



EPA's Next Generation Compliance Strategy and the Role of the Citizen Scientist

NEMC 2016
Citizen Science Session

Orange County, CA

August 9, 2016

David L. Elam, Jr.

Presentation Objectives

1. Define Citizen Science
2. Explore Citizen Science Models
3. Examine Citizen Science Drivers and Enablers
4. Review Two Key Areas of Citizen Science Engagement
5. Outline a Strategy for Working with Citizen Scientists

Oxford Dictionary Definitions of Citizen Science

- **Citizen Science:**

Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.

- **Citizen Scientist:**

A member of the general public who engages in scientific work, often in collaboration with or under the direction of professional scientists and scientific institutions.

or

A scientist whose work is characterized by a sense of responsibility to serve the best interests of the wider community.

History of Citizen Science

- Early scientists were for the most part citizen scientists, undertaking studies without formal support.
- Science research shifted to universities and government agencies in the mid-1900s.
- Citizen science is growing due to affordable computing power, affordable measurement instrumentation, Web-based collaboration tools, government support, and regulations.
- What is the concern?
 - Enabling programs create “Citizen Deputies” instead of “Citizen Scientists”

Three Ideal Models for Citizen Science Programs

Contributory Projects

- Projects designed by professional scientists
- Participants collect, process, or analyze data

Collaborative Projects

- Projects designed by professional scientists
- Participants have a larger role – framing questions, reporting outcomes

Co-Created Projects

- Projects are designed by both professional and avocational scientists
- Much broader participation and contribution by the citizen scientists

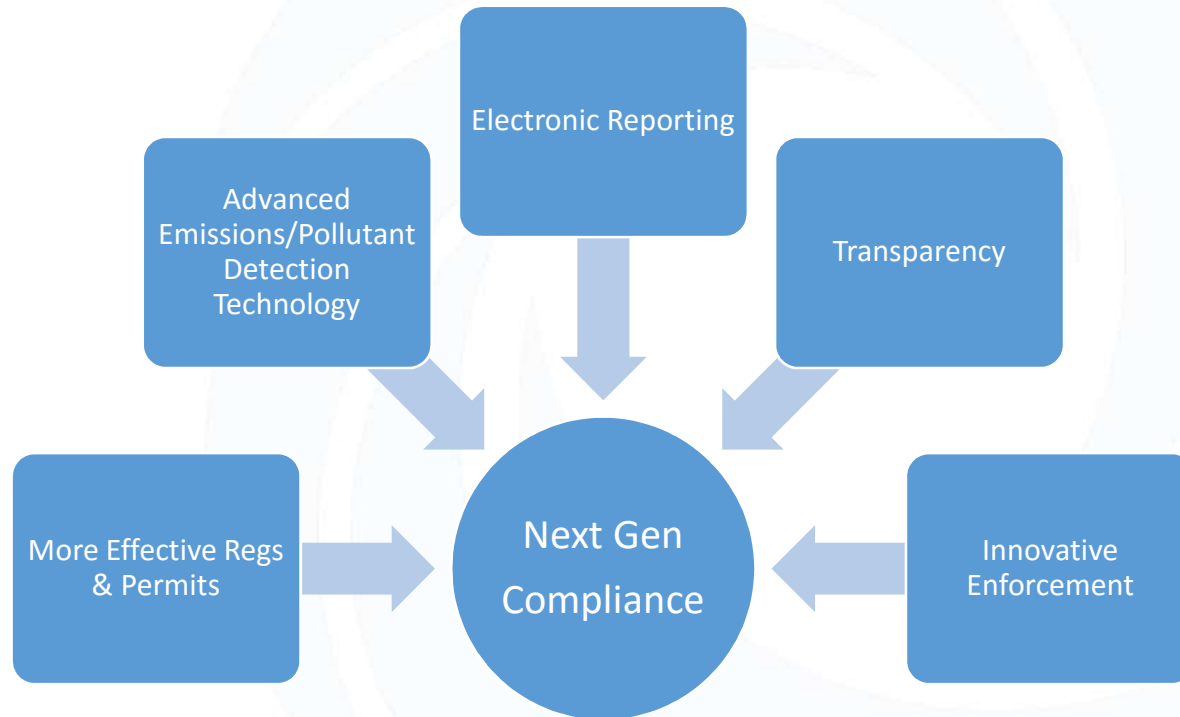
Attributes of a Successful Citizen Science Program

- Project objectives are clear and understood.
- Project team has the appropriate expertise in all required project areas – design, measurement, analysis, reporting.
- Small scale trials are undertaken to test the approach with potential participants.
- Motivations and skillsets of all parties are understood.
- Quality of the scientific data generated is measurable.

Several Factors Drive Citizen Science Involvement in the Environmental Area

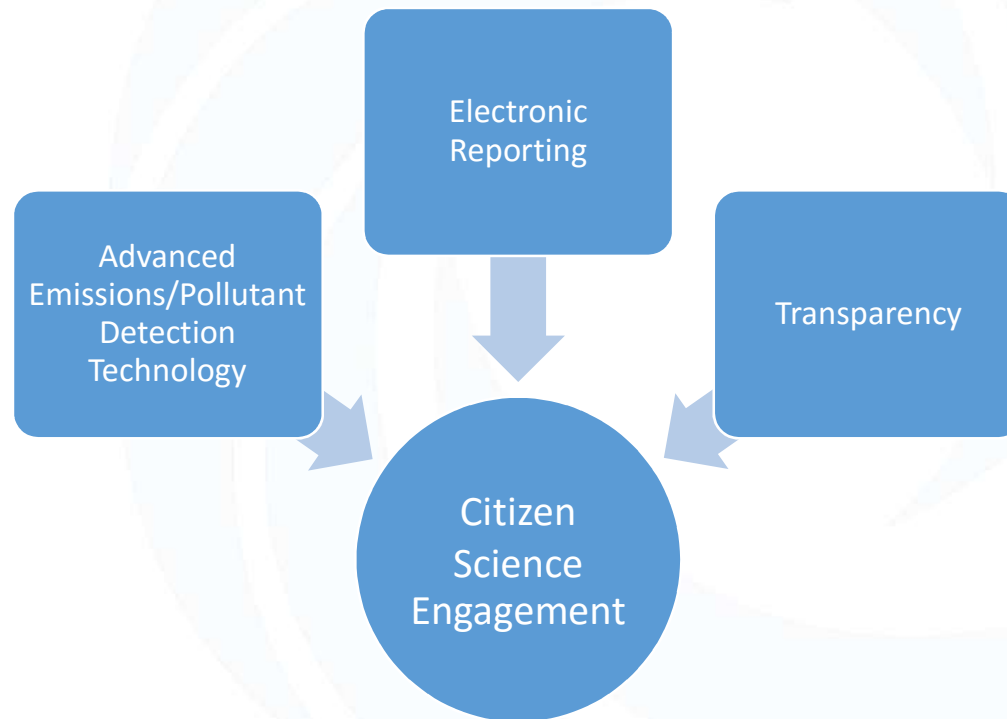
- Public interest in environmental or ecological areas coupled with enabling technology
- Environmental Justice/Community Concerns
- Office of Science and Technology Policy
- University Citizen Science Programs
- EPA Programs
 - *The Changing Paradigm of Air Pollution Monitoring*
- EPA's Next Generation Compliance Strategic Plan

Five Elements Define EPA's Next Generation Compliance Strategy



Explained in Next Generation Compliance Strategy: 2014-2017 dated October 2014.

Three Elements of Next Gen Compliance Engage the Citizen Science Community



Next Gen Compliance Strategy is Underway

- Coal Combustion Residuals Rule
 - Includes a requirement for a fugitive dust management plan and maintenance of a public website
- Petroleum Refinery Sector Rule
 - Includes requirements for fenceline monitoring and electronic reporting via EPA's Central Data Exchange (CDX)
- Electronic Reporting and Recordkeeping Requirements for New Source Performance Standards (Proposed)
 - Will require use of ERT for all NSPS
- NPDES Electronic Reporting Tool
 - Promulgated 9/15 with a five-year phase-in period

EPA Enables the Citizen Scientist in Two Ways

1. Data Generation

EPA recognizes and advances emerging measurement technologies that are deployable by citizen scientists.

2. Data Mining

EPA maintains various electronic reporting tools and databases that are publically accessible.

EPA is Enabling Citizen Scientists to Participate in Air Quality Measurement Activities

- <https://www.epa.gov/air-research/air-sensor-toolbox-citizen-scientists>

EPA is Enabling Citizen Scientists to Participate in Air Quality Measurement Activities

The screenshot shows a web browser window displaying the EPA's "Air Sensor Toolbox for Citizen Scientists" page. The browser's address bar shows the URL: <http://www2.epa.gov/air-research/air-sensor-toolbox-citizen-s>. The page features a blue header with the EPA logo and navigation links. The main content area is titled "Air Sensor Toolbox for Citizen Scientists" and includes a brief description of the toolbox's purpose. A graphic of a toolbox labeled "Air Sensor Citizen Science Toolbox" is also present. Below the description, there is a list of resources and a "Toolbox Resources" section. The page is viewed on a Windows 8 operating system, as indicated by the taskbar at the bottom.

Related Topics: Air Research

Air Sensor Toolbox for Citizen Scientists

EPA's Air Sensor Toolbox for Citizen Scientists provides information and guidance on new low-cost compact technologies for measuring air quality. Since citizens are interested in learning more about local air quality where they live, work and play, EPA scientists created the toolbox to provide citizens resources to effectively collect, analyze, interpret, and communicate air quality data.

The Air Sensor Toolbox resources include information about:

- Sampling methodologies
- Generalized calibration/validation approaches
- Measurement methods options
- Data interpretation guidelines
- Education and outreach
- Low cost sensor performance information

Toolbox Resources

Key Links:

- [Community Air Monitoring Training, July 2015](#)
- [It All Starts With Science Blog](#)
 - [Release of Community Air Monitoring Training Videos](#)
 - [Training Citizen Scientists to Monitor Air Quality](#)
- [Air Sensors Citizen Science Toolbox](#)
- [EPA Science Bits Podcast: DIY Air Quality Monitoring \(mp3, 1.52mb, 2 min 14 sec\)](#)
- [EPA News Release, EPA Administrator Gina McCarthy Joins Senator Booker, Mayor Baraka and ICC to Visit Newark's Community Air Pollution Project which Utilizes EPA Science, March 3, 2015](#)
- [Findings from 2013 EPA Sensors Workshop](#)

News:

- [Podcast: Air Quality Monitoring for Citizen Science](#)
- [HealCity.org](#)
- [SciStarter Blog](#)
- [The Counter Journal](#)
- [The Herald Sun](#)

Related Links:

- [Next Generation Air Measuring](#)
- [Village Green Project](#)

Technical Contact:

- [Ron Williams](#) (williams.ronald@epa.gov)

[Contact Us](#) to ask a question, provide feedback, or report a problem.

EPA Home | Privacy and Security Notice | Accessibility

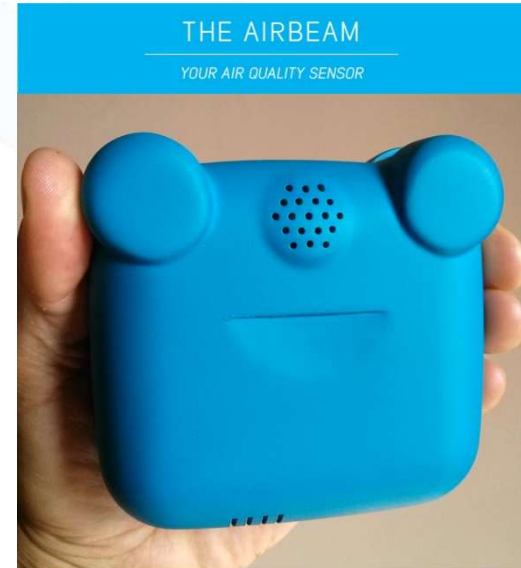
Last updated on October 27, 2015

8:21 AM 11/4/2015

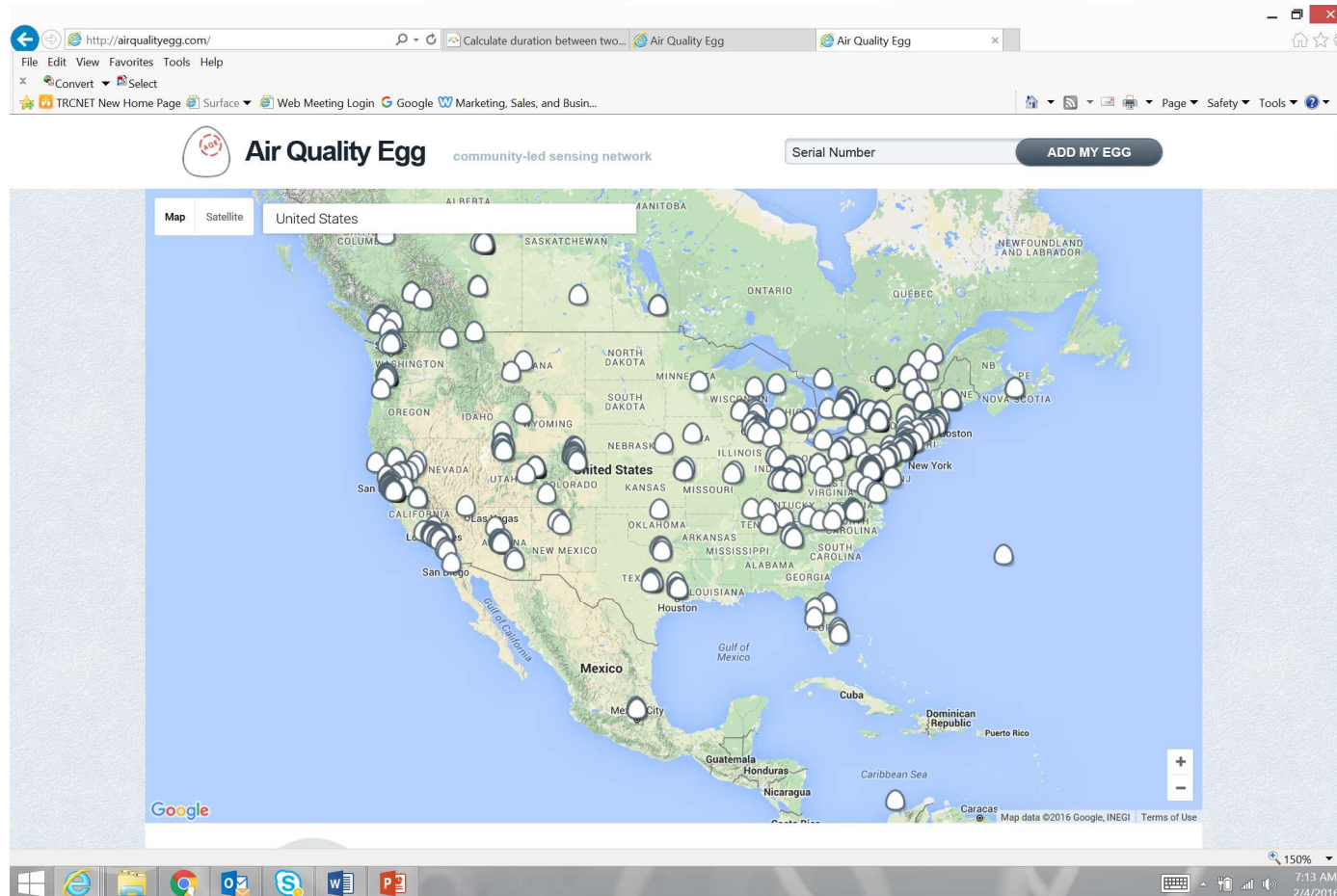
Monitoring Programs Vary in Sophistication

- Air Quality Egg
 - Community-led sensing network for NO₂ and CO contained in the Air Quality Egg (\$240)
- AirCasting
 - Airbeam (\$250) measures PM_{2.5}
- Village Green Project (EPA)
 - Bench (~\$60,000) measures O₃, PM_{2.5}, Temperature, Humidity, and Wind Speed with real-time reporting

Sample Measurement Technologies



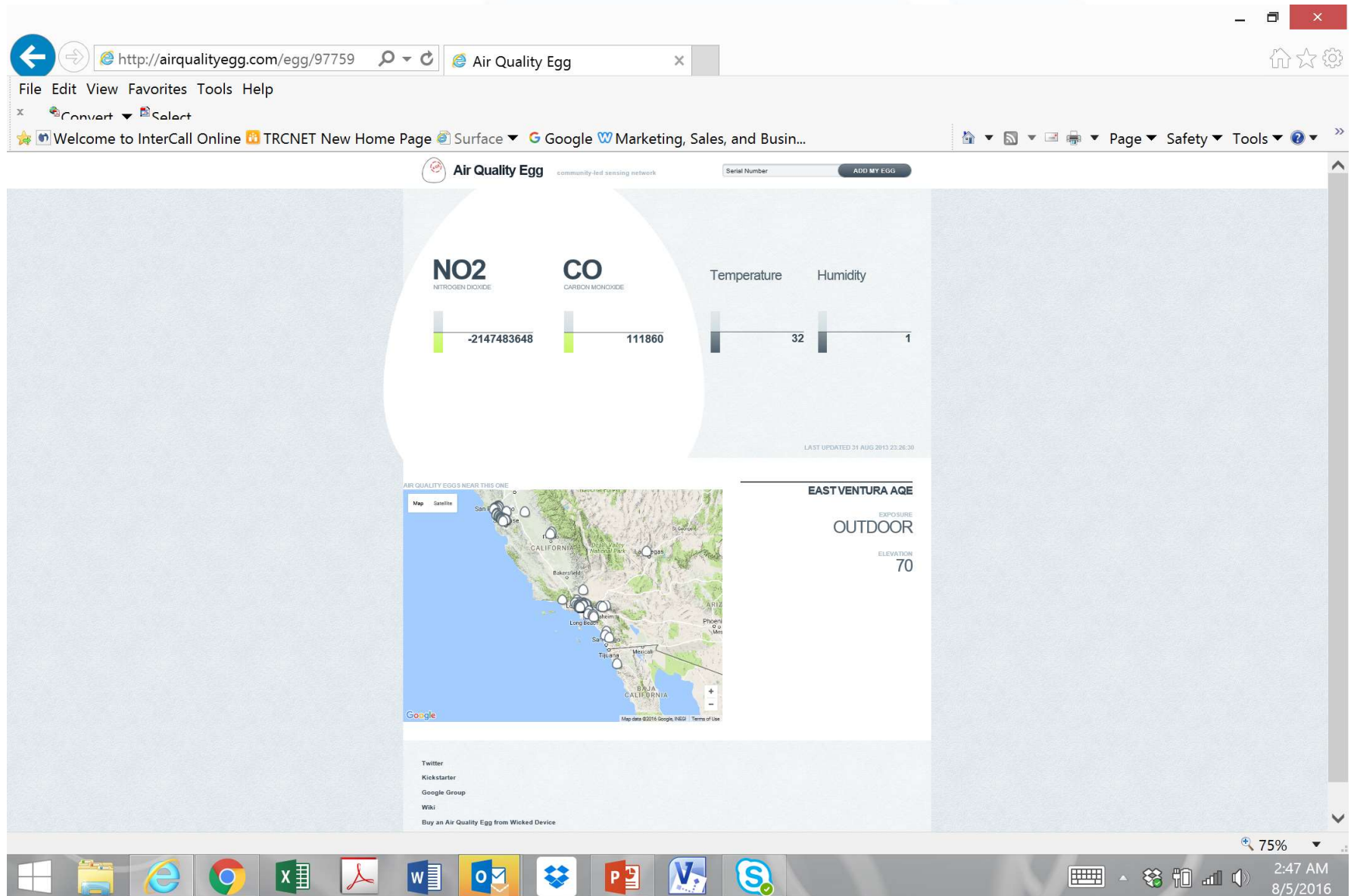
Air Quality Egg Network Screenshot



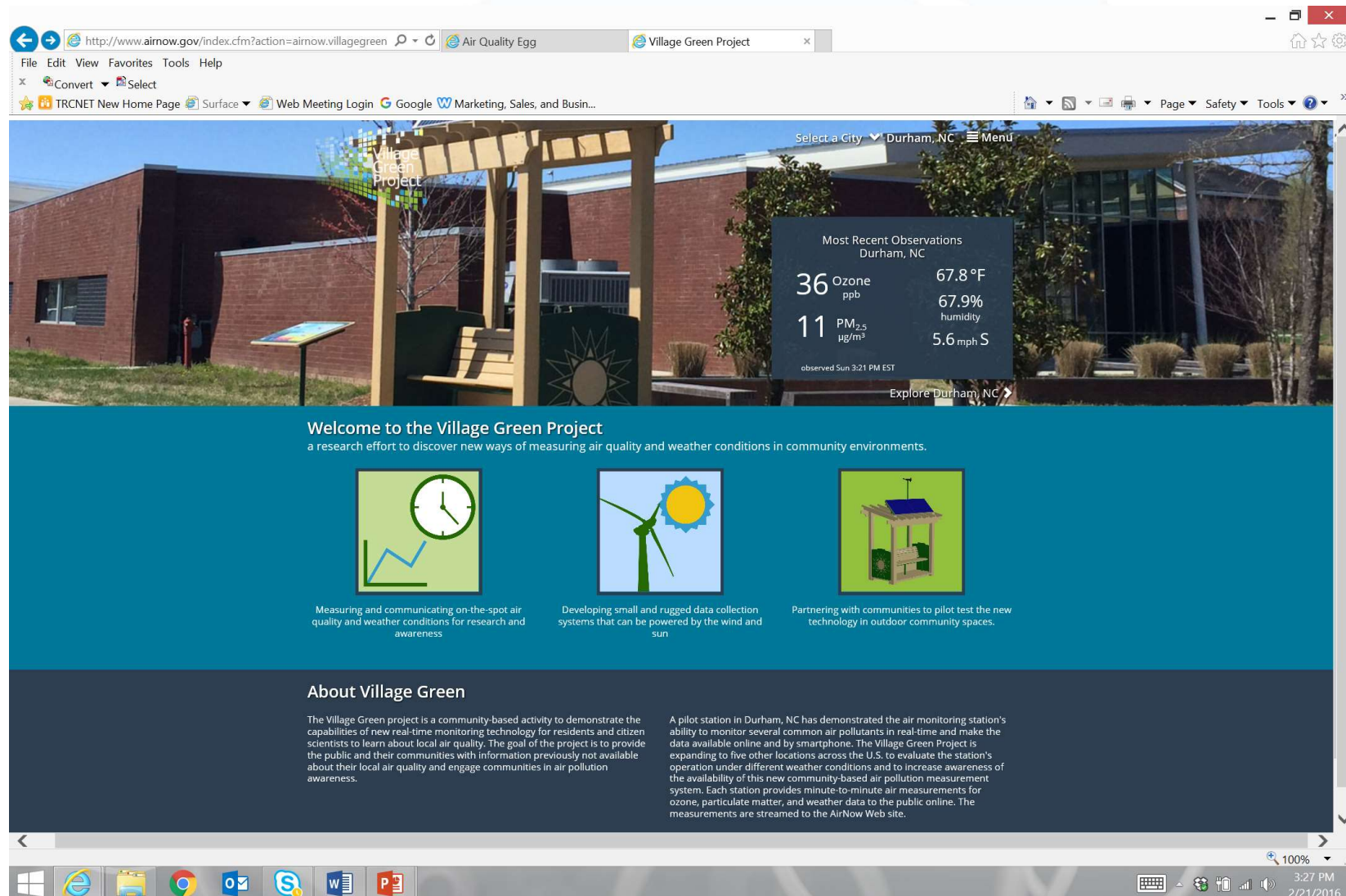
Los Angeles Area Air Quality Egg Data

<http://airqualityegg.com/egg/97759>

Los Angeles Area Air Quality Egg Data



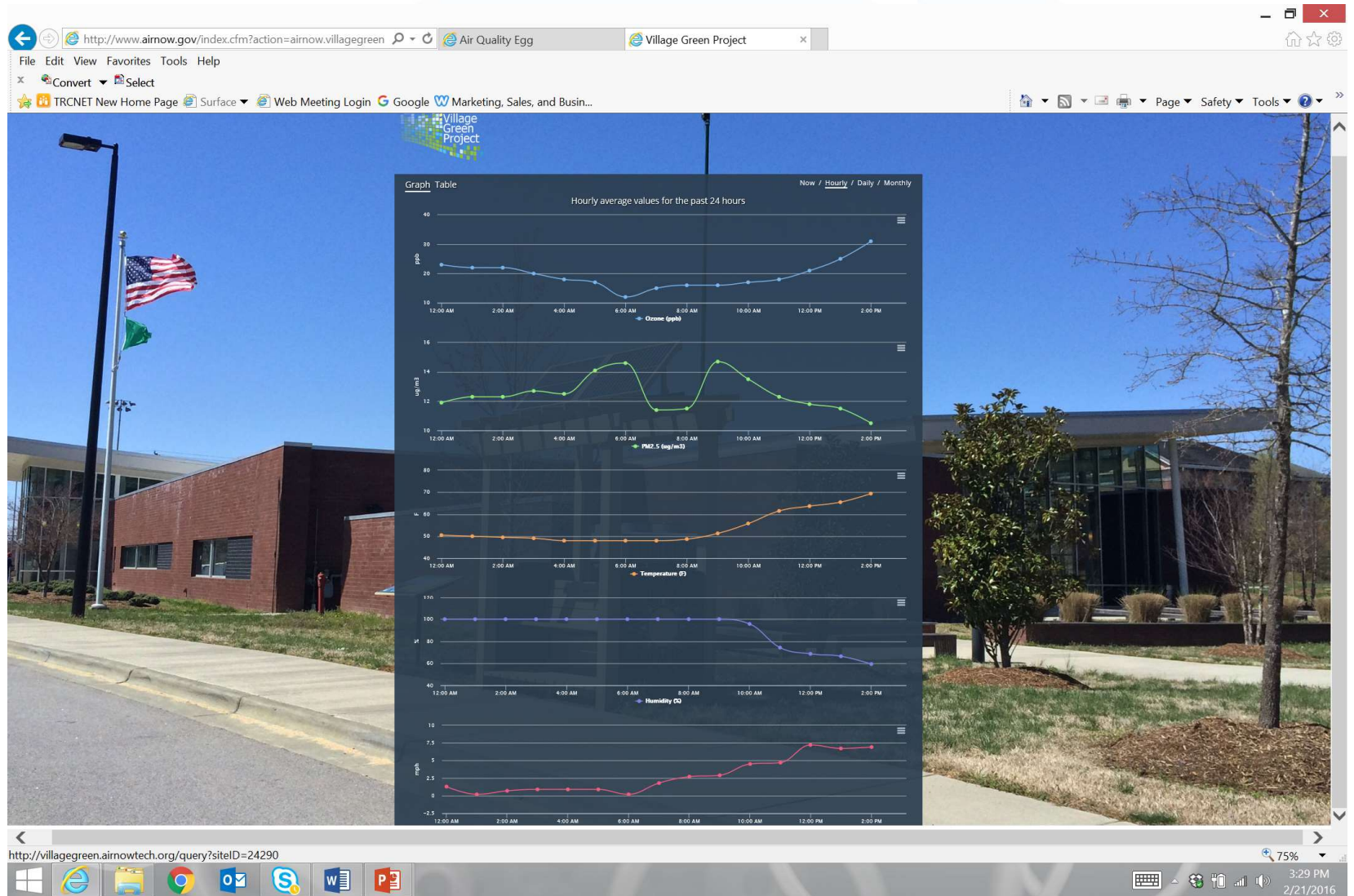
Durham Village Green Park Bench Data (1/2)



Durham Village Green Park Bench Data (2/2)

- Live Feed:
- <https://villagegreen.airnowtech.org/welcome?siteID=24290>

Durham Village Green Park Bench Data (2/2)



Several CDX Systems Provide Public Access to Reported Information

- CEDRI: Compliance and Emissions Data Reporting Interface
- NeT: NPDES eReporting Tool
- TRIMEweb: Toxic Release Inventory Made Easy Web
- ENVIROFACTS: Portal for Several Databases
- ECHO: Enforcement & Compliance History Online
- EJSCREEN: Environmental Justice Screening Tool

Envirofacts Provides Easy Access to Multiple Databases

The screenshot displays the Envirofacts website in a web browser. The browser's address bar shows the URL www3.epa.gov/enviro/. The website's header includes navigation links: Home, Multisystem Search, Topic Searches, System Data Searches, About the Data, Data Downloads, Widgets, Services, Mobile, and Other Datasets. A banner at the top states: "The complete 2014 TRI National Analysis dataset is now available. The 2014 TRI National Analysis, based on this dataset, is planned for publication in January 2016." Below this, it says: "The Envirofacts database is now RESTful service-enabled. See the services tab below for documentation and examples, or visit: [Envirofacts Web Services](#)".

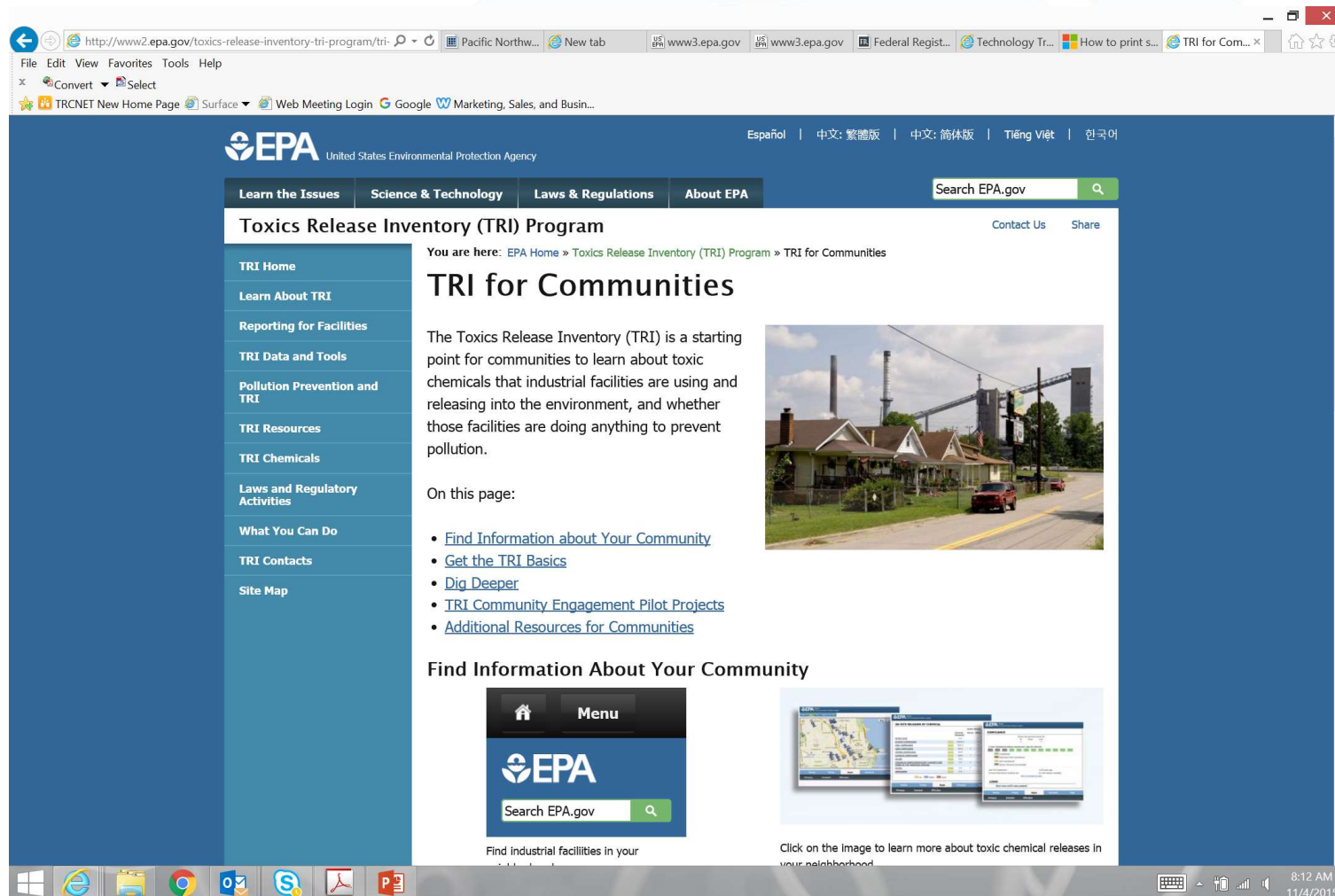
The main content area features a large "Envirofacts" logo with the tagline "Your one-stop source for Environmental Information". To the left, a section titled "Get the EnviroFACTS!" encourages users to "Retrieve information from multiple sources of Envirofacts' System Data for your area of interest." It includes a search input field with placeholder text "Enter a location such as address, zip, city, county, waterbody, park name, etc." and an "Advanced" link. To the right, a "Topic Searches" section offers icons for Air, Land, Water, Waste, Toxics, Radiation, Facility, Compliance, and Other.

Below these, the "Envirofacts System Data Searches" section is divided into three columns. The first column lists: BR Brownfields-Cleanups, CERCLIS Cleanups, ECHO/IDEA, and ICIS-AIR. The second column lists: FRS, EZ Search, Organization Search, Greenhouse Gas, Customized Search, ICIS, and ICR. The third column lists: IGMS, Locational Information, Locational Search, PCS, Customized Search, RADInfo, RadNet, Customized Search, RCRAInfo, SDWIS, SRS, TSCA, and UV Index. To the right of these, the TRI section lists: TRI Explorer, TRI Search, Form R Search, Form R & A Download, EZ Search, Customized Search, and Pollution Prevention.

At the bottom, the "Other Sites of Interest" section includes links for Geospatial Download, EnviroMapper, and MyEnvironment.

The browser's taskbar at the bottom shows the Windows Start button, Internet Explorer, File Explorer, Google Chrome, Outlook, Skype, and PowerPoint. The system clock in the bottom right corner indicates 3:45 PM on 2/23/2016.

TRI Reporting Is Designed to Empower Citizen Scientists



ERT Data Are Available and Ready for Citizen Scientist Analysis

The screenshot shows a web browser window displaying the EPA's Technology Transfer Network Clearinghouse for Inventories & Emissions Factors. The page is titled "WebFIRE Report Search Results and Viewing Instructions". It provides instructions on how to use the search results table, which lists 24 file submissions. The table includes columns for Organization, Facility, City, State, County, Submission Date, Document Name, Size (Bytes), and Report Type. The first few rows of the table are highlighted in blue.

Technology Transfer Network Clearinghouse for Inventories & Emissions Factors

WebFIRE Report Search Results and Viewing Instructions

The Report Search Results table below shows the 24 file submissions in WebFIRE that match your search criteria. Click [here](#) to refine your search criteria.

These files may or may not have been reviewed by the state, local, or tribal air pollution agency or delegated authority.

Click [here](#) for instructions on downloading and opening the zip files. Click [here](#) for instructions on viewing an ERT project data set (PDS) extracted from a zip file.

The following acronyms are used to designate the report type in the results table:

- ERT = Performance test reports
- EVAL = Performance evaluations
- NOCS = Notification of compliance status reports
- AER = Air emissions reports

Report Search Results

Orga...	Facility	City	State	County	Submission Date	Document Name	Size (Bytes)	Report Type
ASH...	ASH GROVE CEMENT WEST INC	SEATTLE	WA	KING	August, 18...	Ash Grove Cement Company_07-16...	1469855	ERT
ASH...	ASH GROVE CEMENT WEST INC	SEATTLE	WA	KING	August, 18...	Ash Grove Cement Company_08-12...	2129421	ERT
ASH...	ASH GROVE CEMENT CO	DURKEE	OR	Baker	August, 10...	Ash Grove Cement Company_08-10...	4844051	ERT
ASH...	ASH GROVE CEMENT CO	DURKEE	OR	Baker	August, 28...	Ash Grove Cement Company_08-27...	4316774	ERT
ASH...	Ash Grove Cement Company	Durkee	OR	Baker	May, 09 20...	Ash Grove Cement Company_05-09...	7129531	ERT
ASH...	ASH GROVE CEMENT CO	DURKEE	OR	Baker	August, 06...	Ash Grove Cement Company_08-06...	9724328	ERT
Ash...	Ash Grove Cement Company	Seattle	WA	USA	May, 21 20...	Ash Grove Cement Company_05-21...	6711929	ERT
BYU...	Brigham Young University Idaho	Rexburg	ID	Madison	December...	Brigham Young University Idaho_12...	12751248	ERT
ECMPS	Centralia	Centralia	WA	Lewis	July, 28 20...	MATS_RATA_BW21.zip	23757342	ERT
ECMPS	Centralia	Centralia	WA	Lewis	July, 28 20...	MATS_RATA_BW21.zip	3888683	ERT
ECMPS	Centralia	Centralia	WA	Lewis	July, 28 20...	MATS_RATA_BW22.zip	23757357	ERT
HAM...	HAMPTON LUMBER MILLS WASHI...	DARRINGTON	WA	Snohomish	August, 17...	Hampton Lumber Mills Washington...	3255858	ERT
KETT...	KETTLE RIVER OPERATIONS MILL	REPUBLIC	WA	UNITED STATES	April, 21 20...	Kettle River - Buckhorn MillEW_04-1...	65835	ERT
KETT...	KETTLE RIVER OPERATIONS MILL	REPUBLIC	WA	UNITED STATES	April, 21 20...	Kettle River - Buckhorn MillPregTrk...	65689	ERT

ECHO Provides an Easy Entry Point for the Citizen Scientist

Facility Search Results | EC x

https://echo.epa.gov/facilities/facility-search/results

Apps ★ Bookmarks Bookmarks Google Google refinery Mact l cc - ... New Tab Web Meeting PM2.5 Marathon

new Jersey Clean Water Act data and some Clean Air Act data are frozen. [Read More...](#)

Hide Map Hide Table Hide Summary Modify Search Report Violation ? Help

Map Legend Basemap Options Birmingham Reset Map

451 Search Results

- 24 Facilities with a Current Violation/s
- 63 Facilities with Violations in the Last Three Years
- 12 Facilities with Formal Enforcement Actions in the Last Five Years
- 55 CAA Sources
- 79 Facilities with CWA Permits
- 345 Facilities with RCRA IDs
- 15 Facilities with TRI Releases

Facility Summary

Search Criteria

City, State, and/or ZIP Code: Austin, Texas
Active/Operating=Yes

Modify Search

Customize Columns Download CSV File Download Excel File Results Guide Reports Legend

Facility Name	Mapped	Street Address	City	State	FRS ID	Reports	Current Significant Violations	Quarters Non Comp (3 yrs)	Inspections (5 yrs)	Formal Enforcement Actions (5 yrs)
SACHEM INC	📍	821 E. WOODWARD	AUSTIN	TX	110000465390	C	N	2	1	①
FREESCALE SEMICONDUCTOR - ED BLUESTEIN FACILITY	📍	3501 ED BLUESTEIN BOULEVARD	AUSTIN	TX	110000465425	C E L A	N	11	2	①
HOSPIRA INC-AUSTIN SITE	📍	3900 HOWARD LN.	AUSTIN	TX	110000465443	C A	N	0	0	①
GOLD STAR MARBLE COMPANY	📍	16240 N. IH 35	AUSTIN	TX	110000465452	C A	N	0	0	①
FREESCALE SEMICONDUCTOR OAK HILL FACILITY	📍	6501 WILLIAM CANNON DR. W.	AUSTIN	TX	110000465470	C A	N	0	0	①
SPANSION LLC	📍	5204 EAST BEN WHITE BOULEVARD	AUSTIN	TX	110000465489	C A	N	0	0	①
GTI COATINGS INC	📍	3733 DROSSETT DR.	AUSTIN	TX	110000465504	C A	N	1	3	①
SAMSUNG AUSTIN SEMICONDUCTOR	📍	12100 SAMSUNG BLVD	AUSTIN	TX	110000465531	C E L A	N	0	2	①

8:55 PM 2/21/2016

Selecting a Facility Returns an ECHO Dashboard

https://echo.epa.gov/detailed-facility-report?fid=11000046

File Edit View Favorites Tools Help

Convert Select

TRCNET New Home Page Surface Web Meeting Login Google Marketing, Sales, and Busin...

Enforcement and Compliance History Online

You are here Home » Detailed Facility Report


Detailed Facility Report

Log In Contact Us

+ Expand All - Collapse All

Report Violation Report Data Error Data Dictionary Print Help

Facility Summary



FREESCALE SEMICONDUCTOR – ED BLUESTEIN FACILITY
3501 ED BLUESTEIN BOULEVARD, AUSTIN, TX 78721
 FRS ID: [110000465425](#)
 EPA Region: 06
 Latitude: 30.27065
 Longitude: -97.66924
 Locational Data Source: TRIS
 Industry: Computer and Electronic Product Manufacturing
 Indian Country: N

3-Year Compliance Status

Unknown/Not Available

	1	2	3	4	5	6	7	8	9	10	11	12
CAA	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation
CWA	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation
RCRA	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation	No Violation

Quarters

No Violation
Unknown/Not Available
Noncompliance
Significant Violation

Enforcement and Compliance Summary

Statute	Insp (5 Years)	Date of Last Inspection	Current Compliance Status	Qtrs in NC (of 12)	Qtrs in Significant Violation	Informal Enforcement Actions (5 years)	Formal Enforcement Actions (5 years)	Penalties from Formal Enforcement Actions (5 years)	EPA Cases (5 years)	Penalties from EPA Cases (5 years)
CAA	--	--	Not Available	0	0	--	--	--	--	--
CWA	1	05/16/2014	Noncompliance	12	0	--	--	--	--	--
RCRA	1	01/09/2015	No Violation	1	0	--	--	--	--	--

Related Reports

- [Air Pollutant Report](#)
- [CWA Pollutant Loading Report](#)
- [CWA Effluent Charts](#)

Regulatory Information

Clean Air Act (CAA): Operating Major (TX0000004845300025)
 Clean Water Act (CWA): Minor, Permit Effective ([TX0101702](#))
 Resource Conservation and Recovery Act (RCRA): Active (H) LQG (TXD069450997)
 Safe Drinking Water Act (SDWA): No Information

Other Regulatory Reports

Air Emissions Inventory (EIS): 5678711
 Greenhouse Gas Emissions (eGGRT): [1010066](#)
 Toxic Releases (TRI): [78721MTRLN3501E](#)

150%

3:41 PM 2/23/2016

Guidelines for Successful Engagement with the Citizen Science Community

1. Don't dismiss the citizen science community.
2. Promote effective citizen science models.
3. Understand the government resources that engage the citizen science community.
4. Work with the citizen science community and enabling organizations to help advance foundational concepts regarding program design, data quality, and data analysis.

“Data quality is a key issue since data of poor or unknown quality is less useful than no data since it can lead to wrong decisions.”
5. Understand the broader implications of monitoring plans, electronic reporting, and databases.
6. Prepare for increased electronic reporting and public review.

Thank you

Questions?

David Elam

P: 919.622.1846 | E: delam@trcsolutions.com

www.trcsolutions.com