GIS for Water, Wastewater and MS4 Mapping

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GIS Analyst
Berks County Planning Commission
Objectives

- Define GIS and the components of GIS
- Understand the benefits of GIS
- Identify different options for GIS data creation and collection
- Identify how to acquire GIS software and training
- Understand the basics for creating a water, wastewater and MS4 inventory in GIS
What is Geography?

Merriam-Webster
“A science that deals with the description, distribution, and interaction of the diverse physical, biological and cultural features of the earth’s surface”

Association of American Geographers (AAG)
“The science of place and space”
Geography, Mapping, Analysis

Linking Information to reveal patterns:

Map Source: esri.com
Linking Information to reveal patterns:
Geography, Mapping, Analysis

Linking Information to reveal patterns:

Map Source: esri.com
What is Spatial Data?

- **Location, shapes and sizes of data**
  - How?  What?  Where?

- **Scale of data**
  - Local to Global

- **Data presentation of spatial data**
  - Words, charts, tables, maps
A **Geographic Information System (GIS)** links spatial data and attribute information together which enables an individual to visualize patterns, relationships, and trends.

### Types of Learners

- **Verbal**: 30%
- **Experiential**: 5%
- **Visual**: 65%

Source: Social Science Research Network
Components of GIS

1. Hardware
2. Software
3. Data
4. Methods
5. People
Benefits of GIS

- Easy to interpret
Benefits of GIS

More than just a pretty map
Benefits of GIS

- Efficient
  - Saves money!

- Easy to manage data
  - Automate a process
  - Update data with a click of a button

- Helps users make more informed decisions
  - Quick queries
  - Ability to layer data

- Operating your own GIS puts **YOU** in control
Where to find GIS Data

- **Databases**
  - Excel, Access, Surveys

- **Online**
  - County Government, PASDA, PADEP, U.S. Census Bureau, USDA NRCS, DCNR

- **Digital and paper maps**
  - Words, charts, tables, aerial imagery
Collecting GIS Data

- **Mobile Devices**
  - GPS, smart phones, tablets

- **Heads-up digitizing**
  - Plans, imagery

- **GIS interns**
  - HUGE money-saver
GIS Software

Open Source GIS
- Quantum GIS (QGIS), Geographic Resources Analysis Support System (GRASS), Open Source Software Image Map (OSSIM), gvSIG

Proprietary GIS
- GeoMedia by Hexagon Geospatial
- ArcGIS by ESRI
## ArcGIS for Desktop

### ArcGIS for Desktop Basic
- Includes ArcGIS Online
- Single License: $1,500
- Concurrent License: $3,500
- [Visit Store →](www.esri.com/products)

### ArcGIS for Desktop Standard
- Includes ArcGIS Online
- Single License: $7,000
- Concurrent License: $7,000
- Call 1-800-447-9778

### ArcGIS for Desktop Advanced
- Includes ArcGIS Online
- Price varies depending on your organization; call 1-800-447-9778

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**Possible grant opportunities**

[www.esri.com/grants](www.esri.com/grants)

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Pricing as of October 6, 2016

Source: [www.esri.com/software](www.esri.com/software)
Certified for Windows Operating Systems

Apple computer running Windows OS
   Must use BootCamp, Parallels or VMWare

Computer hardware requirements must be taken into consideration
ArcGIS Training

Online
  - www.esri.com/training

Instructor-Led
  - www.esri.com/training

Other
  - Seminars, Webinars, MOOCs, Videos, Lessons, Books, Technical Certification via ESRI
A previous MS4 Workshop held by PADEP indicated that mapping is an essential foundation for many requirements in the permit.

PADEP also indicated that mapping was an area that needed improvement.

Source: PADEP
GIS Data for MS4

- Basins
- Inlets
- Piping
- Swales
- Catch Basins
- Channels
- Outfalls
- Zoning ✓
- NWI ✓
- Roads ✓
- Watershed Boundaries ✓
- Municipal Boundaries ✓
- Land Use ✓
- Urbanized Areas ✓
- Community Facilities ✓
- Streams ✓
- Water Bodies ✓
- Impaired Waters ✓
- Water Service Area ✓
- Hydric Soils ✓
GIS Mapping for MS4

Legend
- Infiltration Trench
- Retention Island
- Porous Asphalt
- Porous Concrete
- Porous Pavers
- Rolled Asphalt Curb
- Rain Barrel
- Rain Garden
- Retention Berm
- Rip-Rap
- Sediment Trap
- Subsurface Storage System
- Water Quality Inlet
- Water Quality Unit
- Swale
- Stormwater Lines
- Headwall
- Endwall
- Existing Stormwater Inlet
- Existing Stormwater Outlets
- Outfalls
- Existing Stormwater Manhole
- Storage
- Detention Basin
- Retention Basin
- Stilling Basin
- Impaired Streams
- Streams
- Water Bodies
- Roads
- Municipal Boundaries

Source: Berks County Planning Commission, Berks DES, Berks County Facilities, 2016 Imagery
Creating an Inventory - Water

Wellhead Protection Program

Map Source: PADEP
Creating an Inventory - Water

- **PaWARN**
  - Mapping all water resources in case of a natural or human-caused emergency

- **Water Reports**
  - Monitoring sites
GIS Data for Water

- Water Storage ✓
- Wellheads
- Pumping Stations ✓
- Water Plants ✓
- Water Service Areas ✓
- Water Lines ✓
- Water Treatment Plants ✓
- Municipal Boundaries ✓
- Tax Parcels ✓
- Streams ✓
- Water Bodies ✓
- Floodplain ✓
- NWI ✓
GIS Mapping for Water
Creating an Inventory - Wastewater

- Act 537 Plans
  - Mapping future developments, land use, on-lot system study area

- Chapter 94 Report
  - Digitize tables in GIS
## GIS Data for Wastewater

<table>
<thead>
<tr>
<th>Category</th>
<th>Status</th>
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<tbody>
<tr>
<td>Wastewater Service Areas</td>
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<tr>
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<tr>
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</table>
GIS Mapping for Wastewater
New Geospatial Tool

Web toolkit created by Stroud™ Water Research Center for enhancing knowledge and stewardship of fresh water

Toolkit offers:
- Rapid visualization of watershed data
- Advanced geospatial analysis capabilities
- Science-based predictions of human impacts on stormwater runoff and water quality

Source: PADEP, Stroud™ Water Research Center

www.wikiwatershed.org
New Geospatial Tool

www.wikiwatershed.org
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