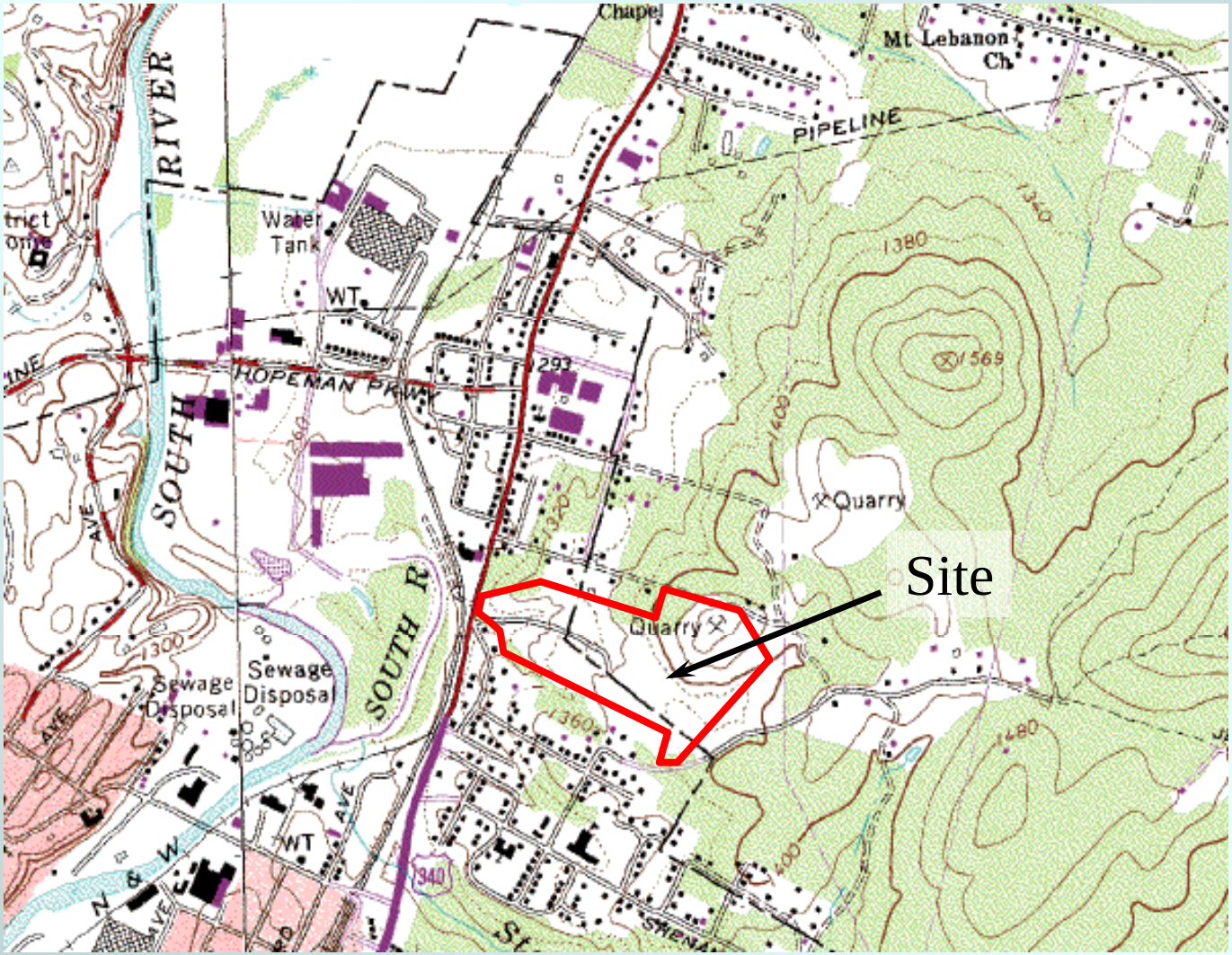
Update: Waynesboro Municipal Landfill and Karst Area

South River Science Team Meeting

April 23, 2002

Waynesboro Municipal Landfill

Waynesboro Municipal Landfill - Site Location Map



Waynesboro Municipal Landfill

- Sources:
  - Jax Bowman, Former Public Works Director
  - Waynesboro Public Works Dept.
  - EPA CERCLA file
- Operational History
  - Mid-1940s? to 1982
  - Small dump site in 1949 (from aerial photo)
  - City of Waynesboro began use as sanitary landfill in ~ 1962
  - Municipal and Industrial waste disposal at the site from ~ 1960 to 1982
  - GE and DuPont main industrial disposers
    - DuPont - inorganics, resins, keytones, aldehydes
      - Hg wastes unlikely due to time frame - stopped off-site sludge disposal in 1945
    - GE - mixed oils, chlorinated solvents, flammable solvents and paint sludge

Waynesboro Municipal Landfill

- Filled ravine
- No indication of previous quarrying operations
- Leachate collection in 1988 (current?)
  - Diversion trench surrounding landfill on south, east, and north sides
    - surface water and leachate seeps
    - discharges to leachate collection pond
  - Leachate collection pond at west end, where bottom of ravine was located
  - Leachate pond discharges to old South River channel via culvert under Rt. 340 and dry stream bed
    - to current South River Channel during high flow ?

Waynesboro Municipal Landfill - 1949 Aerial Photo

Waynesboro Municipal Landfill - 1949 Aerial Photo

Waynesboro Municipal Landfill - 1965 Aerial Photo

Waynesboro Municipal Landfill

- EPA Investigations
  - Preliminary Assessment - 1986
    - Desk study and site visit
  - Site Investigation - 1988
    - Soil, groundwater, leachate/surface water, and sediment sampling
      - 3 surficial soil samples
      - 4 sediment samples
      - 4 surface water samples
      - 2 groundwater samples from residential wells
    - Samples analyzed for TCL inorganics (inc. Hg) and organics

Waynesboro Municipal Landfill

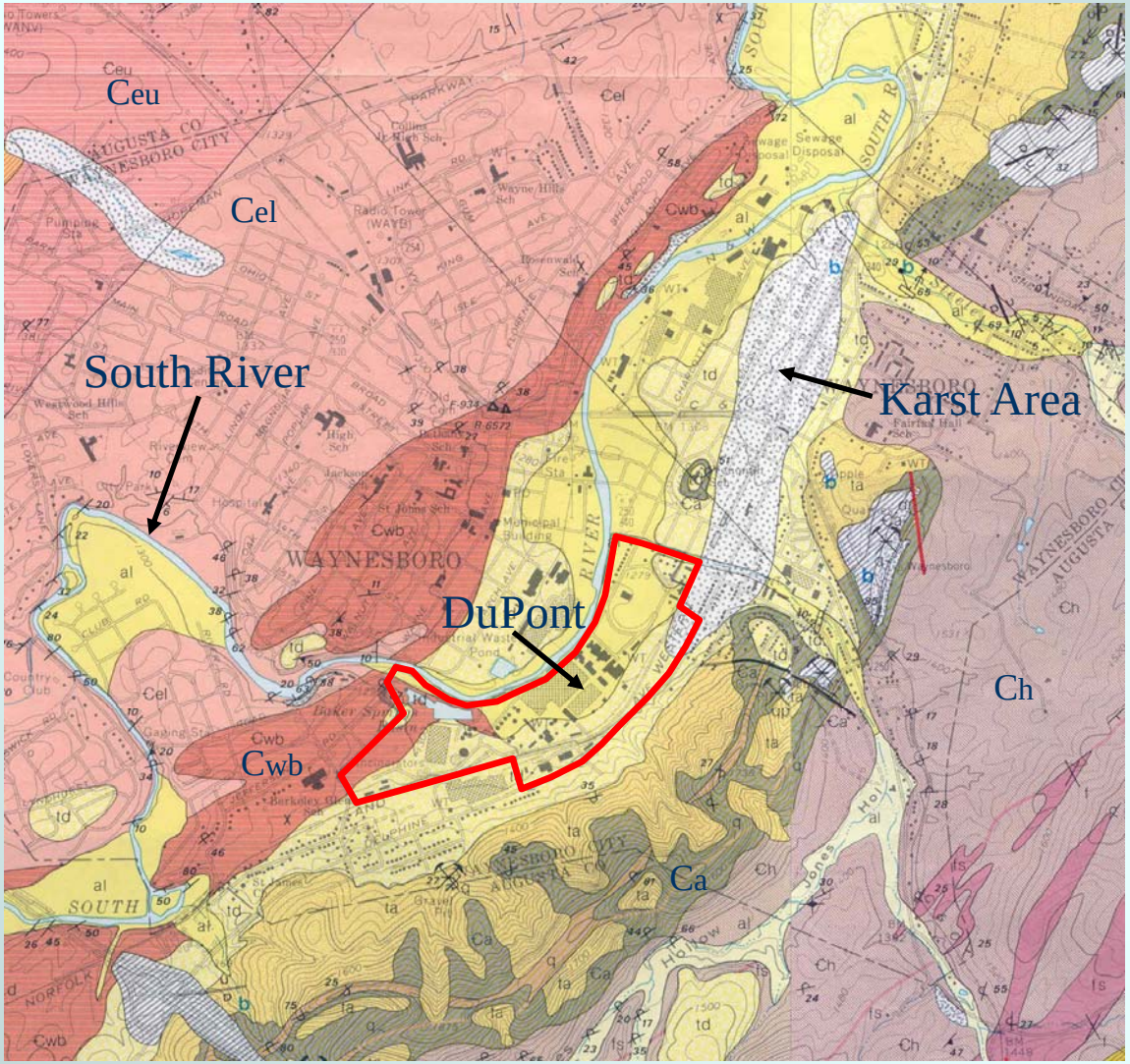
- EPA Findings
  - No mercury contamination identified
  - Metals - antimony, barium, calcium, chromium, lead, silver, cobalt
  - Organics - PAHs, toluene, benzoic acid, and 4-methyl phenol
  - All hits were relatively low concentrations

Waynesboro Municipal Landfill - Path Forward

- Limited site investigation:
  - Verify results of EPA's 1988 site investigation
  - Collect surface water, shallow soil/sediment samples
    - Leachate pond
    - Culvert/stream
    - Old South River / stream confluence
    - Old South River channel down-stream of confluence
  - Analyze all samples for Hg (total and dissolved in water samples)

Karst Area

Karst Area - Geologic Map (Gathright, 1977)

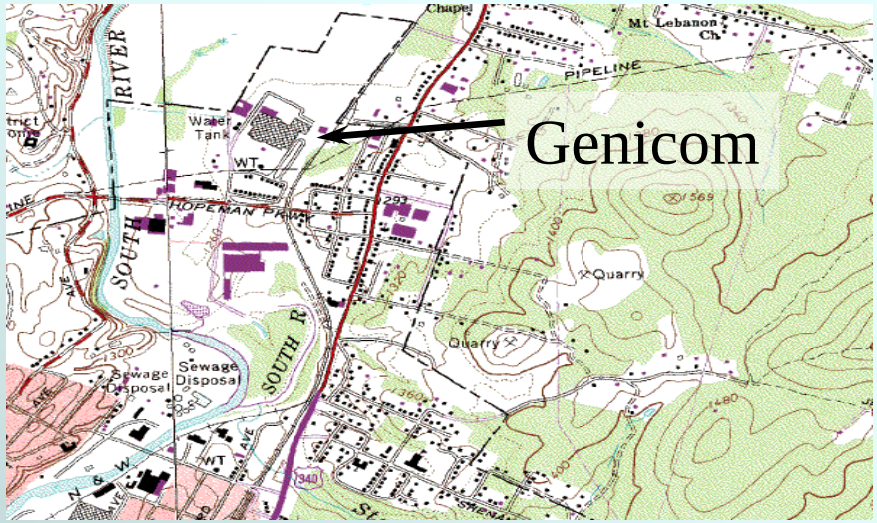


Karst Area

- From Gathright 1977 - Geology of Waynesboro East and Waynesboro West Quadrangles
  - Karst area believed to be associated with the Shady Formation in sub-surface
    - Not exposed in the area
    - Known to be susceptible to karst weathering
    - Present to the north and south of Waynesboro
  - Borings drilled at western toe of Blue Ridge just northeast of Waynesboro - looking for Shady Formation
    - No carbonate identified up to 365 ft BGS
    - Theorized area is mature karst - most of the Carbonate removed/collapsed or is very deep
  - Alternate theories on the area
    - Brecciated zone associated with Blue Ridge thrust faulting

Karst Area

- Genicom RFI documents
  - Site located north of Hopeman Parkway on east side of South River
  - Reviewed RFI reports
  - Shallow alluvial sands and gravels over bedrock aquifer
  - Karst area was not encountered during site investigations



Karst Area - Investigation Techniques

- Tracers
  - Introduced
    - Introduce into known conduit and monitor for presence down-gradient in wells or at seeps/springs
    - Fluorescent Dyes - rhodamine, fluorecene, optical brighteners
    - Ions - chloride, nitrates, nitrites
    - Isotopes - iodine
  - Native
    - Natural cation / anion relationships in groundwater at various locations
    - Ca, Mg, K, Na, Cl, sulfate, bicarbonate, hardness
    - Look for distinct gw signature at down-gradient locations such as seeps, monitoring wells, springs

Karst Area - Investigation Techniques

- Geomorphic analysis
  - Delineate areas where karst weathering is occurring in sub-surface
  - Aerial photographic analysis and ground investigation
  - Lineaments
  - Fracture patterns
  - Land forms - sink holes, disappearing streams, springs
- Intrusive investigation
  - Drilling program in suspected karst area

Karst Area - Investigation Techniques

- Recommended Path Forward
  - Temperature profiling in the South River
    - Detailed investigation of temperature anomalies to identify seeps
    - Water sampling up and down-stream of identified seeps
      - Hg first
      - followed by geochemistry if Hg flux identified
- Let river data guide further investigation of sources if gw seeps w/ Hg flux are identified
  - To determine if Hg sourced from gw plume or sediments
  - May include pore water sampling in sediments, shallow gw sampling adjacent to river, gw sampling further away from river
  - Characterize native geochemistry of gw associated with seep to help determine source