Effective Roadway Management of Septic Systems & Wells

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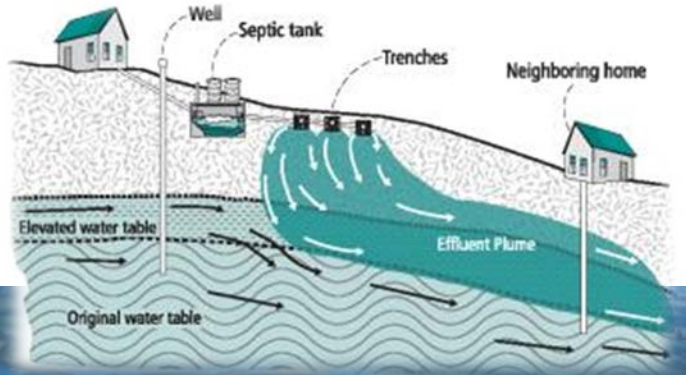

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102nd Annual Purdue Road School
Wednesday, March 9, 2016
2:00-2:50pm

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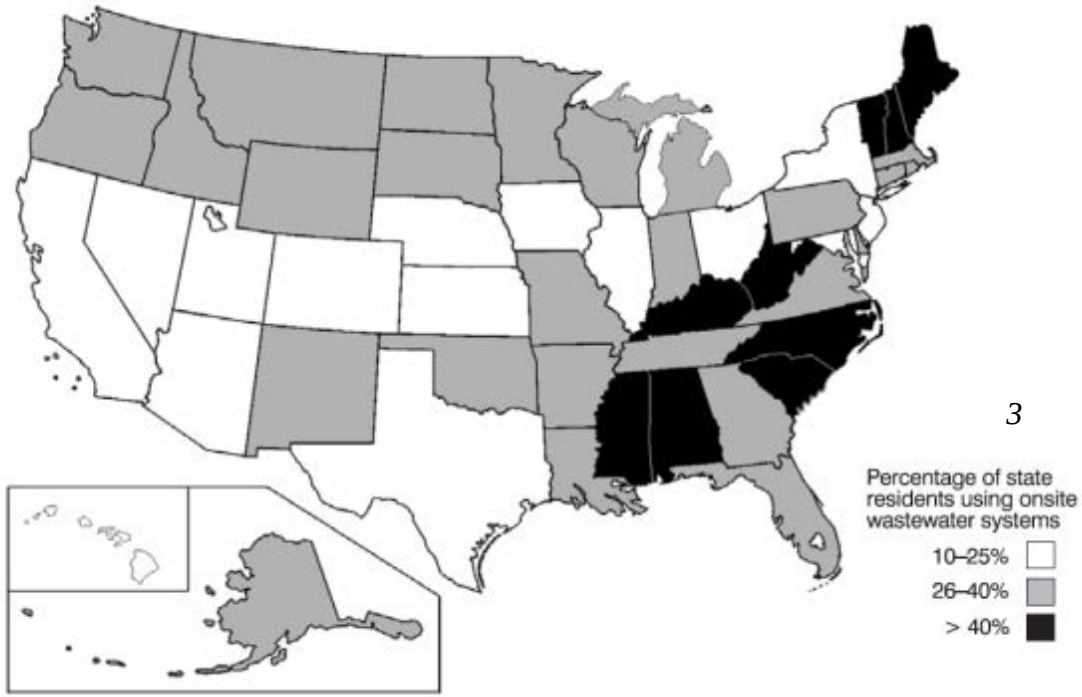
Effective Roadway Management of Septic Systems & Wells

Decentralized Water & Wastewater

- Approx. 1/3 of residences in Indiana utilize septic systems[3]
- Not feasible to centralize all residents in Indiana
- If designed & maintained well & installed <12” deep, septic systems can provide significantly better treatment than municipal WWTP



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Roadways in Rural Regions

- 81% of America's land is rural; 80% of national roads are rural.[4]
- Significant new capacity is often created in rural regions.
- Indiana Major Moves
  - US 31 Plymouth to South Bend
  - US 31 Kokomo Freeway
  - Hoosier Heartland
  - I-69
- LPA projects

The Problem – Decentralized Water/Wastewater

- Typically beneath ground surface
- Don't show up by calling 811
- Owned by individuals
  - Private ownership, may restrict access
  - Owners are typically uninformed, maybe unaware of systems
  - Typically poorly documented
  - Significant variability of systems between neighbors
- Well & Septic Systems can fall through the cracks of typical roadway project management
  - Small construction costs compared to municipal utilities

The Problem – Decentralized Water/Wastewater

- Septic Systems are small, but not simple to replace
- If a roadway project causes a property to be without water or sewer, then the entire property must be purchased.

Problem Example

- US 24 Fort to Port
- 4 parcels became total-takes due to impacts to septic systems
  - Was not discovered until ROW phase
- Total cost of the 4 parcels $644,520 (Does Not Include Relocation cost)
  - One parcel condemned which added time

Problem Example 2

- US 6 at CR29 in Elkhart county
- 2 parcels
- Concern: if the property owners were being compensated for the proper replacement system?
- Once again, the septic systems were not discovered until the ROW phase
- Main concern was time and project delivery, not cost

Wells

- Wells draw raw, untreated groundwater
- 17.5% of groundwater use in Indiana is for individual households[7]
- Quality of well water depends upon groundwater & nearby surficial contaminants
- Typically drilled, but can be hand dug or driven
- Well depth varies
  - Depth dependent upon aquifer yield

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Wells

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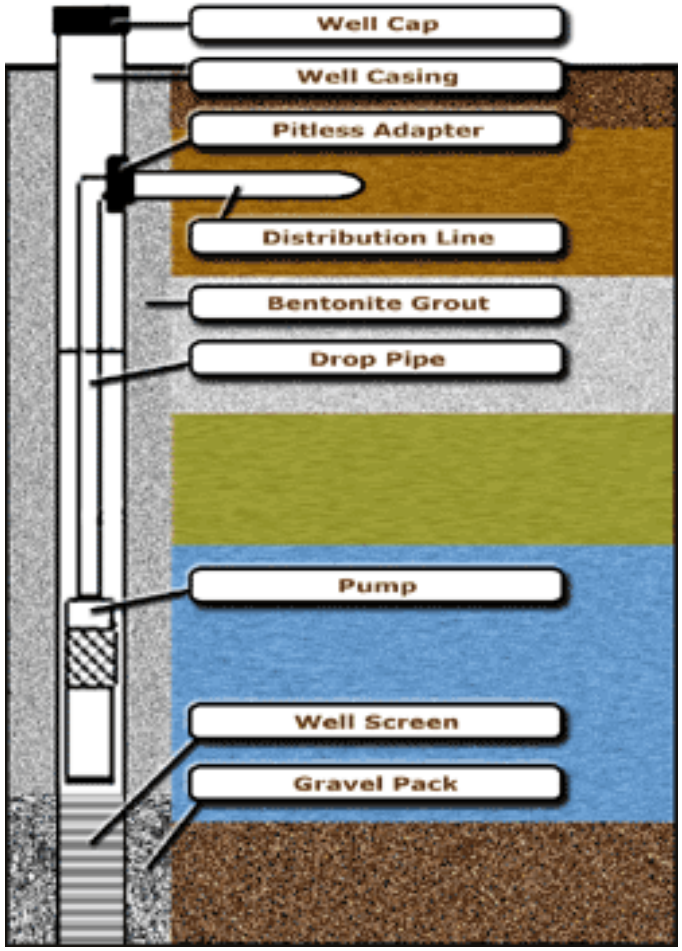


- Typical Components:
  - Well Cap
  - Well Casing
    - ≥5” Ø for residential wells
  - Well Screen
  - Well Pump
    - Small Hp
    - Yield at least 5 gpm
  - Annular Seal
    - Neat cement or bentonite grout between borehole & casing
- > 50’ & 100’ from residential & commercial septic systems, respectively

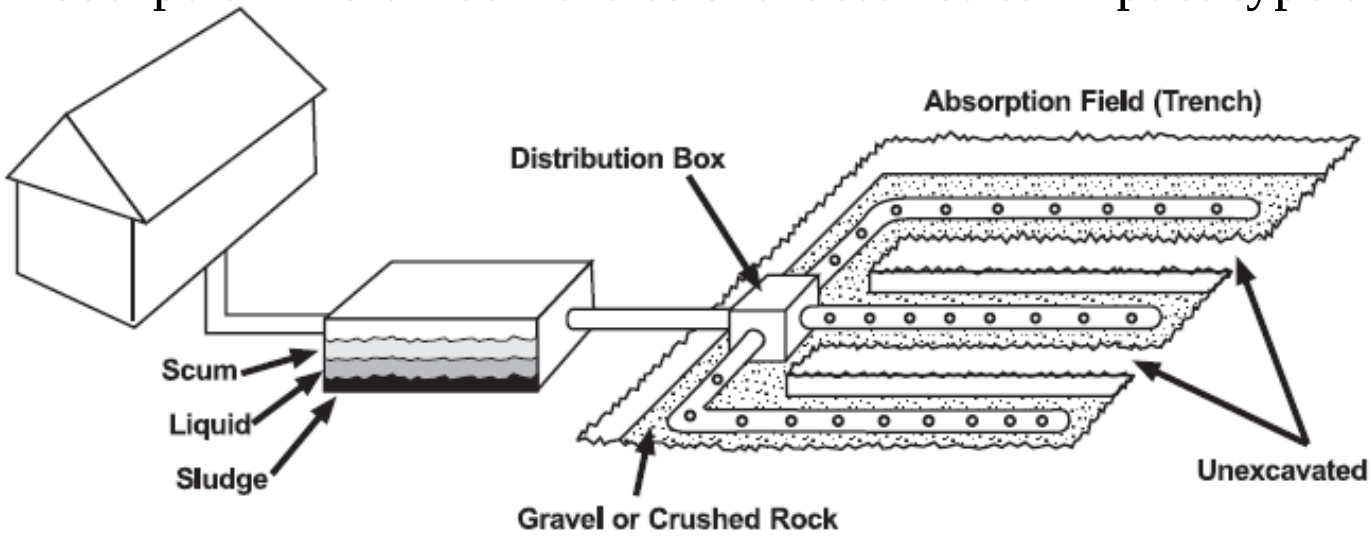
Septic Systems – General Considerations

- In-kind replacement of system must not be assumed
- New systems need to achieve all set back requirements of Code
  - 410 IAC 6-8.3, Table 1 or 410 IAC 6-10.1 Table 2
  - Example: 50’ from any private drinking well, 25’ from stormwater detention, etc
- Sizing a system requires a Soil Evaluation from an I.R.S.S. consultant
- Soil characteristics & topography will greatly impact a replacement system type, sizing and design requirements

Septic Systems

3 Main Components

- Source – wastewater quantity & characteristics affects system size and components
- Septic Tank – Minimum capacity determined by the project flow rate
- Soil Absorption Field –soil & site characteristics impact type and size



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Septic Systems - Source

- Quantity:
  - Residential properties, 410 IAC 6-8.3 prescribes 150 gal/day/bedroom
  - Look for significant building additions
  - Leaky toilets & faucets, sump pump discharge & water softener backwash all need to be investigated for proper function
- Quality:
  - Look for non-residential uses:
    - Bakery production, beauty shop, dog grooming, etc.
- Commercial properties:
  - Wastewater characteristics and design flows are determined by the Indiana State Health Department through a Technical Data Sheet
- The internal plumbing in the structure is important

Septic Systems – Septic Tank

- Settles solids, floats FOGs – not the sole source of treatment
- Anaerobic (oxygen absent) digestion with ≥ 2 day retention
- Should be cleaned every 2-5 years, dependent upon accumulation of sludge and scum.

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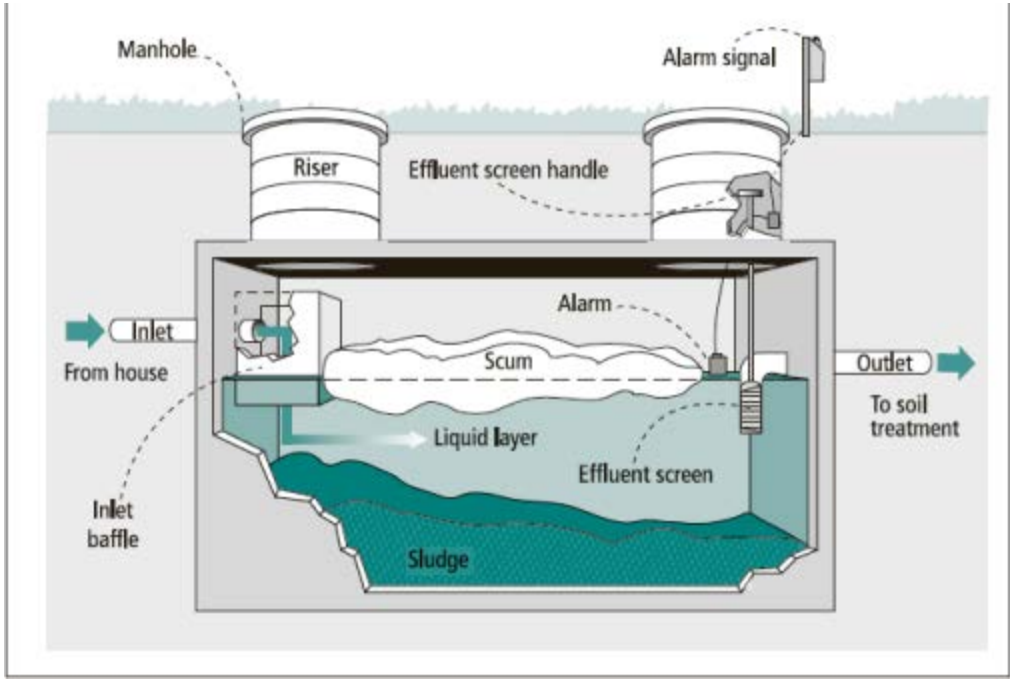

Septic Systems – Soil Absorption Field

- Uses soil to aerobically (oxygen present) treat sewage
- IN requires a I.R.S.S. consultants to describe the soil in the septic field area
- Soil Scientists are not geotechs; they describe soil characteristics which a County or State regulator uses to assign minimum design requirements
- Soil Scientists look at many characteristics, including:
  - Texture
  - Structure
  - Horizons
  - Redoximorphic features
- Soil must be native in-situ (virgin),

  not subject to ponding or flooding and not fill

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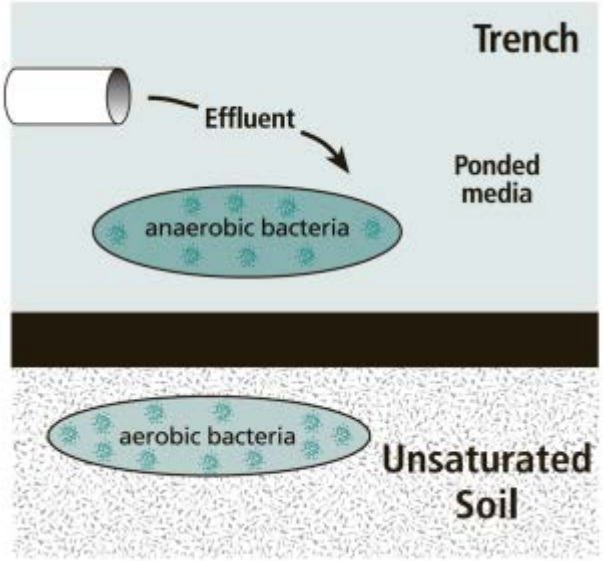

Septic Systems – Soil Absorption Field

- Four common system types:
  1. **Gravity subsurface trenches**; displacement loading of effluent to absorption trenches
     Most common
  2. **Pump Assisted subsurface trenches**; demand dosing of effluent to absorption trenches, including flood dose and pressure distribution
  3. **Elevated Sand Mound**; use of a pressurized distribution network to apply effluent evenly over a single pass sand filter. This higher quality effluent then enters in to the underlying native soil for final treatment.
  4. **Antiquated technologies**: drywells, sand filters (not acceptable)

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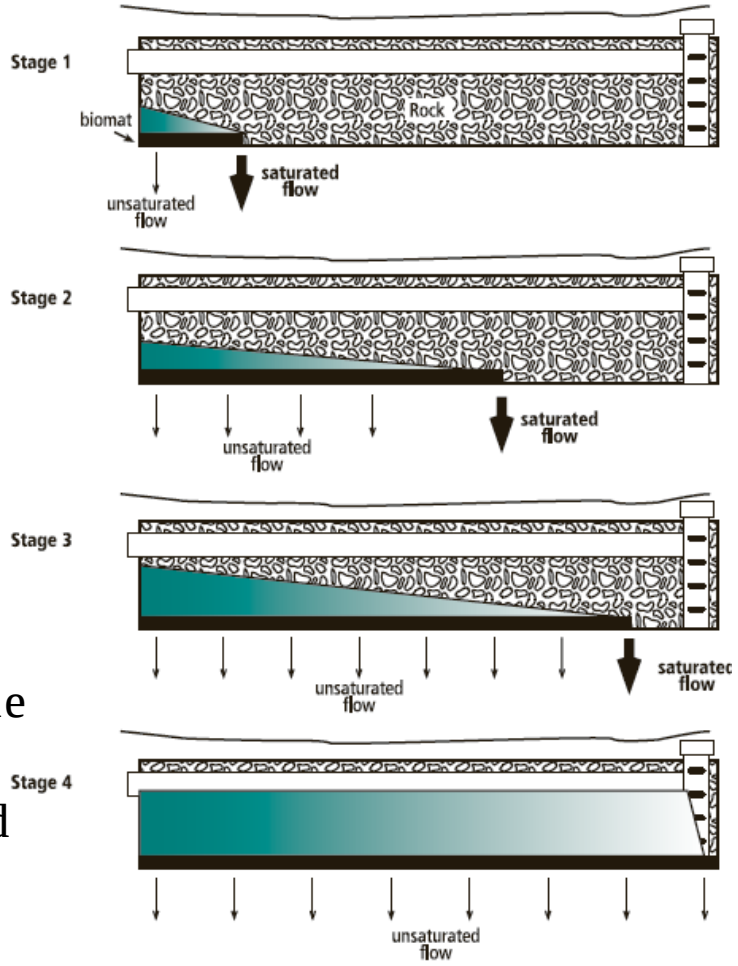
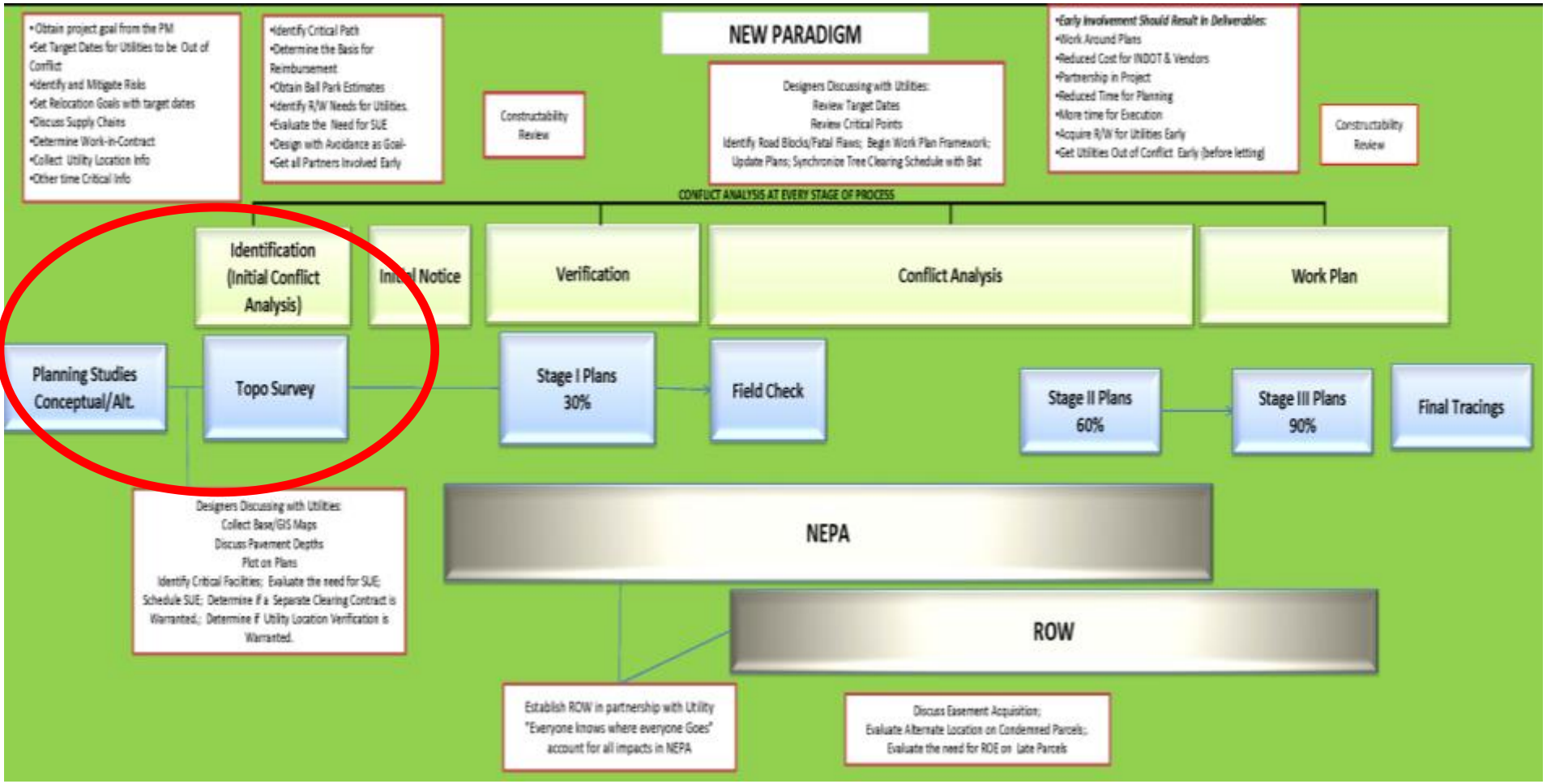


Effective Management of Well & Septic Systems

Don't wait until ROW appraisal to evaluate well & septic systems

Evaluate well and septic systems at scoping and initial utility coordination, before Stage 1

Effective Management of Well & Septic Systems



Best Practice Opinion

- Discovering impacts to well & septic systems during ROW process may jeopardize:
  - critical path schedule
  - project cost
  - feasibility of project
- Should be assessed during both the project scoping & initial utility coordination
- Scoping Engineer, Project Manager & Utility Coordinators should be responsible
- Could include existing well & septic research during survey

Best Practice Opinion

- Alternatives must evaluate impacts to well & septic systems
- Are ROW takes likely?
  - If not, then there's likely no impact
  - Watch for temporary ROW & construction limit impedance upon adjacent property green space
- Urban fringe regions commonly utilize well and septic systems
- Isolated commercial zones may have private mains which connect to public utilities
- Scope may change because of well & septic systems

Best Practice Opinion - Red Flag Rule of Thumb Septic Systems

- If property has:
  1. <1/2Ac of grass-space (trees & water features do not qualify, farmland does qualify);
  2. >15% elev. difference throughout any of the grass-space; **&**
  3. the grass-space is in a low-lying or a poorly drained area.

Then, a more detailed assessment is highly recommended.

- **KEY:** Obtaining a County or State Health Dept. construction permit is only way to know if a system can be replaced

Best Practice Opinion – Determining the Presence of Well & Septic Systems

- Tax records via GIS – easy, but may not be accurate
- Call County Health Department staff
  - http://www.in.gov/isdh/24822.htm
  - Will know regions of well & septic systems
  - Ask if County has old drawings of original systems on file
    - Records may not exist
    - The drawings are not precise, but give a general idea
- Well Caps should be visible
  - Presence of well caps does not guarantee septic systems
  - Hand dug wells will not have well caps

Best Practice Opinion – Determining the Presence of Well & Septic Systems

- Call State Health Dept. officials for commercial system inquiries
  - http://www.in.gov/isdh/24756.htm
- Talk to homeowners
  - Knowledge of system is very unreliable

Best Practice Opinion – Estimating Costs

$1,000,000 **?** = How much does it cost to impact well and septic systems?

- Wells are simpler to replace than septic systems
- Septic systems have many factors that are not obvious
- Exercise more detail than less
- Replacement well or septic system may not be possible
  - buy property or connect to municipal system

Best Practice Opinion – Estimating Costs

- Well replacement considerations:
  - Protect against up-gradient pollution sources
  - Maintain required set-backs to determine new location
  - Contact local well driller for cost – well drillers have a good idea of the depth of new wells
  - If a well is relocated on opposite side of house, then consider internal plumbing needs of relocation
  - Public drinking water wells have larger set-backs
- Typical new well cost = $4-8,000 dependent upon depth

Best Practice Opinion – Estimating Costs

- Septics – Start with bird's eye view:
  - Will impact only be 50' width along rear of 5 Ac lots? **OR**
  - Will impact be ¼ of property's grass space?
- Cost estimates should increase where:
  - Grass-space is small & fill was used to construct the lot
  - Topography is complex & highly variable
  - If neighboring systems have elevated sand mounds or pumped systems
  - Mucky, compacted, poorly drained soils exist
- Typically, new fields cannot be placed where old fields exist
  - Depends on depth of systems, soil types, etc.

Best Practice Opinion – Estimating Costs

- For INDOT projects or commercial properties, contact ISDH Staff:
  - http://www.in.gov/isdh/24756.htm
  - ISDH staff has 2 IRSS Soil Scientists
- For LPA projects or residential properties, contact County Health Staff:
  - http://www.in.gov/isdh/24822.htm
- Septic contractors can provide ball-park costs
  - Recommend IOWPA certified septic installers:

    http://www.iowpa.org/Certified Professionals.html
- Project cannot obtain bids until a construction permit is secured.

Best Practice Opinion – Estimating Costs

- Typical Septic System Cost Ranges:
  - Conventional gravity subsurface trenches = $4-8,000
  - Pump-assisted subsurface trenches= $6-15,000
  - Elevated sand mound = $12-20,000
- Complex lots may require Secondary Treatment = Additional $7-15,000
  - Operation and Maintenance contract required
- Internal plumbing may add cost, if:
  - Extraneous water sources need to be separated from septic system, or
  - Moving septic system to other side of house.
- Finished grade and landscaping may add cost, if:
  - Finished grade requires additional cover soil, or
  - System placement requires tree removal or vegetative cover established

Well Replacement

- Domestic Water Supply
  - Indiana Department of Natural Resources, Division of Water
  - 312 IAC 13-1 Water Well Drillers and Water Well Pump Installers
  - Mark Basch: 317-232-0154 and Monique Riggs: 317-234-1085
- Public Water System
  - 312 IAC 13-1-20 Public water supply well defined in 327 IAC 8-2-1
  - IDEM's *Are You A Public Water System?* (IDEM LINK)
  - Marc Hancock: 317-234-7434
- Local Health Departments may also have local ordinances
  - Presently 20 counties with well programs.

Well Replacement

- IDNR: http://www.in.gov/legislative/iac/T03120/A00130.PDF
  - Well setback of 5 ft. from structure
  - Abandonment requirements
  - Abandonment before or after 1988 have differing requirements
- Costs:
  - Domestic wells- IDNR : No fee. No permit. Licensed driller sets the timeline
  - Public Water Supply-IDEM: There are permits and fees. The timeline varies widely with the scope of the project
  - Local Health Department: Differing fees and permits, primarily domestic

General Septic Permitting Process

- Time from Soil Evaluation to Permit
  - Residential = 8-40+ days, dependent upon septic designer
  - Commercial = 40-60+ days, dependent upon septic designer & ISDH staff
- Septic Construction Season - Soil moisture dependent
- Typical soil evaluation cost per site
  - $300-600, but can be higher if a pit is needed
- Typical permit fee costs per site
  - Residential = $25-300; Commercial = $200-700
- ISDH staff may be able to support replacement efforts for INDOT funded projects

Septic System Permitting Process - Residential

1. Obtain a soil evaluation from IRSS certified consultant.

   Submit to Co. Health Dept. http://oisc.purdue.edu/irss/ http://www.in.gov/isdh/24822.htm
2. Co. Health Dept. reviews soil evaluation & application and issues minimum design specifications (including SLR (gpd/ft^2), size, type of system, depth, etc)
3. Septic designer lays out the proposed system on site & submits a drawing to the Co. Health Dept.
4. Co. Health Dept. reviews drawing and visits site, revisions may be requested and may take several iterations
5. Co. Health Dept. issues construction permit
6. Contractors provide quotes, contractor is selected, contractor installs system
7. Co. Health Dept. inspects the installed system, documents permit requirements were met & approves system for use

Septic System Permitting Process - Commercial

- Application process is similar to residential process, but information is submitted to the IN State Dept. of Health
- State's Plan Review Requirements and Process
  - http://www.in.gov/isdh/files/Plan_Review_Requirements_and_Process.pdf
- ISDH solicits project specific input from County Health Depts.
- For plan reviews which come through ISDH, the plans must be stamped by a professional engineer or architect currently registered in Indiana
- Check with the Co. Health Dept. local permits might still be required

Summary

- Well & septic systems should not be an after-thought of a roadway project, especially if ROW takes are required

- Well & septic systems can create critical path and budget problems for roadway projects if neglected until the ROW phase

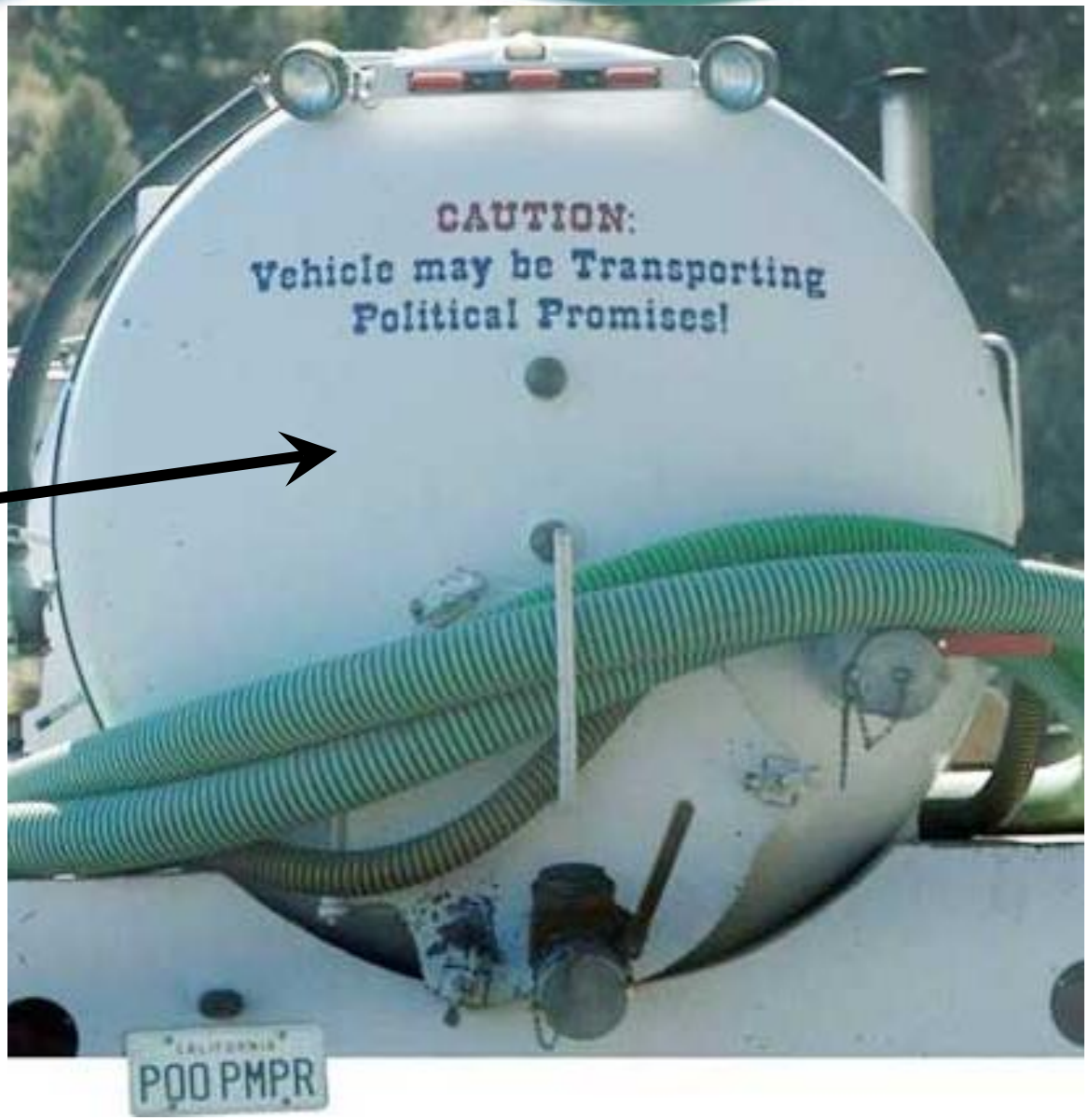
- Well & septic systems should be evaluated at the scoping phase and before Stage 1 plans are developed

Summary

- If significant grass-space will be impacted by a roadway project, then a detailed assessment of the well & septic systems is needed
- Sizing a replacement septic system involves many factors
- State Code requirements must be satisfied for well & septic replacements
- Replacing a septic system requires Health Dept. permits
  - 8-60+ days

QUESTIONS

SEPTIC PUMP TRUCK



RESOURCES

1. INDOT Utility Coordination http://www.in.gov/indot/2389.htm
2. Residential Septic Code 410 IAC 6-8.3 http://www.in.gov/isdh/files/410_IAC_6-8_3.pdf
3. Commercial Septic Code 410 IAC 6-10.1 http://www.in.gov/isdh/files/410_IAC_6-10-1.pdf
4. Indiana State Department of Health – Onsite http://www.in.gov/isdh/23283.htm
5. Indiana State Department of Health Contacts http://www.in.gov/isdh/24756.htm
6. County Health Department Contacts http://www.in.gov/isdh/24822.htm
7. Indiana Onsite Wastewater Prof. Assoc. (septic contractors) http://www.iowpa.org/
8. Indiana Registry of Soil Scientists http://oisc.purdue.edu/irss/
9. Purdue's Septic Fact Sheets https://www.extension.purdue.edu/henv/Septicsystems.htm
10. Pump Assisted Indiana Code Design Tool http://www.stjosephcountyindiana.com/departments/sjchd/spreadsheets.htm
11. USEPA Onsite Wastewater Treatment Design Manual 2002
12. Presenters:

    Matt Gavelek – Septic System & Roadway Consultant: LINK

    Matthew Witt – INDOT FW District ROW – mwitt@indot.in.gov

    Denise Wright – ISDH – Training Officer

CITATIONS

1. Onsite Sewage Treatment Program, University of Minnesota. 2011. Manual for Septic System Professionals in Minnesota, 2nd Ed. St. Paul, MN.
2. Media Gallery
3. USEPA. (2002) Onsite wastewater treatment systems manual. EPA/625/R-00/008.
4. FHWA. (2001) Planning for Transportation in Rural Areas. 04705r02 090701-10.47.
5. INDOT. Aerial map of U.S. 31 Kokomo Project. 2012. US 31 Kokomo Maps. Web. Feb 2016.
6. USEPA, Private Wells. November 17, 2015, Web. Feb 2016.
7. NGWA. (2016) Groundwater Use in Indiana. Web. Feb 2016.
8. INDOT. Utility Coordination. Utility Relocation Process Flow Chart. 6/16/2018. Web. Feb 2016.