

PFAS

An Industry Perspective

Presented By

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PFAS – How Big is the Problem

EBJ Working Model of Sites with PFAS Contamination

| Site Category | Sites | % possible PFAS contamination | Est. Sites PFAS contamination | Avg \$mil remediation costs | Total \$mil remediation costs | Upgrading System Cost* \$mil |
|------------------------------------|----------------|-------------------------------|-------------------------------|-----------------------------|-------------------------------|------------------------------|
| NPL: Superfund | 1,850 | 20-40% | 555 | 7.5 | 4,163 | |
| RCRA Corrective Action | 4,000 | 20-30% | 1,000 | 5.0 | 5,000 | |
| RCRA UST | 140,000 | 3-5% | 5,600 | 0.5 | 2,800 | |
| DOD AFFF Sites | 300 | 100% | 300 | 30.0 | 9,000 | |
| DOD | 4,400 | 60-70% | 2,860 | 2.5 | 7,150 | |
| DOE | 5,000 | 10-15% | 600 | 5.0 | 3,000 | |
| Civilian Agencies | 3,000 | 25-30% | 810 | 2.0 | 1,620 | |
| State Sites | 120,000 | 5-10% | 8,400 | 0.5 | 4,200 | |
| PFAS Manufacturing Sites | 60 | 100% | 60 | 300 | 18,000 | |
| Manufacturing Sites Using PFAS | 3,600 | 80-90% | 2,880 | 7.5 | 21,600 | |
| Other Manufacturing Sites | 270,000 | 2-3% | 6,750 | 0.5 | 3,375 | |
| Chromium/Electroplating Operations | 4,400 | 30-50% | 1,760 | 1.0 | 1,760 | |
| Refineries | 130 | 80-90% | 104 | 20.0 | 2,080 | |
| Landfills: Active | 3,100 | 50-70% | 1,860 | 2.0 | 3,720 | |
| Landfills: Closed | 10,000 | 40-50% | 4,500 | 0.5 | 2,250 | |
| Airports: Major | 260 | 80-90% | 221 | 20.0 | 4,420 | |
| Airports: Regional | 1,200 | 30-40% | 396 | 7.5 | 2,970 | |
| Airports: Commercial/Private | 17,540 | 3-5% | 702 | 6.0 | 4,210 | |
| Biosolids/Landfarming | 500 | 70-80% | 375 | 2.0 | 750 | |
| Wastewater: POTWs 10 MGD+ | 500 | 70-80% | 375 | 100 | | 37,500 |
| Wastewater: POTWs <10 MGD | 15,000 | 30-40% | 4,950 | 7.5 | | 37,125 |
| Water Utilities: Urban | 4,000 | 30-40% | 1,320 | 15 | | 19,800 |
| Water Utilities: Rural | 50,000 | 10-20% | 7,500 | 1.5 | | 11,250 |
| Other | 50,000 | 5-10% | 3,500 | 0.5 | 1,750 | |
| Total | 708,840 | 8% | 57,378 | 1.8 | 103,817 | 105,675 |

Source: Environmental Business International, Inc. EBI estimates using site count estimates from EPA, ITRC, US Census, US DOT FAA, and others; a consensus of respondents to % possible PFAS contamination from a survey and interviews with remediation experts and estimated sites with PFAS contamination a factor of 'possible' sites. * water/wastewater treatment system cost is capex and estimated opex for 20-year O&M

PFAS – What Technology is Available?

PFAS Treatment Methods Used on Remediation Sites, 2019-2022

| | % of Projects in 2019 | % of Projects in 2022 |
|--|-----------------------|-----------------------|
| SOIL: Capping | 11.9% | 11.5% |
| SOIL: Excavation & Incineration | 20.3% | 21.4% |
| SOIL: In situ sorption/stabilization | 11.4% | 5.5% |
| SOIL: In situ thermal treatment | 5.1% | 5.3% |
| SOIL: Bioremediation | 9.8% | 4.4% |
| SOIL: Monitored Natural Attenuation | n/a | 7.5% |
| GROUNDWATER: Extraction & carbon/GAC treatment | 28.2% | 33.2% |
| GW: Extraction & resin/ion exchange | 14.8% | 13.5% |
| GW: Chemical reduction / advanced oxidation | 4.9% | 8.4% |
| GW: Reverse osmosis / ultrafiltration | 7.3% | 8.5% |
| Other innovative technologies | 4.3% | 10.9% |
| Total | 118% | 130% |

Source: 2019 and 2022 EBJ Remediation Technology Surveys. Question was: Please estimate the percentage of PFAS sites/projects that you have encountered using the following technologies: (Note: There may be multiple applications at a number of sites, so number ranges can add up to more than 100%.)

PFAS – EPA Guidance on D&D of PFAS

- Underground injection (UIC)
- Landfills
- Thermal treatment under certain conditions, which includes incineration.

PFAS – Where do we go from here?

- EPA's 3/29/2024 proposed MCL rule includes the following remedial strategies: GAC, Ion Exchange, Reverse Osmosis and Nanofiltration as BAT methods for treatment of drinking water
- sets MCLs for PFOA and PFOS at 4 ppt with a Hazard Index for PFAS at 1

PFAS – Where is DOD Responding?

| STATE/TERRITORY | DOD COMPONENT | INSTALLATION NAME |
|-----------------|---------------|--|
| Alabama | Army | AASF #1 R W Shepherd Hope Hull |
| Arizona | Air Force | Davis-Monthan AFB |
| Arizona | Air Force | Luke AFB |
| Arizona | Air Force | Morris (Tucson International Airport) |
| California | Navy | ALAMEDA NAS |
| California | Navy | Treasure Island NS |
| California | Air Force | Castle AFB |
| California | Air Force | March AFB |
| California | Air Force | Mather AFB |
| Colorado | Army | Fort Carson |
| Colorado | Air Force | Peterson Space Force Base |
| Illinois | Air Force | Chanute AFB |
| Maine | Navy | Brunswick NAS |
| Maryland | Navy | CHESAPEAKE BEACH MD RESLB |
| Massachusetts | Navy | South Weymouth NAS |
| Massachusetts | Air Force | Otis ANG (Joint Base Cape Cod -Massachusetts Military Reservation) |
| Michigan | Army | MTC-H Camp Grayling Airfield (installation-wide PAI) |
| Michigan | Army | MTC-H Camp Grayling-Cantonment |
| Michigan | Air Force | Selfridge |
| Michigan | Air Force | Wurtsmith AFB |
| New Hampshire | Air Force | Pease AFB |
| New Mexico | Air Force | Cannon AFB |
| New York | Air Force | Stewart International Airport |
| North Dakota | Army | Bismarck AASF Complex |
| Ohio | Air Force | Wright Patterson AFB |
| Pennsylvania | Navy | Willow Grove NASJRB |
| Pennsylvania | Air Force | Biddle ANGB (formerly Horsham/Willow Grove ANG) |
| Rhode Island | FUDS | NAVAL AUX LANDING FIELD |
| South Carolina | Air Force | Shaw AFB |
| South Dakota | Air Force | Ellsworth AFB |
| Texas | Army | El Campo |
| Texas | Navy | Dallas NAS |
| Texas | Air Force | Goodfellow AFB |
| Texas | Air Force | Joint Base San Antonio - Lackland, Randolph, Ft Sam Houston, Camp Bullis |
| Texas | Air Force | Reese AFB |
| Vermont | Air Force | Burlington |
| Virginia | Army | Fort Gregg-Adams (Formerly Fort Lee) |
| Virginia | Navy | OCEANA VA NAS |
| Washington | Navy | WHIDBEY IS WA NAS |
| Washington | Air Force | Fairchild AFB |