Digital Opacity Compliance System

Second Generation

Shawn Dolan, Virtual Technology LLC

FNSB Overview

October 16, 2012

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888 872 3836,

How DOCS II Works

- **Contrasting background with foreground within user-selected regions of a JPG image of the visible emission evaluation, (VEE)**
  - **DOCS II Data Capture**, validates entire VEE record for integrity
  - Images taken in conformance with selected "Rule" e.g. Method 9 (15 second intervals)
  - Location Documented (sun angle, tilt, distance, weather, etc.)
  - **DOCS II Analysis,** user selects area of plume and background
  - DOCS II uses algorithms to determine opacity of image
  - DOCS II stores archive of validated analysis
- **Less variation than Method 9 against NIST traceable transmissomiter**
- **Ideal conditions (high contrast) DOCS II ±5%, Method 9 ±10%**
- **Difficult conditions (low contrast) DOCS II ±10%, Method 9 ±15%**
- **Precision of DOCS II ±5% for 4 readers, Method 9 ±15% for 4 readers**
- **Flexible applicability**
  - **Clouds, Rain, Snow**
  - **Trees, Buildings**
  - **Day, Night**
  - **Close and Far**
- **Significant Data Collected and Analyzed by Industry SME's for 7 + Years**
- **ASTM International and US EPA Domestic Standards Supported**

Simple, Fast, Reliable, Repeatable

ASTM D7520 vs Method 9

ASTM D7520-09 (10/09)

- Camera, computer, software 300 reading, certification
- Operator training
  - 8 hour course
  - 50 plume certification
  - ±7.5% overall and <=15%
- Cert. duration 3 ½ years
- Digital Validated Record
- Operational conditions
  - Unlimited backgrounds
  - Unlimited weather conditions

EPA Method 9

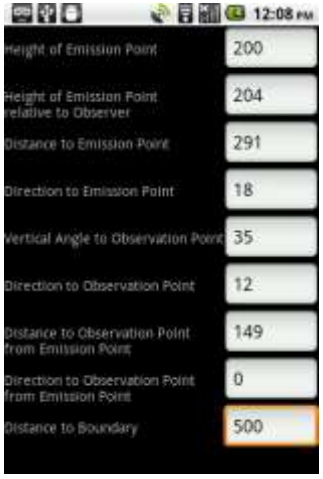
- Person With/Without Device 50 reading, certification
  - 8 hour course
  - 50 plume certification
  - ±7.5% overall and <= 15%
- Cert. duration 6 months
- Paper Non-Validated Record
- Operational conditions
  - Unlimited backgrounds
  - Unlimited weather conditions

Electronic Method 9, allows separation of data "Capture" from "Analysis"

Opacity Lab Analysis, by Subject Matter Experts

Field Data Collection

DOCS II SaaS Simple, Fast, & Accurate



EPA ALT 082

- Additional Certification Requirements
  - 6 certification runs must have various backgrounds
    - Include RGB, trees, clouds, sky, buildings.
  - Four different Analyzers of all 6 runs (300 images)
    - All must pass all 6 image sets
  - Power up self test
    - Analyzes all 300 certification images answers matched to certification no deviation allowed
- Applicability
  - 40 CFR All of Subparts 60, 61, 63 in lieu of EPA Method 9

EPA ALT 082 exceeds ASTM certification requirements, Defines applicability and acceptance

EPA ALT 082 Update
Published as Broadly Applicable Standard

- Federal Register February 2012
  - Can be used in Lieu of Method 9
    - Federal Permit changes not required
    - Has limits of ASTM D7520-09
    - Case by case allowed for stacks >7' exit (May 2012)
- 301A Test being defined to eliminate 7' limit
  - EPA desires comparison to Human Method 9 observers
  - RMB Consulting wants comparison to in-stack transmissometers
    - In-stack opacity and exit opacity correlation not possible but RMB want to use DOCS II to determine how to do this.
  - Virtual Technology LLC is supporting EPA direction per 301a "comparison with current compliance method"

ASTM D7520 Update

- D7520-12 Updated Approved by D22-03 In April 2012
  - Allows used of any Digital Image Device
    - High Definition Digital Recorders
    - CDMA based Cameras
    - CCD based Cameras
  - Matches ASTM Certification requirements to EPA ALT 082
  - Allows certification of optical and digital zoom
  - Enforces Performance of any configuration within Method 9 tolerances and precision and bias of ASTM
- Fugitive Dust Applicability
  - Testing study completed January 2012
  - New standard submitted to ASTM April Ballot
  - New standard pulled from ballot, based on technical procedure complaint by RMB
  - ASTM Research Report submitted to committee July 2012
  - Updated standard resubmitted to ballot August 5, 2012

D7520 Update will allow Web Cams

FESTIVAL FAIRBANKS

Home | History | Celebrations | Photos | Festival Fairbanks | Store

Mounted Web Cam View

Problems & Solutions

- The top three problems defending Human Method 9 readings.
  I. VEE record not technically correct, missing data, sun angle, point of view…..
  II. VEE not performed by Certified Observer
  III. Smoke School Quality Assurance Protocol not meeting the requirements set forth by USEPA for VE certification programs.

- DOCS II SaaS Model separates data collection from Certified Analysis.
  I. VEE record completely validated upon save.
  II. Certified Analyst always available to perform analysis
  III. Certified Analyst history of opacity determination across hundreds of readings eliminating personnel bias.

DOCS II SaaS,
Complete & Validated, Certified, Reproducible
Most Samples are sent to Labs
Why not Opacity samples?

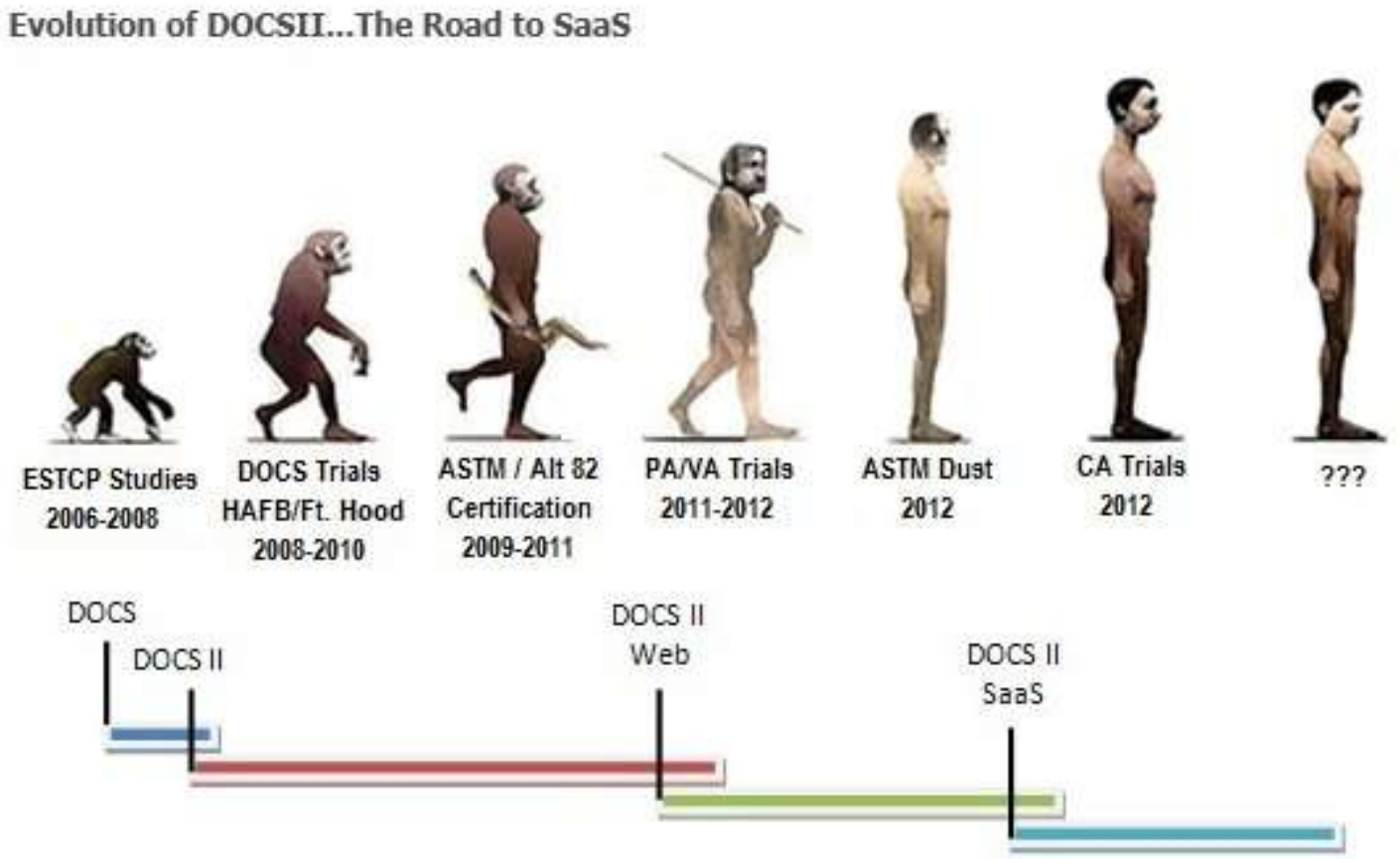
Precedent

- Lemaire v. Cooper/T. Smith
  23RD JUDICIAL DISTRICT COURT FOR THE PARISH OF ASCENSION STATE OF LOUISIANA DOCKET NO. 99094 DIVISION "E" August 2011.
  1) Pictures taken by an untrained operator with an uncertified camera can not be used for Opacity
  2) Camera and operator certification is available "could have been used" .
  3) Camera systems have to meet Operational requirements of LA DEQ

- ASTM D7520 Validated
  1) Cameras and picture takers require Certification
  2) Certification of cameras and operators is commercially available
  3) Enforcement agencies set operational conditions

VT LLC/ETA on the defense team of this case

Evolution Of DOCS II (2006-2012)



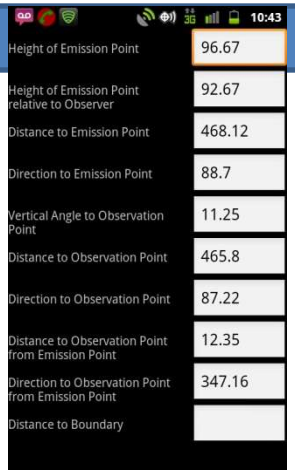
Visual Emissions Evaluation
Samples in the Field, Data Analysis in the Lab

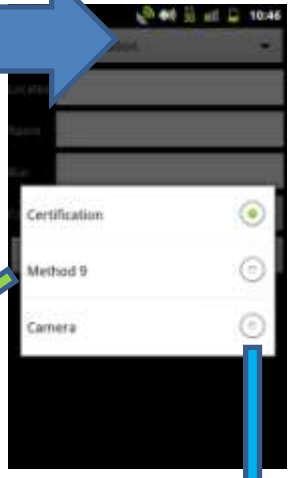
DOCS II Software as a Service (SaaS)

- Smart Phone/Camera Data Collection for DOCS II
  - Smart Phone Validated VEE Record
  - Camera Images of Observation
- Uses Smart Phone, to measure VEE data including:
  - Weather Conditions – From Web NOAA
  - GPS Position Location, Sun Position, & Time
  - Distance to Target Emission Source, enter angle
  - Transmit Images of Visual Emissions & Source, Date/Time

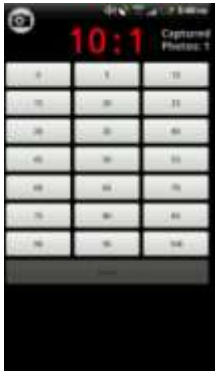
DOCS II SaaS Data Collection

“ Method 9” in the Google Play Store

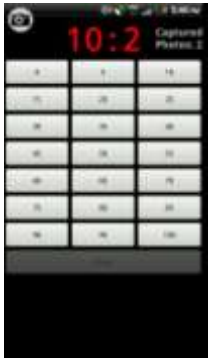




Method 9



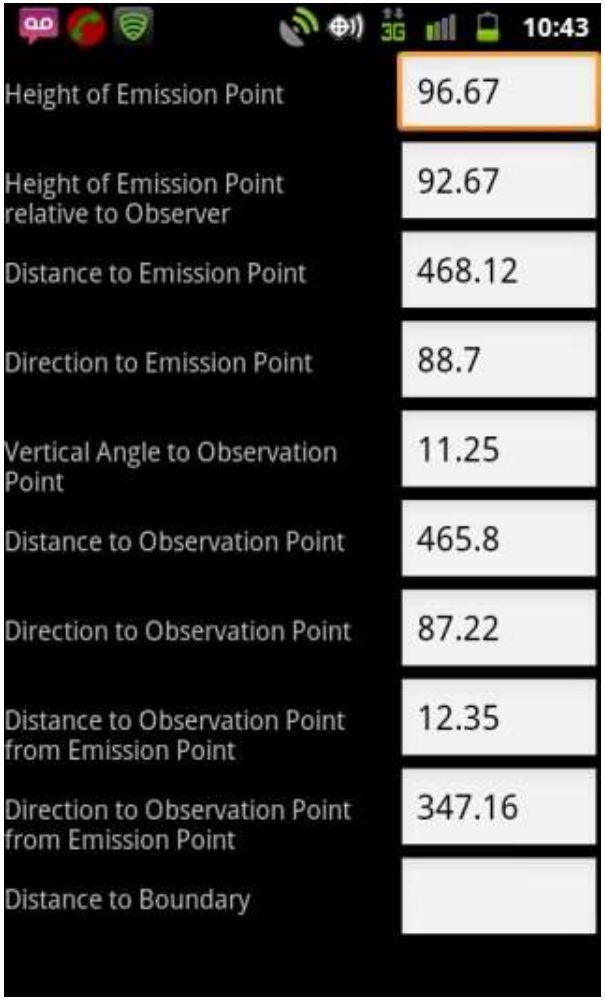
Display Timer & Count



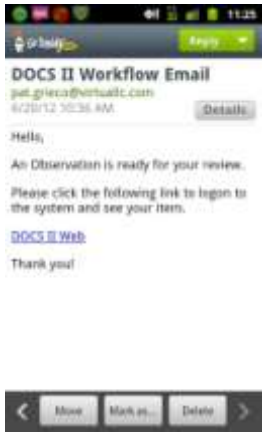
Alt. Method 082

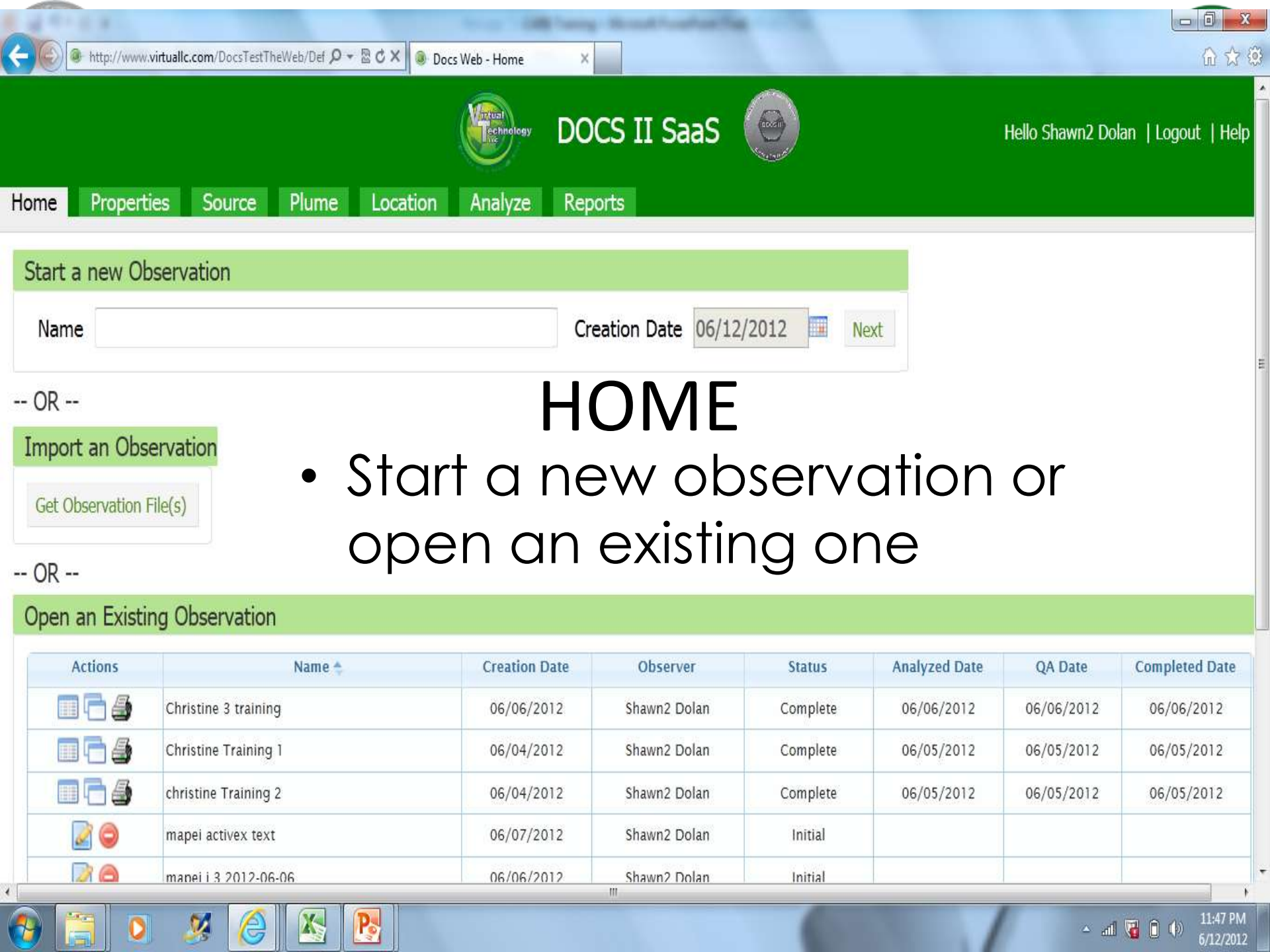
Auto Timer & Count

Sun angle is Key to good pictures
View angle is Key to distance and height



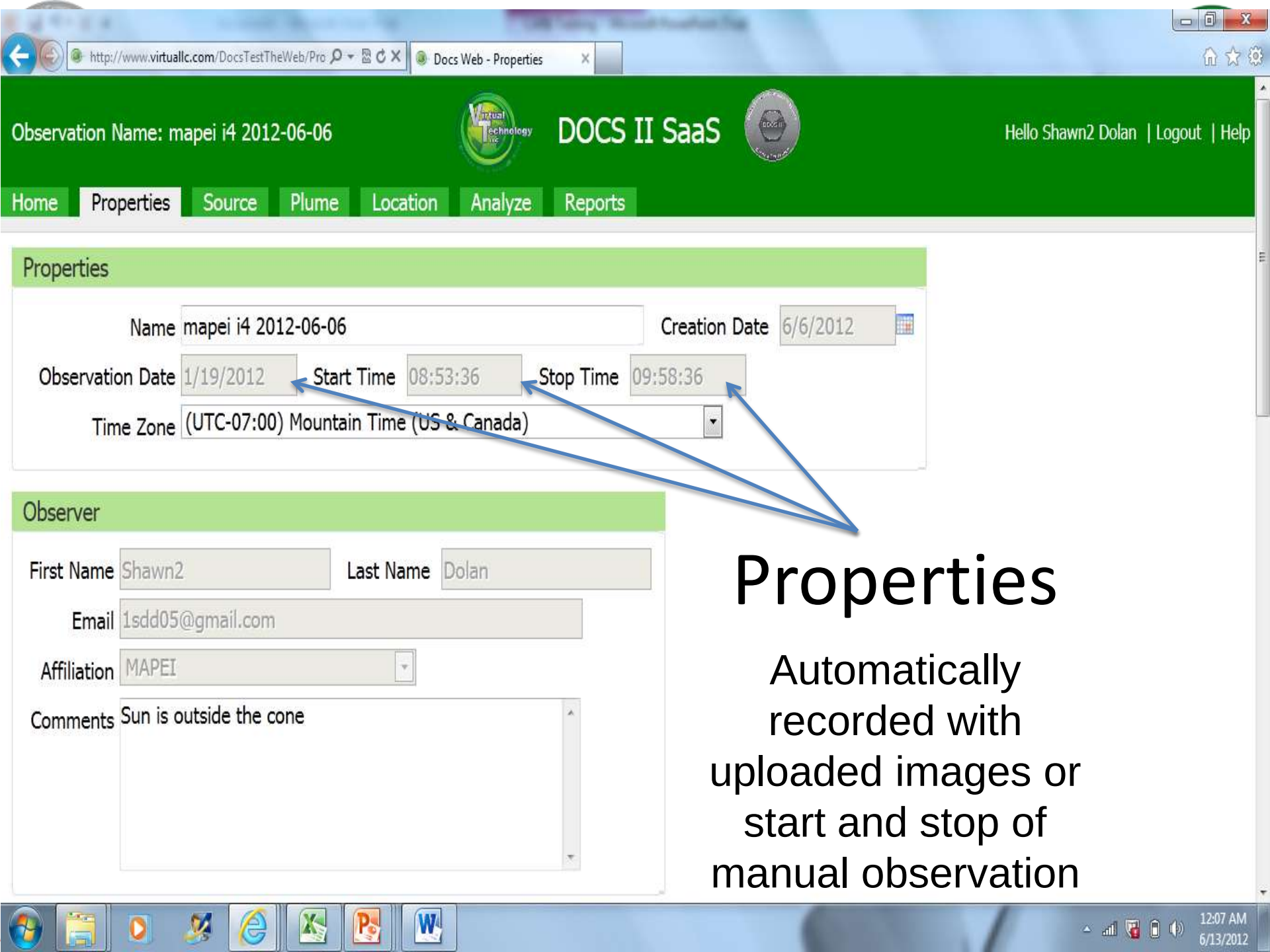
Final Edit & Analysis Performed In Web Application





HOME

- Start a new observation or open an existing one


http://www.virtuallc.com/DocsTestTheWeb/Pro
Docs Web - Properties
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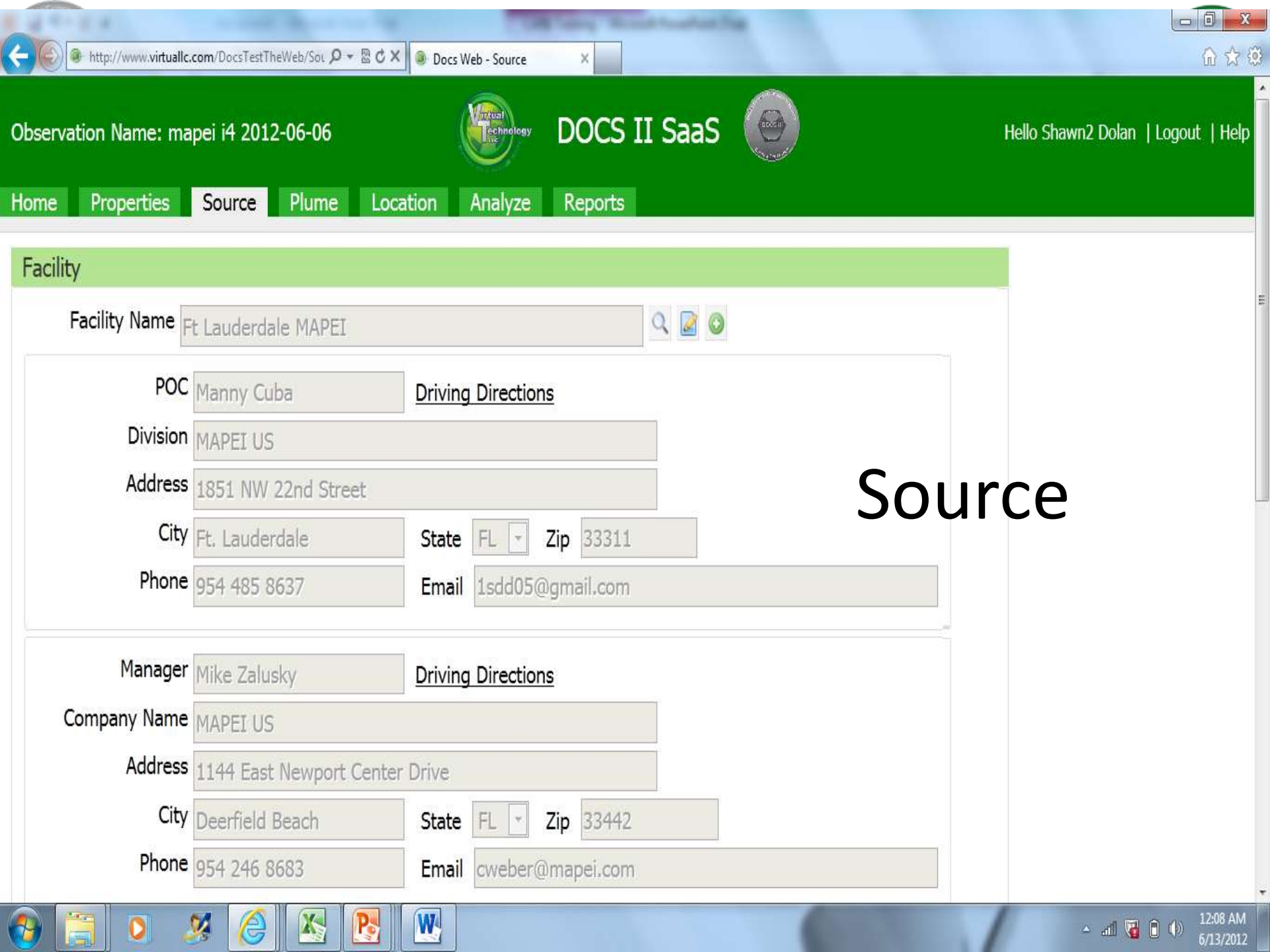
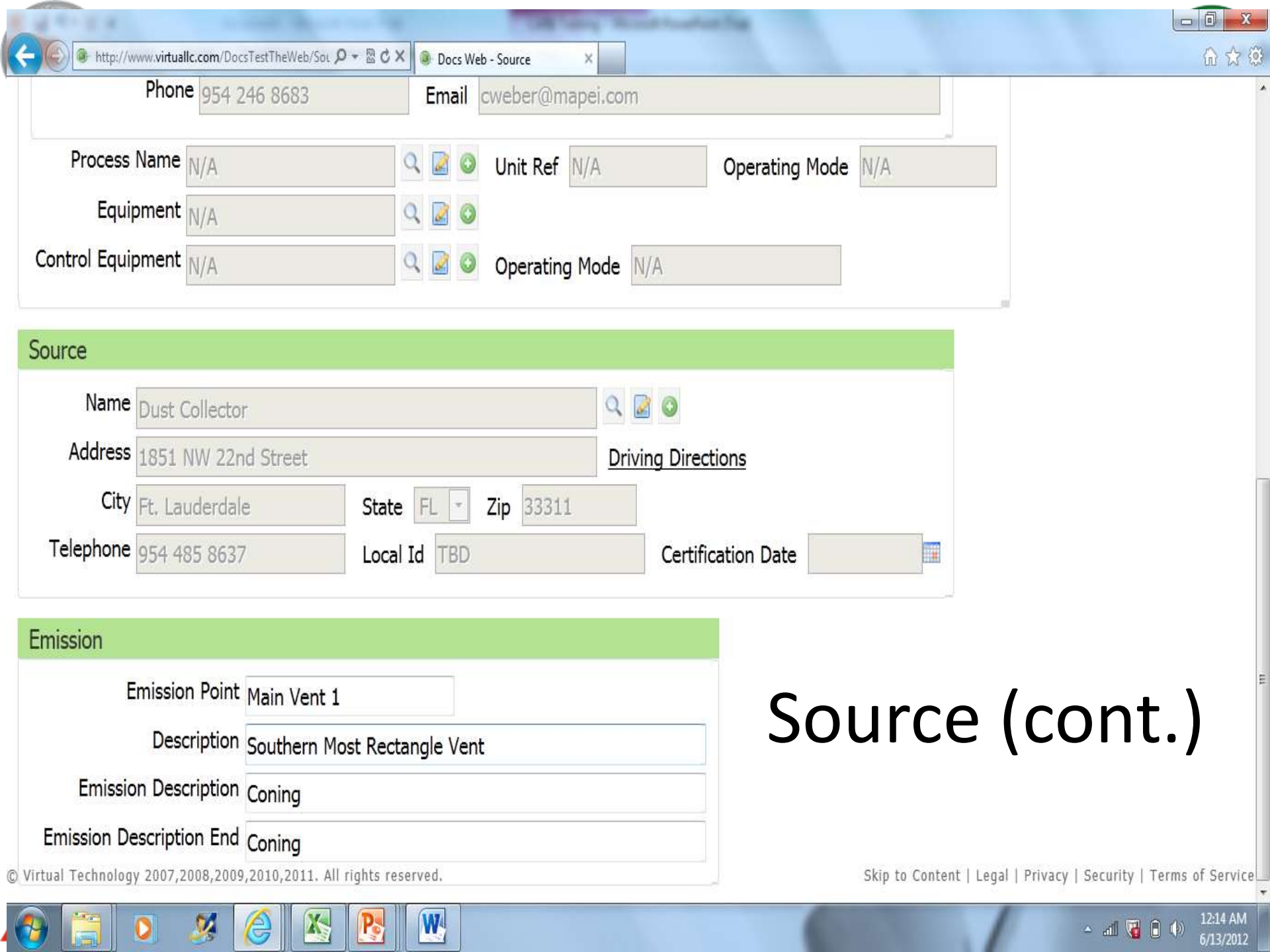
DOCS II SaaS
Hello Shawn2 Dolan | Logout | Help
Home
Properties
Source
Plume
Location
Analyze
Reports
Properties
Name mapei i4 2012-06-06
Creation Date 6/6/2012
Observation Date 1/19/2012
Start Time 08:53:36
Stop Time 09:58:36
Time Zone (UTC-07:00) Mountain Time (US & Canada)
Observer
First Name Shawn2
Last Name Dolan
Email 1sdd05@gmail.com
Affiliation MAPEI
Comments Sun is outside the cone
Properties
Automatically recorded with uploaded images or start and stop of manual observation
12:07 AM
6/13/2012


http://www.virtuallc.com/DocsTestTheWeb/Sou
Docs Web - Source
Observation Name: mapei i4 2012-06-06
DOCS II SaaS
Hello Shawn2 Dolan | Logout | Help
Home
Properties
Source
Plume
Location
Analyze
Reports
Facility
Facility Name
Ft Lauderdale MAPEI
POC
Manny Cuba
Driving Directions
Division
MAPEI US
Address
1851 NW 22nd Street
City
Ft. Lauderdale
State
FL
Zip
33311
Phone
954 485 8637
Email
1sdd05@gmail.com
Manager
Mike Zalusky
Driving Directions
Company Name
MAPEI US
Address
1144 East Newport Center Drive
City
Deerfield Beach
State
FL
Zip
33442
Phone
954 246 8683
Email
cweber@mapei.com
Source
12:08 AM
6/13/2012


http://www.virtuallc.com/DocsTestTheWeb/Sou
Docs Web - Source
Phone 954 246 8683
Email cweber@mapei.com
Process Name N/A
Unit Ref N/A
Operating Mode N/A
Equipment N/A
Control Equipment N/A
Operating Mode N/A
Source
Name Dust Collector
Address 1851 NW 22nd Street
Driving Directions
City Ft. Lauderdale
State FL
Zip 33311
Telephone 954 485 8637
Local Id TBD
Certification Date
Emission
Emission Point Main Vent 1
Description Southern Most Rectangle Vent
Emission Description Coning
Emission Description End Coning
© Virtual Technology 2007,2008,2009,2010,2011. All rights reserved.
Skip to Content | Legal | Privacy | Security | Terms of Service
12:14 AM
6/13/2012

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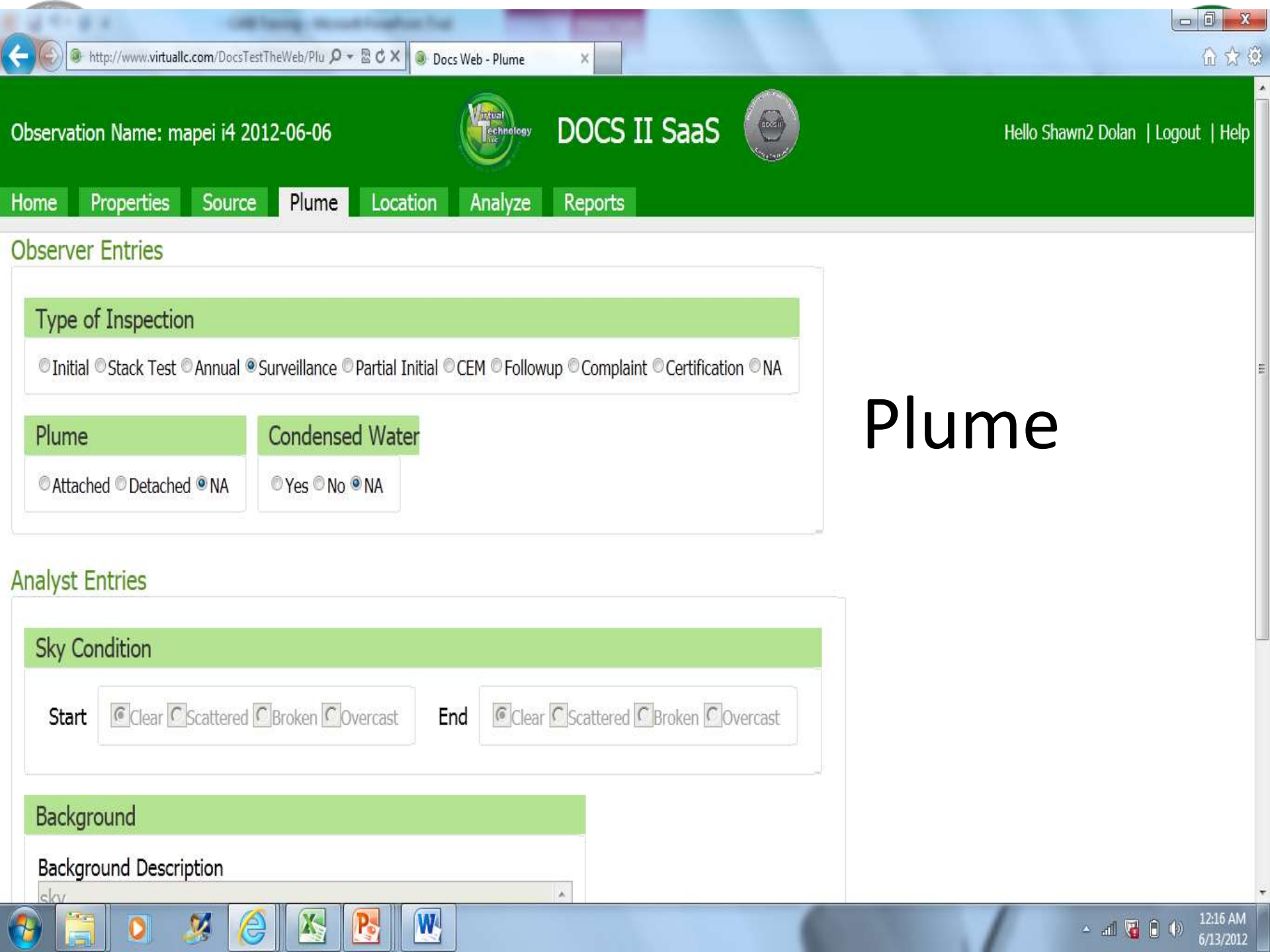

http://www.virtuallc.com/DocsTestTheWeb/Plu
Docs Web - Plume
Observation Name: mapei i4 2012-06-06
DOCS II SaaS
Hello Shawn2 Dolan | Logout | Help
Home
Properties
Source
Plume
Location
Analyze
Reports
Observer Entries
Type of Inspection
Initial Stack Test Annual Surveillance Partial Initial CEM Followup Complaint Certification NA
Plume
Attached Detached NA
Condensed Water
Yes No NA
Analyst Entries
Sky Condition
Start
Clear Scattered Broken Overcast
End
Clear Scattered Broken Overcast
Background
Background Description
sky
12:16 AM
6/13/2012

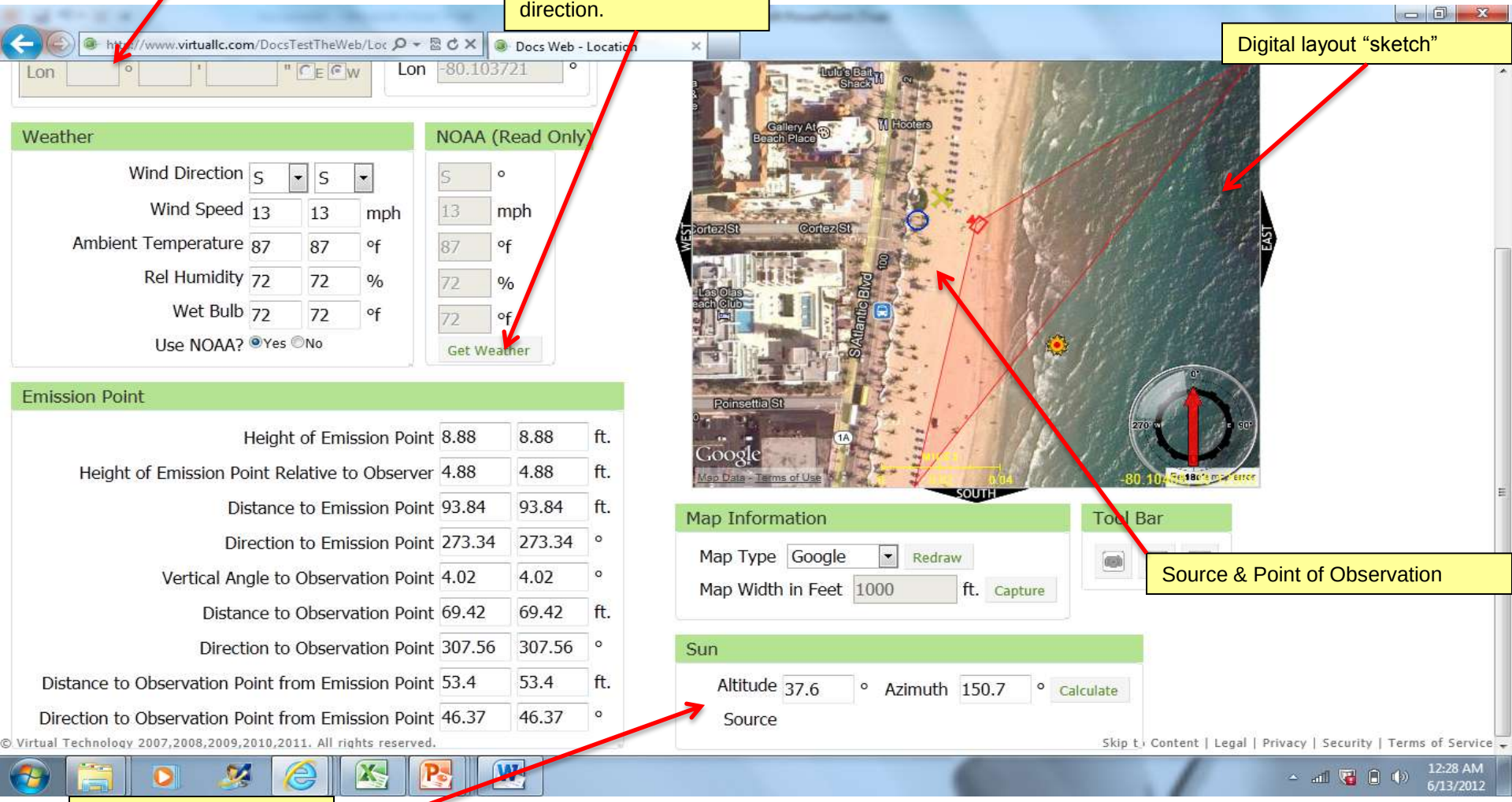
Plume

Location

Location of camera

The current weather for lat/long coordinates is retrieved when pushing this button. Once the weather is entered the compass indicates wind direction.

Digital layout "sketch"

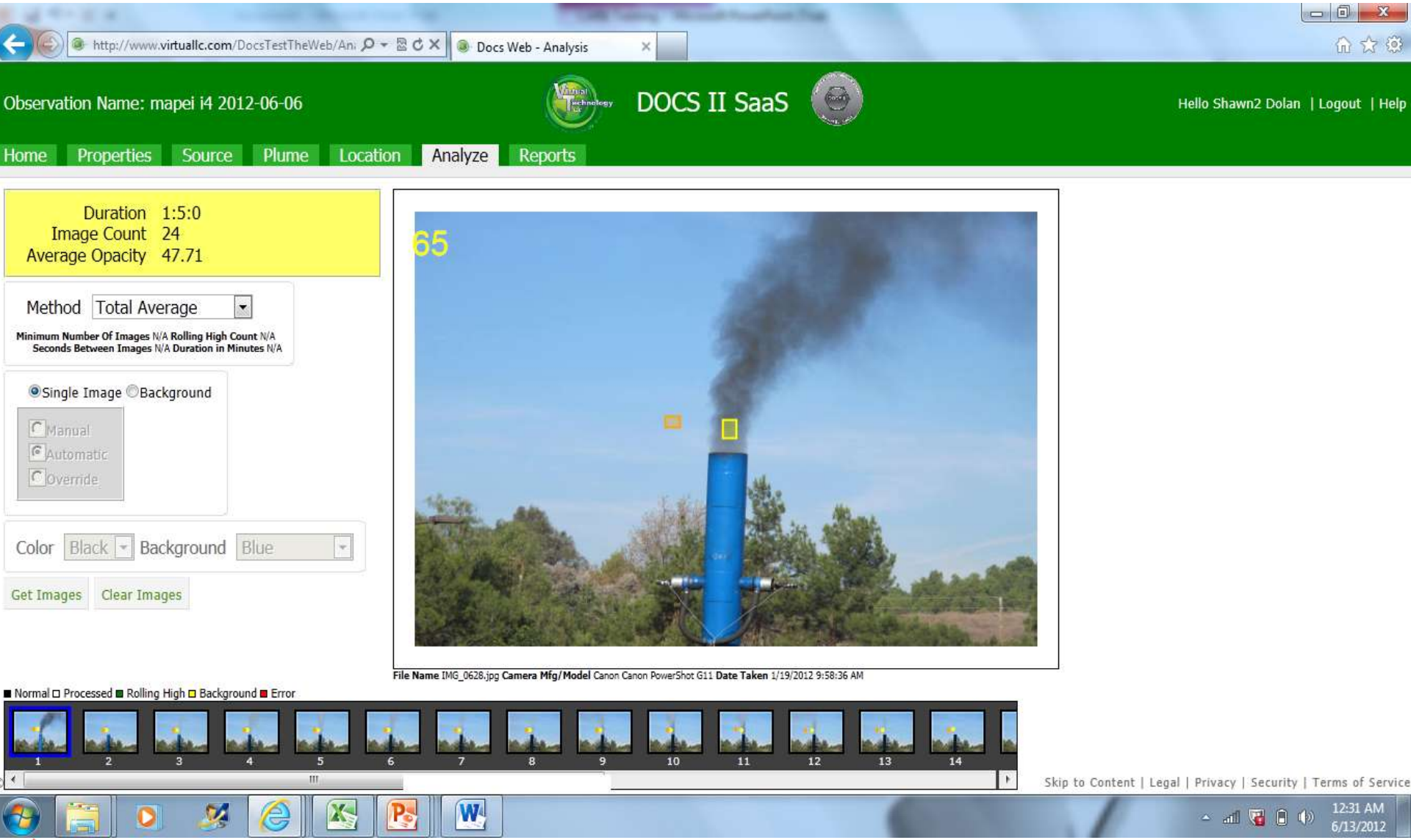


Source & Point of Observation

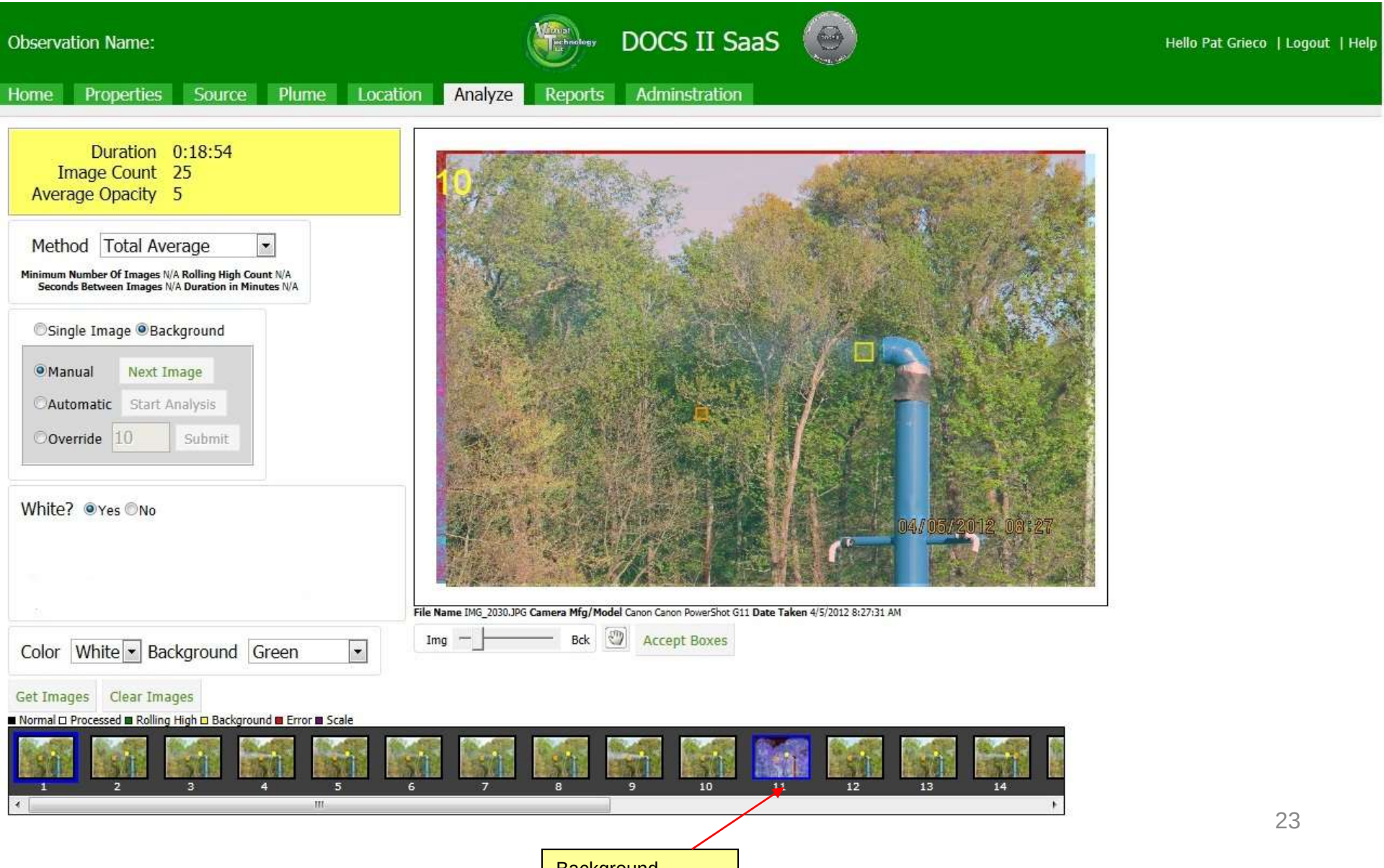
The position of the sun is calculated in two modes.
1) Survey
2) Observation

Height of Emission Point = Physical Stack Height

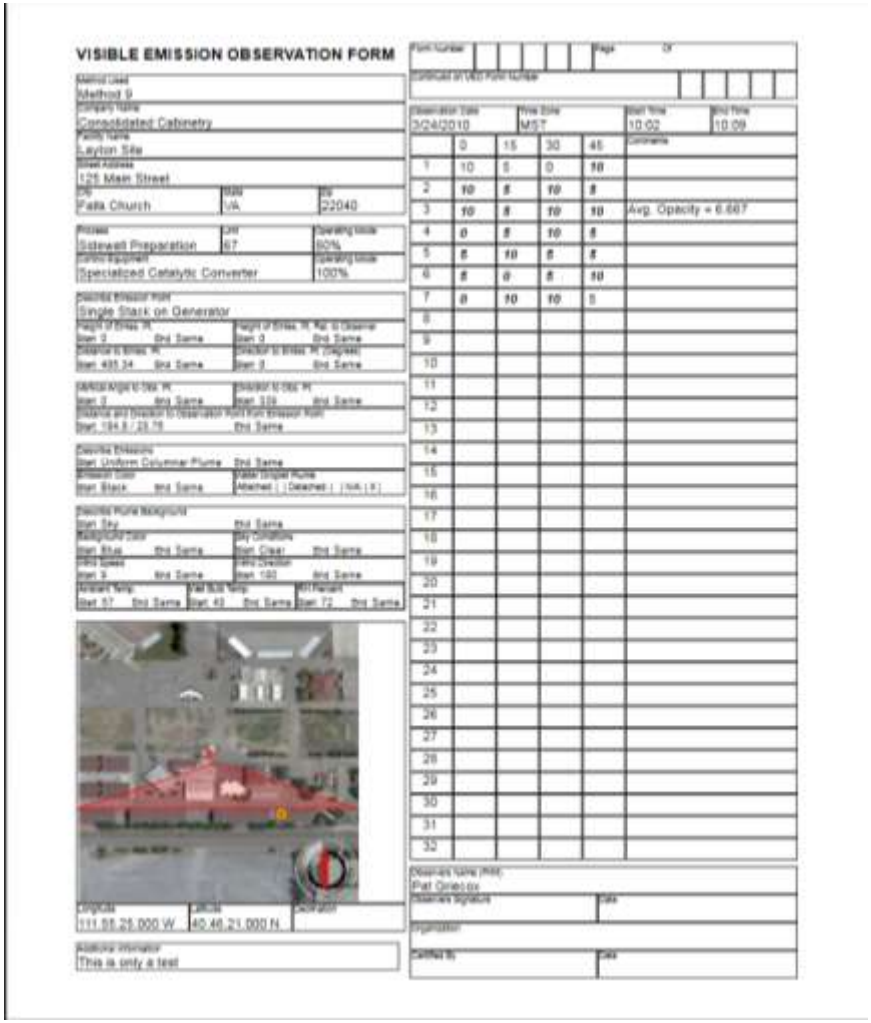
Analysis


http://www.virtuallc.com/DocsTestTheWeb/An
Docs Web - Analysis
Observation Name: mapei i4 2012-06-06
DOCS II SaaS
Hello Shawn2 Dolan | Logout | Help
Home
Properties
Source
Plume
Location
Analyze
Reports
Duration 1:5:0
Image Count 24
Average Opacity 47.71
Method Total Average
Minimum Number Of Images N/A Rolling High Count N/A
Seconds Between Images N/A Duration in Minutes N/A
Single Image Background
Manual
Automatic
Override
Color Black Background Blue
Get Images
Clear Images
65
File Name IMG_0628.jpg Camera Mfg/Model Canon Canon PowerShot G11 Date Taken 1/19/2012 9:58:36 AM
Normal Processed Rolling High Background Error
1 2 3 4 5 6 7 8 9 10 11 12 13 14
Skip to Content | Legal | Privacy | Security | Terms of Service
12:31 AM
6/13/2012

Analysis (Complex Background)



Report



VISIBLE EMISSION OBSERVATION FORM

Method 9

Consolidated Cabinetry

Layton Site

125 Main Street

Falls Church | VA | 22040

Process: Sidewall Preparation | SCC: 67 | Operating Mode: 80%

Control Equipment: Specialized Catalytic Converter | Operating Mode: 100%

Describe Emission Point: Single Stack on Generator

Height of Stack: Start: 0 ft | Height of Stack: Start: 0 ft | Rel. to Observer: Start: 0 ft

Distance to Stack: Start: 405.24 ft | Direction to Stack: Start: 0 | Start: 0

Distance and Direction from Observer to Emission Point: Start: 194.8 / 23.76 ft

Describe Emission: Start: Uniform Columnar Plume

Emission Color: Start: Black | Water Droplet Plume: Attached | Detached | N/A

Describe Plume Background: Start: Sky

Background Color: Start: Blue | Sky Condition: Start: Clear

Wind Speed: Start: 0 | Wind Direction: Start: 180

Ambient Temp: Start: 57 | Wet Bulb Temp: Start: 48 | Wind Velocity: Start: 72

Latitude: 111 55 25.000 W | Longitude: 40 46 21.000 N

Additional Information: This is only a test

Form Number | Page | Of

Duplicate on next Form Number

Observation Date: 3/24/2010 | Time Zone: MST | Start Time: 10:02 | End Time: 10:09

	0	15	30	45	Comments
1	10	5	0	10	
2	10	5	10	5	
3	10	5	10	10	Avg. Opacity = 6.667
4	0	5	10	5	
5	5	10	5	5	
6	5	0	5	10	
7	0	10	10	5	
8					
9					
10					
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28					
29					
30					
31					
32					

Observer's Name (Print): Pat Oneacre

Observer's Signature | Date

Organization

Certified By | Date

Image	Opacity	Coordinates	Camera and Weather Information
IMG_0234_010.jpg	10	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:03:48 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48
IMG_0235_010.jpg	10	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:04:00 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48
IMG_0244_010.jpg	5	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:04:18 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48
IMG_0245_010.jpg	10	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:04:30 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48
IMG_0246_010.jpg	5	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:04:48 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48
IMG_0247_010.jpg	10	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:06:00 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48
IMG_0248_010.jpg	5	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:06:18 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48
IMG_0249_010.jpg	10	Foreground Coordinates: T 1488, L 1680, B 2122, R 1888; Background Coordinates: T 1945, L 1373, B 2110, R 1299	Date Taken 3/24/2010 10:06:30 AM; Camera Mfg/Model Canon/Canon PowerShot G11; Wind Direction S; Wind Speed 9; Temperature 57; Rel Humidity 72; Wet Bulb Temp 48

Forensic Data

Image	Opacity	Coordinates	Camera and Weather Information
 IMG_0222.JPG	55	Foreground Coordinates T: 1761, L: 1882, B: 2128, R: 1606 Background Coordinates T: 1788, L: 1280, B: 2183, R: 996	Date Taken 3/24/2010 10:00:40 AM Camera Mfg/Model Canon/Canon PowerShot G11 Wind Direction SW Wind Speed 10 Temperature 60 Rel Humidity 38 Wet Bulb Temp 34
 IMG_0223.JPG	75	Foreground Coordinates T: 1783, L: 1911, B: 2139, R: 1595 Background Coordinates T: 1714, L: 1181, B: 2018, R: 994	Date Taken 3/24/2010 10:00:57 AM Camera Mfg/Model Canon/Canon PowerShot G11 Wind Direction SW Wind Speed 10 Temperature 60 Rel Humidity 38 Wet Bulb Temp 34
 IMG_0224.JPG	85	Foreground Coordinates T: 1732, L: 1917, B: 2124, R: 1583 Background Coordinates T: 1703, L: 1291, B: 2093, R: 1033	Date Taken 3/24/2010 10:01:20 AM Camera Mfg/Model Canon/Canon PowerShot G11 Wind Direction SW Wind Speed 10 Temperature 60 Rel Humidity 38 Wet Bulb Temp 34

CA Campaign Summer 2012

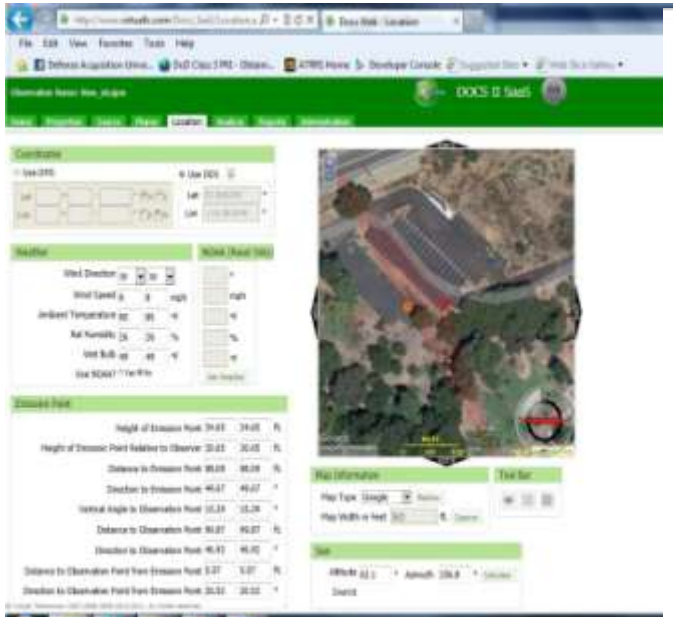
- Environmental Studies Students
- Never heard of Opacity before May 2012

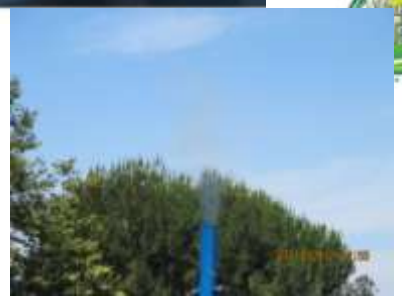
Michelle, 2 yrs. @ U of A

Allison, 2 yrs. @ NAU

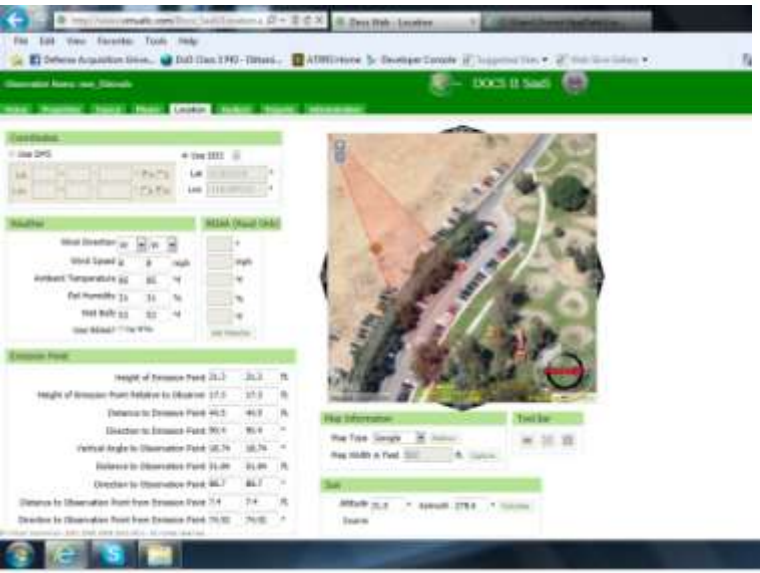
- Now Both CA Certified Visual Observers
- Now Both DOCS II Certified Operators

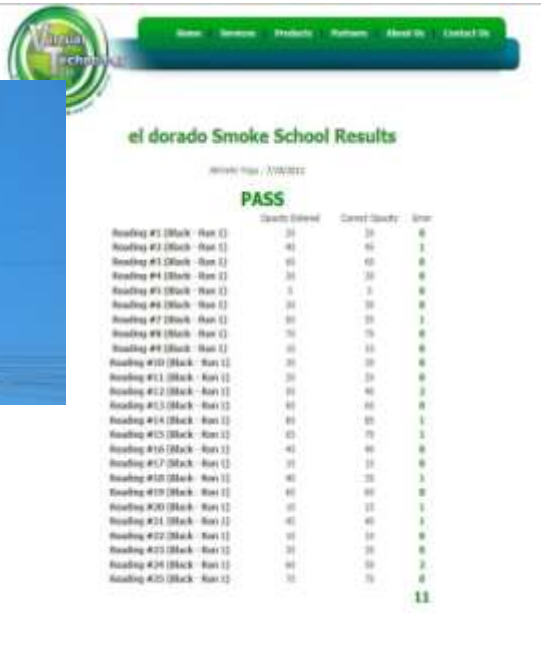
El Cajon, CA Campaign 2012





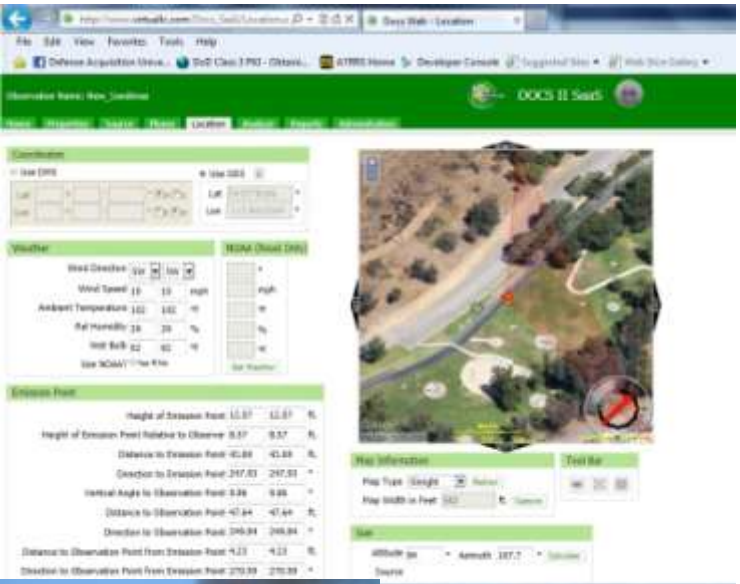
El Dorado Park, CA Campaign 2012

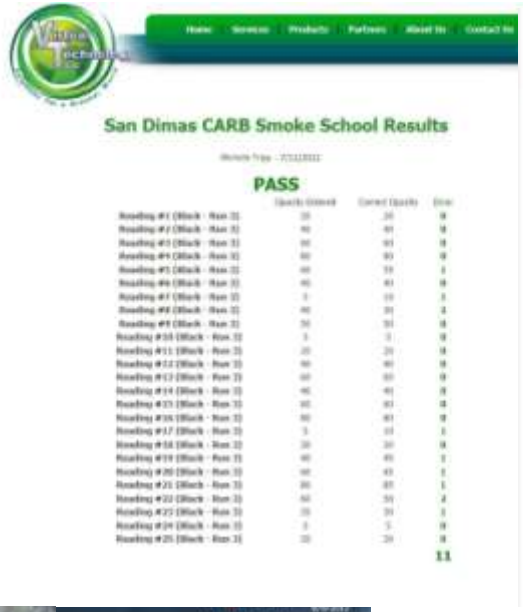


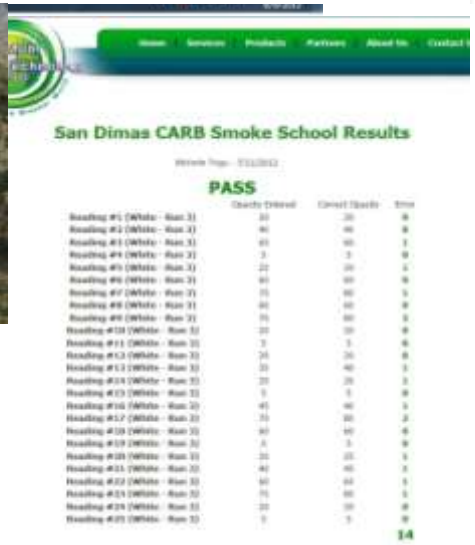


Long Beach, CA (Night) Campaign 2012

San Dimas, CA Campaign 2012

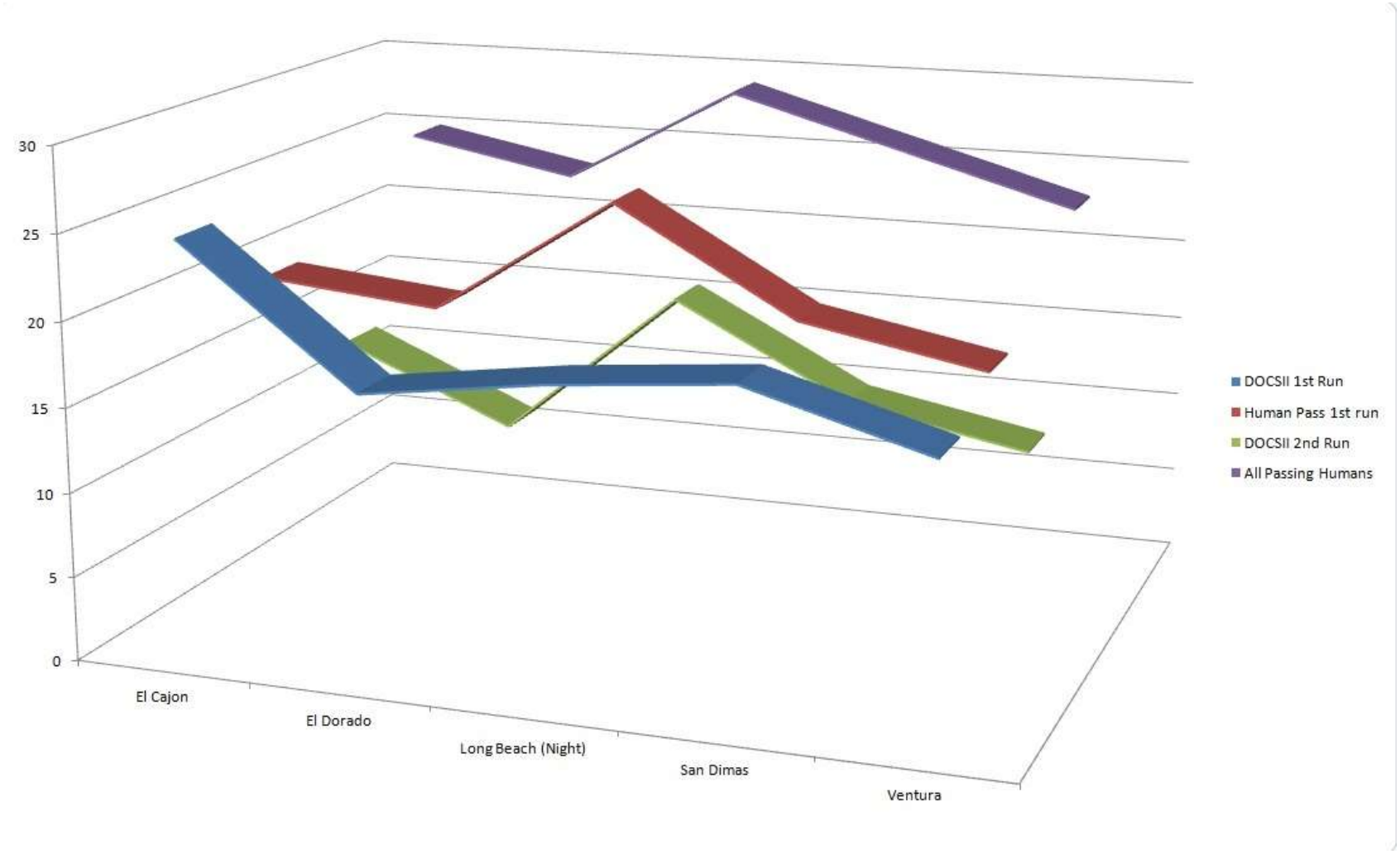






Venture, CA Campaign 2012

Matched up to humans



Reaching Out in the Distance

EPA ALT 082, Distance only limited by Optical Zoom Capability

Visible Emissions Throughput

Human Certified Method 9 Yield

Total One Time VEE Trained Observers	Reduction field QA Problem	Reduction Re-Certification of Observer
	Legal Record	6 Month Recertification

DOCS II SaaS Yield

Total One Time VEE Trained Observers	Validated Record NO Reduction in field QA Problem	Certified Analyst Always Available NO Reduction Re-Certification of Observer
	Automated Records Validation and QA Defendable Legal Record	3.5 Year Recertification, 300 images each SME's, highly qualified Analysts increased consistency and data quality

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Use low resolution camera settings

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Stay out of Shadows

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Use the optical zoom

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
If you have to shoot pics in shadows
make sure the lighting is even

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Don’t move the camera

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Contrast the background

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Use the optical zoom

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Even color backgrounds

VA DEQ Standalone Trials

VA DEQ Testing Images

Certification Image

Lesson Learned
Use auto angle correction, but get an even colored background

VA DEQ Standalone Trials

VA DEQ Testing Images

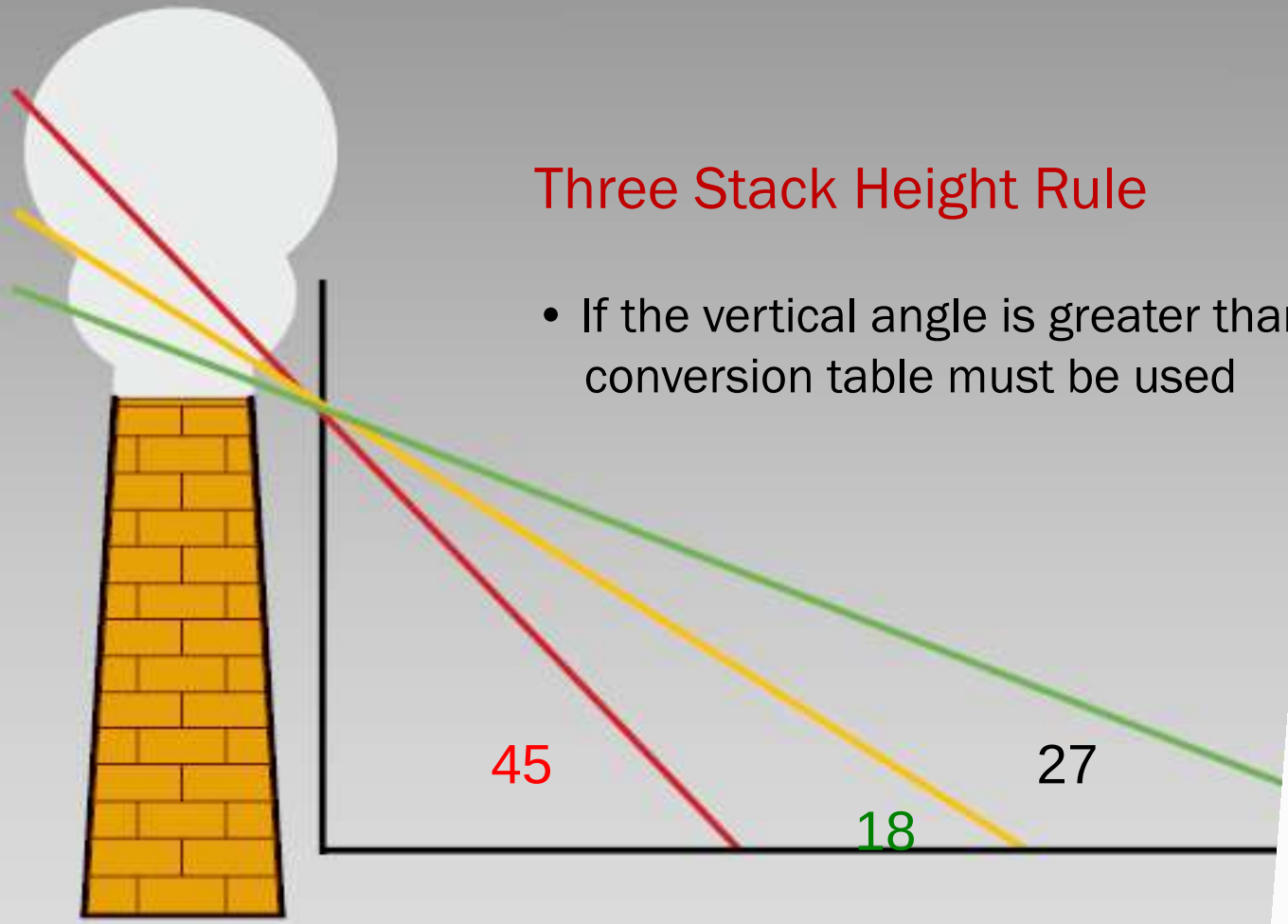
Certification Image

Lesson Learned
Don’t move the camera

Qualifications

- 3 Stack Height Rule, Distance from “evaluation point”
- Sun is behind camera within the 140 degree cone
- Identify the “Plume” and “Background” of Picture
  - Contrasting background
    - Even “Like” Colors
    - Even Light Intensity
      - No shadows
      - All shadows
- Stabilize Camera and Frame
  - Shadows all Out (preferred) or all In
  - Opacity fills 2/3rds of photo (Zoom)

Vertical Angle to Emission Point



Three Stack Height Rule

- If the vertical angle is greater than 18°, then conversion table must be used

All 50%



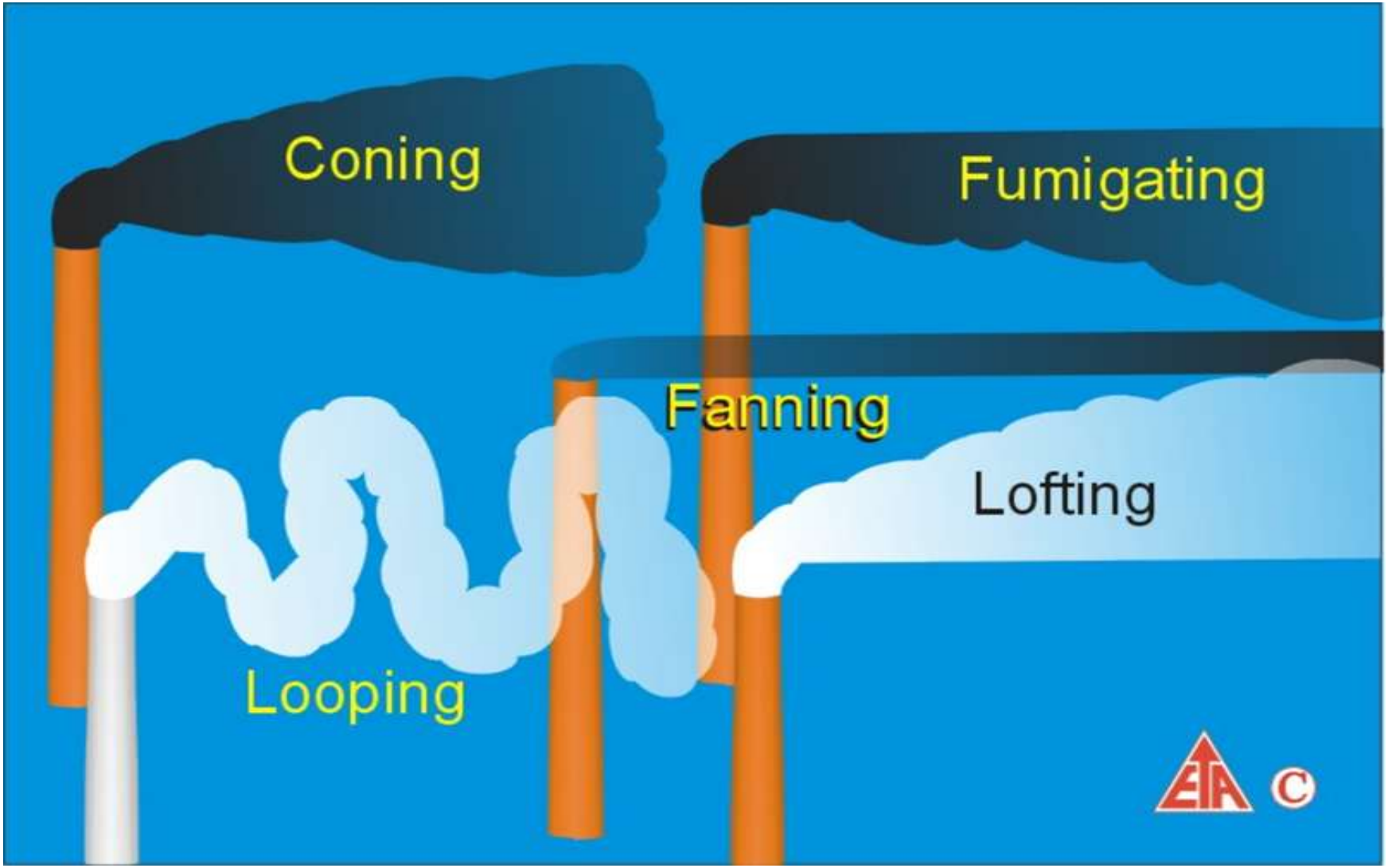



Sun Angle, Background, Weather
All Make a Difference

Emission

- Emission Point:
  - Specific vent, stack, etc.
  - Ex) Main Vent 1
- Description:
  - Where is it?
  - What does it look like?
  - Ex) Southernmost Rectangular Vent
- Emission Description/Emission Description End:
  - Ex) Coning, Fanning, Fumigating, Looping, Lofting
  - Auto-fill can be modified

Emission Description



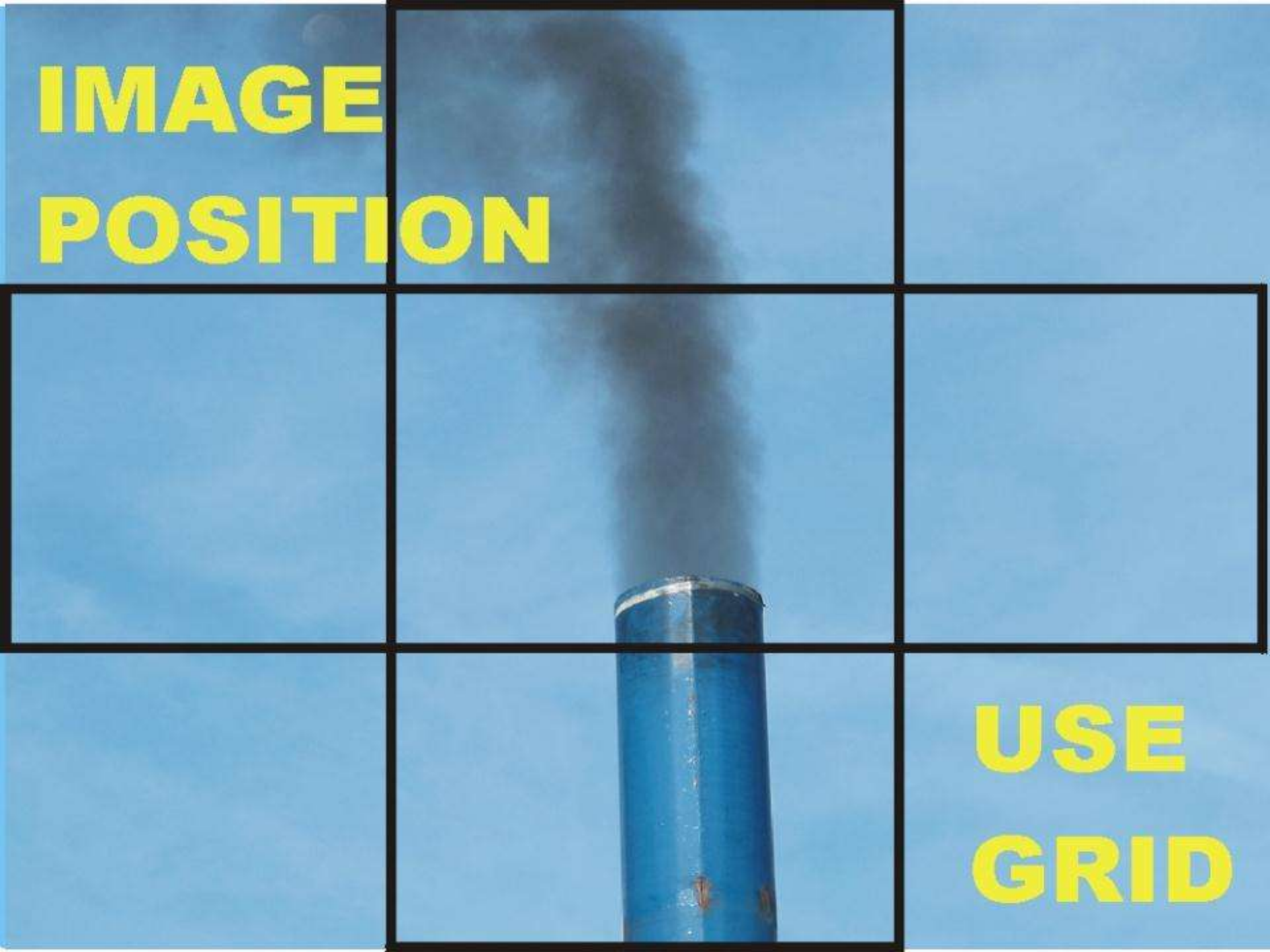


IMAGE
POSITION
USE
GRID

Tripods and Framing CRITICAL

- Allows you to capture excellent quality images without the need for image stabilization.
  - Necessary piece of equipment
- Auto Focus and Zoom Camera On:
  - Point of highest apparent opacity AND clear background WITHOUT shadow &/or condensed water vapor
  - Zoom as required to fill 2/3 of frame with plume area

Stabilization

Consistency: Must
Sun compliance: Must

Framing/zoom: Must

Brown Background

Zero image: ok

Image stabilization: ok

Brown Background

Zoomed in: ok

Zoomed out: bad

Keeping out of Caves

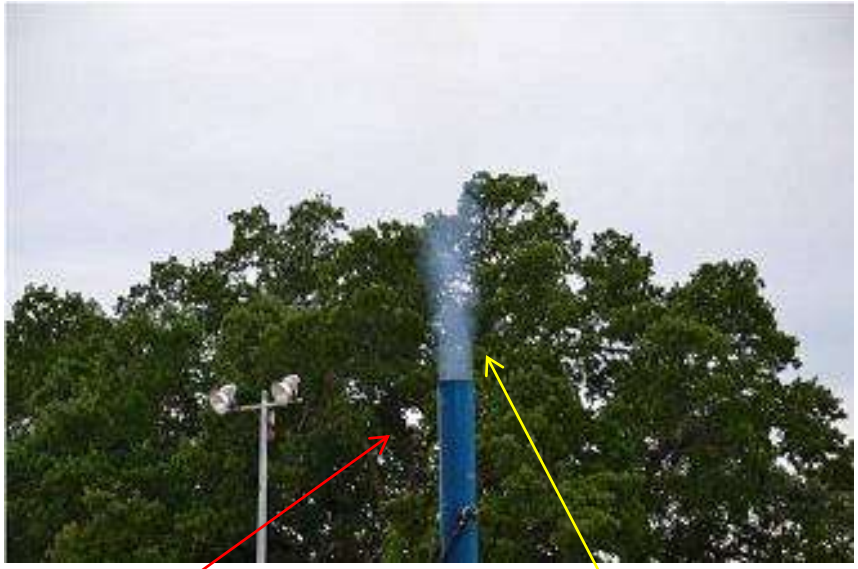
Shadow Cave: bad

Zoom: ok

Tree Gaps

Consistence Contrast: Preferred Zero Image

Find Dense leaves



Density of leaves: Bad

Density of leaves: ok

Water Vapor

Background: ok

Zoom: a little too far back

Background: bad

Zoom: bad

Vents

Sun Compliance: Bad

Combining Plumes: Bad

Zoom: ok

Shoot for the Sky

Zero Image: ok

Broken Clouds: ok

Shoot for the Sky

Zero Image: ok

Clear Sky: ok

Blue Sky

White Smoke: ok

Zoom: ok

Black Smoke: ok

Zoom: ok

Lining up Cloud Coverage

Background: ok

Broken Clouds: ok

Poor Pictures

Background: bad

Framing: bad

Zoom: bad

Fumigating

Careful to NOT Capture Plume Multipliers

Folding Over

Mushrooming

Image Quality

Horizontal Lines of Light

Folding with Scattered Backgrounds

Mushrooming Plume with Scattered Cloud Coverage

Image Quality Checklist

Avoid

- Shadow Caves
- Complicated Backgrounds
- Long Distance Pictures
- Bad Framing
- Combining Plumes
- Folding/Mushrooming Plumes

Ideal

- Sun Compliance
- Clear Backgrounds
- Correct Framing
- Zoom Satisfaction
- Consistency
- Stabilization
  - Tripod
  - Intervalometer

How Does Color Contrast Affect Evaluation?

Poor Color Contrast Yields a Negative Bias!

Negative Bias!

50% = Ringelmann 2 1/2

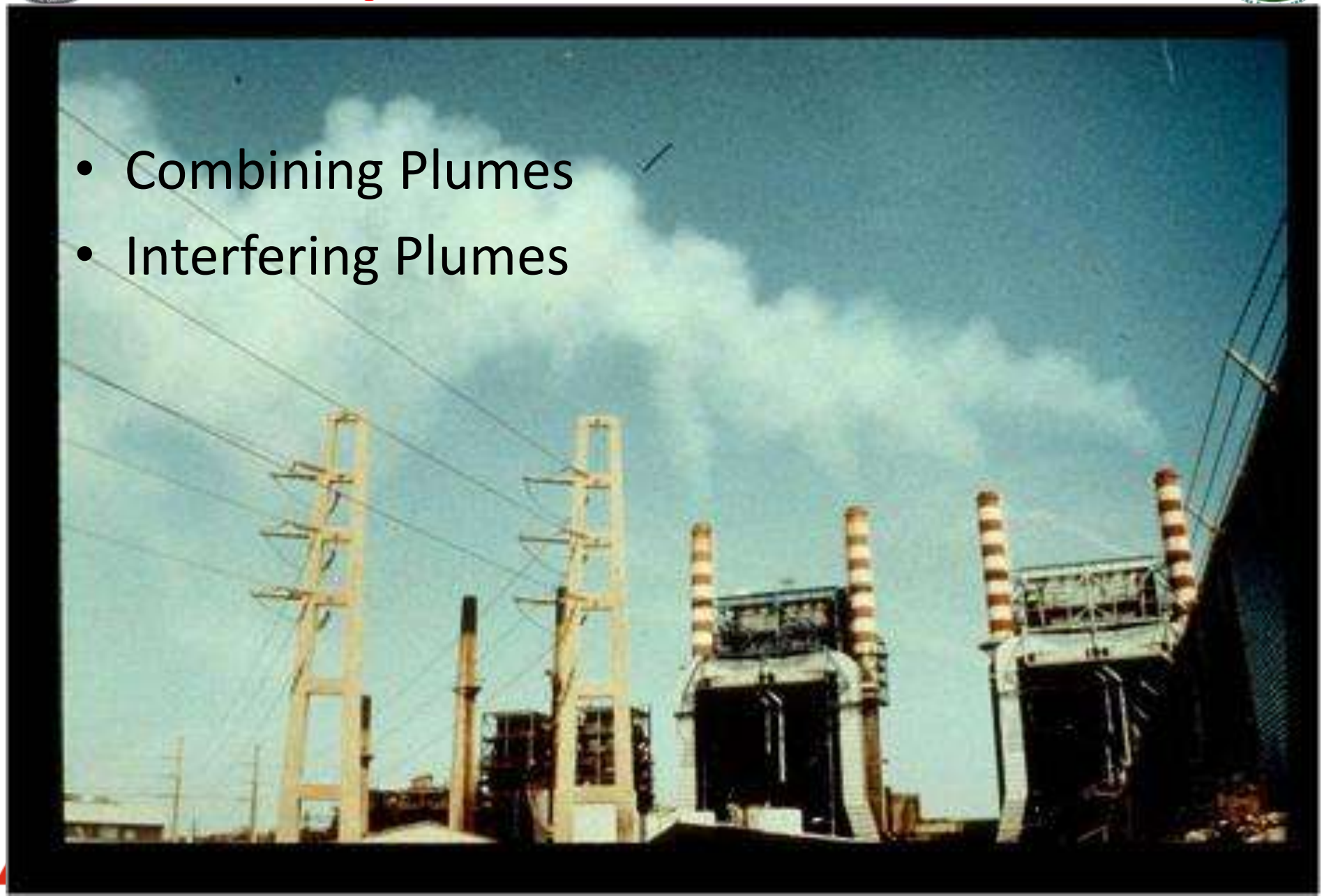
Light Interactions

- **Luminous conditions**
  - Refers to the ambient lighting conditions
- **Color contrast**
  - Refers to the emission color in relation to the background
- **Attenuation**
  - Is the gradual loss in intensity of any kind of light through a medium

Avoid:

Avoid: Sunsets/Sunrises

Multiple Source Issues Avoid:



- Combining Plumes
- Interfering Plumes

Bad Framing

Good Framing

Good: Satisfactory Framing & Zoom

Bad: No Optical Zoom & Too Far Away

- Combing/Interfering Plumes
- Shadows
- Framing
- No Tripod
- Inconsistency

❑Good

Framing Checklist

- **Sun behind camera in 140 degree sector?**
- **Observation Point "Plume" within center frame taking up ~2/3 of that frame, And 2/3 of total frame?**
- **Where will the analyst draw Plume and Background sticks? Is the background clear of residual plume, wind shear?**
- **Does the Background evenly contrast with Plume**
- **Is there going to be any interference?**
- **Do I need a zero image?**
- **If plume moves will it be framed correctly?**






DOCS II SUMMARY

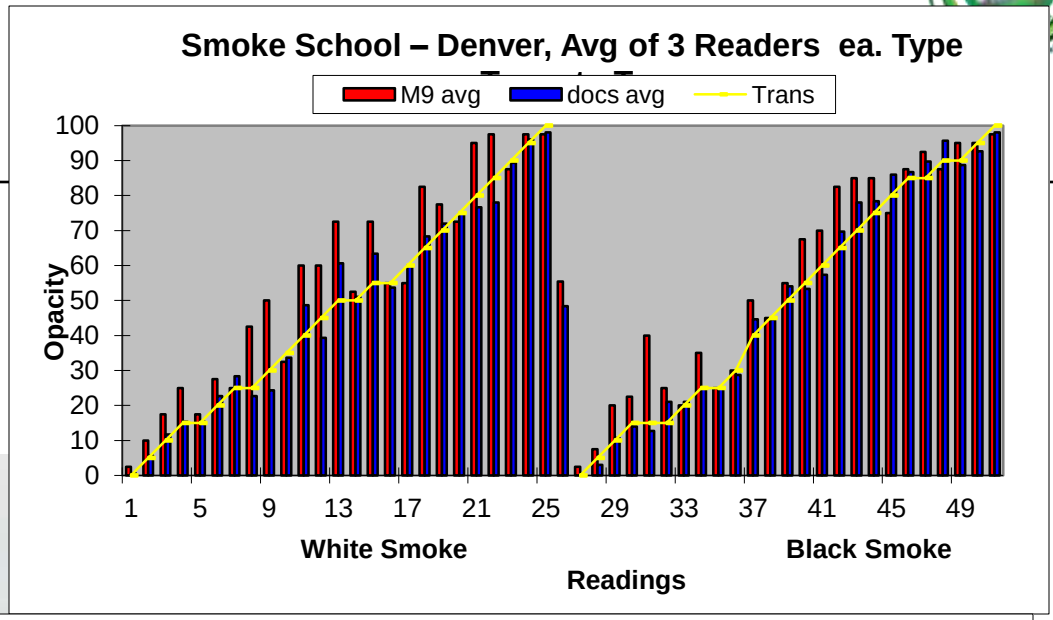
- **DOCS II "Method 9" app available in Google Play Store**
- **DOCS II SaaS submitted for GSA Schedule 70 at 5K/yr, + $100/VEE with, 1 time Image and Data Collection Course at $2500,**
- **Pricing Tailored by:**
  - Number of sources and VE's required
  - Current costs of achieving VE objectives
  - Requirements for defend ability of opacity readings
  - Archive storage and security requirements
- **Objective is standardize on DOCS II through out the AF and DOD community based on permit requirements and current expenditures**
- **DOCS II offers a more consistent, complete and verifiable VEE record than Method 9 records**
- **DOCS II meets all requirements for "Most Credible Evidence"**
- **DOCS II is certified to EPA ALT 082 and ASTM D7520**
- **ALT 082 is an EPA Approved Alternate to Method 9 for 40 CFR 60, 61, 63**

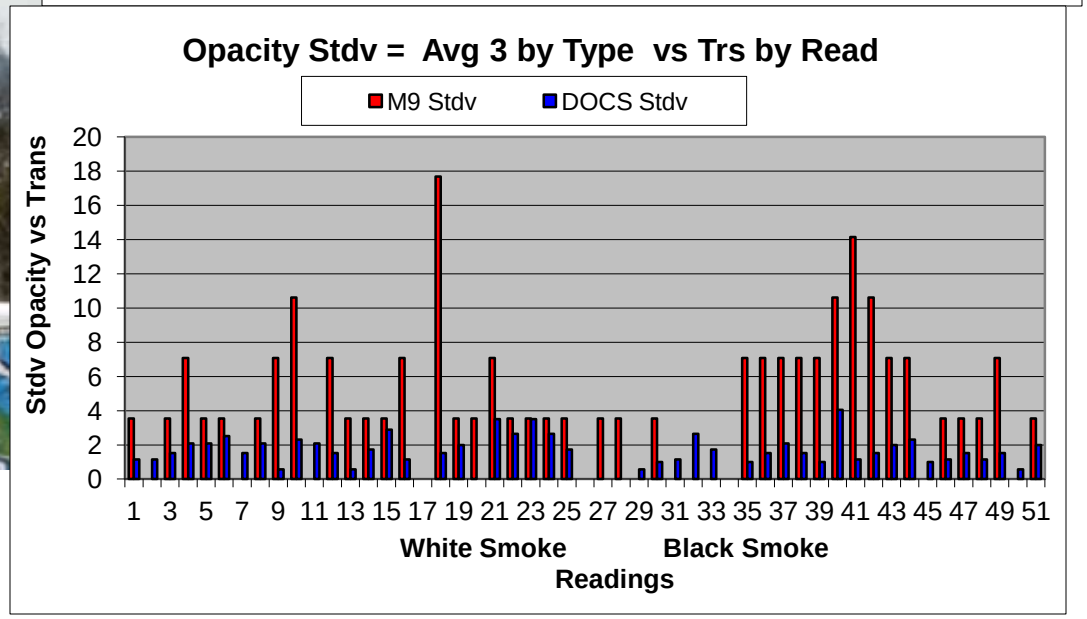
Digital Opacity Compliance System, Second Generation

Virtual Technology LLC
Shawn Dolan
888-872-3836
shawn.dolan@virtuallc.com

Back up data DOCS II Smoke School Region 6 Test 02 20 07

- 3) DOCS II Operators, and 3) Certified Method 9 Observers Compared to NIST COM

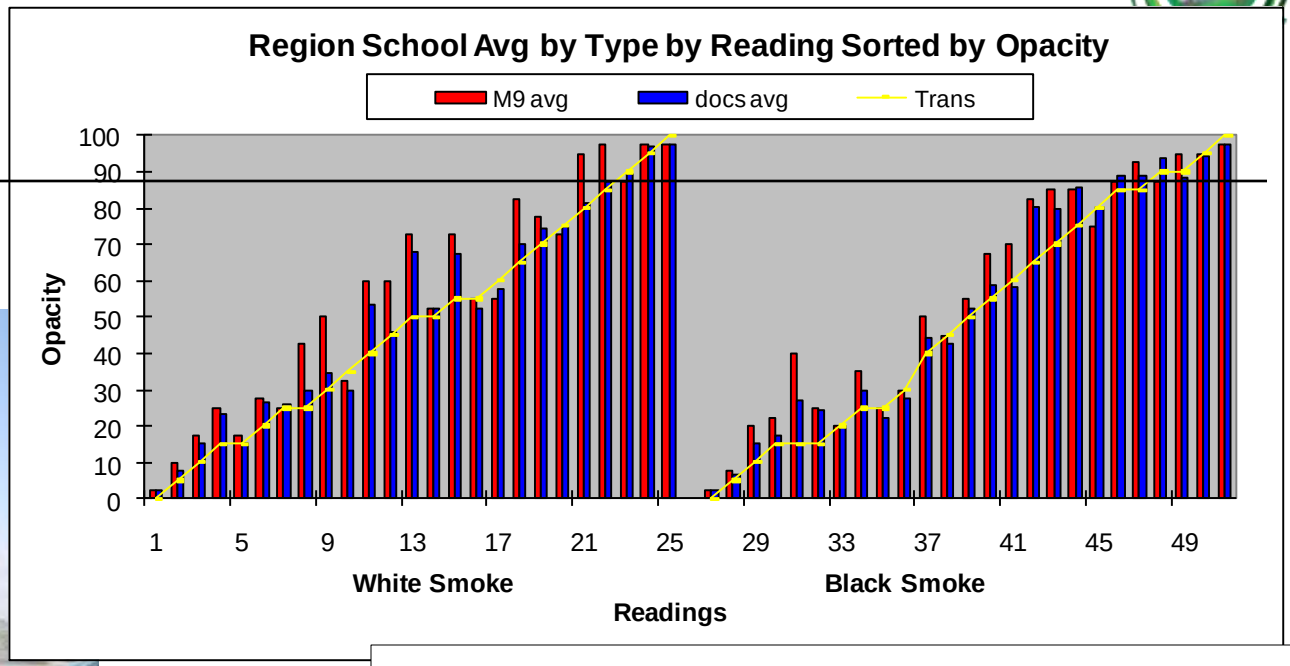


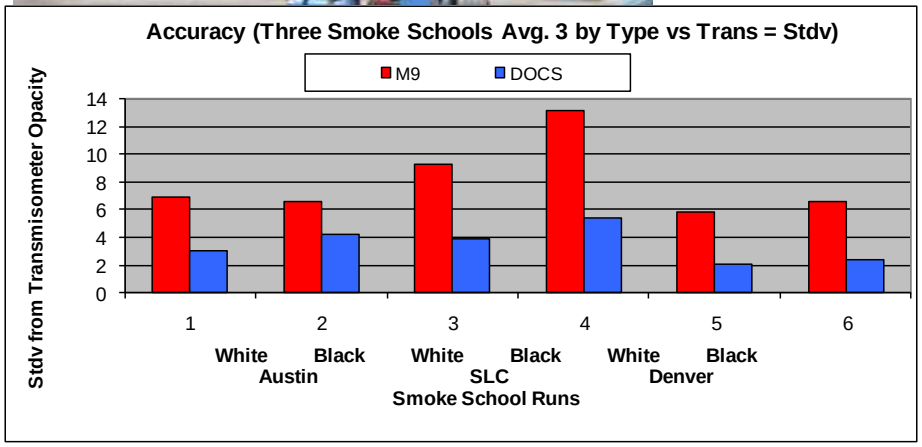


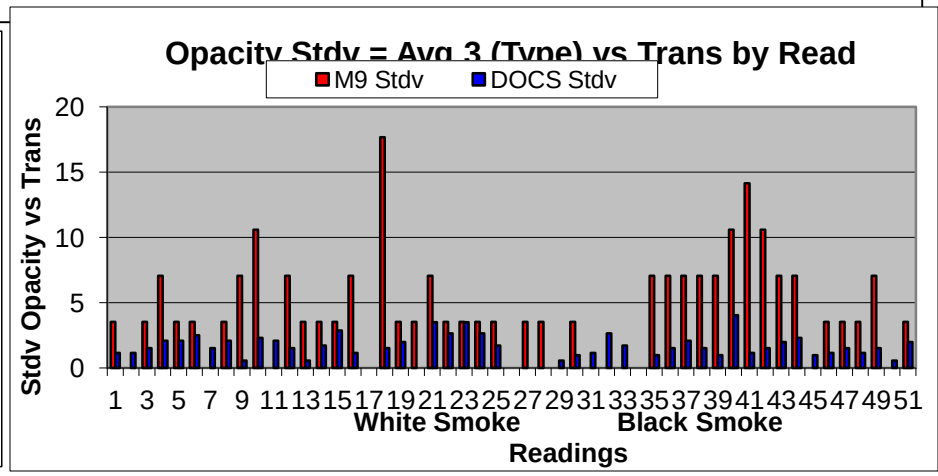
Validated DOCS II Capability Against Method 9 and Transmissometer

Backup data DOCS II Smoke School Region 8 Test 04 17 07

3) DOCS II & 3) Method 9 vs NIST COM







Validation of DOCS II Capability

Average Accuracy Validated, Instantaneous Capability Established

DOCS II Passed Smoke School Just Like Method 9 Readers

Software as a Service:
Cloud Computing Category:
BA02 Asset management, BA15 Engineering, BA29 Tracking and monitoring tools

Price: $4995/yr (1 Required, Per 10 Trained VEE Users)
Product Name:
DOCS II Digital Opacity Compliance System Setup
Description:
Price is for 1 Certified Account per year, allowing 10 Trained VEE Users. Provides set up of organization specific Air emission sources, permits, limits, frequencies, processes and alerts reference set of VEE requirements for the organization .
Product URL:
http://www.virtuallc.com/apps/DOCSIIAC/index.html

Price: $2499/ea (1 Required for each Trained VEE User)
Product Name:
DOCS II Digital Opacity Compliance System Train
Description:
Price is for 1 Visible Emission Evaluation Data Collection Certification required once for all DOCS II Trained VEE User Accounts with in a Certified Account
Product URL:
http://www.virtuallc.com/apps/DOCSIITR/index.html

Price: $99/ea (Opacity Analysis of User VEE data)
Product Name:
DOCS II Digital Opacity Compliance System VEE
Description:
Price is for 1 Visible Emission Evaluation Record Set. Web based Opacity determinations from Certified Account, Trained VEE User, input of required VE dataset: acquisition location, source images.
Product URL:
http://www.virtuallc.com/apps/DOCSIIOA/index.html

Price: $49/yr (Storage for ~100 VEE records)
Product Name:
DOCS II Digital Opacity Compliance System Storage
Description:
Price is per GB of Visible Emission Evaluation Record Set Storage per year. Secure virtual storage and easy retrieval of VEE records, VEE record ~ 7MB
Product URL:
http://www.virtuallc.com/apps/DOCSIIST/index.html

Price: $499/ea (Litigation Detail Report/VEE)
Product Name:
DOCS II Digital Opacity Compliance System LDR
Description:
Price is for 1 Visible Emission Evaluation Certification Detail report, includes: DOCS II certification package, NIST trace to smoke generator certification, Analyst certification history, Source comparative analysis within Certified Account
Product URL: http://www.virtuallc.com/apps/DOCSIILD/index.html

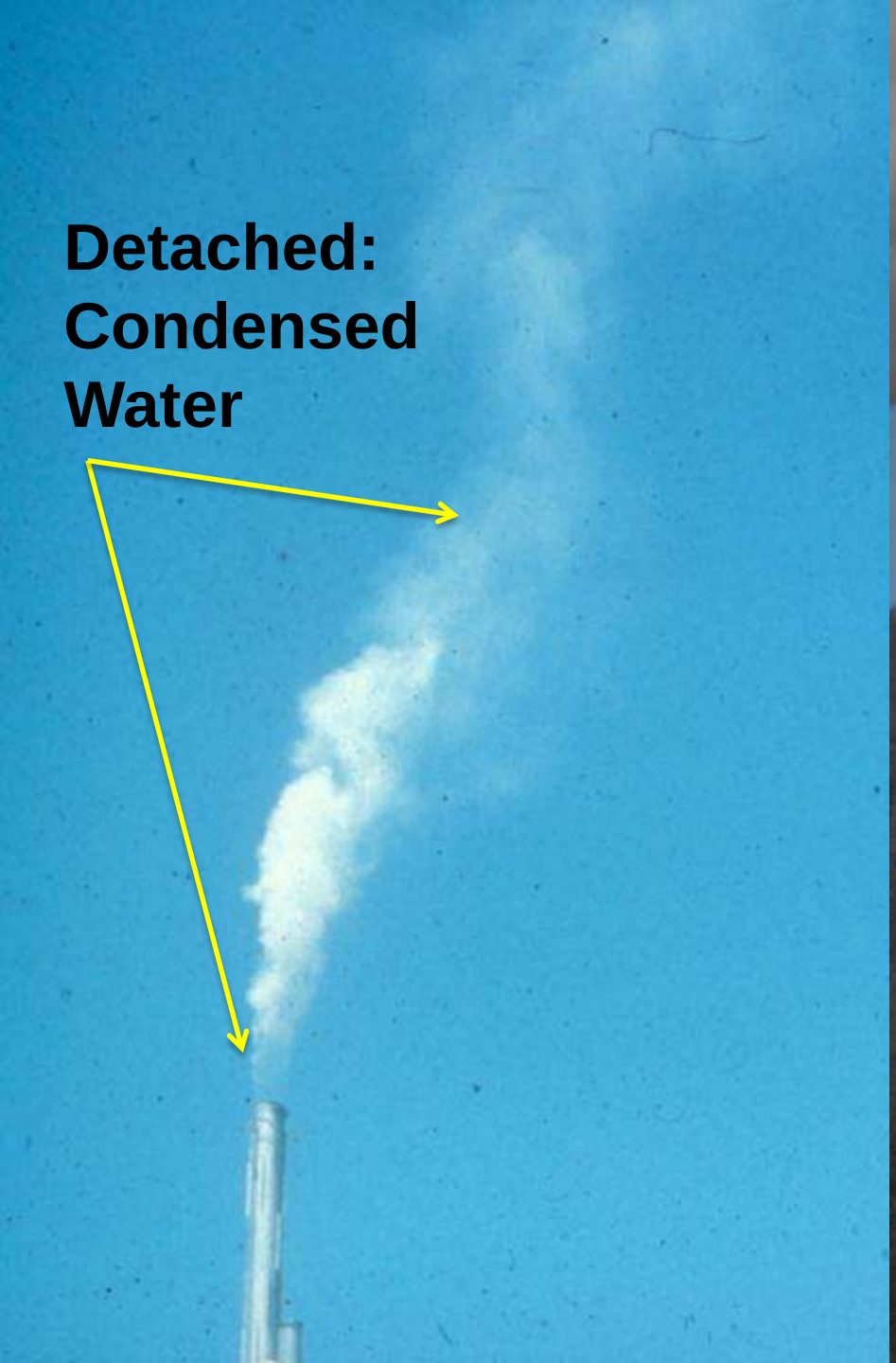
The Future of Visual Emissions Evaluation Data Collection

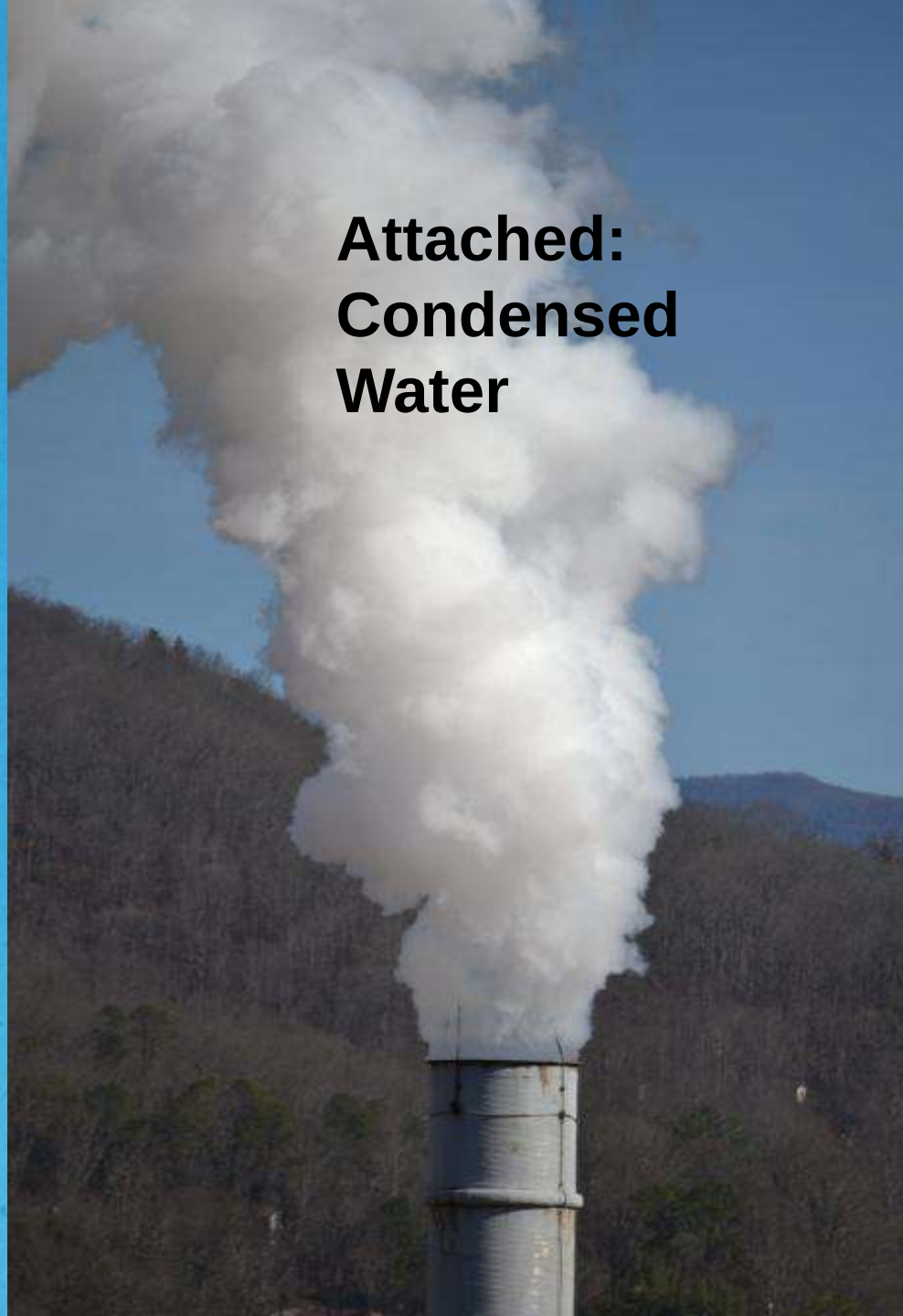
Handheld Real Time Climatic Sensor

- Handheld Data Collection Device for DOCS II Application
  - One Device Collects all Required Data
  - Error-Free Automated Data Collection

- Integrated Weather Meter, GPS, Rangefinder, & Camera
- Measures all Required Report Data including:
  - Weather Conditions - Wind Speed, Wind Direction, Temperature, & Humidity
  - GPS Position Location, Sun Position, & Time
  - Distance to Target Emission Source, Angle of View
  - Digital Images of Visual Emissions & Source, Date/Time
- Automated Data Collection for DOCS II SaaS

Virtual Technology LLC
888.872.3836, www.virtuallc.com


Detached:
Condensed
Water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