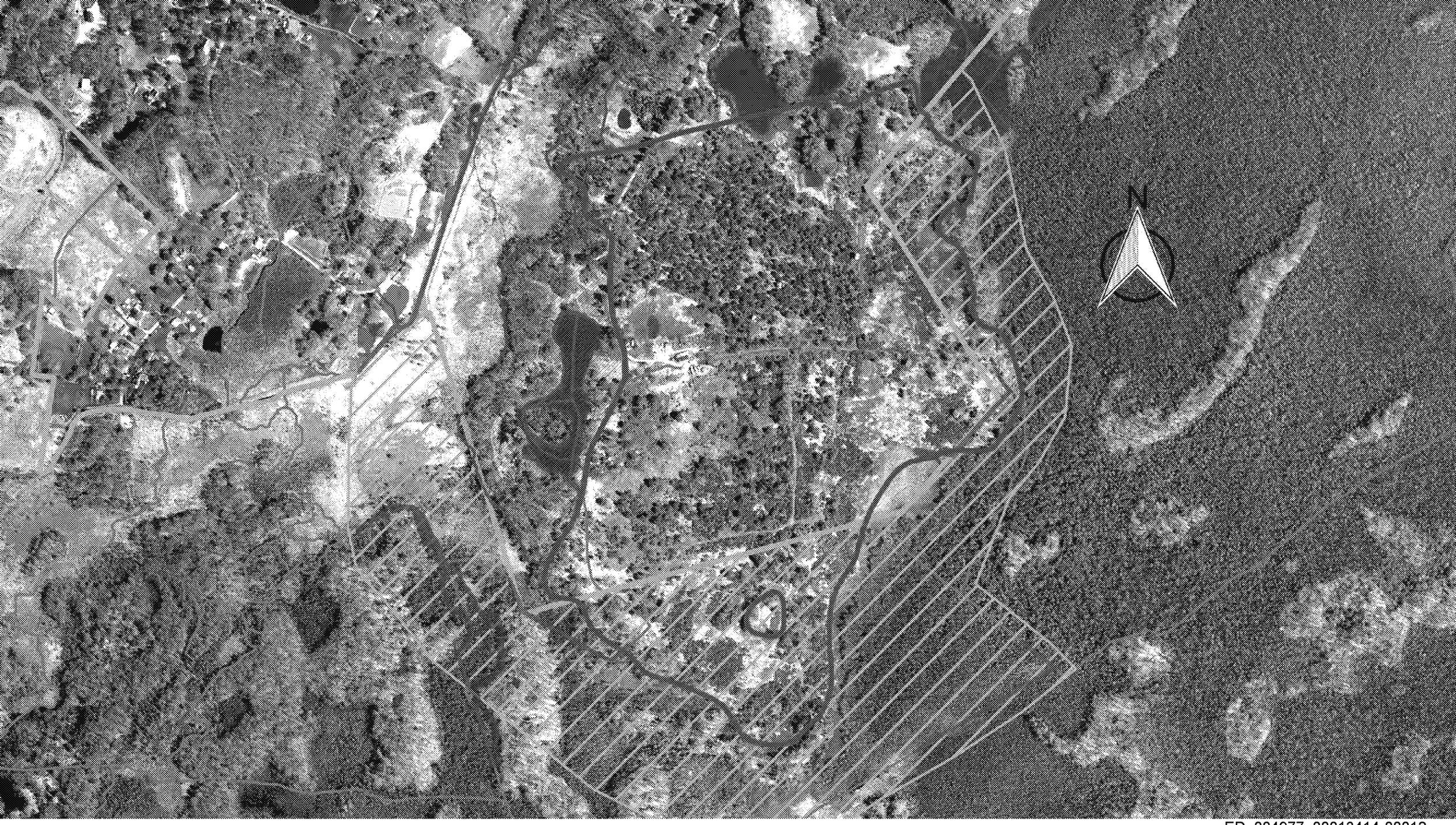
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Rolling Knolls Site – Assessment of Draft Feasibility Study Alternatives

Do draft alternatives meet DOI/FWS (Agencies) requirements & concerns?

- Refuge's Comprehensive Conservation Plan (CCP)
- DOI Environmental Compliance Memorandum (ECM)
- Applicable or Relevant and Appropriate Requirements (ARARs) for the Refuge portion of the Site (Refuge)

Assessment Questions

1. Has the Refuge been impacted by landfill wastes?
2. If the Refuge has been impacted, is the impact significant and impairing?
3. If the Refuge has been significantly impacted, do the remedial/removal alternatives proposed in the FS address the impacts?
4. Are there other remedial/removal alternatives or modifications of existing remedial/removal alternatives that would address the impacts?

Focus on Refuge Impacts and Whether FS Alternative Addressed Impacts

Documents Reviewed

- 2018 Draft FS
- 2018 RI
- 2016 BERA
- 2014 BHHRA

Assess Impacts on Refuge Property to:

- Surface Soils
- Sediments
- Groundwater

Key Findings - Surface Soils

Findings

Surface soils on the Refuge contaminated by Pb, PCBs and other chemicals related to landfill wastes at concentrations that suggest risk to Refuge ecological receptors and recreational users

Ecological, wildlife risk-based soils PRGs required for key COPECs (next slide)

Modify FS Section 4, accordingly

Ecological PRGs guide soils remedial action alternatives affecting the Refuge

FS Assessment

1. Only Alternative 5 (extensive capping) would fully contain source landfill waste at the Site and cover some, but not all of the impacted areas of the Refuge
2. Only alternatives that include full removal of contaminated materials from the Refuge meet the requirements of the Refuge CCP, the DOI ECM and other ARARs
3. Expand Alternative 4 to include removal of all areas on the Refuge where the Pb Eco PRG is exceeded, consolidate on private portion of Site and cap. This modified alternative would most closely address the Refuge requirements

Surface Soils – Many Ecological Benchmarks Exceeded

Surface Soil Parameter	Number	Percent of RAOI Samples
RAOI Surface Soil Samples	56	-
Number Exceed Background 75th Percentile (38.4 mg/kg)	50	89%
Number Exceed 400 mg/kg (Benchmark Pb Concentration) [A]	20	36%
Exceed Eco SSL Mammal (56 mg/kg) [B]	45	80%
Exceed Eco SSL Plants (120 mg/kg) [B]	33	59%
Exceed Eco SSL Soil Invertebrate (1700 mg/kg) [B]	4	7%
Exceed American robin NOAEL Benchmark (~ 11 mg/kg)	55	98%
Exceed American robin LOAEL Benchmark (~ 50 mg/kg)	47	84%
Exceed Short-tailed shrew NOAEL Benchmark (~ 130 mg/kg)	31	55%
Exceed Short-tailed shrew LOAEL Benchmark (~ 464 mg/kg)	20	36%
Exceed meadow vole NOAEL benchmark (~ 906 mg/kg)	17	30%
Exceed meadow vole LOAEL benchmark (~3223mg/kg)	1	2%
Exceed RAOI Pro UCL Lognormal 95% UCL Exposure Point Concentration (EPC) (1521 mg/kg)	6	11%
Exceed "Landfill" PRG (2700 mg/kg)	1	2%

Short-tailed shrew	NOAEL HQ	LOAEL HQ
Total PCBs	3.2	1.6
PCB–TEQ Congeners (mammals)	54	6.8
PCDDF-TEQ Congeners (mammals)	16	2.6
Barium	4.2	1.6
Cadmium	26	3.8
Chromium	130	22
Lead	27	7.5
Methyl mercury	74	15
Selenium	22	10
Vanadium	21	10
Zinc	6.2	0.77

American robin	NOAEL HQ	LOAEL HQ
Total PCBs	4.1	0.56
PCB–TEQ Congeners (avian)	46	4.6
PCDDF-TEQ Congeners (avian)	47	4.7
Barium	23	12
Cadmium	33	11
Lead	180	34
Methyl mercury	53	41
Selenium	32	14
Vanadium	35	17
Zinc	25	15

Source: NOAEL and LOAEL HQs based on Terrestrial - Within GSNWR Mean EPCs in BERA Appendix H (Integral Consulting 2018).

Significant Refuge Area Is Impacted – Typically Pb

> 50 mg/kg ~ 87 acres

(American Robin LOAEL)

> 130 mg/kg ~ 38 acres

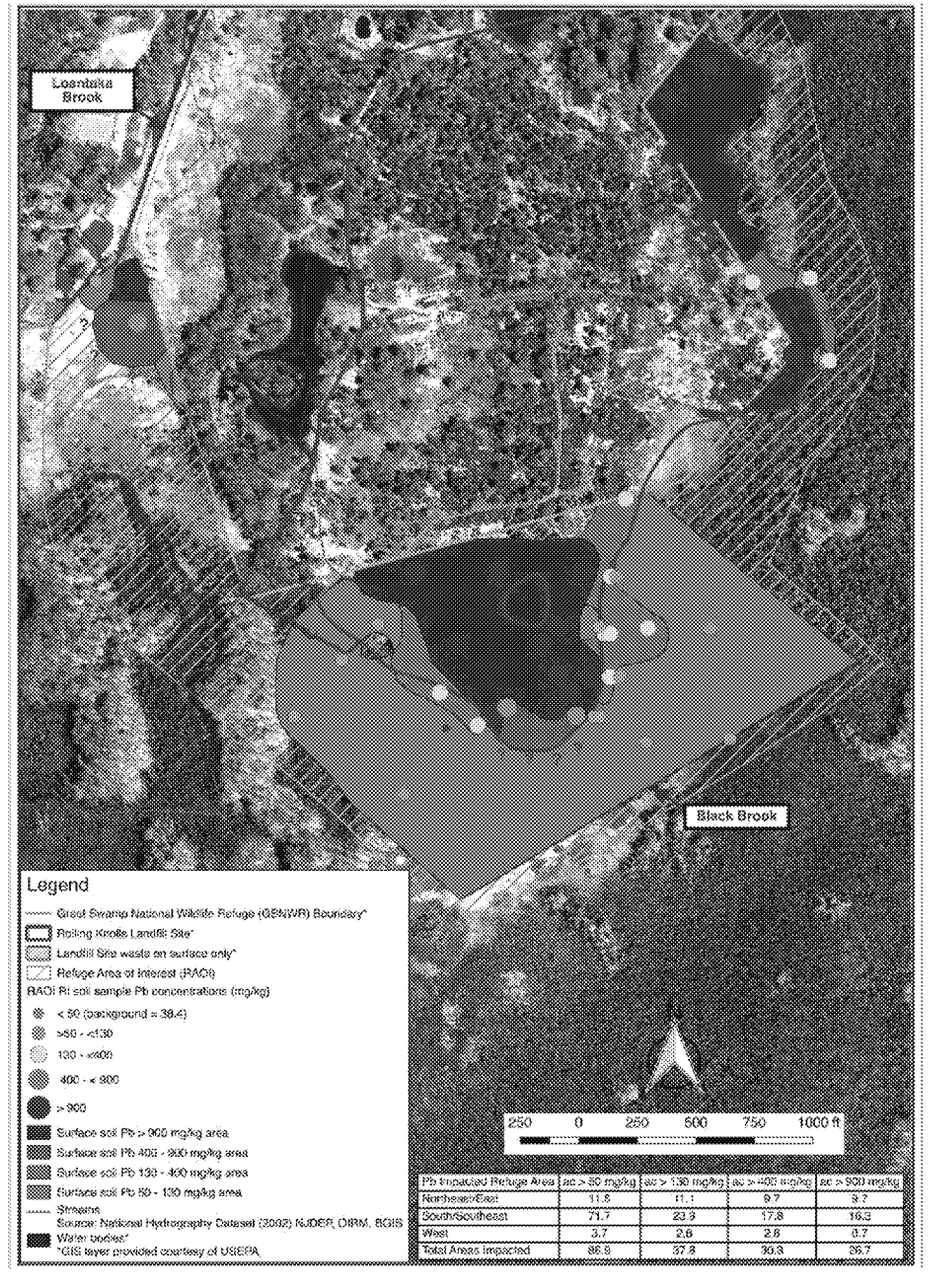
(Short-tailed Shrew NOAEL)

> 400 mg/kg ~ 30 acres

(Recreational users & Short-tailed Shrew LOAEL)

> 900 mg/kg ~ 27 acres

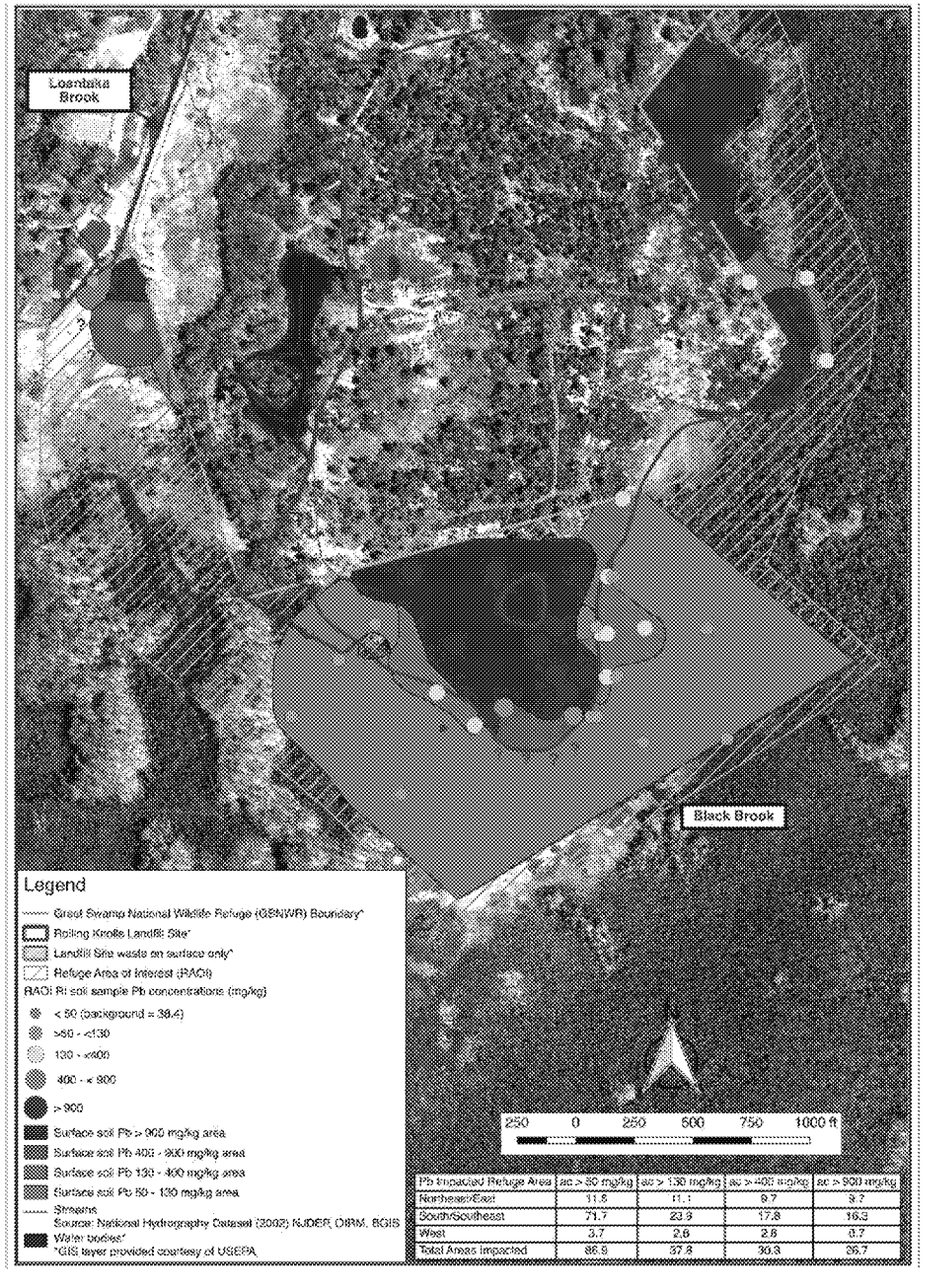
(Meadow Vole NOAEL)



Pb Impacted Refuge Area	ac > 50 mg/kg	ac > 130 mg/kg	ac > 400 mg/kg	ac > 900 mg/kg
Northeast/East	11.6	11.1	9.7	9.7
South/Southeast	71.7	23.9	17.8	16.3
West	3.7	2.6	2.6	0.7
Total Areas Impacted	86.9	37.8	30.3	26.7

Significant Refuge Area And Receptors At Risk

Representative receptor Acreage posing risk	~ Home Receptor Range – Acres
American robin (verminivorous birds) 87 Acres	0.3 to 2.0
Short-tailed shrew (verminivorous mammals) 30 Acres	1.0
Meadow vole (herbivorous mammals) 27 Acres	0.05



Key Findings – Sediments

Black Brook sediment impacted

- SEDs 006 and 007 (Black Brook) exceed Screening Benchmarks
  - Possible bioaccumulation (e.g., PCBs)
- Vernal ponds significantly exceed up gradient concentrations

Loantaka Brook and vernal ponds south of the landfill and on the Refuge are impacted

- Sediment concentrations exceed USEPA Probable Effects Levels (PELs), State of New Jersey Severe Effects Levels (SELs), and NJDEP EBSLs

Key Findings – Sediments

FS Alternatives Assessment

1. Alternative 5 would fully contain the landfill waste to prevent contaminant exposures and further migration of contaminants into the surface water and sediment of the Refuge
    - Alternative 5 would not address the contaminated sediment in Black Brook
2. Sediment contamination characterization insufficient to support alternatives that do not fully contain the source landfill waste to prevent further contaminant migration
3. Primary concern for sediments is continued migration of contaminants from the source landfill waste onto the Refuge
    - Modify FS Alternatives to fully contain source landfill waste and remove or contain Refuge resources contaminated by this waste

Sediments – Many Ecological Benchmarks Exceeded In Refuge Sediments

Black Brook (East Side)

Chemicals of Potential Ecological Concern (COPEC) from BERA Figure 4-3	Unit	Black Brook Upstream			Black Brook Upstream of Vernal Ponds		Vernal Ponds		Black Brook Downstream of Vernal Ponds		
		SD 34 (2008)	SD 35 (2008)	SD 36 (2008)	SD 22 (2008)	SD 23 (2008)	SD 38 (2014)	SD 44 (2014)	SD 24 (2008)	SD 25 (2008)	SD 26 (2008)
Total DDx [A]	µg/kg	-	-	-	-	-	-	-	-	-	-
4,4-DDE	µg/kg	9.2	6	7.1	6	9.5	29	-	6.2	5.2	-
DDD	µg/kg	-	24	-	12	17	150	67	11	-	-
o,p-DDD	µg/kg	-	11	-	8.8	-	78	25	-	-	-
o,p-DDE		-	-	-	-	-	17	9.2	-	-	-
Total PCBs [A]	µg/kg	-	-	-	82	160	1300	864	-	-	-
Aroclor 1254	µg/kg	-	-	-	82	160	690	350	-	-	-
Aroclor 1260	µg/kg	-	-	-	-	-	240	64	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	28.3	21.1	32.7	71.8	102	618	135	94.8	61.3	19.1
Lead	mg/kg	116	62.9	-	150	242	845	160	208	117	-
Mercury	mg/kg	0.32	-	-	0.46	0.84	4.4	0.89	0.84	0.41	0.26
Nickel	mg/kg	22.9	-	-	24.3	35.6	70.2	58.3	39.8	23.1	-
Zinc	mg/kg	135	128	125	293	660	2270	637	497	333	-

Sediments – Many Ecological Benchmarks Exceeded In Refuge Sediments

Loantaka Brook (West Side)

Chemicals of Potential Ecological Concern (COPEC) from BERA Figure 4-3	Unit	Loantaka Brook Upstream					Loantaka Brook Downstream (mid-stream [A])					Vernal Ponds Area (south RAOI Area)				Loantaka Brook Downstream			
		SD 7 (2008)	SD 8 (2008)	SD 9 (2008)	SD 10 (2008)	SD 11 (2008)	SD 12 (2008)	SD 13 (2008)	SD 14 (2008)	SD 15 (2008)	SD 16 (2008)	SD 27 (2008)	SD 35 (2014)	SD 36 (2014)	SD 37 (2014)	SD 28 (2008)	SD 29 (2008)	SD 30 (2008)	SD 31 (2008)
Total DDx [B]	µg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4,4-DDE	µg/kg	-	-	13	-	-	-	-	10	16	-	-	13	8.6	-	-	-	-	-
DDD	µg/kg	-	-	-	-	-	-	-	-	-	-	-	22	-	-	-	-	-	-
o,p-DDD	µg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o,p-DDE	µg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-DDT	µg/kg	-	-	8.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT	µg/kg	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total PCBs [B]	µg/kg	-	-	120	-	-	-	-	-	-	-	-	164	-	-	-	-	-	-
Aroclor 1254	µg/kg	-	-	120	-	-	-	-	-	-	-	-	82	-	-	-	-	-	-
Aroclor 1260	µg/kg	-	-	-	-	-	-	-	-	-	-	-	58	39	26	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	58.3	-	-	-	16.6	57.3	69.7	-	23.8	79.9	118	37.4	-	18.1	-	-
Lead	mg/kg	-	-	74.3	-	-	-	-	-	64.3	-	-	167	294	90.9	-	59.5	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-	-	-	-	0.78	1	0.42	-	-	-	-
Nickel	mg/kg	-	-	38.1	-	-	-	-	24.3	38.9	-	-	22	34.1	12.4	-	-	-	-
Zinc	mg/kg	-	-	224	-	-	-	-	192	255	-	-	365	541	185	-	-	-	-

Key Findings – Groundwater

Findings

- Groundwater in 8 RAOI wells impacted
- Many reported concentrations exceed State of New Jersey water quality requirements for dissolved and total metals and, in one well, benzene
- New Jersey's groundwater quality requirements identified as possible chemical-specific applicable requirements (ARARs)

Key Findings – Groundwater

FS Alternatives Assessment

1. Draft FS implies that groundwater alternatives 2 and 3 will achieve ARARs at some point in time
2. 8 Refuge impacted wells are not specifically addressed in the FS
3. Potential future impacts to surface water from contaminated groundwater discharges need to be evaluated to support consideration of alternatives that do not fully contain the source landfill waste to prevent further migration of contaminants into the groundwater
4. Unclear if other groundwater alternatives or modifications of groundwater alternatives 2 or 3 will ensure compliance with chemical-specific ARARs
5. Modification of the landfill alternatives to fully contain source landfill waste would address continued migration of contaminants into the groundwater

Groundwater
8 Wells Exceeding NJ Standards

Well	No. Consitiuents Exceeding New Jersey Groundwater Standards [a]	Summary
MW - 2	4	Dissolved Metals
MW - 4	4	Dissolved Metals
MW-12	5	Dissolved Metals
MW -14	4	Dissolved Metals
MW - 19	5	Dissolved Metals and Benzene
X-1	6	Dissolved Metals
X-2	4	Dissolved Metals
X-3	3	Dissolved Metals
Source: RI Figure 4-2 (Geosyntec Consultants, 2018)		
[a] N.J.A.C. 7:9C Ground Water Quality Standards		

Questions? - Discussion