



FORMER MCAS EL TORO

Per- and Polyfluoroalkyl Substances Update

Former Marine Corps Air Station El Toro, Irvine, California

121st Restoration Advisory Board Meeting

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San Diego, California

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Presentation Overview



- **Background**
 - Per- and polyfluoroalkyl substances (PFAS)
 - Department of Defense guidance
 - Hydrogeologic setting
 - Local water supply/existing remedial systems
- **Groundwater Investigation Timeline**
- **Groundwater Plumes**
 - Shallow Groundwater Unit (SGU)
 - Principal Aquifer (PA)
- **Collaboration with Water Districts**
- **Program Status/Future Work**
- **Summary**



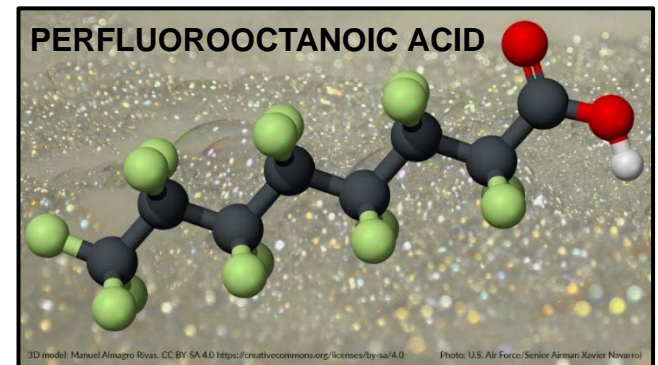
Background



PFAS



- **Synthetic organofluorine compounds**
- **Thermally stable, hydrophobic, and lipophobic**
- **Decades of use in industrial and consumer products**
 - *Firefighting foams (e.g., aqueous film-forming foam)*
 - *Metal plating operations (mist suppression)*
 - Stain-resistant/waterproof textiles (e.g., GORE-TEX®)
 - Nonstick cookware (e.g., Teflon™)
 - Cleaning products
 - Carpeting
 - Upholstery
 - Food wrappings
- **Not currently regulated and no promulgated standards exist**
- **U.S. Environmental Protection Agency (U.S. EPA) considering designating PFAS as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**



Department of Defense Guidance (15 October 2019 Memorandum)



- Bring PFAS into the CERCLA process, despite current lack of regulation
- Use U.S. EPA Regional Screening Levels; apply factor of 0.1 when more than one PFAS is present
- Determine need to move into CERCLA Remedial Investigation (RI) phase

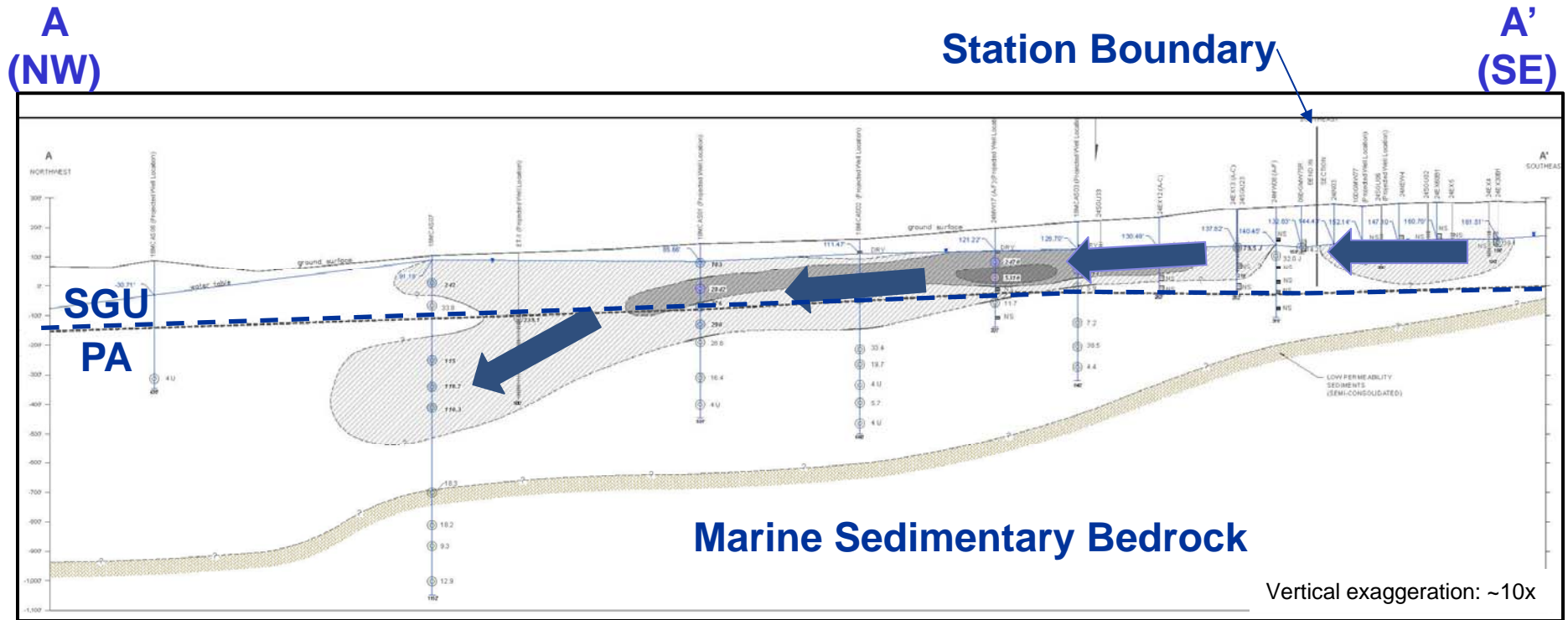
PFAS	Tap Water (ng/L)	Residential Soil (ng/kg)	Industrial Soil (ng/kg)
PFOA	40	130,000	1,600,000
PFOS	40	130,000	1,600,000
PFBS	40,000	130,000,000	1,600,000,000

Values assume more than one PFAS is present.
 ng/kg = nanograms per kilogram (parts per trillion)
 ng/L = nanograms per liter (parts per trillion)
 PFAS = per- and polyfluoroalkyl substances

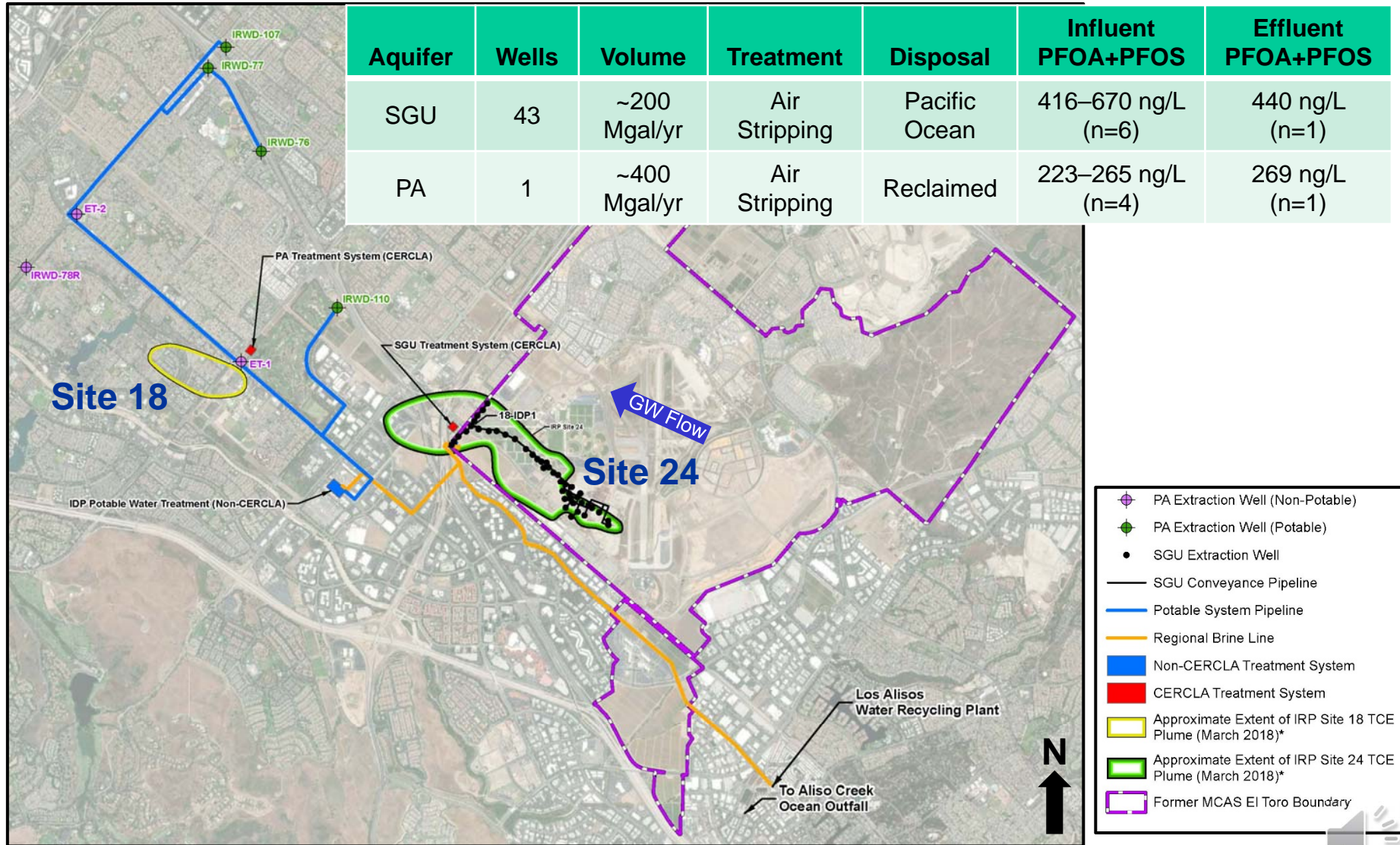
PFBS = perfluorobutanesulfonic acid
 PFOA = perfluorooctanoic acid
 PFOS = perfluorooctane sulfonate



Hydrogeologic Setting



Water Supply/Remedial Systems



Groundwater Investigation Timeline



Groundwater Investigation Timeline



2016

- Searched Navy databases, surrounding well locations
- Identified 7 sites as possible PFAS source areas

2017

- Sampled all 7 sites (n=25; 3,830* ng/L)
- Notified regulatory agencies and stakeholders

2018

- Informed by OCWD of no hits at closest potable extraction well, IRWD-110
- Sampled 2 sentry wells upgradient of IRWD-110 (n=10; 45.6* ng/L)
- Initiated regular meetings with the Water Districts to address the problem

*maximum PFOA+PFOS concentration
IRWD = Irvine Ranch Water District

OCWD = Orange County Water District
Water Districts = IRWD and OCWD



Groundwater Investigation Timeline (cont.)



2019

- Sampled to better define impacts at Sites 18, 24 (n=11; 5,310* ng/L)
- Continued regular meetings with the Water Districts

2020

- Sampled to better define impacts at Sites 18, 24 (n=33; 726* ng/L)
- Continued regular meetings with the Water Districts

2020
(cont.)

- Initiated CERCLA process via Draft Preliminary Assessment
- Collected and analyzed 171 groundwater samples to date in coordination with OCWD

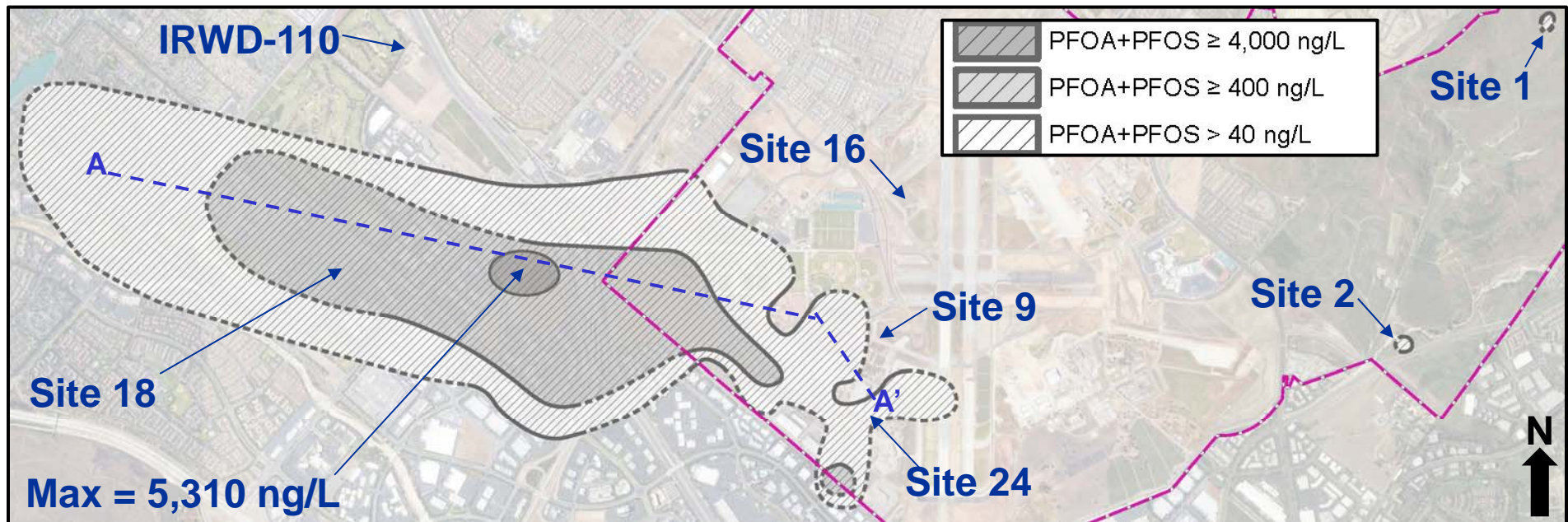
*maximum PFOA+PFOS concentration



Groundwater Plumes



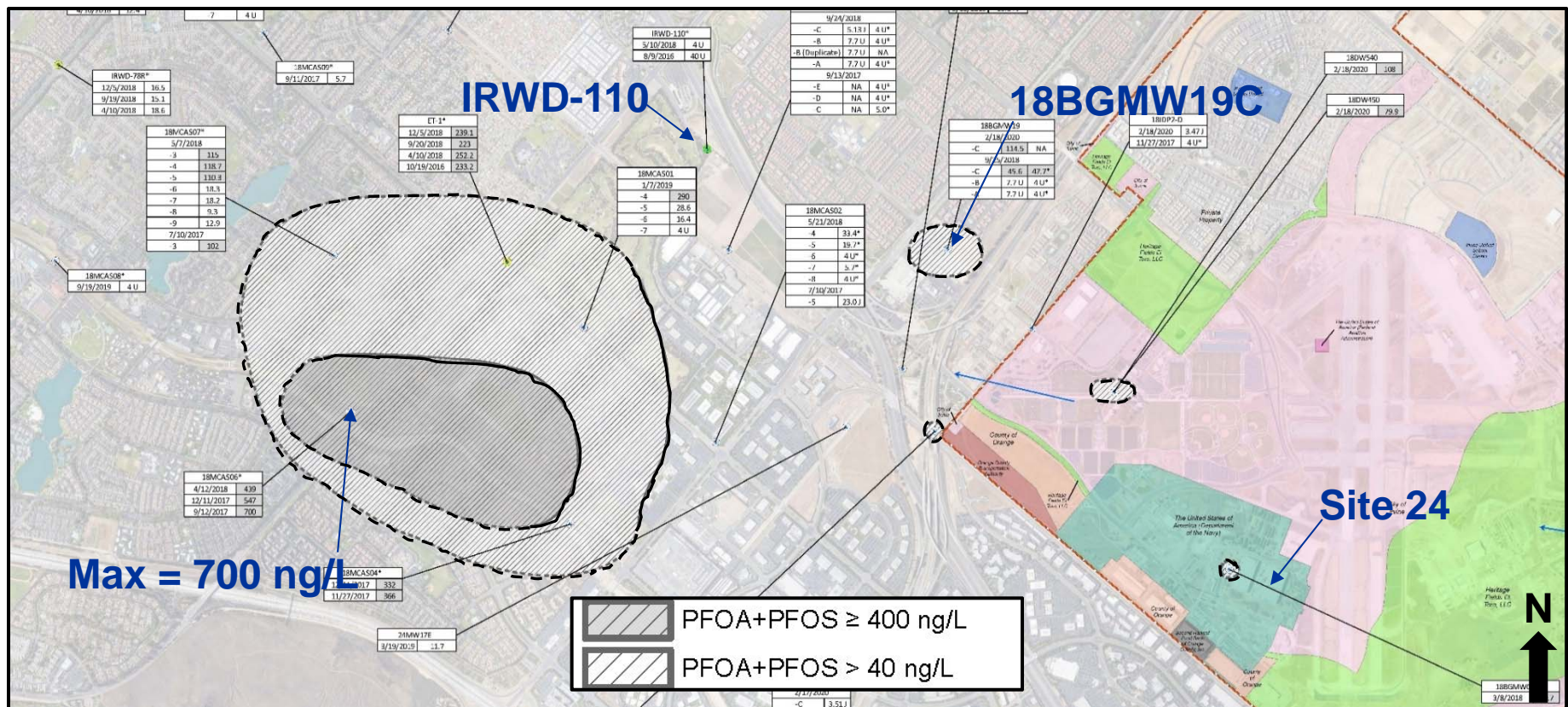
Shallow Groundwater Unit Plumes



PFOA+PFOS plume extents are estimated based on data collected by the Navy (n=47) and OCWD (n=28) from July 2016 through August 2020. Maximum concentrations were used where duplicate, split, or sequential sample results were available or when data from multiple depth intervals within the SGU were available.



Principal Aquifer Plumes



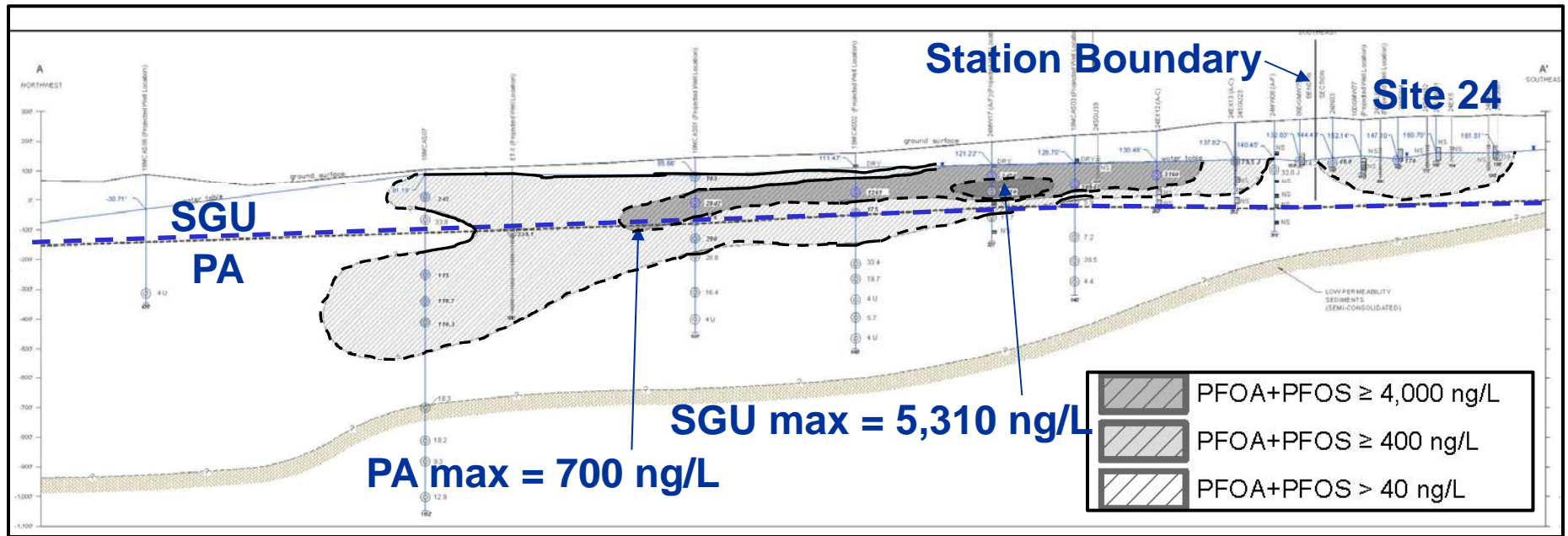
PFOA+PFOS plume extents are estimated based on data collected by the Navy (n=19) and OCWD (n=77) from July 2016 through August 2020. Maximum concentrations were used where duplicate, split, or sequential sample results were available or when data from multiple depth intervals within the PA were available.

Groundwater Plumes in Cross-Section



A
(NW)

A'
(SE)



Collaboration with Water Districts



Collaboration with Water Districts



- Existing groundwater treatment (air stripping) systems designed to address volatile organic compounds but not PFAS
- Regular meetings to discuss potential treatment system modifications, but hampered by:
 - lack of CERCLA hazardous substance designation
 - complex Settlement Agreement governing the operation and maintenance of the existing treatment systems
- Funds for treatment system modifications in discussion
- Pilot studies on efficacy of various media underway
- In the meantime, the Navy and Water Districts continue to share data, coordinate split sampling, and plan additional actions



Program Status/Future Work



Program Status/Future Work



- **Preliminary Assessment/Site Inspection ongoing**
- **32 Areas of Interest identified**
- **Next steps a function of:**
 - previous groundwater sampling results, if available
 - expected impacts based on conceptual site model/site knowledge
 - current regulatory status
 - current property ownership
- **Continue the CERCLA process on property owned by the Navy and/or subject to ongoing CERCLA response; disclose findings to owners of other property not subject to ongoing CERCLA response**
- **Soil sampling will be conducted in addition to groundwater sampling**



Program Status/Future Work (cont.)



GW Results	Expected Impacts	CERCLA Status	Property Owner	Notify	SI	RI	Example
N/A	Unknown	N/A	Non-Navy	X			Plane Crash Site
N/A	Unknown	Closed	Navy			X	Site 12 (WWTP)
<DoDSL	None	Open	Non-Navy	X			Site 16 (FFTA)
>DoDSL	Limited	Open	Navy		X		Site 1 (EOD)
>DoDSL	Limited	Open	Non-Navy	X	X		Site 2 (LF)
>DoDSL	Extensive	Closed	Navy			X	Site 9 (FFTA)
>DoDSL	Extensive	Open	Non-Navy	X		X	Site 18 (PA)
>DoDSL	Extensive	Open	Navy			X	Site 24 (SGU)
>DoDSL	Extensive	Open	Non-Navy	X		X	Site 24 (SGU)

DoDSL = Department of Defense screening level
 EOD = Explosive Ordnance Disposal Training Range
 FFTA = Firefighter Training Area
 GW = groundwater

LF = landfill
 N/A = not available or not applicable
 SI = Site Inspection
 RI = Remedial Investigation
 WWTP = wastewater treatment plant



Approximate Schedule



- **Finalize CERCLA Preliminary Assessment/Site Inspection Report (May 2021)**
- **Submit Draft SI and RI Work Plans (Summer 2021)**
- **Finalize SI and RI Work Plans (December 2021)**
- **Conduct fieldwork (First Half of 2022)**
- **Submit Draft SI and RI Reports (Late 2022)**



Summary



Summary



Forward-leaning approach resulted in extensive pre-CERCLA characterization of El Toro PFAS plumes

- 171 samples collected (max PFOA+PFOS = 5,310 ng/L)
- Concentrations generally decrease with depth, some by orders of magnitude
- No drinking water supply wells affected, but plumes have moved onto previously transferred property and beyond Station boundaries
- Navy recognized favorably by regulatory agencies and Water Districts

Existing air stripping systems not effective for PFAS

- Impacted groundwater entering reclaimed system, ocean
- Ongoing collaboration with the Water Districts for treatment modifications
- Ongoing pilot studies to evaluate various treatment media
- Lack of CERCLA hazardous substance designation and convoluted Settlement Agreement have complicated tactics



Acronyms



BRAC – Base Realignment and Closure

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act

CPSS – Certified Professional Soil Scientist

DoDSL – Department of Defense screening level

EOD – Explosive Ordnance Disposal

FFTA – firefighter training area

GW – groundwater

IRWD – Irvine Ranch Water District

LF – landfill

Mgal/yr – million gallons per year

MS – Master of Science

n – number of samples

Navy – U.S. Department of the Navy

ng/kg – nanograms per kilogram

ng/L – nanograms per liter

OCWD – Orange County Water District

PA – Principal Aquifer

PFAS – per- and polyfluoroalkyl substances

PFBS – perfluorobutanesulfonic acid

PFOA – perfluorooctanoic acid

PFOS – perfluorooctane sulfonate

PFOA+PFOS – summed concentration of PFOA and PFOS

PG – Professional Geologist

RI – Remedial Investigation

S – soil

SGU – Shallow Groundwater Unit

SI – Site Inspection

U.S. EPA – United States Environmental Protection Agency

Water Districts – IRWD and OCWD

WWTP – wastewater treatment plant