



EVALUATION AND RESTORATION OF PASSIVE TREATMENT SYSTEM PERFORMANCE IN PENNSYLVANIA



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Pennsylvania PTS: A Brief Background

- ▶ ~77 billion gal/yr of AMD treated in PA alone¹
- ▶ <300 publicly funded PTS in PA¹
- ▶ PTS are low maintenance, not no maintenance.



¹www.datashed.org

Pennsylvania PTS: A Brief Background

- ▶ Most PA treatment systems maintained by grassroots watershed organizations.
- ▶ Sufficient O&M funding typically not included in PTS budgets



Operation & Maintenance Technical Assistance Program

- ▶ Assist PA watershed groups, non-profits, conservation districts, etc.
- ▶ 2011–Current (multiple grants)
- ▶ Technical assistance & water sampling
- ▶ Funding Sources
 - PA DEP Growing Greener Program
 - Foundation for PA Watersheds
 - In-kind/match watershed groups



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION



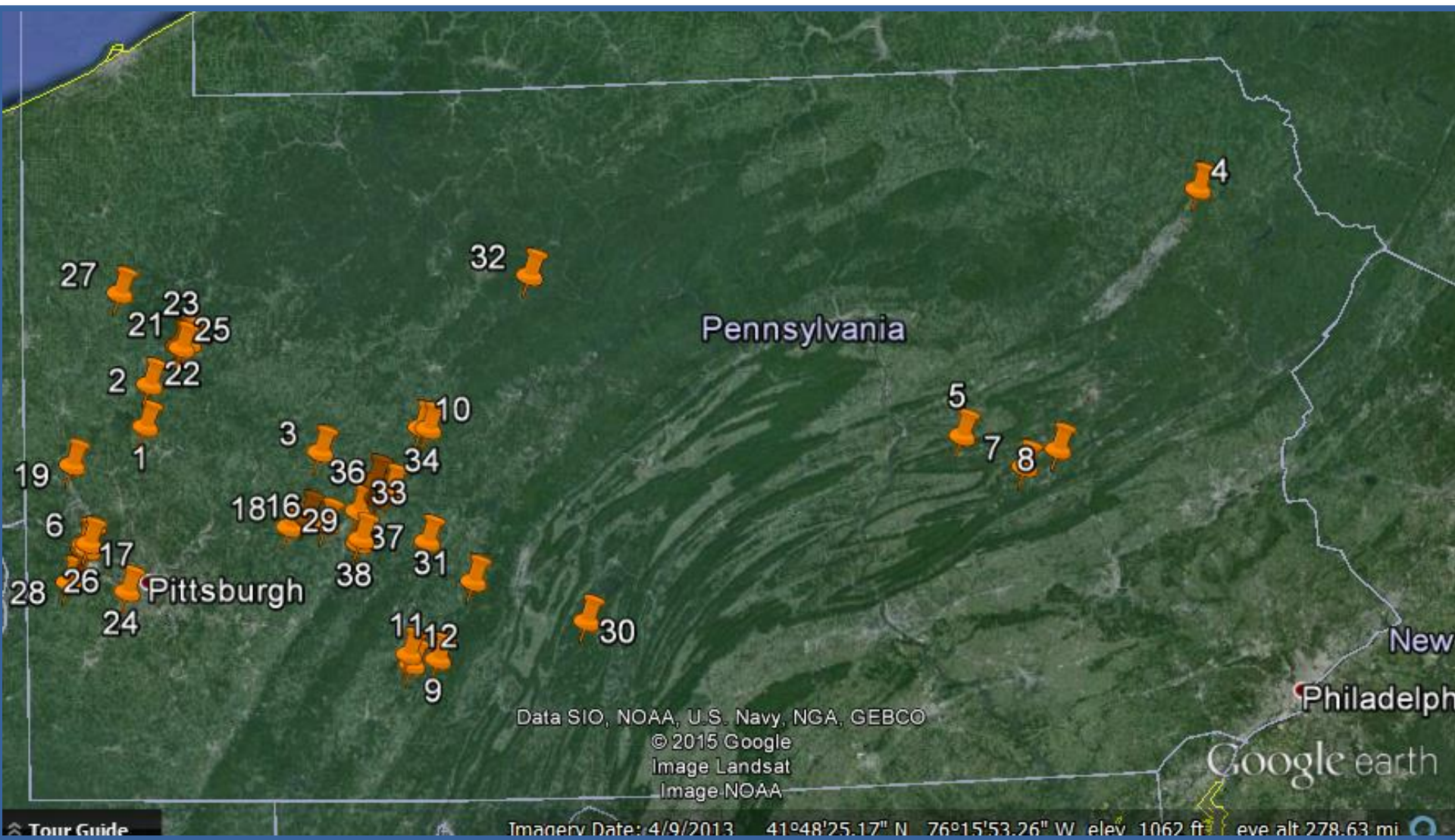
Foundation for
Pennsylvania Watersheds

Site Assessment

- ▶ Most sites require maintenance over time
- ▶ Regular site visits and observations allow many problems to be addressed quickly and efficiently
- ▶ PA PTS Snapshot

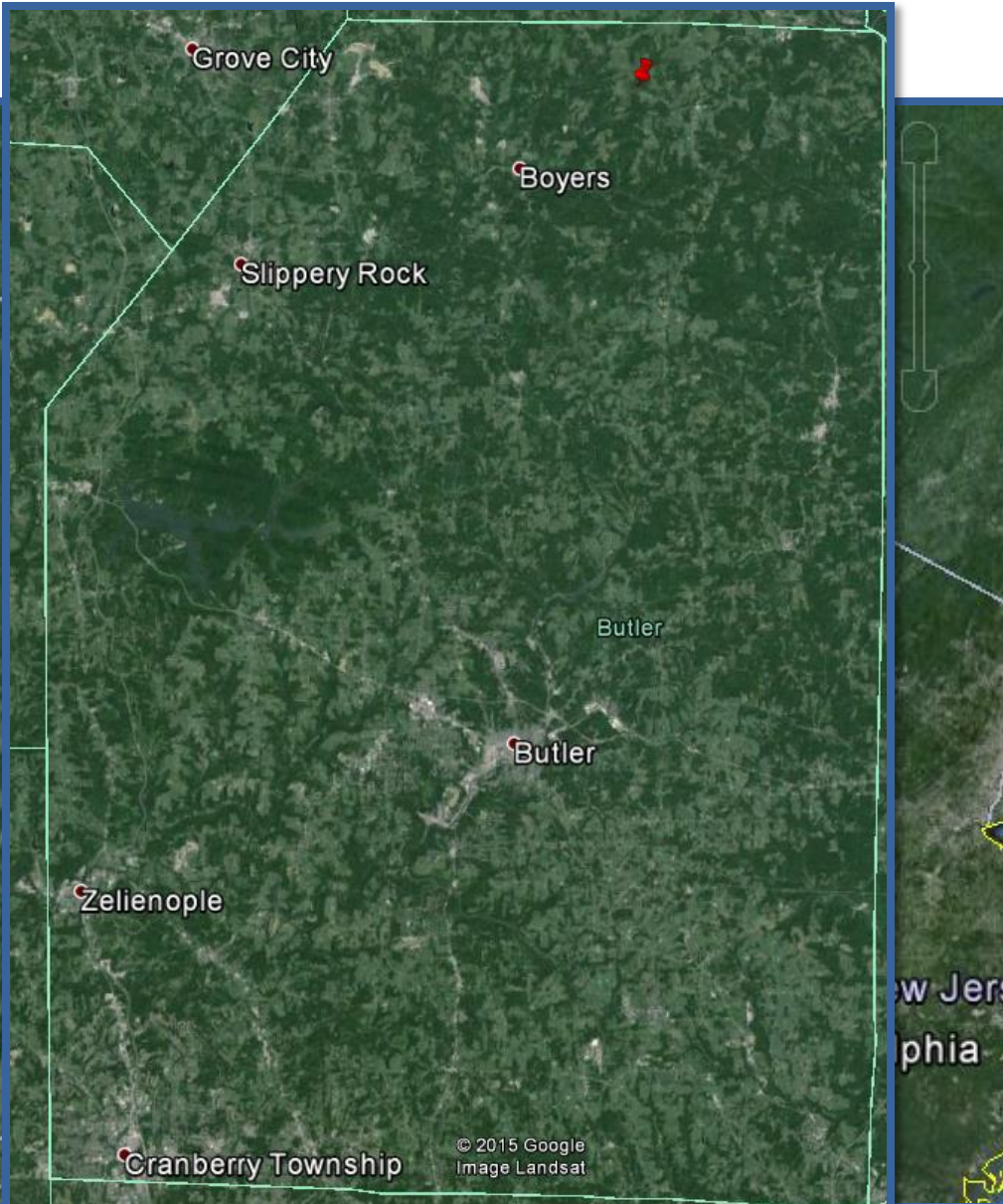


O&M to date



*Images courtesy of Google Earth

O&M- DeSale II



*Images courtesy of Google Earth

DeSale II Background

AMD Source: Abandoned Surface Mine
Venango Twp, Butler Co.

Funding:
Foundation for PA Watersheds,
PA DEP Growing Greener, In Kind Contributions

Stream: Seaton Creek

Water Quality (Avg.)

| Parameter | Forebay | HFLB Effluent |
|------------|---------|---------------|
| pH | 3.12 | 6.27 |
| alkalinity | 0 | 74.22 |
| acidity | 211.35 | neg. |
| Fe | 15.08 | 2.45 |
| Mn | 44.57 | 24.69 |
| Al | 10.33 | <1 |

*Total metals mg/L, acidity and alkalinity as CaCO3 mg/L



DeSale II– History/Maintenance

- ▶ 2000–Site constructed
- ▶ 2012– decreased treatment performance noted
- ▶ VFP East Stir
- ▶ Forebay inlet and outlet cleaned



DeSale II– History/Maintenance

- ▶ WL outlet cleared of vegetation
- ▶ HFLB stone re-leveled
- ▶ VFP outlet spillway cleared of vegetation buildup



DeSale II– Recent Maintenance

- ▶ Multiple issues noted during site visit by SRWC
- ▶ Forebay pipe inlet clogged
- ▶ VFP performance decreased



Desale II-Forebay



Desale II- Vertical Flow Pond



Desale II- Vertical Flow Pond



Desale II- Vertical Flow Pond



O&M– DeSale II

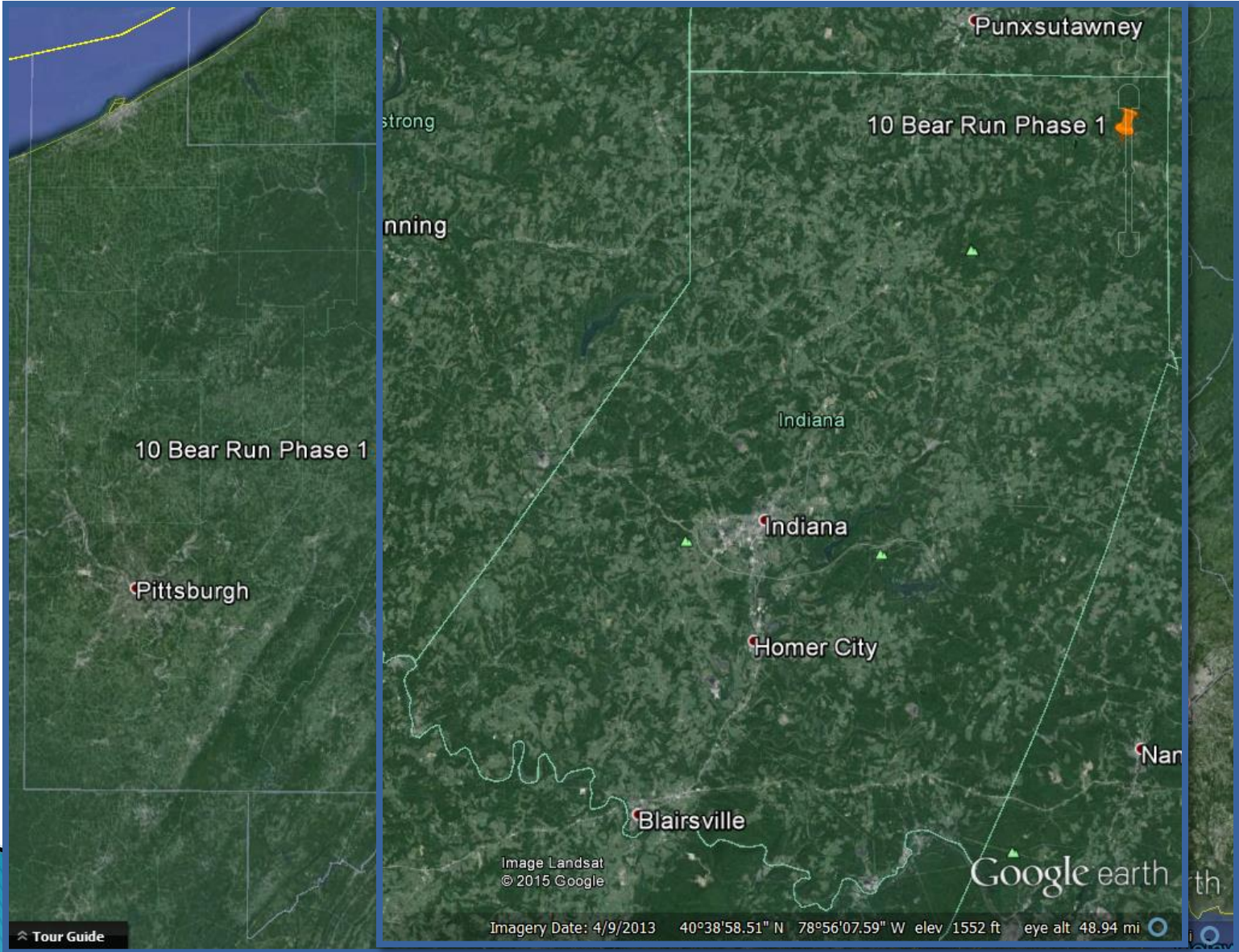
Pre- and Post- O&M Effluent Field Water Quality Data

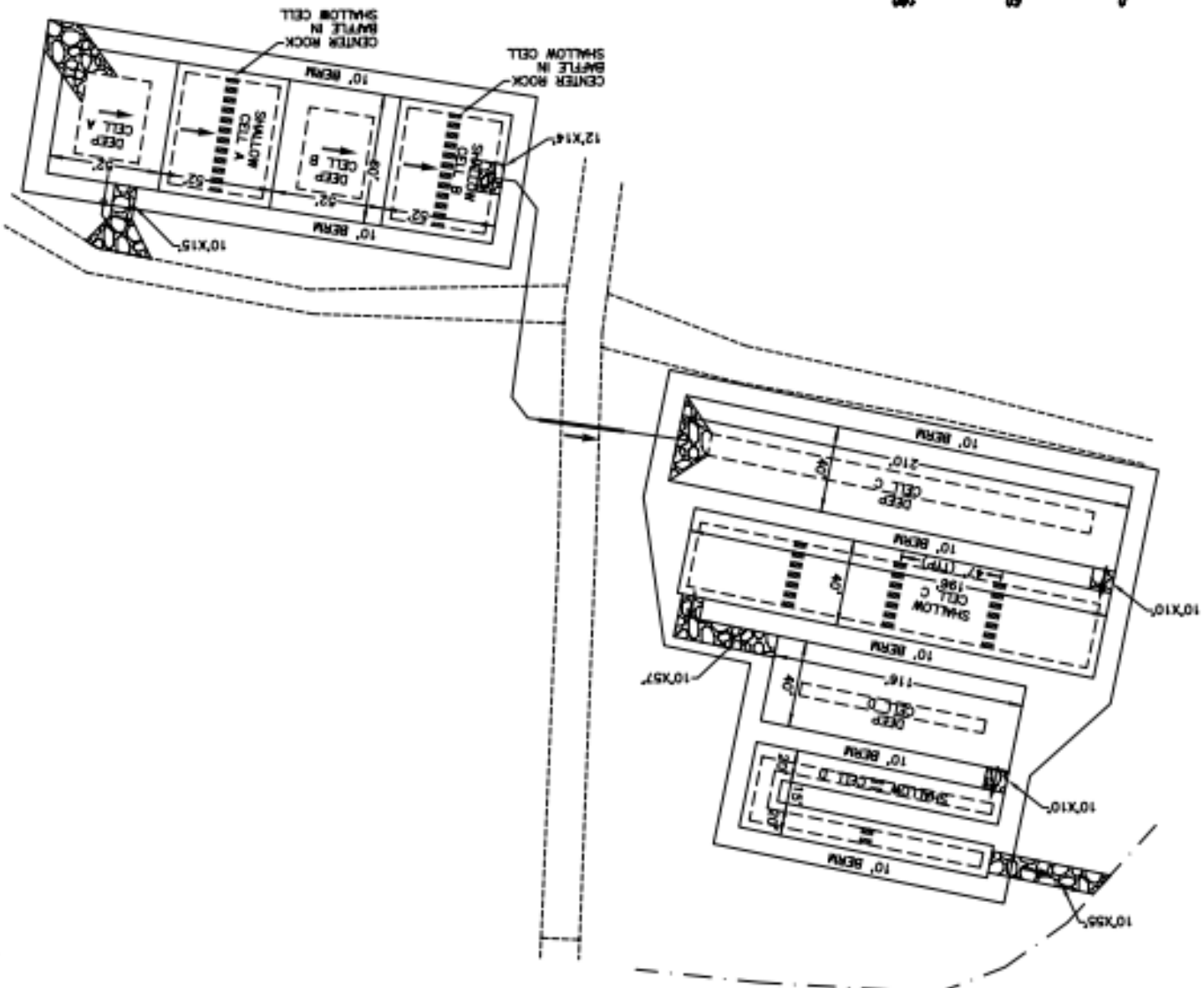
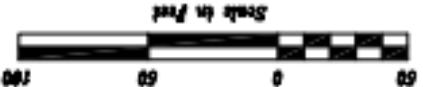


| Parameter | Pre- O&M | Post- O&M |
|------------|-------------|--------------|
| pH | 6.0 | 6.9 |
| alkalinity | 20 | ~70 |
| Fe (mg/l) | 4-8 | 0.5 - 1 |

Total metals mg/L, acidity and
alkalinity as CaCO₃ mg/L

O&M- Bear Run Phase 1





**RAIN RUN ANTIWASH T
AND PASSIVE TREATMENT FACILITY**
WASTEWATER TREATMENT
DESIGN PLAN

USDA NRCS
Natural Resources Conservation Service

| NO. | DATE | BY | CHKD | DESCRIPTION |
|-----|------|----|------|-------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Bear Run Phase 1 Background

AMD Source: Underground Mine Banks Twp, Indiana Co.

Funding:
PADEP Growing Greener Title IV, Appalachian Clean Streams Initiative

Stream: Bear Run



Water Quality (Avg.)

| Parameter | Raw | Effluent |
|------------|-------|----------|
| pH | 6.4 | 6.8 |
| alkalinity | 75 | 64 |
| acidity | neg. | neg. |
| Fe | 36.21 | 2.13 |
| Mn | 2.61 | 2.45 |
| Al | >1 | >1 |

*Total metals mg/L, acidity and alkalinity as CaCO3 mg/L

Bear Run Phase 1 Background

- ▶ 8" pipe flows 100' under road, blocked multiple times
- ▶ SRI assisted ICCD and the Evergreen Conservancy in clearing the blockage using a clean out tool
- ▶ Iron precipitation also reduced flow



Bear Run Phase 1 – Next Round



Bear Run Phase 1



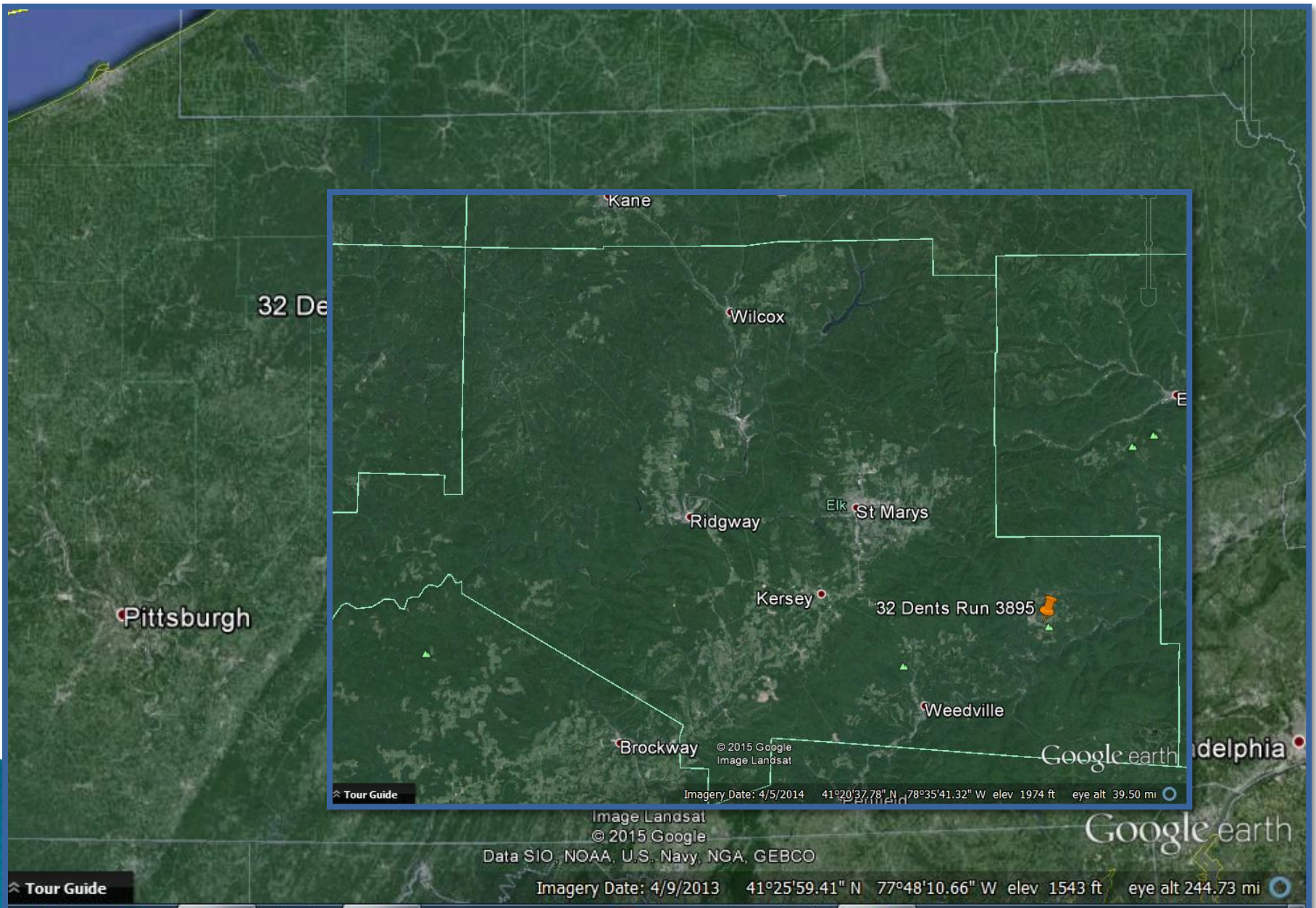
Bear Run Phase 1



Bear Run Phase 1

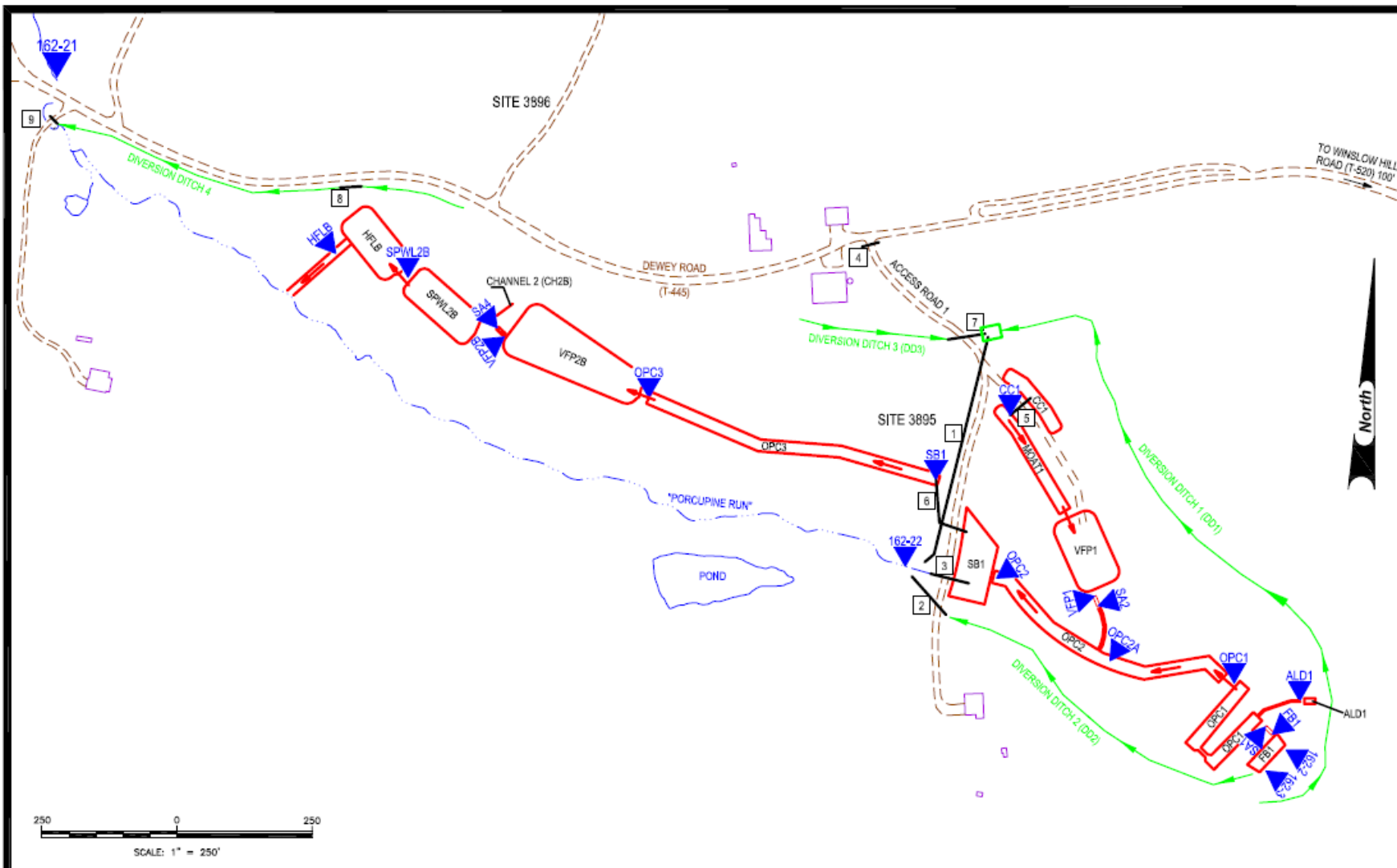


Dents Run 3895



Dents Run 3895 – Elk Country!!





250 0 250
SCALE: 1" = 250'

DENTS RUN SITE 3895
SECTION 206, ACID MINE DRAINAGE
BENZETTETOWNSHIP, ELK COUNTY, PA
USACE Contract W912DR-04-D-0007, DO 0001-04
OPERATION & MAINTENANCE PLAN
SITE SCHEMATIC

| | | |
|---|--------------------------------|---|
| U.S. ARMY ENGINEER DISTRICT, BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND | Designed by: TPD | Date: JULY 2007 |
| | Down By: SLB Ckd by: CFD | Design file no. 1622 95 LOC-SCH |
| BioMost, Inc. Mining and Reclamation Services 3016 Unimatic Road Cranberry Township, PA 15066 (724) 776-0161 | Reviewed by: MHD | Drawing number: |
| | Submitted by: BIOMOST, INC. | File name: Plot date: Plot Scale: 1" = 250' |

- PASSIVE TREATMENT COMPONENT
- DIVERSION DITCH
- CULVERT
- DIRT/AGGREGATE ROAD
- ~~~~~ STREAM
- STRUCTURE
- ▲ WATER MONITORING POINT

Dents Run 3895 Background

AMD Source: Underground
Benzette Twp., Elk Co.
Funding: US Army Corps of
Engineers
Stream: Porcupine Run

Water Quality (Avg.)

| Parameter | Forebay | HFLB Effluent |
|------------|---------|---------------|
| pH | 2.69 | 7.3 |
| alkalinity | 0 | 212.41 |
| acidity | 1389.55 | neg. |
| Fe | 311.33 | <1 |
| Mn | 20.05 | 7.38 |
| Al | 130.52 | <1 |



*Total metals mg/L, acidity and alkalinity as CaCO3 mg/L

Dents Run 3895

- ▶ 2008–Site constructed
- ▶ 2014– Hydraulic issues noted





Dents Run 3895

- ▶ Box outlet clogged
- ▶ Vegetation removed, outlet depth increased




Dents Run 3895



Dents Run 3895



Conclusions

- ▶ Passive treatment is not maintenance free;
 - ▶ Like a car, regular inspections and occasional maintenance are needed for a treatment system to reach it's design life;
 - ▶ Poor water quality does not always mean the system is a failure or has reached its design life;
 - ▶ Treatment performance can often be restored through maintenance activities that rejuvenate the system instead of replacing the treatment media or rebuilding the system and thus saving money;
- 

Acknowledgement

- ▶ Thanks to PA DEP, Foundation for PA Watersheds for funding, and conservation districts, Watershed volunteers, and all the others who help to make projects like these possible!

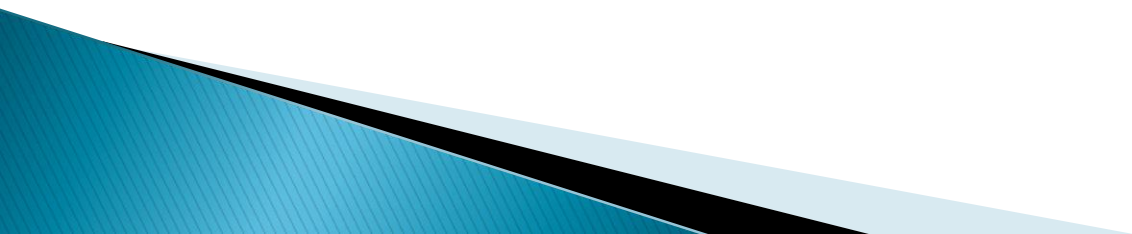


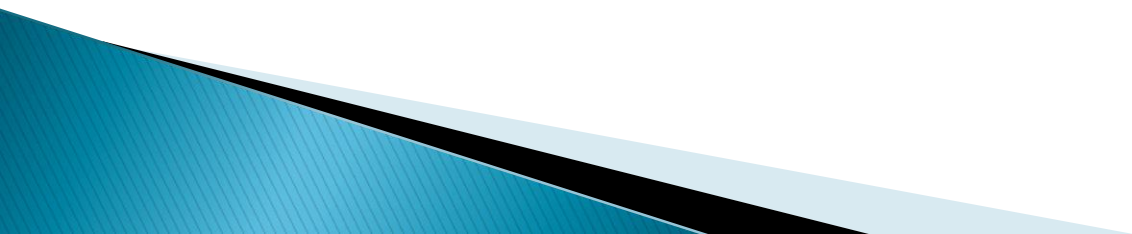
References

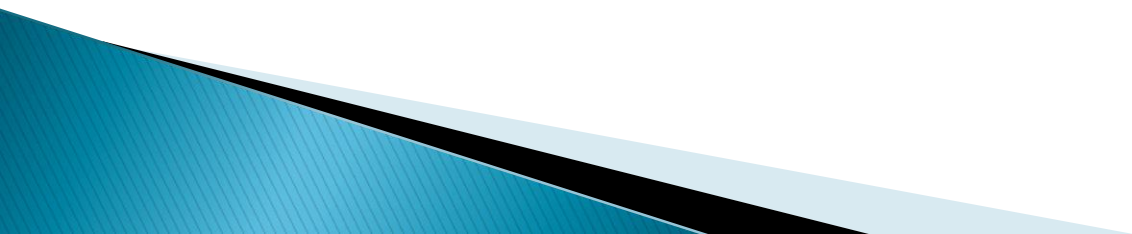
- ▶ <http://www2.datashed.org/>
- ▶ Google Earth <http://www.google.com/earth/>
- ▶ Bing Maps <http://www.bing.com/maps/>

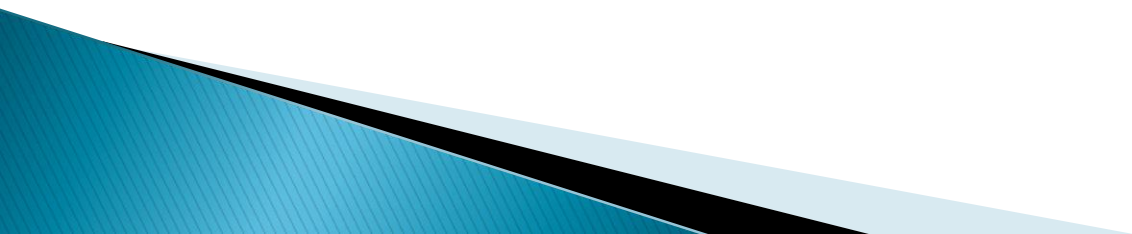
Questions?











Operation and maintenance: An Overview (continued)



At Laurel Run #1 Vertical flow ponds (Top) and flush ponds (Bottom) were rehabilitated by Biomost, Inc. alongside the addition of a new VFP by Amerikohl Mining, Inc.



Why Do Passive Systems “Fail”?

- Design – undersized, wrong application/developing technology, etc.
 - Construction – sloppiness, short-cuts, accidental errors
 - Site conditions – not enough room, something vs. nothing
 - Unanticipated issues – water quality or quantity changes
 - Design life met and/or treatment media spent
 - Lack of O&M
- 