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## McGuire Air Force Base #1

*Wrightstown, New Jersey*

*EPA Facility ID: NJ0570024018*

*Basin: Crosswicks-Neshaminy*

*HUC: 02040201*

*Basin: Lower Delaware*

*HUC: 02040202*

### Executive Summary

McGuire Air Force Base #1, which is situated on the upper reaches of the Crosswicks Creek and Rancocas Creek watersheds, has provided support, maintenance, and logistics for USAF aircraft since 1937. The USAF's Installation Restoration Program has identified 17 contaminant source areas, most of which are adjacent to tributary streams of Crosswicks Creek and Rancocas Creek. Metals, PAHs, pesticides, and PCBs have been detected in surface water, sediment, groundwater, and soil samples collected at the base and downgradient of the base, during investigations conducted by the USAF and the USEPA. Surface water runoff and sediment transport are the primary pathways for the migration of contaminants from the site to NOAA trust resources; groundwater transport is a secondary pathway. The habitats of primary concern to NOAA are Crosswicks Creek, including North Run and South Run, and the North Branch of Rancocas Creek, including Jacks Run and Larkins Run. Crosswicks Creek and the North Branch of Rancocas Creek are tributaries of the Delaware River. The NOAA trust resource present in the vicinity of the site is the catadromous American eel.

### Site Background

The McGuire Air Force Base #1 site (McGuire site, the base) is an active facility that encompasses approximately 1,415 ha (3,497 acres) in a rural area of Wrightstown, Burlington County, New Jersey. The McGuire site lies within the Crosswicks Creek and Rancocas Creek watersheds, which discharge to the Delaware River (Figure 1). The base is bordered to the north by Wrightstown and to the east, south, and west by the U.S. Army's Fort Dix military installation. Two streams, North Run and South Run, traverse the base. Major wetlands are present along both streams, which are tributaries of Crosswicks Creek. Jacks Run and Larkins Run, which are tributaries of the North Branch of Rancocas Creek, drain a small area of the southern portion of the base (Figure 2). The base lies within the Pinelands National Reserve (Figure 1).

From 1937 to 1948, the base was under the control of the U.S. Army. In 1948, jurisdiction over the facility was transferred to the U.S. Air Force (USAF). The base has served as headquarters of the New Jersey Air National Guard, Military Transport Service, Military Airlift Command and Air Mobility Command, and provided support, aircraft maintenance, logistics, aircraft fueling, and fuel storage for USAF aircraft. Since 1994, the base has supported worldwide airlifts for the 305th Air Mobility Wing to place military forces into combat situations.

Metals, polycyclic aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs) have been detected in surface water, sediment, groundwater, and soil samples

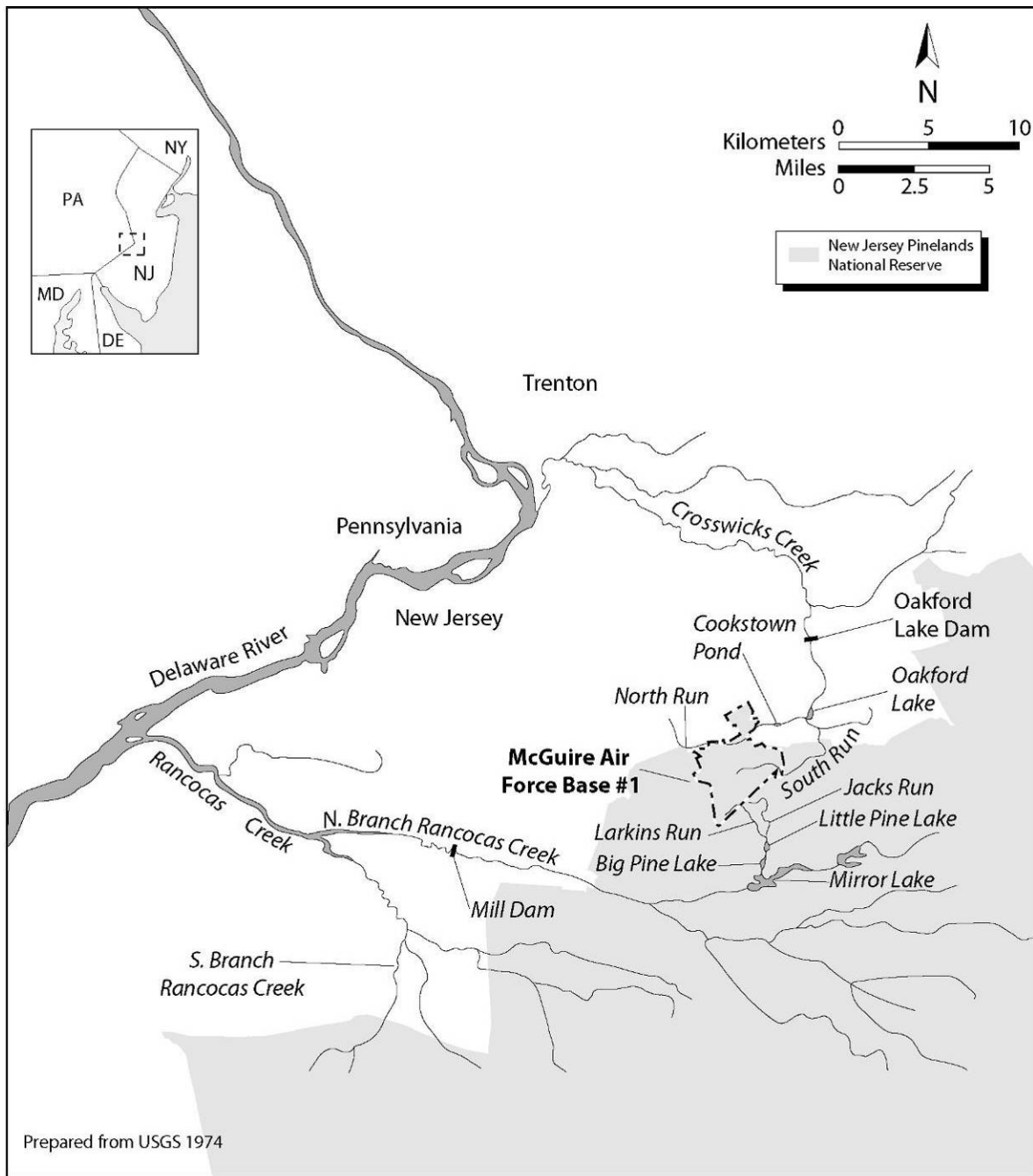


Figure 1. Location of the McGuire Air Force Base # 1 site in Wrightstown, New Jersey.

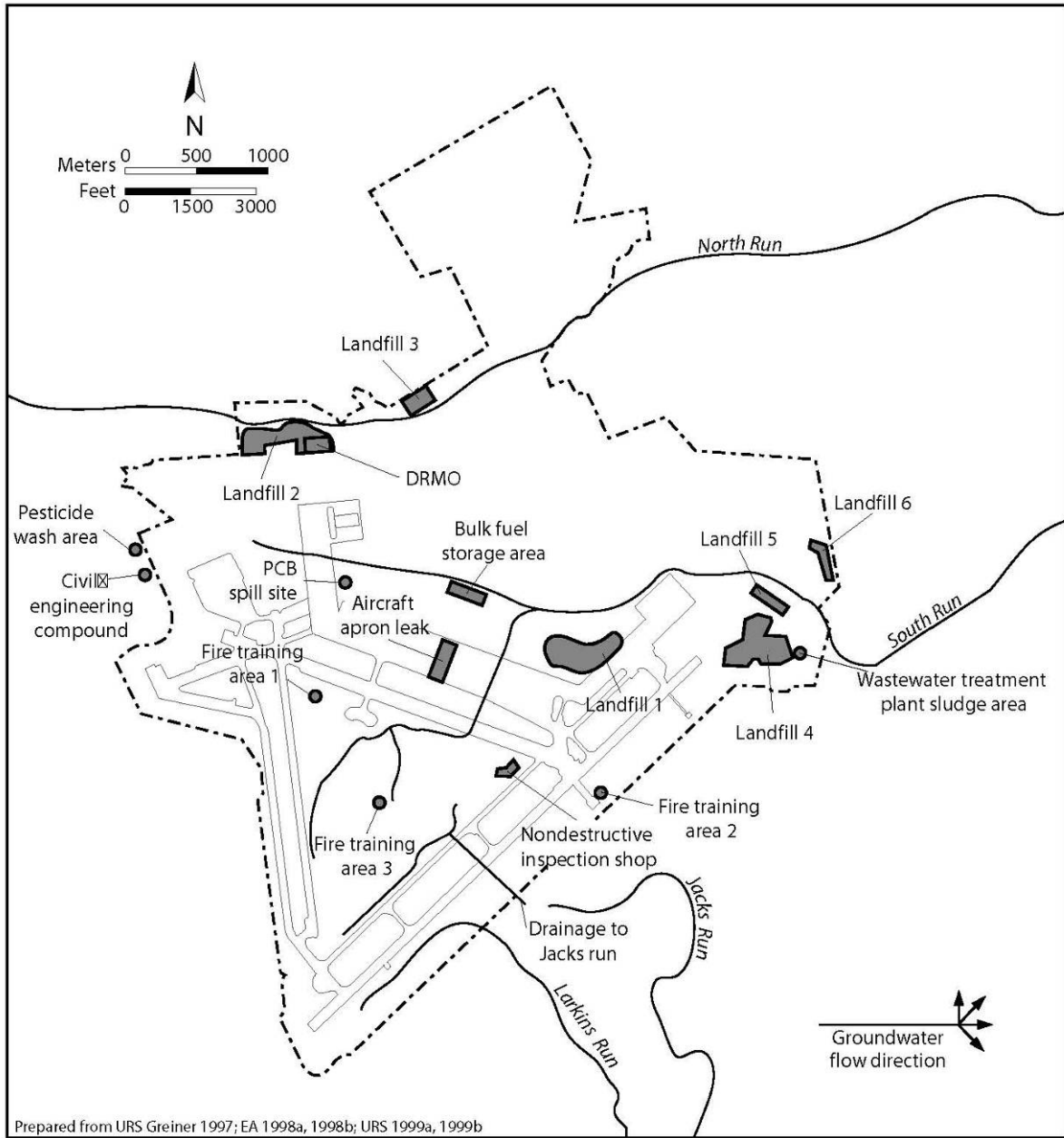


Figure 2. Detail of the McGuire Air Force Base #1 property.

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collected at the base and downgradient of the base, during investigations conducted by the USAF and the U.S. Environmental Protection Agency (USEPA). Potential contaminant source areas on the McGuire site include several landfills and fuel storage, fire training, and sludge disposal areas. Numerous preliminary investigations and site assessments have been conducted at 17 source areas under the USAF's Installation Restoration Program (EA 1998a, 1998b; URS 1999a, 1999b; URS Greiner 1997). Table 1 describes each of the 17 source areas and the nearby NOAA trust habitats.

The McGuire site was proposed to the National Priorities List (NPL) on July 22, 1999, and was placed on the NPL on October 22, 1999 (USEPA 2005a). In 2002, the Federal Facilities Assessment Branch and the Agency for Toxic Substances and Disease Registry (ATSDR) completed a public health assessment for the McGuire site (ATSDR 2002). A remedial investigation and feasibility study initiated by the USEPA on June 30, 2003, is ongoing (USEPA 2005a).

Surface water runoff and sediment transport are the primary pathways for the migration of contaminants from the site to NOAA trust resources; groundwater transport is a secondary pathway. Surface water runoff is directed to diversion structures, drainage ditches, and storm sewers, which discharge to North Run and its tributaries in the northern portion of the base, to South Run and its tributaries in the central portion of the base, and to drainage ditches in the southern portion of the base. These drainage ditches empty into Jacks Run and Larkins Run south of the base (Figure 2). Groundwater beneath the site is encountered from 0.3 to 6.1 m (1 to 20 ft) below ground surface (URS Greiner 1997). Groundwater beneath the site flows to the north, northeast, east, and southeast before discharging to the nearest surface water body (URS Greiner 1997).

### NOAA Trust Resources

The habitats of primary concern to NOAA are Crosswicks Creek, including tributaries North Run and South Run, and the North Branch of Rancocas Creek, including tributaries Jacks Run and Larkins Run. Crosswicks Creek and the North Branch of Rancocas Creek are tributaries of the Delaware River.

As shown on Figure 1, North Run flows to the northeast to Cookstown Pond. North Run then flows from the outlet of Cookstown Pond to empty into Oakford Lake on Crosswicks Creek. South Run flows to the east and turns north before also discharging into Crosswicks Creek, which then flows north to Oakford Lake. From its Oakford Lake outlet, Crosswicks Creek flows approximately 32 km (20 mi) before discharging to the Delaware River.

Jacks Run and Larkins Run flow to the south before discharging into Little Pine Lake. Little Pine Lake flows into Big Pine Lake. From the mouth of Big Pine Lake, Jacks Run converges with Mirror Lake on the North Branch of Rancocas Creek. The North Branch of Rancocas Creek flows approximately 48 km (30 mi) before converging with the South Branch of Rancocas Creek to form Rancocas Creek, which discharges to the Delaware River.

The migration of anadromous fish is blocked by dams on Crosswicks Creek and the North Branch of Rancocas Creek that are at least 15 km (9 mi) downstream of the base. The dams nearest the site that block fish passage are the Oakford Lake Dam on Crosswicks Creek and the Mill Dam on North Branch of Rancocas Creek (Figure 1). Fish passage facilities for both streams are in various stages of the design process (USACE 2005).

Table 1. Contaminant source areas identified on McGuire Air Force Base #1 (URS Greiner 1997; EA 1998a, 1998b; URS 1999a, 1999b; ATSDR 2002).

Source Area	Period of Operation	Source Area Size	Description of the Source Area	NOAA Trust Habitat Near Source Area
Landfill 1	Unknown	12 ha (30 acres)	Located on southern portion of the base. General refuse and unidentified waste were found at the landfill.	Adjacent to South Run
Landfill 2	1950-1956	5.1 ha (12.6 acres)	Located on the northwestern portion of the base. All base-generated wastes, including drums of waste oil and industrial chemicals, were placed in excavated trenches down to 6 m (20 ft).	Adjacent to North Run
Landfill 3	1956-1957	1 ha (2.5 acres)	Located along northern border of the base. General refuse, drums of unknown chemicals, scrap materials, and coal ash were buried in 5.5- to 6-m (18- to 20-ft) excavations.	Adjacent to North Run
Landfill 4	1958-1970s	7.3 ha (18 acres)	Located on the southeastern portion of the base. General base refuse, coal ash, and other industrial chemicals were placed in excavated trenches down to 4.5 m (15 ft).	Adjacent to unnamed tributary of South Run
Landfill 5	1970-1973	1.9 ha (4.7 acres)	Located on the southeastern portion of the base. Primarily construction debris, coal ash, and scrap metal were disposed of at the landfill. Chemical wastes may have occasionally been disposed of at the landfill.	Adjacent to South Run
Landfill 6	1973-1976	2.2 ha (5.4 acres)	Located on the southern portion of the base. General refuse, including concrete, metal, wood, glass, paper, and plastic, was disposed in trenches excavated to 4.5 m (15 ft). Disposal of hazardous substances at the landfill has not been documented.	Adjacent to South Run
Bulk Fuel Storage Area	1963-present	4 ha (10 acres)	Eight above ground storage tanks that store jet fuel and heating oil located on the central portion of the base. Fuel spills of up to 2 million L (528,344 gal) were documented in 1967, 1984, 1987, and 1993. Sludge from tanks, fly ash, coal, and slag were disposed or buried at the bulk fuel storage area.	Adjacent to unnamed tributary of South Run
Aircraft Apron Fuel Leak	1988	Unknown	Located on the south-central portion of the base. In 1988, a JP-4 jet fuel line ruptured, releasing an unknown volume of fuel that percolated into the shallow groundwater.	About 550 m (1,804 ft) from unnamed tributary of South Run
PCB Spill Site	1982	Unknown	Approximately 280 to 760 L (74 to 200 gal) of PCB-containing transformer oil was spilled in this area in 1982.	Approximately 227 m (745 ft) from unnamed tributary of South Run

Table 1 continued on next page

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Table 1, *cont.*

Civil Engineering Compound	1950s	0.8 ha (2 acres)	Located on the northwestern portion of base. Fifty 208-L (55-gal) drums of waste oil and solvents were allegedly buried in this area in the 1950s.	Approximately 457 m (1,499 ft) from unnamed tributary of South Run
DRMO	Unknown	2 ha (5 acres)	Located on the northwestern portion of the base. Drums containing chemical and petroleum wastes and out-of-service transformers possibly containing PCBs were disposed of in this area. Bulk liquid wastes were also stored in the area in a 37,800-L (9,986-gal) underground storage tank.	Adjacent to North Run
Pesticide Wash Area	Unknown	Unknown	Located on the northwestern portion of the base. Pesticide spray equipment was washed and rinsed on a paved pad in this area. Runoff from the paved area discharged into a drainage ditch.	Approximately 457 m (1,499 ft) from unnamed tributary of South Run
Fire Training Area 1	Unknown	46 m (151 ft) diameter	Located on the central portion of the base. Waste oils, waste aviation gasoline, jet fuels, hydraulic fluids, spent solvents, and alcohols were used in this area.	Approximately 457 m (1,499 ft) from South Run
Fire Training Area 2	1958-1973	15 to 23 m (49 to 75 ft) diameter	Located on the southern portion of the base. Jet fuel was used during fire training exercises in this area.	About 700 m (2,297 ft) from unnamed tributary of Jack's Run
Fire Training Area 3	1970s-1980s	91 m (299 ft) diameter	Located on the southern central portion of the base. Jet fuel was used during fire training exercises in this area.	Adjacent to unnamed tributary of South Run
NDI Shop Drain Fields	1966-1972	0.61 ha (1.5 acres) 0.8 ha (2 acres)	Located on the southern portion of the base. Penetrants, emulsifiers, and developers were periodically disposed of onto a drain field in this area and were allowed to percolate into the soils.	About 300 m (984 feet) from a tributary of Jack's Run
WWTP Sludge Disposal Area	1970-1980	0.2 ha (0.5 acre)	Located on the southeastern border of the base. Sludge from a wastewater treatment plant was dewatered in this area by placing it onto unlined drying beds.	Adjacent to a tributary of South Run

The NOAA trust resource present in the vicinity of the McGuire site is the catadromous American eel, which is ubiquitous throughout the entire Delaware River basin. American eel enter rivers as juveniles and reside in freshwater habitats throughout their adult lives, migrating widely in most river systems. American eel are capable of traversing lowhead dams and small waterfalls. Because of this ability, the species is able to access the upper reaches of streams even when most anadromous species are blocked (Carberry 2000; Smith 2005).

Recreational fishing occurs in both Crosswicks Creek and Rancocas Creek, particularly in impoundments such as Mirror Lake on the North Branch of Rancocas Creek and the lower reaches of Crosswicks Creek. Warm-water resident freshwater species are targeted by recreational fishers. Fish resources in both streams are actively managed by the State of New Jersey (Carbury 2000). There is no commercial fishery in the vicinity.

The New Jersey Department of Environmental Protection (NJDEP) has issued a statewide fish and shellfish consumption advisory for PCBs and dioxins (NJDEP 2006). The fish consumption advisory for the lower Delaware River recommends reduced consumption of American eel, striped bass, white catfish, channel catfish, and white perch for the general public and no consumption for high-risk individuals. The NJDEP has also issued a statewide freshwater fish consumption advisory for mercury. The fish consumption advisory for the Pinelands Region recommends that the general public consume no more than one meal per month of largemouth bass and chain pickerel and no more than one meal per week of brown bullhead, yellow bullhead, and sunfish. It is recommended that high-risk individuals not consume largemouth bass, chain pickerel, brown bullhead, or yellow bullhead and eat no more than one meal per month of sunfish (NJDEP 2006).

### **Site-Related Contamination**

Large numbers of surface water, sediment, groundwater, and soil samples have been collected over the years during numerous environmental investigations conducted at the McGuire site. These samples have been analyzed for a wide range of environmental contaminants, including semivolatile organic compounds (including PAHs), metals, pesticides, and PCBs.

Table 2 summarizes the maximum concentrations of contaminants of concern to NOAA detected during the site investigations and compares them to relevant screening guidelines. Site-specific or regionally specific screening guidelines are always used when available. In this case, regionally specific screening guidelines include the New Jersey Residential Direct Contact Soil Cleanup Criteria (RDCSCC; NJDEP 1999) and the New Jersey Groundwater Quality Standards (GWQS; NJDEP 2005). In the absence of such site-specific or regionally specific guidance, the screening guidelines for water are the ambient water quality criteria (AWQC; USEPA 2002); the screening guidelines for sediment in a freshwater environment are the threshold effects concentrations (TECs; MacDonald et al. 2000); and the screening guidelines for soil are the Oak Ridge National Laboratory final preliminary remediation goals (ORNL-PRGs; Efrogmson et al. 1997) and the USEPA's ecological soil screening guidelines (USEPA 2005b). Exceptions to these screening guidelines, if any, are noted in Table 2. Only maximum concentrations that exceeded one or more relevant screening guidelines, or for which there are no screening guidelines currently available, are discussed below. When known, the general sampling locations are also provided for maximum concentrations that exceeded screening guidelines or do not have screening guidelines. The general sampling locations discussed below are depicted on Figure 2.

### Surface Water

Eight metals were detected in surface water samples collected from the McGuire site at maximum concentrations that exceeded screening guidelines. The maximum concentrations of arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc were detected in samples collected from North Run in the vicinity of the Defense Reutilization and Marketing Office (DRMO) storage facility. The maximum concentration of arsenic exceeded the GWQS by three orders of magnitude. The maximum concentration of lead exceeded the AWQC by two orders of magnitude and the GWQS by one order of magnitude. The maximum concentrations of cadmium and chromium exceeded the AWQC by one order of magnitude and the GWQS by factors of five and seven, respectively. The maximum concentration of copper exceeded the AWQC by one order of magnitude. The maximum concentration of zinc exceeded the AWQC by a factor of five. The maximum concentration of selenium exceeded the AWQC by a factor of four. The maximum

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concentration of nickel exceeded the AWQC by a factor of three and the GWQS by a factor of two.

One PAH for which no screening guideline is currently available was detected in a surface water sample collected from the McGuire site: the maximum concentration of 2-methylnaphthalene occurred in a sample taken from South Run.

Table 2. Maximum concentrations of contaminants of concern to NOAA at the McGuire Air Force Base #1 site (URS Greiner 1997; EA 1998a, 1998b; URS 1999a, 1999b). Contaminant values in bold exceed or are equal to screening guidelines.

Contaminant	Soil (mg/kg)			Water (µg/L)				Sediment (mg/kg)	
	Soil	ORNL-PRG <sup>a</sup>	New Jersey RDCSCC <sup>b</sup>	Ground-water	Surface Water	AWQC <sup>c</sup>	New Jersey GWQS <sup>d</sup>	Sediment	TEC <sup>e</sup>
<b>METALS/INORGANICS</b>									
Arsenic	<b>57</b>	9.9	20	<b>420</b>	<b>96</b>	150	0.02	<b>14</b>	9.79
Cadmium	<b>37</b>	0.36 <sup>f</sup>	39	<b>190</b>	<b>19</b>	0.25 <sup>g</sup>	4	<b>12</b>	0.99
Chromium <sup>h</sup>	<b>190</b>	0.4	270	<b>1,200</b>	<b>480</b>	11	70	<b>59</b>	43.4
Copper	<b>100</b>	60	600	<b>3,200</b>	<b>340</b>	9 <sup>g</sup>	1,300	<b>71</b>	31.6
Lead	<b>600</b>	40.5	400	<b>490</b>	<b>330</b>	2.5 <sup>g</sup>	5	<b>170</b>	35.8
Mercury	<b>0.54</b>	0.00051	14	<b>8.5</b>	0.64	0.77 <sup>i</sup>	2	<b>0.74</b>	0.18
Nickel	<b>50</b>	30	250	<b>810</b>	<b>170</b>	52 <sup>g</sup>	100	<b>24</b>	22.7
Selenium	<b>5.5</b>	0.21	63	<b>41</b>	<b>21</b>	5.0 <sup>j</sup>	40	3.9	NA
Silver	<b>3.6</b>	2	110	3	2.9	3.2 <sup>g,k</sup>	40	<b>7.1</b>	4.5 <sup>l</sup>
Zinc	<b>570</b>	8.5	1,500	<b>1,200</b>	<b>590</b>	120 <sup>g</sup>	2,000	<b>340</b>	121
<b>PAHs</b>									
Acenaphthene	1.1	20	3,400	3	ND	520 <sup>m</sup>	400	<b>32</b>	0.290 <sup>l</sup>
Acenaphthylene	0.23	NA	NA	0.3	ND	NA	NA	<b>1.2</b>	0.160 <sup>l</sup>
Anthracene	1.6	NA	10,000	2	ND	NA	2,000	<b>57</b>	0.0572
Benz(a)anthracene	<b>2.5</b>	0.1 <sup>n</sup>	0.9	<b>0.9</b>	ND	NA	0.05	<b>120</b>	0.108
Benzo(a)pyrene	<b>1.8</b>	0.1 <sup>n</sup>	0.66	<b>0.2</b>	ND	NA	0.005	<b>90</b>	0.15
Benzo(b)fluoranthene	<b>1.9</b>	0.1 <sup>n</sup>	0.9	<b>0.3</b>	ND	NA	0.05	130	NA
Benzo(k)fluoranthene	<b>1.6</b>	0.1 <sup>n</sup>	0.9	0.2	ND	NA	0.5	<b>43</b>	13.4 <sup>l</sup>
Chrysene	2.4	NA	9	<b>20</b>	ND	NA	5	<b>130</b>	0.166
Dibenz(a,h)anthracene	0.03	0.1 <sup>n</sup>	0.66	ND	ND	NA	0.005	<b>7.2</b>	0.033
Fluoranthene	5.5	NA	2,300	4	ND	NA	300	<b>380</b>	0.423
Fluorene	1.3	NA	2,300	2	ND	NA	300	<b>39</b>	0.0774
Indeno(1,2,3-cd)pyrene	<b>0.97</b>	0.1 <sup>n</sup>	0.9	<b>0.1</b>	ND	NA	0.05	<b>38</b>	0.330 <sup>l</sup>
2-Methylnaphthalene	97	NA	NA	110	12	NA	NA	2.3	NA
Naphthalene	<b>250</b>	0.1 <sup>n</sup>	230	200	ND	620 <sup>m</sup>	300	<b>0.82</b>	0.176
Phenanthrene	<b>6</b>	0.1 <sup>n</sup>	NA	10	ND	NA	NA	<b>330</b>	0.204
Pyrene	<b>3.7</b>	0.1 <sup>n</sup>	1,700	3	ND	NA	200	<b>300</b>	0.195
<b>PESTICIDES/PCBs</b>									
Aldrin	<b>0.082</b>	NA	0.04	<b>0.062</b>	ND	3.0 <sup>k</sup>	0.002	<b>0.6</b>	0.040 <sup>l</sup>
Chlordane	ND	NA	NA	ND	ND	0.0043	0.01	<b>0.89</b>	0.00324
4,4'-DDD	1.2	NA	3	0.017	ND	0.6 <sup>k,m</sup>	0.1	<b>0.98</b>	0.00488
4,4'-DDE	1.8	NA	2	0.039	ND	1,050 <sup>k,m</sup>	0.1	<b>2.3</b>	0.00316
4,4'-DDT	<b>7.2</b>	0.7 <sup>n</sup>	2	<b>0.092</b>	ND	0.001 <sup>o</sup>	0.1	<b>2</b>	0.00416
Dieldrin	<b>6</b>	0.000032 <sup>f</sup>	0.042	<b>0.44</b>	<b>0.085</b>	0.056	0.002	<b>0.9</b>	0.0019
Endrin	0.031	NA	17	ND	ND	0.036	2	<b>0.017</b>	0.00222
Heptachlor	0.019	NA	0.15	<b>0.0048</b>	ND	0.0038	0.008	ND	0.010 <sup>l</sup>
Heptachlor Epoxide	0.1	NA	NA	<b>0.041</b>	ND	0.0038	0.004	<b>0.092</b>	0.00247
PCBs	<b>3,100<sup>p</sup></b>	0.371	0.49	<b>0.87<sup>q</sup></b>	ND	0.014	0.02	<b>0.47<sup>p</sup></b>	0.0598

Table 2 continued on next page



Table 2, *cont.*

- a: Oak Ridge National Laboratory (ORNL) final preliminary remediation goals (PRG) for ecological endpoints (Efroymsen et al. 1997).
  - b: Human health criteria for New Jersey Residential Direct Contact Soil Cleanup Criteria (RDCSCC) (NJDEP 1999).
  - c: Ambient water quality criteria for the protection of aquatic organisms (USEPA 2002). Freshwater chronic criteria presented.
  - d: New Jersey Groundwater Quality Standard (GWQS) (NJDEP 2005).
  - e: Threshold Effects Concentration (TEC). Concentration below which harmful effects are unlikely to be observed (MacDonald et al. 2000).
  - f: Ecological soil screening guidelines (USEPA 2005b).
  - g: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L CaCO<sub>3</sub>.
  - h: Screening guidelines represent concentrations for Cr.<sup>+6</sup>
  - i: Derived from inorganic, but applied to total mercury.
  - j: Criterion expressed as total recoverable metal.
  - k: Chronic criterion not available; acute criterion presented.
  - l: Freshwater upper effects threshold (UET) for bioassays. The UET represents the concentration above which adverse biological impacts would be expected.
  - m: Lowest observable effects level (LOEL) (USEPA 1986).
  - n: Canadian Council of Ministers of the Environment (CCME) environmental quality guidelines for agricultural land uses (CCME 2003).
  - o: Expressed as total DDT.
  - p: Aroclor 1260.
  - q: Aroclor 1254.
  - NA: Screening guidelines not available.
  - ND: Not detected.
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One pesticide was detected in a surface water sample collected from the McGuire site. The maximum concentration of dieldrin, which was detected in a sample taken from South Run in the vicinity of the bulk fuel storage area, exceeded the AWQC by a factor of 1.5 and the GWQS by one order of magnitude.

### Sediment

Nine metals were detected in sediment samples collected from the McGuire site at maximum concentrations that exceeded screening guidelines, and one metal was also detected for which no screening guideline is currently available. The maximum concentrations of arsenic, cadmium, chromium, copper, nickel, and zinc were detected in samples collected from North Run in the vicinity of the DRMO storage facility. The maximum concentration of cadmium exceeded the TEC by one order of magnitude. The maximum concentrations of zinc and copper exceeded the TECs by factors of three and two, respectively. The maximum concentrations of arsenic and chromium exceeded the TECs by factors of under 1.5, and the maximum concentration of nickel slightly exceeded the TEC.

The maximum concentration of lead, which was detected in a sediment sample collected from the bulk fuel storage area, exceeded the TEC by a factor of five.

The maximum concentrations of mercury and selenium were detected in samples collected from Jacks Run. The maximum concentration of mercury exceeded the TEC by a factor of four. No screening guideline is currently available for comparison to the maximum concentration of selenium detected in the sediment samples.

The maximum concentration of silver, which was detected in a sample collected from South Run in the vicinity of Landfill 4, exceeded the TEC by a factor of 1.5.

Fourteen PAHs were detected in sediment samples taken from the McGuire site at maximum concentrations that exceeded screening guidelines, and two PAHs were also

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detected for which no screening guidelines are currently available. The maximum concentrations of all 16 detected PAHs (Table 2) occurred in samples taken from South Run. The maximum concentrations of anthracene, benz(a)anthracene, phenanthrene, and pyrene exceeded the TECs by three orders of magnitude. The maximum concentrations of acenaphthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, and indeno(1,2,3-cd)pyrene exceeded the TECs by two orders of magnitude. The maximum concentrations of acenaphthylene, naphthalene, and benzo(k)fluoranthene exceeded the TECs by factors of 7.5, five, and three, respectively. No screening guidelines are currently available for comparison to the maximum concentrations of benzo(b)fluoranthene and 2-methylnaphthalene detected in the sediment samples.

Eight pesticides were detected in sediment samples taken from the McGuire site at maximum concentrations that exceeded screening guidelines. The maximum concentrations of aldrin, chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, and heptachlor epoxide were detected in samples taken from South Run. The maximum concentrations of chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and dieldrin exceeded the TECs by two orders of magnitude. The maximum concentrations of aldrin and heptachlor epoxide exceeded the TECs by one order of magnitude.

The maximum concentration of endrin, which was detected in a sample taken from Landfill 4, exceeded the TEC by a factor of eight.

One PCB Aroclor was detected in sediment samples taken from the McGuire site at a maximum concentration that exceeded screening guidelines. The maximum concentration of Aroclor 1260, which was detected in a sample taken from North Run in the vicinity of Landfill 3 and the DRMO storage facility, exceeded the TEC by a factor of eight.

### Groundwater

Nine metals were detected in groundwater samples collected from the McGuire site at maximum concentrations that exceeded screening guidelines. The maximum concentrations of arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc were detected in samples collected from monitoring wells throughout the bulk fuel storage area. The maximum concentration of arsenic exceeded the GWQS by four orders of magnitude and the AWQC by a factor of three. The maximum concentrations of cadmium, chromium, and lead exceeded the AWQC by two orders of magnitude and the GWQS by one order of magnitude. The maximum concentration of copper exceeded the AWQC by two orders of magnitude and the GWQS by a factor of 2.5. The maximum concentration of nickel exceeded the AWQC by one order of magnitude and the GWQS by a factor of eight. The maximum concentration of mercury exceeded the AWQC by one order of magnitude and the GWQS by a factor of four. The maximum concentration of zinc exceeded the AWQC by one order of magnitude.

The maximum concentration of selenium, which was detected in a sample taken from a monitoring well in the aircraft apron area, exceeded the AWQC by a factor of eight and slightly exceeded the GWQS.

Five PAHs were detected in groundwater samples taken from the McGuire site at maximum concentrations that exceeded screening guidelines, and three PAHs were also detected for which no screening guidelines are currently available. The maximum concentrations of acenaphthylene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were detected in samples taken from monitoring wells throughout Landfill 4. The maximum

concentration of benzo(a)pyrene exceeded the GWQS by one order of magnitude. The maximum concentrations of benzo(b)fluoranthene and indeno(1,2,3-cd)pyrene exceeded the GWQS by factors of six and two, respectively. No screening guideline is currently available for comparison to the maximum concentration of acenaphthylene detected in the groundwater samples.

The maximum concentrations of benz(a)anthracene and chrysene were detected in samples taken from monitoring wells throughout the aircraft apron area. The maximum concentration of benz(a)anthracene exceeded the GWQS by one order of magnitude. The maximum concentration of chrysene exceeded the GWQS by a factor of four.

The maximum concentration of 2-methylnaphthalene was detected in a sample taken from a monitoring well in the bulk fuel storage area. The maximum concentration of phenanthrene was detected in a sample taken from a monitoring well in Landfill 2. No screening guidelines are currently available for comparison to the maximum concentrations of 2-methylnaphthalene and phenanthrene detected in the groundwater samples.

Five pesticides were detected in groundwater samples collected from the McGuire site at maximum concentrations that exceeded screening guidelines. The maximum concentrations of aldrin, heptachlor, and heptachlor epoxide were detected in samples taken from Landfill 4. The maximum concentration of aldrin exceeded the GWQS by one order of magnitude. The maximum concentration of heptachlor epoxide exceeded the AWQC and the GWQS by one order of magnitude. The maximum concentration of heptachlor slightly exceeded the AWQC.

The maximum concentration of 4,4'-DDT, which was detected in a sample taken from Landfill 2, exceeded the AWQC by one order of magnitude,.

The maximum concentration of dieldrin, which was detected in a sample taken from the DRMO storage facility, exceeded the GWQS by two orders of magnitude and the AWQC by a factor of eight.

One PCB Aroclor was detected in a groundwater sample taken from Landfill 2. The maximum concentration of Aroclor 1254 exceeded the AWQC and the GWQS by one order of magnitude.

### Soil

Ten metals were detected in soil samples taken from the McGuire site at maximum concentrations that exceeded screening guidelines. The maximum concentrations of arsenic, cadmium, lead, and selenium were detected in samples taken from the bulk fuel storage area. The maximum concentration of cadmium exceeded the USEPA ecological soil screening guideline by two orders of magnitude. The maximum concentration of selenium exceeded the ORNL-PRG by one order of magnitude. The maximum concentration of lead exceeded the ORNL-PRG by one order of magnitude and the RDCSCC by a factor of 1.5. The maximum concentration of arsenic exceeded the ORNL-PRG by a factor of six and the RDCSCC by a factor of three.

The maximum concentrations of chromium and silver were detected in soil samples taken from Landfill 6. The maximum concentration of chromium exceeded the ORNL-PRG by two orders of magnitude. The maximum concentration of silver exceeded the ORNL-PRG by a factor of two.

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The maximum concentrations of copper, mercury, and zinc were detected in soil samples taken from Landfill 5. The maximum concentration of mercury exceeded the ORNL-PRG by three orders of magnitude. The maximum concentration of zinc exceeded the ORNL-PRG by one order of magnitude. The maximum concentration of copper exceeded the ORNL-PRG by a factor of two.

The maximum concentration of nickel, which was detected in a sample taken from Landfill 2, exceeded the ORNL-PRG by a factor of two.

Eight PAHs were detected in soil samples taken from the McGuire site at maximum concentrations that exceeded screening guidelines, and two PAHs were also detected for which no screening guidelines are currently available. The maximum concentrations of 2-methylnaphthalene and naphthalene were detected in samples taken from the DRMO storage facility. The maximum concentration of naphthalene exceeded the Canadian Council of Ministers of the Environment (CCME) environmental quality guidelines for agricultural land uses by three orders of magnitude and slightly exceeded the RDCSCC. No screening guideline is currently available for comparison to the maximum concentration of 2-methylnaphthalene detected in the soil samples.

The maximum concentrations of acenaphthylene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were detected in samples taken from Landfill 5. The maximum concentration of benzo(a)pyrene exceeded the CCME environmental quality guideline by one order of magnitude and the RDCSCC by a factor of three. The maximum concentration of benzo(b)fluoranthene exceeded the CCME environmental quality guideline by one order of magnitude and the RDCSCC by a factor of two. The maximum concentration of indeno(1,2,3-cd)pyrene exceeded the CCME environmental quality guideline by almost one order of magnitude and slightly exceeded the RDCSCC. No screening guideline is currently available for comparison to the maximum concentration of acenaphthylene detected in the soil samples.

The maximum concentrations of benz(a)anthracene, benzo(k)fluoranthene, phenanthrene, and pyrene were detected in samples taken from Landfill 2. The maximum concentration of benz(a)anthracene exceeded the CCME environmental quality guideline by one order of magnitude and the RDCSCC by a factor of three. The maximum concentration of benzo(k)fluoranthene exceeded the CCME environmental quality guideline by one order of magnitude and the RDCSCC by a factor of two. The maximum concentrations of phenanthrene and pyrene exceeded the CCME environmental quality guidelines by one order of magnitude.

Three pesticides were detected in soil samples taken from the McGuire site at maximum concentrations that exceeded screening guidelines, and one pesticide was also detected for which no screening guideline is currently available. The maximum concentrations of aldrin and dieldrin were detected in samples taken from Landfill 4. The maximum concentration of dieldrin exceeded the USEPA ecological soil screening guideline by five orders of magnitude and the RDCSCC by two orders of magnitude. The maximum concentration of aldrin exceeded the RDCSCC by a factor of two.

The maximum concentrations of 4,4'-DDT and heptachlor epoxide were detected in samples taken from the DRMO storage facility. The maximum concentration of 4,4'-DDT exceeded the CCME environmental quality guideline by one order of magnitude and the RDCSCC by a factor of 3.5. No screening guideline is currently available for comparison to the maximum concentration of heptachlor epoxide detected in the soil samples.

One PCB Aroclor was detected in soil samples taken from the McGuire site at a maximum concentration that exceeded screening guidelines. The maximum concentration of Aroclor 1260 exceeded both the ORNL-PRG and the RDCSCC by three orders of magnitude.

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