

New Mexico Office of Natural Resources Trustee



Radioactive & Hazardous Materials Committee

Issues Involving Per- and Poly-fluoroalkyl Substances
October 15, 2024



Following a Release of Hazardous Substances Responsibility is Shared:

NMED: Remediation

NMED Requires Responsible Party to:

- (1) Identify and characterize the release(s); and
- (2) Clean up contamination to protect public health and the environment.



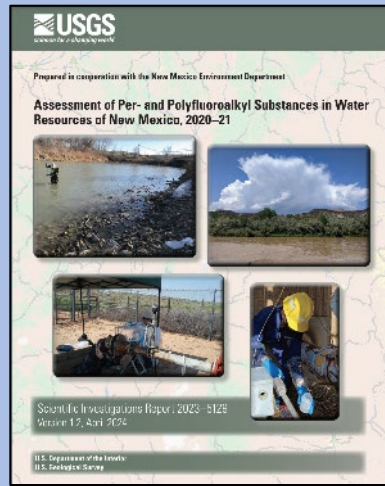
ONRT: Restoration

ONRT Requires Responsible Party to:

1. Restore injured natural resources to pre-release condition
2. When that's not possible in a timely way, to replace or acquire the equivalent.
3. Compensate affected communities for loss of use from time of release to complete restoration



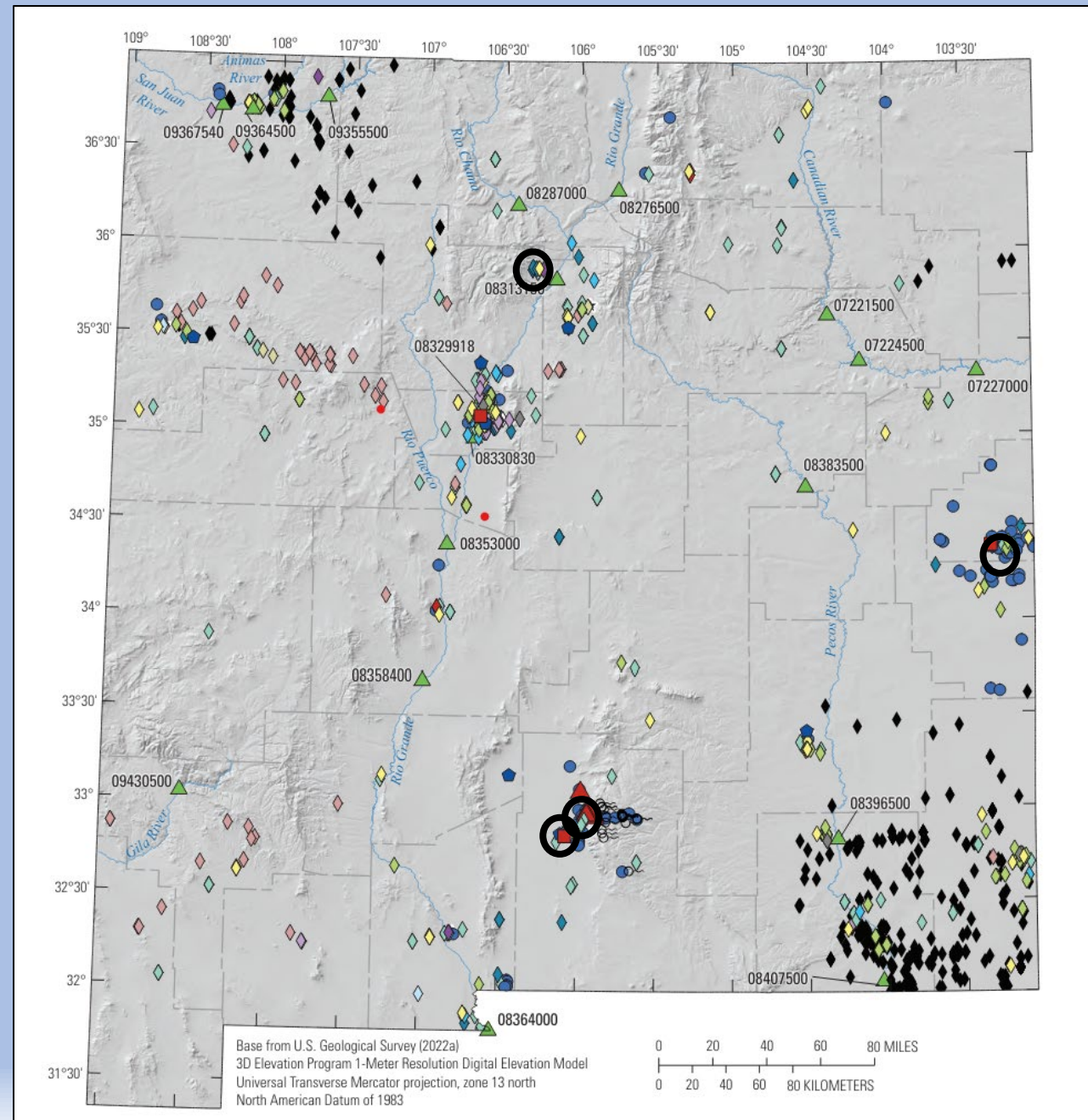
USGS, 2024 – PFAS in NM Water Resources – Potential Sources



Legend

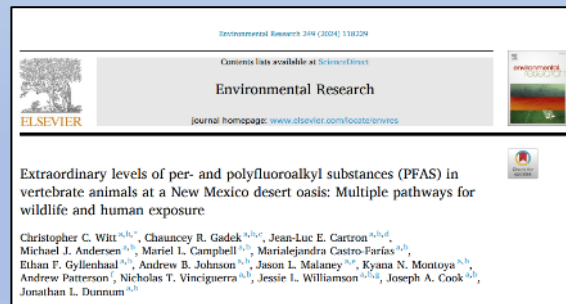
Facilities that may use PFAS (EPA, 2022)			
	Airports		Furniture and carpet
	Cement manufacturing		Glass products
	Chemical and cleaning product manufacturing		Metal coating and machinery manufacturing
	Consumer products		Mining and refining
	Electronics industry		National defense
	Paints, coatings, plastics and resins		Paper mills and products and printing
	Waste management		Textiles and leather
	Oil and gas		Surface water sampling location and identifier

	Federal agency location with known or suspected PFAS detections (U.S. Environmental Protection Agency [EPA], 2022)
	Calls reporting Aqueous Film Forming Foam usage (EPA, 2022)
	Groundwater well
	Spring
	Surface-water diversion



Holloman Air Force Base

- Holloman Lake is an ecologically important water source in the Tularosa Basin
- Very high PFAS levels in surface water and biological tissues
- Historical biological tissue samples confirm exposure and injury back to 1990s (unique for PFAS)



“Holloman Lake is the largest and most ecologically significant water source in the Tularosa Basin (16,800 km²)”

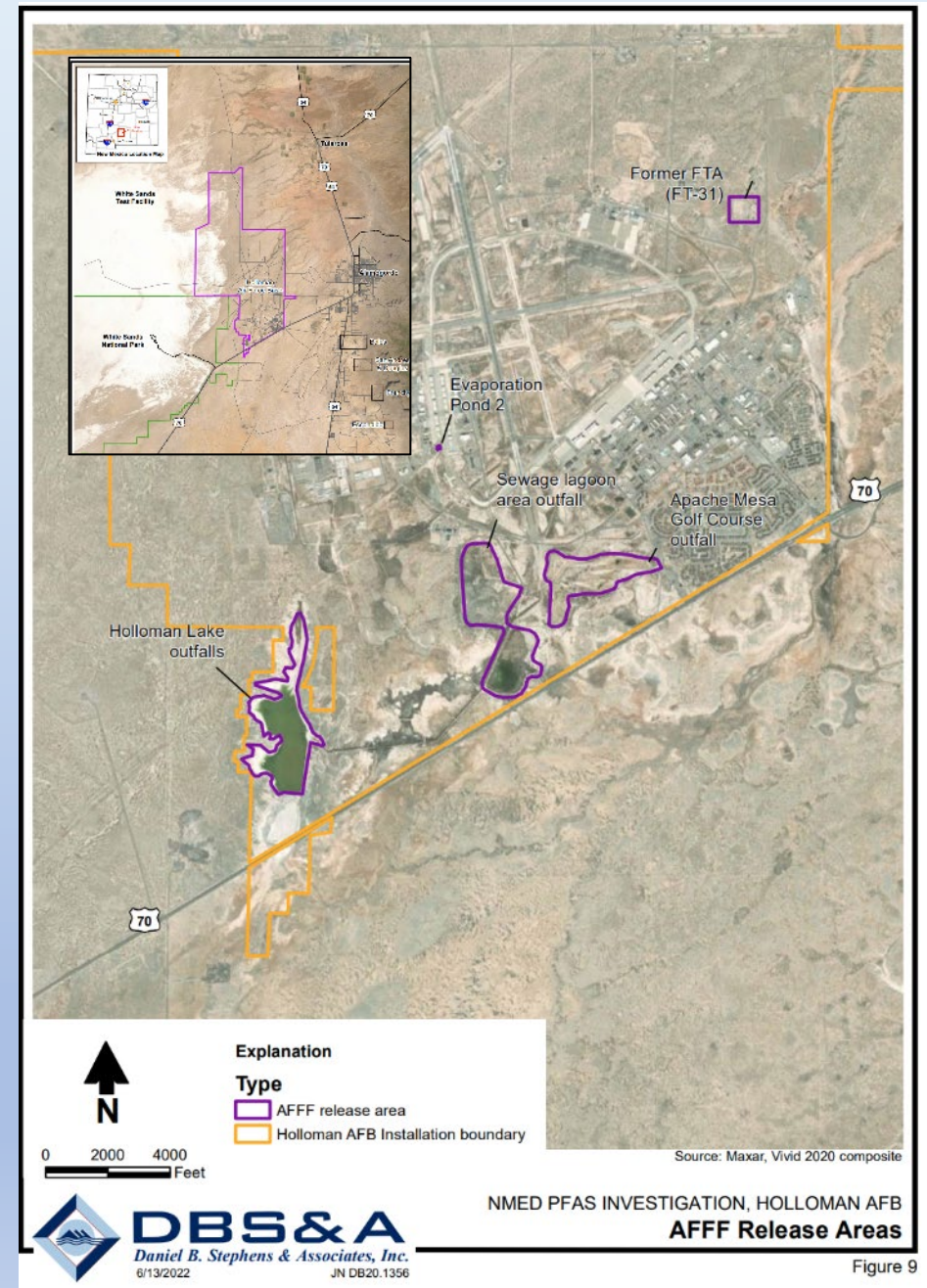



Figure 9

Holloman Lake PFAS in Surface Water

Phase 1 PFAS Investigation Report
Holloman Air Force Base and Surrounding Area
Otero County, New Mexico

Prepared for
New Mexico Environment Dept
Hazardous Waste Bureau
Santa Fe, New Mexico

Prepared by

a Geo-Logic Company

DBS&A Agency, 311, Suite 100
Albuquerque, New Mexico 87104
www.dbsandassociates.com
8221.1060

June 30, 2022

Phase 2 Investigation Report
NMED PFAS Investigation
Holloman Air Force Base and Surrounding Area

Prepared for
New Mexico Environment Department
Hazardous Waste Bureau
Santa Fe, New Mexico

Prepared by

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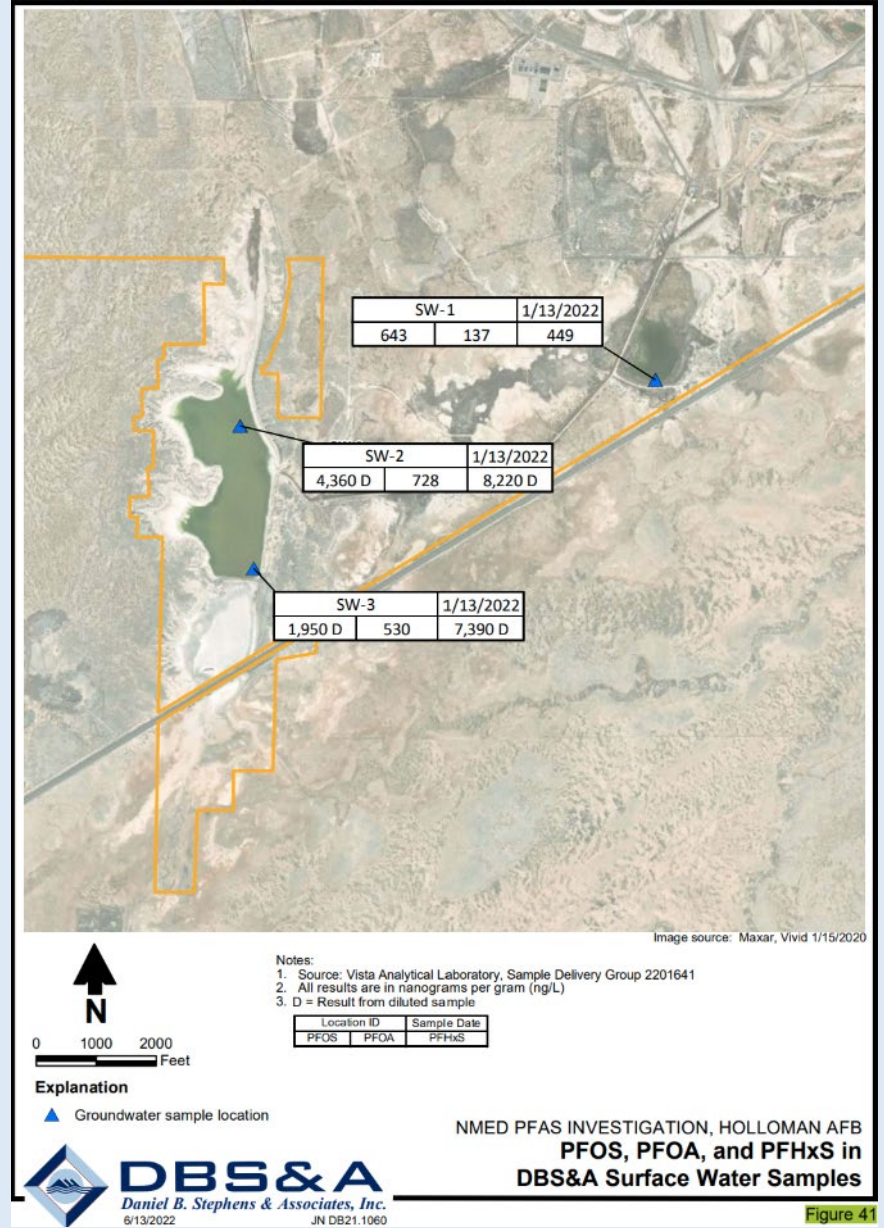
DBS&A Agency, 311, Suite 100
Albuquerque, New Mexico 87104
www.dbsandassociates.com
8221.1060

June 30, 2023

Agency	Sampling Date	PFOA	PFOS
USAF	2017 (2 samples)	74.6 - 378 ng/L	951 – 2,810 ng/L
NMDOH	April 2019 (3 samples)	990 - 1,600 ng/L	1,700 - 5,900 ng/L
NMED/ DBS&A	Jan 2022 (2 samples)	530 - 728 ng/L	4,360 – 1,950 ng/L

Exposure to these high surface water concentrations has resulted in elevated tissue concentrations in wildlife, which has been measured in:

- Bird muscle, liver
- Mammal liver, blood
- Plants



Biological injury:

An injury to a biological resource has resulted from the discharge of oil or release of a hazardous substance if concentration of the substance is sufficient to ...

Edible portions of organisms are unsafe for human consumption

“...Exceed action or tolerance levels established under section 402 of the Food, Drug and Cosmetic Act, 21 U.S.C. 342, in edible portions of organisms”

[43 CFR § 11.62(f)(1)(ii)]

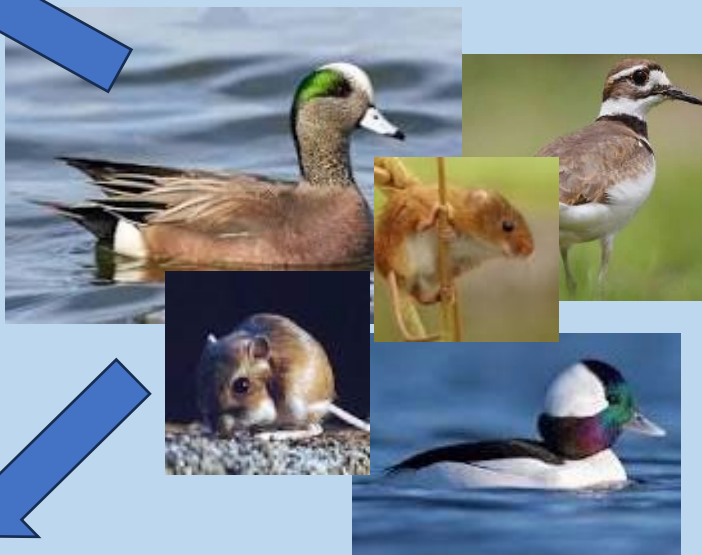
Advisories

“...Exceed levels for which an appropriate state health agency has issued directives to limit or ban consumption of such organism”

[43 CFR § 11.62(f)(1)(iii)]

Reduced reproduction; adverse effects to other biota via their diet

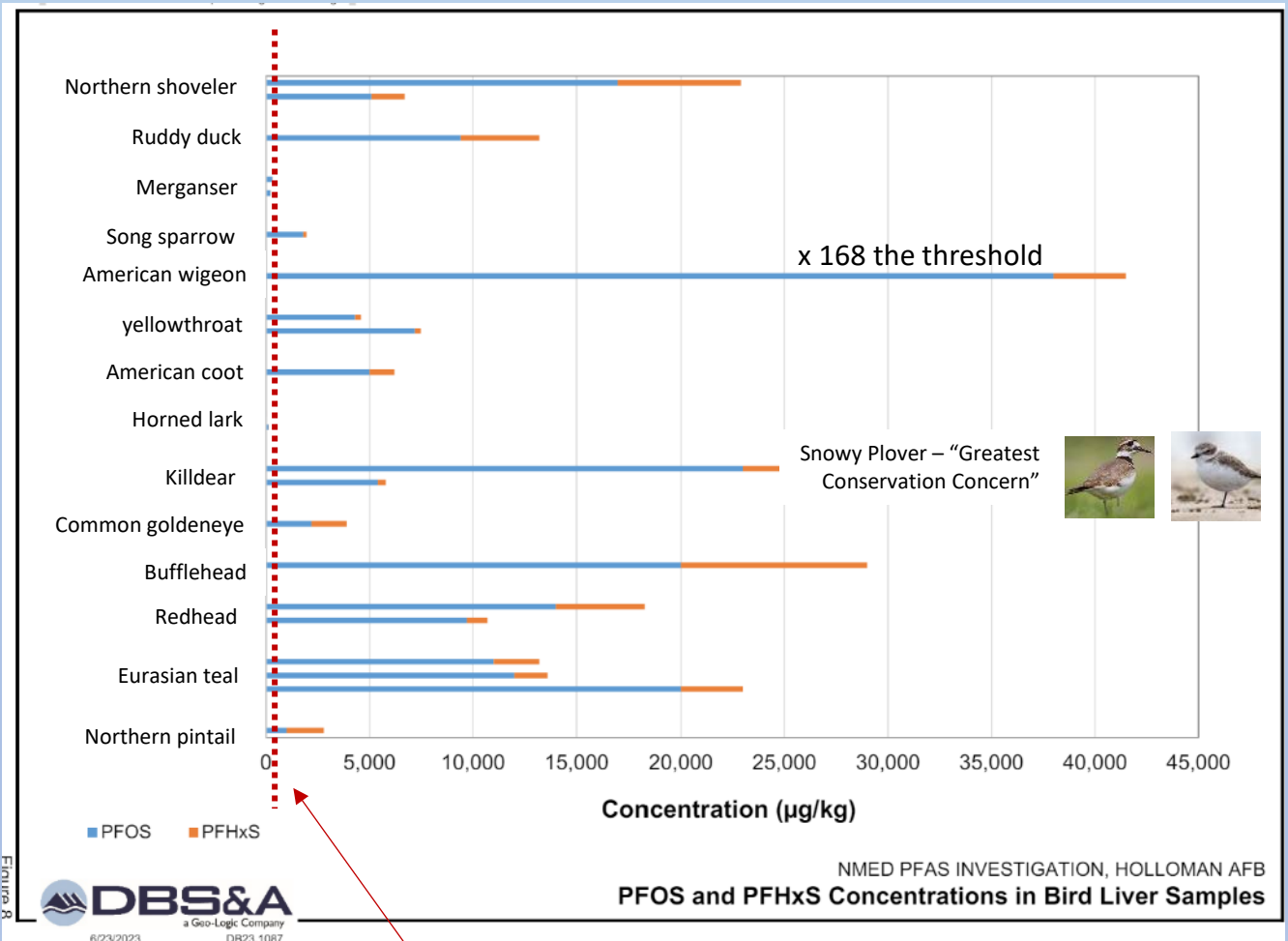
“...Cause the biological resource or its offspring to have undergone at least one of the following adverse changes in viability: death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations”
[43 CFR § 11.62(f)(1)(ii)]



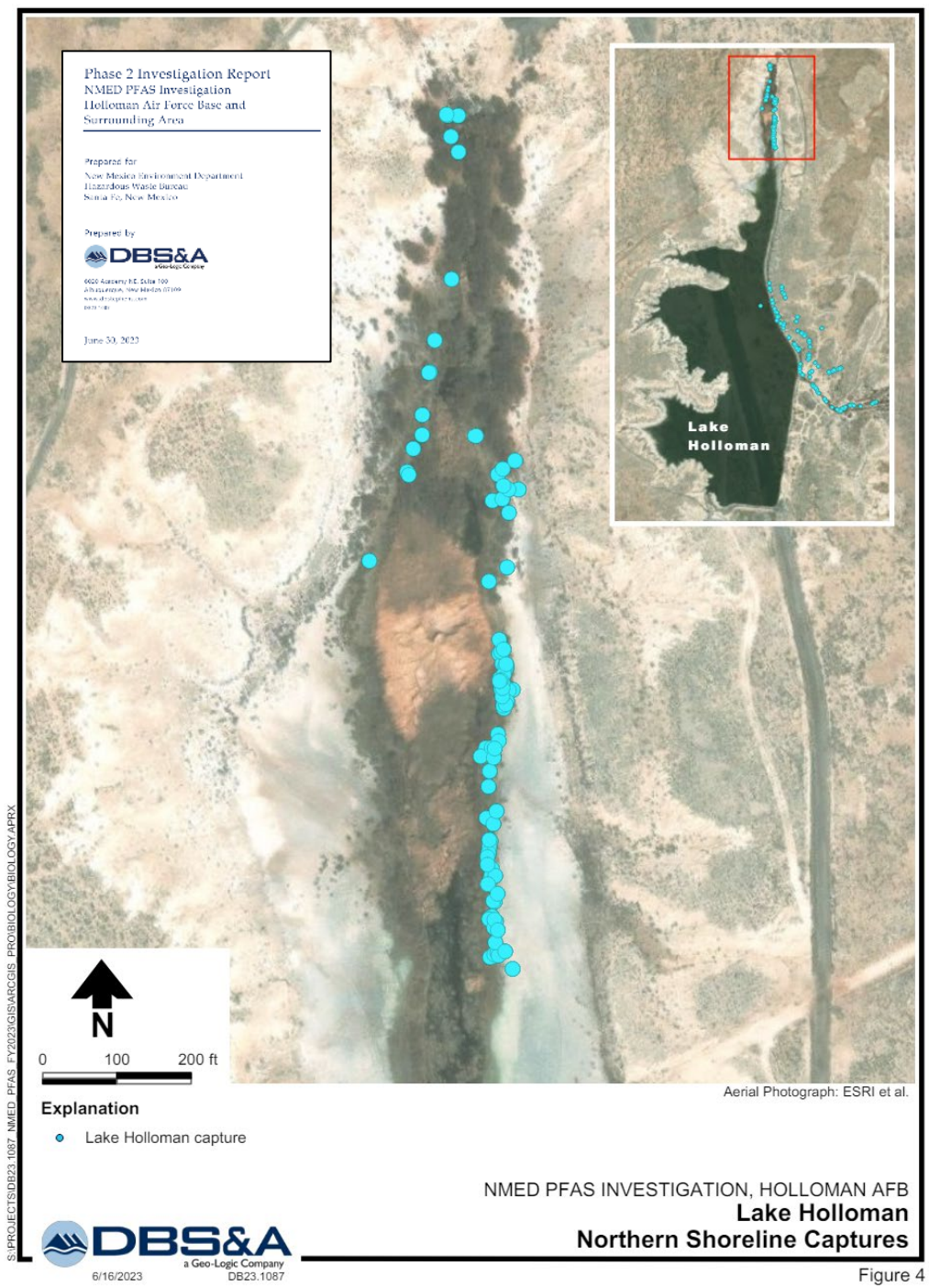
Surface water injury:

Concentrations and duration of substances sufficient to have caused injury as defined in paragraphs (c), (d), (e), or (f) of this section to ground water, air, geologic, or biological resources, when exposed to surface water, suspended sediments, or bed, bank, or shoreline sediments” [43 CFR § 11.62(b)(1)(v)]

Holloman – Bird Liver Tissue Threshold Exceedances



PFOS liver tissue threshold - reduced reproduction
 226 - 325 µg/kg (Dennis et al, 2021)
 600 µg/kg (Newsted et al., 2005)



NMED PFAS INVESTIGATION, HOLLOMAN AFB
Lake Holloman
 Northern Shoreline Captures

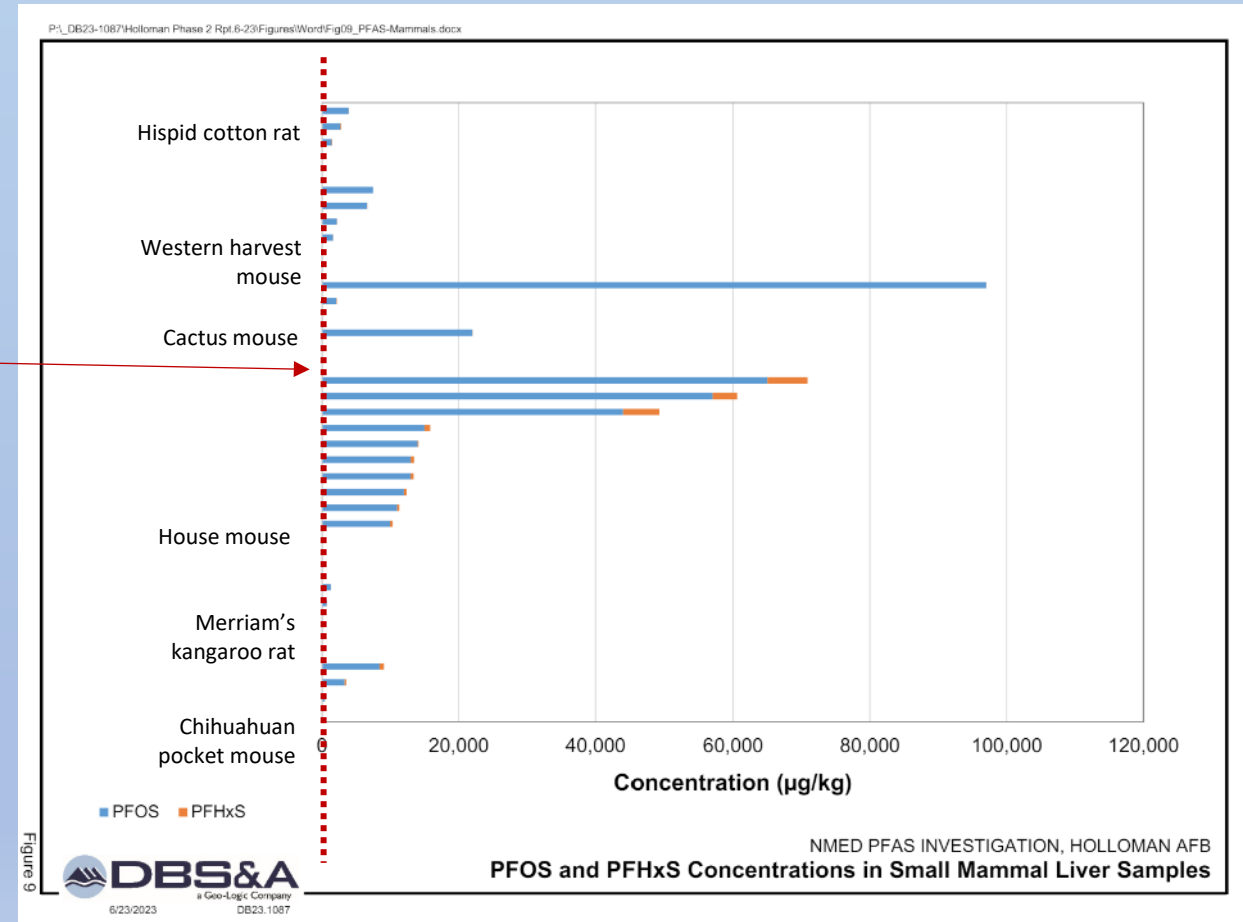
Figure 4



Holloman– Dietary Based Wildlife Threshold Exceedances

Threshold	PFOS (ug/kg)	Source
Dietary value for avian wildlife	8.2	Environment and Climate Change Canada (2018)
Dietary value for mammalian wildlife	4.6	
Secondary poisoning - predators	33	European Commission (2011)

*Risk-based thresholds – based on “no effects levels”, protective of high percentage of species
 For NRDA we need to show a “measurable adverse effect” – so injury thresholds will likely be higher than these values




Holloman – Edible Portion of Organisms Threshold

- Estimated PFOS “safe consumption” level for adults = ~30 ng/g (range: 3 – 60 ng/g)
- Based on 25 ng/kg/day (EPA), 0.8 g of protein per kg of body wt consumed per day
- These levels are ~280 to 1,200 times greater than the “safe consumption” level

Phase 2 Investigation Report
 NMED PFAS Investigation
 Holloman Air Force Base and
 Surrounding Area

Prepared for
 New Mexico Environment Department
 Hazardous Waste Bureau
 Santa Fe, New Mexico

Prepared by

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June 30, 2023

Bird Liver and Muscle Concentrations

PFAS	bird							
	liver				muscle			
	control	Holloman			control	Holloman		
	n = 1	n = 24			n = 9	n = 15		
	value	mean	range	mean	range	mean	range	
10:2 FTS	BDL	0.66	BDL-4.5	BDL	–	0.13	BDL-1.2	
4:2 FTS	BDL	BDL	–	BDL	–	BDL	–	
6:2 FTS	BDL	1.12	BDL-8.6	BDL	–	0.05	BDL-0.71	
8:2 FTS	BDL	16.35	BDL-70	BDL	–	2.65	BDL-12	
PFBS	BDL	0.40	BDL-1.4	BDL	–	0.14	BDL-0.7	
PFBA	1.60	1.57	BDL-3.3	BDL	–	0.90	BDL-2.6	
PFDA	31.00	22.13	BDL-57	0.16	BDL-0.4	6.24	0.94-24	
PFHpS	1.20	150.99	BDL-480	BDL	–	50.00	BDL-230	
PFHpA	BDL	1.02	BDL-7.4	BDL	–	0.37	BDL-1.9	
PFHxA	BDL	0.39	BDL-1.9	BDL	–	0.12	BDL-1	
PFNA	850.00	202.82	0.5-630	0.49	BDL-1.7	52.54	0.78-270	
PFPeS	BDL	17.18	BDL-77	BDL	–	7.21	BDL-37	
PFPeA	BDL	0.23	BDL-0.7	BDL	–	0.09	BDL-0.6	
PFUnA	13.00	3.49	BDL-16	BDL	–	0.87	BDL-3.9	
Br-PFHxS	BDL	104.92	BDL-450	BDL	–	43.53	BDL-200	
L-PFHxS	BDL	1738.43	0.38-8600	0.03	BDL-0.3	946.67	BDL-4500	
Total PFHxS	BDL	1832.18	0.38-9000	0.03	BDL-0.3	992.00	BDL-4700	
Br-PFOA	BDL	2.43	BDL-37	BDL	–	0.29	BDL-1.2	
L-PFOA	11.00	101.06	BDL-940	0.1	BDL-0.3	52.81	BDL-380	
Total PFOA	11.00	103.52	BDL-980	0.1	BDL-0.3	53.09	BDL-380	
Br-PFOS	6.500	2209.34	2.4-9500	0.3	BDL-0.9	437.71	2.5-2200	
L-PFOS	52.00	7020.88	12-29000	2.37	0.4-5.0	1454.20	15-6600	
Total PFOS	59.00	9154.04	14-38000	2.68	0.6-5.3	1903.20	17-8800	



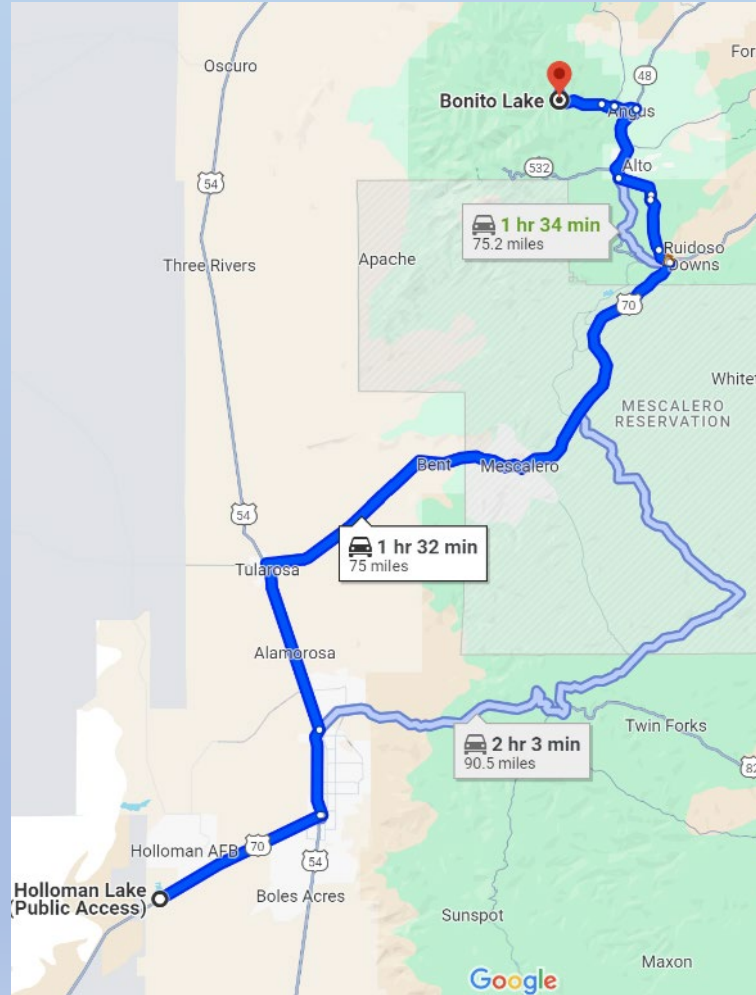
Holloman – What next?

- Work with NMED and USFWS to determine next round of testing
- Work with Department of Defense to identify early restoration opportunities



Restoration Project Example – Bonito Lake

- 0.2 acre lake (comparable size - Holloman is 0.5 ac)
- Closed beginning in 2012 due to wildfire
- Provides recreational & ecological services
- Drinking water supply source for Alamogordo
- Restoration = removal of eroded sediments/ash, erosion control structures, construction of facilities (restrooms)
- Completed project – gives us a real cost per acre
- Project cost is > \$8 million = ~ \$20- \$40 million/ac



<https://www.krqe.com/news/environment/new-mexico-lake-closed-for-a-decade-inches-towards-reopening/>

Restoration Project Example – Curry County Playa Conservation Project

- \$489,000 settlement in 2004 (~\$828,000 in 2024 \$)
- Ten playas enrolled for conservation
- 975 acres
- 11.5 year conservation agreements
- \$849/acre



Search ... Search



STATE OF NEW MEXICO
OFFICE OF NATURAL RESOURCES TRUSTEE

MISSION

Our mission is to return injured natural resources and the services they provide to the condition that would have existed absent the release of contamination

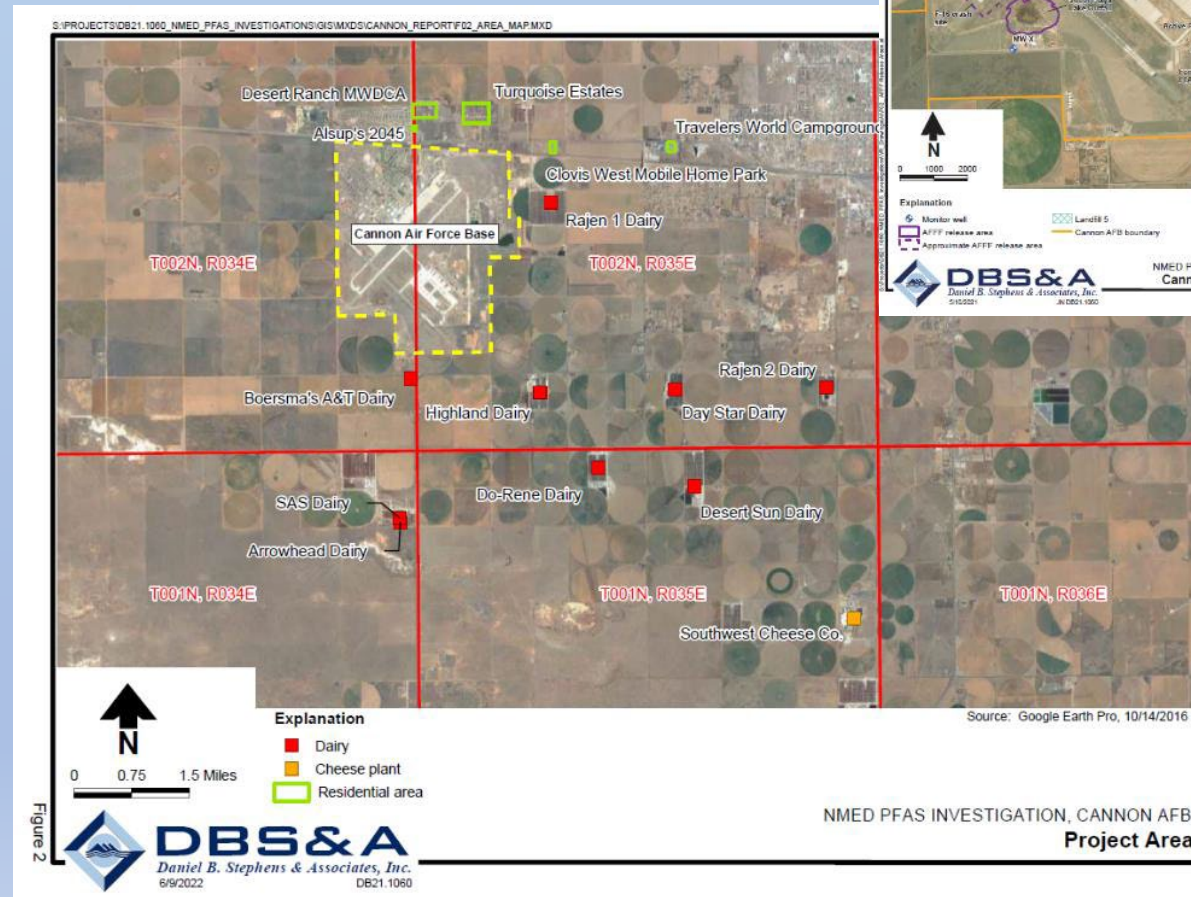
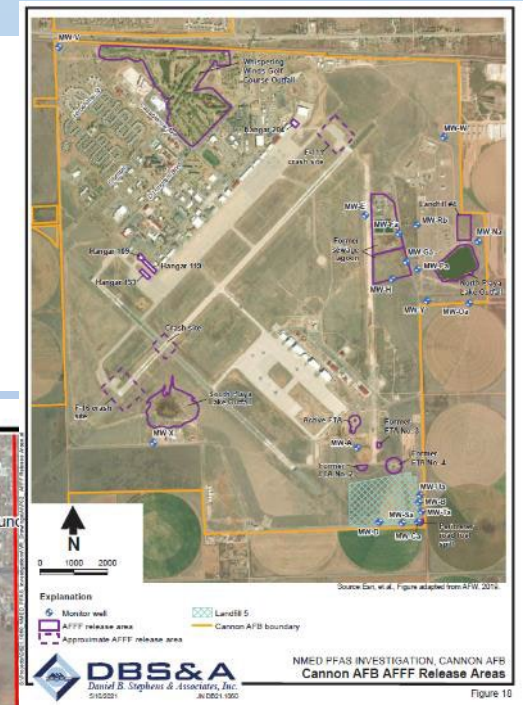
The Final [Natural Resources Restoration Plan and Environmental Assessment for the AT&SF \(Clovis\) New Mexico Superfund Site](#) dated April 2007, identifies the Curry County Playa Conservation Project as the selected restoration project.

Curry County Playa Conservation Project

This project focused on the protection and restoration of playas within Curry County. The primary objective of the project was to preserve beneficial playa habitat through 11.5-year conservation agreements with landowners. Healthy playas are considered keystone ecosystems that serve as critical sites of biodiversity in an area otherwise characterized by semi-arid rangeland and intensive agriculture. The playas also play a very valuable role as groundwater recharge areas to the Ogallala aquifer, the largest and most important aquifer in the High Plains. Project restoration activities included limiting grazing, brush management, range planting, and earthwork. Ten playas, amounting to approximately 975 acres of playa lakes and immediately adjacent uplands, were enrolled for conservation from November 2007 through December 2018. The ONRT and the U.S. Fish and Wildlife Service oversaw the restoration activities implemented by the Central Curry Soil and Water Conservation District to ensure the success of this playa protection and conservation project.

Cannon AFB

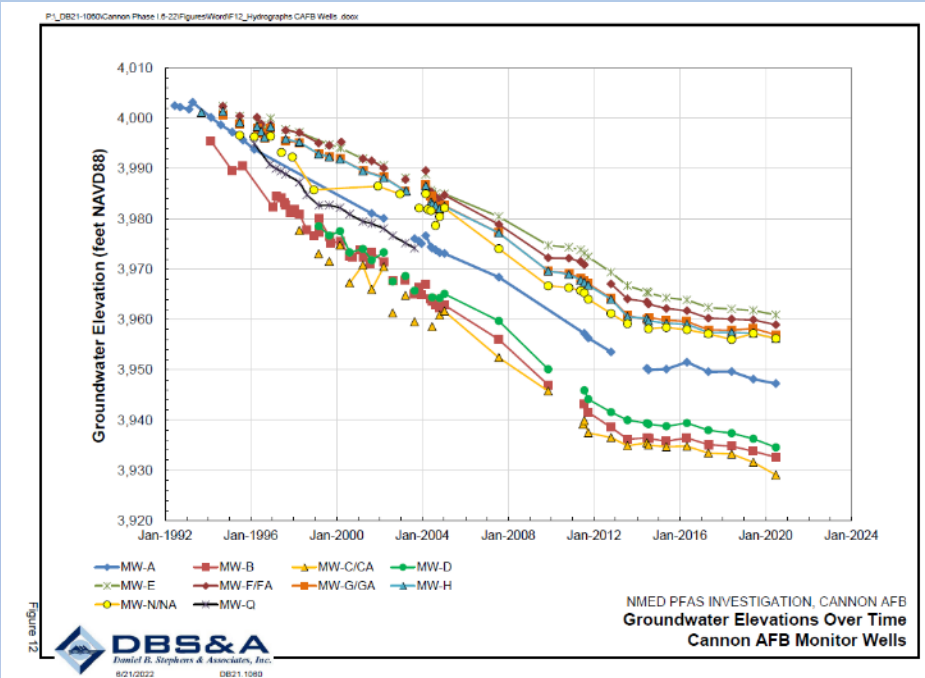
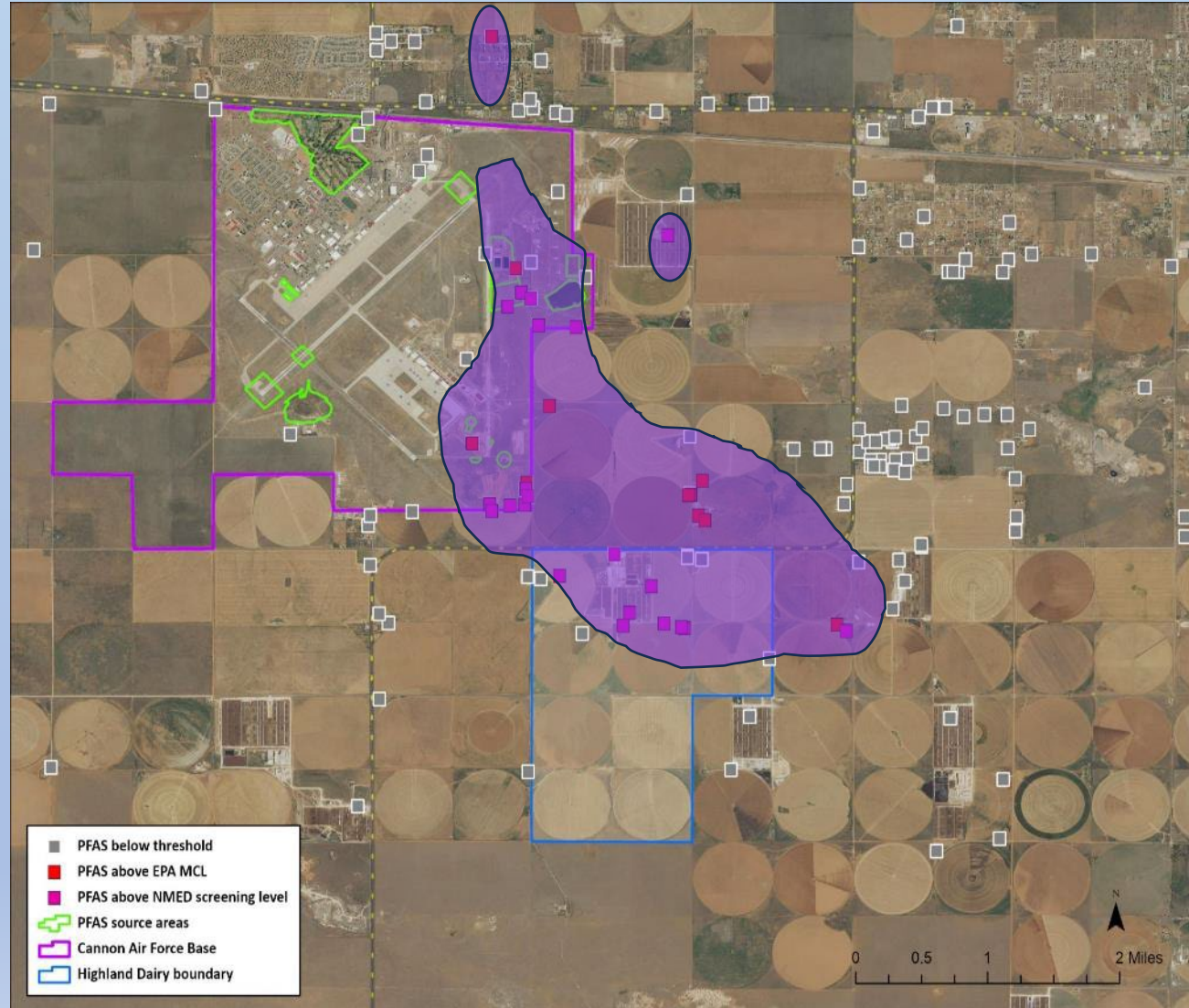
- PFAS contamination of the Ogallala Aquifer
- The Ogallala Aquifer is the primary source of water for agricultural, industrial, drinking and domestic uses in the area.
- Much of the area surrounding Cannon AFB is occupied by dairy farming operations, farms commonly irrigate with groundwater from the Ogallala Aquifer.



Cannon – Groundwater Plume

Plume parameters:

- ~3,360 acres
- 54ft thick (1980 – 140 ft thick)
- 0.148 specific yield



Current Status/Next Steps



Milestones

- ONRT joins MDL 2024
- Identify potential early restoration projects
- Settlement negotiations with USAF & USDOJ



Potential Restoration Project Ogallala Land & Water Conservancy

Program Approach:

- Ogallala Land & Water Conservancy (OLWC) was formed to work with local farmers to:
 - Put in place short-term 3-4 yr leases to immediately cease pumping from irrigation wells (interim stop-gap while CEs are put in place)
 - Follow-up with CEs to keep the wells out of production long term
 - Partners: Cannon AFB, DoD REPI, City of Clovis, Curry County, Conservation District, NMOSE



Program target: 26 landowners with 77 parcels covering approx. 21,800 acres

Parcels within the paleochannel northwest of Cannon AFB targeted for GW leases & conservation easements (orange and yellow squares)

Cannon AFB

Approx. location of PFAS groundwater plume

Potential Restoration Project

Playa Lake Restoration

- Important source of water recharge to the Ogallala Aquifer
- Small temporary wetlands in a clay basin, collect rainfall and runoff, and recharges the aquifer
- 4 acre playa provides ~1 acre feet of water per year, enough to supply water to a family of 4 for 2 years
- Many are degraded in the area due to sediment-infilling, lack of riparian areas, pits and ditches



photo credit: Playa Lake Joint Venture

Questions?

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