



PFAS Datathon

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Research Scientist III

California State Water Boards

Division of Drinking Water

December 4-5, 2019





Why We're Here

How might we
build the
foundation for
solutions?

Management Questions



Data



Solutions



Draft/Preliminary: CA PFAS Data Fingerprint Analysis

Matt Small and Shea Caspersen, U.S. EPA Region 9





Background

- Question to be answered:
“Can we visually discern any PFAS chemical occurrence trends from CA PFAS data.”
- Note: this analysis is draft and preliminary. Trends are for discussion only and should be verified and investigated with additional data.





Process

- Downloaded spreadsheet from CA Waterboard web site.
<https://www.waterboards.ca.gov/pfas/>
- Edited spreadsheet: removed non-detects, removed summed PFOA/PFAS, renamed compounds with short names.
- Created analysis app using EPA Enterprise data analytics tool Qlik.
<https://www.qlik.com/us/>
- Soon to be released as a publicly available web app.

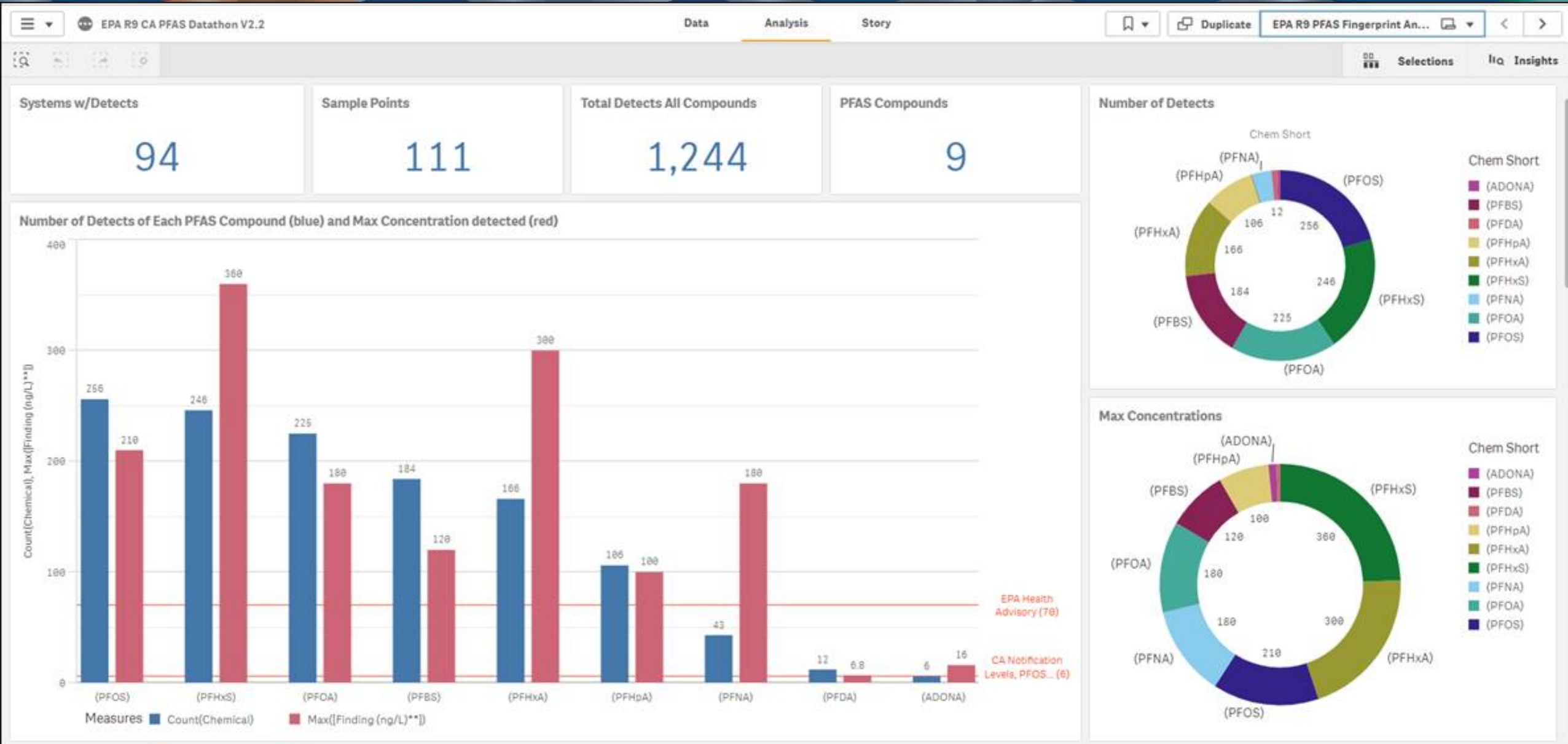




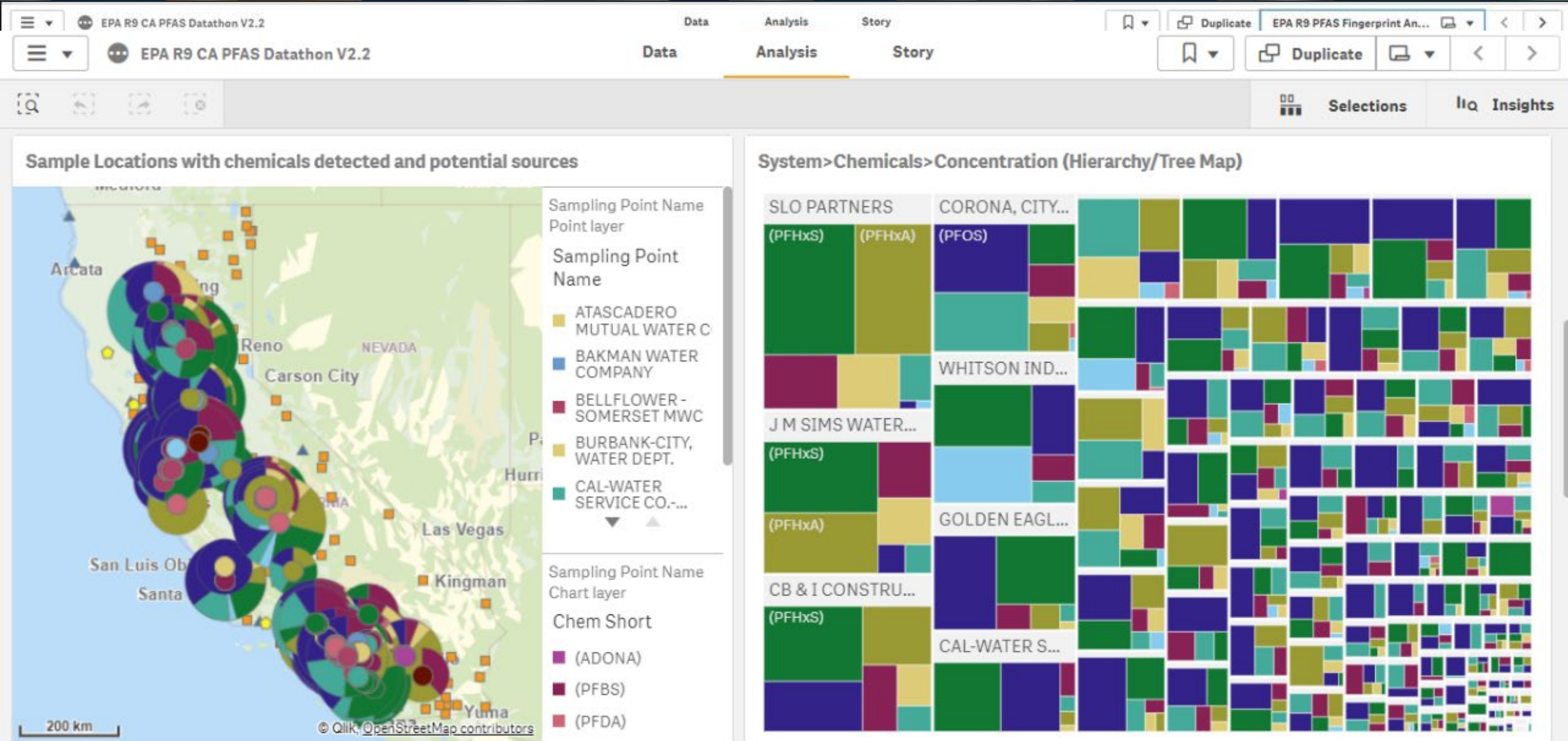
Results

- Preliminary observations

App Overview: Data view

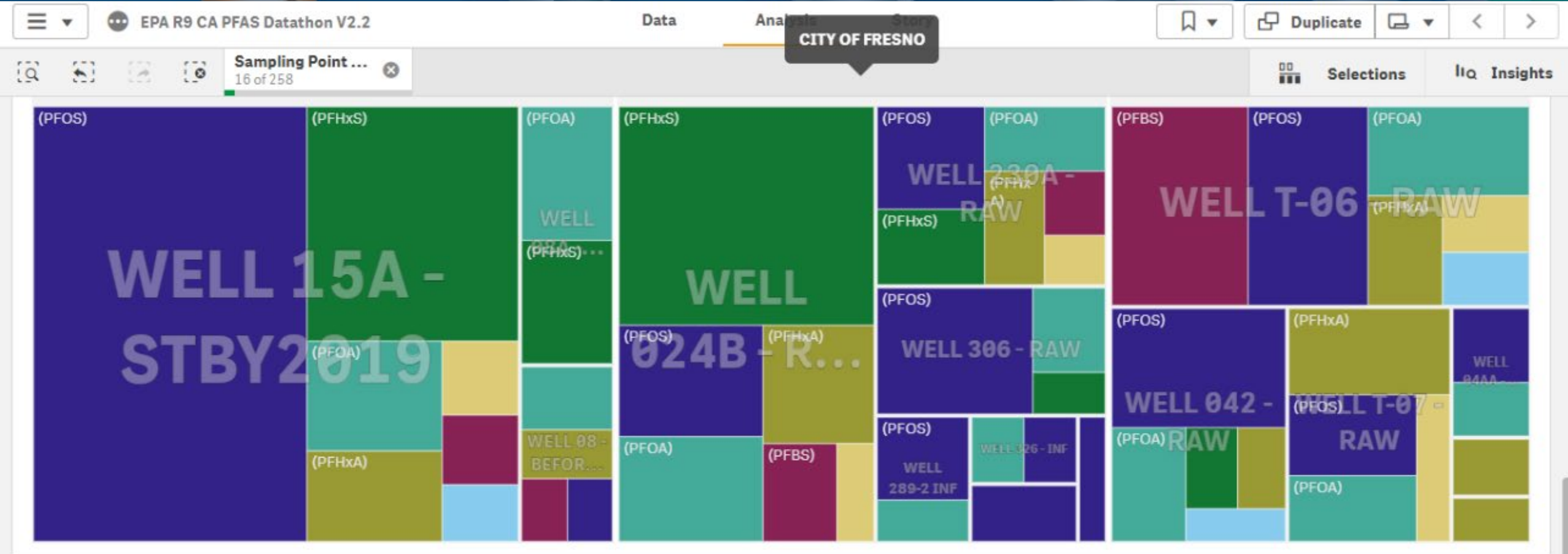


App Overview: Pie Chart Map and Tree Map



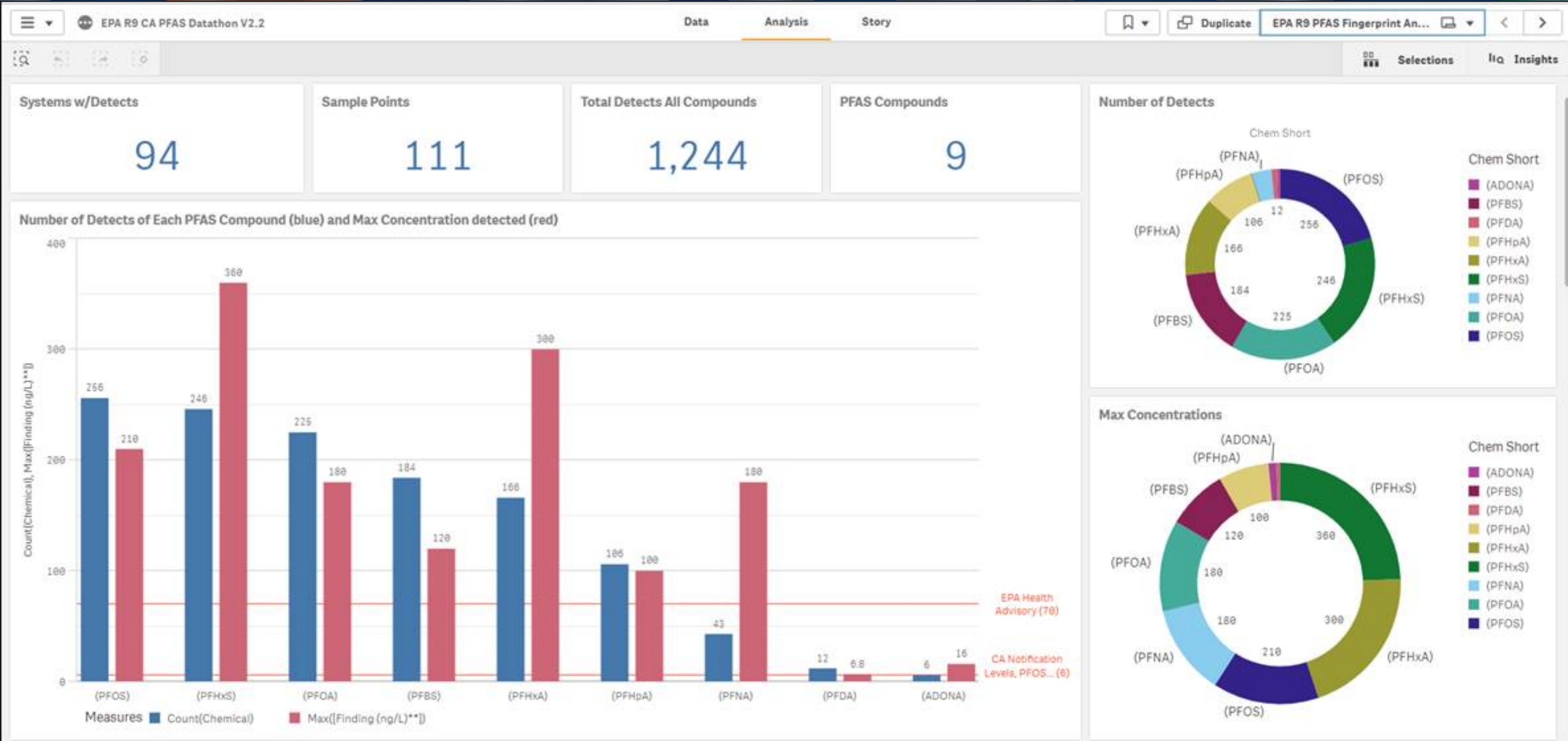


App Overview: Well Tree Map and Data Table

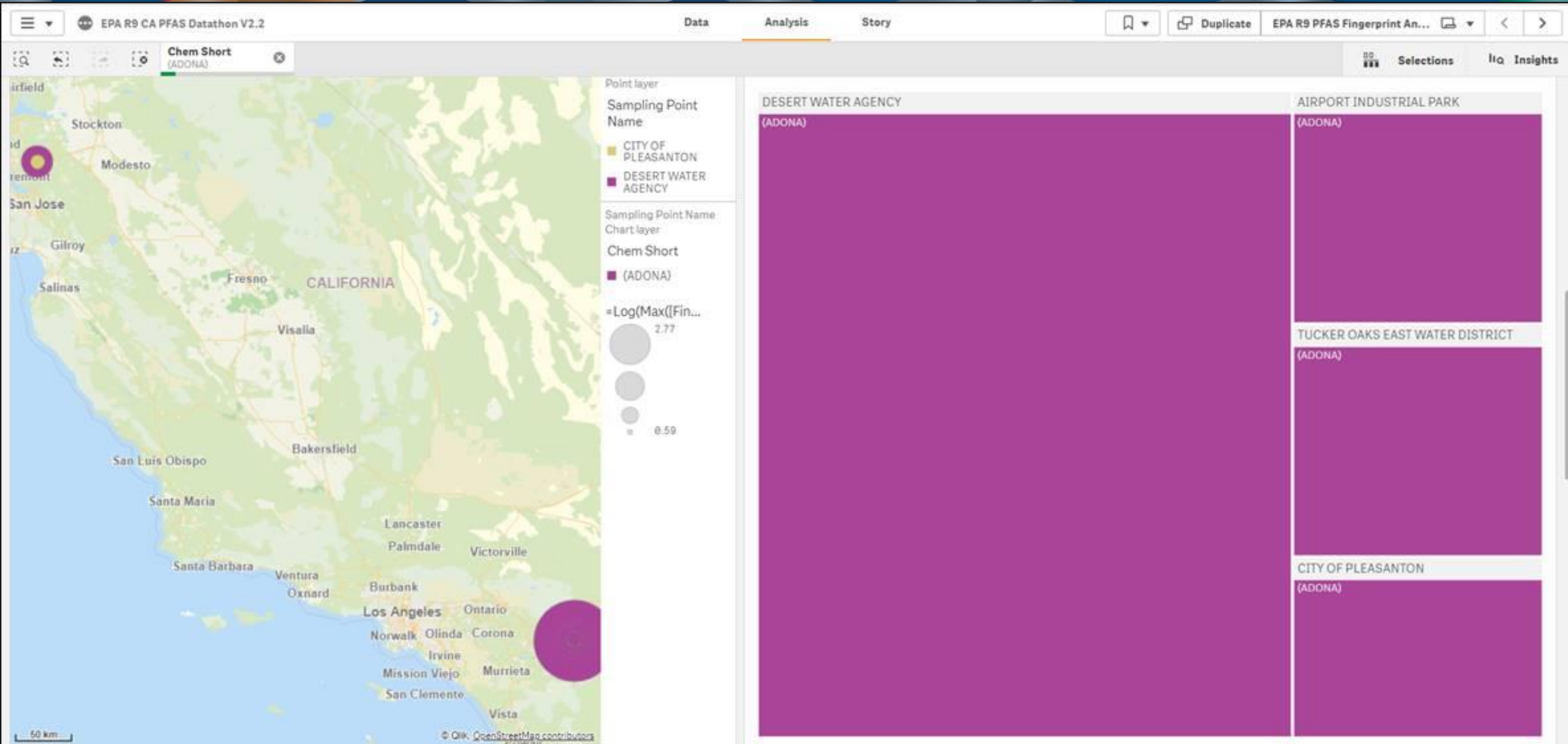


Chemical	District/LPA	Finding (ng/L)...	Location***	Sample Point ID	Sampling Point Name	Stat
PERFLUOROBUTANESULFONIC ACID (PFBS)	DISTRICT 11 - MERCED	1.2	Airport (2mi)	622	WELL 230A - RAW	A
PERFLUOROBUTANESULFONIC ACID (PFBS)	DISTRICT 11 - MERCED	2.2	Not Phase 1	393	WELL 024B - RAW	A

Preliminary Trend: Adona



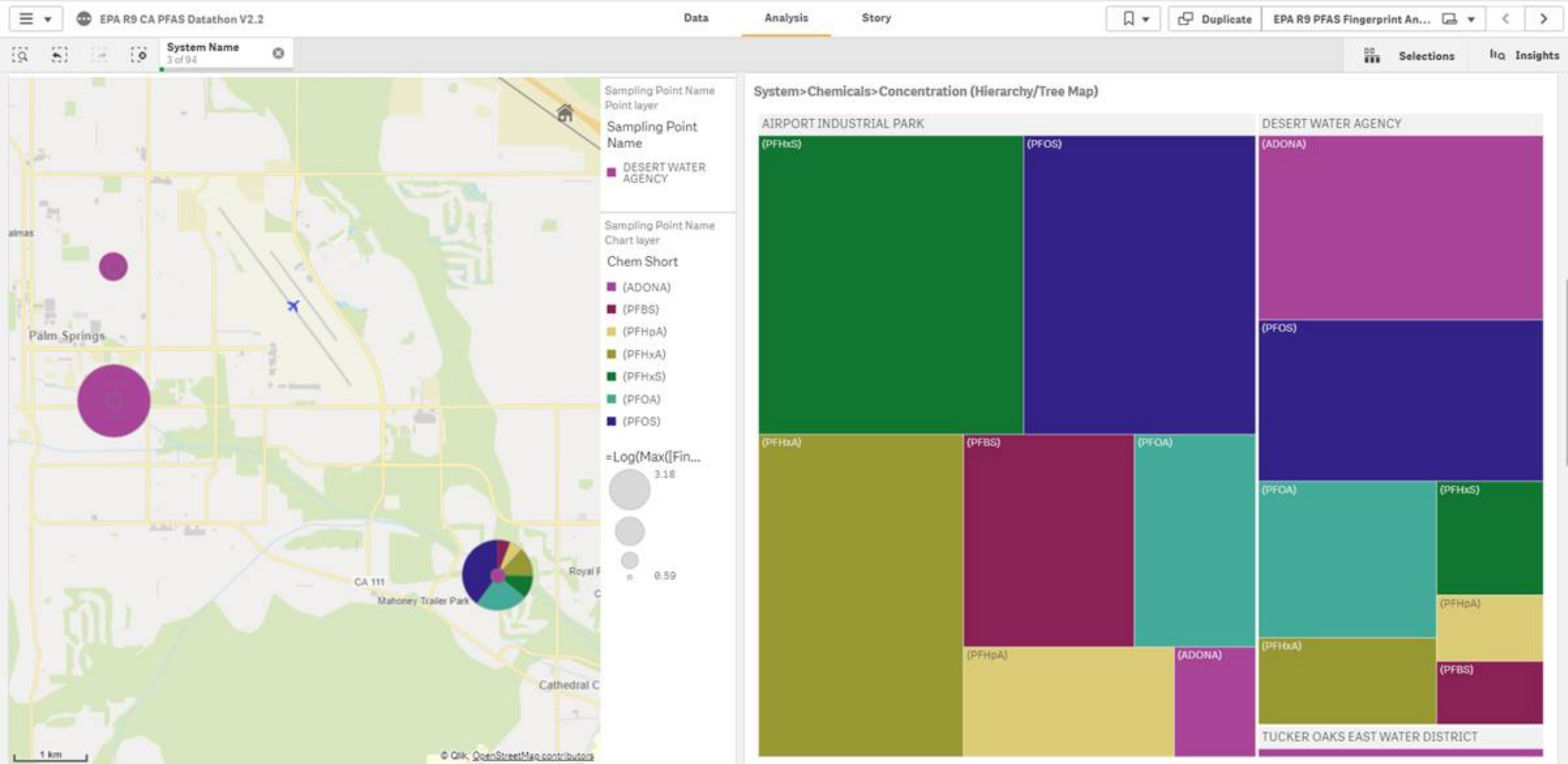
Preliminary Trend: Adona



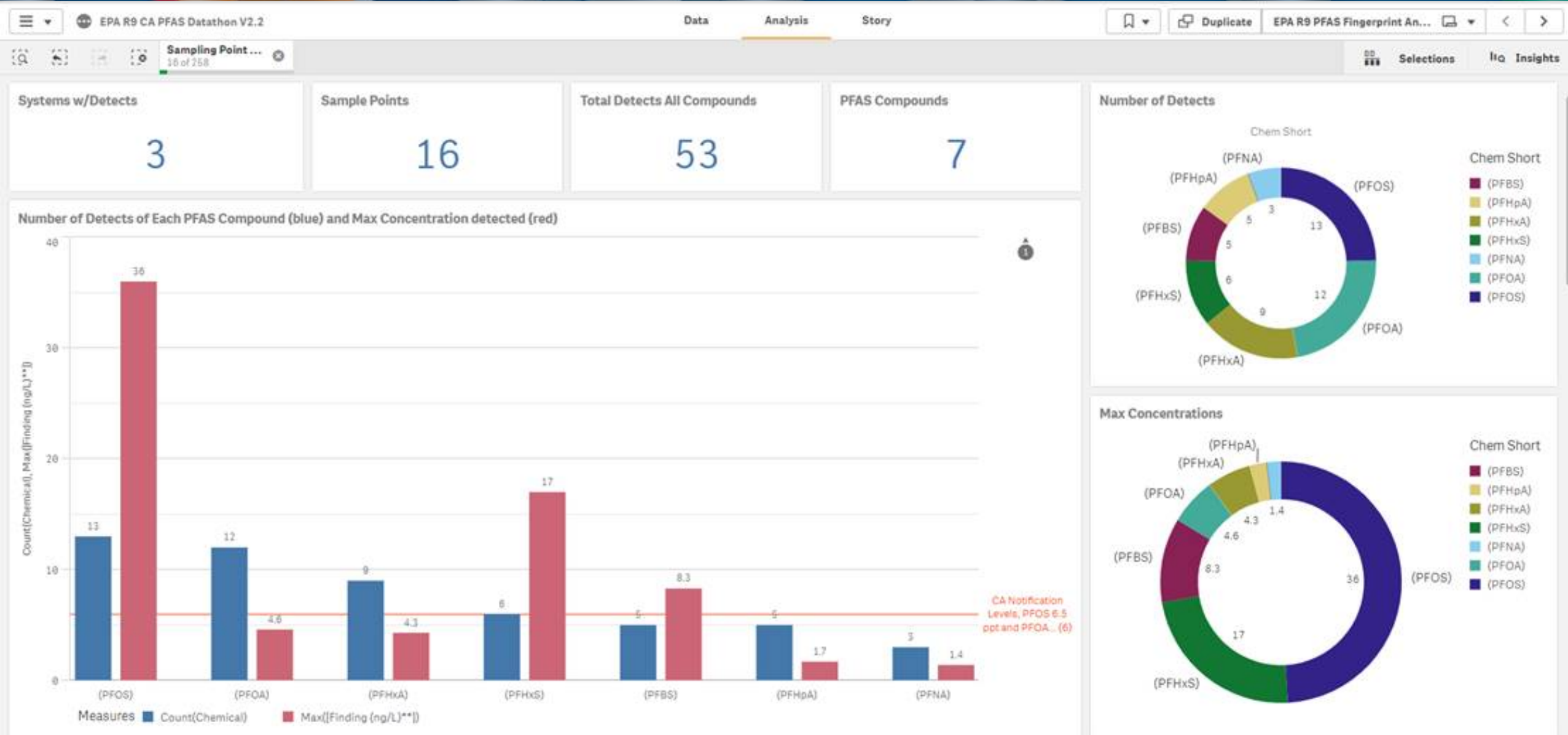
December 5, 2019

Draft: CA PFAS Data Fingerprint Analysis

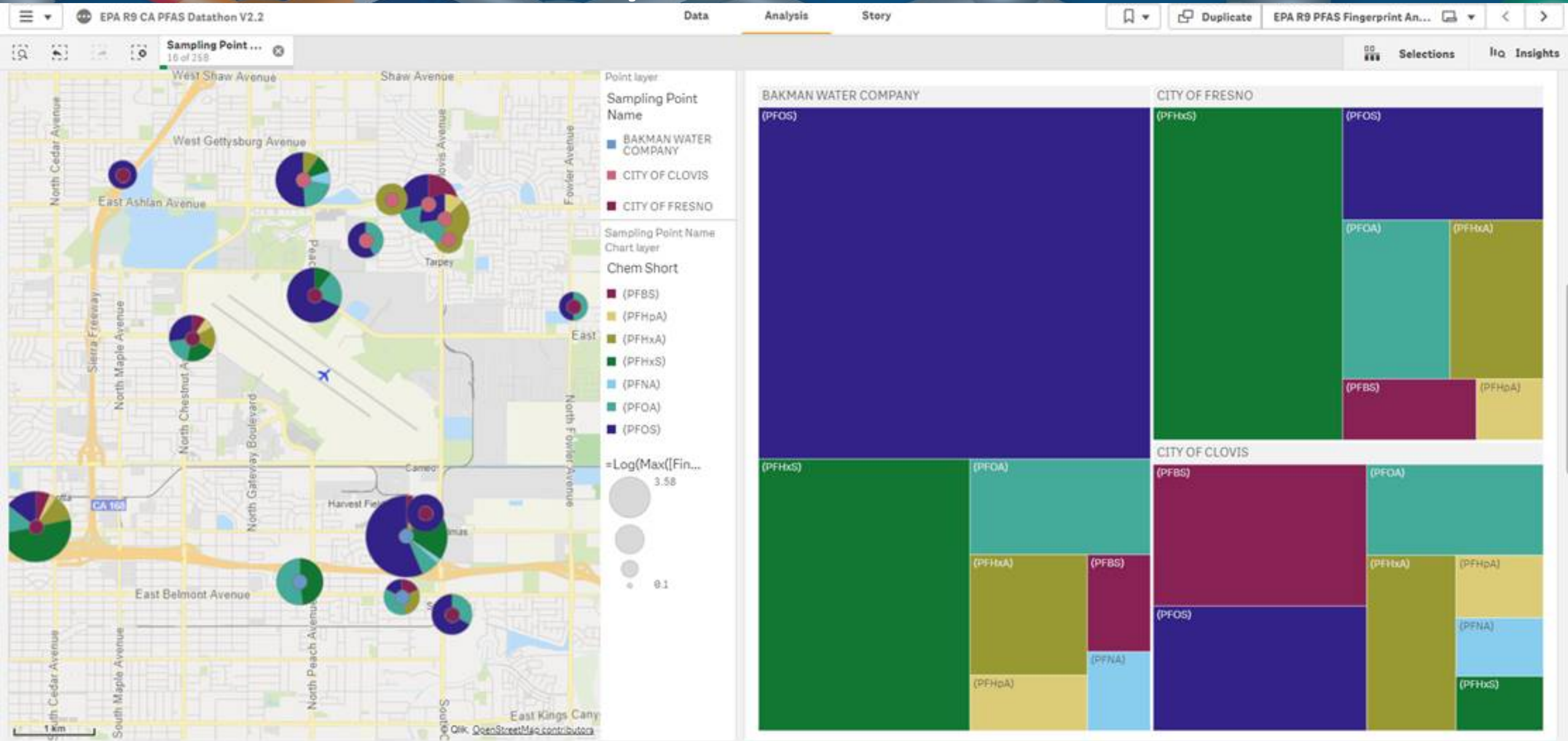
Preliminary Trend: Adona



Preliminary Trend: Fresno Area



Preliminary Trend: Fresno Area



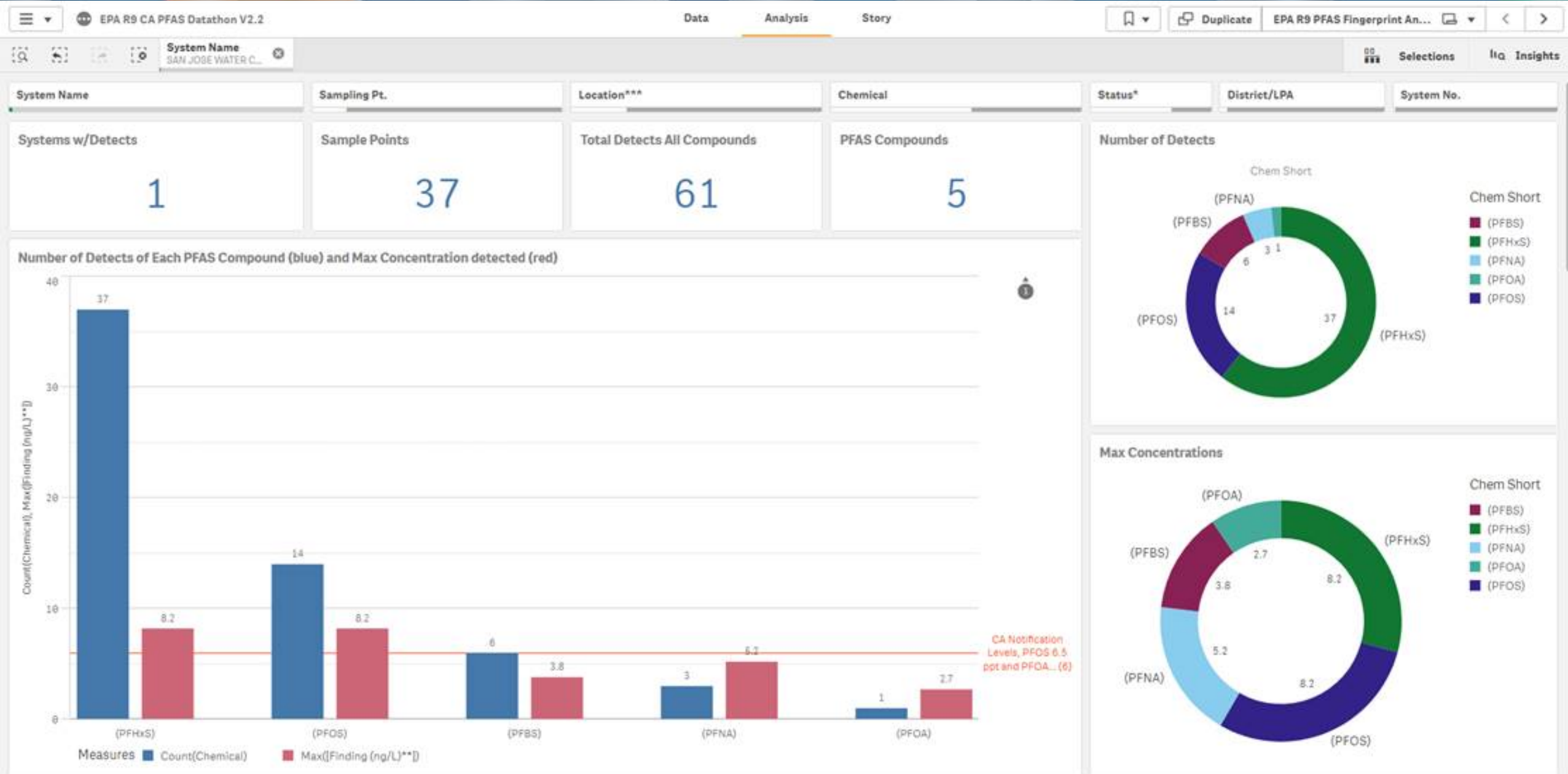
December 5, 2019

Draft: CA PFAS Data Fingerprint Analysis

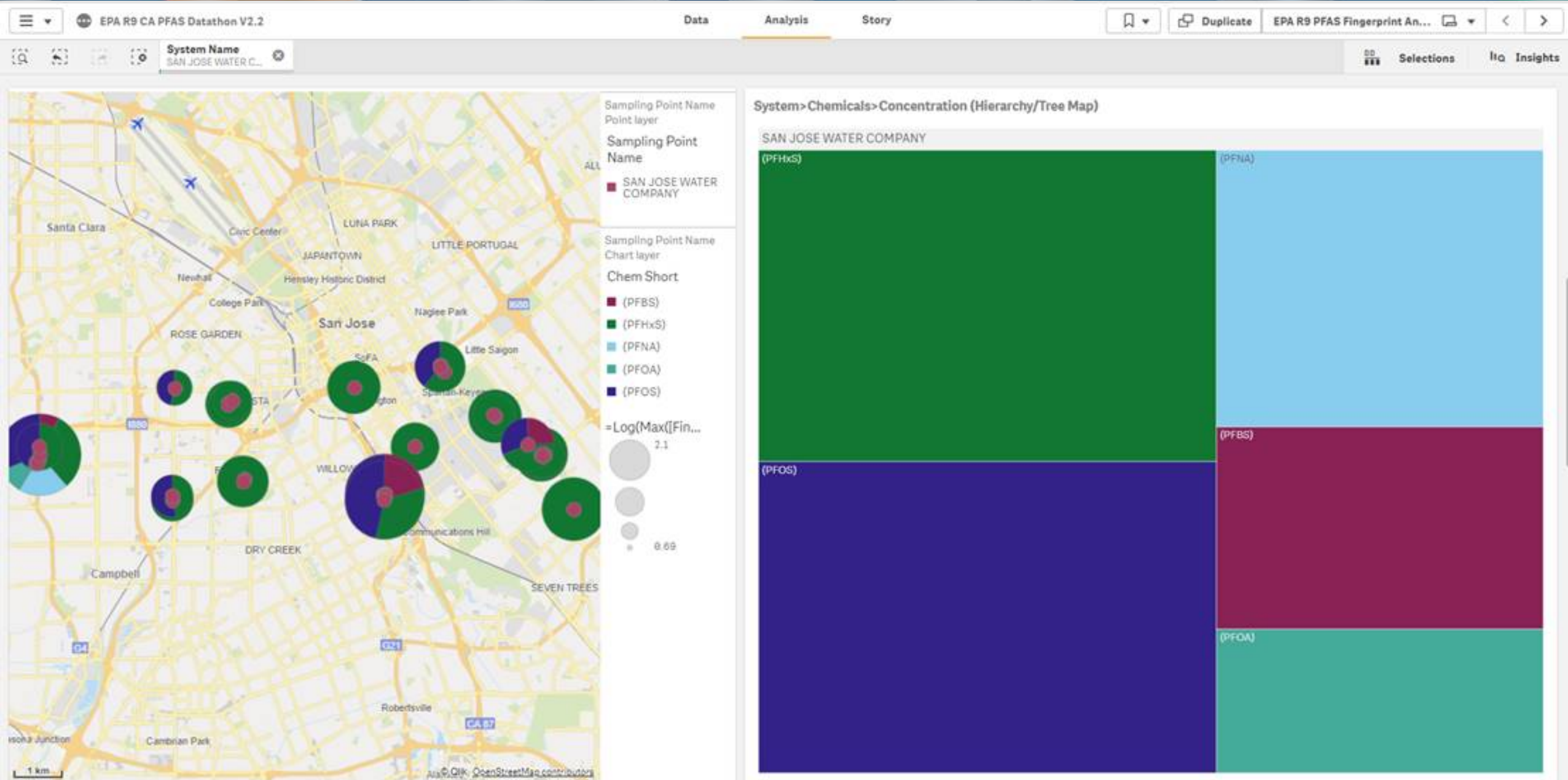
Preliminary Trend: Fresno Area



Preliminary Trend: San Jose Water Company

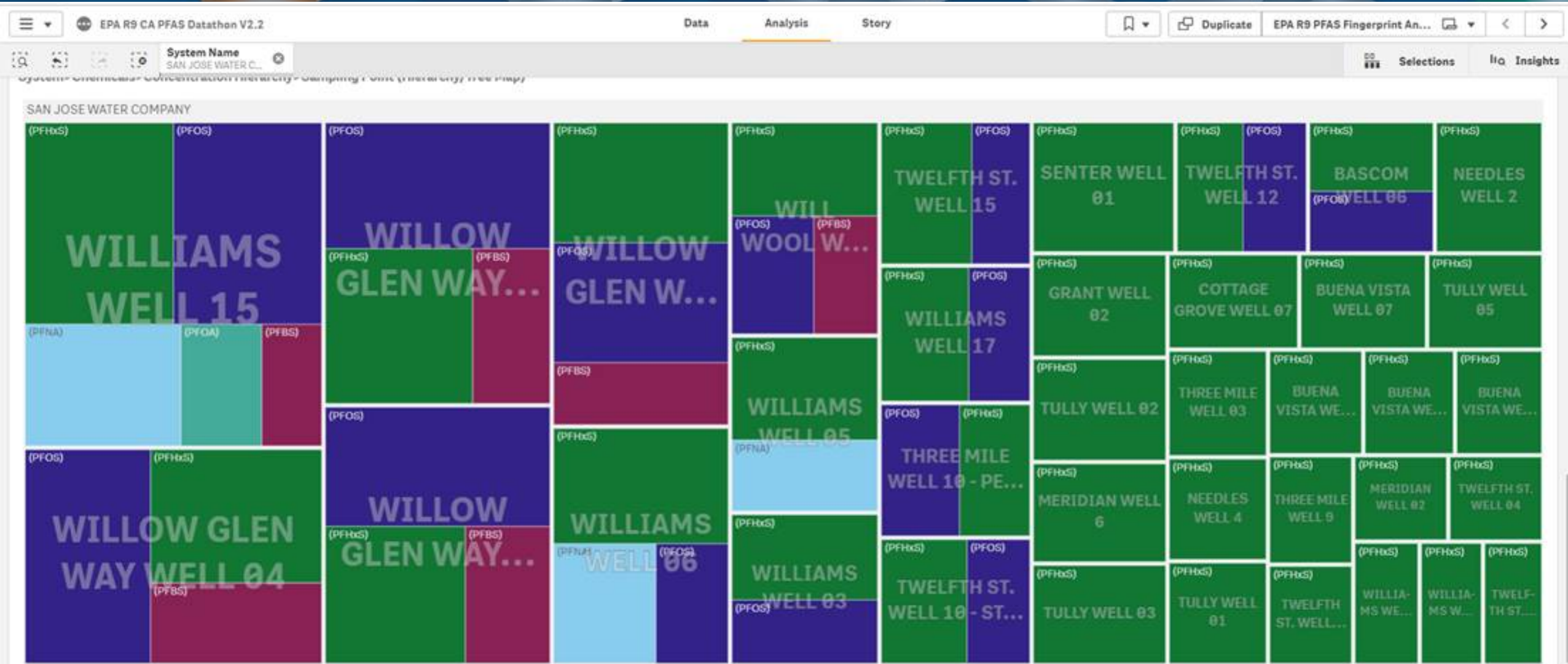


Preliminary Trend: San Jose Water Company

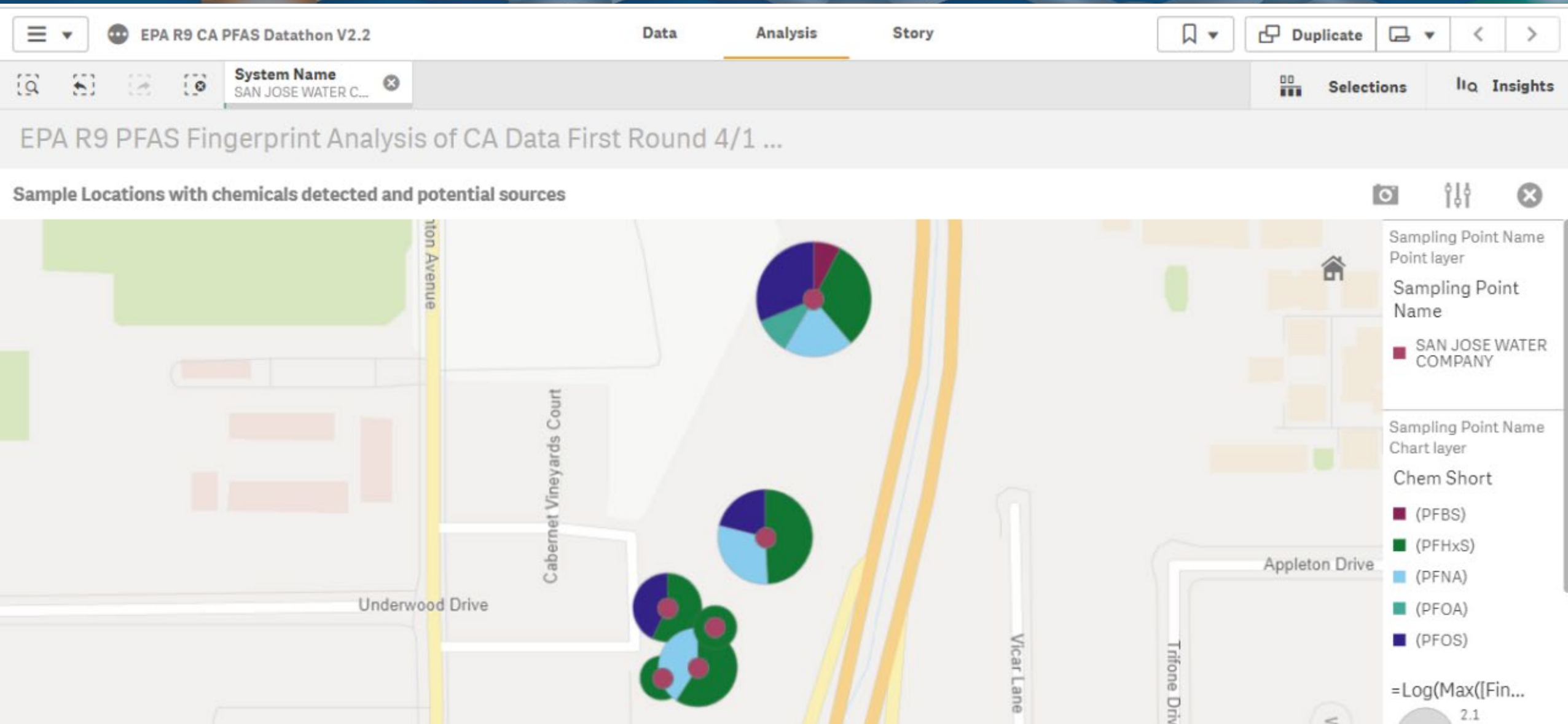




Preliminary Trend: San Jose Water Company



Preliminary Trend: Fate and Transport Trend?





Summary

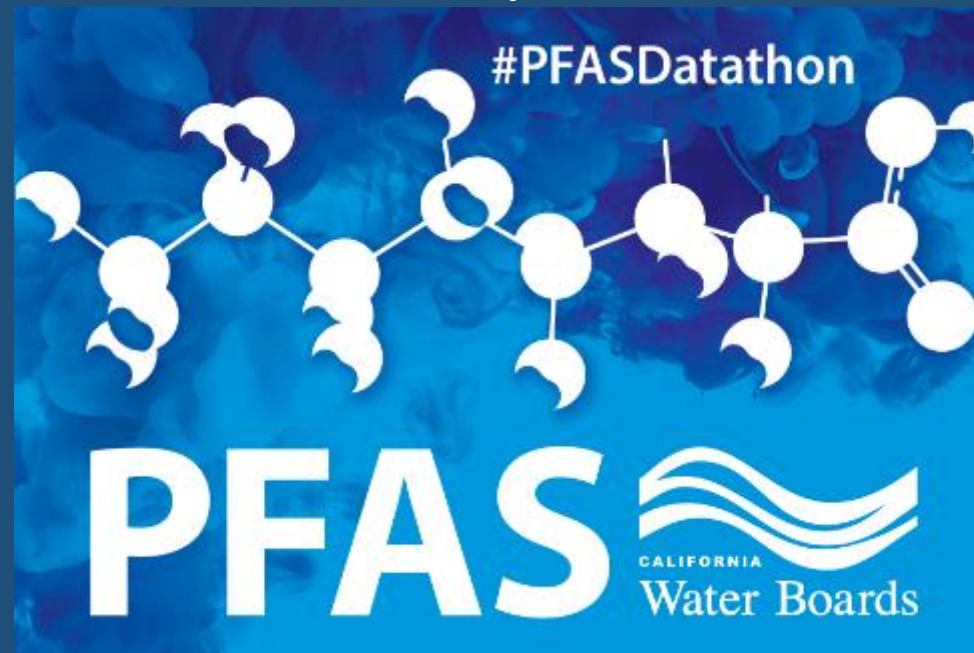
- YES, we can visually discern any PFAS chemical occurrence trends from CA PFAS data.
- Multiple potential explanations exist for these trends.
- Additional detailed data is needed to further evaluate these trends such as: well data, pumping rates, capture zones, screen lengths, ground water flow vectors, business types, PFAS use trends, etc.
- Evaluate observed trends using additional data sources.



Thank you!

Draft/Preliminary: CA PFAS Data Fingerprint Analysis

Matt Small and Shea Caspersen, U.S. EPA Region 9





PFAS ANALYSIS AND INTERVENTION

Melissa Salazar

Andrew Cullen, Brittany Saleeby





Background

- Web based application to analyze and possibly implement interventions to prevent further contamination.
- Analysis may be time consuming or the personnel to do the analysis is non-existent
- The initial dataset came from a test site along the Santa Ana River





Process

- Sourcing existing resources: CA Water Boards
 - https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/EDTlibrary.html
- Wrangling data to provide appropriate format for analysis
- Standardizing the process to create consistency
- Developing pipelines for long term analysis and insight generation





December 5, 2019

PFAS ANALYSIS AND INTERVENTION





Summary

- Future work
 - Minor code changes to improve efficiencies
 - Implement a weather API to bring in historical data as well as forecasted
- https://meldataaa.shinyapps.io/PFAS_Analysis_and_Intervention/
- <https://github.com/CAWaterBoardDataCenter/PFAS-Analysis-and-Intervention>

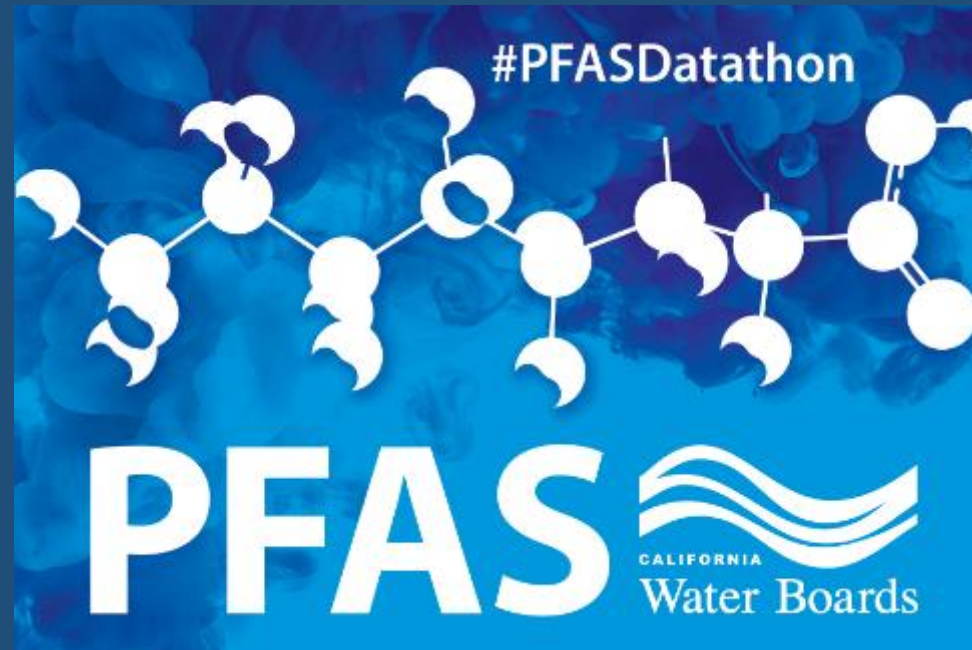



Thank you!

PFAS ANALYSIS AND INTERVENTION

Melissa Salazar

Andrew Cullen, Brittany Saleeby





PFAS In Drinking Water: Correlations to PFAS in Blood Serum?

Team members:

Dori Bellan (DWQ), Emily Houlihan (DWQ),
Payman Alemi (DDW), Hung Bui (DDW), Rassam Zarghami (DDW),
Heidi Dieffenbach-Carle (Wood E&I, PLC)





THE RELATIVE CONTRIBUTION OF PFAS IN DRINKING WATER TO BODY LOAD IS UNKNOWN

GROUNDWATER QUALITY

- STATE WATER BOARD 13267 ORDERS FOR GROUNDWATER QUALITY IN SELECTIVE REGIONS IN THE STATE
- OF THE SEVEN PFAS CHEMICALS ANALYZED IN BLOOD SERUM, 926 RECORDS OF GROUNDWATER QUALITY

BLOOD SERUM

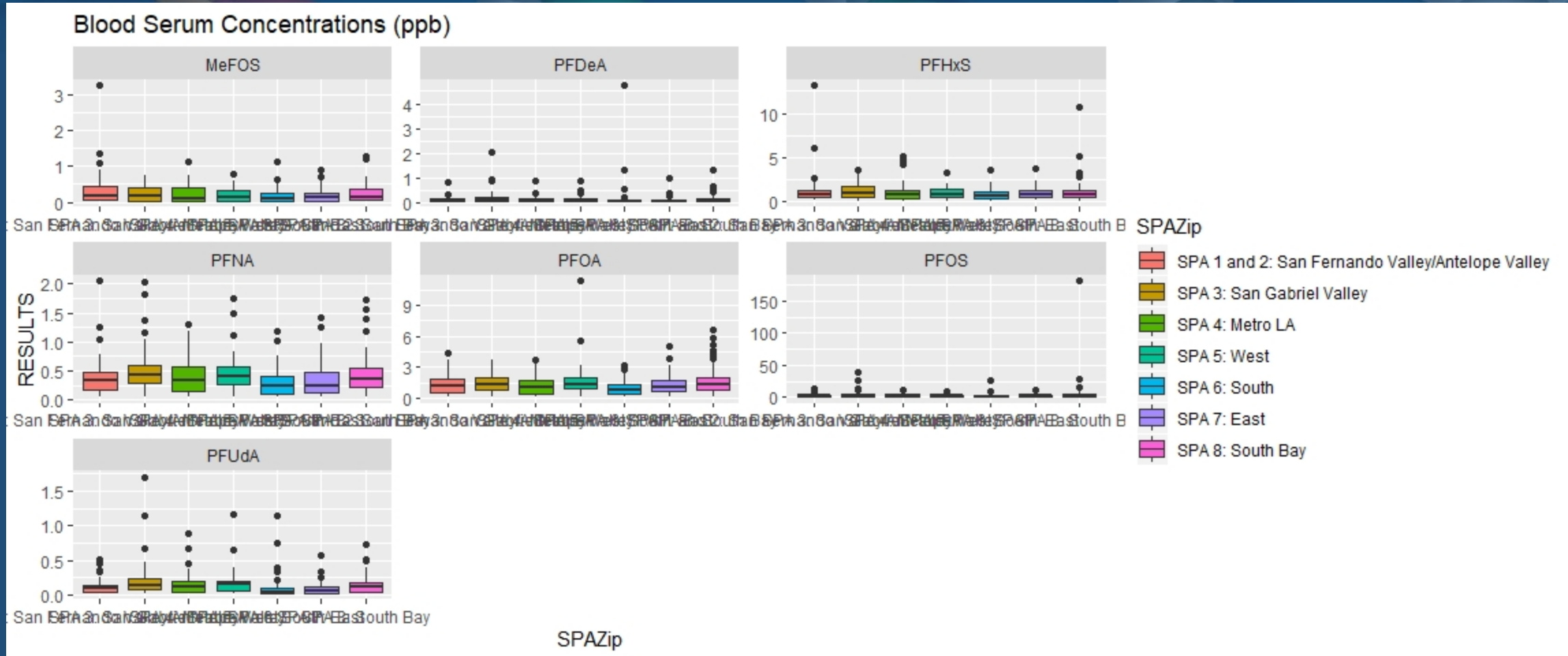
- CDPH CONDUCTED BIOMONITORING FOR PFAS IN LOS ANGELES COUNTY
- IN LA COUNTY, 425 PEOPLE WERE TESTED FOR SEVEN PFAS CHEMICALS IN THEIR BLOOD SERUM
- ALL DATA WAS SCRAMBLED- CONFIDENTIAL ISSUES

THE GOAL OF THIS PROJECT IS TO DETERMINE IF DRINKING WATER PFAS LEVELS ARE CORRELATED MEASURED EXPOSURE CONCENTRATIONS

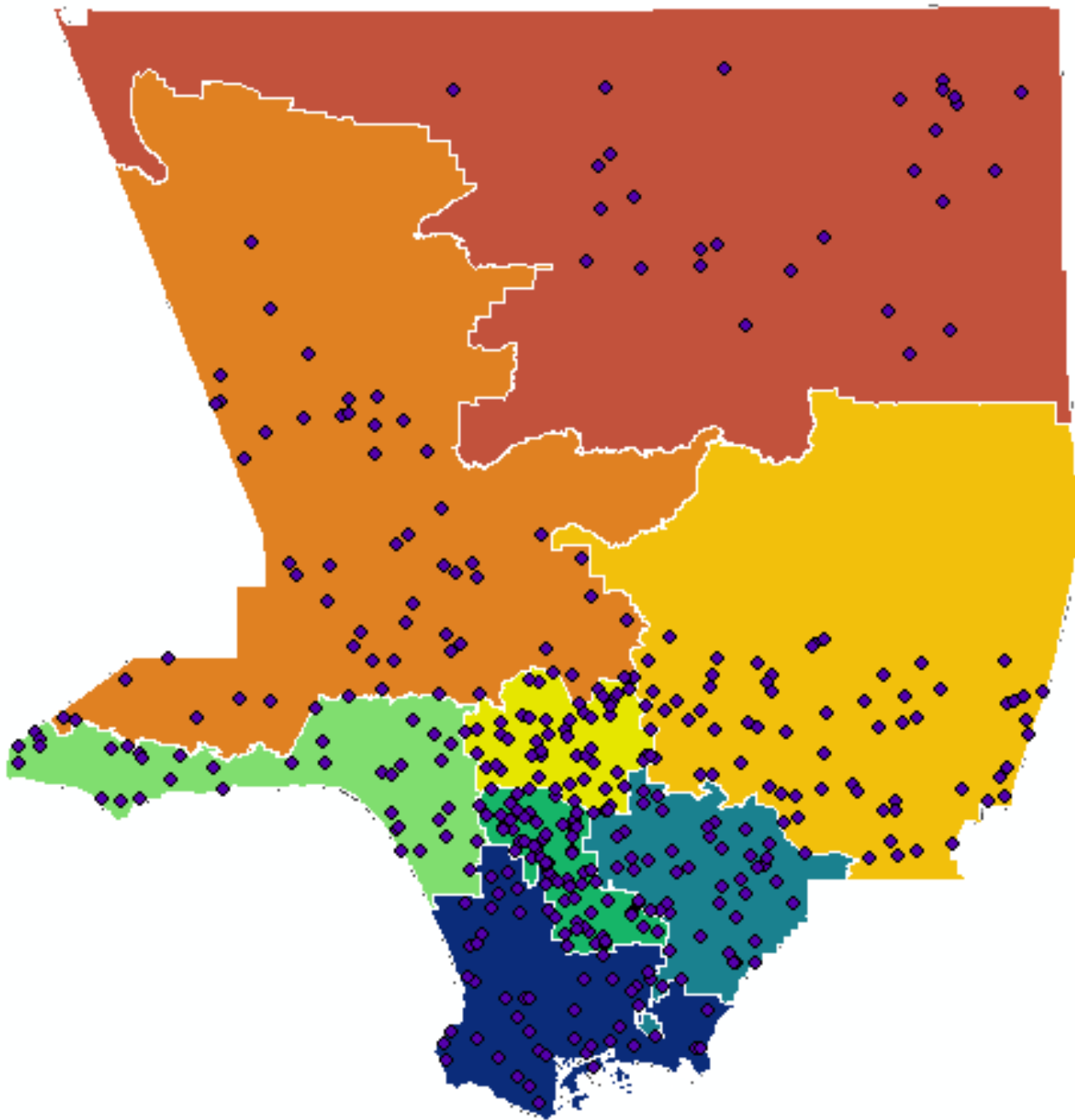


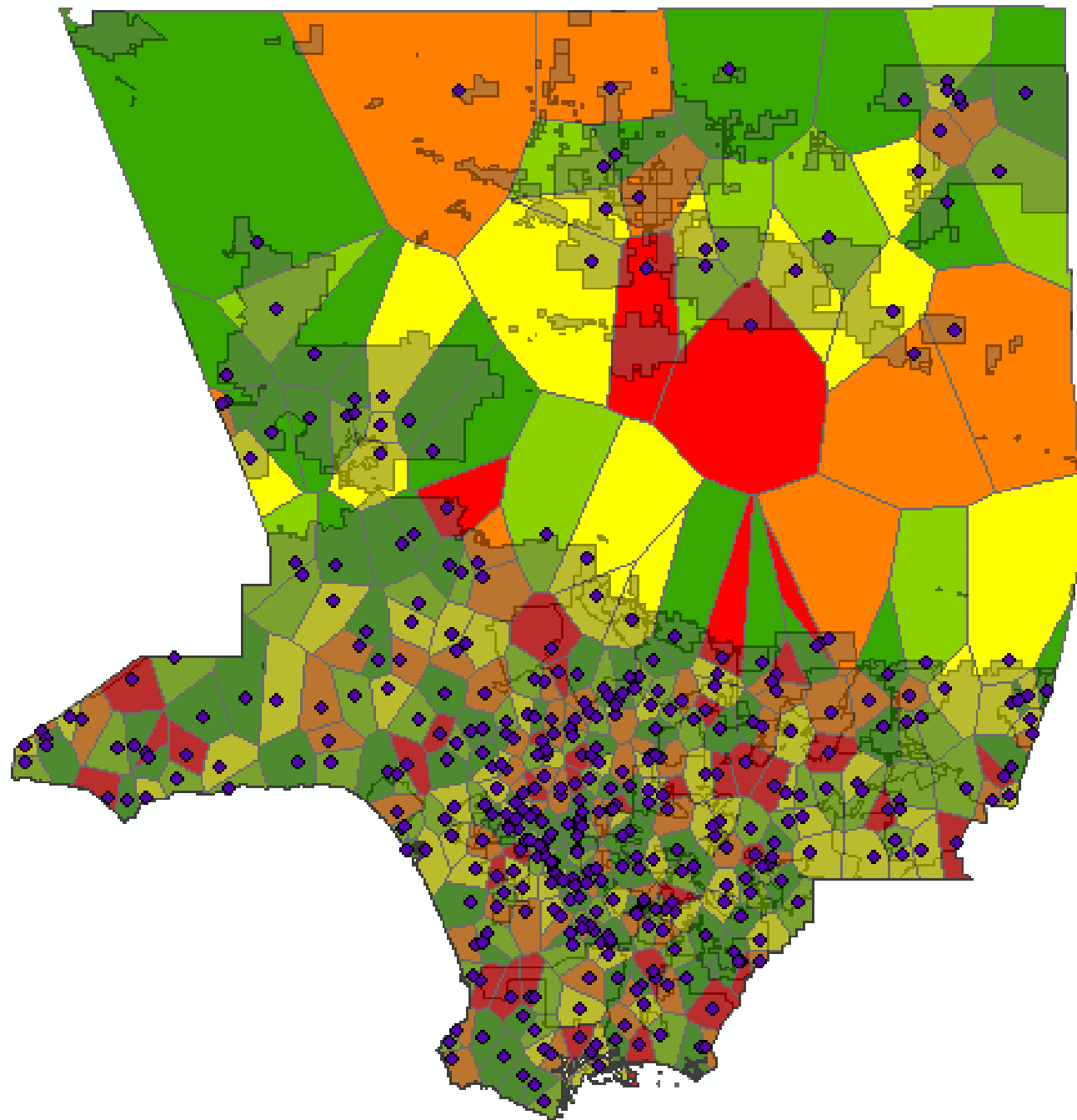


PFAS Levels in Blood Serum

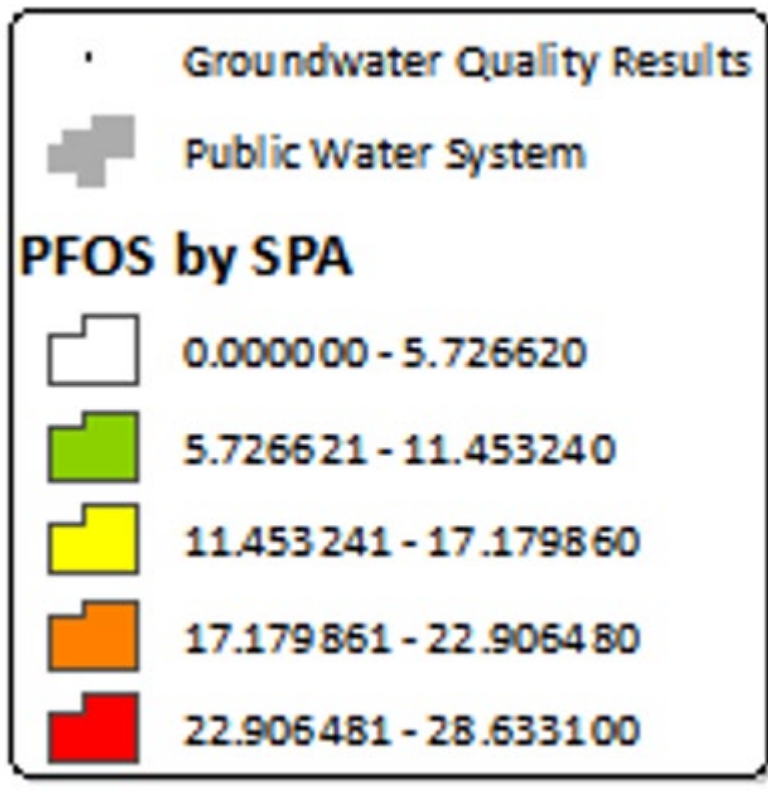
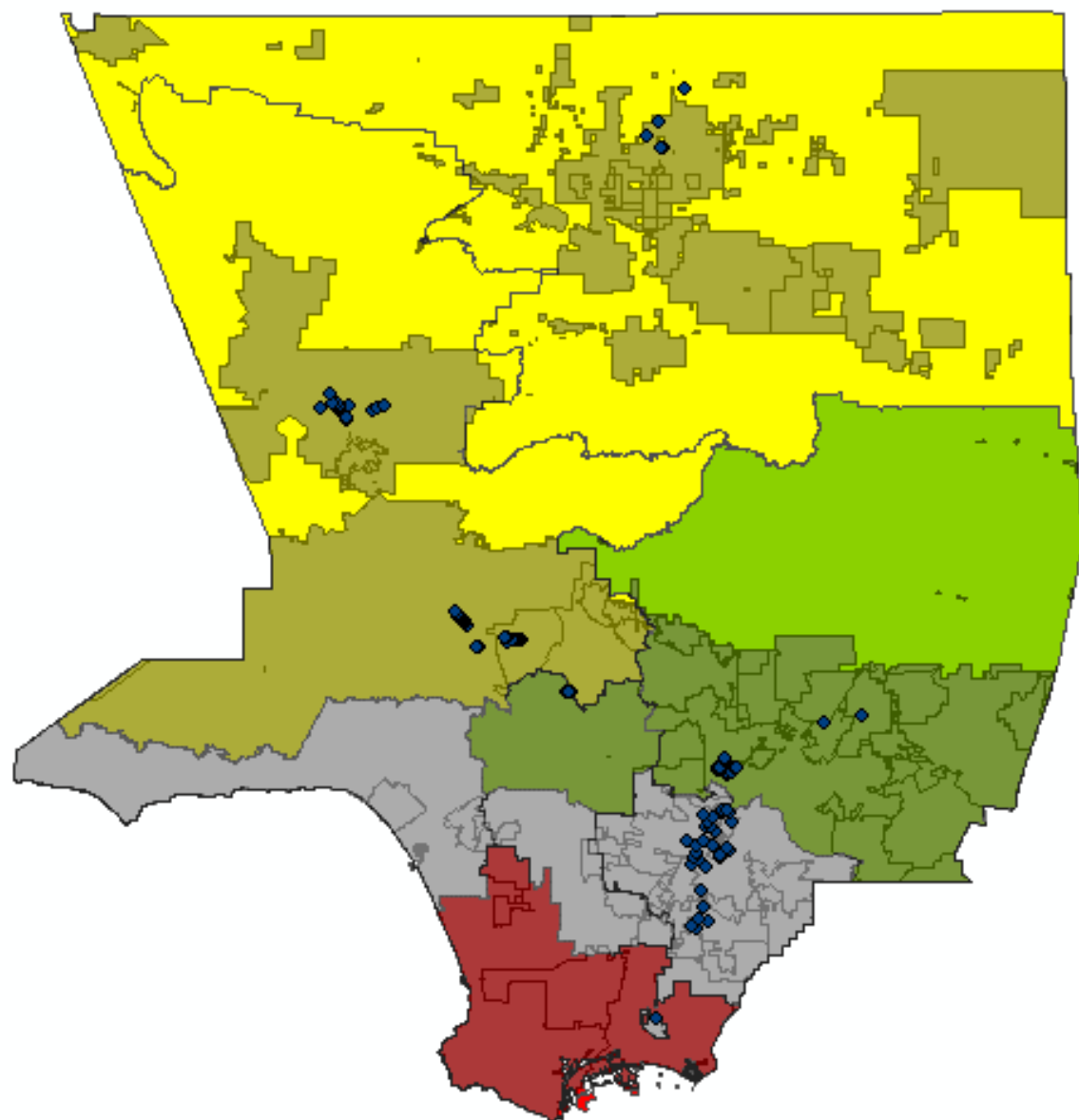


SPAs with Randomized Serum Points

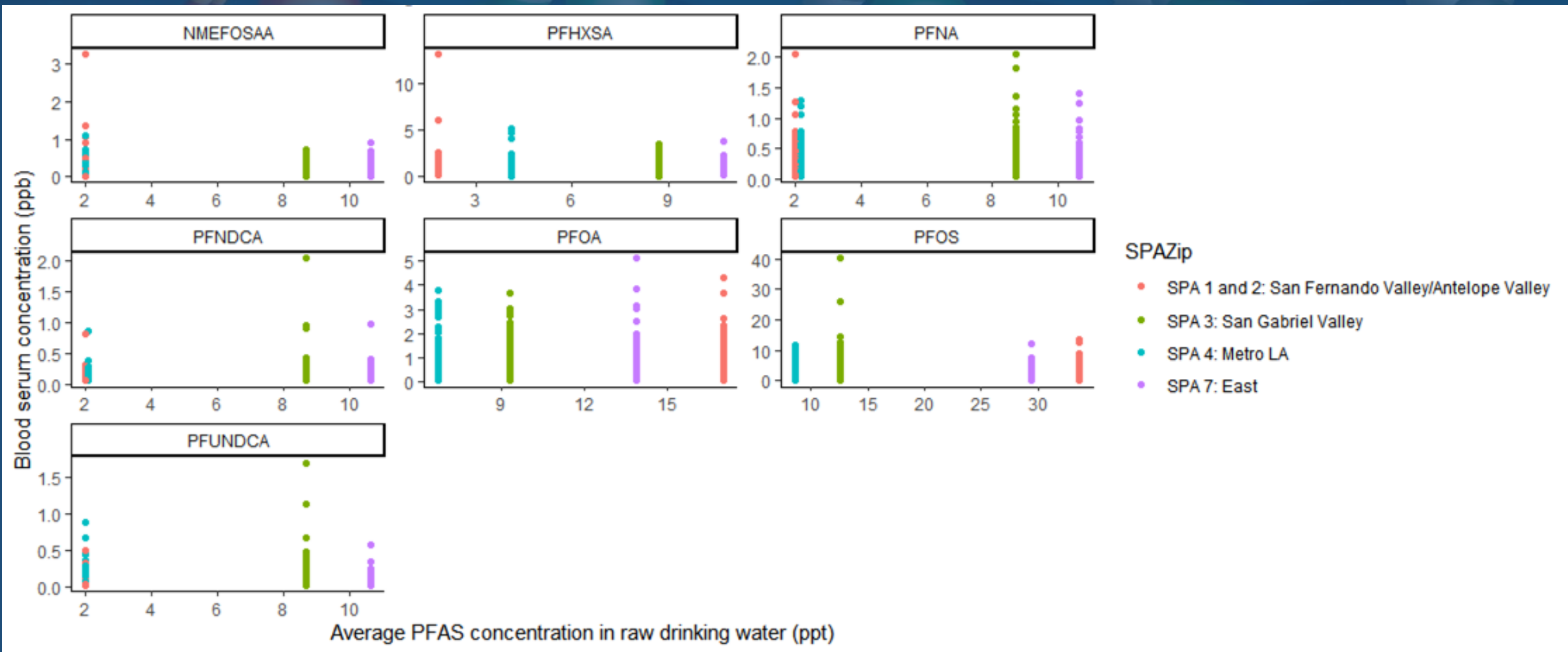




SPAs with Randomized Serum Points on Voronoi Plot of PFOS



PFAS Levels in Raw Groundwater and Blood Serum





Future Work and Improvements

- Receiving actual blood serum would allow actual comparisons with groundwater quality
- Attaining the source of drinking water per person analyzed for serum levels would eliminate assumptions of source
- Once DDW can specify source (surface vs ground vs purchased) within the system, we can remove assumption of source by location in system





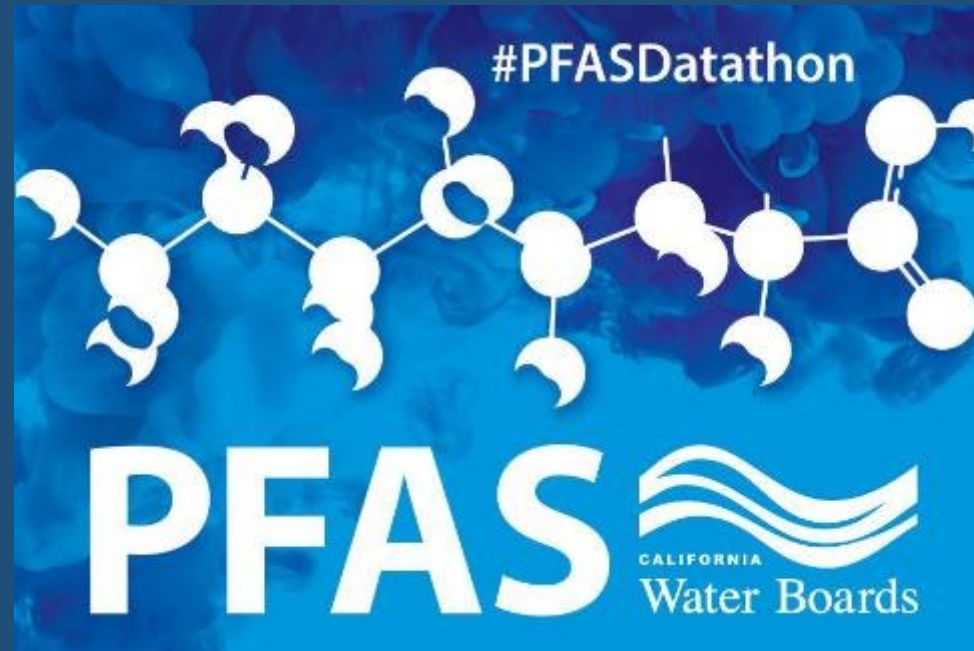
Recommendations

- Collect more demographics and lifestyle information about participants for a better understanding of all PFAS exposure
- Find way to remove excessive confidentiality from serum data so more accurate analyses can be completed timely



Thank you!

Dori Bellan (DWQ), Emily Houlihan (DWQ),
Payman Alemi (DDW), Hung Bui (DDW), Rassam Zarghami
(DDW),
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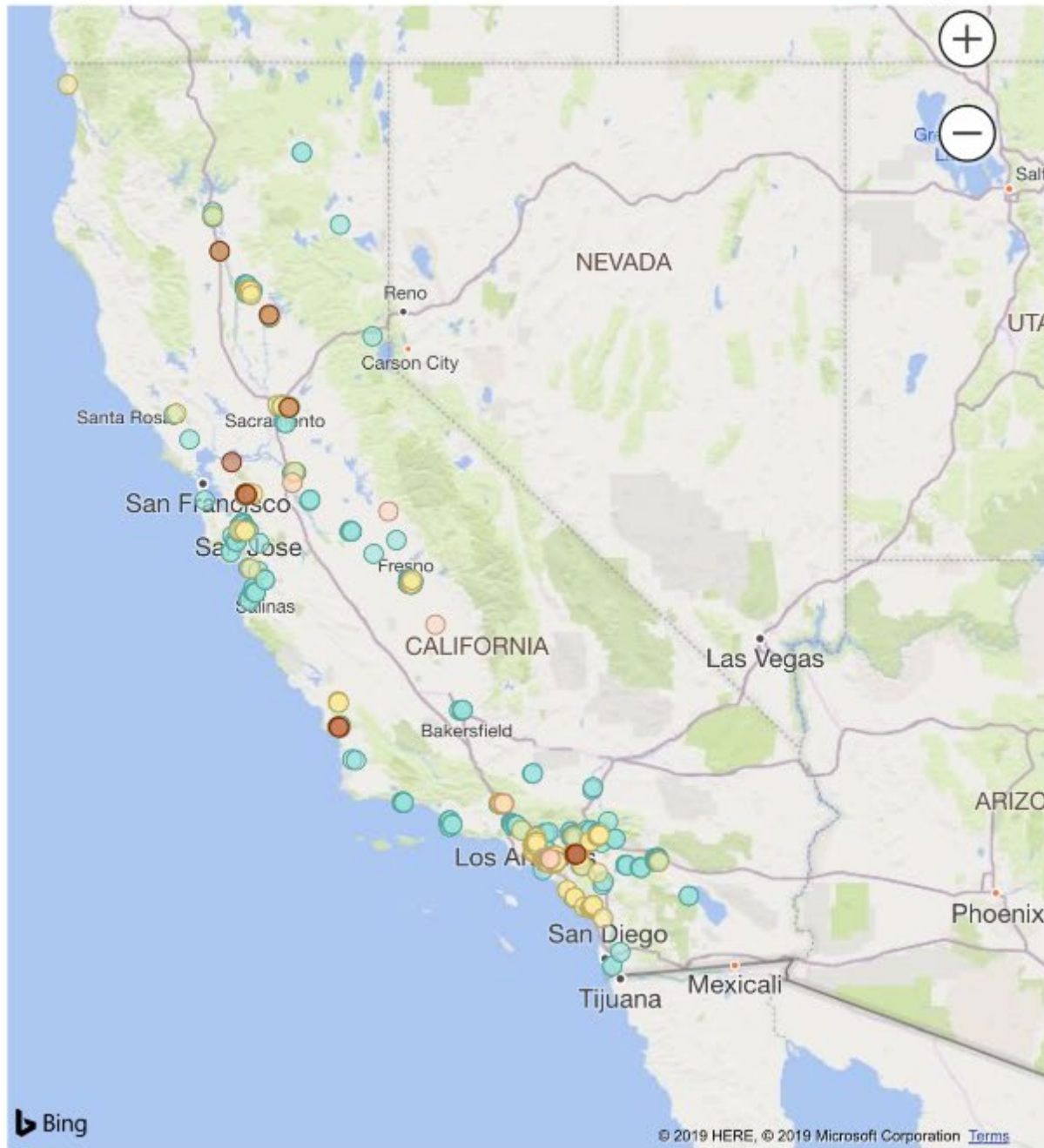


PFAS Source Identification and Prediction Through Fingerprinting

Sarabeth George



Advisory Levels: ● Less than Notification... ● Between the Notifi... ● Between the R... ● >100 ppt



One part per trillion (ppt) denotes one part per 1,000,000,000,000 parts, and a value of 1×10^{-12} . This is equivalent to about thirty seconds out of a million years.

Concentration Range:

Notification Level (NL) is set at 5.1 ppt for PFOA, and 6.5 ppt for PFOS.

Response Level (RL) is set at 70 ppt for PFOA, PFOS and the sum of PFOA + PFOS

↶ Reset

Advisory Levels

☐ Select all

☒ Less than Notification Limit

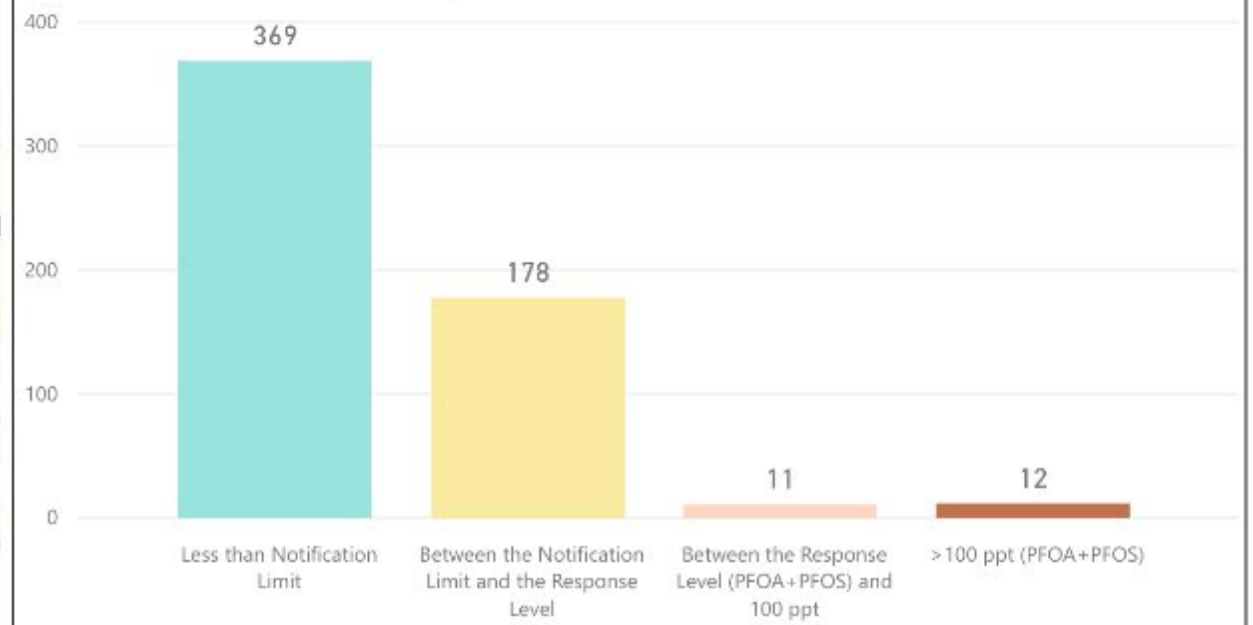
☒ Between the Notification Limit and the Response Level

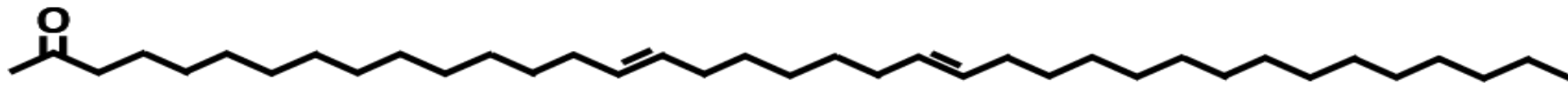
☒ Between the Response Level (PFOA+PFOS) and 100 ppt

☒ >100 ppt (PFOA+PFOS)

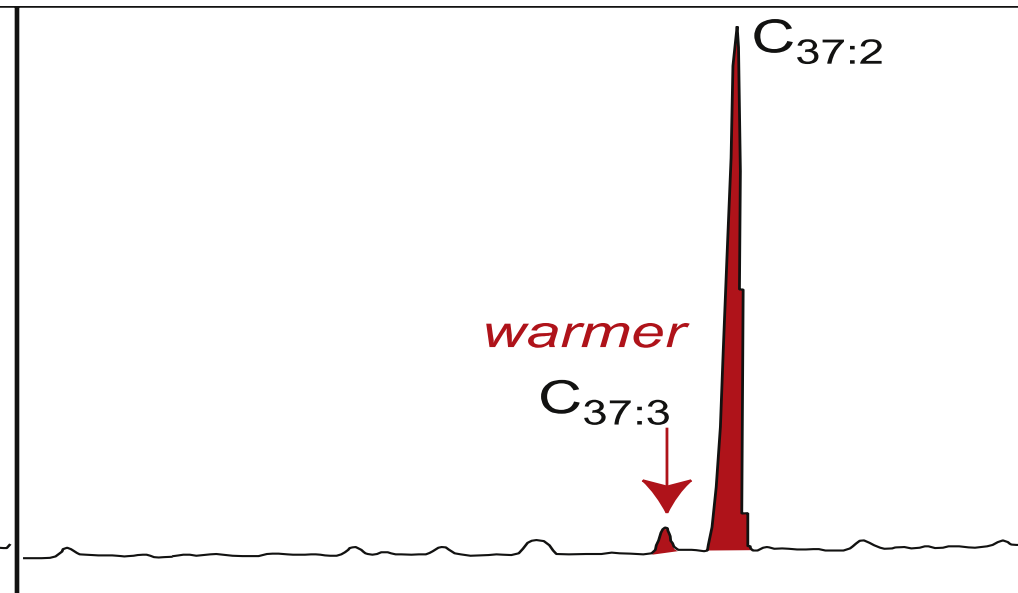
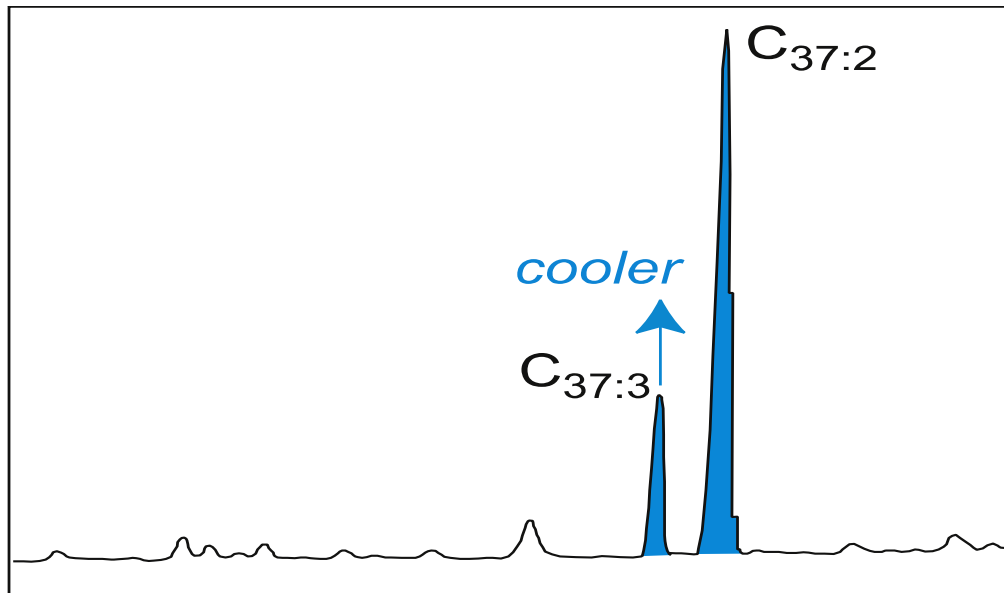
Hold down the 'CTRL' key to select multiple Concentrations.

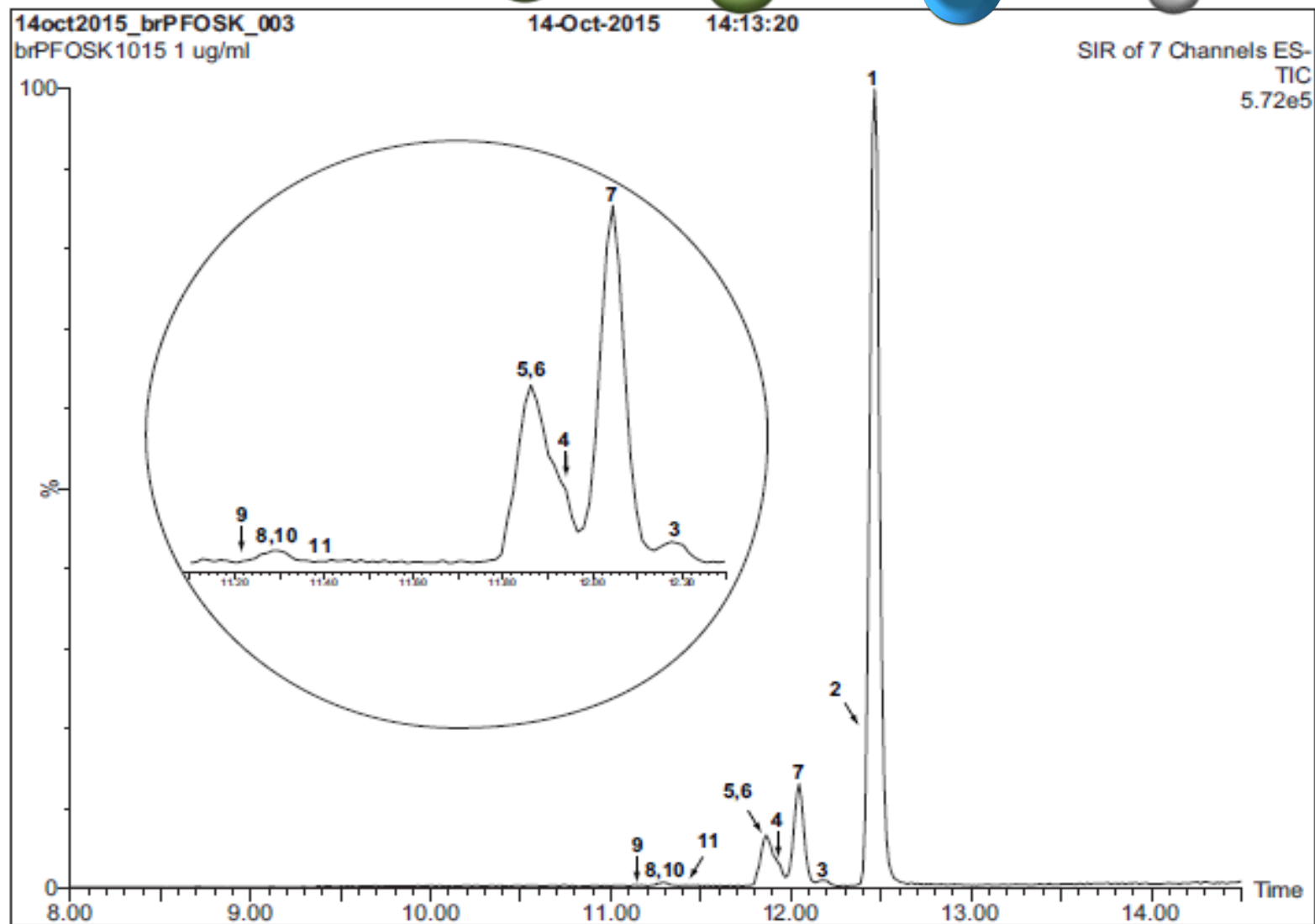
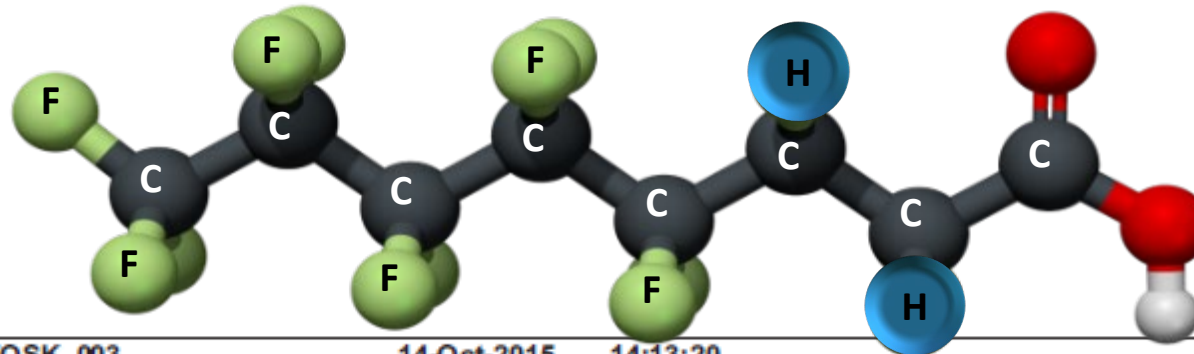
Advisory Levels for PFOA and PFOS





(Paleo)climatology





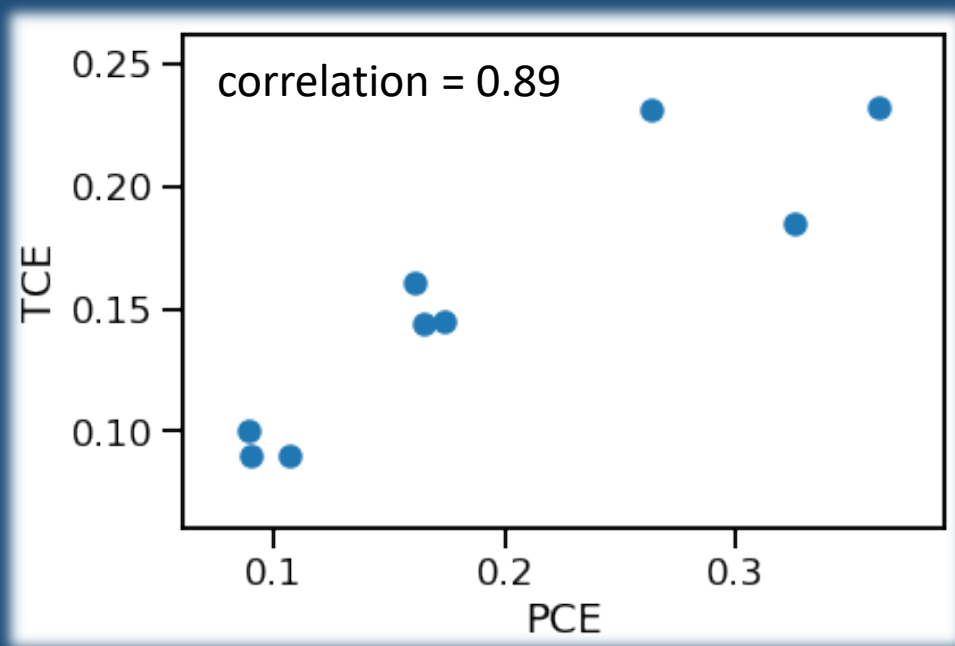


1. Dataset

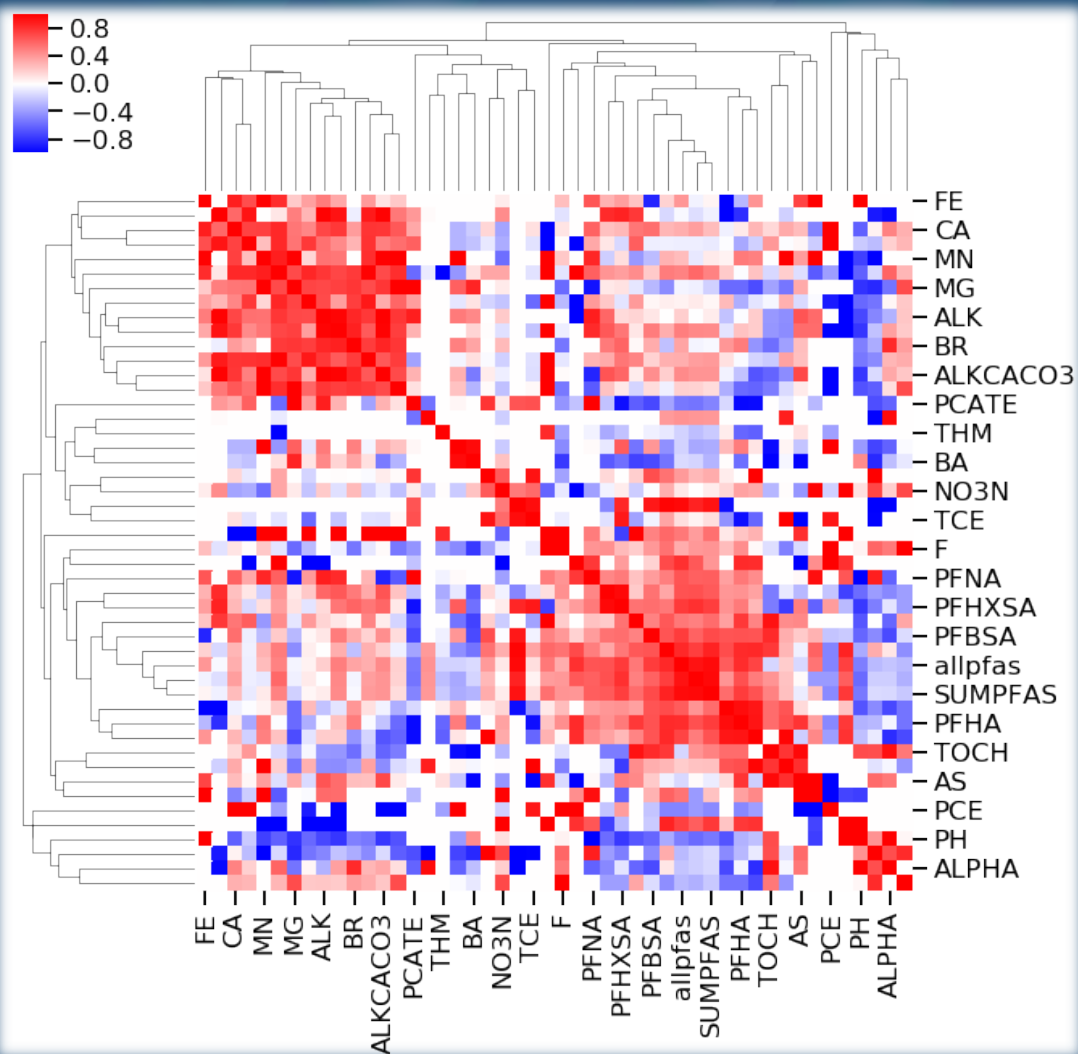
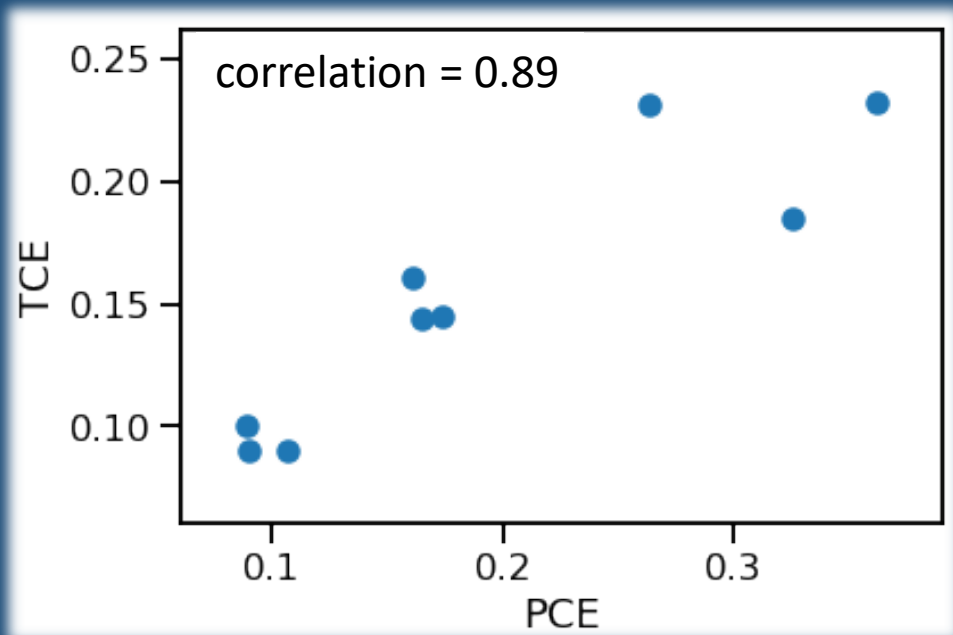
- Downloaded all PFAS sampling results for the state of California and associated monitoring data for other chemicals (GAMA, DDW, SDWIS, UCMR3)
- Cleaned and normalized data to uniform scale
- Integrated data into single file for downstream analysis

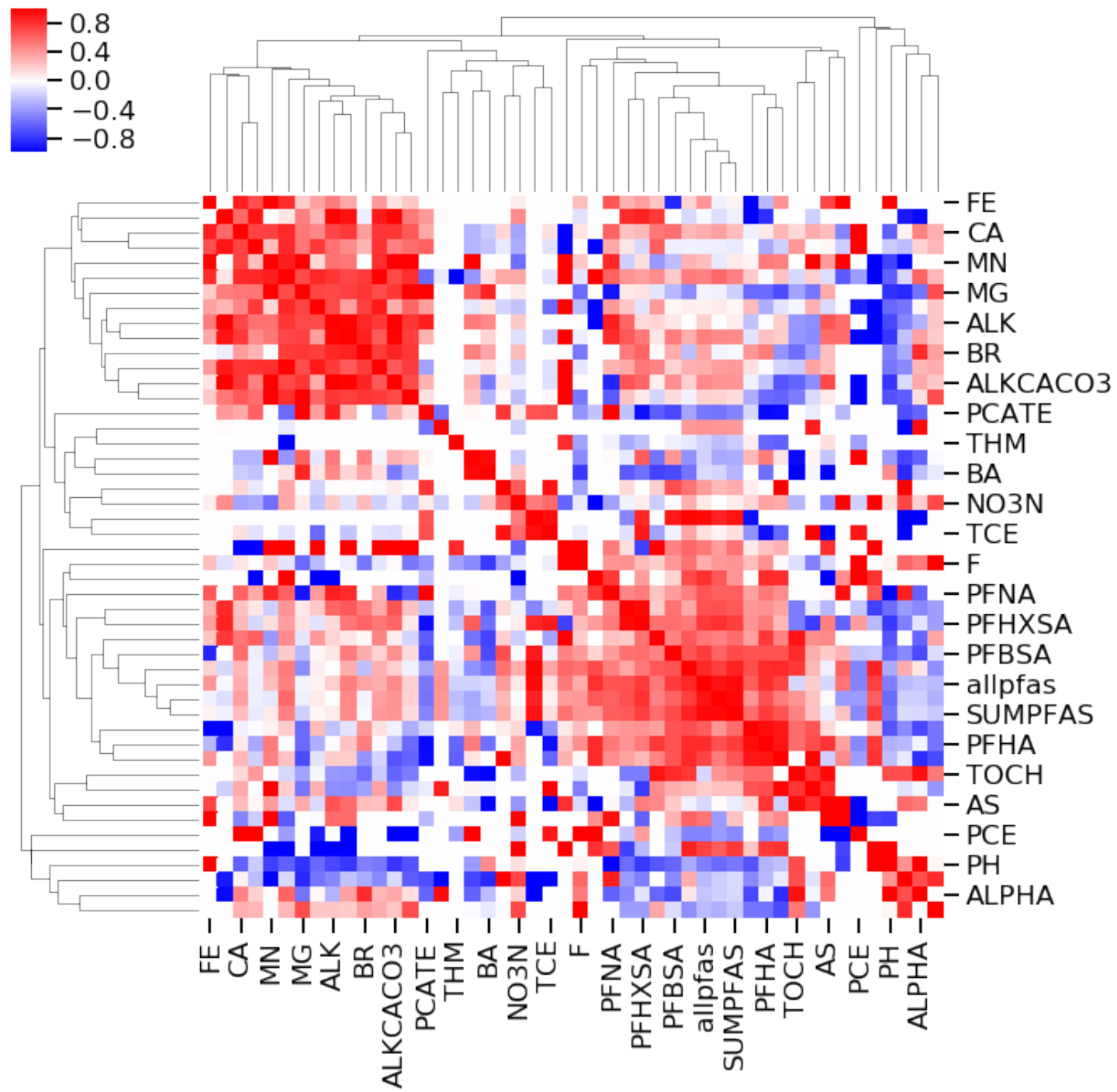


2. Correlation



2. Correlation





3. Clustering & Fingerprinting



3. Clustering & Fingerprinting

Fingerprint 1

Fingerprint 2

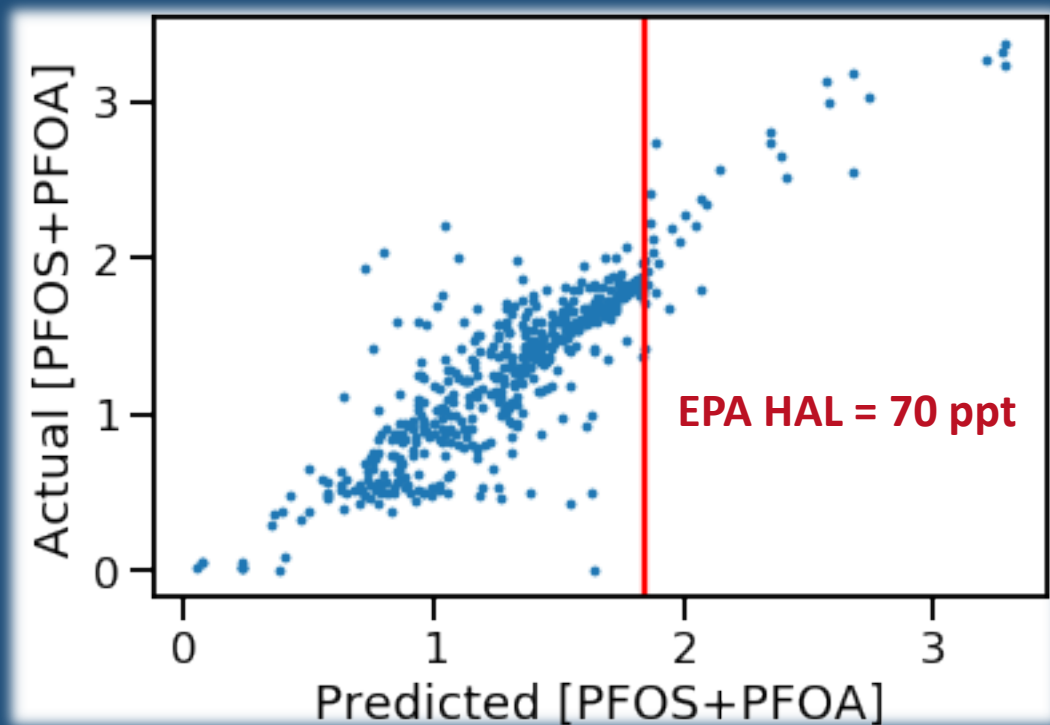
Fingerprint 3

Fingerprint 4

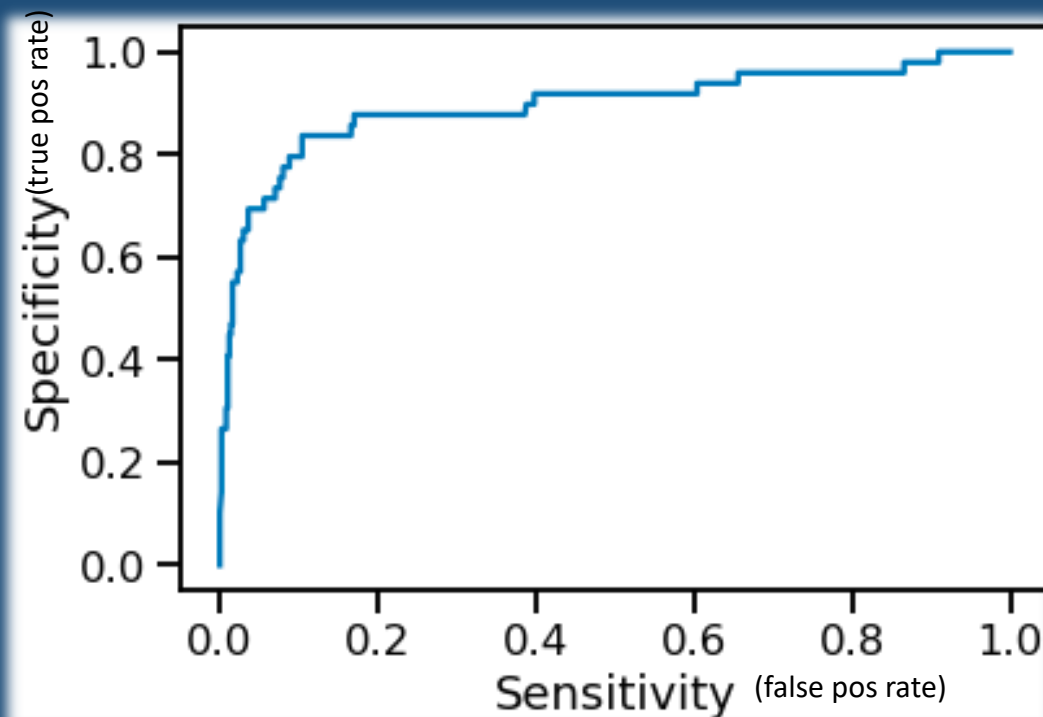
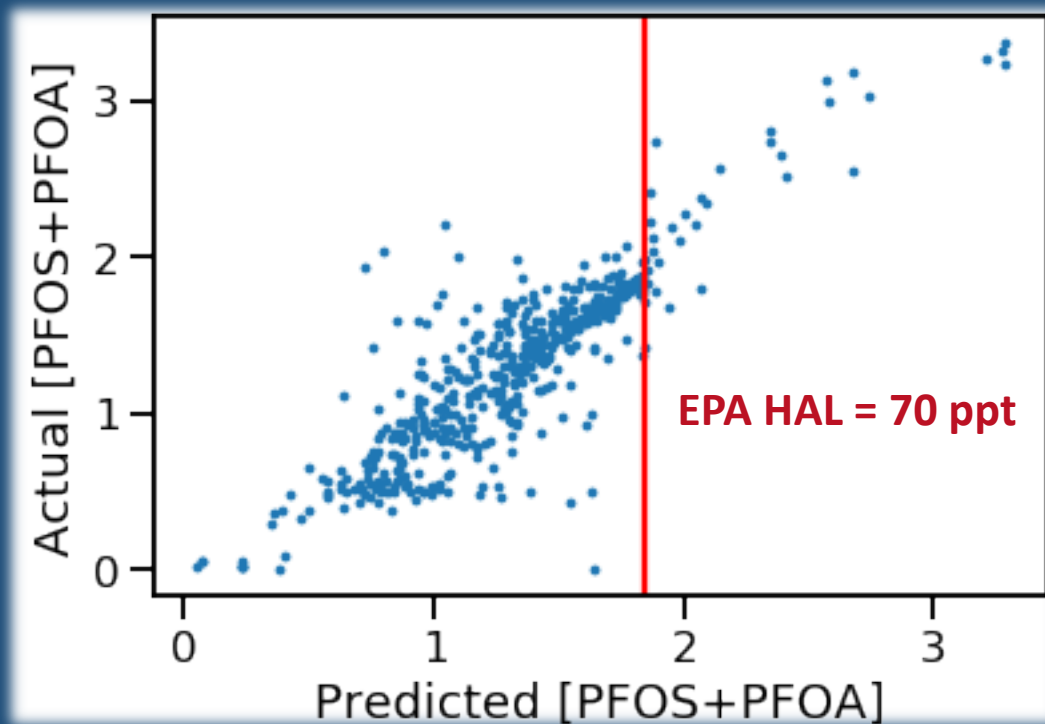
Fingerprint 5



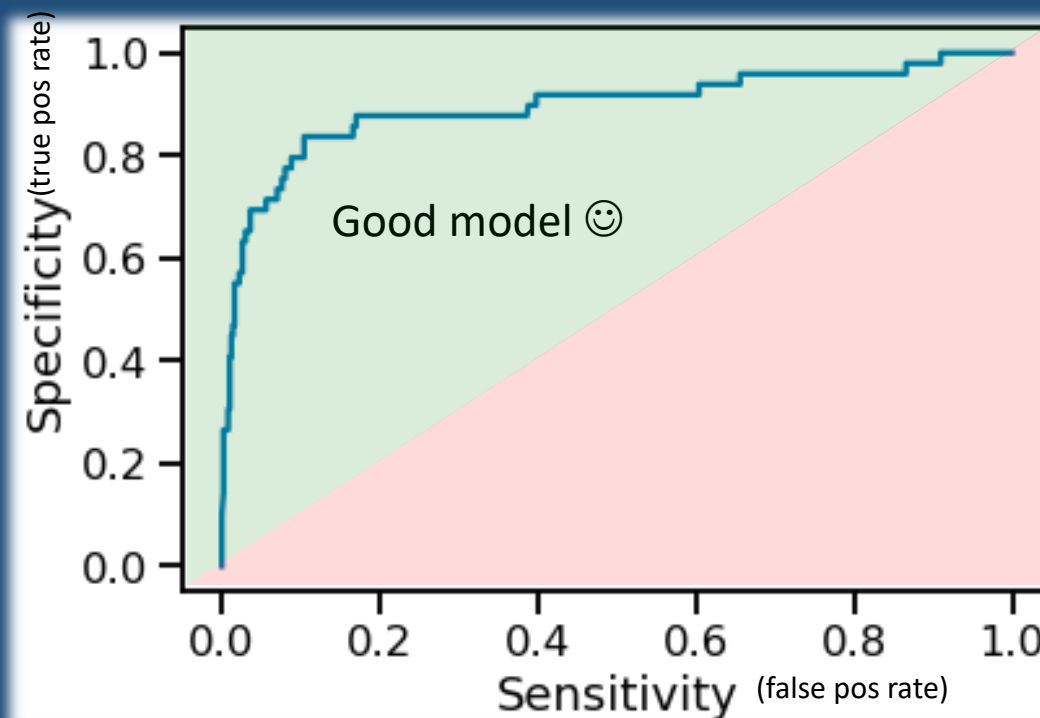
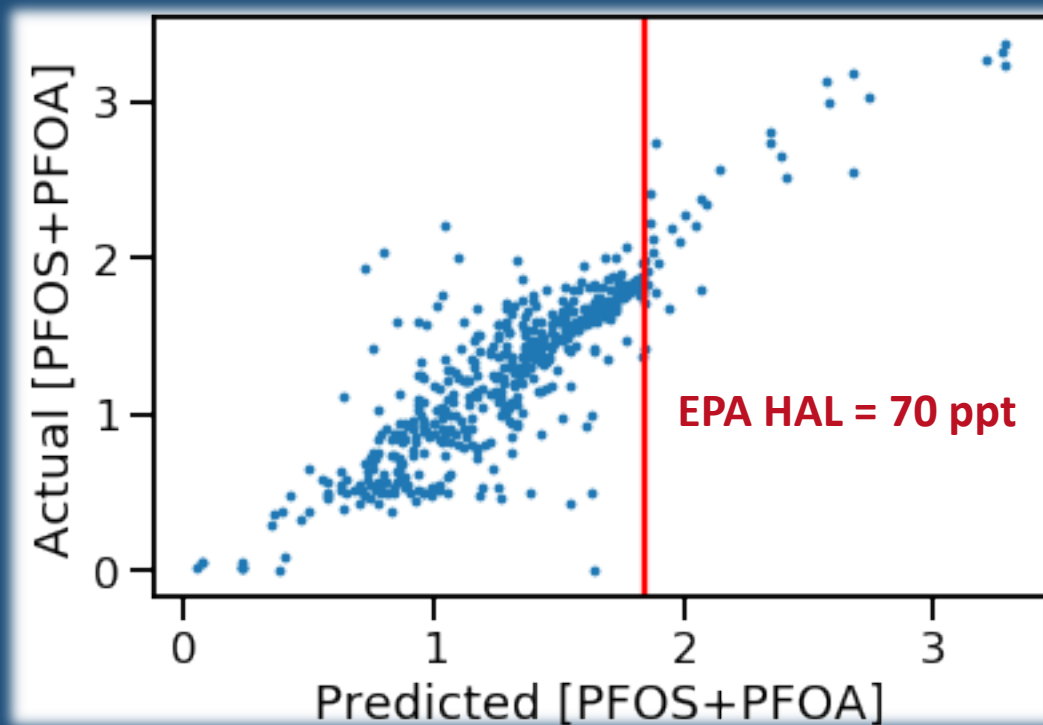
4. PFAS Prediction from non-PFAS monitoring data



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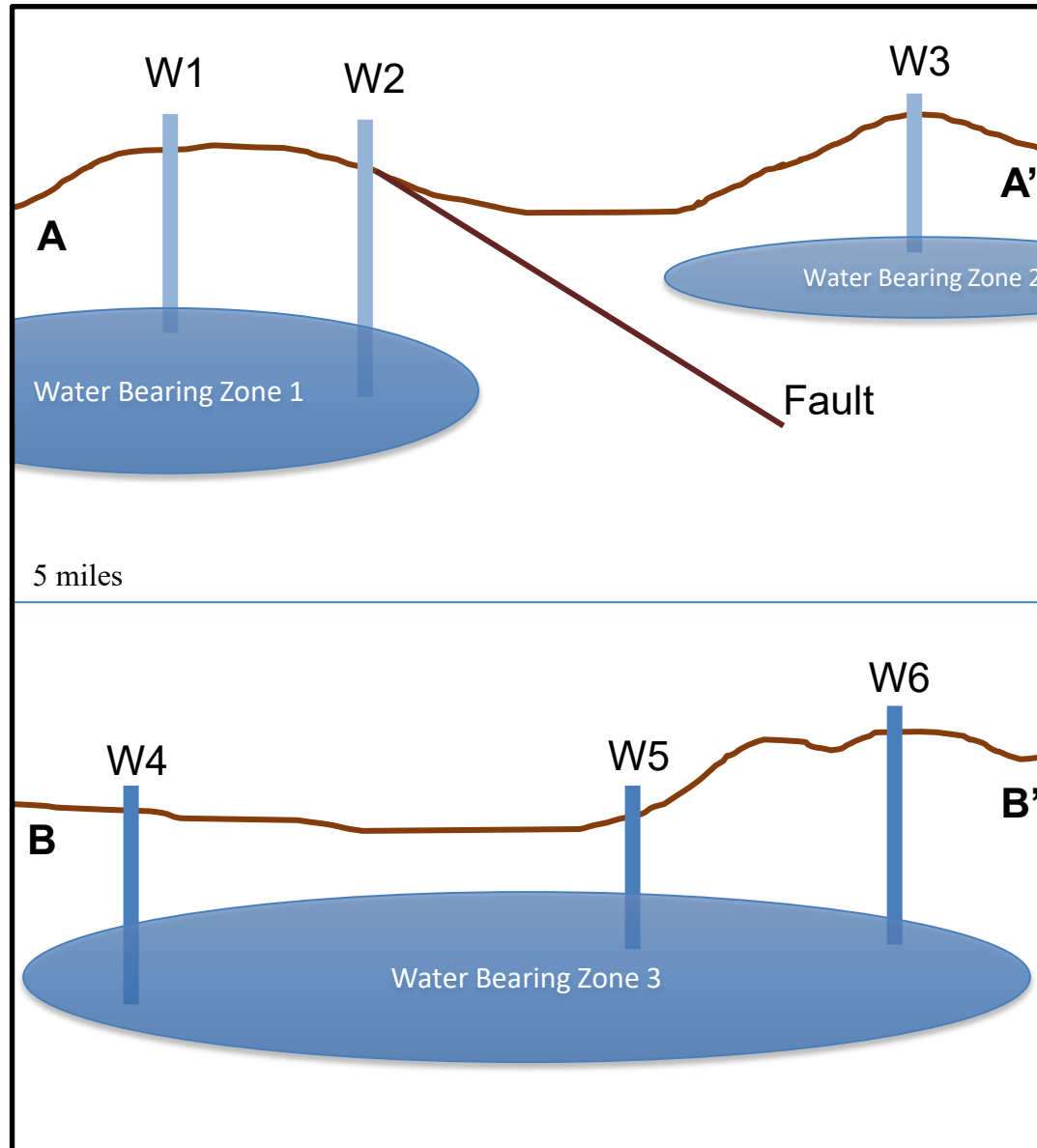
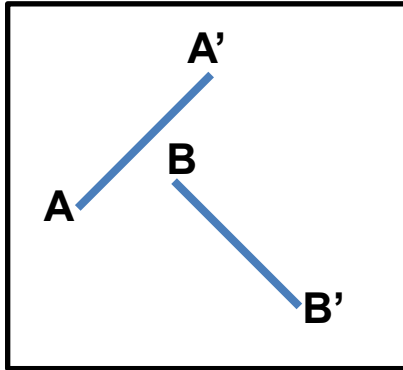


4. PFAS Prediction from non-PFAS monitoring data



Cross Section

Map View



5. Source Identification

Fingerprint 1 = Source A

Fingerprint 2 = Source B

Fingerprint 3 = Source C

Fingerprint 4 = Source D

Fingerprint 5 = Source E





Summary

- Existing PFAS and other chemical monitoring data contain useful information for identifying areas of concern
 - This tool could be used to ‘fingerprint’ PFAS profiles, identify source areas, and expedite the cleanup process
 - This tool could also be used as guidance for future monitoring programs where groundwater is used as a source of drinking water

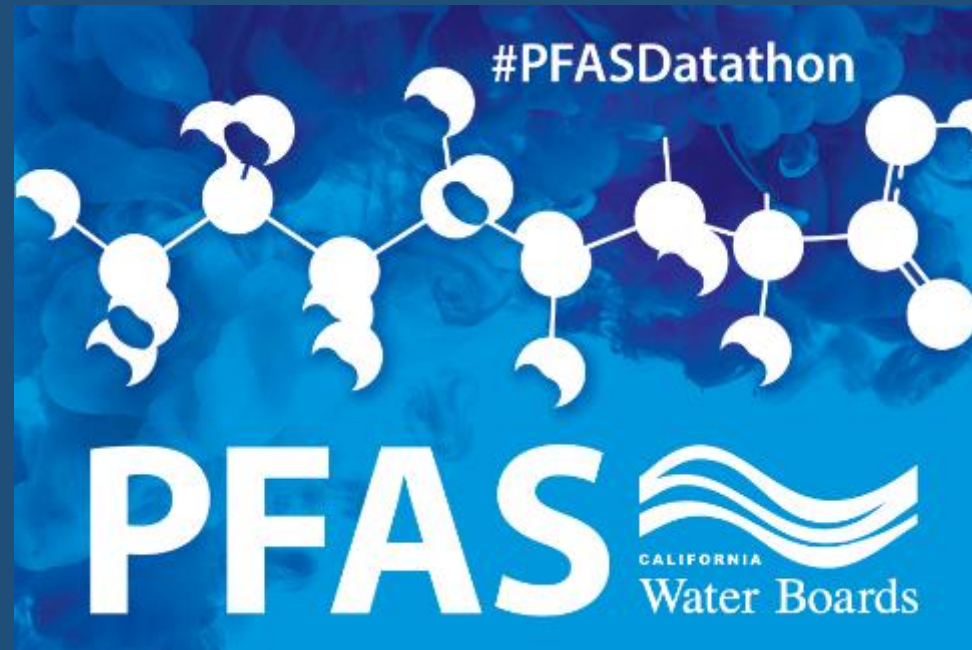


Thank you!

PFAS Source Identification Through Fingerprinting

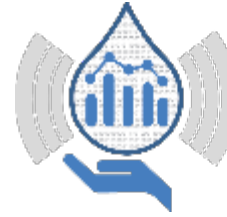
Thank you ~wonderful~ Datathon collaborators!*

Priya Shivaani Chauhan, Jennifer Chen, Sara Huber, Erica Kalve, Brittany Saleeby, Susie Smith



*Collaborators listed in alphabetical order.

Upcoming Events!



California Water Boards
DATA CENTER



Trash Datathon 2020 Event Series Kickoff

February 28, 2020

9:00 AM – 4:00 PM

CalEPA Building - Klamath Room

More Info and RSVP:

<http://bit.ly/TrashDatathonFeb28>

Water Data Science Symposium & Concurrent PFAS Hackathon

June 29-30, 2020

CalEPA Building - Klamath Room

More details coming soon!

https://www.waterboards.ca.gov/resources/data_databases/wq_science_symposium.html