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Systems Thinking, Collaborative Leadership and Civic-Data Engagement

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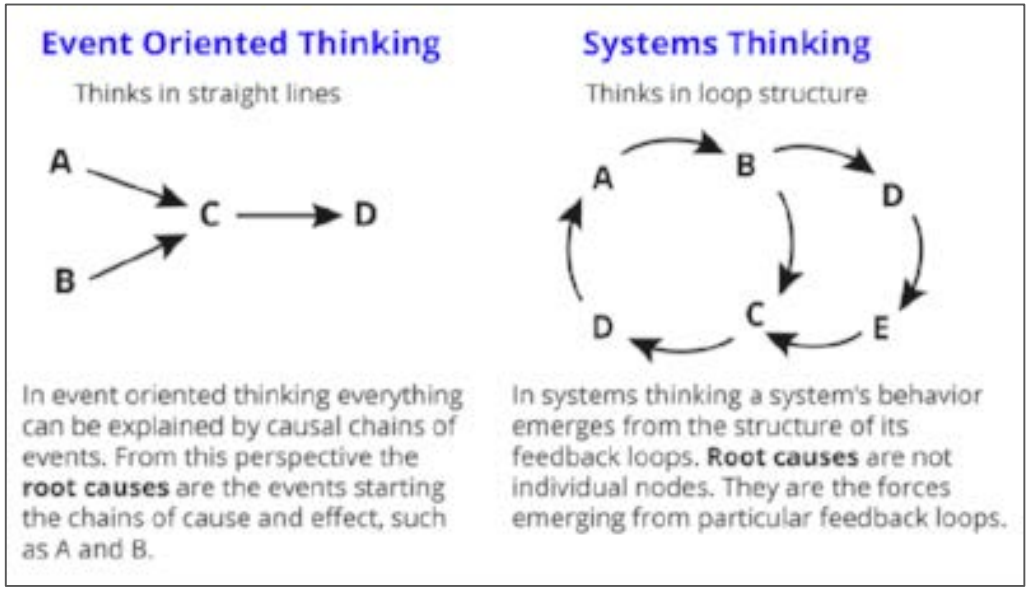
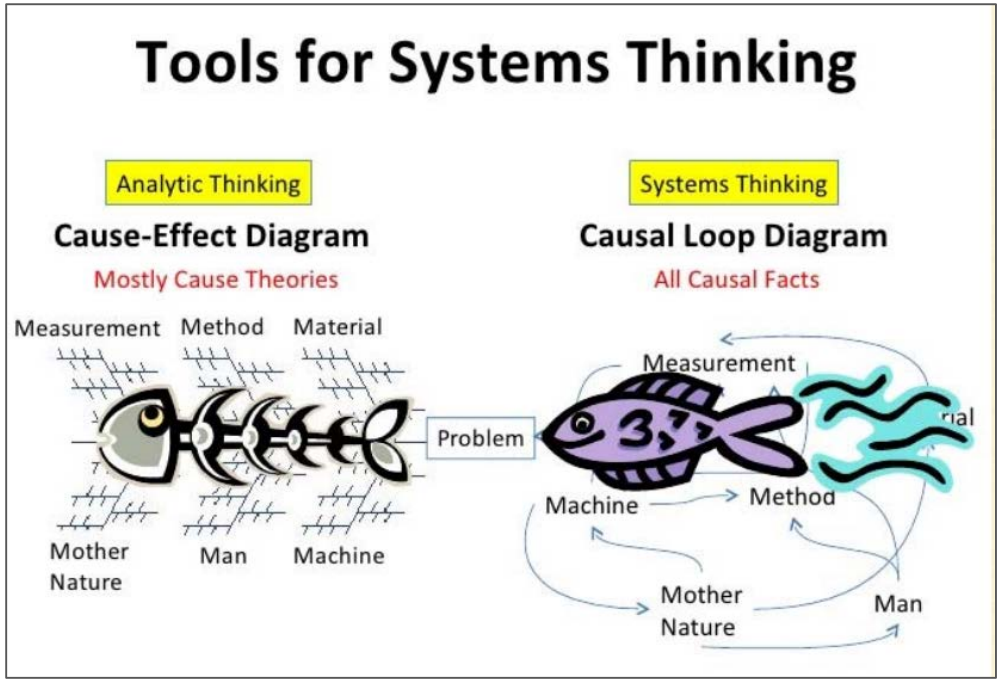
California State Water Resources Control Board
Office of Information Management & Analysis

Overview of presentation

- Introduction to “systems thinking” as it applies to leadership curriculum at Water Boards
- High level overview of “collaborative leadership” and interest based facilitation and negotiation processes
- Some examples of how this has helped me and our organization achieve better services and outcomes
- Contemporary version of stakeholder involvement → civic/data engagement





Why systems thinking?

“Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static 'snapshots'...

Today systems thinking is needed more than ever because we are becoming overwhelmed by complexity. Perhaps for the first time in history, humankind has the capacity to create far more information than anyone can absorb, to foster far greater interdependency than anyone can manage, and to accelerate change far faster than anyone's ability to keep pace.”

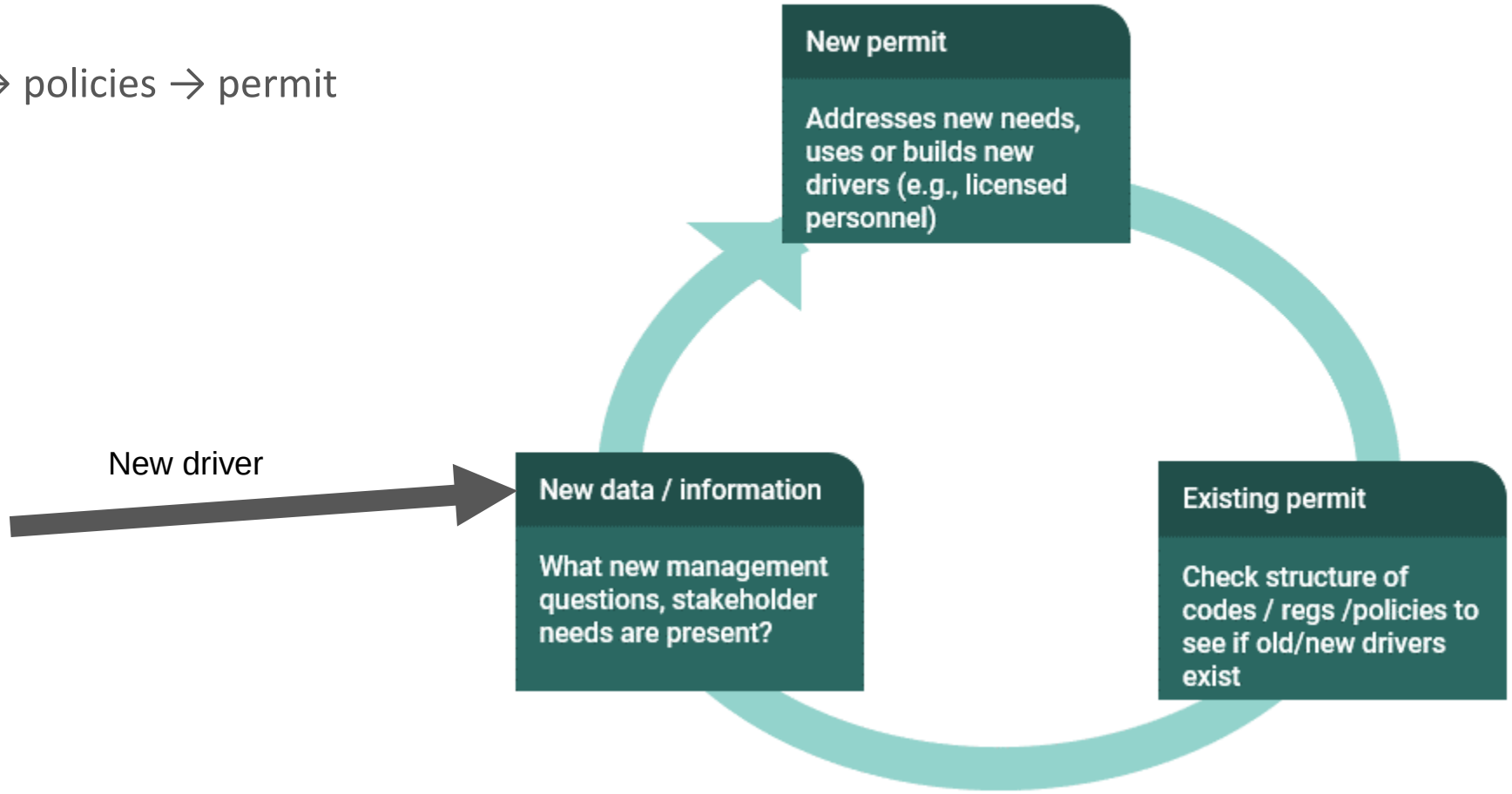
Peter Senge, The Fifth Discipline

Systems example for my work

Permit reissuance:

- Analytical thinking
  - statutes → regulations → policies → permit requirements

- Systems thinking



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Principles of systems thinking

- Systems thinking is a way of thinking about the world
- Systems behave as a whole
- Systems understanding is observer or perspective dependent
- A systems approach requires multiple perspectives
- Where we draw systems boundaries effects the system
- We need to be aware of what is going on inside the system but also outside
- Systems are ‘nested’ we should always think about the system we’re looking at as being made up of smaller systems and being part of larger systems
- Being alive is being in relationship – with everything!
- Truth’ is subjectively defined, requires a diversity of opinion and perspectives
- Understanding is to enquire, examining connections, interdependence and polarities
- Use research and ‘feedback loops’ to collect and constantly renew relevant information so that learning and adaptation are possible
- Demands flexibility and capacity to invent • Values creativity, spontaneity and innovation
- Embraces complexity and values diversity
- Traces cycles and looks for underlying structure and patterns over time
- Anticipates unintended consequences

Collaborative leadership

- Interest based facilitation and negotiation
- Design of a collaborative process is critical (way easier than “fixing” one that is already going)
- We have been teaching a collaborative leadership curriculum at the Water Boards since 2002
- Water issues are always changing, this approach to doing our work adapts

Evolution of Interest-Based Collaboration

- Top-down, expert-based decisions or purely political decisions: us vs. them
- Good PR - sell citizens on the government's decision
- Gather input from the usual suspects – we really are listening (and then we will do what we want anyway)
- Gather oodles of input from everyone- we are really listening; trust us!
- Public participation, try to resolve some differences - compromise, find the middle

Interest-based Negotiation and Collaboration

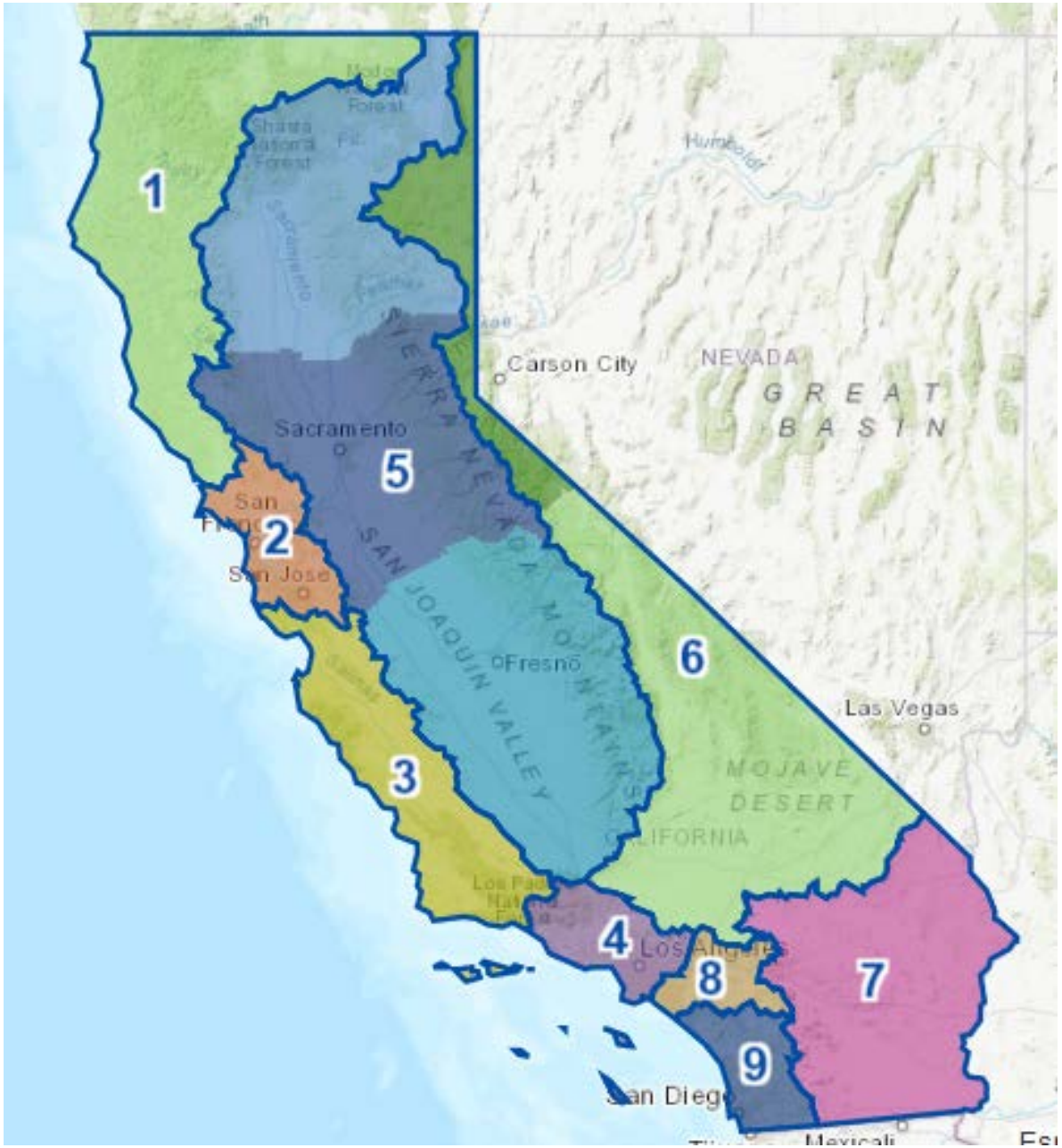
- Inclusive, broad representation, all interests identified, represented and present
- Carefully structured assessment, education and negotiating process
- Shared decision-making
- Not just input or discussion, but collaborative problem-solving and relationship building
- Win-win-win solutions; interest-based not positional; creative packages of agreements
- Built on enlightened self-interest model

Interest-based best practices

- Reframing (of pointed, positional questions and statements)
- Design (“Designing an Effective Stakeholder Engagement Project” course)
- Mid process corrections (sometimes even good designs and plans get new input/drivers)
- Scenarios and role-playing in training and practice
- Practitioners groups
- More slides

CA Water Boards

- 10 Boards (9 Regional WQ, 1 State WR)
- 68 (7*9 + 5*1 = 68) Governor-appointed Board Members
- State Board has water quality, water rights, drinking water, funding and fiscal/administration duties



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Water Boards by the Numbers

- Water Quality, Water Rights and Drinking Water number (of June 30, 2018)
  - **10** Boards, **43** office locations
  - **18** drinking water offices, **25** State and Regional Board office locations
  - **>45** programs, ~**15** core regulatory programs
  - **2178** positions, **338** in supervisory / management positions
  - **$736,000,000** annual operating budget
  - Regulate ~**38,000** dischargers
  - Allocate ~**34,000** water right holders
  - Plan/Assess **$37,600,000** in monitoring
  - Fund **$902,000,000** in local assistance funding and cleanup
  - Fund **$10,600,000,000** in loans (as of June 30, 2018)
  - Fund **$20,000,000** in penalties assessed in 2017

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Background

- September 2016 – **AB 1755: The Open and Transparent Water Data Act**
  - Develop an integrated platform for existing water and ecological data
  - Make water-related data, tools, and applications developed using state funds publicly accessible
  - Promote principles of openness and interoperability ("making information accessible, discoverable, and usable by the public can foster entrepreneurship, innovation, and scientific discovery")
- July 2018 – **State Water Resources Control Board Resolution 2018-0032:** Adopting Principles of Open Data as a Core Value and Directing Programs and Activities to Implement Strategic Actions to Improve Data Accessibility and Associated Innovation
  - Make Data Accessible ("Open First"): make all critical public data available in machine readable datasets with metadata and data dictionaries
  - Understand Data Quality and Integrity: ensure data are of known and acceptable quality; deploy practices to protect its integrity with standards and protocols

Background (cont.)

What is Open Data?

According to Project Open Data:

- **Public** – presumption in favor of openness
- **Accessible** – available in convenient, modifiable, and open formats that can be retrieved, downloaded, indexed, and searched; format should be machine-readable (i.e., data are structured to allow automated processing)
- **Described** – provide sufficient information to understand strengths, weaknesses, analytical limitations, security requirements, as well as how to process (metadata and data dictionaries)
- **Reusable** – available under an open license with no restrictions on use
- **Complete** – published with the finest possible level of granularity that is practicable; aggregate data should reference the primary data
- **Timely** – made available as quickly as necessary to preserve the value of the data, accounting for key audiences and downstream needs
- **Managed Post-Release** – point of contact to assist with data use

Improve Data Flows

Enhance internal and external data sharing

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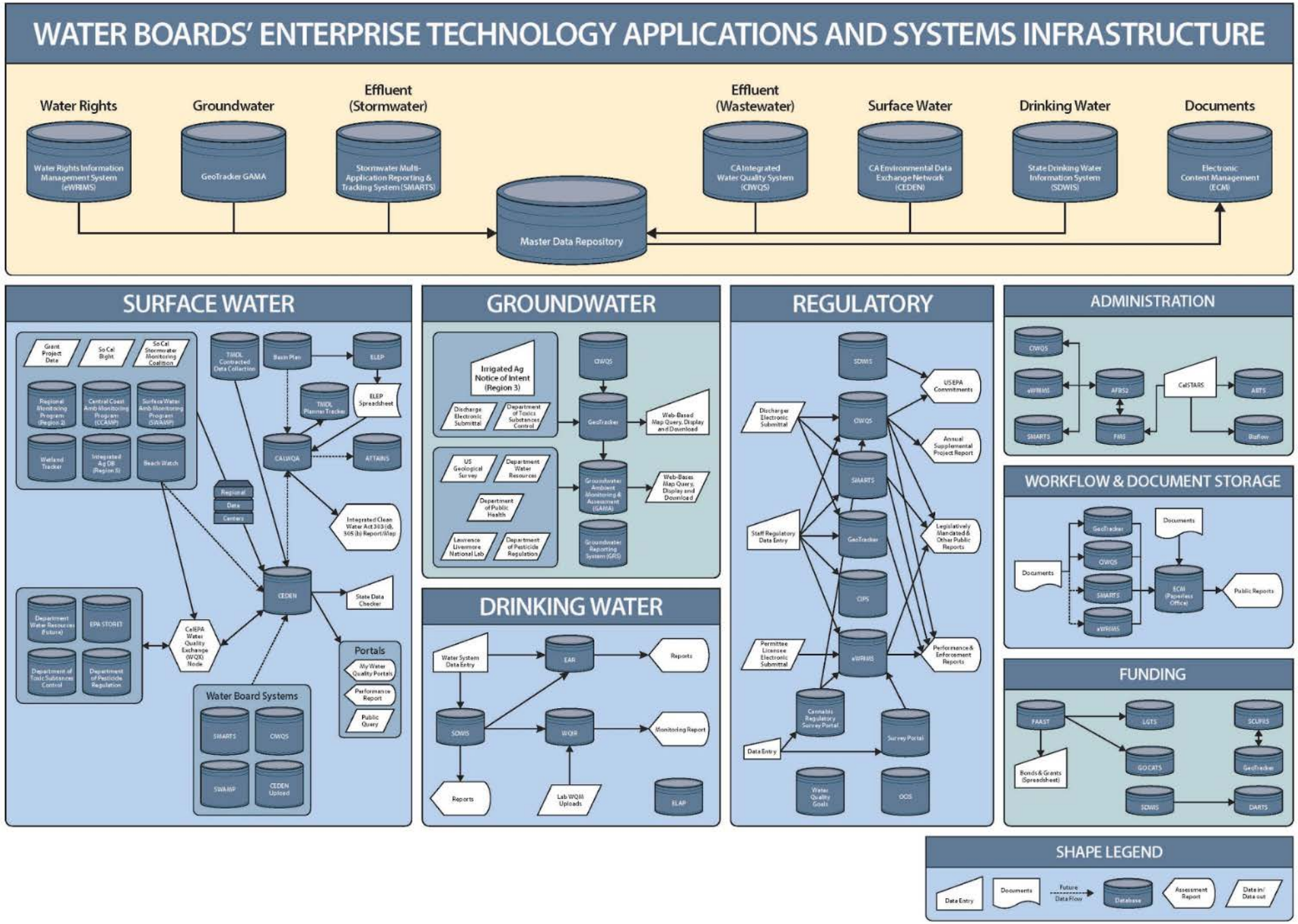
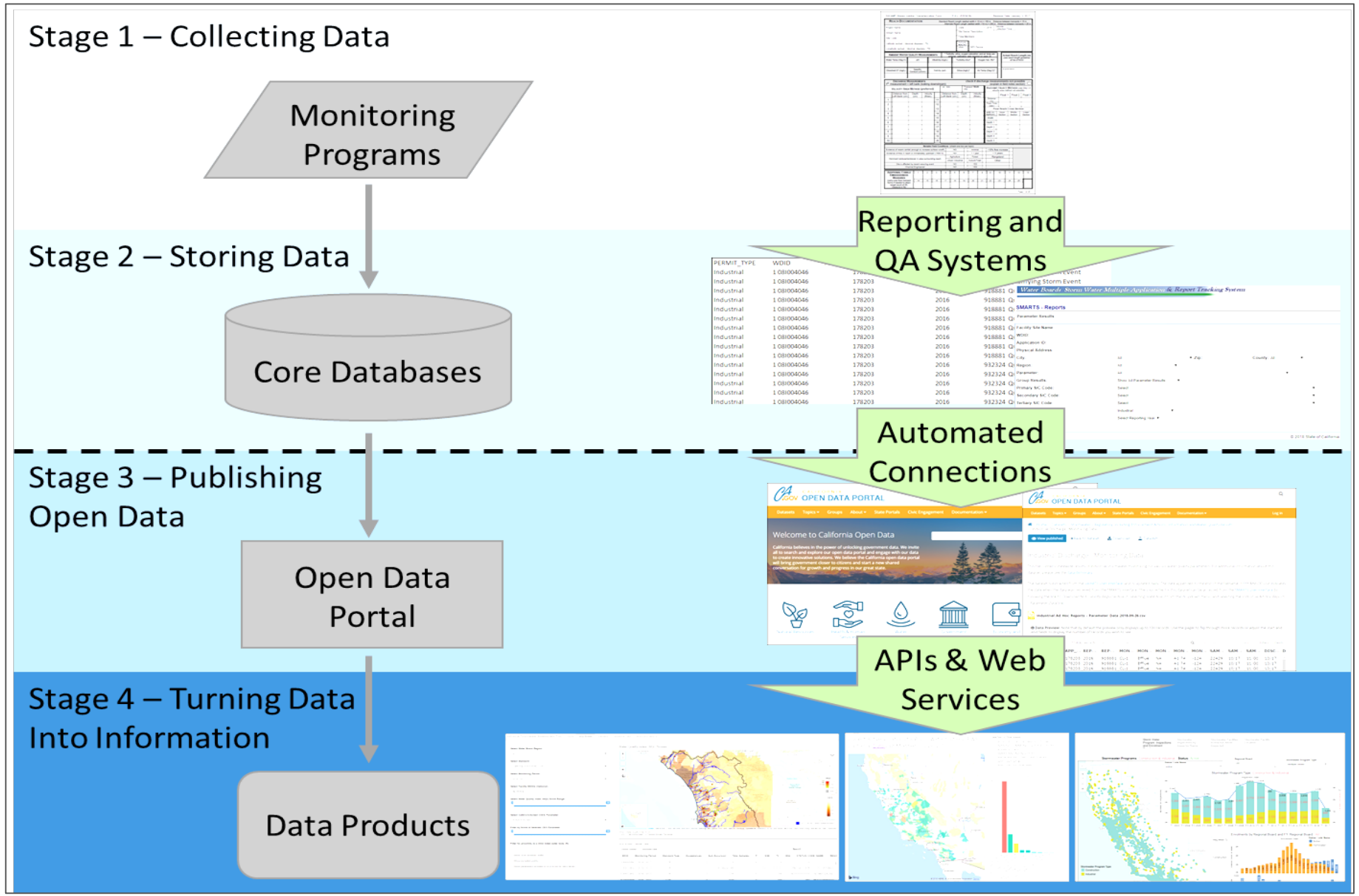
Water Boards' Enterprise Technology Applications and Systems Infrastructure



Data Flows

Databases
→ Flat Files



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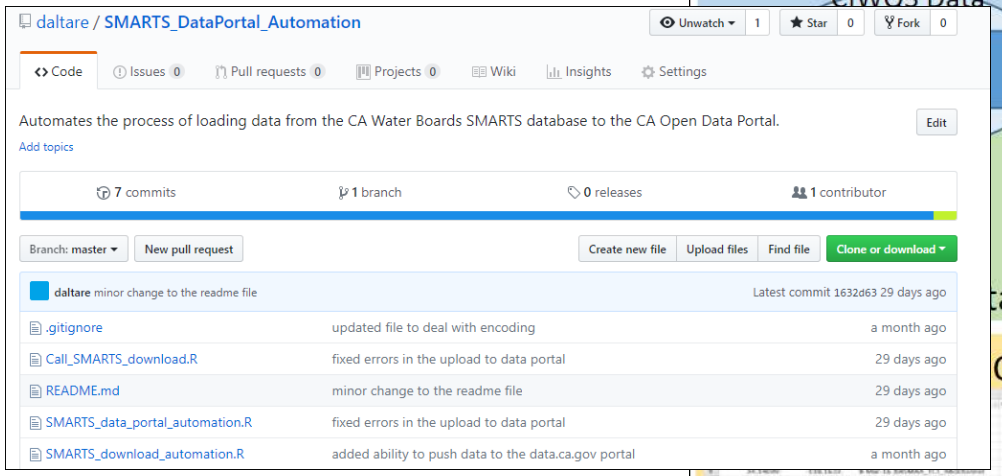
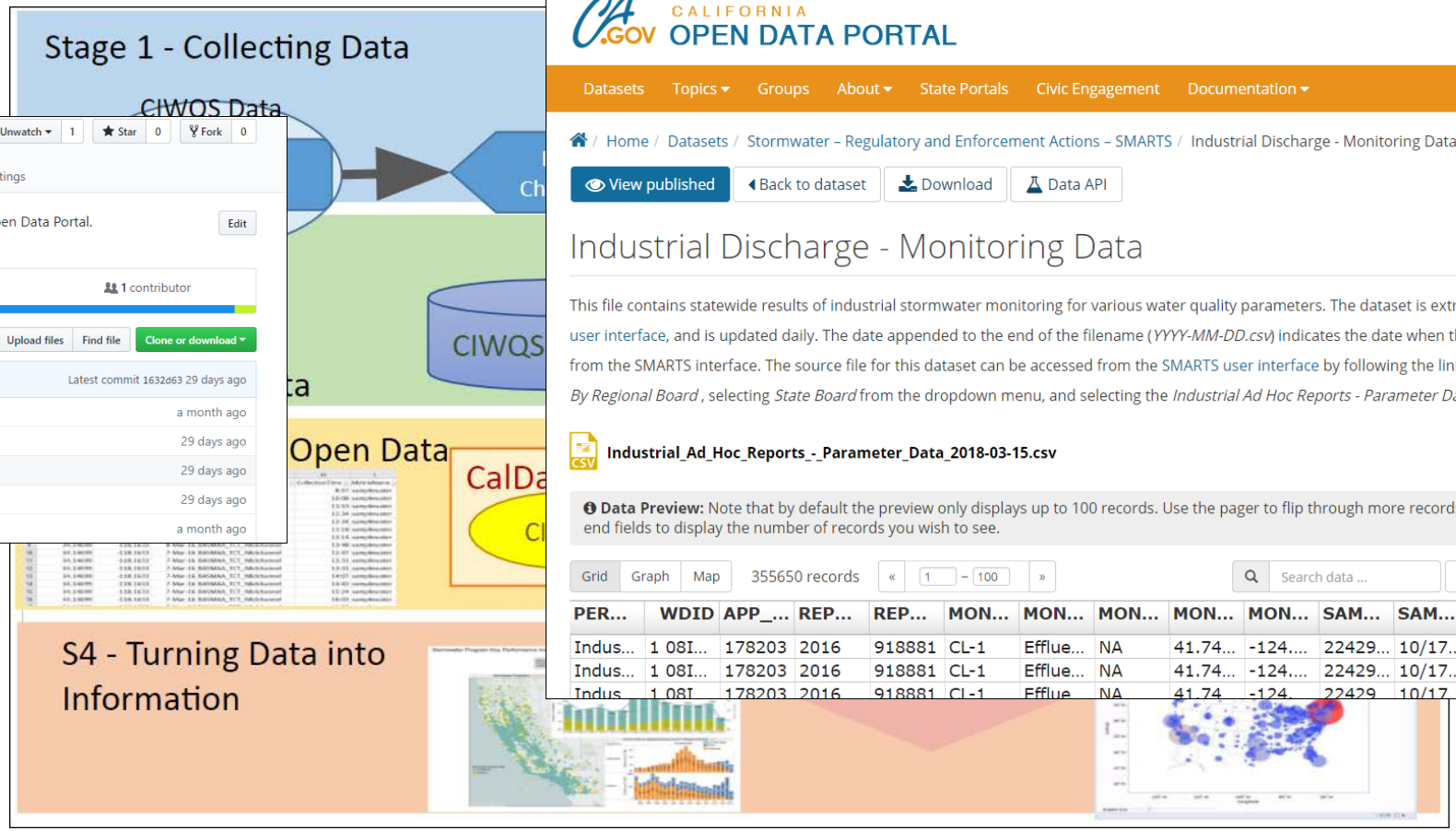
Open Data Portal

Open Data Portal

- Tools to automate cleaning and loading data





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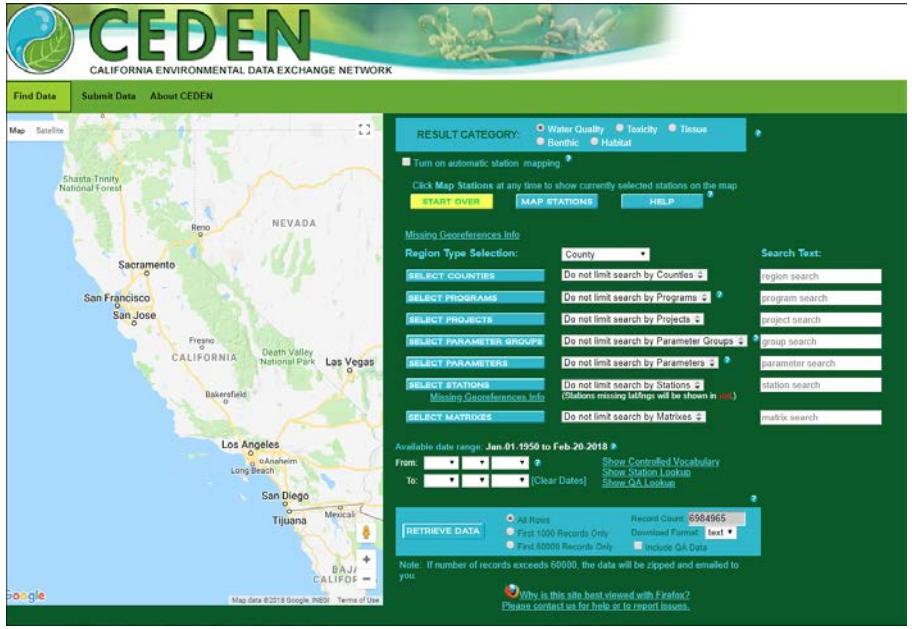
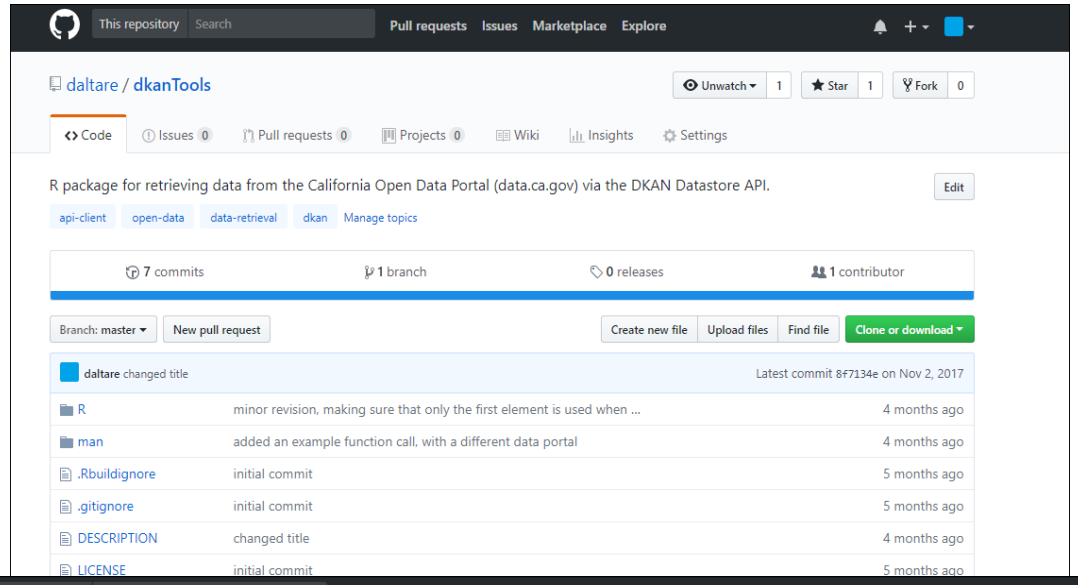
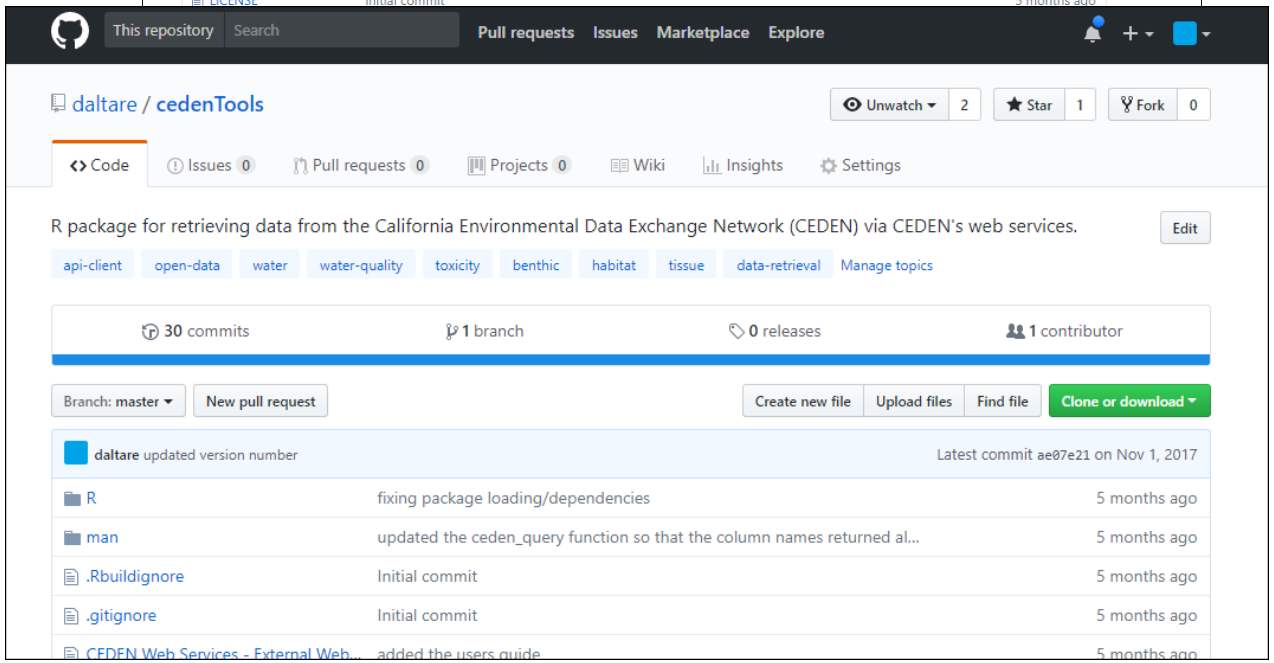
APIs

APIs

- Open Data Portal (dkan)
- Internal Databases







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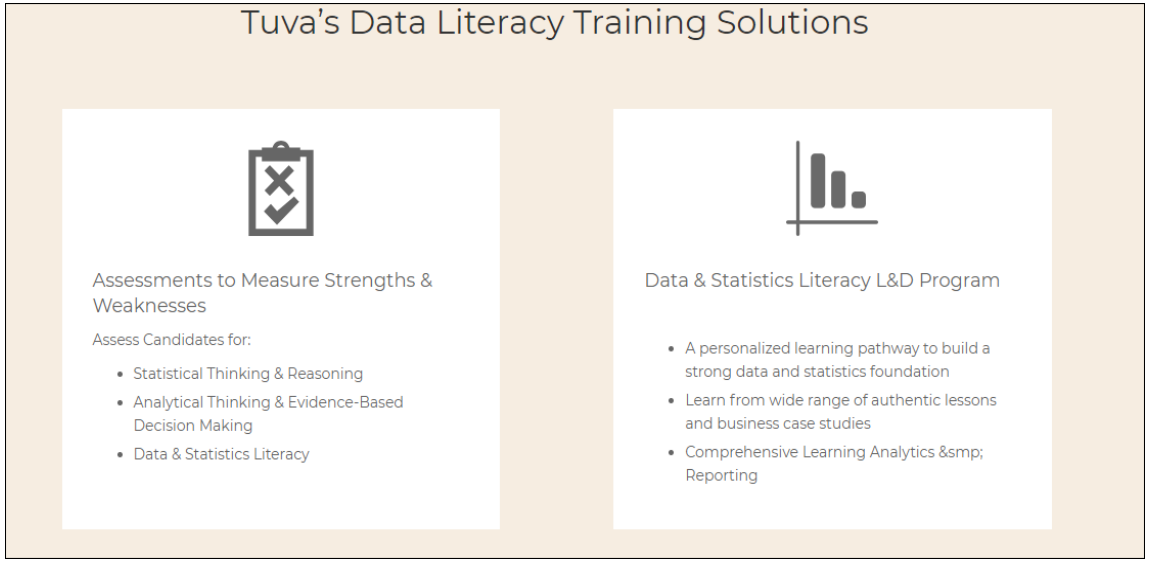
Build Capacity

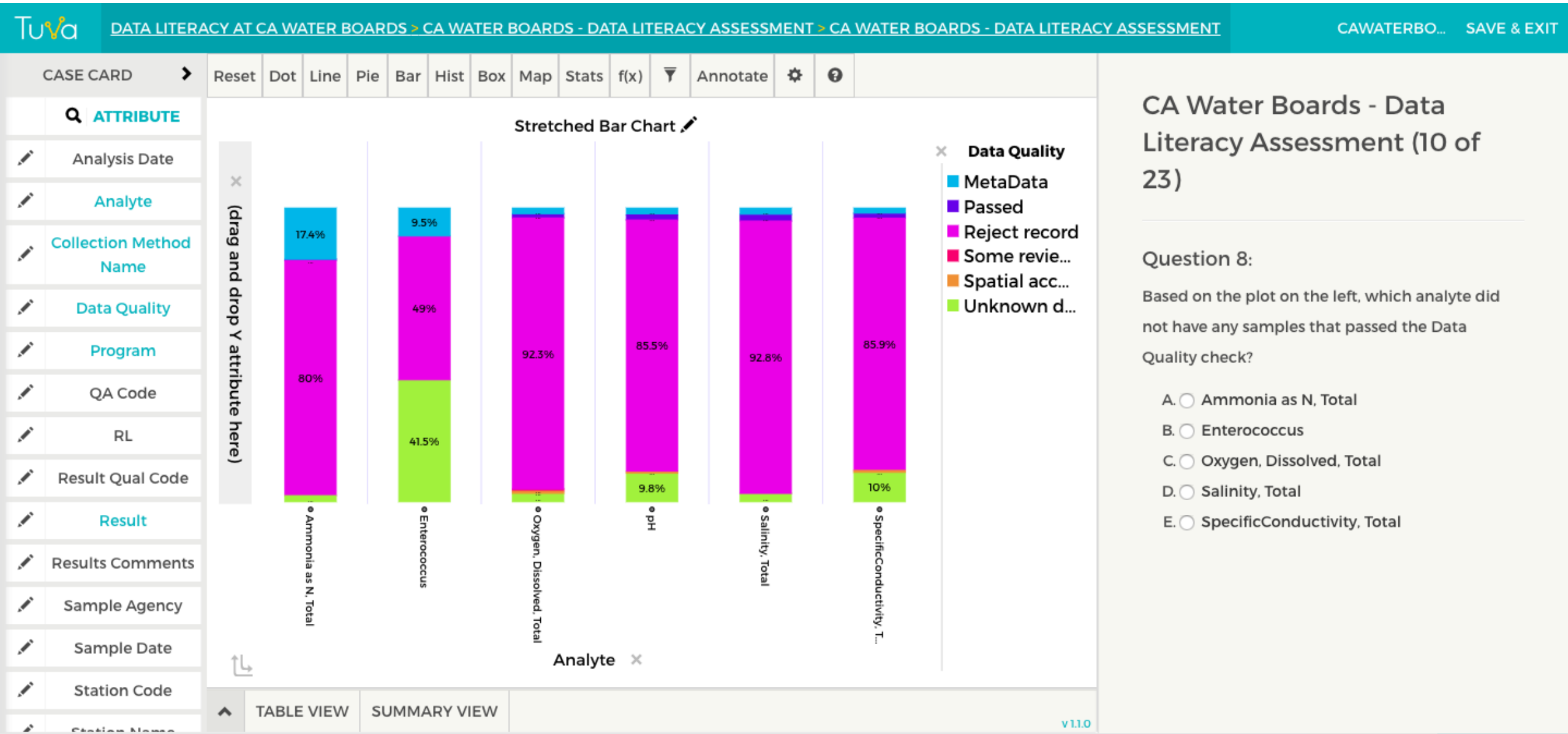
Enhance organization-wide ‘data literacy’

Pilot assessment and training program:

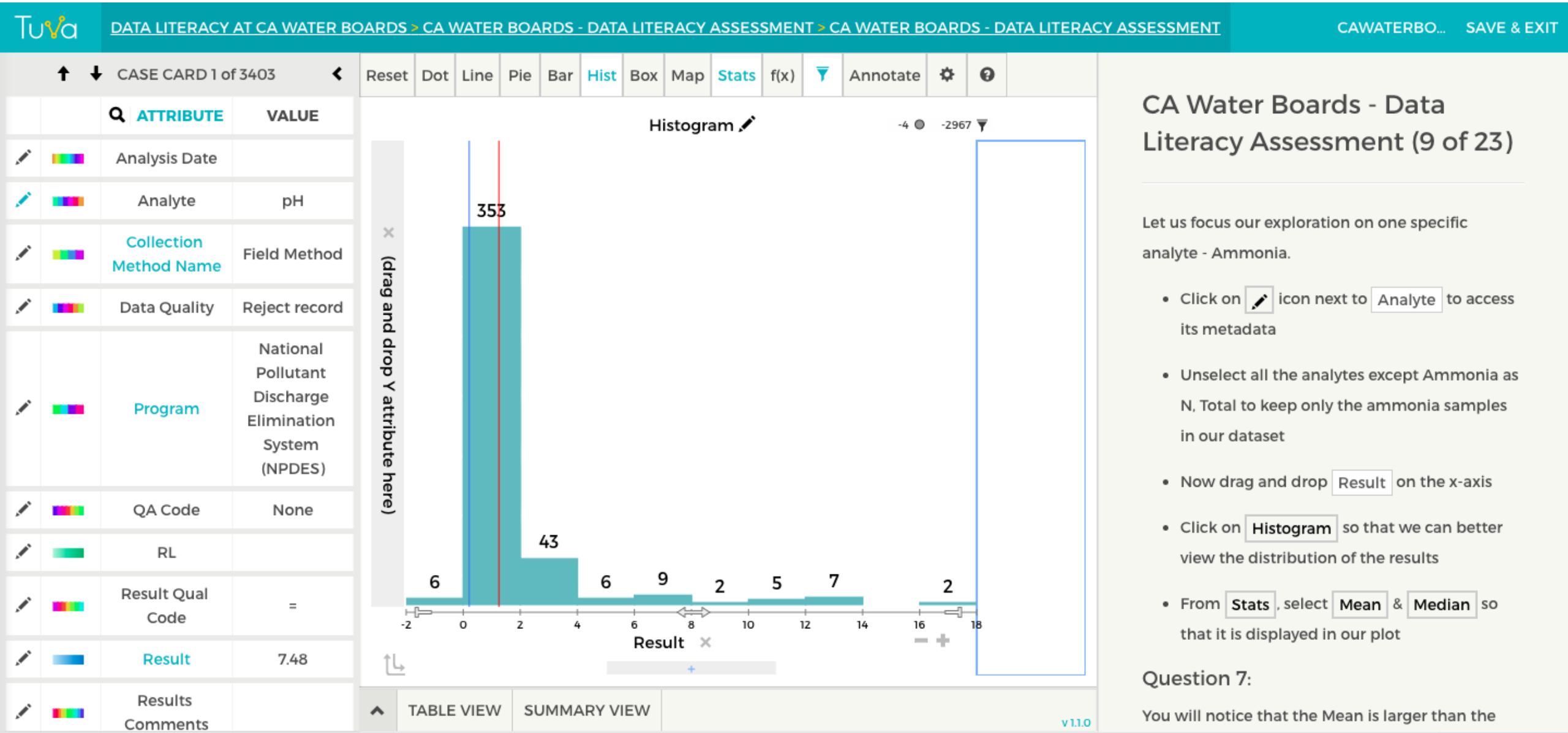
- Reinforce basic concepts (how to engage with data)
- Apply best practices throughout the data life cycle (collecting, storing, managing, sharing, analyzing, reporting, …)



Data Literacy Assessment



Data Literacy Assessment Continued



Data Literacy Assessment (cont.)

Tuva | DATA LITERACY AT CA WATER BOARDS > CA WATER BOARDS - DATA LITERACY ASSESSMENT > CA WATER BOARDS - DATA LITERACY ASSESSMENT | CAWATERBO... | SAVE & EXIT

CASE CARD 1 of 3403

ATTRIBUTE	VALUE
Analysis Date	
Analyte	pH
Collection Method Name	Field Method
Data Quality	Reject record
Program	National Pollutant Discharge Elimination System (NPDES)
QA Code	None
RL	
Result Qual Code	=
Result	7.48
Results Comments	

Reset | Dot | Line | Pie | Bar | Hist | Box | Map | Stats | f(x) | Annotate

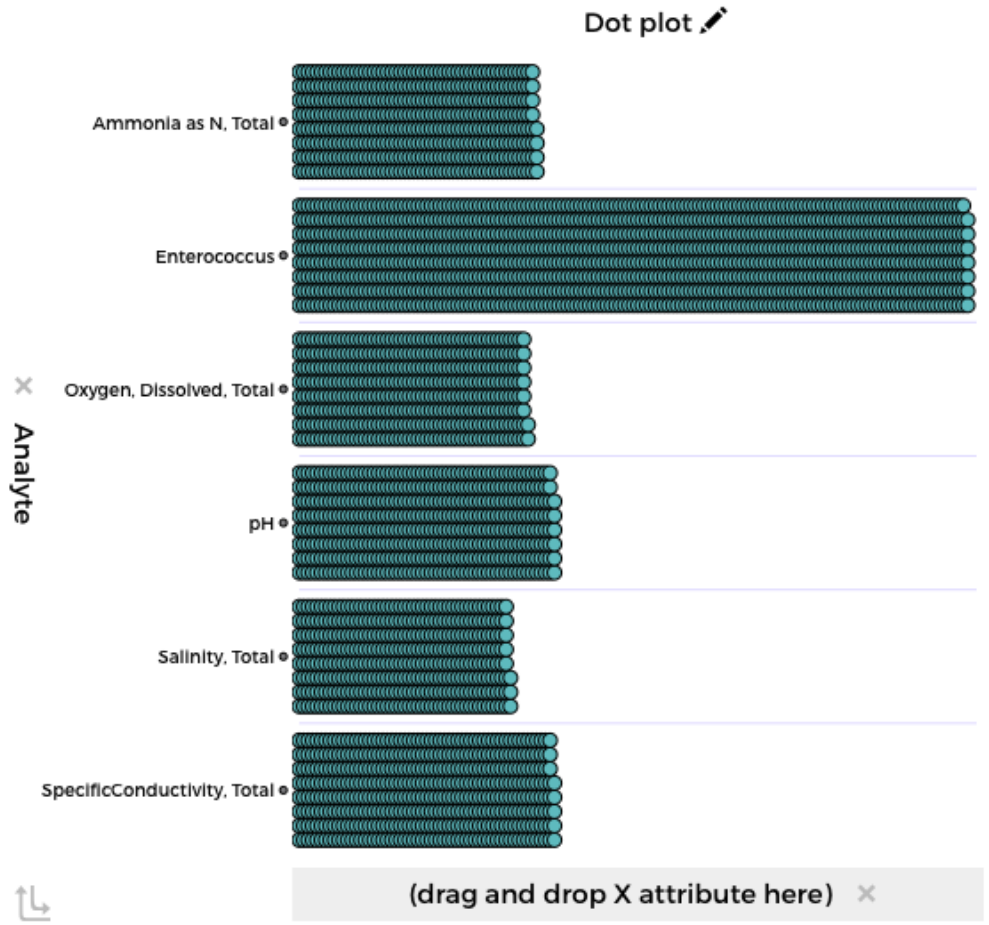


TABLE VIEW | SUMMARY VIEW

v 1.1.0

CA Water Boards - Data Literacy Assessment (7 of 23)

The dataset on the left contains 3403 samples from chemistry and field analyses of the Tijuana River.

- Drag Analyte to the y-axis
- Drag Unit to the x-axis

Question 5:

Based on the plot, which of the following analytes is measured in more than one unit.

A. Ammonia as N, Total
B. Oxygen, Dissolved, Total
C. pH
D. Salinity, Total

Text Size | Report Issue | Previous | Next

Foster Engagement With Data

Encourage data use and internal / external collaboration

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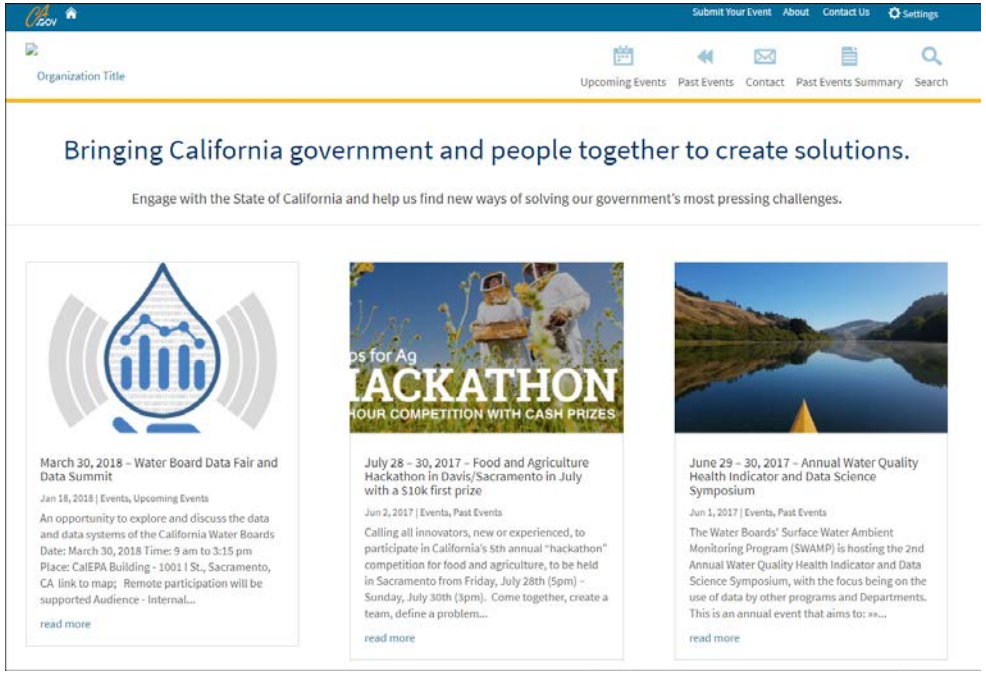
Engagement With Data

Civic Engagement

- Water Board Data Fair – March every other year
- Watershed Health Indicator and Data Science Symposium – June every year
- California Water Data Challenges – Every year (most recent trash and drinking water)

Data Science Group

- Staff and partners



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California Safe Drinking Water Data Challenge
Submit your open data project by Oct. 1, 2018!
WEST BIG DATA INNOVATION HUB
WATER FOUNDATION
GOVERNOR'S OFFICE OF PLANNING AND RESEARCH
STATE OF CALIFORNIA
IMAGINE H2O
BAYAREA COUNCIL
waterchallenge.data.ca.gov
#CAWaterDataChallenge

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20 new datasets in machine-readable format

- Human Right to Water - Drinking Water Enforcement
- Monthly Water Production Reported by Water Suppliers in the Electronic Annual Reports (2011-2015)
- Drinking Water Watch - Public Water Systems Information
- Disadvantaged Communities Mapping and Land Use by Parcel

...in addition to over 1,000 datasets to explore!

California Safe Drinking Water Data Challenge

WEST BIG DATA INNOVATION HUB

WATER FOUNDATION

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH · STATE OF CALIFORNIA

IMAGINE H2O

BAYAREA COUNCIL

CalGovOps
CALIFORNIA GOVERNMENT OPERATIONS AGENCY

CALIFORNIA Water Boards

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA

California DEPARTMENT OF TECHNOLOGY

CALIFORNIA natural resources AGENCY

Berkeley Division of Data Sciences

CODE FOR AMERICA
NATIONAL DAY OF CIVIC HACKING

Well
Water Education for Latino Leaders

LEONARDO DICAPRIO FOUNDATION

BERKELEY LAB

BIDS
BERKELEY INSTITUTE FOR DATA SCIENCE

UNIVERSITY of WASHINGTON eScience Institute

NATIONAL DATA SERVICE · PARTICIPANT

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

Kitware

CALIFORNIA WATER SERVICE CO.

WOLFRAM

jupyter

Data for Good Exchange

Bloomberg

DATA FOR DEMOCRACY

brighthive

waternow alliance

Microsoft

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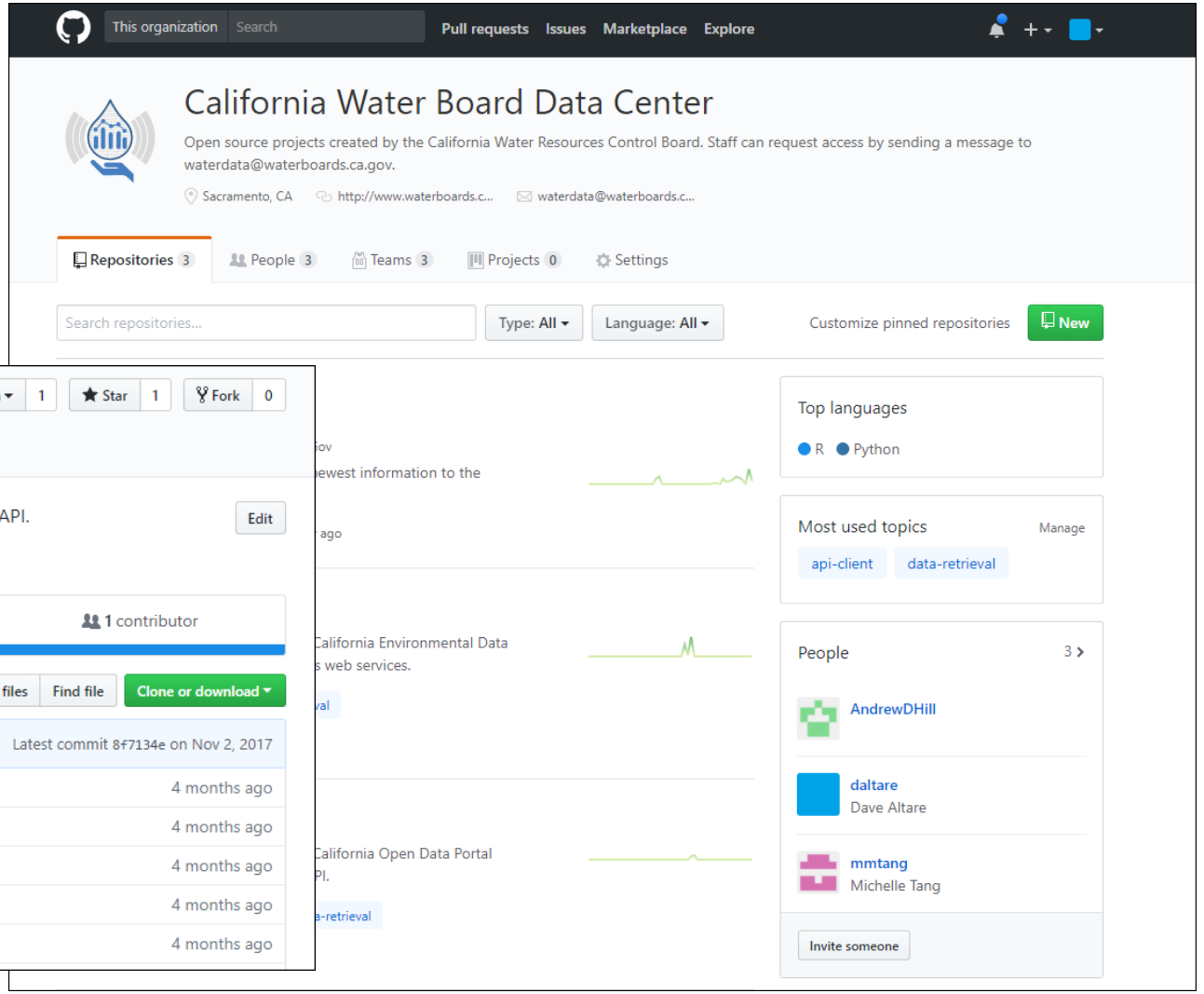
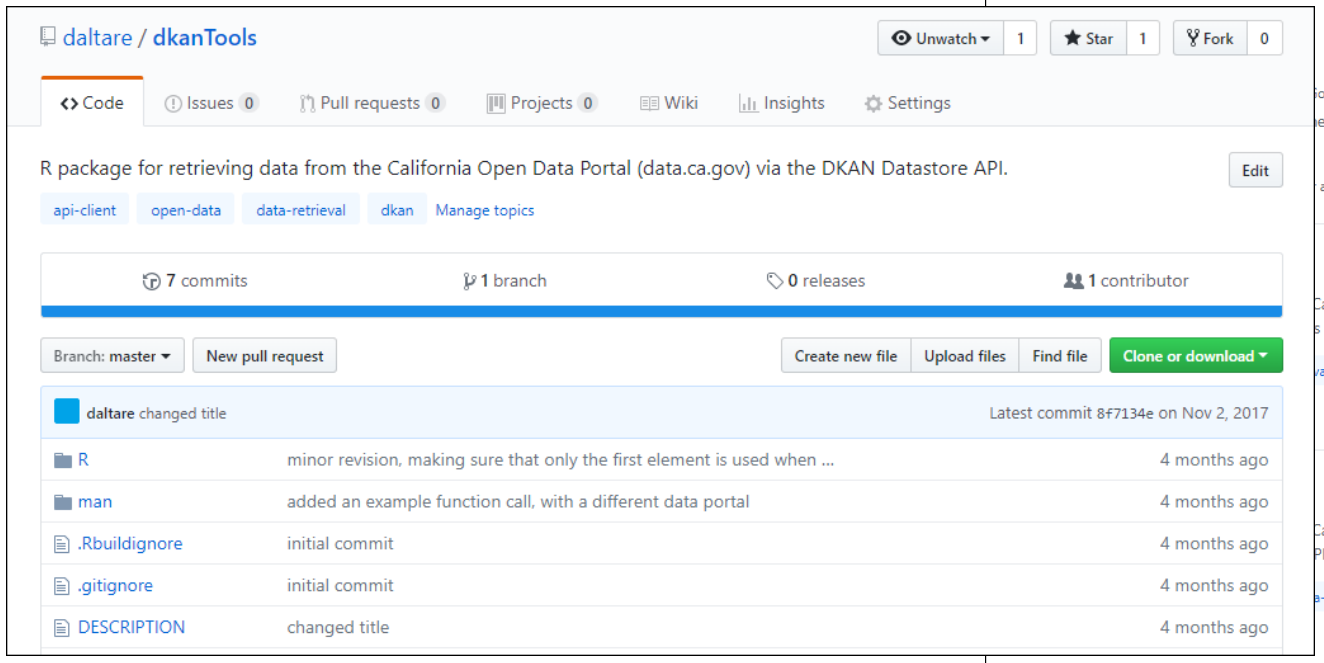
Sharing and Collaborating

- Organizational GitHub
- Open source tools / projects

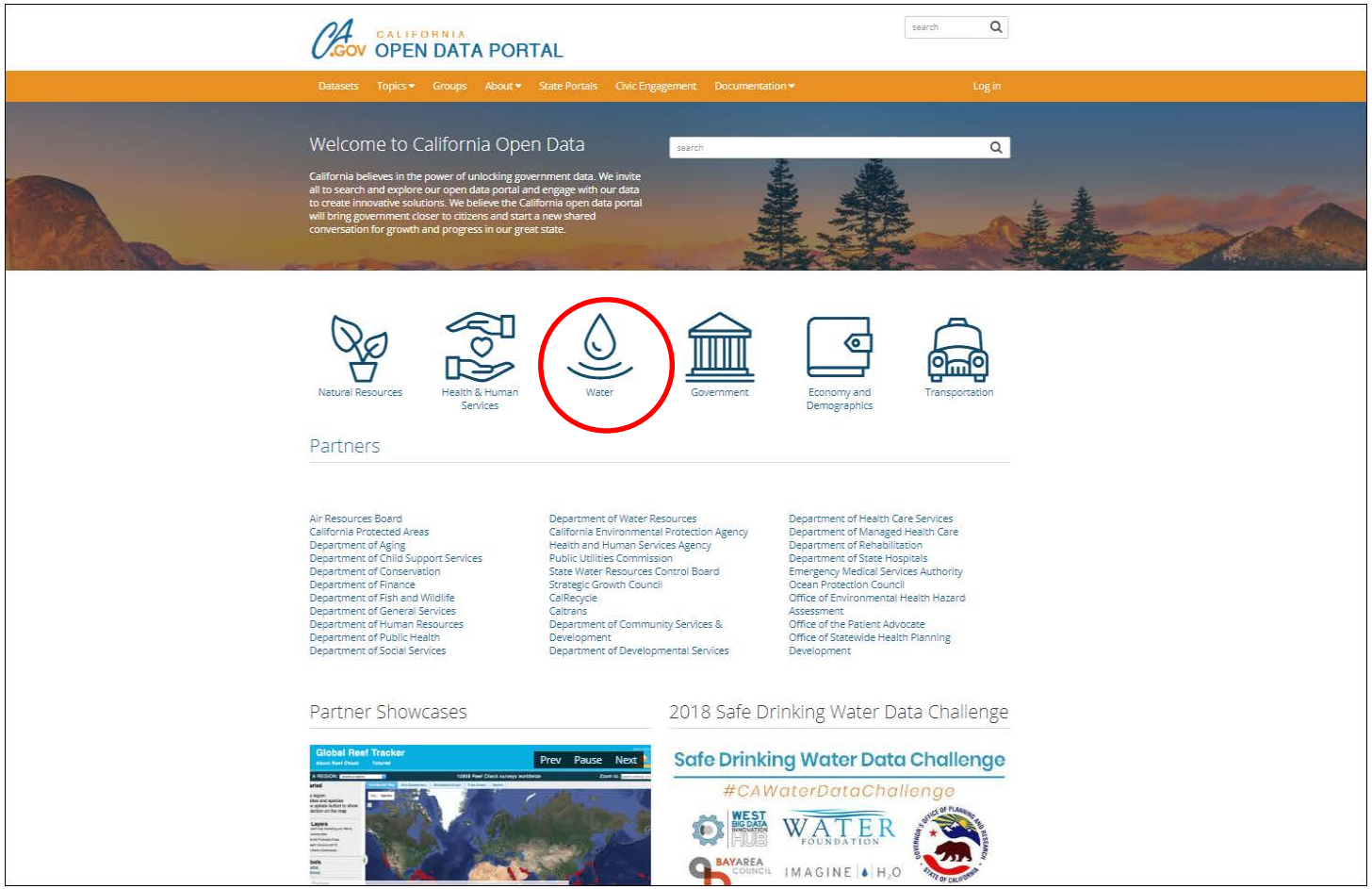




Data.ca.gov

California Open Data Portal: data.ca.gov

- Click on the Water icon to find State Water Board data



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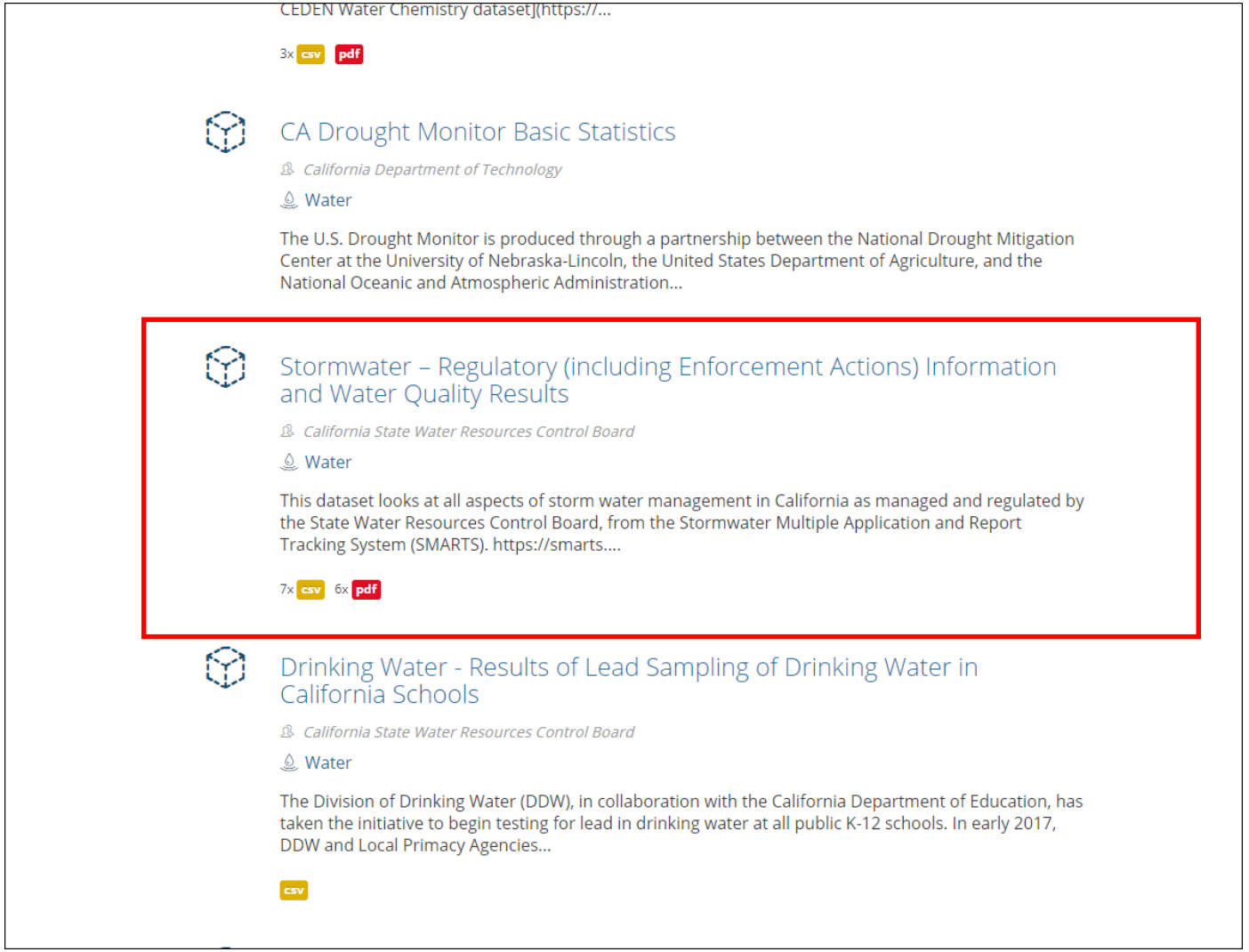
Stormwater Datasets

California Open Data Portal

- Stormwater datasets



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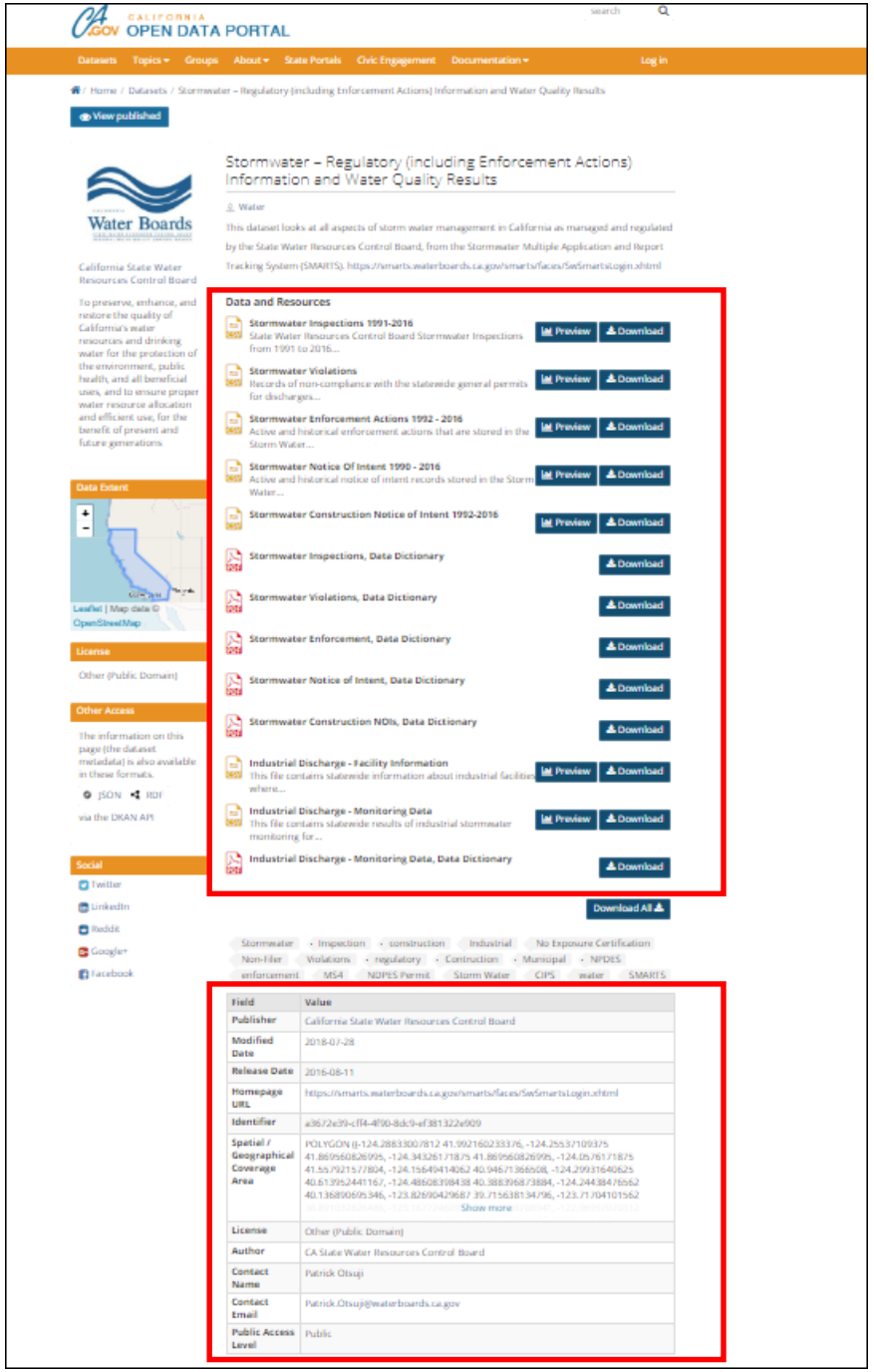
Open Data Services

[California Open Data Portal]

- Datasets available as .csv files
- Data dictionaries
- Data description and metadata

- Currently available stormwater datasets include:
  - Industrial stormwater discharges (monitoring data and facility information)
  - Inspections, violations, and enforcement actions
  - Notice of Intent records



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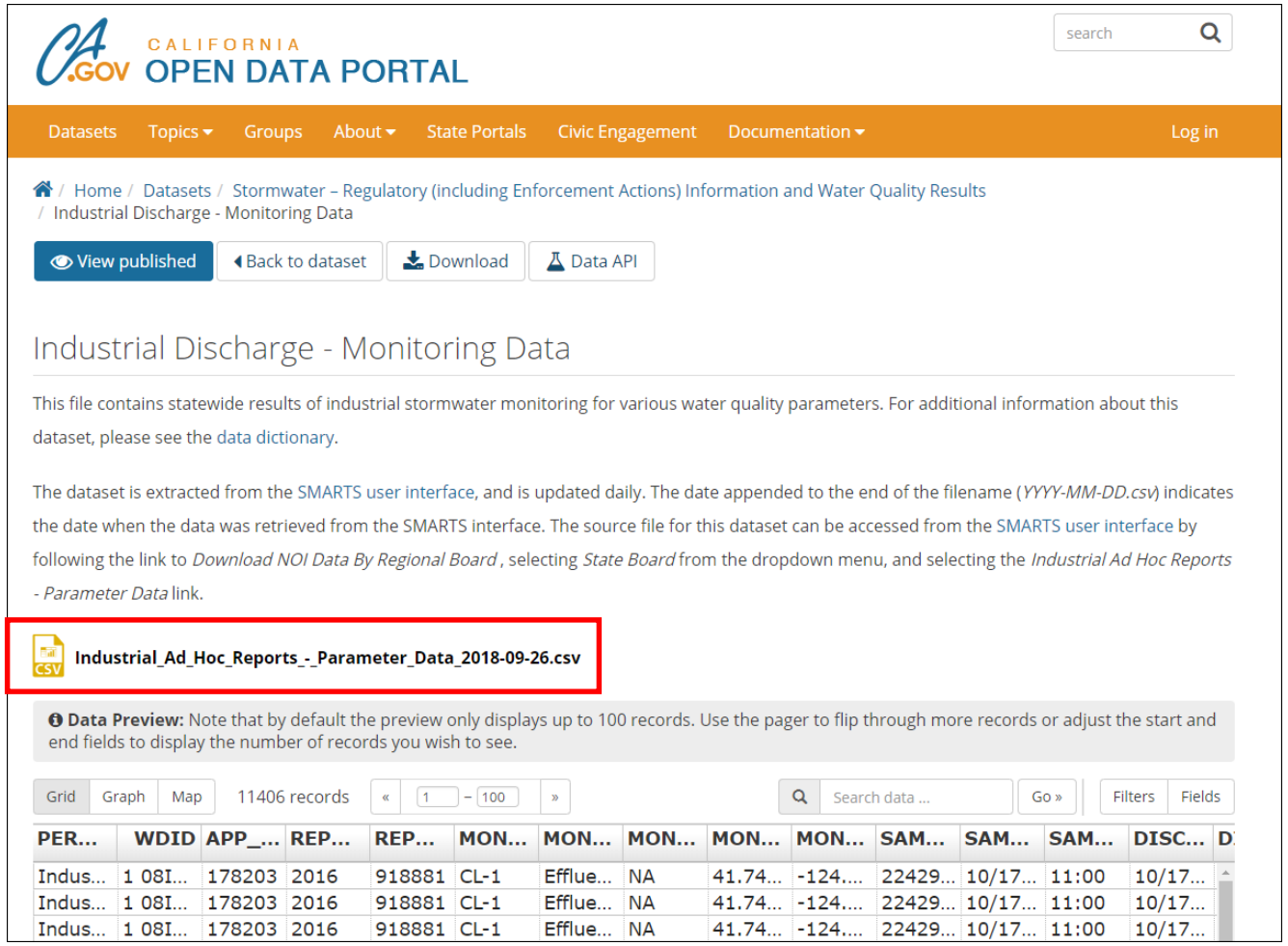
More Open Data Services

Industrial Discharge Data

- Updated regularly via an automated process
- Persistent link to the data file
- API enabled



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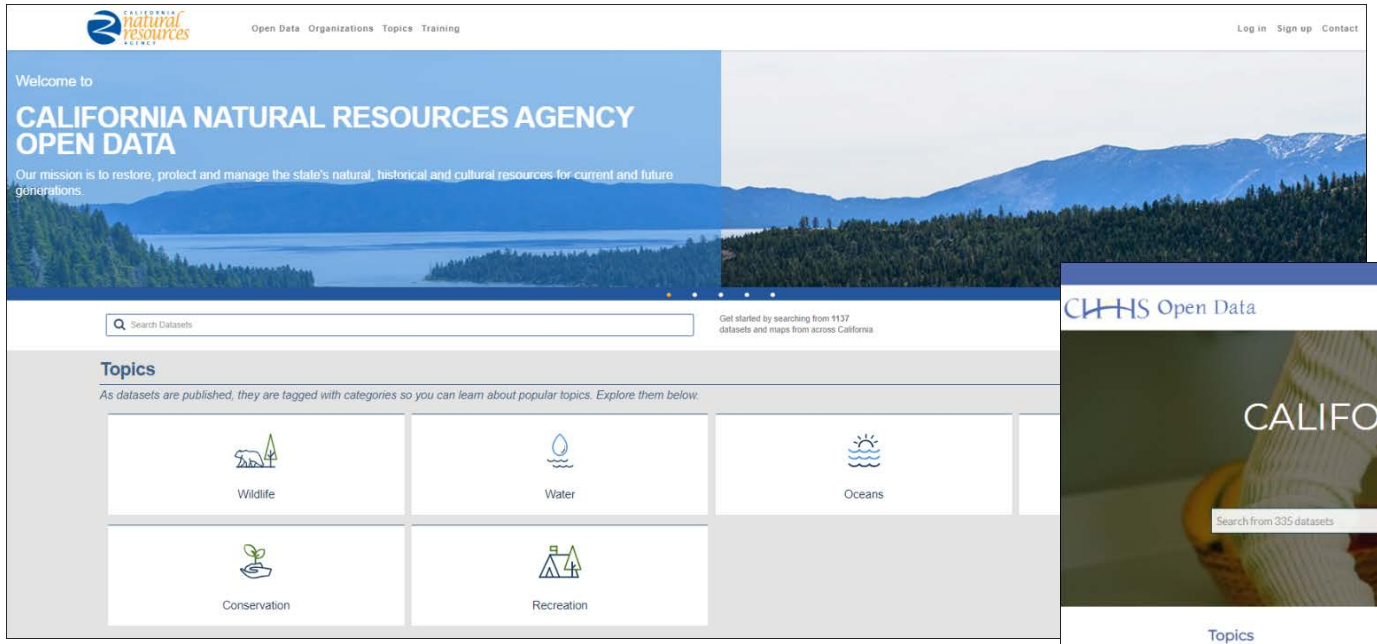
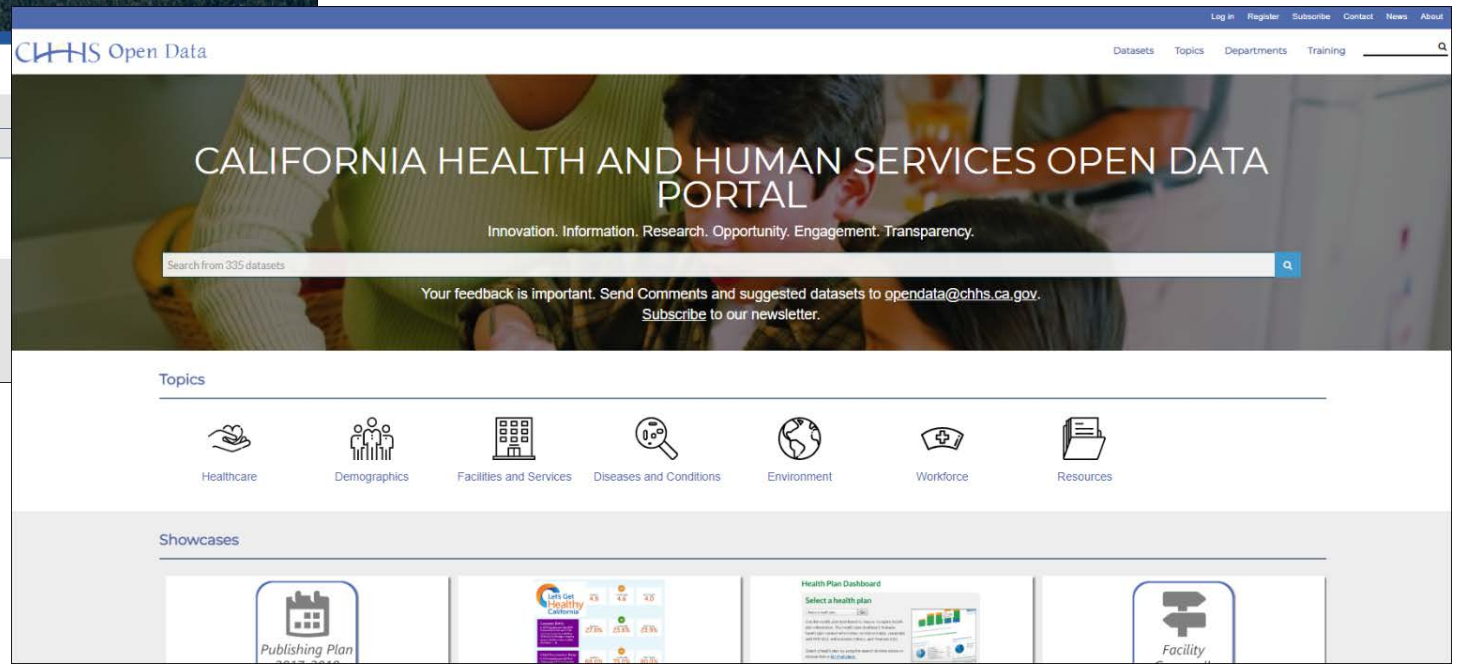
Other State Portals

- California Natural Resources Agency
- California Department of Health & Human Services
- Others





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Data Products

Integrate open data services into tools for internal and external use

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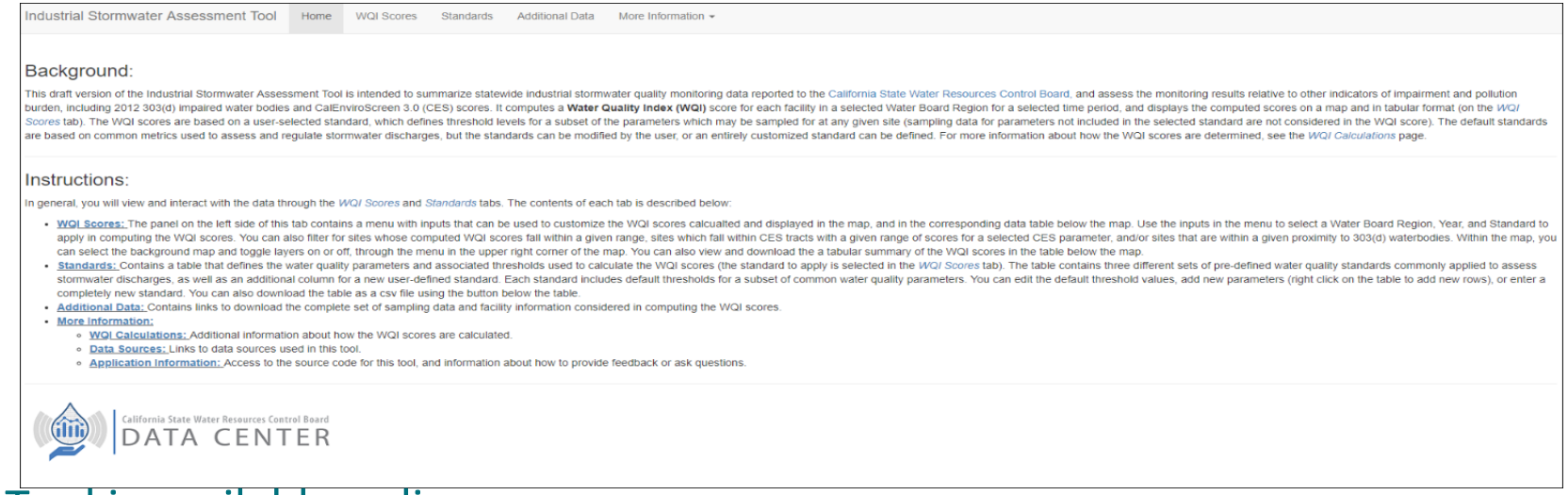
Industrial Stormwater Assessment Tool



- Tool is available online.
- Derived from a tool first developed by the California Coastkeeper Alliance / San Diego Coastkeeper and Water Board's Office of Enforcement
- Assesses water quality of industrial stormwater discharges relative to other indicators of water quality impairment and pollution (303d Listed Waterbodies, CalEnviroScreen 3.0)

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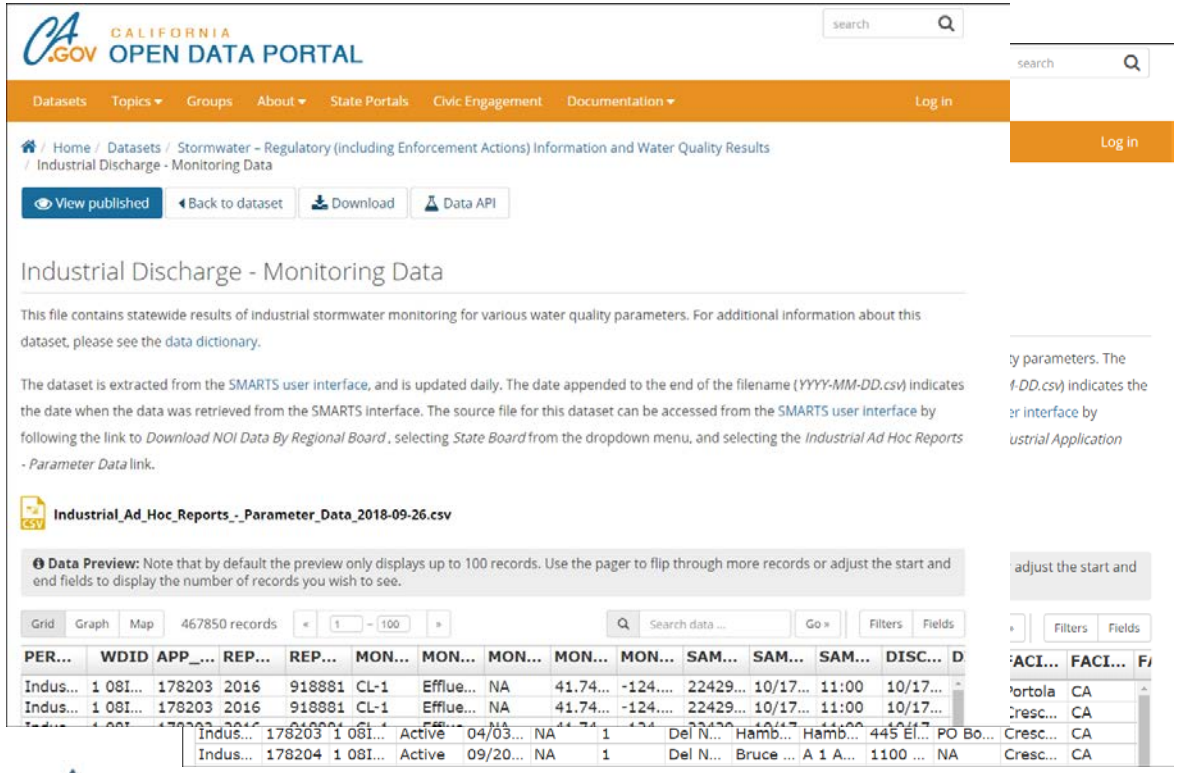
Stormwater Assessment Tool

Industrial Stormwater Assessment Tool:

- Accesses data from the CA Open Data Portal
- Built with open source tools (R Programming Language) – code available on GitHub



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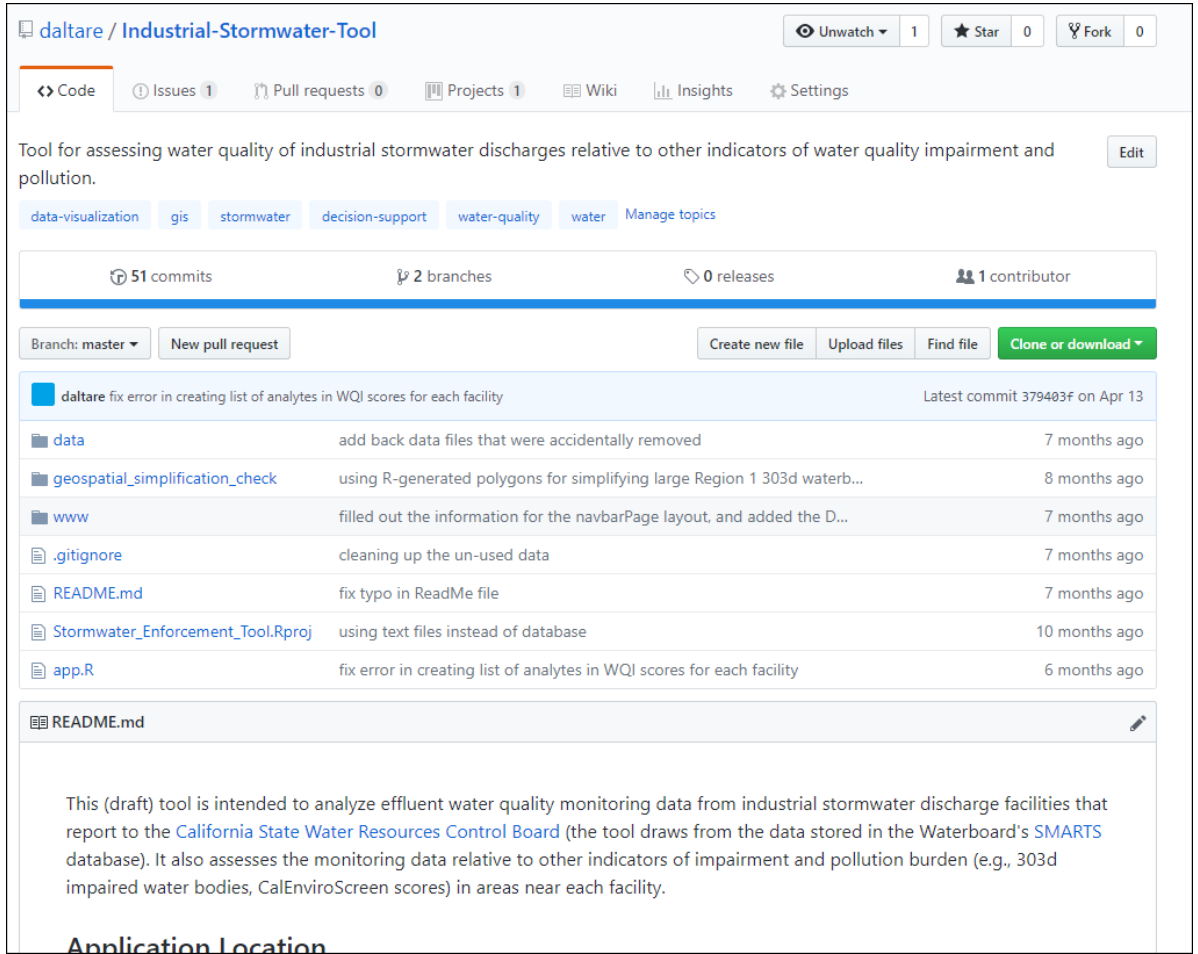
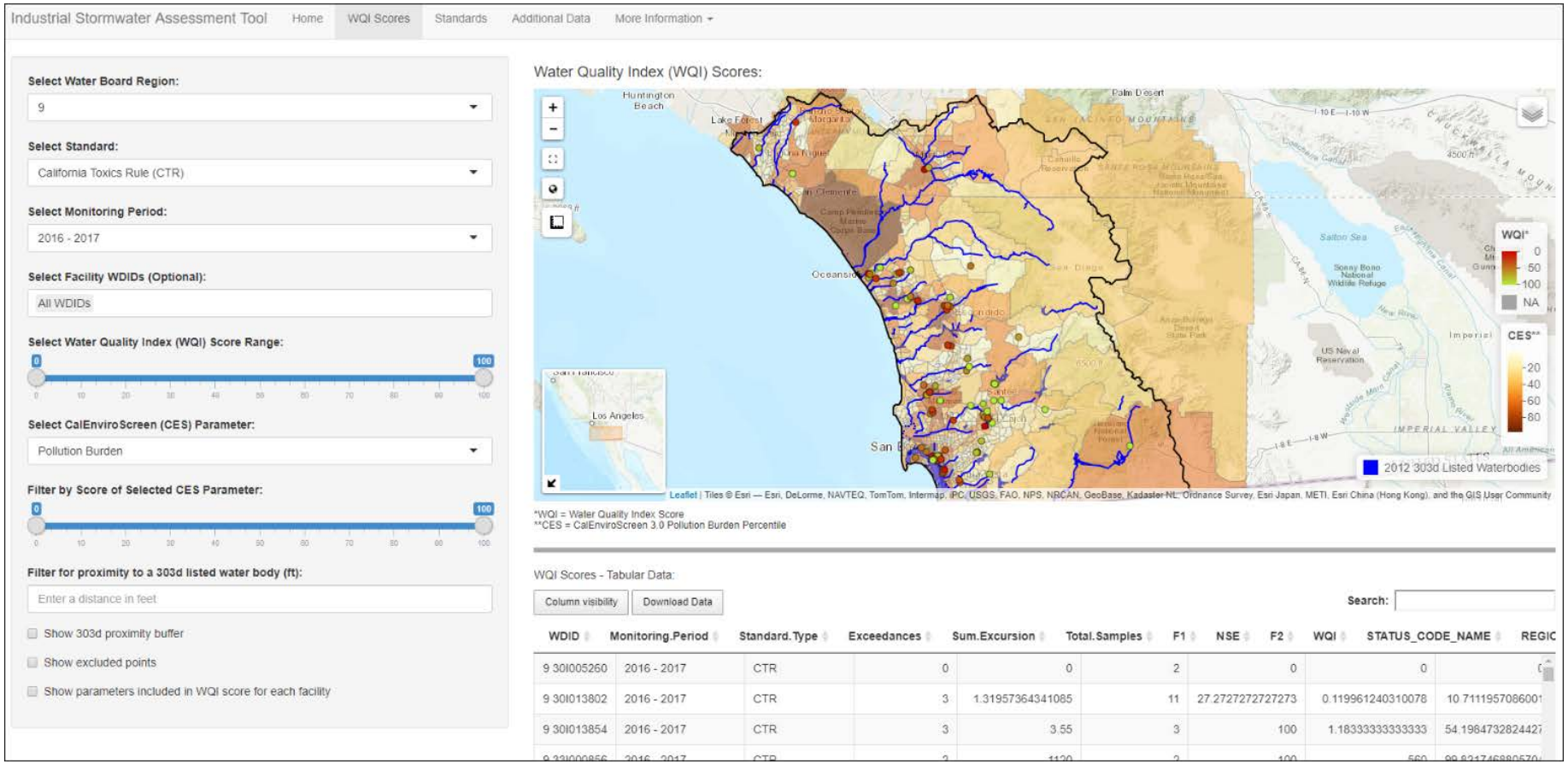


Stormwater Assessment Tool (example)

Industrial Stormwater Assessment Tool:

- Calculates a Water Quality Index (WQI) score for each facility in a selected Water Board Region for a selected time period, and displays the computed scores on a map and in tabular format



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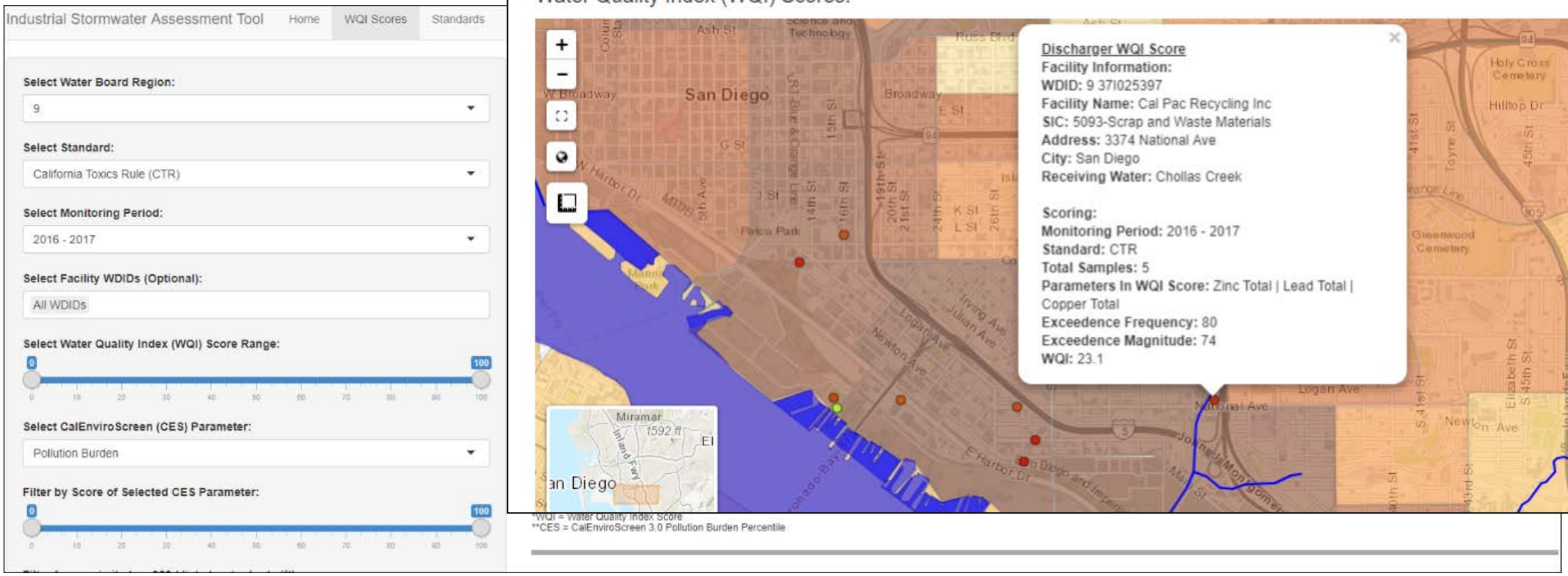
Stormwater Assessment Tool (ex. 2)

Industrial Stormwater Assessment Tool:

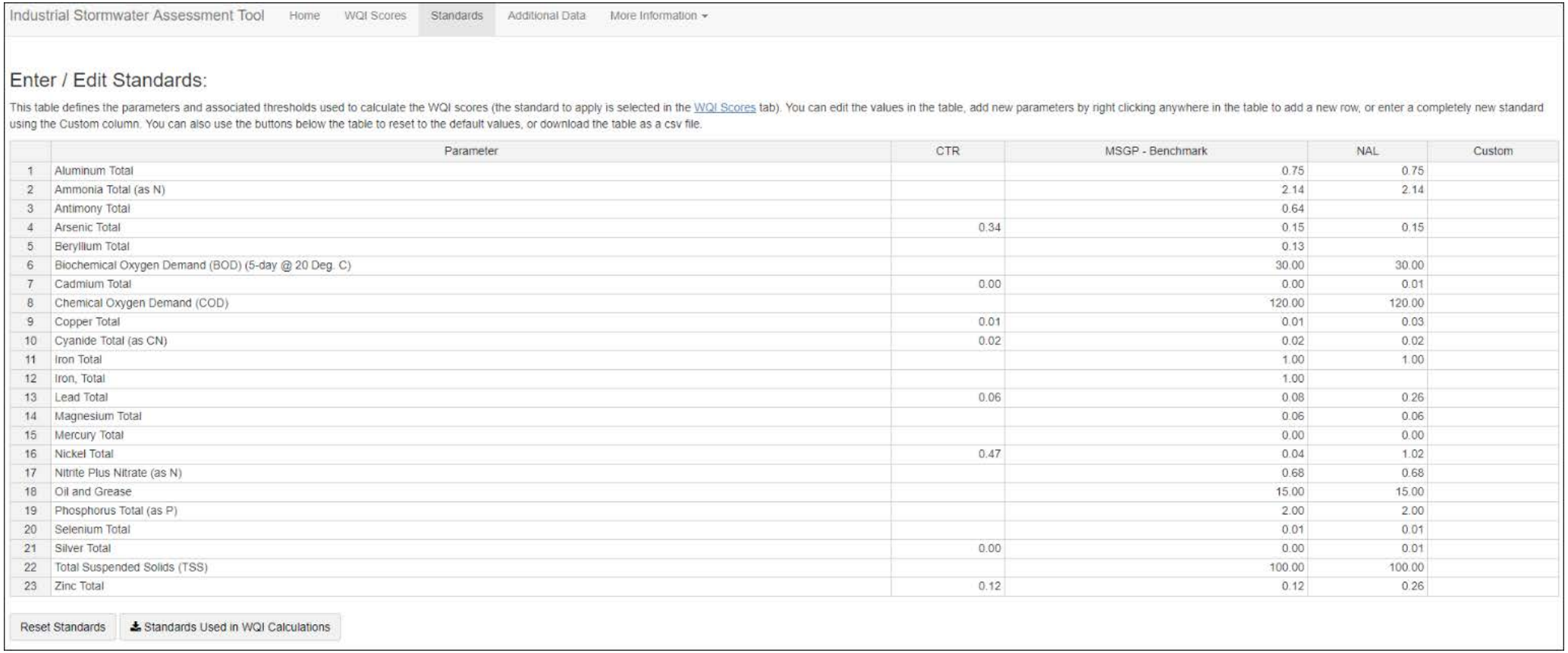
- Water Quality Index (WQI) score considers the frequency and magnitude of exceedance of water quality thresholds/standards (details available under *More Information* tab)



Stormwater Assessment Tool (ex. 3)

Industrial Stormwater Assessment Tool:

- Standards used in calculating Water Quality Index (WQI) scores can be customized (pre-populated standards available based on existing rules and regulations)



Industrial Stormwater Assessment Tool | Home | WQI Scores | Standards | Additional Data | More Information

Enter / Edit Standards:

This table defines the parameters and associated thresholds used to calculate the WQI scores (the standard to apply is selected in the WQI Scores tab). You can edit the values in the table, add new parameters by right clicking anywhere in the table to add a new row, or enter a completely new standard using the Custom column. You can also use the buttons below the table to reset to the default values, or download the table as a csv file.

	Parameter	CTR	MSGP - Benchmark	NAL	Custom
1	Aluminum Total		0.75	0.75	
2	Ammonia Total (as N)		2.14	2.14	
3	Antimony Total		0.64		
4	Arsenic Total	0.34	0.15	0.15	
5	Beryllium Total		0.13		
6	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)		30.00	30.00	
7	Cadmium Total	0.00	0.00	0.01	
8	Chemical Oxygen Demand (COD)		120.00	120.00	
9	Copper Total	0.01	0.01	0.03	
10	Cyanide Total (as CN)	0.02	0.02	0.02	
11	Iron Total		1.00	1.00	
12	Iron, Total		1.00		
13	Lead Total	0.06	0.08	0.26	
14	Magnesium Total		0.06	0.06	
15	Mercury Total		0.00	0.00	
16	Nickel Total	0.47	0.04	1.02	
17	Nitrite Plus Nitrate (as N)		0.68	0.68	
18	Oil and Grease		15.00	15.00	
19	Phosphorus Total (as P)		2.00	2.00	
20	Selenium Total		0.01	0.01	
21	Silver Total	0.00	0.00	0.01	
22	Total Suspended Solids (TSS)		100.00	100.00	
23	Zinc Total	0.12	0.12	0.26	

Reset Standards | Standards Used in WQI Calculations

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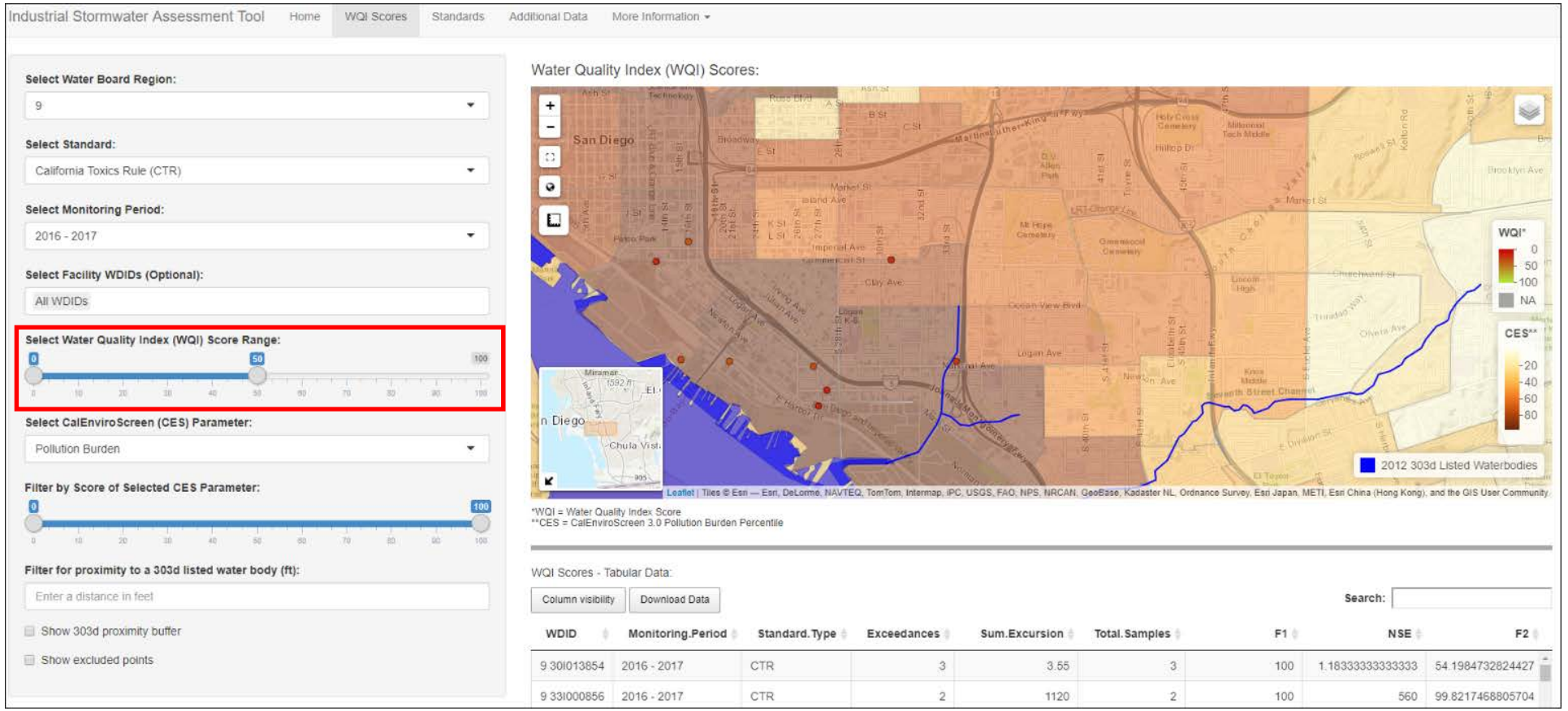
Stormwater Assessment Tool (ex. 4)

Industrial Stormwater Assessment Tool:

- Filter results based on: **WQI Score**



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Stormwater Assessment Tool (ex. 5)

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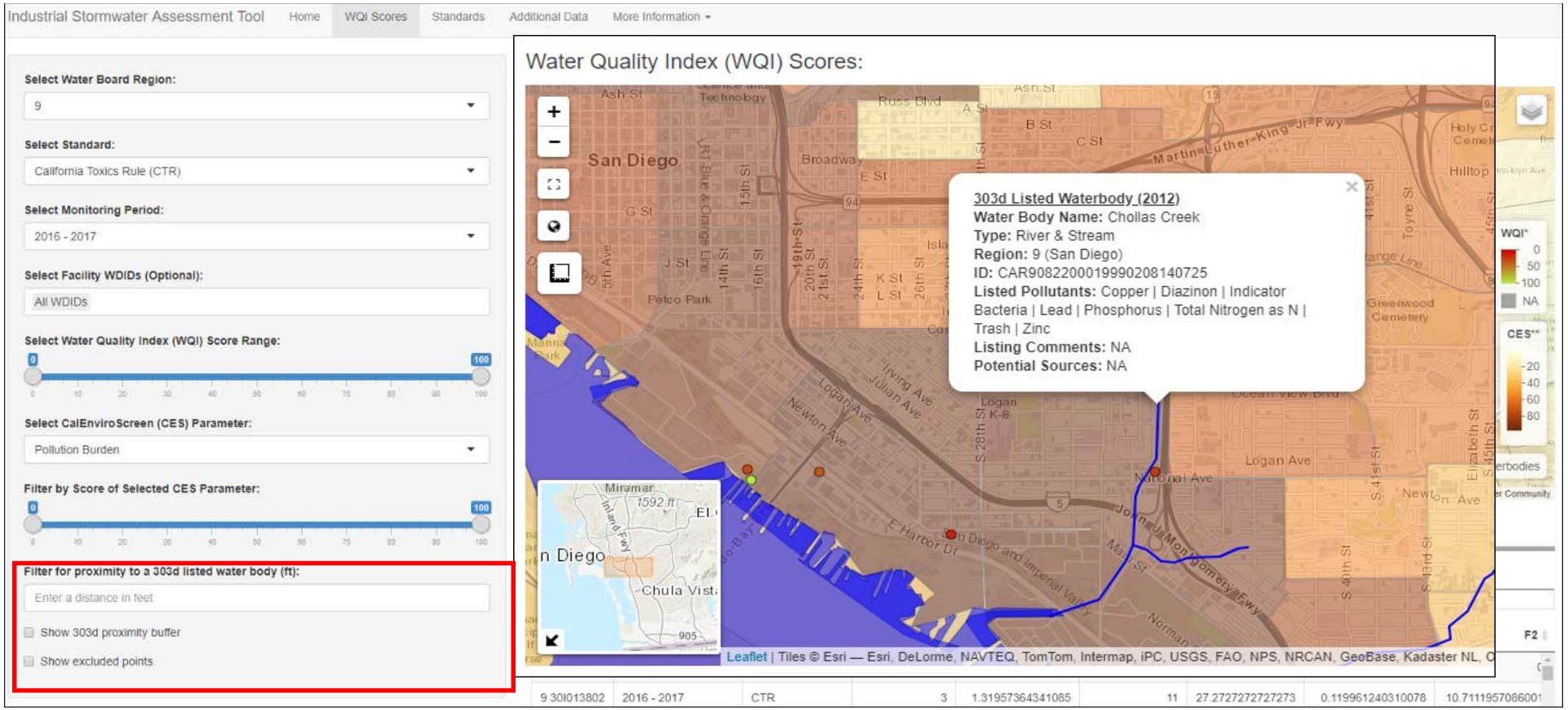
Industrial Stormwater Assessment Tool:

- Filter results based on: **proximity to 303d listed waterbodies**

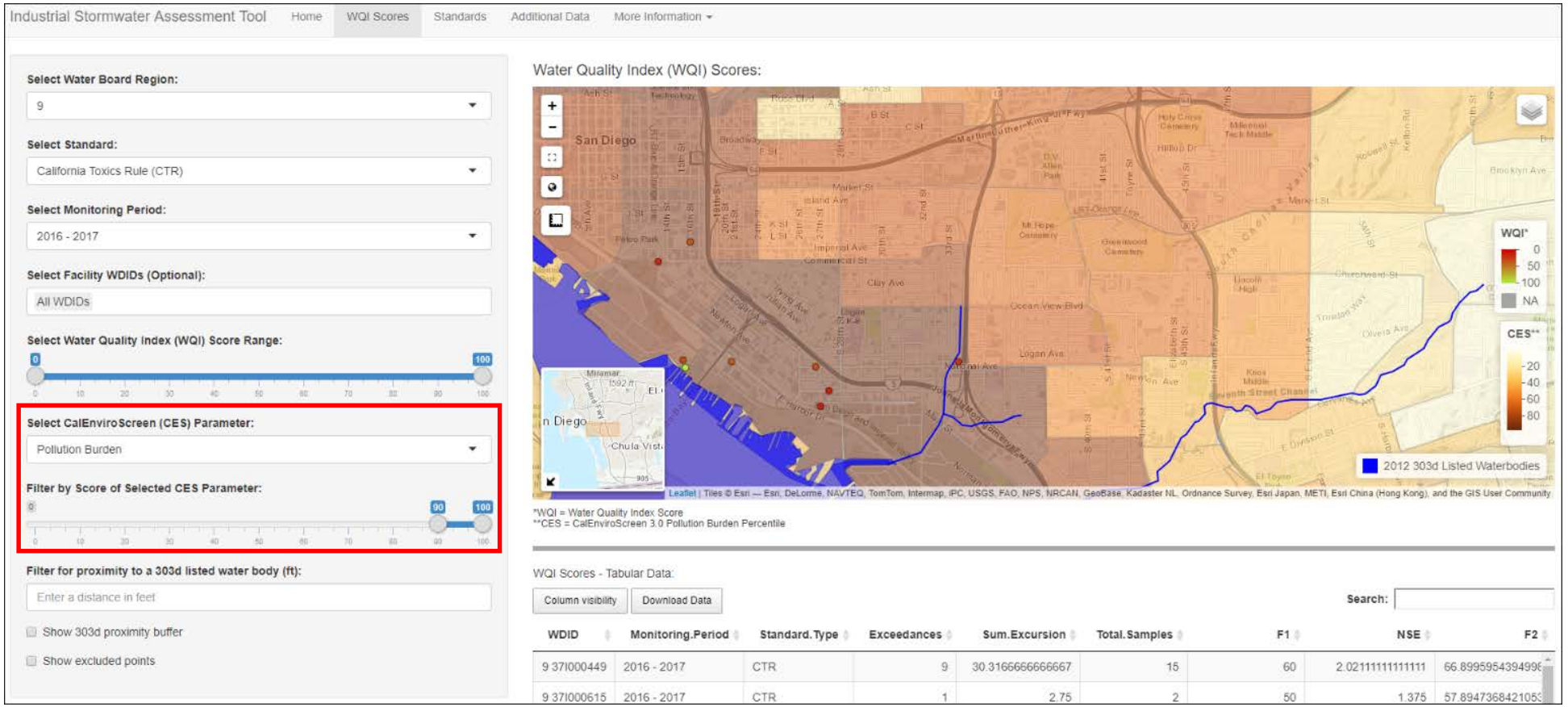


Stormwater Assessment Tool (ex. 6)

California State Water Resources Control Board
DATA CENTER

Industrial Stormwater Assessment Tool:

- Filter results based on: **CalEnviroScreen 3.0 parameter values (by census tract)**

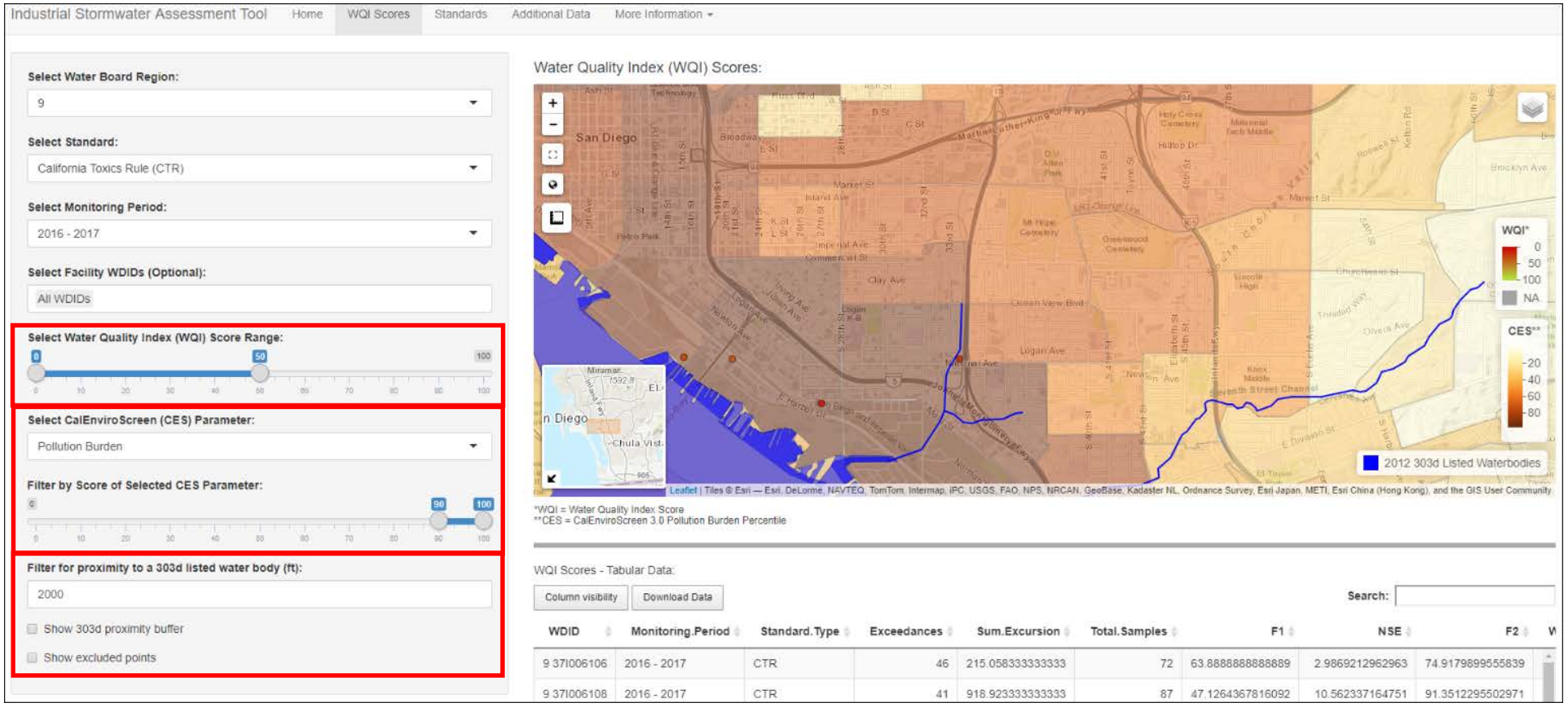


Stormwater Assessment Tool (ex. 7)

California State Water Resources Control Board
DATA CENTER

Industrial Stormwater Assessment Tool:

- Filter results based on: **WQI Score, proximity to 303d listed waterbodies, and CalEnviroScreen 3.0 parameter values**

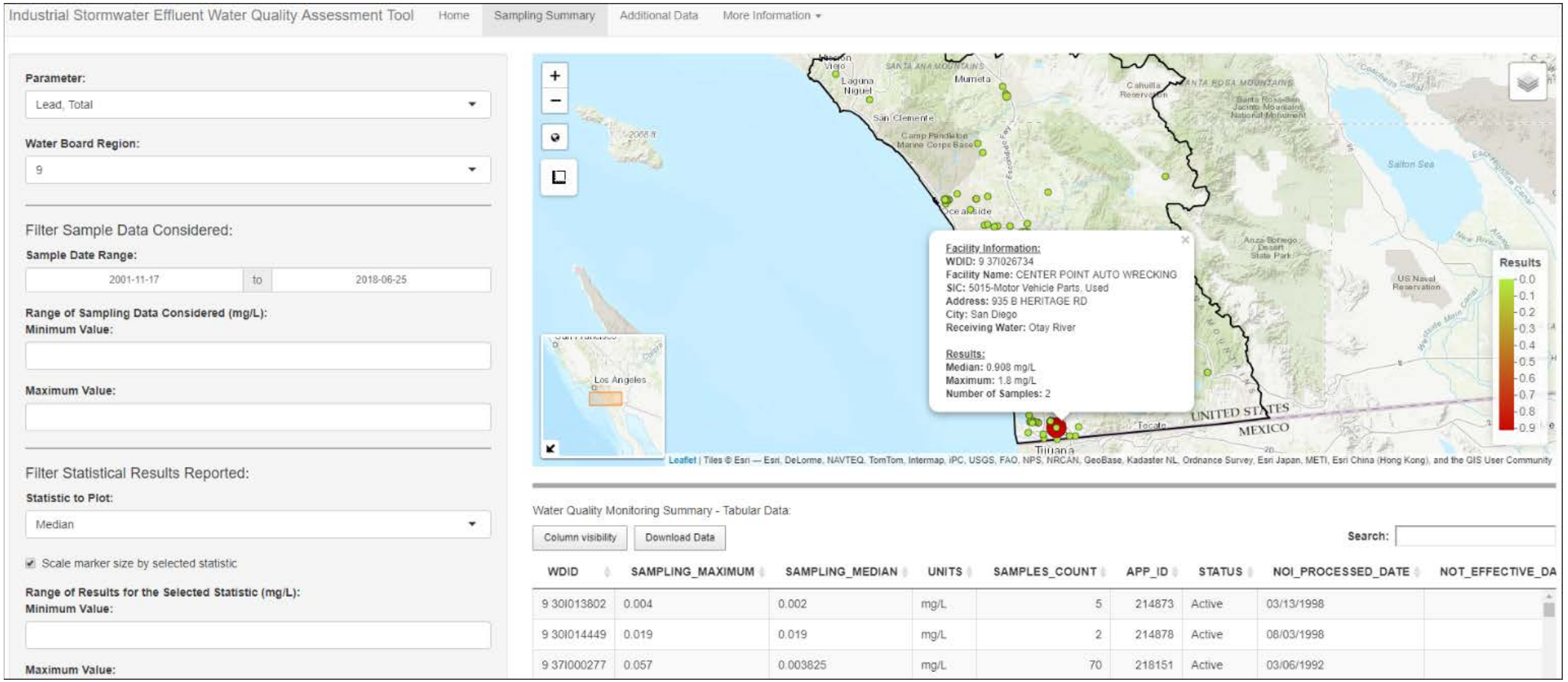


Stormwater Assessment Tool (ex. 8)

California State Water Resources Control Board DATA CENTER

Similar tool developed to investigate individual water quality parameters:

- Can be used to assess water quality and to perform QA/QC (e.g. identify outliers)



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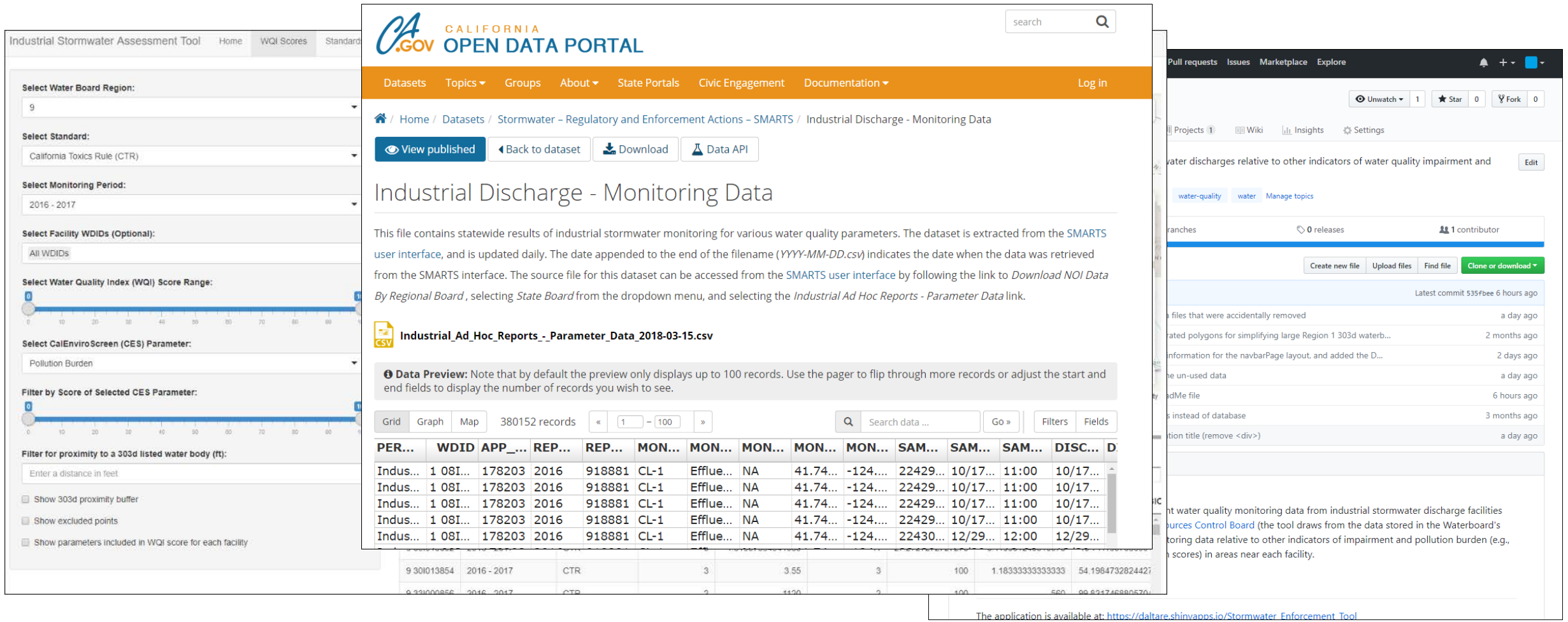
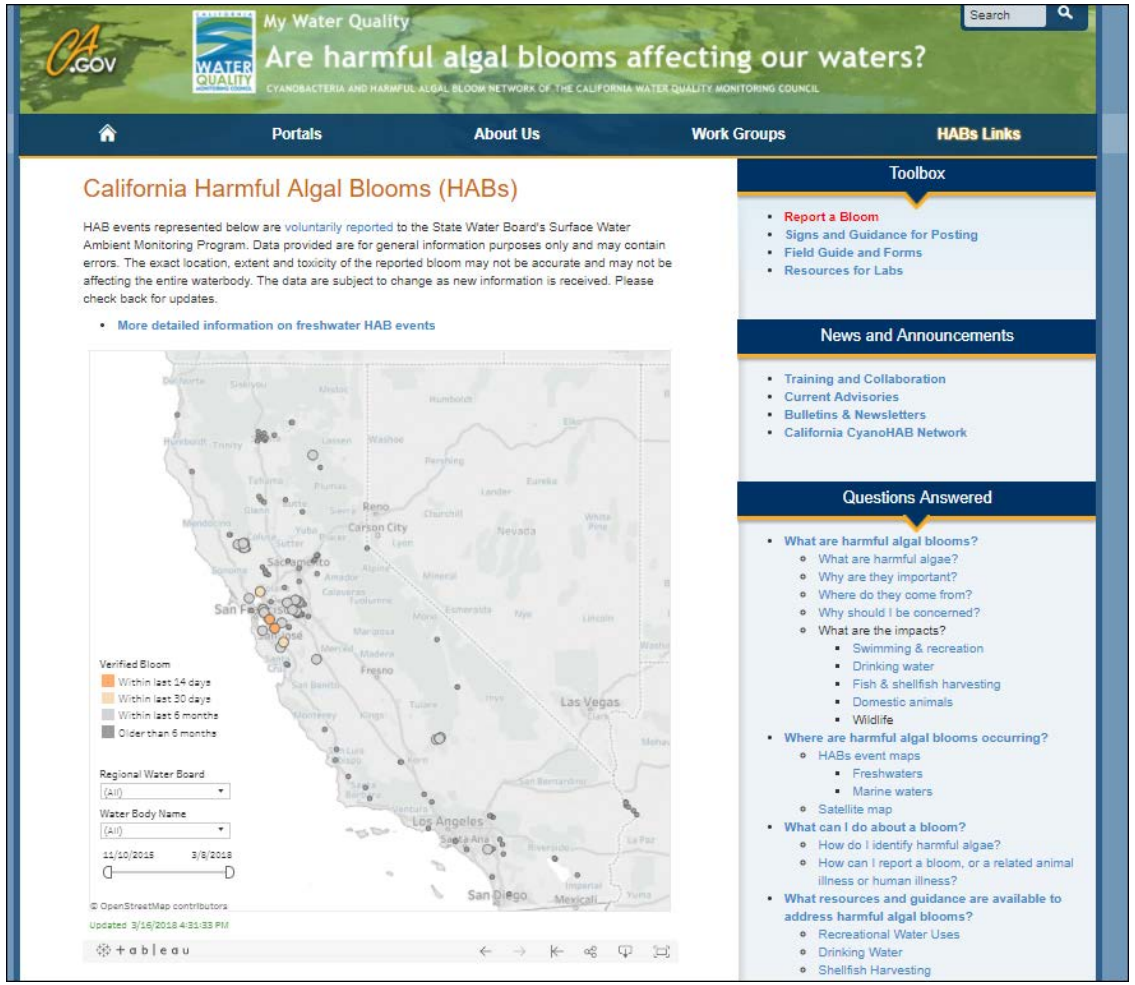
Enable data-driven decision making



More Data Products

Communicate vital information to the public



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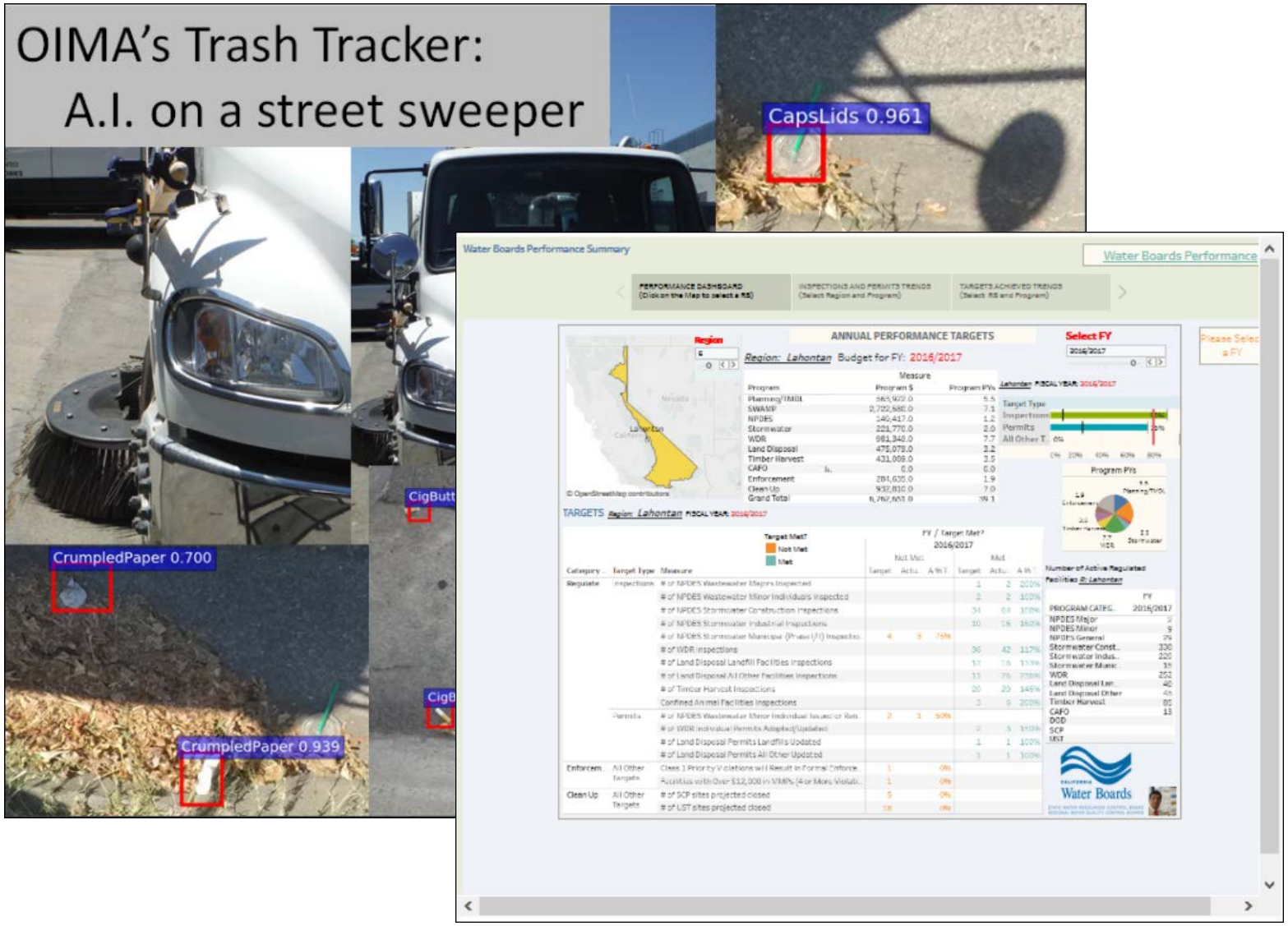
More Examples

More examples – Data-Driven Management (Performance Report), Innovative Tools (Trash Tracker), etc.



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Open Data at the CA Water Boards

The Open and Transparent Water Data Act (AB1755), our efforts to better manage our data, and the related principles adopted by the State Water Board in July 2018

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The Open and Transparent Water Data Act (AB 1755)

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AB1755 requirements operative to WBs

- DWR is leading effort to build platform, develop protocols, etc.
- Water Board and WQ Monitoring Council is supporting DWR effort(s)
- Water Board must publish open data by September 2019. In addition, by August 2020 we must:
  - **12415.** The statewide integrated water data platform created pursuant to Section 12410 shall, at a minimum, do all of the following:
  - (a) Integrate existing water and ecological data information from multiple autonomous databases managed by federal, state, and local agencies and academia using consistent and standardized formats.
  - (b) Integrate the following datasets, as available:
  - (1) The department's information on State Water Project reservoir operations, groundwater use, groundwater levels, urban water use, and land use.
  - (2) The state board's data on water rights, water diversions, and water quality through California Environmental Data Exchange Network (CEDEN)

5 Guiding Principles for WB Data Management

1. **Make Data Accessible ("Open First")**: our organization values transparency and strives to make all critical data available in machine readable datasets with metadata and data dictionaries
2. **Understand Data Quality and Integrity**: our data are thoughtfully planned, of known and useful quality, and we deploy practices to protect its integrity with standards and protocols
3. **Improve Data Literacy**: our whole organization understands its data needs and responsibilities, can speak the language of data science the staff and managers have robust data science capacity

5 Guiding Principles for WB Data Management (cont.)

4. **Use Data to Govern:** our organization uses data to govern, or makes decisions that are in the best interest of our mission(s)

5. **Govern our Data:** our organization takes proactive steps to develop effective data and information technology management practices to ensure our data flows to where it is needed in a timely manner while complying with our data sharing policies

Data Driven Management Examples

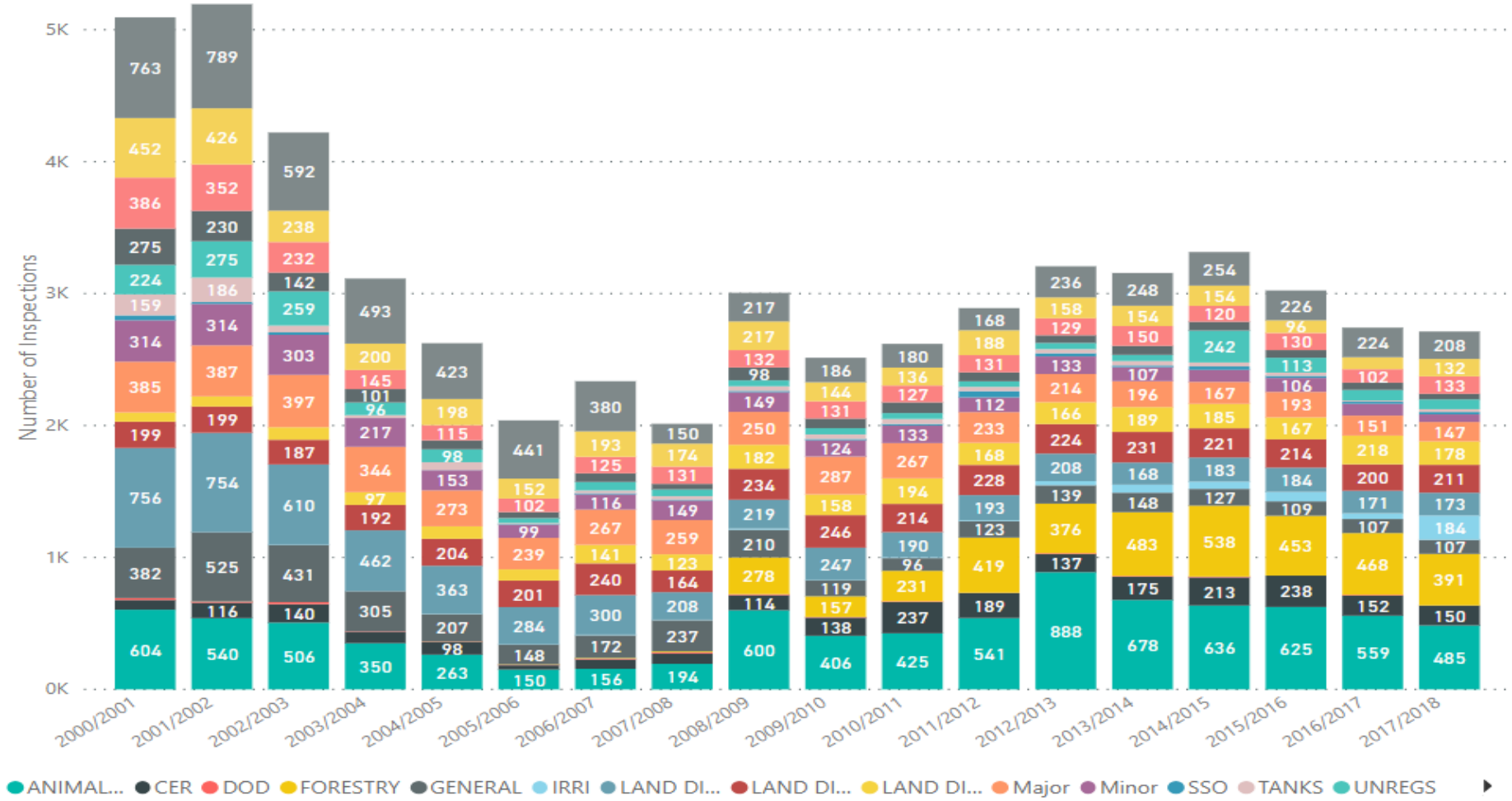
Water Quality Status Reports (2017 and 2018)

FY2016/17 Water Boards Performance Report Story

California State Water Resources Control Board
DATA CENTER

This pilot dashboard shows inspection trends for 9 Regional Boards for all programs could replace almost 50 report cards currently posted as individual HTML pages.

REGULATE: ALL PROGRAMS
MEASURE: INSPECTION TRENDS



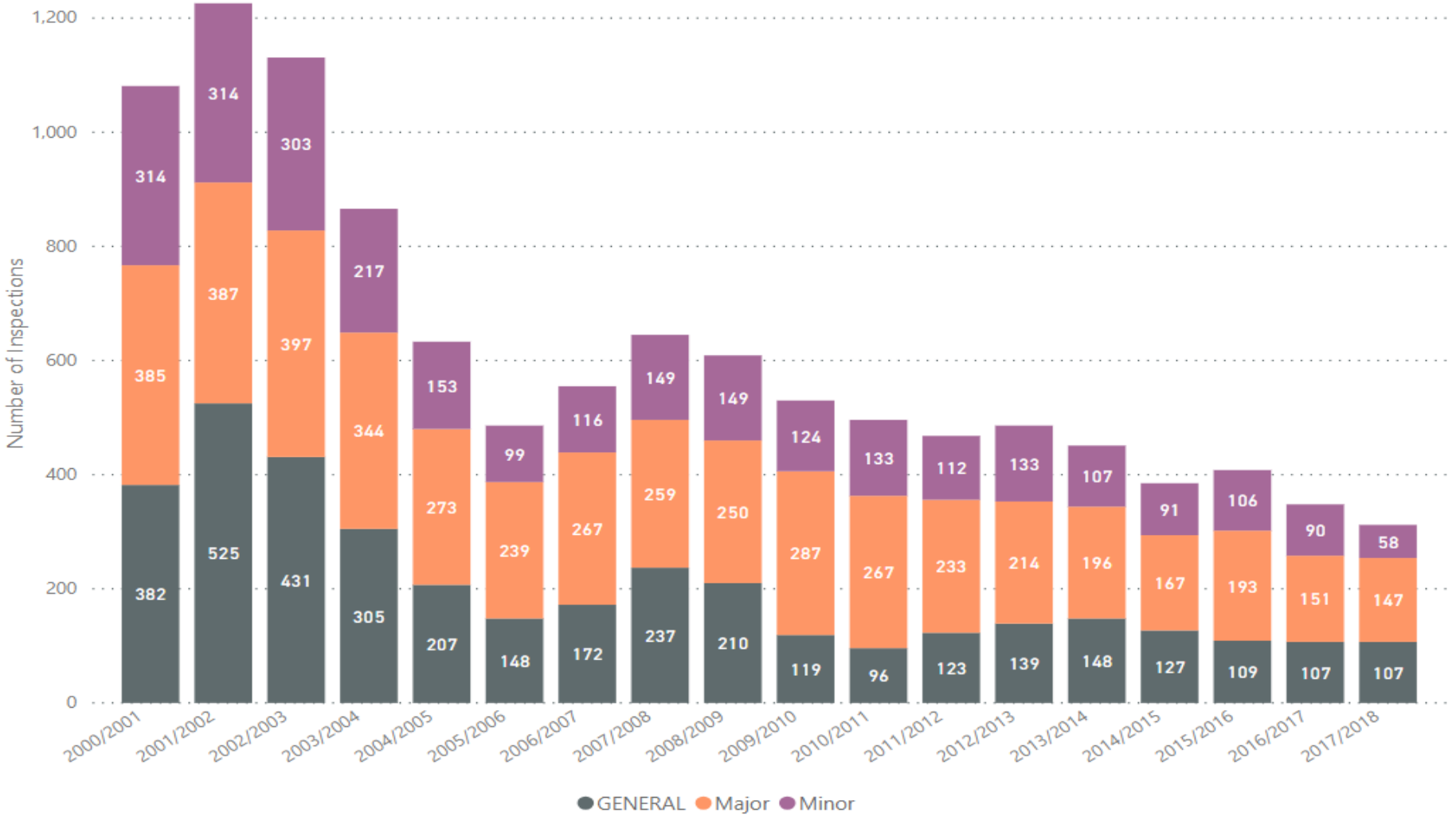
Key Statistics FY 2017-18

Master Program Type	Total Inspections
ANIMALWASTE	485
CER	150
DOD	1
FORESTRY	391
GENERAL	107
IRRI	184
LAND DISPOSAL ALL OTHER	173
LAND DISPOSAL CLOSED LANDFILL	211
LAND DISPOSAL OPEN LANDFILL	178
Major	147
Minor	58
SSO	18
TANKS	21
UNREGS	74
WDR All Other	42
WDR BIG	133
WDR Industrial	132

Additionally, the tool encourages more interaction and allows users to see more granular data. All due to open data techniques.

REGULATE: ALL PROGRAMS
MEASURE: INSPECTION TRENDS

REGION: All | PROGRAM CATEGORY: NPDESWW | MASTER PROGRAM TYPE: All



Key Statistics FY 2017-18

Master Program Type	Total Inspections
GENERAL	107
Major	147
Minor	58

Water Quality Report Card

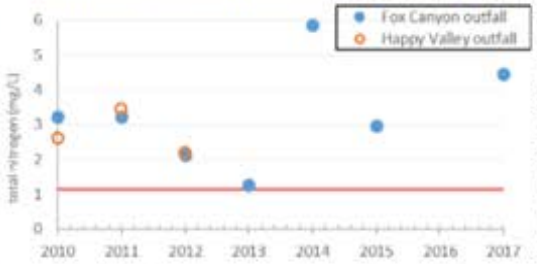
Water Quality Report Card - Algae in the Ventura River

Regional Water Board:	**Los Angeles, Region 4**	**STATUS**	☐ Conditions Improving ☐ Data Inconclusive ☑ **Improvement Needed** ☐ Targets Achieved/Water Body Delisted
Beneficial Uses Affected:	**REC-1, REC-2, WARM, COLD, EST, WILD, RARE, MIGR, SPWN, WET, MUN**		
Implemented Through:	NDPES Permits, MS4 Permits, Conditional Waivers	**Pollutant Type:**	☑ Point Source ☑ Nonpoint Source ☐ Legacy
Effective Date:	June 28, 2013	**Pollutant Source:**	Urban Storm Water Runoff; Irrigated Crop Production; Onsite Wastewater Treatment Systems; Wastewater Discharges; Horses and Livestock; Non-Point Source Runoff
Attainment Date:	2023		

Water Quality Improvement Strategy

The Ventura River watershed is in Ventura and Santa Barbara Counties in Southern California. The Ventura River, including its estuary and tributaries, is impaired due to algae, eutrophic conditions, low dissolved oxygen, and elevated nitrogen. The primary sources of these impairments are nutrients discharged from the municipal separate storm sewer system (MS4), agriculture operations, livestock facilities, onsite wastewater treatment systems (OWTS), and the Ojai Valley Waste Water Treatment Plant (WWTP). In 2013, USEPA approved the TMDL for Algae, Eutrophic Conditions, and Nutrients in the Ventura River and its Tributaries to restore water quality. The TMDL includes numeric targets for algal biomass, dissolved oxygen, and pH, and load allocations (LAs) and waste load allocations (WLAs) for total nitrogen and total phosphorus. The TMDL assigns more stringent nitrogen and phosphorus allocations for dry weather than wet weather because dry weather (May 1 to September 30) is the growing season. The TMDL allows the Ojai WWTP 12 years, MS4 permittees six years, agriculture operations six years, livestock facilities 10 years, and OWTS 10 years to attain allocations. The Ojai WWTP intends to attain WLAs by upgrading its nutrient removal processes. Agriculture operations will implement iterative management practices to control nutrients in their discharges. The MS4 permittees' compliance approach is to eliminate dry-weather discharges by implementing best management practices (BMPs). Horse facilities will implement manure management plans. Individual responsible parties are monitoring their discharges to demonstrate compliance with allocations and multiple responsible parties are jointly monitoring algal biomass, nutrients, and other constituents in receiving waters to assess watershed-wide conditions. The Board intends to adopt a Conditional Waiver for horse facilities in FY 18-19. Agriculture operations will implement nutrient management as required by the Conditional Waiver.

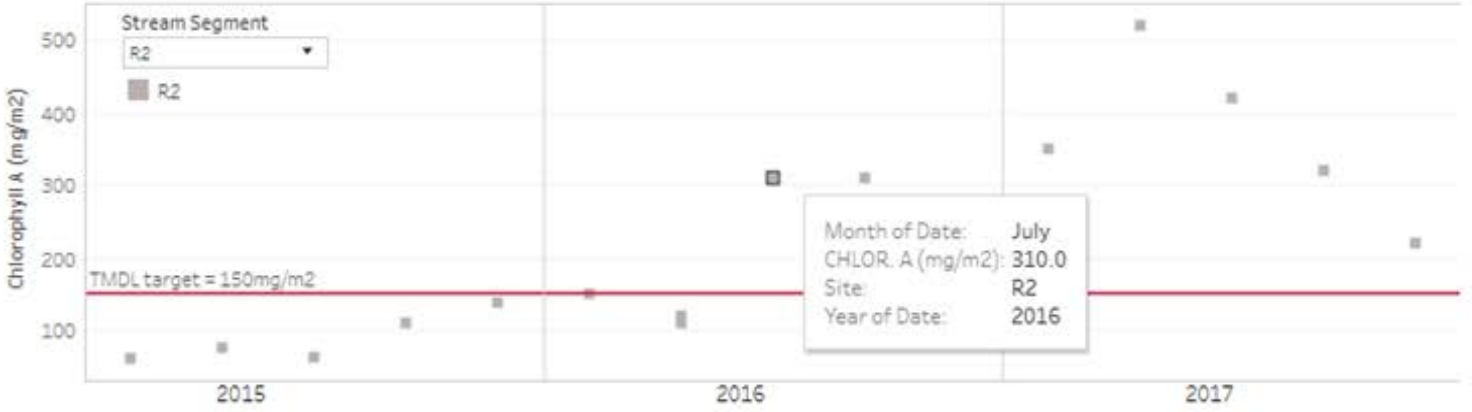
Comparison of MS4 Effluent to Dry Weather WLA



Blank Total Nitrogen values, as seen for Happy Valley outfall after 2012, are due to zero flow and represent WLA attainment.

Water Quality Outcomes

- *Monitoring data show that algal biomass continues to exceed the numeric target. Total nitrogen in MS4 outfalls exceeds the WLA when there is sufficient flow to sample. However, no flow and no sample in the outfalls amounts to WLA attainment.*
- *WLAs have not been incorporated into the MS4 permits, but permittees are implementing BMPs, including a bioswale at the Happy Valley outfall in Reach 4, which has reduced dry-weather flow.*
- *The Ojai WWTP is on schedule to implement the nitrogen removal upgrades required by its permit to attain the WLAs. Venture County is studying which OWTS will be upgraded to advanced treatment. The agriculture LAs are incorporated into a Conditional Waiver.*
- *The TMDL is still in the early stages of implementation. The multiple sources, complex interaction between groundwater and surface water, and variable flow make this a complicated TMDL.*
- *Responsible parties will continue implementation actions.*



+ableau

Water Quality Report Card (cont.)

A story map

Water Quality Report Card- Pesticides in the Palo Verde Outfall Drain and Lagoon

Regional Water Board -Colorado River Basin, Region 7

Beneficial Uses Affected - Contact Water Recreation (REC-1); Non-Contact Water Recreation (REC- 2); Warm Freshwater Habitat (WARM); Wildlife Habitat (WILD); Rare, Threatened, Endangered Species (RARE)

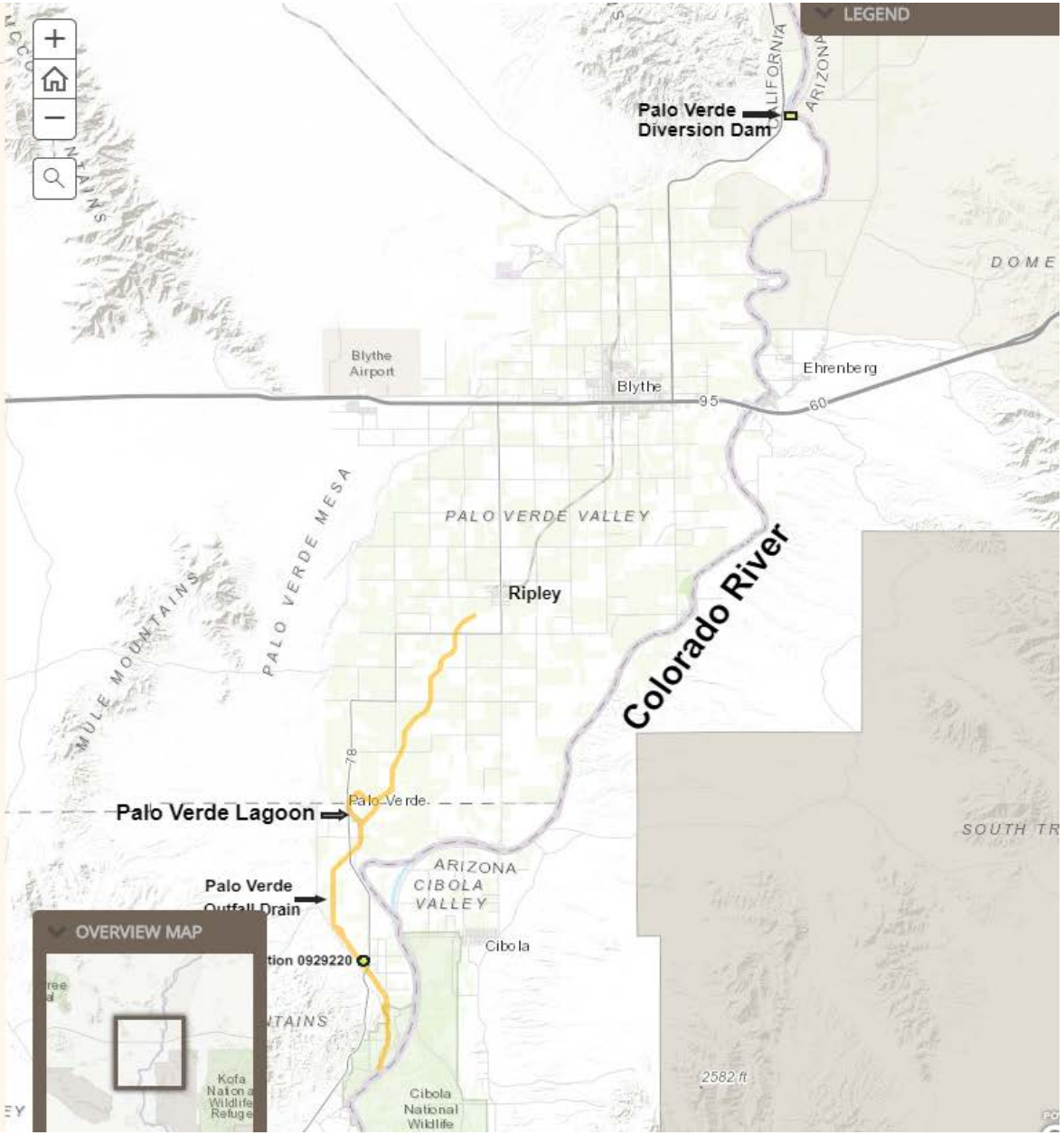
Implemented Through - Conditional Waiver of Waste Discharge Requirements (WDR)

Pollutant Type: Non-Point Source, Legacy Pollutant Source: Irrigated Crop Production

Status: Data Inconclusive

Effective date: September 20, 2012 Attainment Date: 2036

The Palo Verde Outfall Drain (PVOD) and Lagoon is located in Palo Verde Valley and Mesa (approximately 131,000 acres of agricultural land) in Imperial and Riverside counties. Palo Verde Outfall Drain and Lagoon are impaired by the legacy pesticides, Dichloro-Diphenyl-Trichloroethane (DDT) and Toxaphene and listed on the



Water Quality Report Card- North Coastal Basin Rivers

Water Quality Report Card - North Coastal Basin Rivers Cyanobacteria

Regional Water Board -North Coast Region, Region 1

Beneficial Uses Affected - Cold Freshwater Habitat (COLD); Rare, Threatened, and Endangered Species (RARE); Migration of Aquatic Organisms (MIGR); Spawning, Reproduction, and/or Early Development (SPWN); Commercial and Sport Fishing (COMM); Tribal Tradition and Culture (CUL) Contact Water Recreation (REC-1); Non-Contact Water Recreation (REC- 2)

Implemented Through - Restoration, Coordination efforts

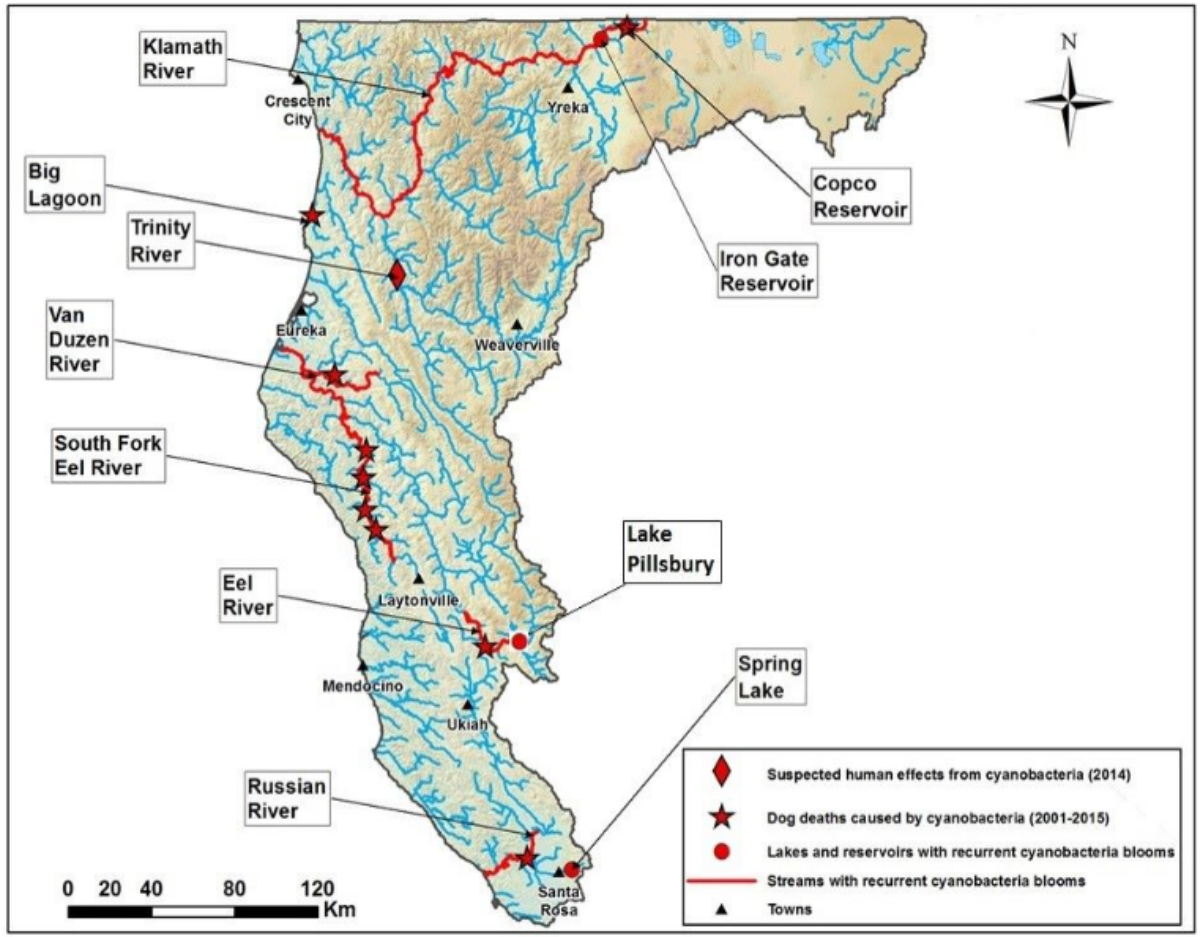
Pollutant Type: Non-Point Source, Legacy

Pollutant Source: Irrigated Crop Production, Hydromodification, Non-Point Source Run-off, Naturally Occurring, Logging, Grazing

Status: - Improvement Needed

Effective date - December 28, 2012

Attainment Date - 2050 or longer



Extra URLs

TMDLs to be done

Safe to Swim

Rafa's Tableau wonderland

WQ Story map

Github repo

Trash-tobacco project


Questions?
Greg Gearheart,
Deputy Director
Office of Information
Management and Analysis