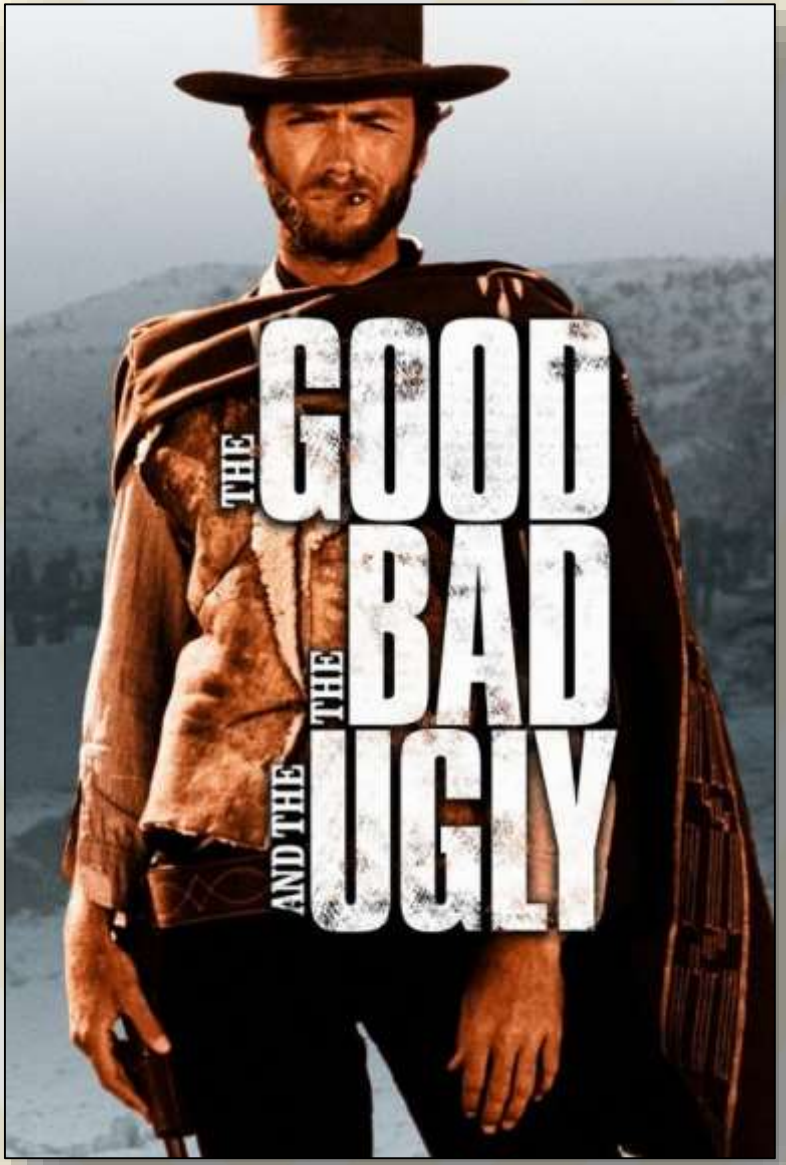
MARCELLUS SHALE ENERGY AND ENVIRONMENT LABORATORY

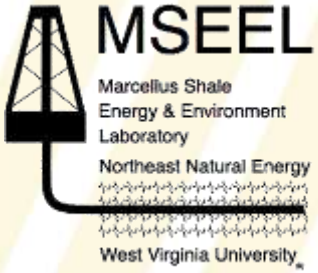
MSEEL



Tim Carr
Phone: 304.293.9660
Email: tim.carr@mail.wvu.edu

MARCELLUS SHALE ENERGY AND ENVIRONMENT LABORATORY
MSEEL

The objective of the Marcellus Shale Energy and Environment Laboratory (MSEEL) is to provide a long-term collaborative field site to develop and validate new knowledge and technology to improve recovery efficiency and minimize environmental implications of unconventional resource development



MSEEL VISION

- Demonstrate the Best Approach to Drill, Complete and Produce a New Horizontal Well That Minimizes Any Environmental/Social Costs While Maximizing Economic Productivity
- Monitor and Document Impacts in a Controlled Environment
  - Greenhouse Gas Emissions
  - Local Air Pollution
  - Water Supply and Quality
  - Noise and Activity
  - Societal Impacts
- Develop New Technologies
  - Microseismic Monitoring
  - Production Monitoring
  - Advanced Logging
- Develop New Scientific and Engineering Approaches to Apply to Multi-disciplinary and Multi-institutional Natural Resource Studies

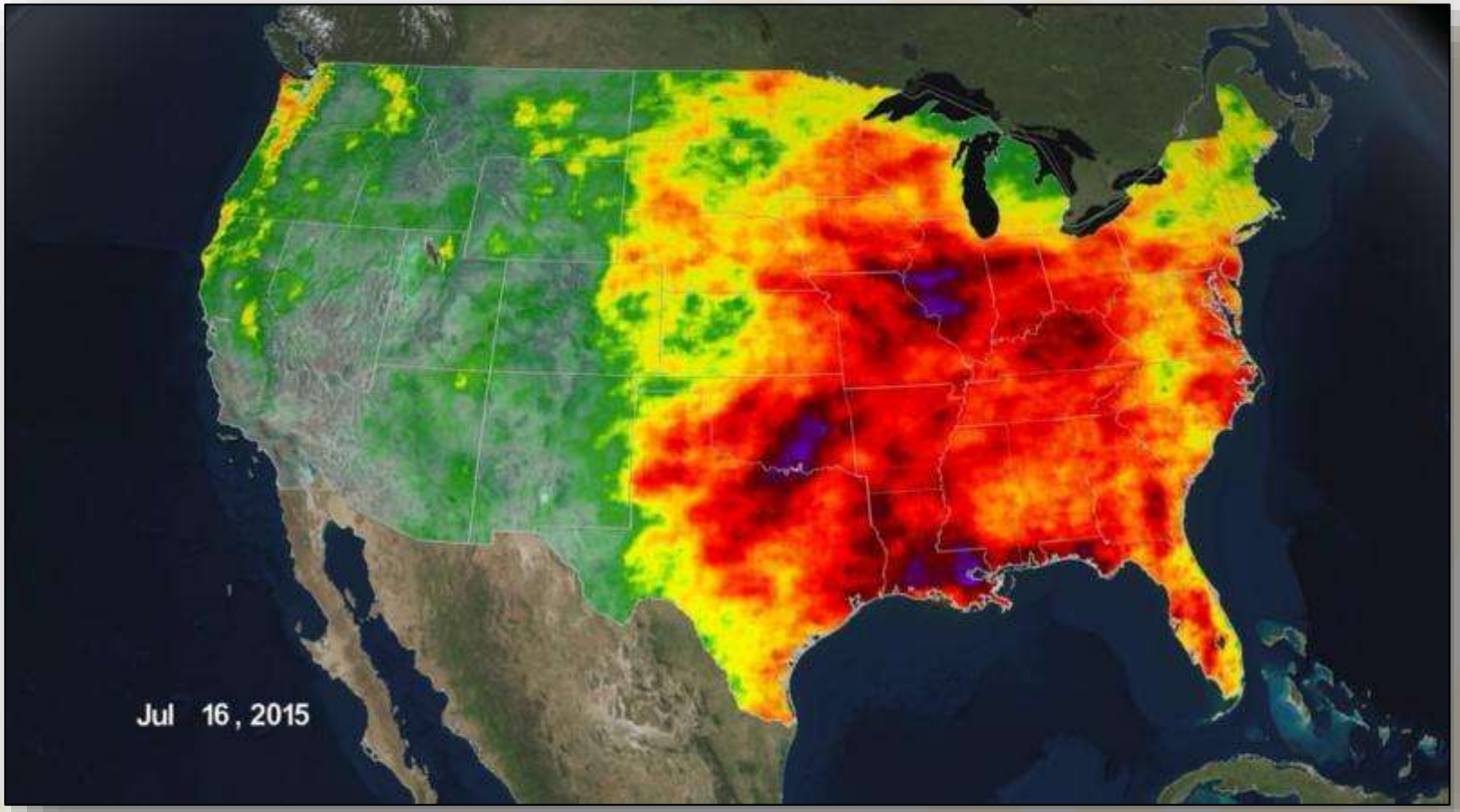
MARCELLUS SHALE ENERGY AND ENVIRONMENT LABORATORY - MSEEL

The Good

MARCELLUS SHALE ENERGY AND ENVIRONMENT LABORATORY - MSEEL

The Good

RECORD PRECIPITATION IN THE EASTERN UNITED STATES



The Bad

Morgantown in June - Twenty Days of Precipitation – 6.15 inches, 49% above normal

http://phys.org/news/2015-07-tale-extremes-rainfall.html

SCIENCE WELL SITE MITIGATION

and The Ugly

GSI, Peter MacKenzie

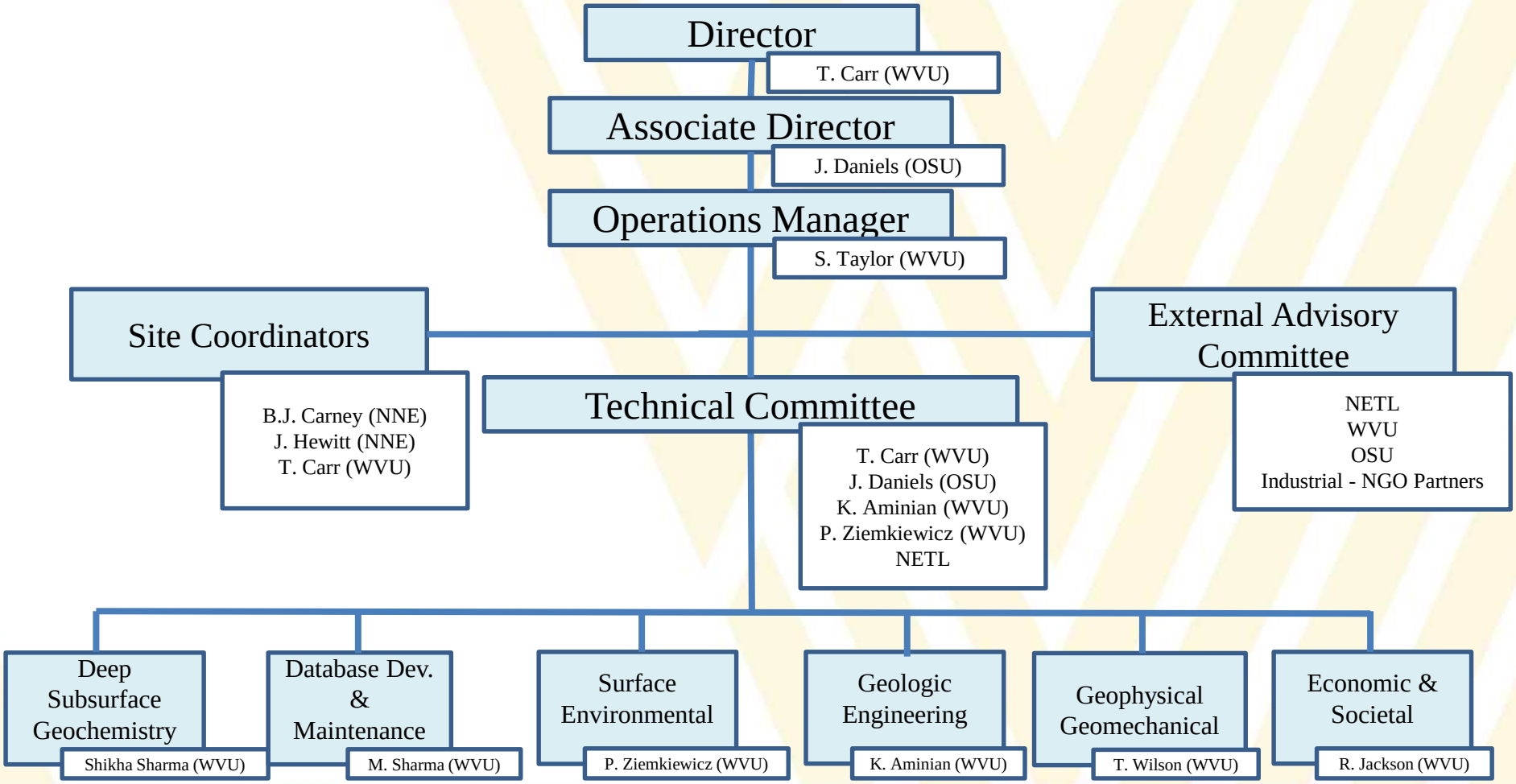
MSEEL MAJOR ACTIVITIES YEAR 1

- Budgets and Contracts
- Developed PMP December, 2014
- Revised July, 2015
- Develop Safety Protocols – Training May, 2015
- Locate Service Companies
- Database/Website Development
- Baseline Geology, Engineering & Environment
- External Requests
- Drilling and Completion Plan
  - Present Technical Plan to Advisory Committee, May 18
  - Revised July, 2015
  - Drilled Topholes 3H and 5H

MSEEL TASK 1.1

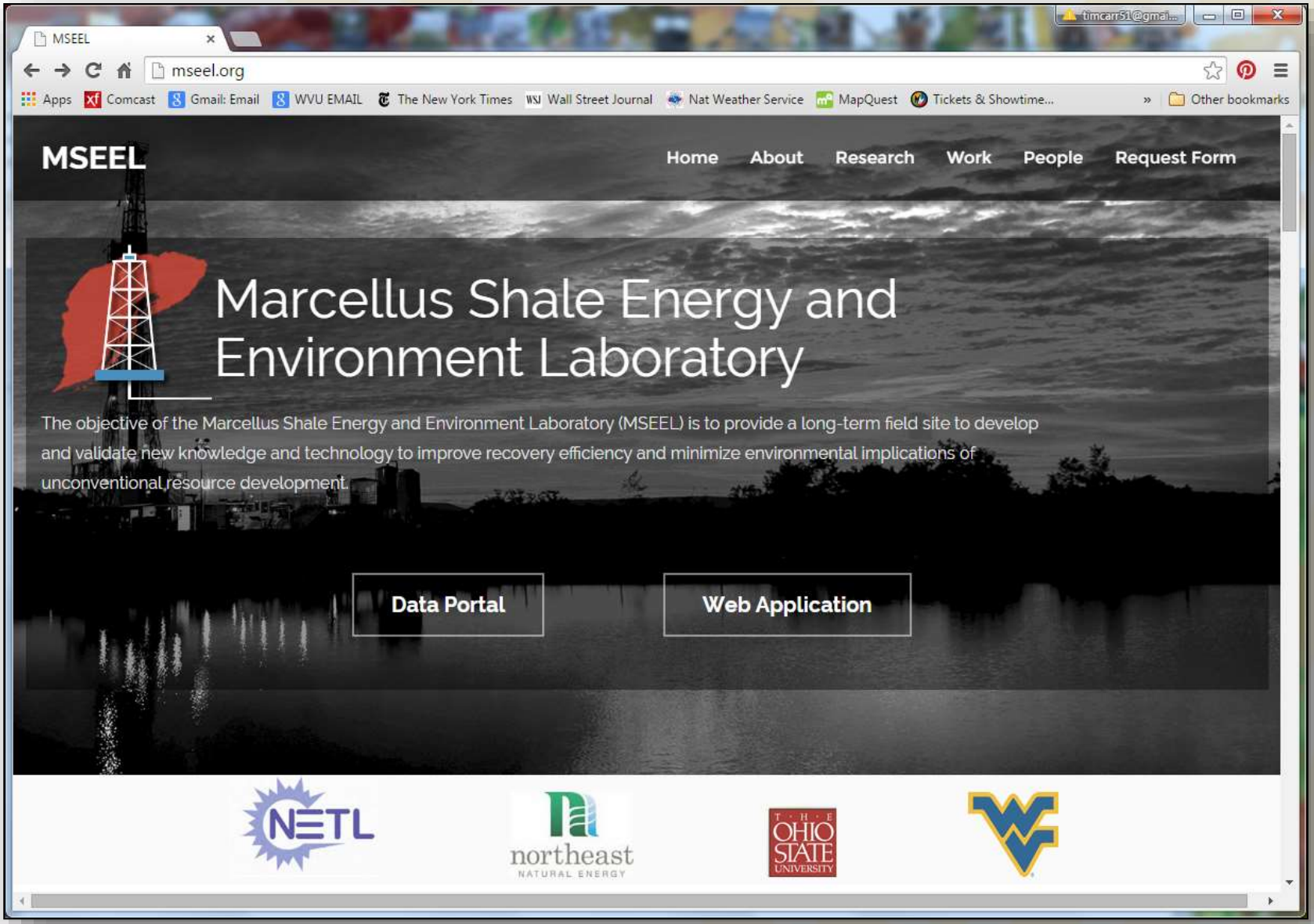
- Subtask 1.1.1 – Ongoing Project Management
  - Quarterly Reports
  - Revisions of SOPO and Schedules
  - Revisions of Budget
- Subtask 1.1.2 – Establish Advisory Team
  - Presented Technical Plan to Advisory Committee, May 18
  - Scott Rotruck (Spillman, Thomas & Battle), Richard Bajura (WVU-NRCCE), Brian Anderson (WVU-Energy Institute), Paul Reig (WRI)
- Subtask 1.1.3 – Data Generation and Loading
  - Data loaded into MSEEL Portal (Task 1.2)

MSEEL PROJECT ORGANIZATION



MSEEL TASK 1.2

- Subtask 1.2.1 – Relational Database & Collaboration Platform
  - Established Data Portal - CKAN
  - Link to EDX Established
- Subtask 1.2.2 – Online Information Transfer Site
  - MSEEL.ORG online
  - Added Number of Visualizations


MSEEL
mseel.org
Apps
Comcast
Gmail: Email
WVU EMAIL
The New York Times
Wall Street Journal
Nat Weather Service
MapQuest
Tickets & Showtime...
Other bookmarks
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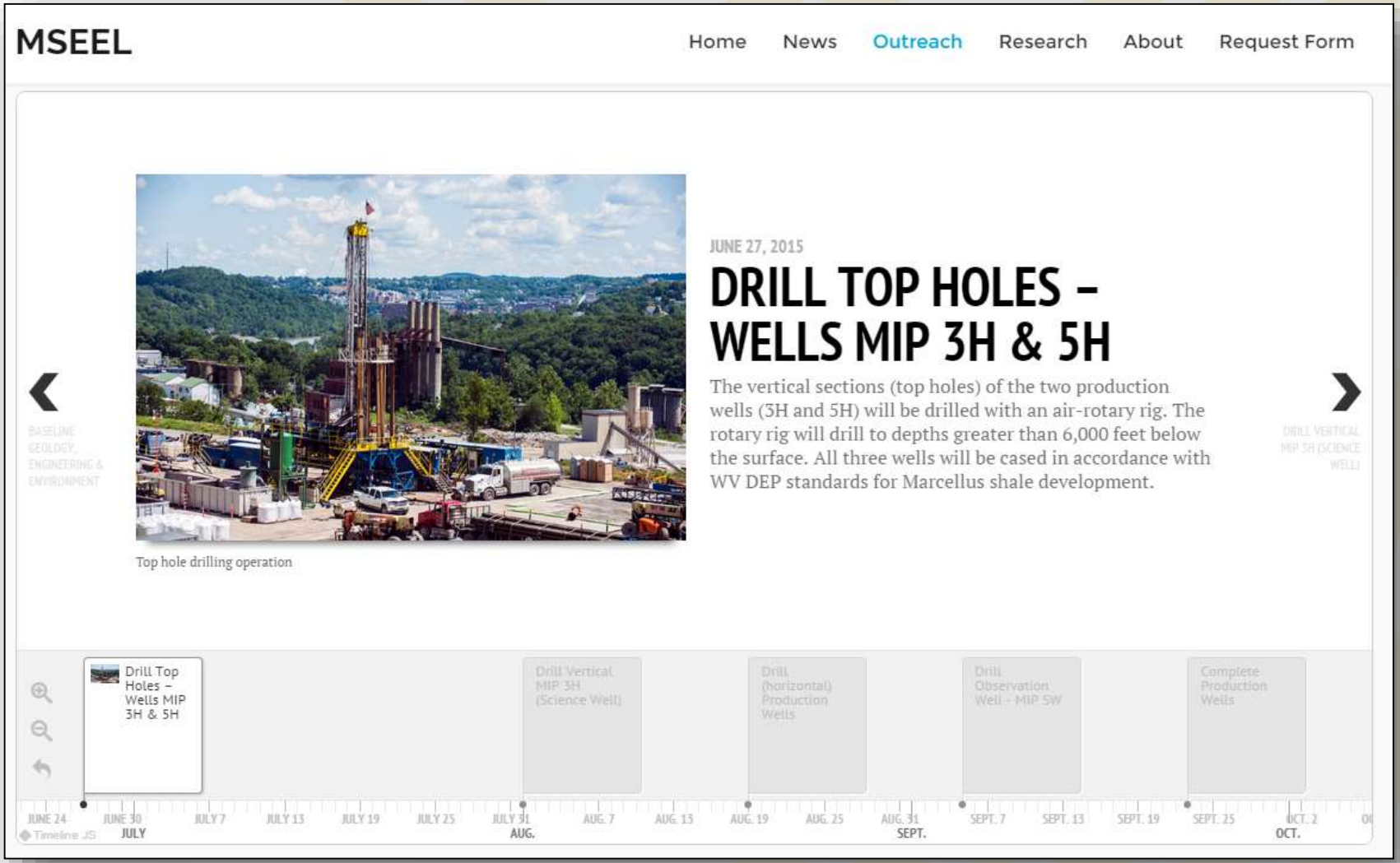
People
Request Form
Marcellus Shale Energy and Environment Laboratory
The objective of the Marcellus Shale Energy and Environment Laboratory (MSEEL) is to provide a long-term field site to develop and validate new knowledge and technology to improve recovery efficiency and minimize environmental implications of unconventional resource development.
Data Portal
Web Application
NETL
northeast
NATURAL ENERGY
THE OHIO STATE UNIVERSITY

MSEEL.ORG

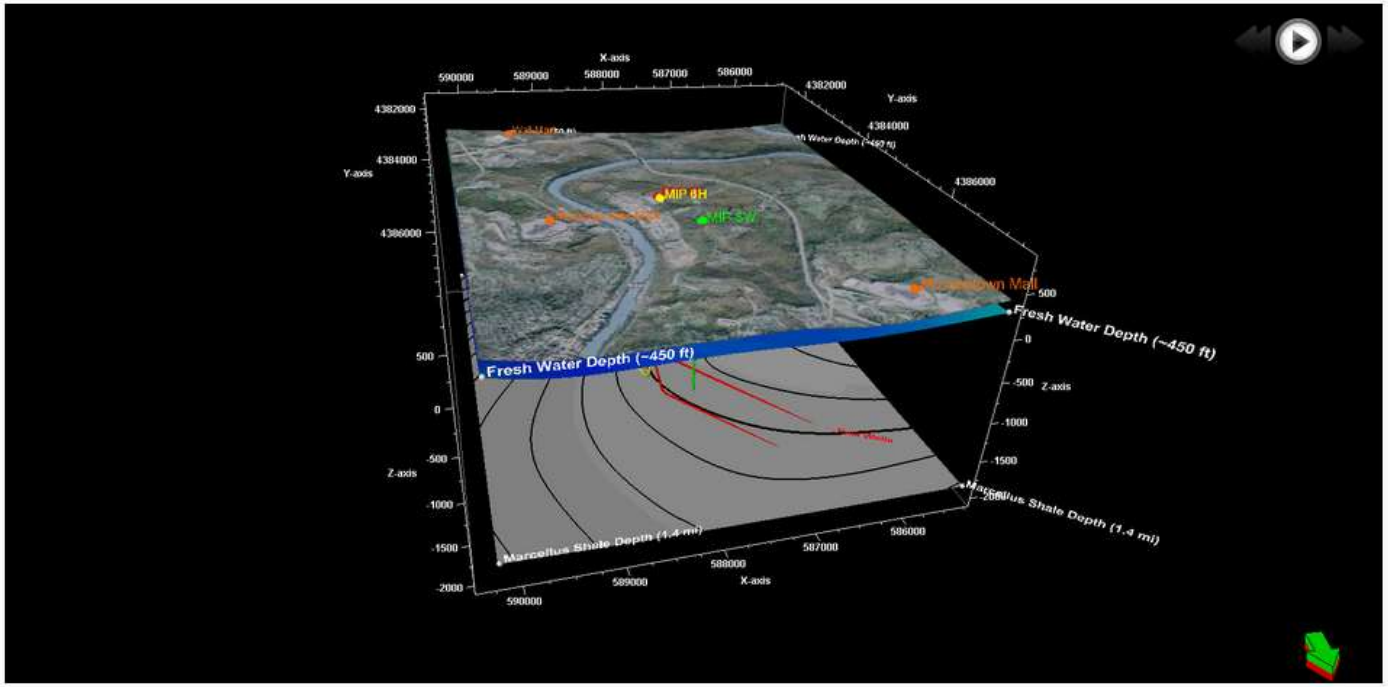

MSEEL
Home
News
Outreach
Research
About
Request Form
JUNE 27, 2015
DRILL TOP HOLES – WELLS MIP 3H & 5H
The vertical sections (top holes) of the two production wells (3H and 5H) will be drilled with an air-rotary rig. The rotary rig will drill to depths greater than 6,000 feet below the surface. All three wells will be cased in accordance with WV DEP standards for Marcellus shale development.
Top hole drilling operation
Drill Top Holes – Wells MIP 3H & 5H
Drill Vertical MIP 3H (Science Well)
Drill (horizontal) Production Wells
Drill Observation Well - MIP SW
Complete Production Wells
JUNE 24
JUNE 30
JULY 7
JULY 13
JULY 19
JULY 25
JULY 31
AUG. 7
AUG. 13
AUG. 19
AUG. 25
AUG. 31
SEPT. 7
SEPT. 13
SEPT. 19
SEPT. 25
OCT. 2
JULY
AUG.
SEPT.
OCT.

MSEEL.ORG

MSEEL

Home News Outreach Research About Request Form

Click and drag left or right make the image below spin.



MSEEL site model shows the paths of the existing wells (yellow), new wells (red) and observation well (green) in relation to surface features and the bottom of the fresh water limit. The average fresh water depth is ~450 ft beneath the surface. The depth of the Marcellus shale at 1.4 miles beneath the surface.

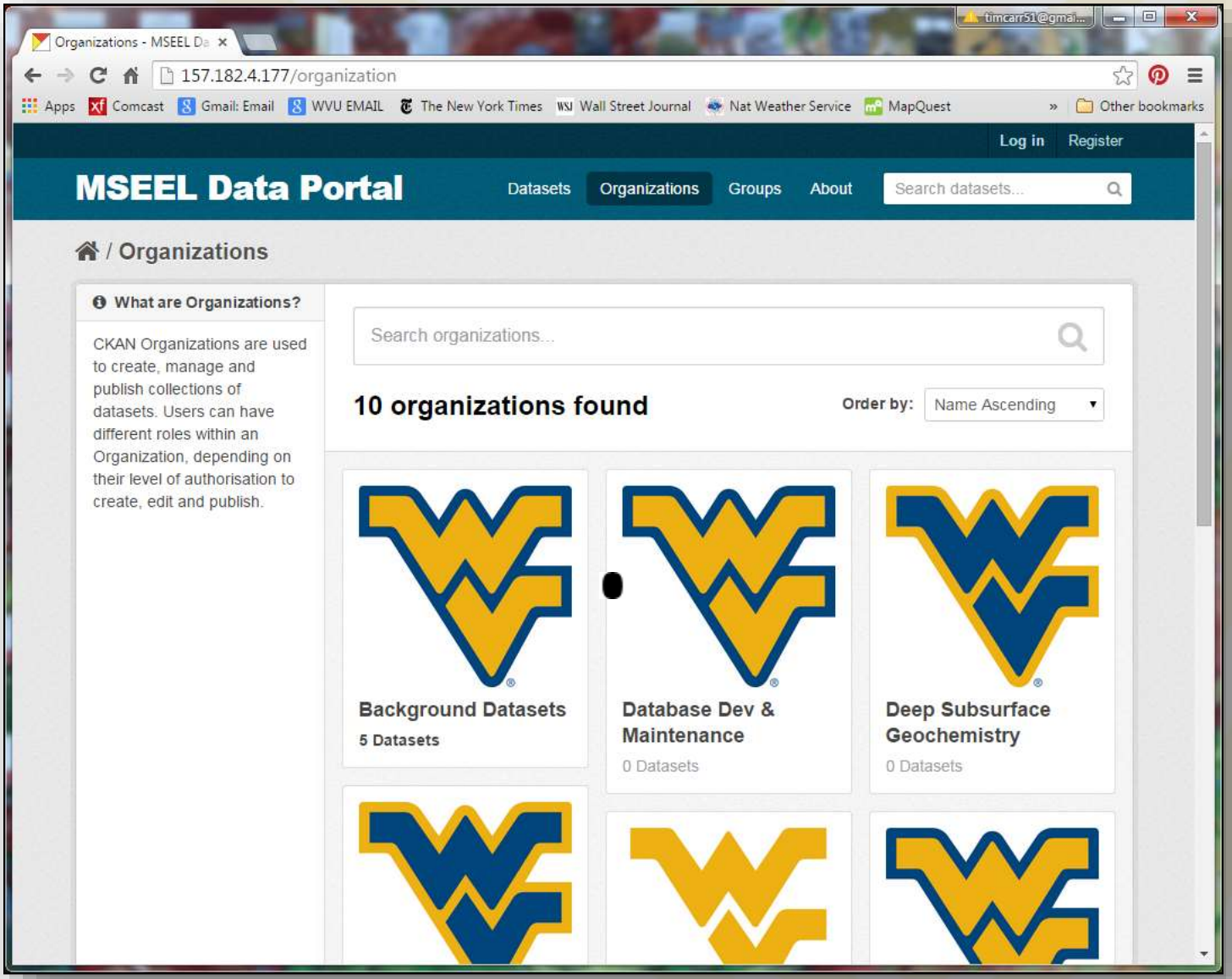
MSEEL DATA PORTAL

- Data portal will serve as central place to exchange and search for data
- **CKAN** - Open source data portal software (www.ckan.org) will be used
  - EDX and Data.gov among several agencies use the same platform
  - Data Portal Features

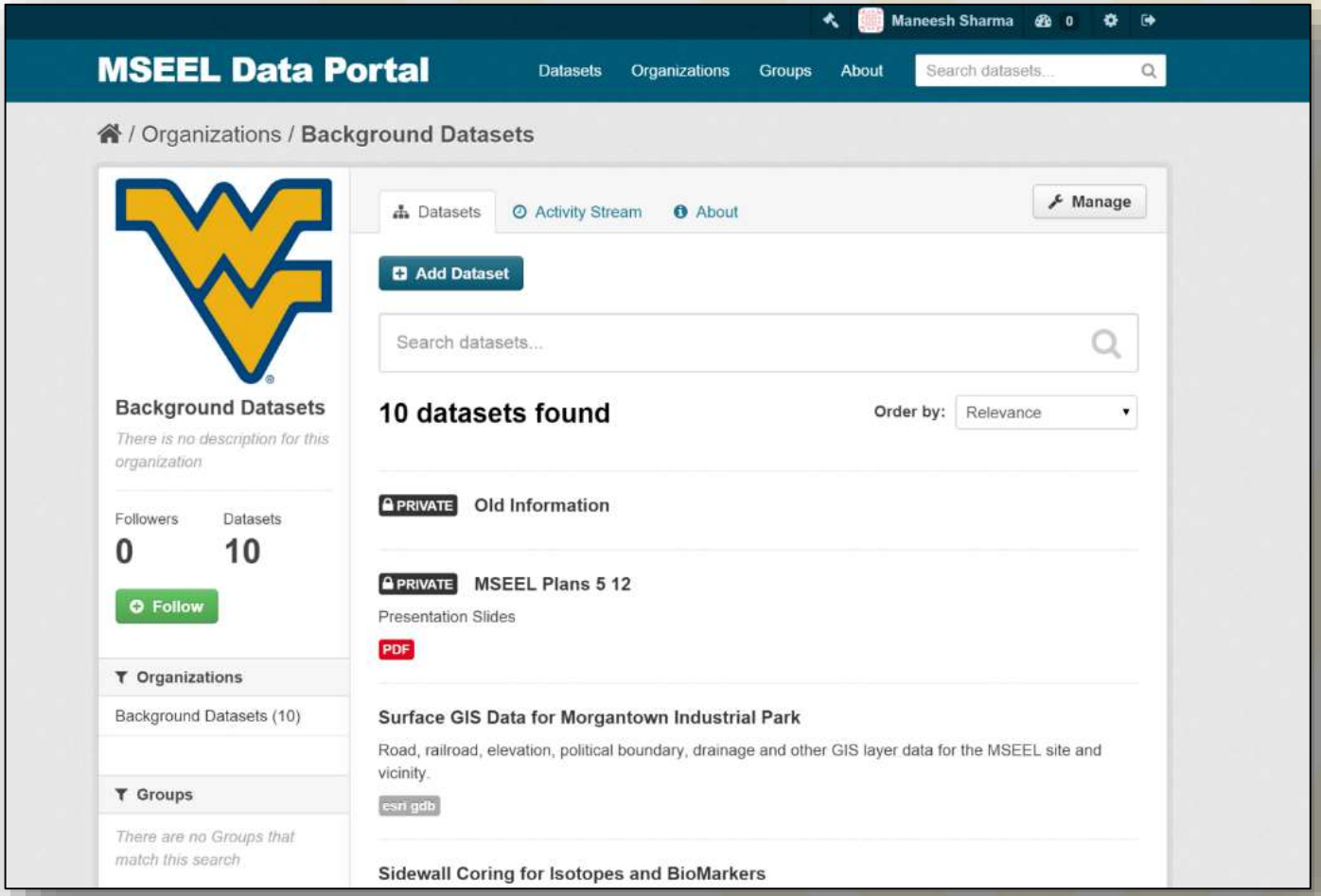
    Publish and find datasets

    Store and manage data

    Private Workspaces and Federate
    - Store raw data and metadata
    - Add data directly through web interface
    - Harvesting – Using same data portal will allow to search data in different federal databases
    - Search and Discovery
    - Search and Display Geospatial Data


Organizations - MSEEL Da
157.182.4.177/organization
Apps
Comcast
Gmail: Email
WVU EMAIL
The New York Times
Wall Street Journal
Nat Weather Service
MapQuest
Other bookmarks
Log in
Register
MSEEL Data Portal
Datasets
Organizations
Groups
About
Search datasets...
/ Organizations
What are Organizations?
CKAN Organizations are used to create, manage and publish collections of datasets. Users can have different roles within an Organization, depending on their level of authorisation to create, edit and publish.
Search organizations...
10 organizations found
Order by:
Name Ascending
Background Datasets
5 Datasets
Database Dev & Maintenance
0 Datasets
Deep Subsurface Geochemistry
0 Datasets

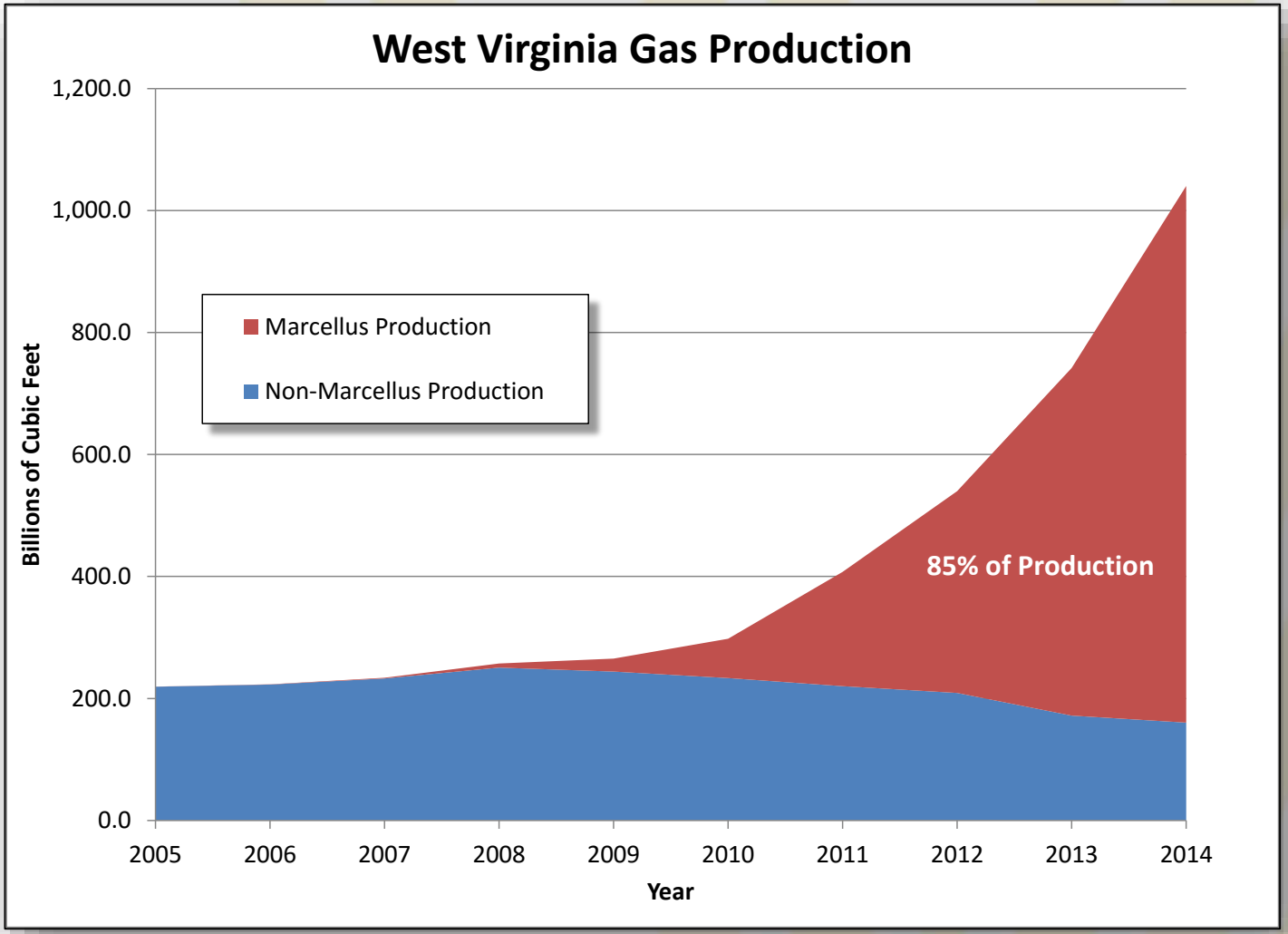
PUBLIC VS. PRIVATE



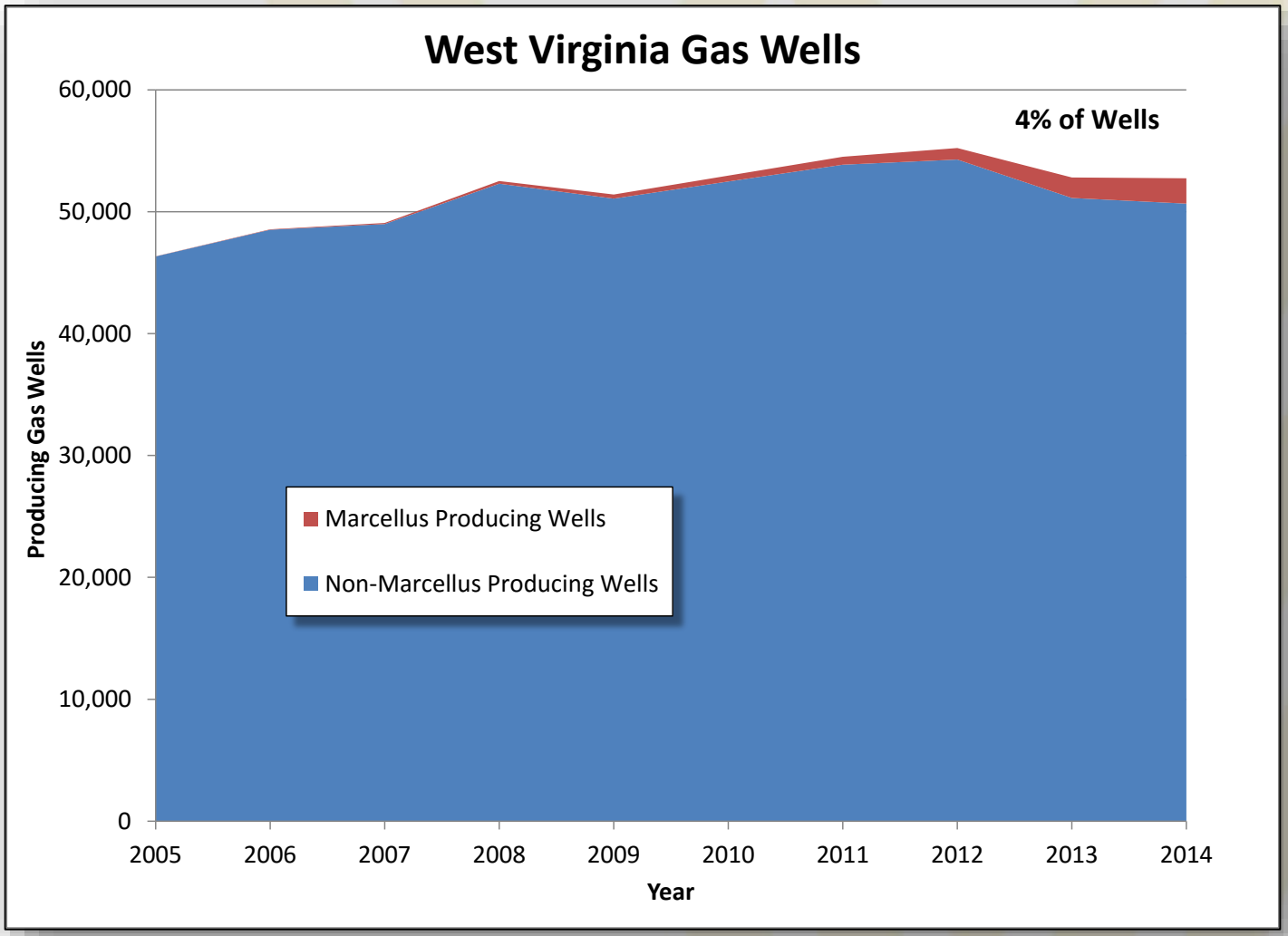
MSEEL TASK 1.3

- Subtask 1.3.1 – Community and Public Perception Baseline
  - On hold due to co-PI withdrawal
- Subtask 1.3.2 – Regional Economic Impact Baseline
  - Initial Production Data Assembled

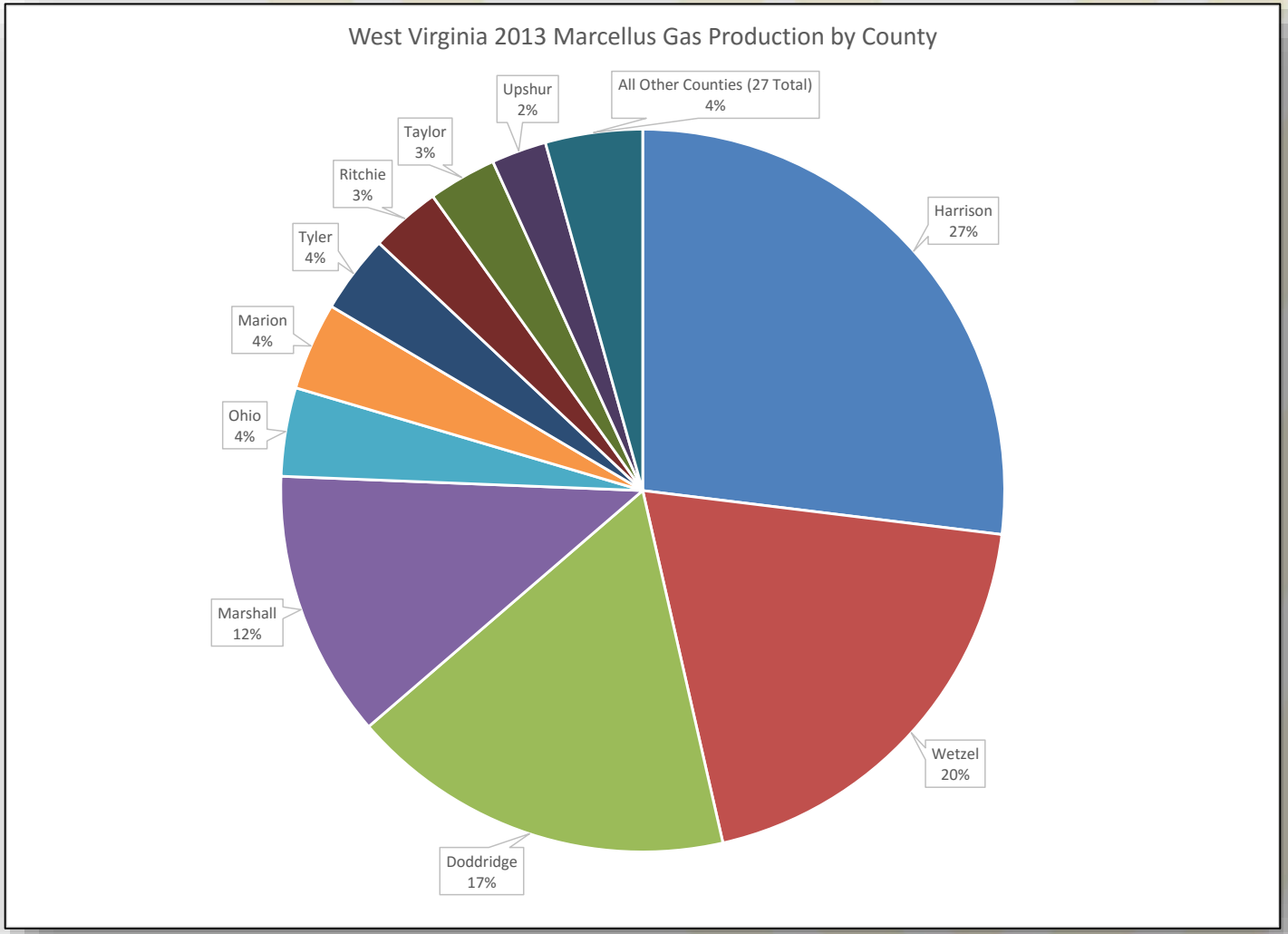
GAS PRODUCTION



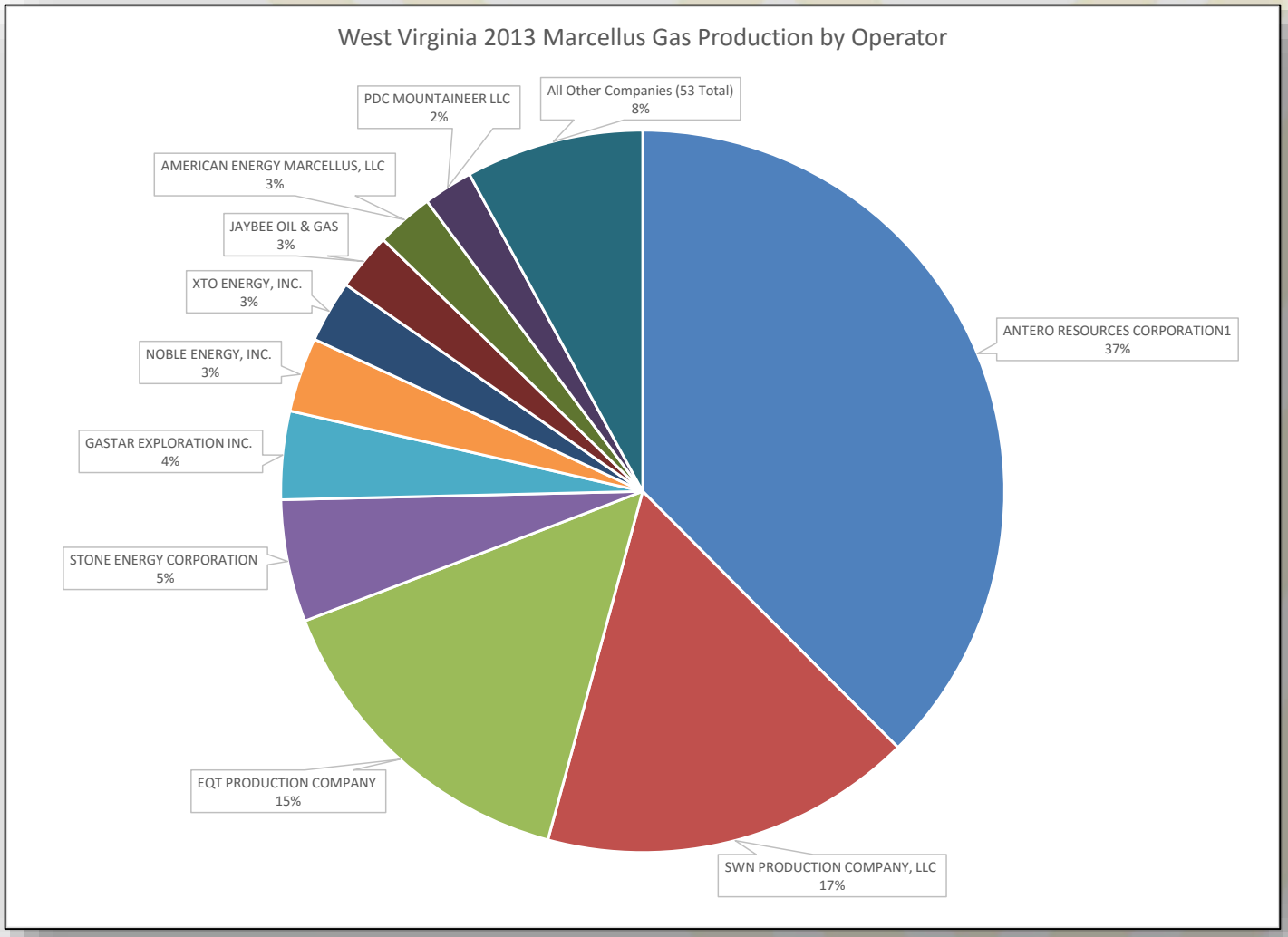
GAS PRODUCTION



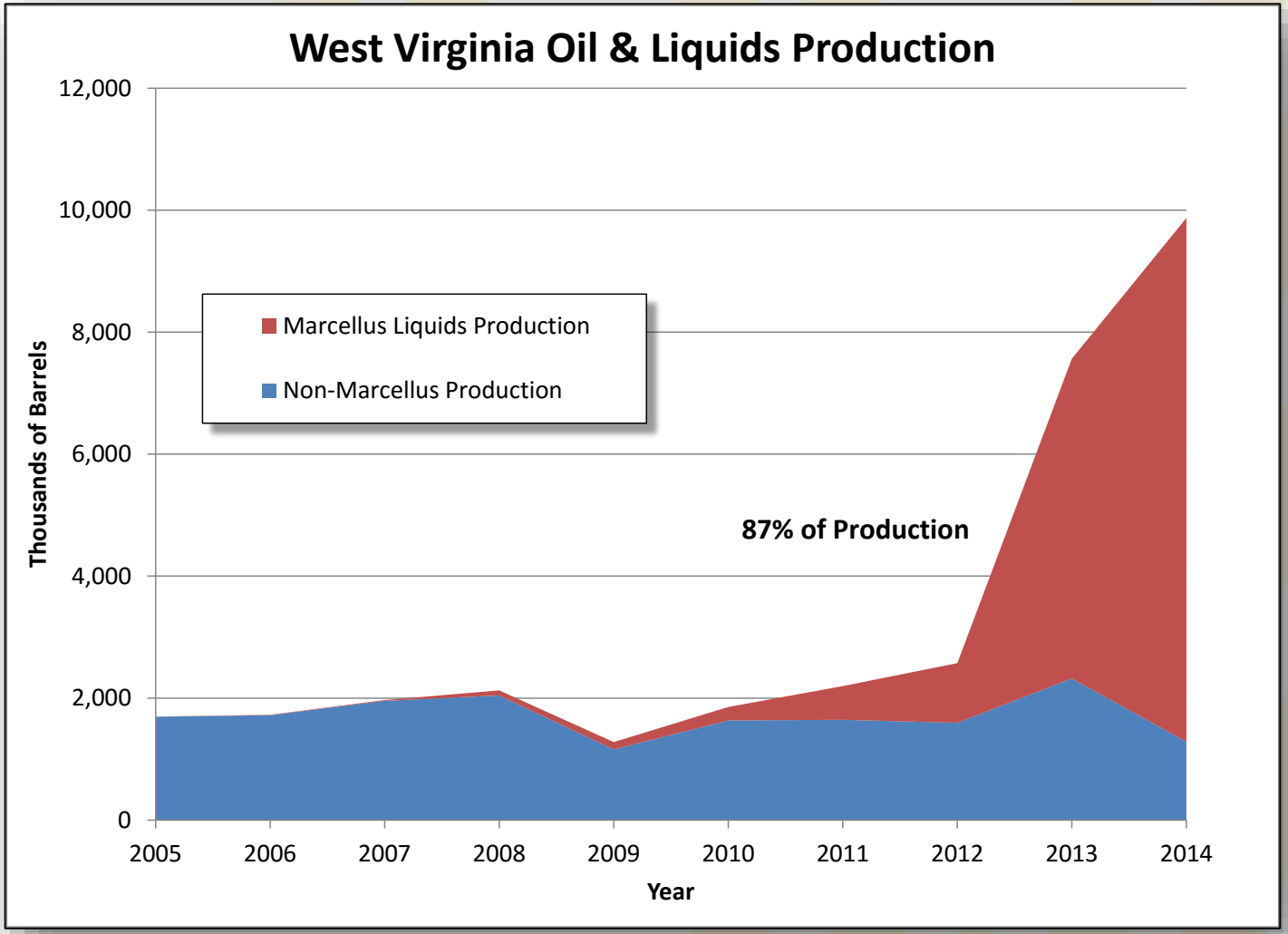
GAS PRODUCTION



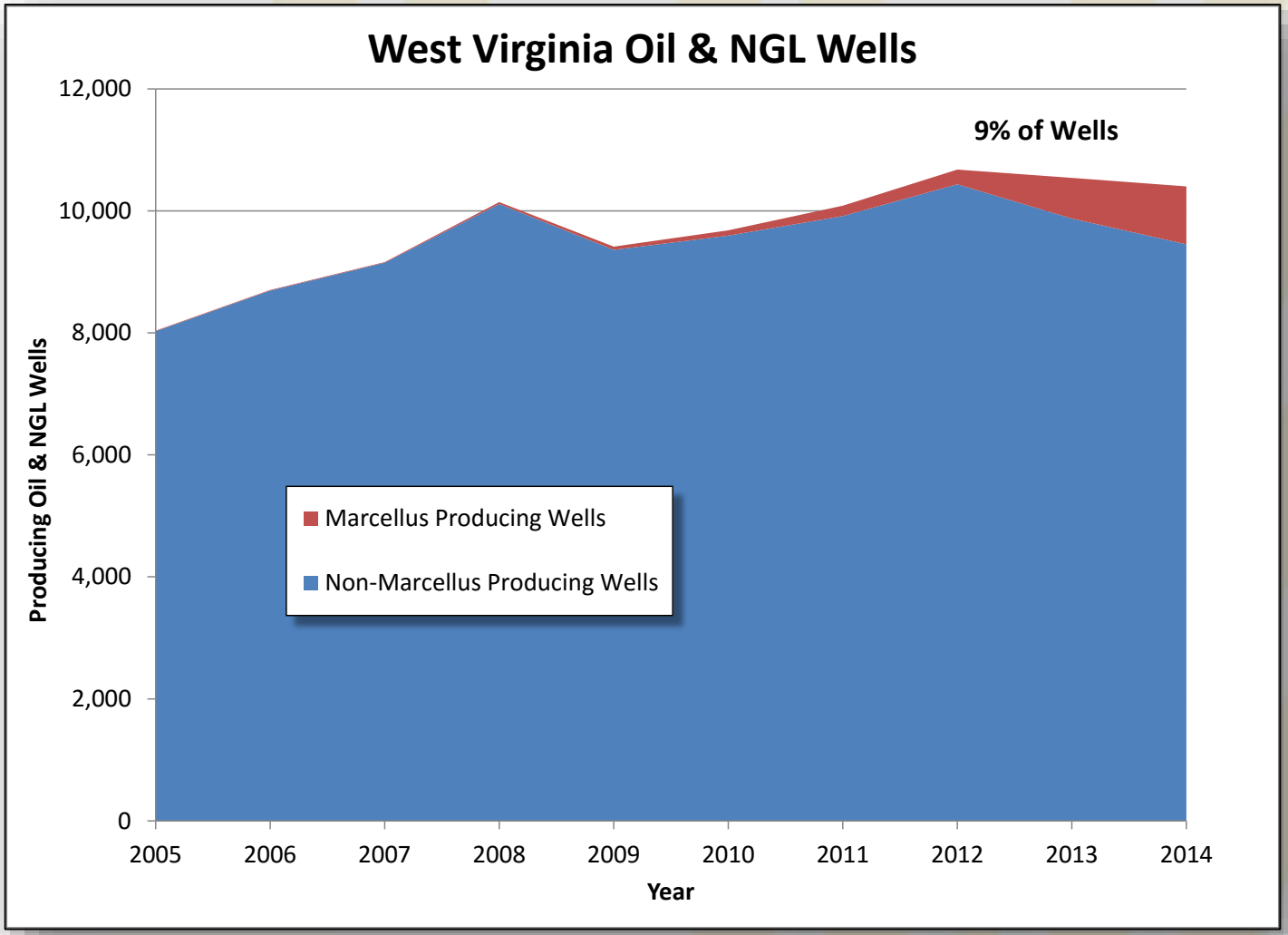
GAS PRODUCTION



LIQUIDS PRODUCTION



LIQUIDS PRODUCTION



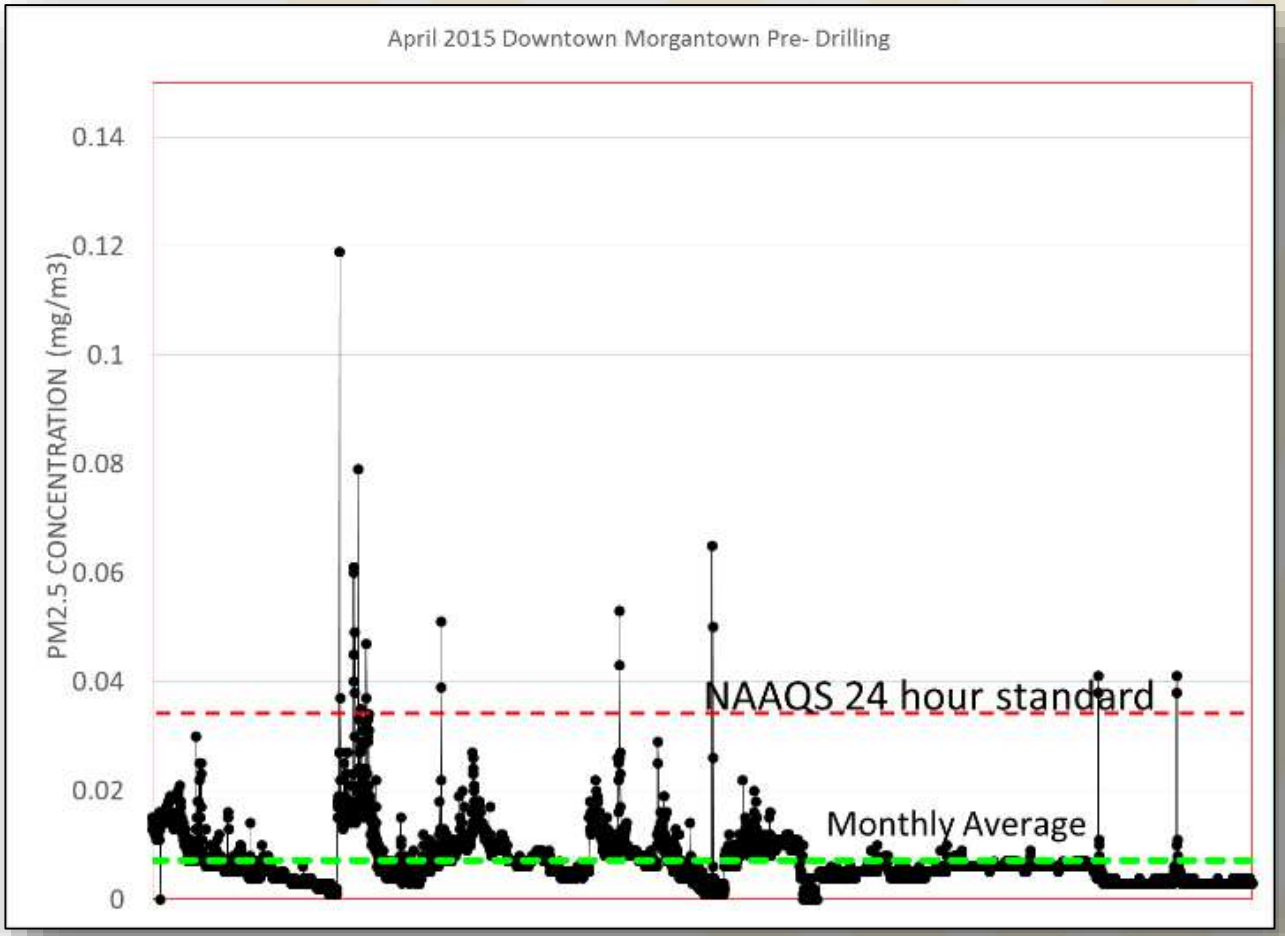
MSEEL TASK 1.4

- Subtask 1.4.1 –Surface Sampling Plan
  - Water Sampling Data Available On Data Portal
  - No Apparent Contamination
- Subtask 1.4.2 – Air Quality Baseline Measurements
  - Air Sampling Data Available On Data Portal
- Subtask 1.4.3 – Noise and Light Baseline Monitoring
  - Data Collection Underway

BASELINE SURFACE WATER MONITORING STATIONS

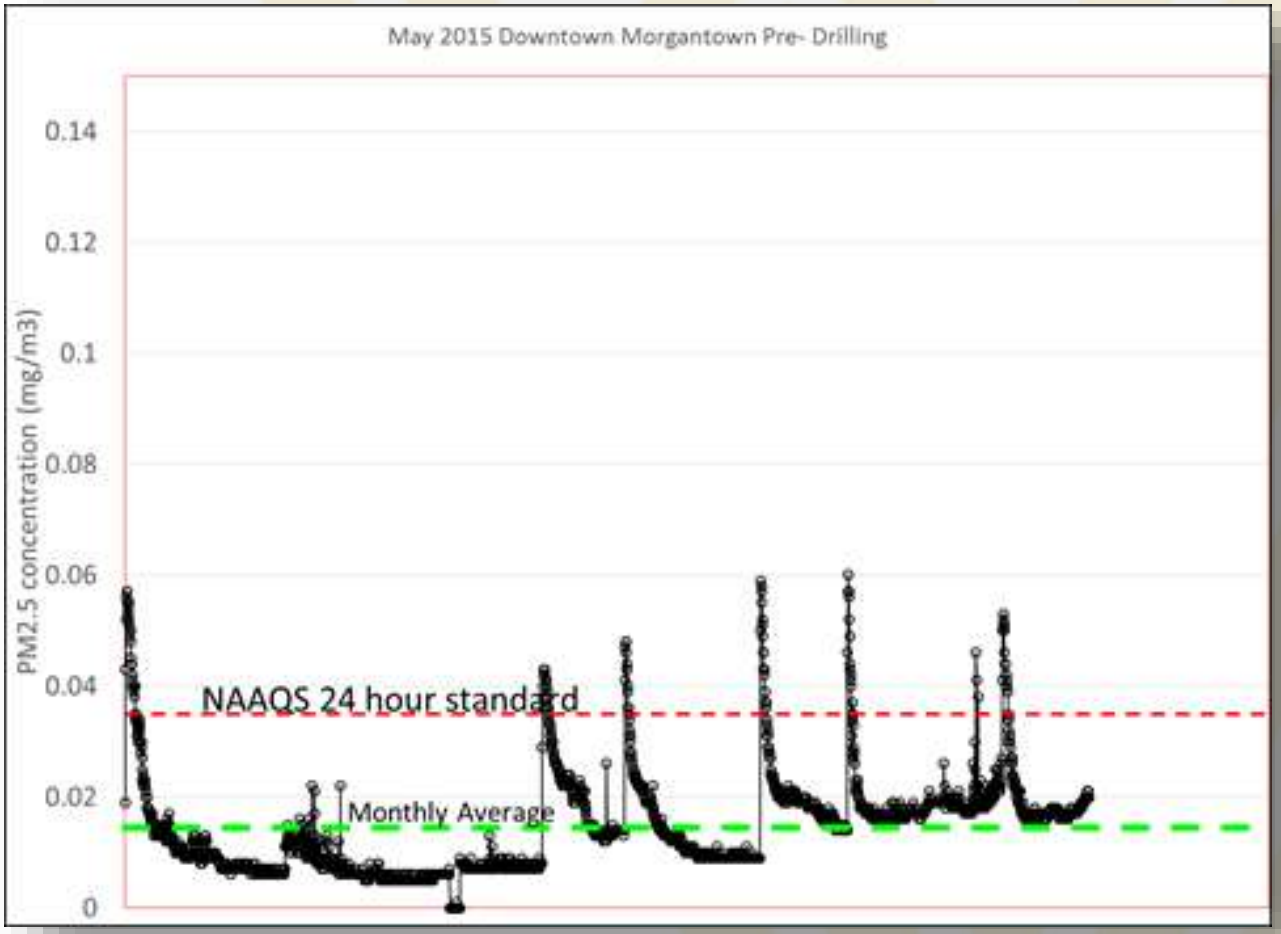
Paul Ziemkiewicz

BASELINE AIR MONITORING



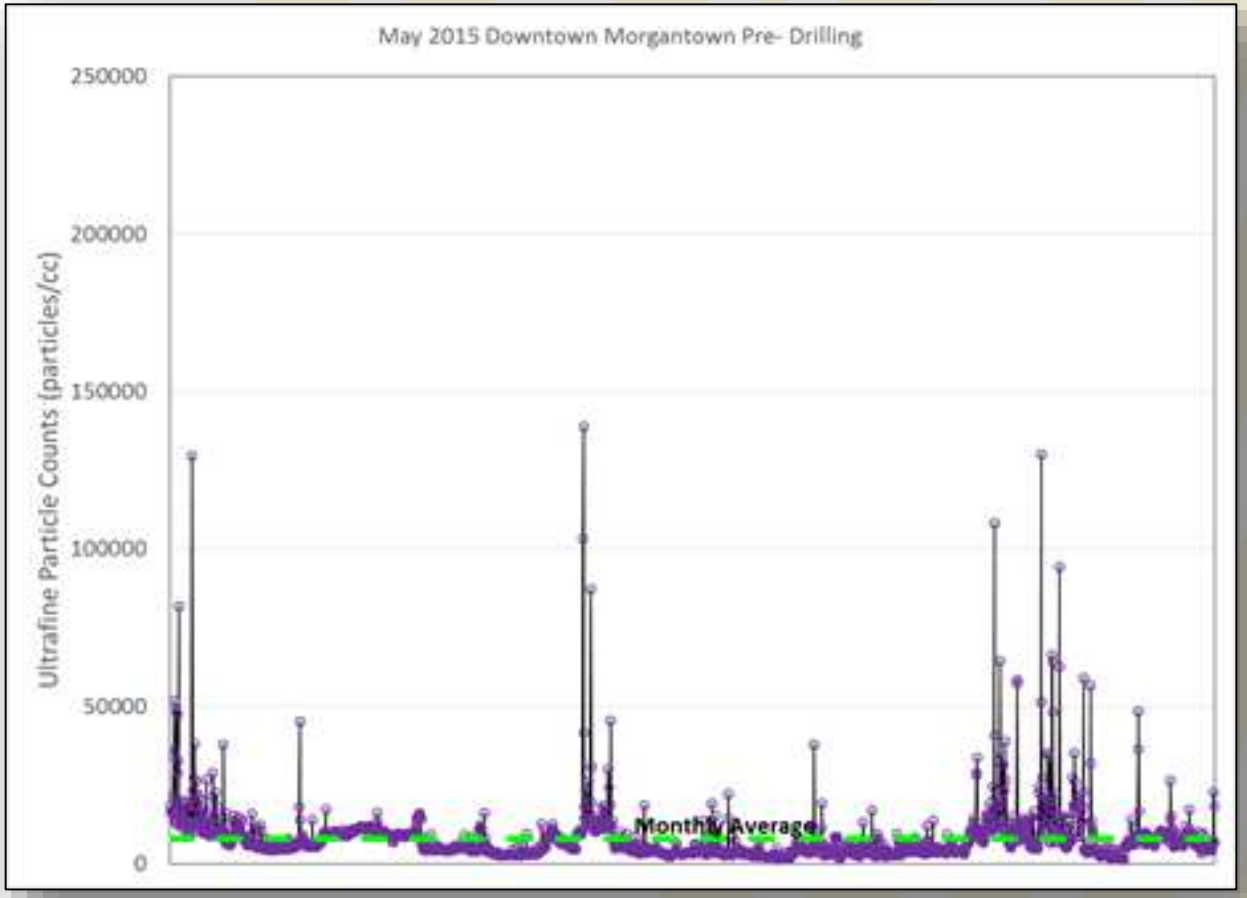
Michael McCawley

BASELINE AIR MONITORING



Michael McCawley

BASELINE AIR MONITORING

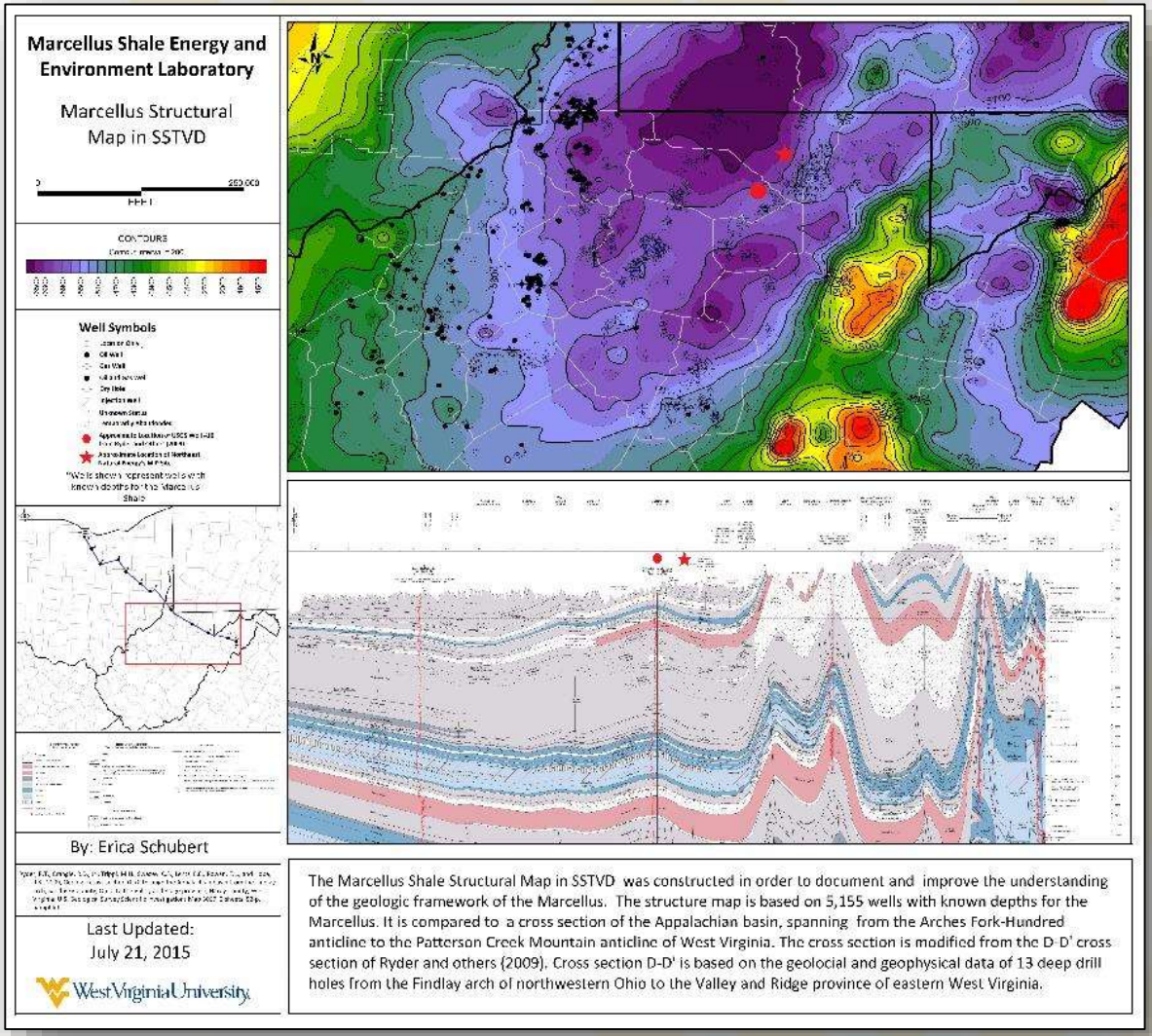


Michael McCawley

MSEEL TASK 1.5

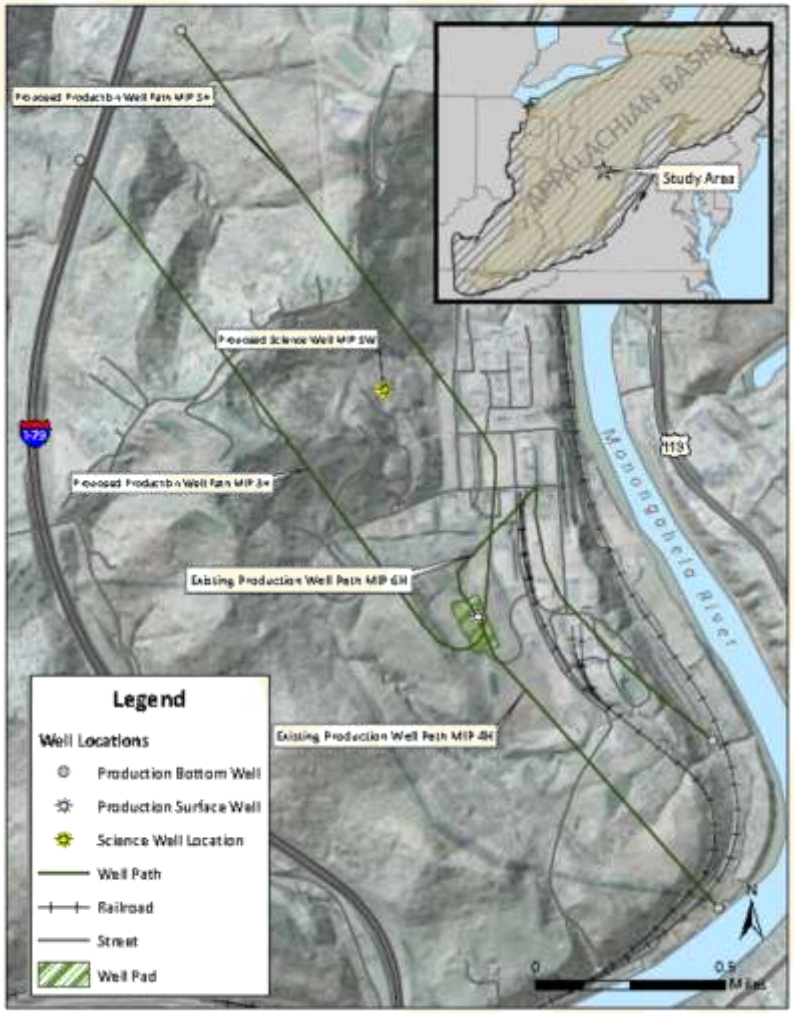
- Subtask 1.5.1 – Collect existing subsurface data
  - Data in MSEEL Portal
- Subtask 1.5.2 – Locate vertical well and design sampling plan
- Subtask 1.5.3 – Site Remediation SW Well Pad
- Subtask 1.5.4 – Vertical Section Sampling of 3H
  - Core (120') and Sidewalls (50)
- Subtask 1.5.5 – Geophysical Logging 3H
  - Complete Suite
- Subtask 1.5.6 – Drill a vertical scientific observation well
  - Obtain sidewall cores

REGIONAL SETTING



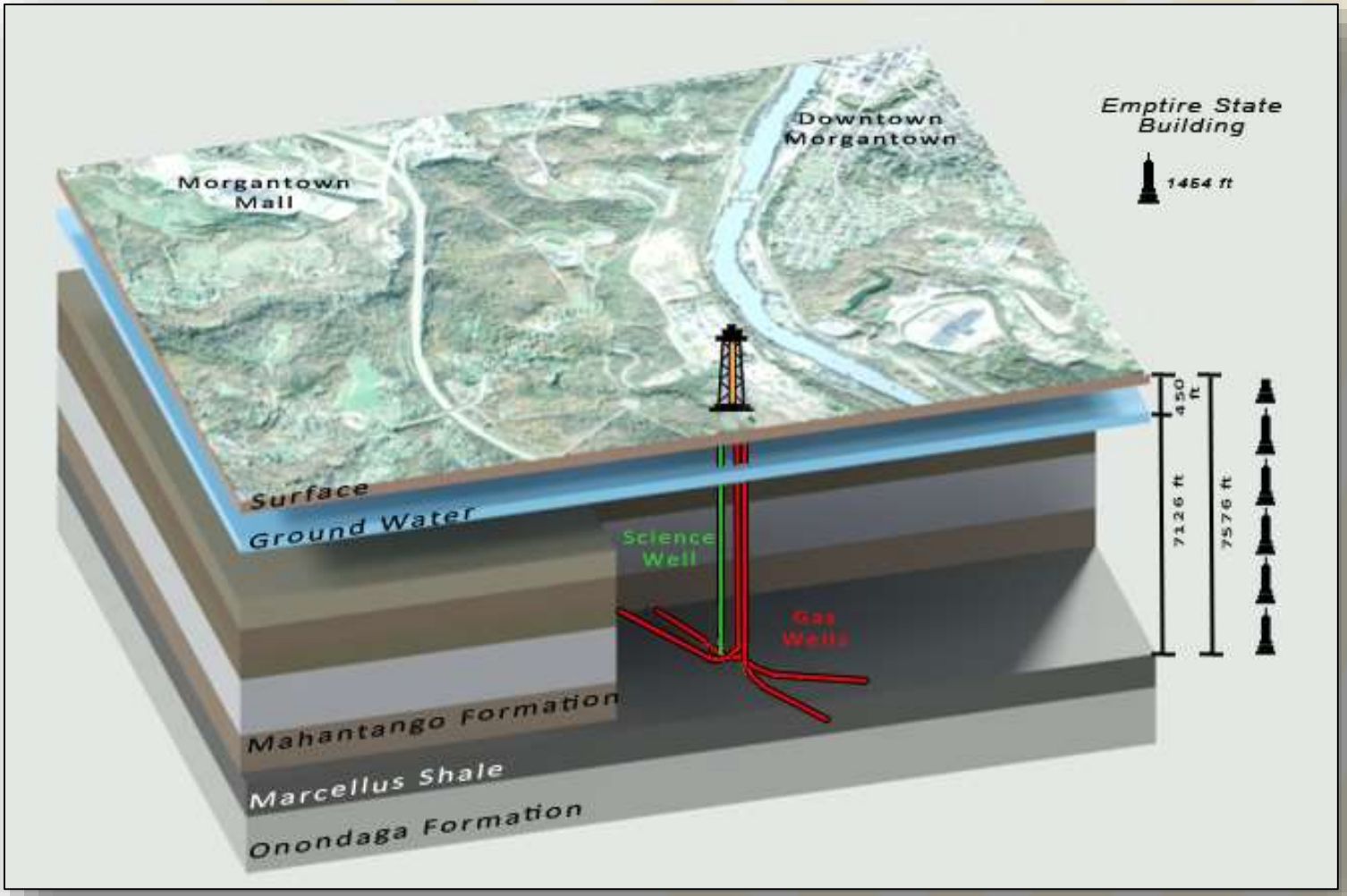
Erica Schubert

MARCELLUS SHALE PRODUCTION & MSEEL SCIENCE WELLS



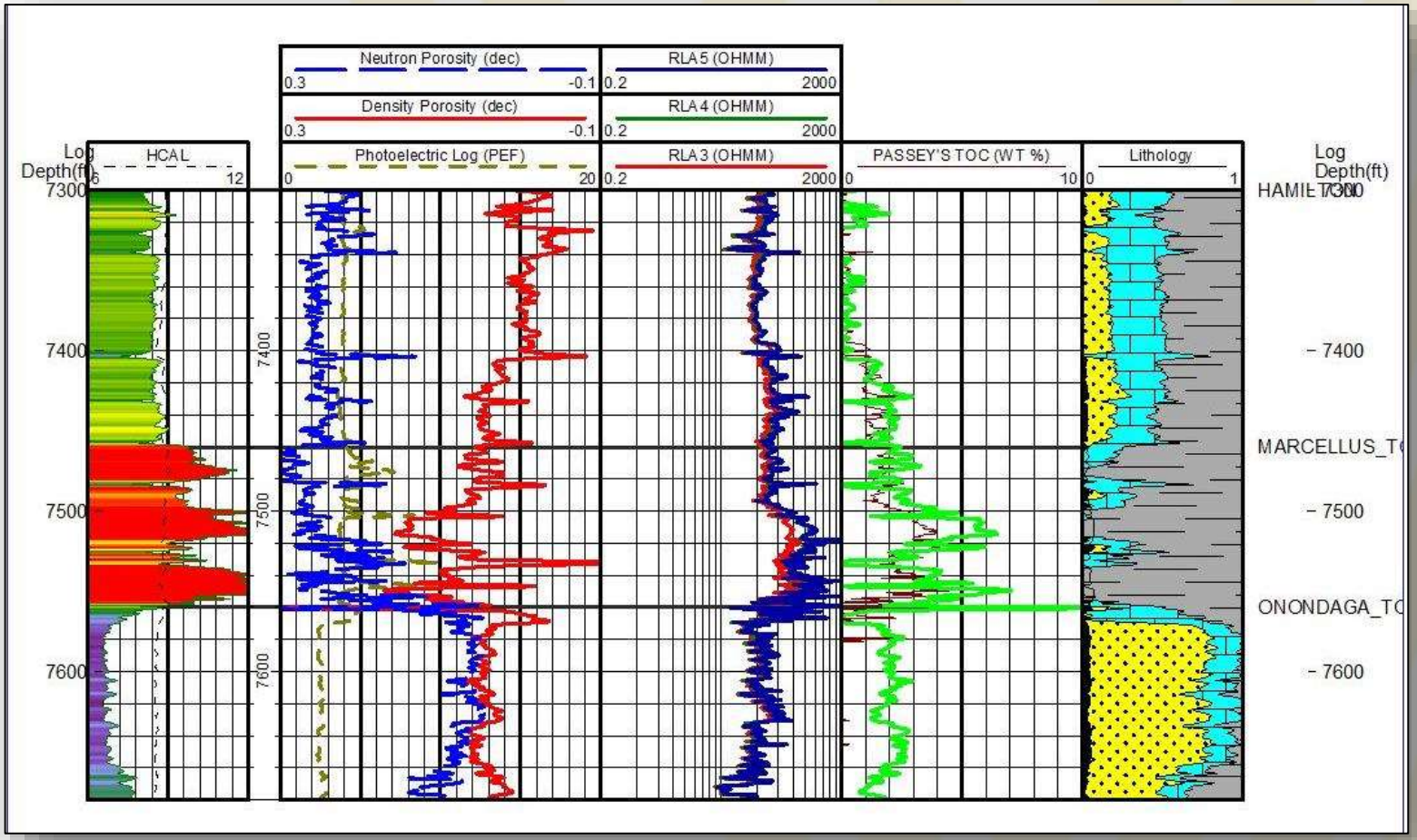
Jessica Brewer

LOCAL SETTING



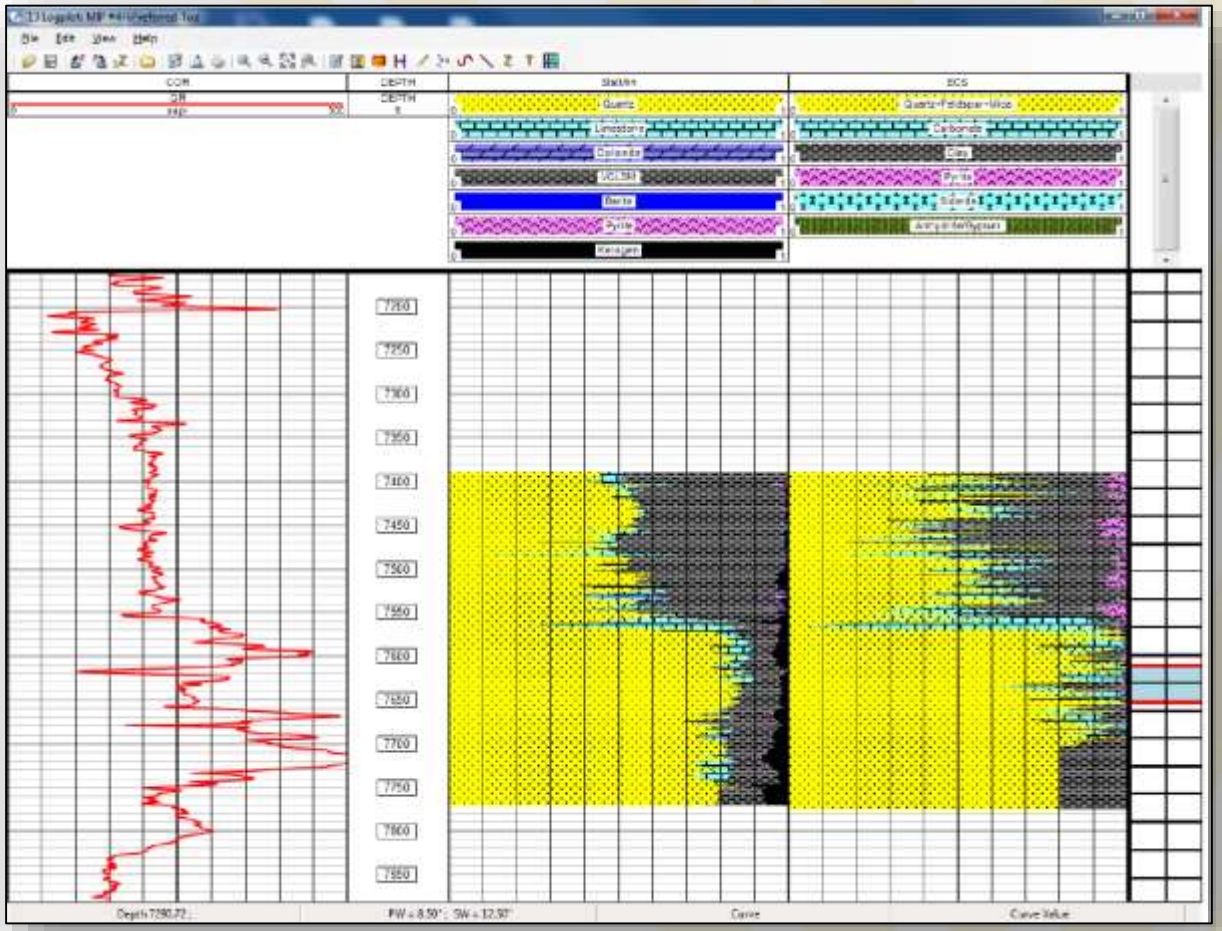
Jessica Brewer

NNE MIP 4H RHOMAA-UMAA MODEL

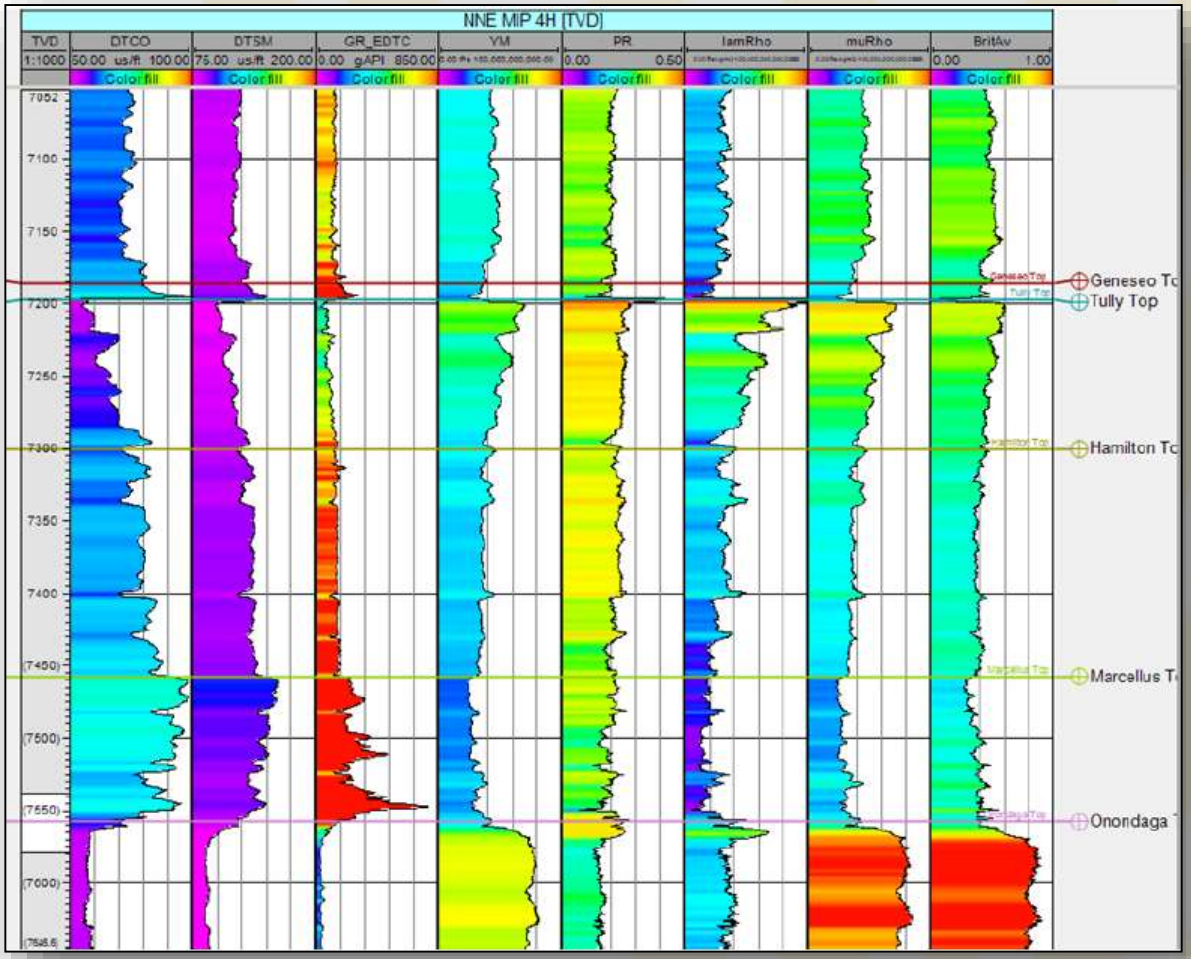


Tom Paronish

NNE MIP 4H STATMIN MODEL

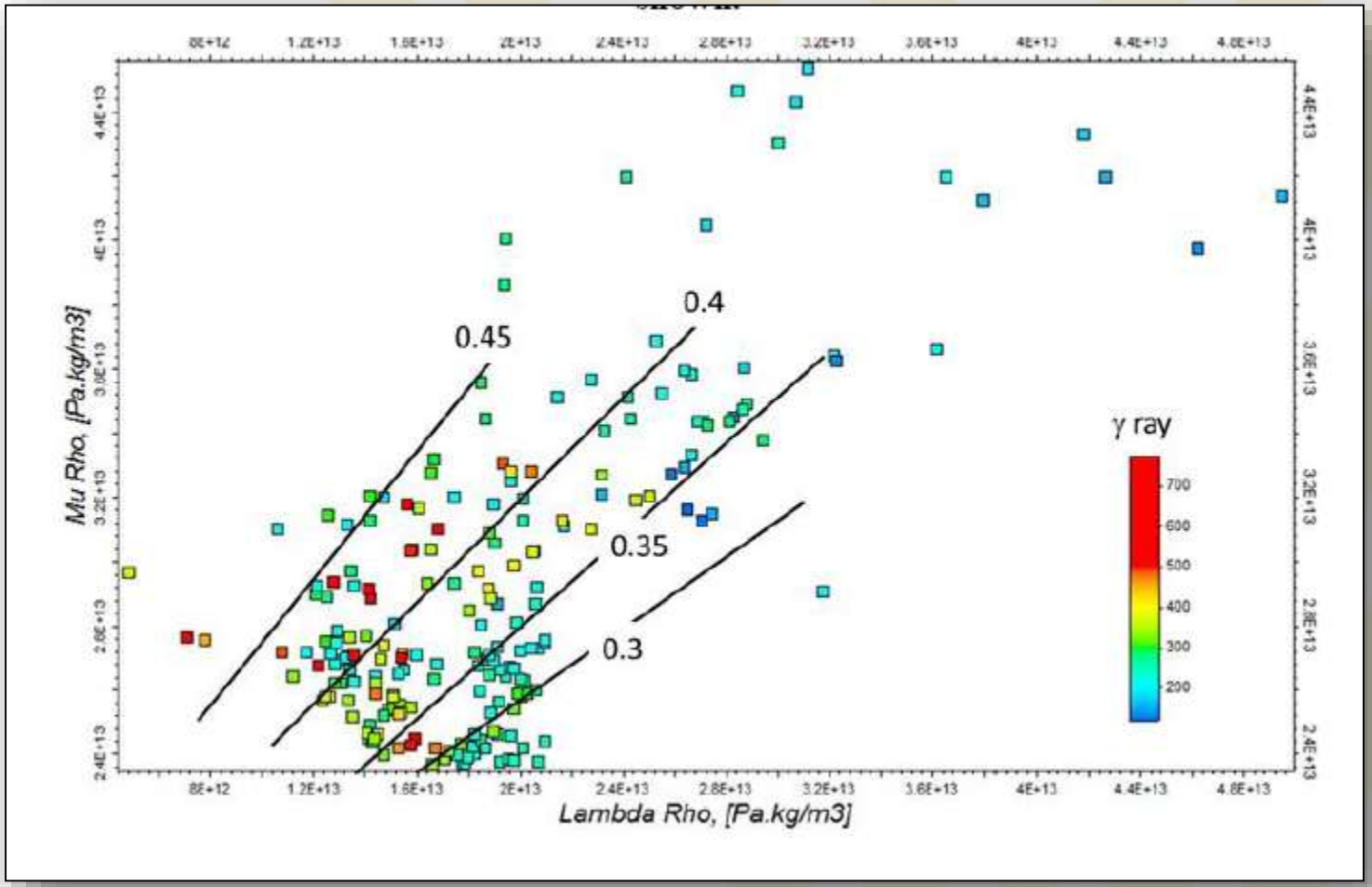


NNE MIP 4H GEOMECHANICAL MODEL



Tom Wilson

NNE MIP 4H GEOMECHANICAL MODEL



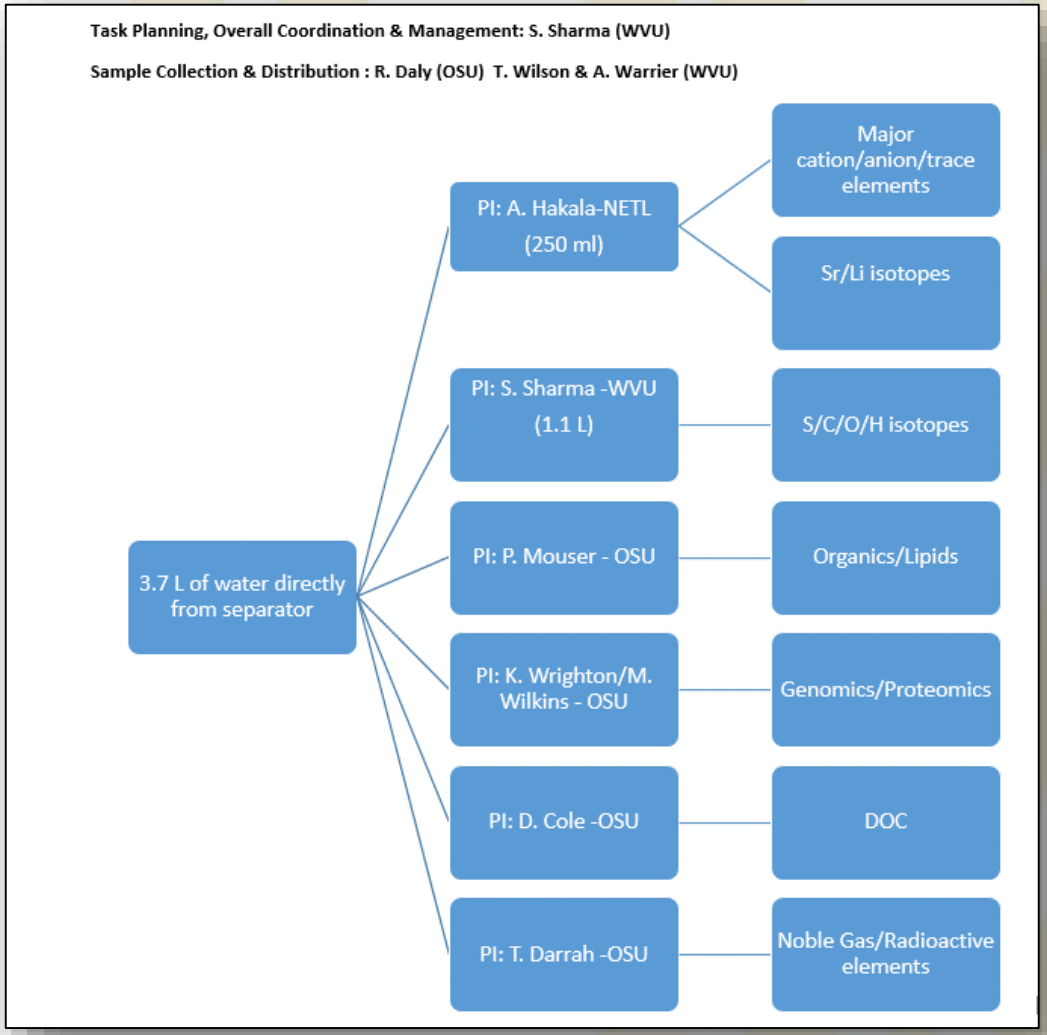
Tom Wilson

DRILLED VERTICAL TOP-HOLES

DRILLED VERTICAL TOP-HOLES

Top hole	YEAR	Spud TH	Tophole
MIP 5H	2015	6/27/2015	7/6/2015
MIP 3H	2015	7/7/2015	7/16/2015
SW	2015	9/5/2015	9/14/2015

FLUID SAMPLING PLAN - SEPARATOR



EXTERNAL REQUESTS

Name	Institution	Request Summary
Bill Carey	LANL	12-36 1"-diameter cores at lengths from 1-3"
Hugh Daigle	Univ Texas	4 - 10X12 inch core butts. Will take core plugs
Emily Elliot	Univ Pittsburgh	Access for Air Monitoring
Rick Hammack	NETL	Access for Microseismic
Kristian Jenssen	USC	6 - 2X3 inch sections whole core
Timothy Kneafsey	LBL	5kg sample and 5 to 10 Round Core Sections
William Orem	USGS	Drill cuttings
William Orem	USGS	Flowback Water
Natalie Pekney	NETL	Access for Air Monitoring
Daniel Soeder	NETL	6 - 1x2 inch plugs
Yifeng Wang	Sandia	Core Samples few inches in diameter and length
Zhang Wu	NETL	Access to Real-time Drilling Data
Hongwu Xu	LANL	1 whole core sample 2-3 feet in length
Ding Zhu	Texas A&M	10 - 8X3 inch blocks, but flexible
SubTer	DOE	50 Core Plugs

MSEEL TASK 1.6

- Subtask 1.6.1 – Geophysical Logging of 3H and 5H
  - Complete Suite in Vertical Leg of 3H
  - Coring and Sidewall Sampling in 3H Vertical Leg of 3H
  - Logging of Lateral 3H
  - Traditional Logs in 5H
- Subtask 1.6.2 – Drilling Fluid and Cuttings Sampling
- Subtask 1.6.3 – Drilling & Well Construction Data
- Subtask 1.6.4 – Fiber Optic Monitoring
  - Temperature and Acoustic Monitoring
- Subtask 1.6.5 – Microseismic Monitoring
- Subtask 1.6.6 – Fluid and Gas Sampling
- Subtask 1.6.7 – Environmental Monitoring

DRILL SW AND LATERALS

Top hole	YEAR	Spud TH	Tophole
MIP 5H	2015	6/27/2015	7/6/2015
MIP 3H	2015	7/7/2015	7/16/2015
SW	2015	9/5/2015	9/14/2015

Horizontal	Program	Spud Hz	Horizontal
MIP 3H	2015	8/19/2015	9/5/2015
MIP 5H	2015	9/6/2015	9/16/2015

COMPLETE AND MONITOR LATERALS

Completions	Start	End
MIP 5H	9/23/2015	10/13/2015
MIP 3H	9/23/2015	10/13/2015

DRILLING SERVICES

- Patterson 254
- Rotary Steerable (Archer)
- Synthetic Based Mud (Megadril/Warp)
- PDC MDSi613
- Solids control (Reuse)

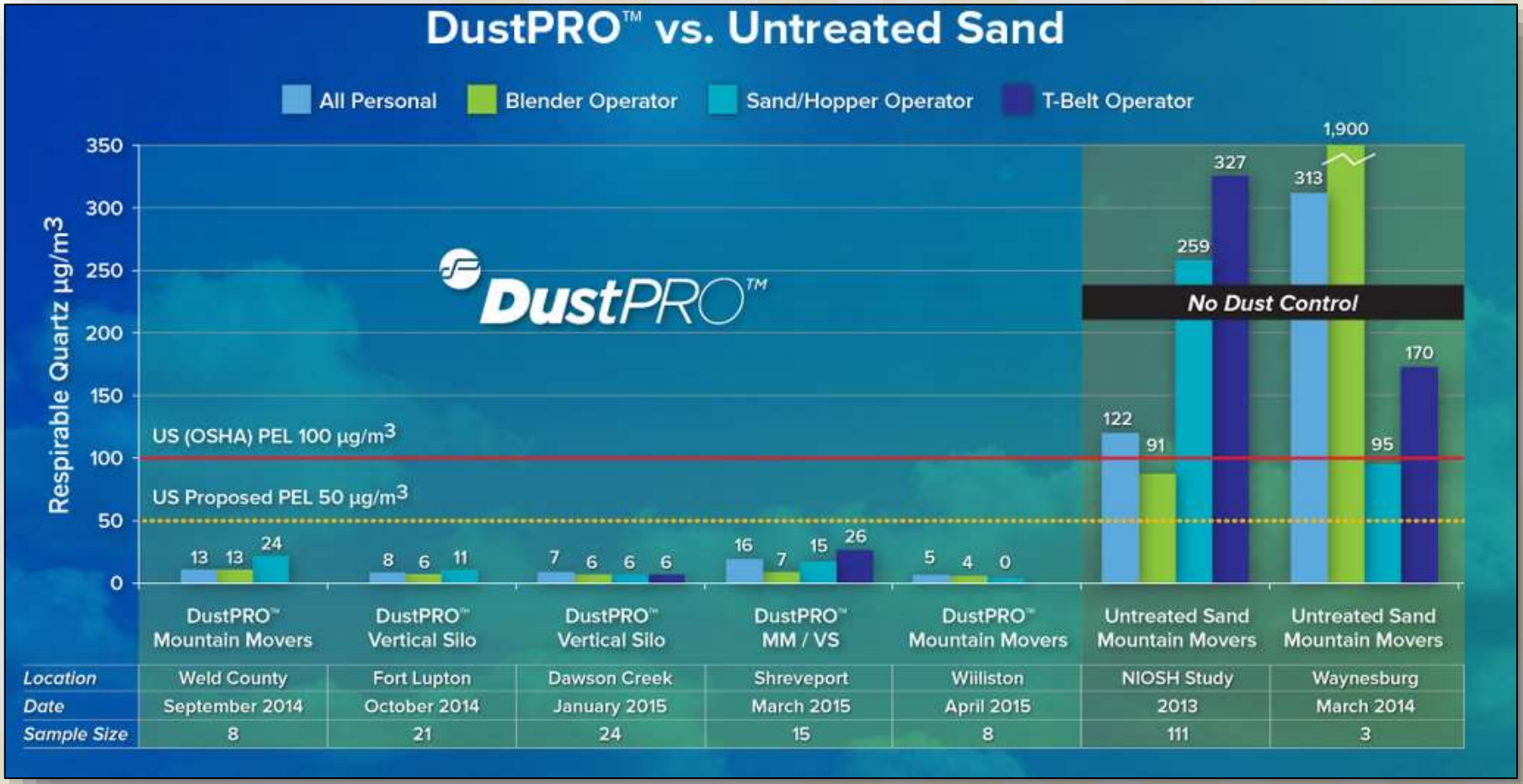
COMPLETIONS

NORTHEAST NATURAL ENERGY SANDBOX LOGISTICS & DUSTPRO

- Reduced road traffic
- Reduced personnel on frac site
- Eliminate silica dust particles

http://www.sandboxlogistics.com/gallery.php

NORTHEAST NATURAL ENERGY SANDBOX LOGISTICS & DUSTPRO



http://www.dustpro.com/system/

BUDGET DATA

ORIGINAL PLAN

	DOE-NETL	NNE	Total
MIP SW	$3,283,900	$0	$3,283,900
MIP 3H	$697,900	$5,903,800	$6,601,700
MIP 5H	$0	$5,978,700	$5,978,700
Total	$3,981,800	$11,882,500	$15,864,300

REVISED PLAN

	DOE-NETL	NNE	Total
MIP SW	$2,822,700	$0	$2,822,700
MIP 3H	$2,320,400	$4,572,600	$6,893,000
MIP 5H	$0	$6,283,600	$6,283,600
Total	$5,143,100	$10,856,200	$15,999,300

DOE-NETL CHANGES

	Original	Revised	Change
MIP SW	$3,283,900	$2,822,700	-$461,200
MIP 3H	$697,900	$2,320,400	$1,622,500
MIP 5H	$0	$0	$0
Total	$3,981,800	$5,143,100	$1,161,300

SCIENCE WELL (SW) CHANGES

	Original	Revised	Change
Pre-Drilling	$696,500	$1,646,500	$950,000
Drilling	$2,587,400	1,176,200	-1,411,200
Total	$3,283,900	$2,822,700	-$461,200

- Site Preparation/Mitigation – Increase
- Moved Coring and Advanced Logging to MIP 3H - Decrease

MIP 3H CHANGES

	Original	Revised	Change
DOE-NETL	$697,900	$2,320,400	$1,622,500
NNE	$5,903,800	$4,572,600	-$1,331,200
Total	$6,601,700	$6,893,000	$291,300

- Change in Drilling Costs – Decrease
- Coring, Sidewall and Logging Moved from Science Well - Increase
- Change in Fiber Optics - Increase

MIP 5H CHANGES

	Original	Revised	Change
DOE-NETL	$0	$0	$0
NNE	$5,978,700	$6,283,600	$304,900
Total	$5,978,700	$6,283,600	$304,900

- Change in Drilling Costs – Decrease
- Increased Lateral Length - Increase
- Change in Stimulation - Increase

Building Partnerships for Research, Education, and Outreach

Tim Carr
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Email: tim.carr@mail.wvu.edu

MSEEL
Marcellus Shale Energy & Environment Laboratory
Northeast Natural Energy
West Virginia University