Webcast Sponsored by EPA's Watershed Academy

TWIST: The Wastewater Information System Tool

for Managing Onsite and Clustered (Decentralized) Wastewater Treatment Systems

Barry Tonning and Sabu Paul, Tetra Tech
Steve Hogye, US EPA

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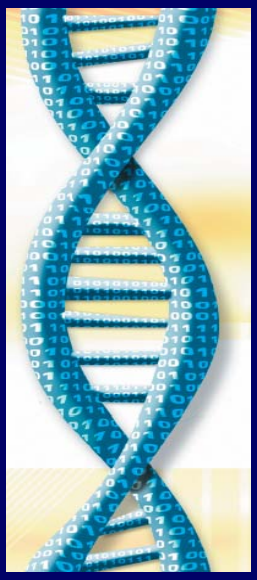
Topics for today's webcast

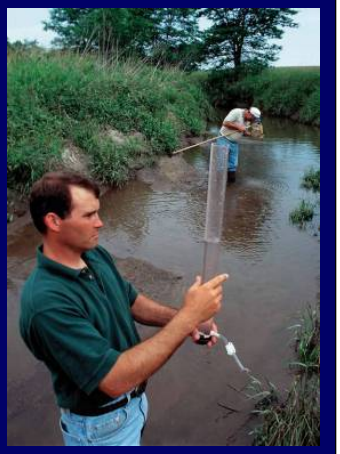
- Overview of watershed and wastewater management issues
- The need for treatment system inventory information
- Accessing and using TWIST
- Other US EPA tools for wastewater management



2

Condition of U.S. surface waters

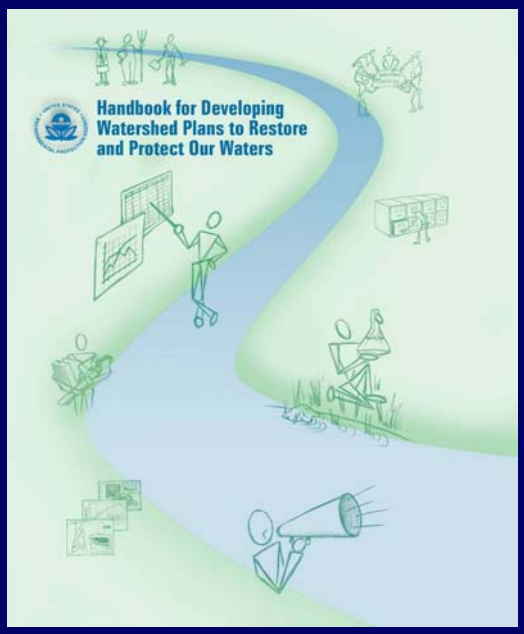
- Pollutant-impaired waters include* :
  - 45% of assessed rivers and streams
  - 47% of assessed lake acres
  - 32% of assessed bay and estuarine square miles
- Polluted (nonpoint) runoff is mostly to blame
- Chief causes are nutrients, pathogens, and sediment



*National Water Quality Inventory, 2002 Reporting Cycle. About 30% of U.S. waters were assessed by the states for this report.

3

Watershed Planning Handbook



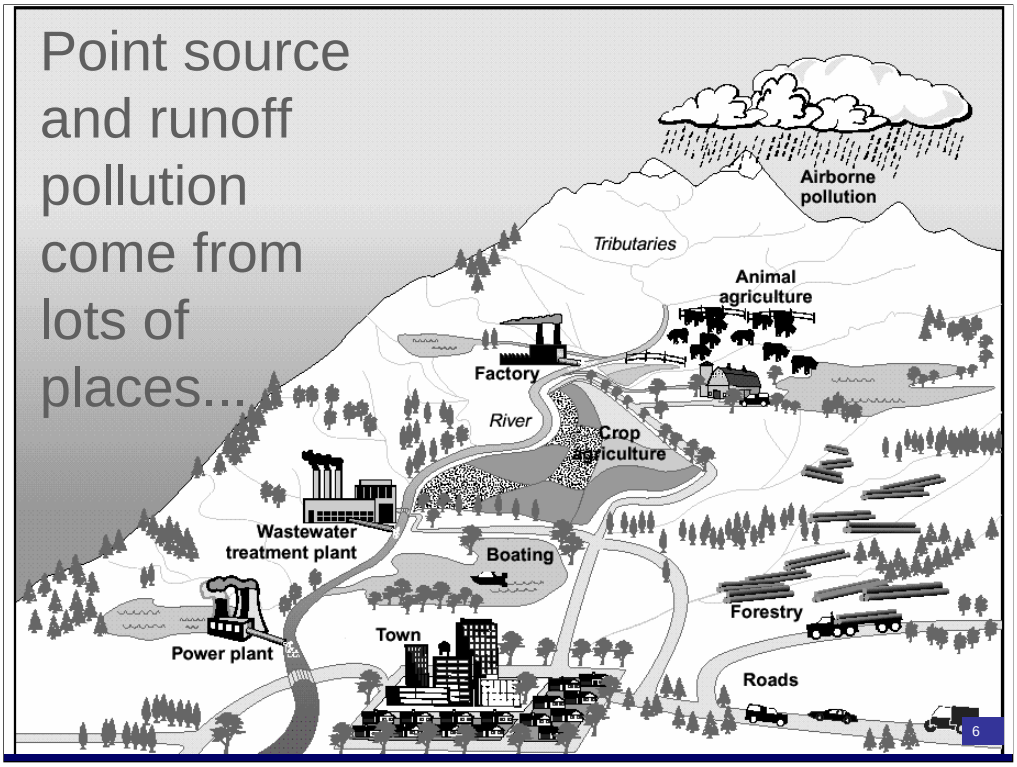
http://www.epa.gov/owow/nps/watershed_handbook/

4

Watershed planning steps

- Build partnerships
- Assess the watershed
- Identify goals & BMPs
- Create implementation plan
- Implement the plan
- Measure progress, adapt

5


Point source and runoff pollution come from lots of places...
Airborne pollution
Tributaries
Animal agriculture
Factory
River
Crop agriculture
Wastewater treatment plant
Boating
Forestry
Town
Power plant
Roads
6

Wastewater pollutants of concern

- Pathogens – bacteria & viruses mainly; plus protozoa, worm eggs
- Nitrogen – causes algal growth in nitrogen-limited (mostly coastal) waters; nitrate can cause “blue baby” syndrome
- Phosphorus – causes algal growth in P-limited (mostly inland fresh) waters
- Others – pharmaceuticals, cleaners, solvents, & other toxics (most of which affect treatment processes)

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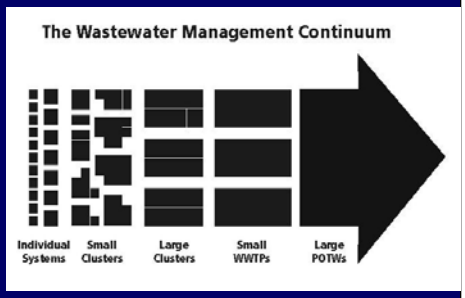
Sewage treatment

- What are the options?
  - Individual onsite “septic” or advanced wastewater treatment systems
  - Clustered systems with soil infiltration
  - “Package” plants with ditch/stream discharge
  - Centralized plant with lake/river/ocean discharge



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Centralized treatment plants

- Most discharge to rivers, lakes, streams, ocean, & need state/federal NPDES permit
- Some older plants have CSOs or SSOs
- New regulations forcing higher treatment levels
- Upgrades & expanded collection systems costly
- Local opposition to siting some new plants

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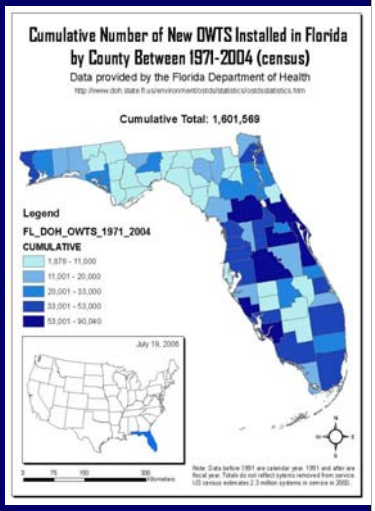
Decentralized soil-discharging systems



- Individual systems
  - Septic tank with gravity flow
  - Tank with pressure dosing
  - Advanced systems with dosing
- Clustered systems
  - Each home has a tank
  - Effluent collected via gravity or pumped
  - Multiple options for treatment facility
  - Dosed or gravity flow dispersal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Integrated wastewater/stormwater management & low-impact development

- Conservation of natural drainage system, trees & vegetation
- Clustered wastewater treatment
- Open space / greenways provide for wastewater & stormwater dispersal

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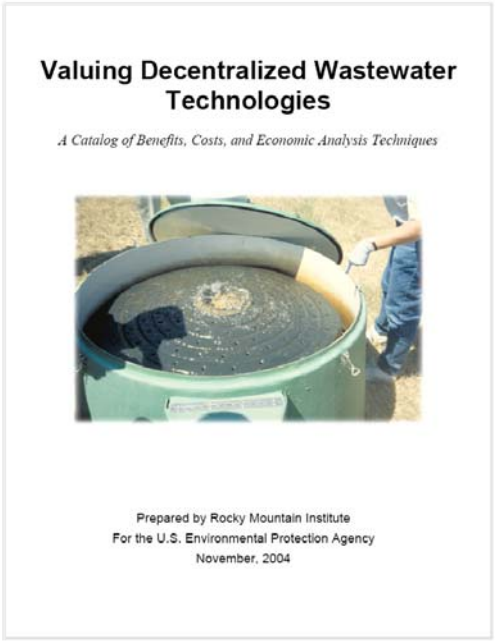
Conserving natural drainages, trees and other vegetation, and soils is the first step in low impact development. Trees and natural forest cover in the Pacific Northwest are terrific “sponges” for storing and slowly releasing stormwater. Comprehensive land use planning, watershed or basin planning, habitat conservation plans, and stream and wetland buffers are good tools to identify and set aside natural areas within a community and on an individual site.

Once conservation areas are established for each site, the designer can then work within the developable area envelope and evaluate the effects of design options on these areas. A significant portion of trees and other vegetation should be left in a natural state and not developed.

Rocky Mountain Institute Cost/Benefit Analysis of Centralized and Decentralized Wastewater Options

www.rmi.org



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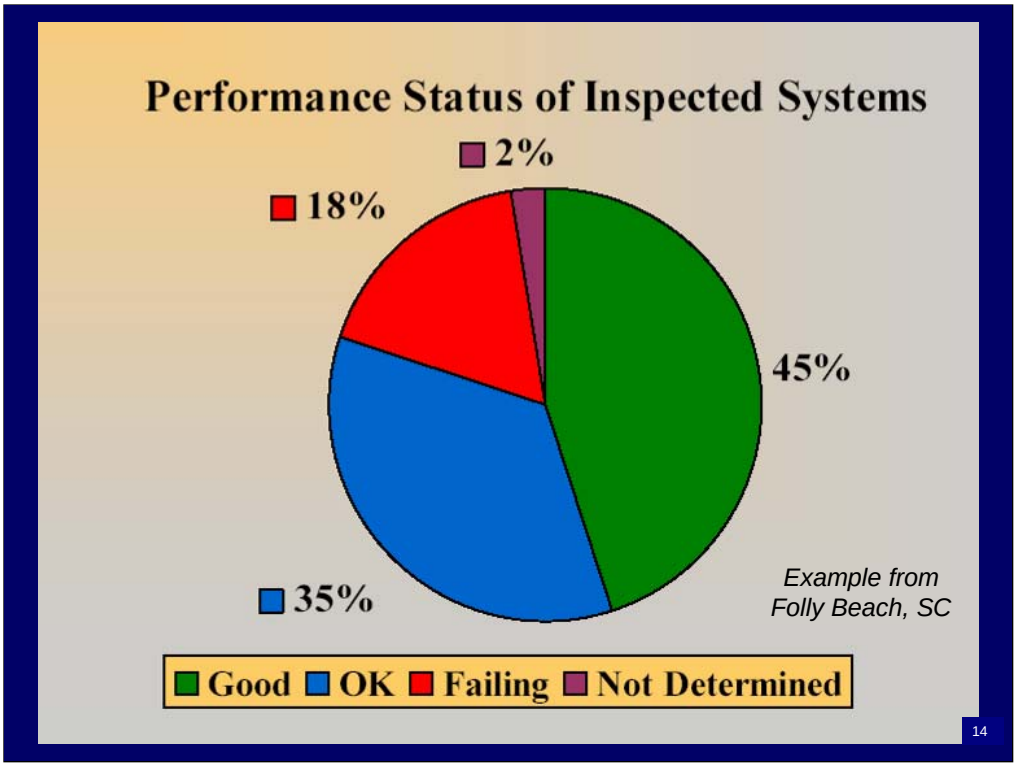
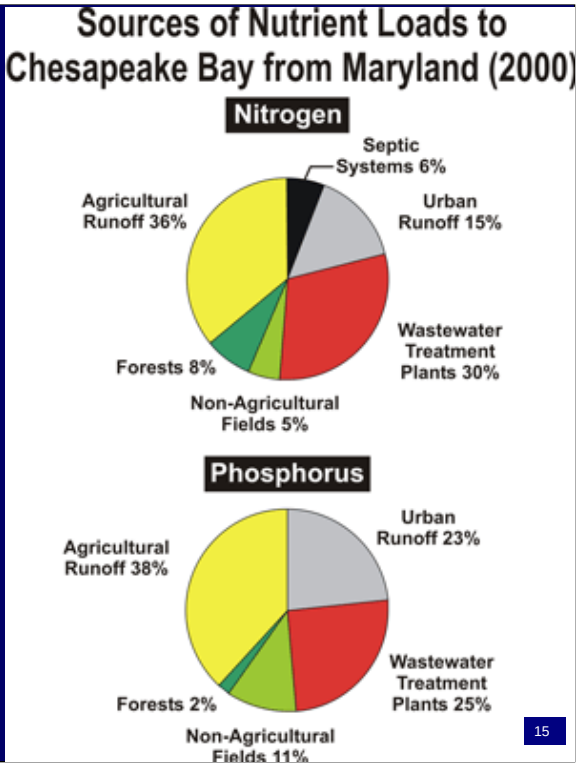

Performance Status of Inspected Systems
2%
18%
45%
35%
Example from
Folly Beach, SC
Good
OK
Failing
Not Determined
14

Localized impacts can be significant

Landscape scale effects can be outweighed by other factors



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U.S. Environmental Protection Agency
STEPL - Spreadsheet Tool for Estimating Pollutant Load
Recent Additions | Contact Us | Print Version
Search:
GO
EPA Home > STEPL
Home
Access STEPL Data Server for Input Data
Models and Documentation
Welcome to STEPL
http://it.tetratech-ffx.com/stepl
Spreadsheet Tool for Estimating Pollutant Load (STEPL) employs simple algorithms to calculate nutrient and sediment loads from different land uses and the load reductions that would result from the implementation of various best management practices (BMPs).STEPL provides a user-friendly Visual Basic (VB) interface to create a customized spreadsheet-based model in Microsoft (MS) Excel. It computes watershed surface runoff; nutrient loads, including nitrogen, phosphorus, and 5-day biological oxygen demand (BOD5); and sediment delivery based on various land uses and management practices. For each watershed, the annual nutrient loading is calculated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as the land use distribution and management practices. The annual sediment load (sheet and rill erosion only) is calculated based on the Universal Soil Loss Equation (USLE) and the sediment delivery ratio. The sediment and pollutant load reductions that result from the implementation of BMPs are computed using the known BMP efficiencies.
Region 5 model is an Excel workbook that provides a gross estimate of sediment and nutrient load reductions from the implementation of agricultural and urban BMPs. The algorithms for non-urban BMPs are based on the "Pollutants controlled: Calculation and documentation for Section 319 watersheds training manual" (Michigan Department of Environmental Quality, June 1999). The algorithms for urban BMPs are based on the data and calculations developed by Illinois EPA. Region 5 model does not estimate pollutant load reductions for dissolved constituents.
Questions? Please contact:
STEPL E-mail support
Telephone support (EPA and EPA clients only): (703)385-6000 (Ting Dai or Henry Manguerra)
Developed for EPA Office of Water
Grants Reporting and Tracking System
By Tetra Tech, Inc.
Last revised: 7/3/2003
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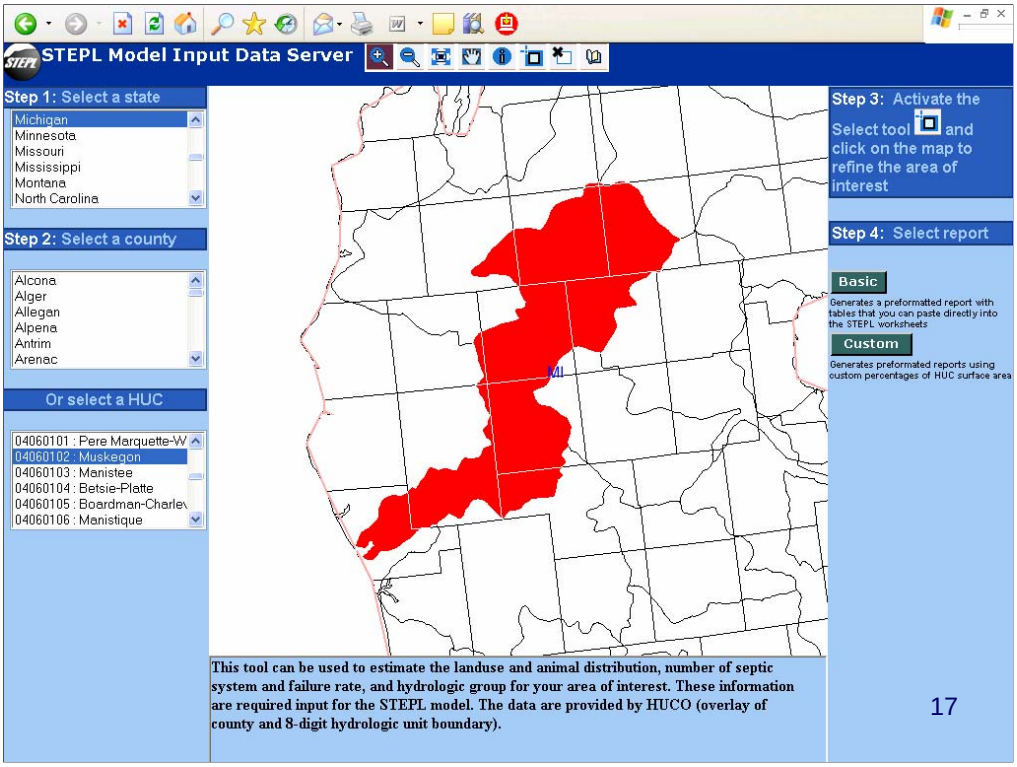
STEPL Model Input Data Server
Step 1: Select a state
Michigan
Minnesota
Missouri
Mississippi
Montana
North Carolina
Step 2: Select a county
Alcona
Alger
Allegan
Alpena
Antrim
Arenac
Or select a HUC
04060101 : Pere Marquette-W
04060102 : Muskegon
04060103 : Manistee
04060104 : Betsie-Platte
04060105 : Boardman-Charlev
04060106 : Manistique
MI
Step 3: Activate the Select tool and click on the map to refine the area of interest
Step 4: Select report
Basic
Generates a preformatted report with tables that you can paste directly into the STEPL worksheets
Custom
Generates preformated reports using custom percentages of HUC surface area
This tool can be used to estimate the landuse and animal distribution, number of septic system and failure rate, and hydrologic group for your area of interest. These information are required input for the STEPL model. The data are provided by HUCO (overlay of county and 8-digit hydrologic unit boundary).
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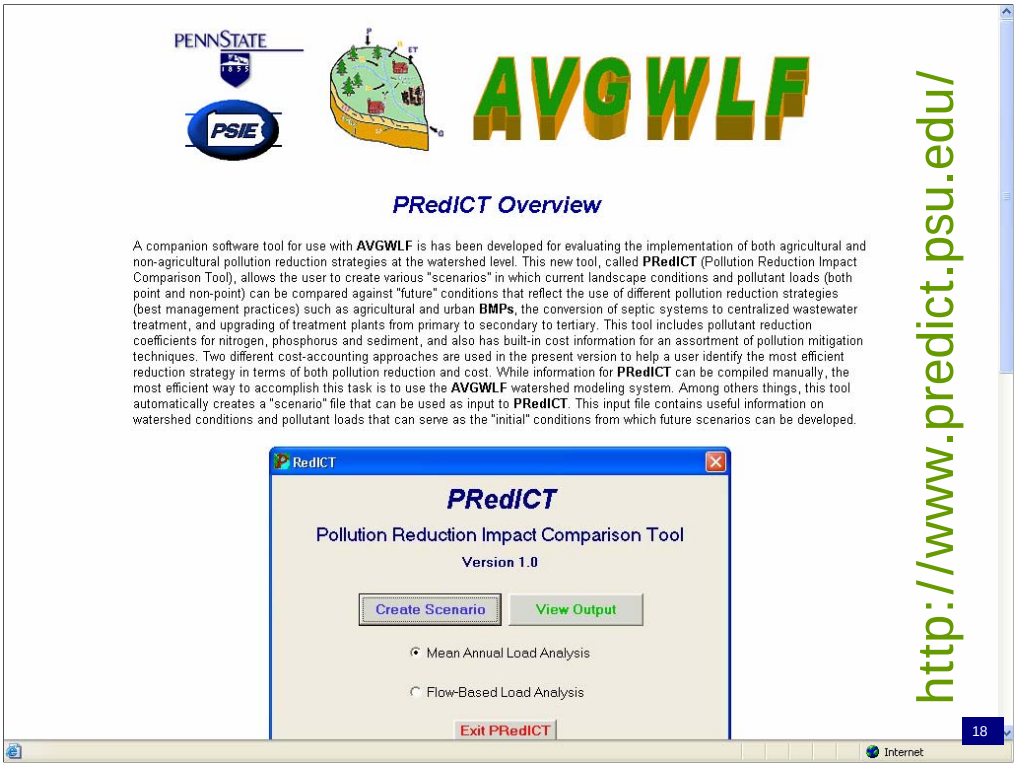
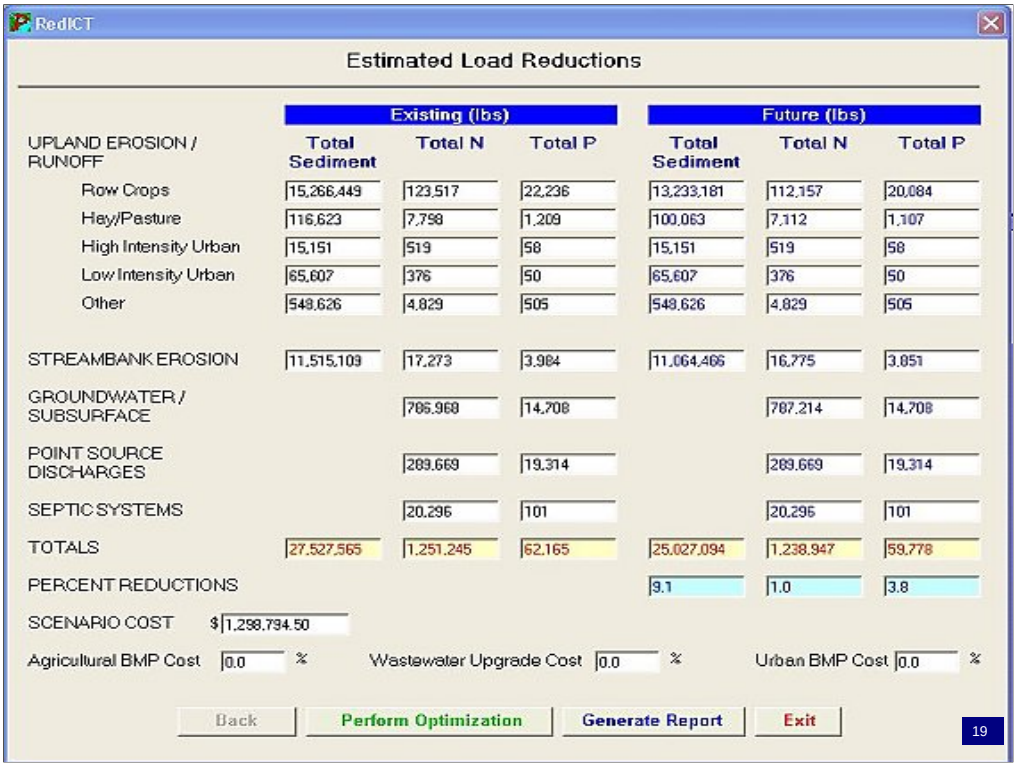

PENNSTATE
PSIE
AVGWLF
PRedICT Overview
A companion software tool for use with AVGWLF is has been developed for evaluating the implementation of both agricultural and non-agricultural pollution reduction strategies at the watershed level. This new tool, called PRedICT (Pollution Reduction Impact Comparison Tool), allows the user to create various "scenarios" in which current landscape conditions and pollutant loads (both point and non-point) can be compared against "future" conditions that reflect the use of different pollution reduction strategies (best management practices) such as agricultural and urban BMPs, the conversion of septic systems to centralized wastewater treatment, and upgrading of treatment plants from primary to secondary to tertiary. This tool includes pollutant reduction coefficients for nitrogen, phosphorus and sediment, and also has built-in cost information for an assortment of pollution mitigation techniques. Two different cost-accounting approaches are used in the present version to help a user identify the most efficient reduction strategy in terms of both pollution reduction and cost. While information for PRedICT can be compiled manually, the most efficient way to accomplish this task is to use the AVGWLF watershed modeling system. Among others things, this tool automatically creates a "scenario" file that can be used as input to PRedICT. This input file contains useful information on watershed conditions and pollutant loads that can serve as the "initial" conditions from which future scenarios can be developed.
RedICT
PRedICT
Pollution Reduction Impact Comparison Tool
Version 1.0
Create Scenario
View Output
Mean Annual Load Analysis
Flow-Based Load Analysis
Exit PRedICT
http://www.predict.psu.edu/
18
Internet


RedICT
Estimated Load Reductions
Existing (lbs)
Future (lbs)
UPLAND EROSION / RUNOFF
Total Sediment
Total N
Total P
Total Sediment
Total N
Total P
Row Crops
15,266,449
123,517
22,236
13,233,181
112,157
20,084
Hay/Pasture
116,623
7,798
1,209
100,063
7,112
1,107
High Intensity Urban
15,151
519
58
15,151
519
58
Low Intensity Urban
65,607
376
50
65,607
376
50
Other
548,626
4,829
505
548,626
4,829
505
STREAMBANK EROSION
11,515,109
17,273
3,984
11,064,466
16,775
3,851
GROUNDWATER / SUBSURFACE
786,968
14,708
787,214
14,708
POINT SOURCE DISCHARGES
289,669
19,314
289,669
19,314
SEPTIC SYSTEMS
20,296
101
20,296
101
TOTALS
27,527,565
1,251,245
62,165
25,027,094
1,238,947
59,778
PERCENT REDUCTIONS
9.1
1.0
3.8
SCENARIO COST
$1,298,794.50
Agricultural BMP Cost
0.0
%
Wastewater Upgrade Cost
0.0
%
Urban BMP Cost
0.0
%
Back
Perform Optimization
Generate Report
Exit
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Managing onsite/clustered systems

- Management for existing systems
  - Assess surface & groundwater quality
  - Assess treatment systems & related risks
  - Find & fix problems
- New system mgmt
  - Planning & design
  - Construction
  - O&M
- System inventories are needed!

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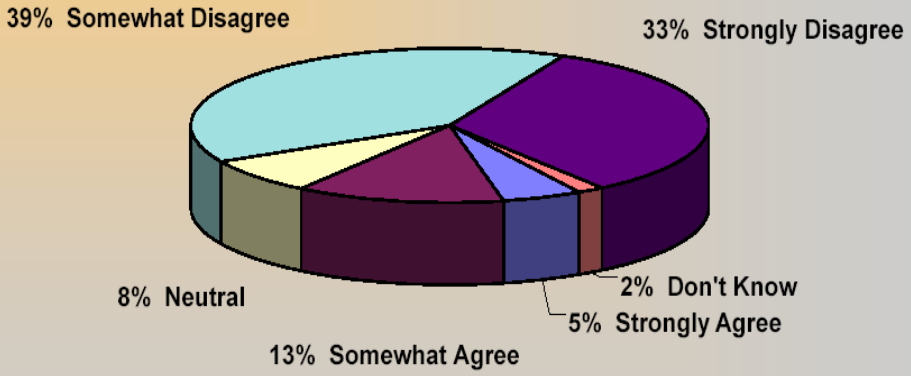
Most Homeowners with Septic Systems are Knowledgeable about Septic System Operation and Maintenance



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General management approach

- Management intensity is tied to risk
  - Sensitivity of receiving water, local setting
  - Complexity & density of treatment systems
- Public/private mgmt entity is necessary!
  - Example: sanitation district
  - Maintenance contracts
  - Operating permits
  - 3rd party operation/ownership
- Public agencies provide regulatory oversight

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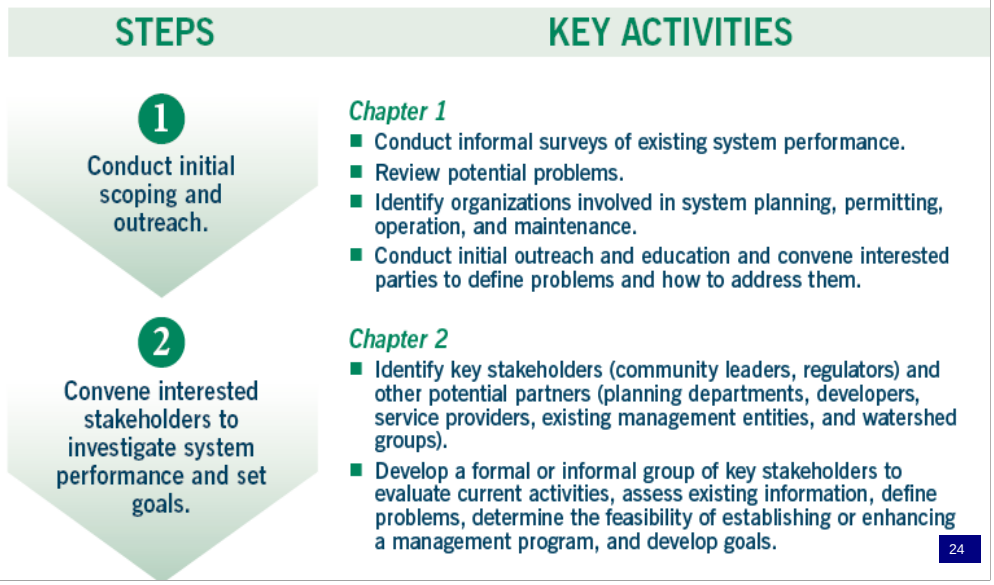
US EPA resources at www.epa/gov/owm/septic

- Design guidance
- Management guidelines
- Case studies
- Technology fact sheets
- State and local examples
- Research, demonstration projects, and other tools

US EPA Management Handbook

Figure 1. *Process for developing a decentralized wastewater management program*



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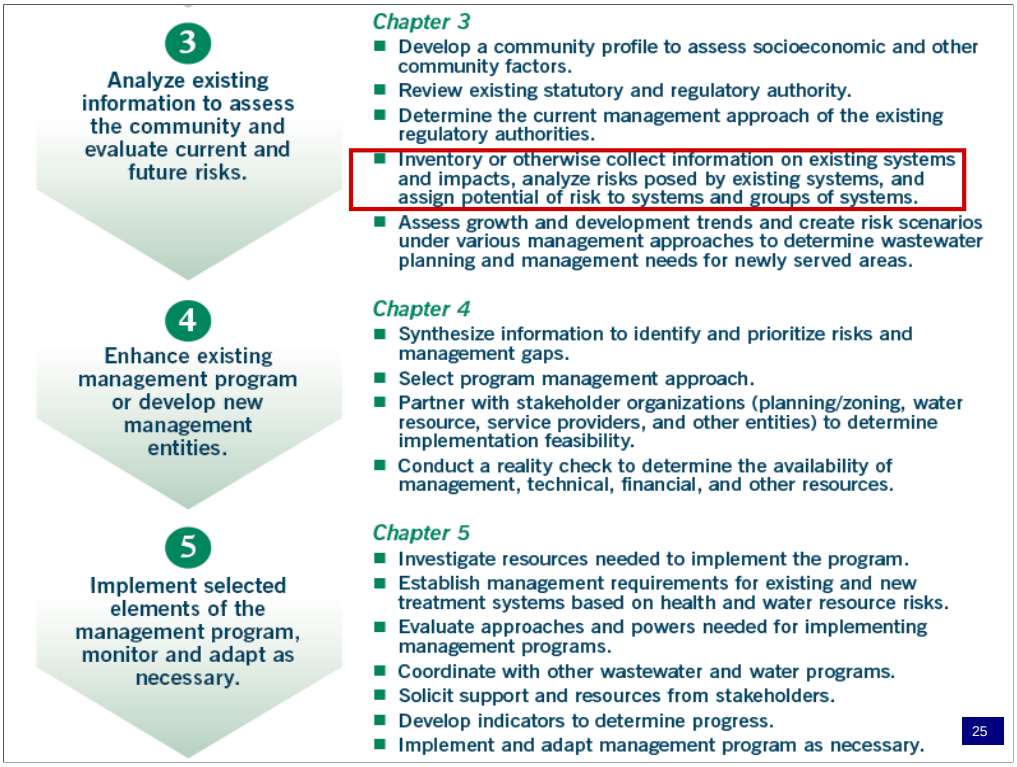
3
Analyze existing information to assess the community and evaluate current and future risks.
Chapter 3
Develop a community profile to assess socioeconomic and other community factors.
Review existing statutory and regulatory authority.
Determine the current management approach of the existing regulatory authorities.
Inventory or otherwise collect information on existing systems and impacts, analyze risks posed by existing systems, and assign potential of risk to systems and groups of systems.
Assess growth and development trends and create risk scenarios under various management approaches to determine wastewater planning and management needs for newly served areas.
4
Enhance existing management program or develop new management entities.
Chapter 4
Synthesize information to identify and prioritize risks and management gaps.
Select program management approach.
Partner with stakeholder organizations (planning/zoning, water resource, service providers, and other entities) to determine implementation feasibility.
Conduct a reality check to determine the availability of management, technical, financial, and other resources.
5
Implement selected elements of the management program, monitor and adapt as necessary.
Chapter 5
Investigate resources needed to implement the program.
Establish management requirements for existing and new treatment systems based on health and water resource risks.
Evaluate approaches and powers needed for implementing management programs.
Coordinate with other wastewater and water programs.
Solicit support and resources from stakeholders.
Develop indicators to determine progress.
Implement and adapt management program as necessary.
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Questions?

Barry Tonning, Tetra Tech, Inc.

The Wastewater Information System Tool (TWIST)

Part 2

TWIST Application

January 16, 2007

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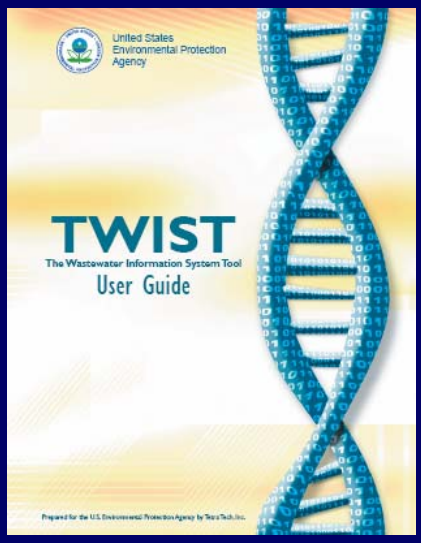
Overview

- TWIST Application Overview
- Data Entry Workflow
- Functionalities
- System Implementation



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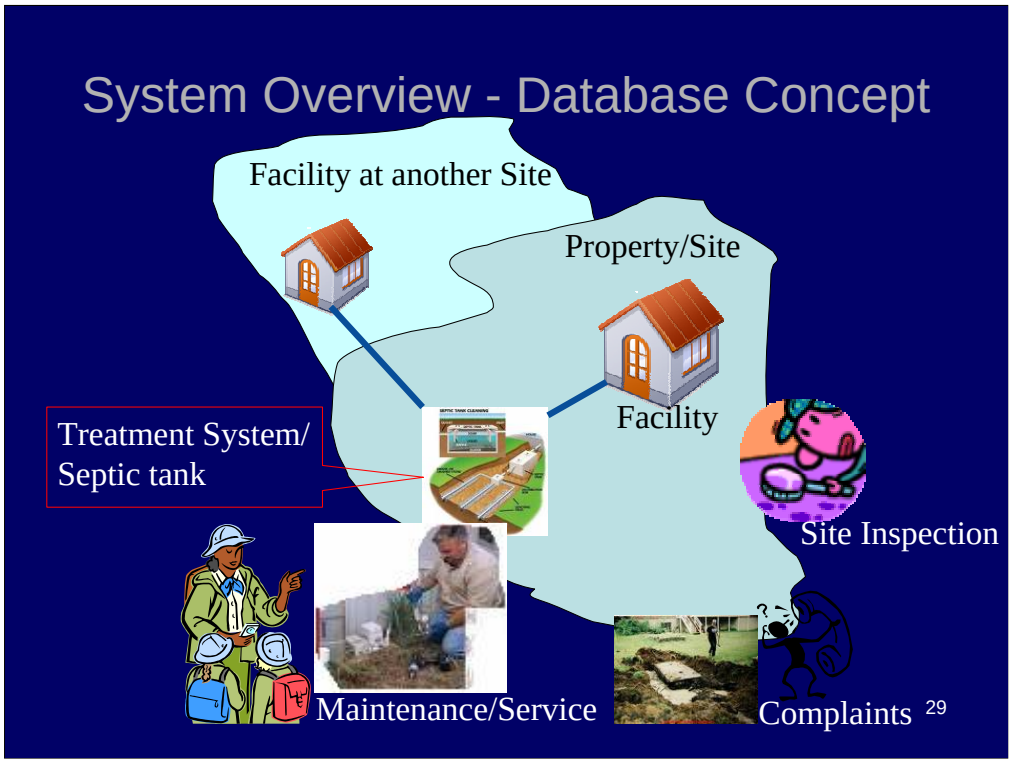
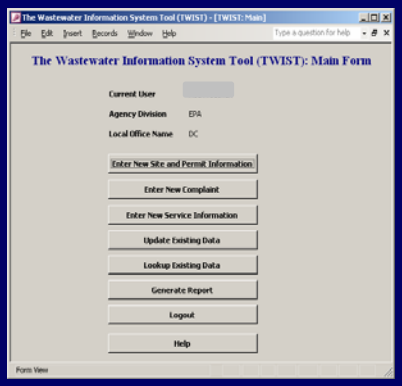
System Overview - Database Concept



System Overview – contd.



- MS Access database developed with EPA's guidance to help local, county, and state health departments
  - adaptable tool for tracking and managing onsite and clustered wastewater treatment systems
- Asset management system or Inventory tool
  - To enter new data
  - To update existing data
  - To view existing data and
  - To view report (sample available)

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Developed for EPA to help local, county, and state health departments

-It is a tool to track and manage onsite and clustered wastewater treatment systems.

-Any agency and take the tool, adapt it to their own requirement and use it.

The database is structured to inventory all the relevant information about the wastewater treatment systems such as,

General Site Information – Ownership information and property details

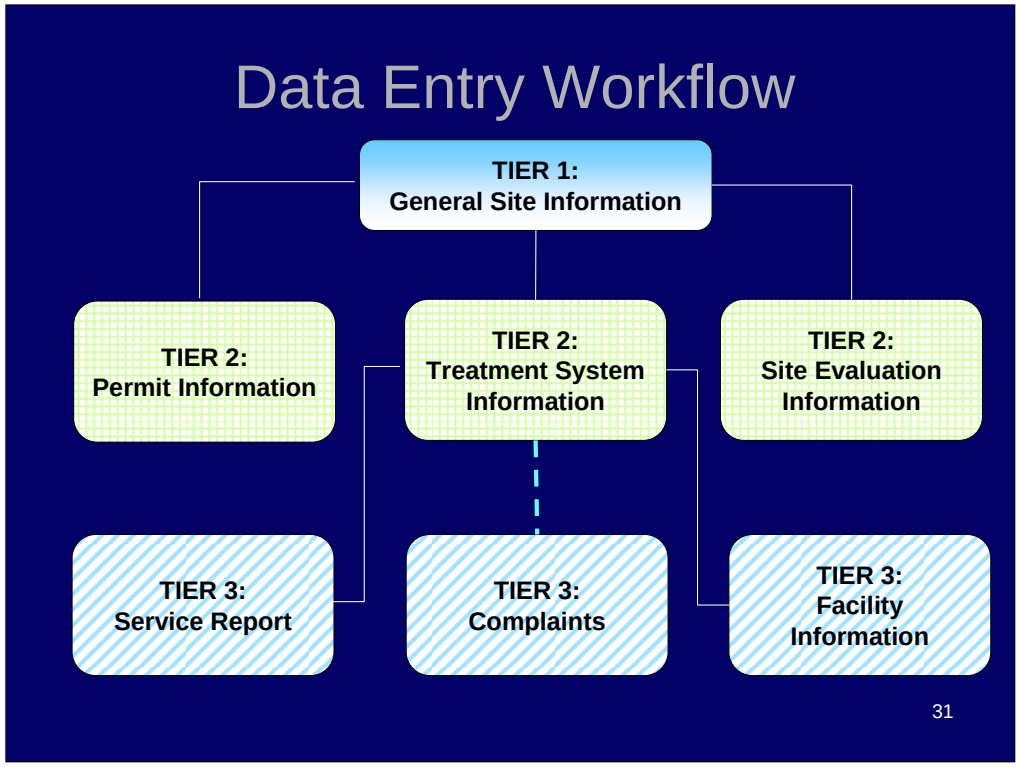
Permit Information -

Facility Served

Site Evaluation Information,

Treatment System, and

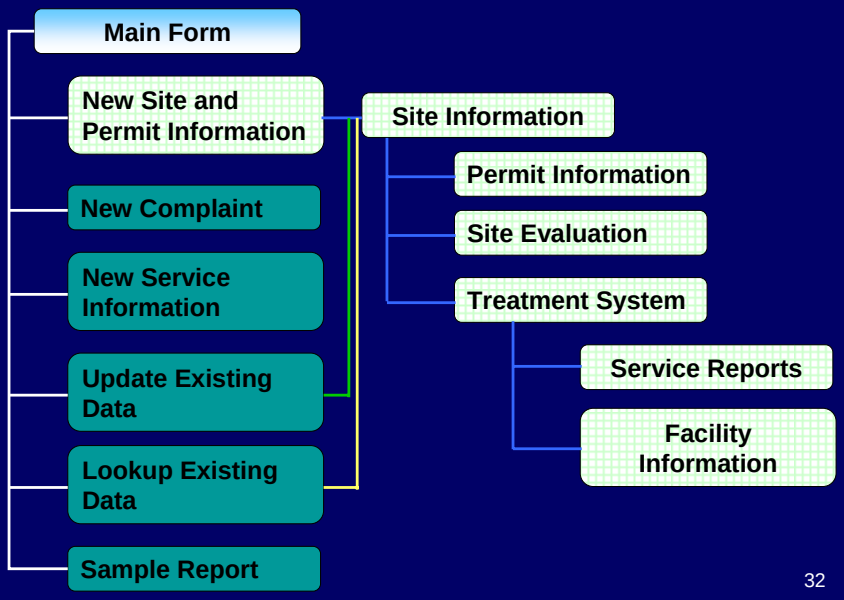
Service Reports.



Data is divided into three categories: Tier 1, Tier 2 and Tier3. Nearly all data in TWIST is dependent upon the data entered in *General Site Information* labeled TIER 1.

Until data are entered in the *General Site Information* data form, data regarding permits, site details, and the wastewater treatment system (represented by the TIER 2 *Permit Information, Site Evaluation Information*, and*Treatment System Information* boxes, respectively) cannot be entered. Likewise, TIER 3 data can be entered only after the requisite TIER 2 data are entered.

Data Entry Workflow – contd.



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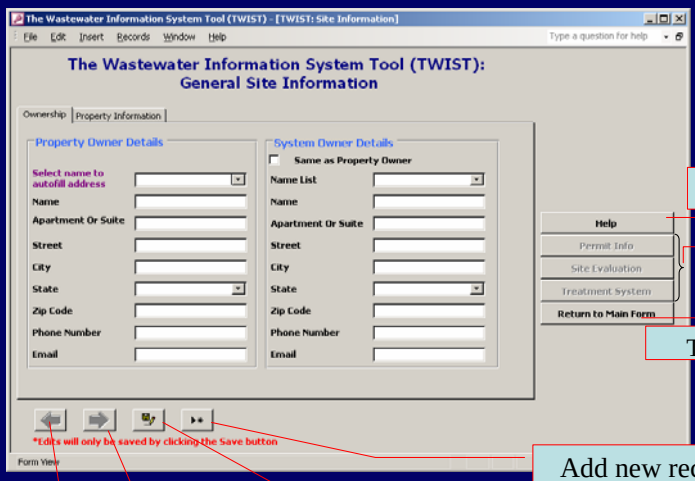
Navigation



Help Document

To related forms

To Main Form

Add new record

Save record

Next record

Previous record

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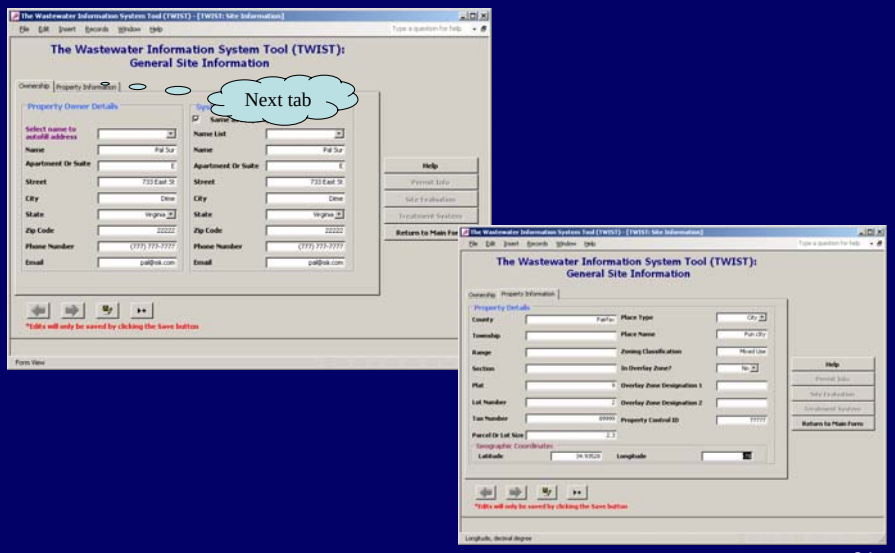
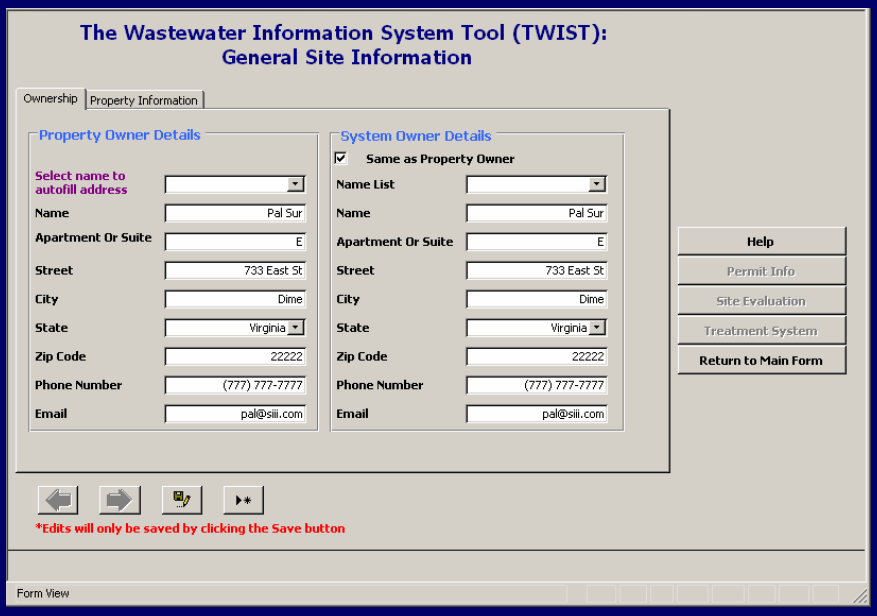
Tabbed forms



General Site Information: Ownership



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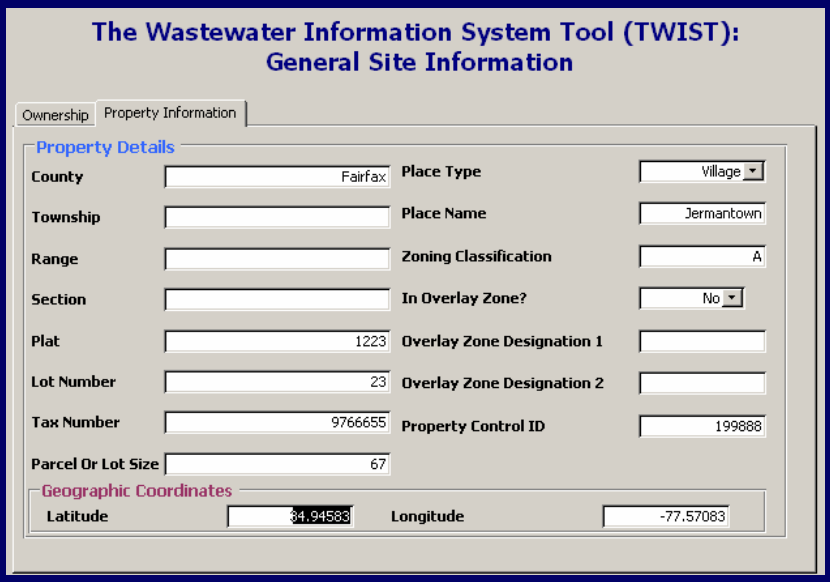
The tool is a template containing all relevant data fields to inventory the wastewater systems. However, the end users can modify appropriately to fit to their specific needs.

Contains required interfaces to enter new data, update existing data, and view existing data. The database includes a sample report and the users can add more reports to fit to their requirement.

General Site Information: Property Information



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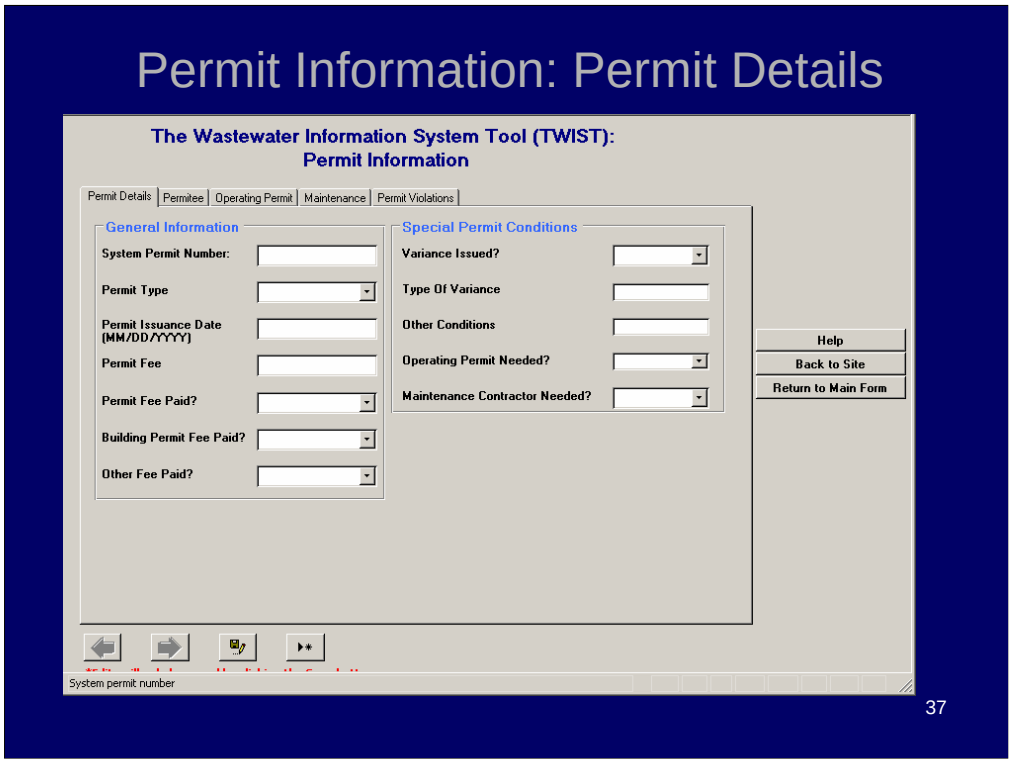

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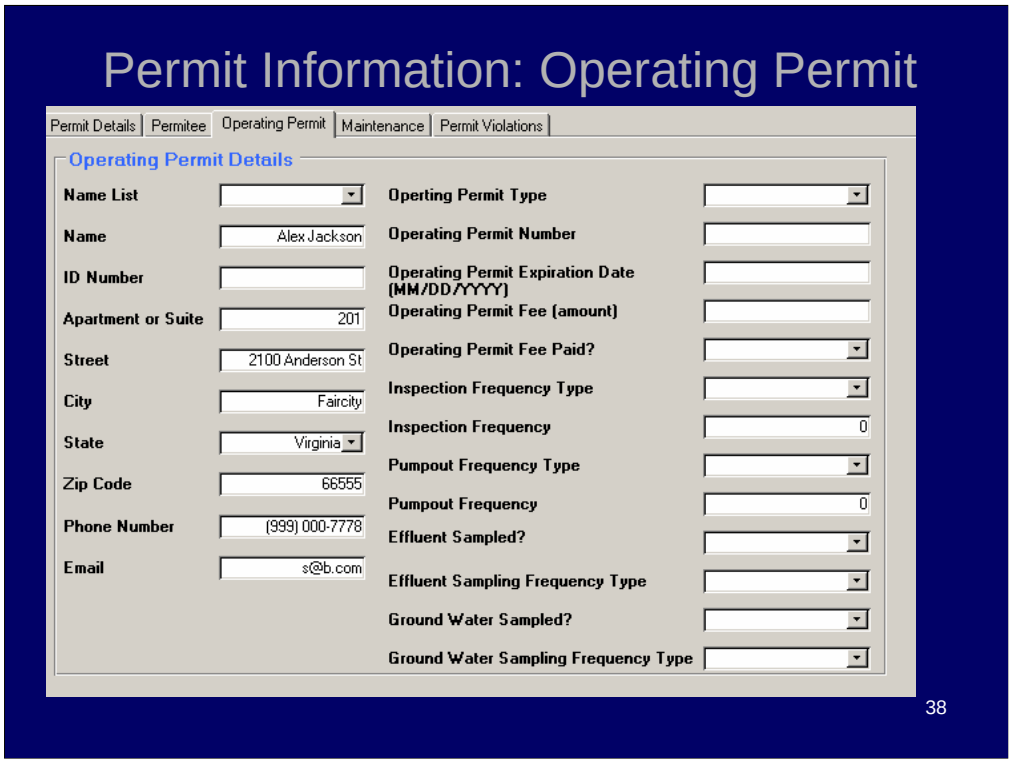

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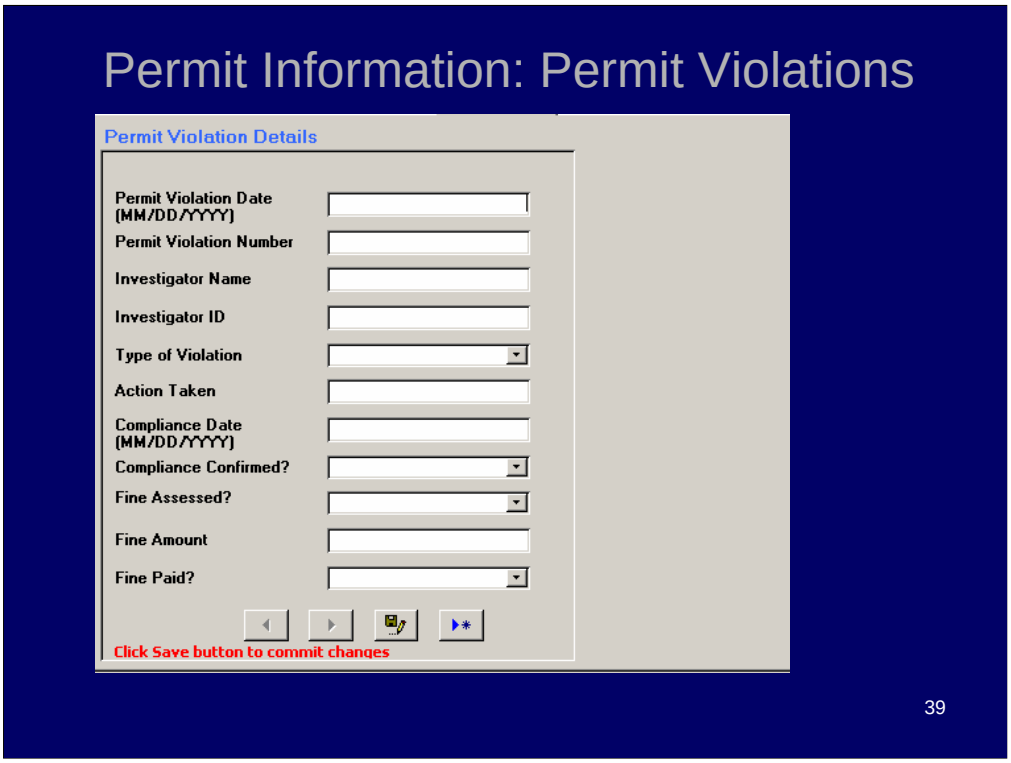

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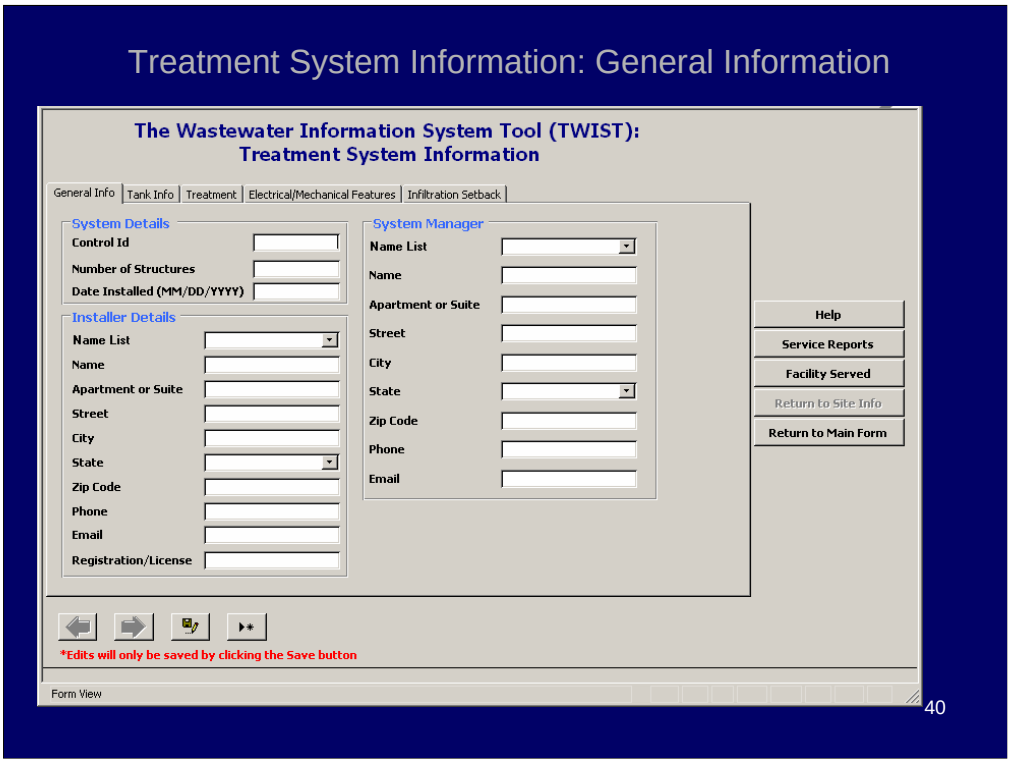

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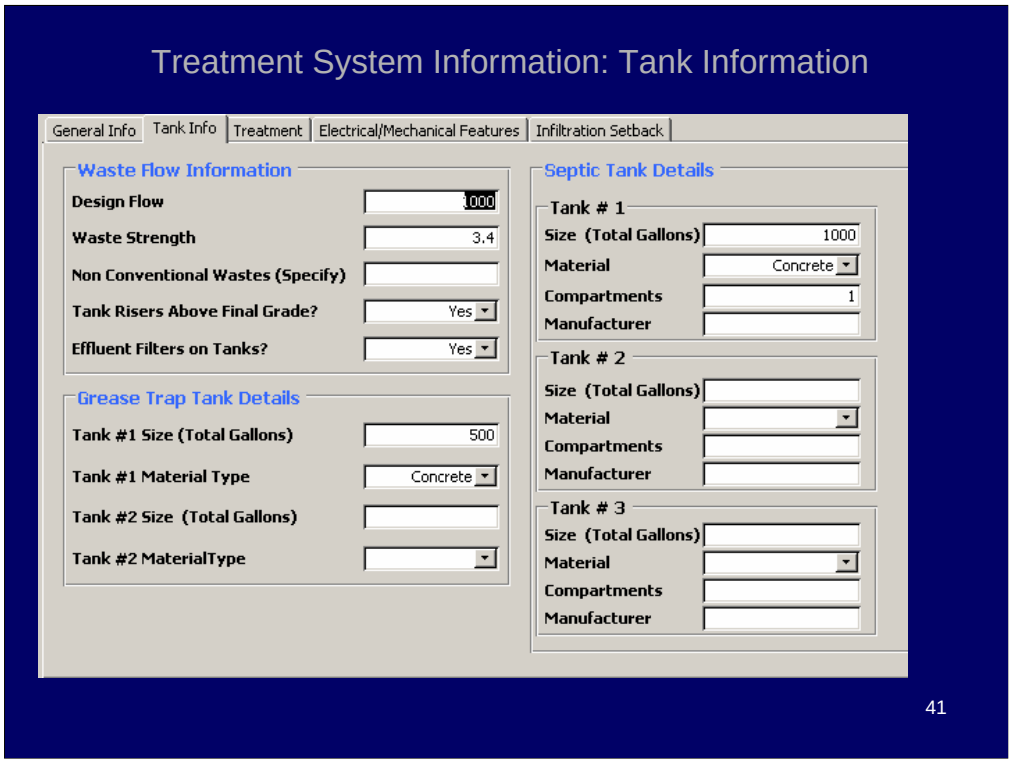

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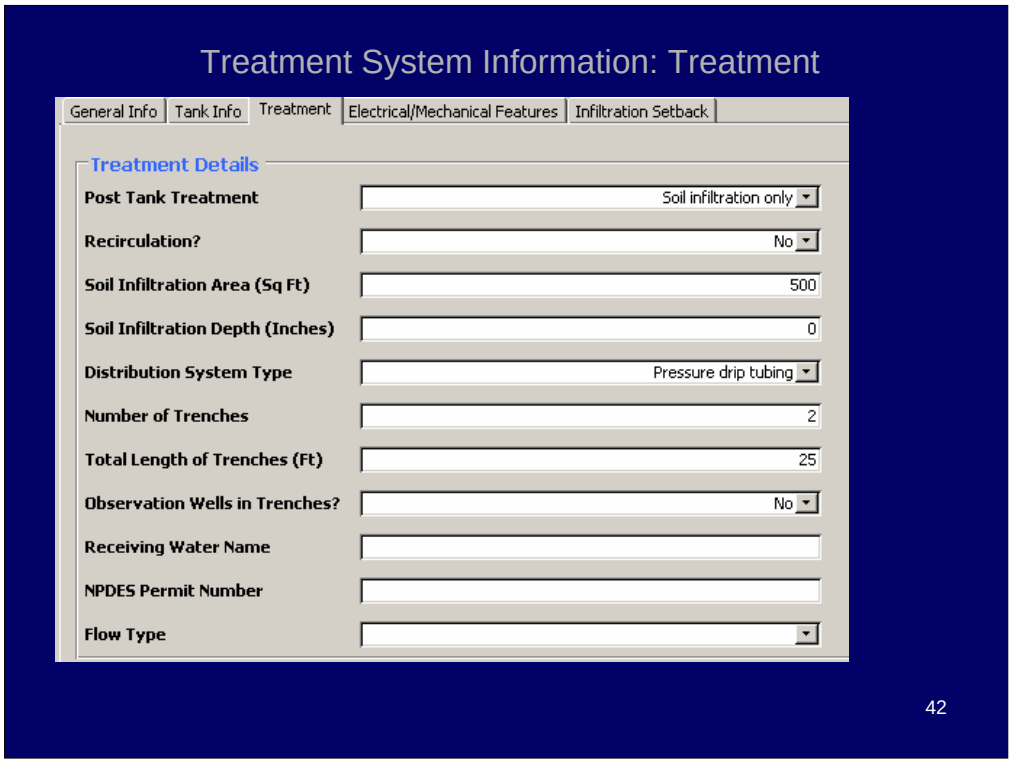
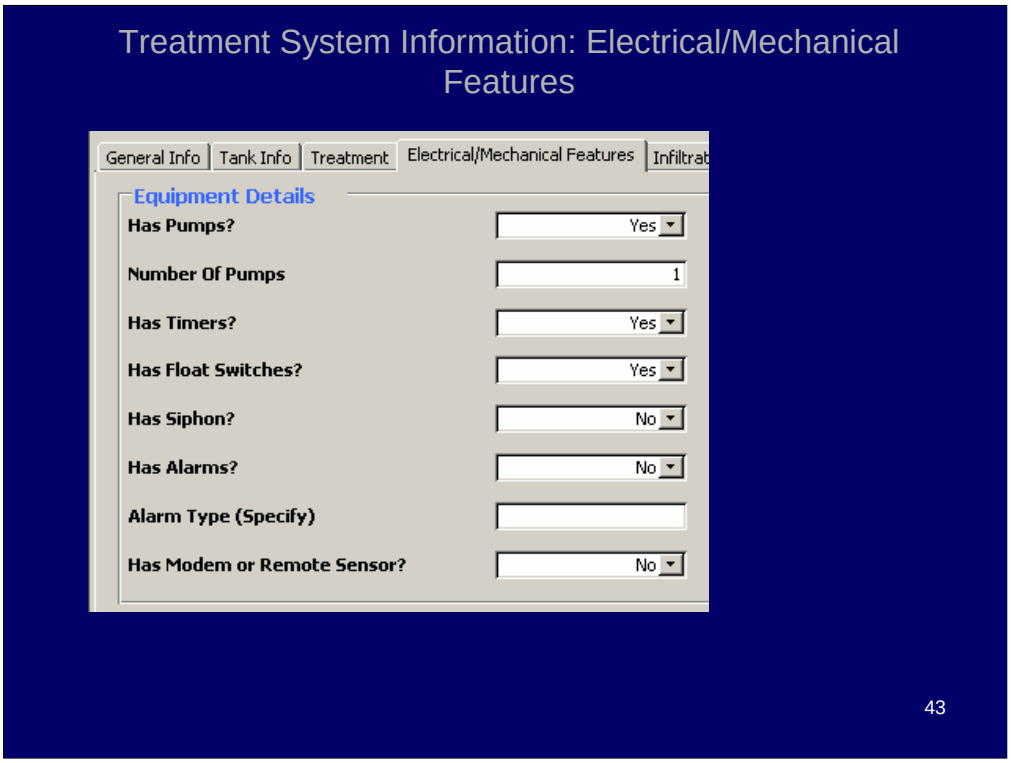


The tool is a template containing all relevant data fields to inventory the wastewater systems. However, the end users can modify appropriately to fit to their specific needs.

Contains required interfaces to enter new data, update existing data, and view existing data. The database includes a sample report and the users can add more reports to fit to their requirement.



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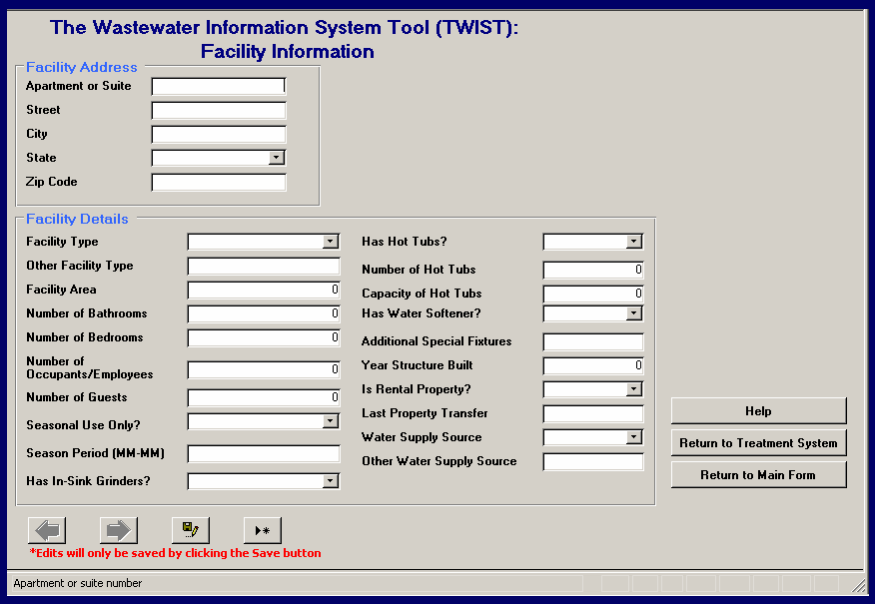
Facility Information



44

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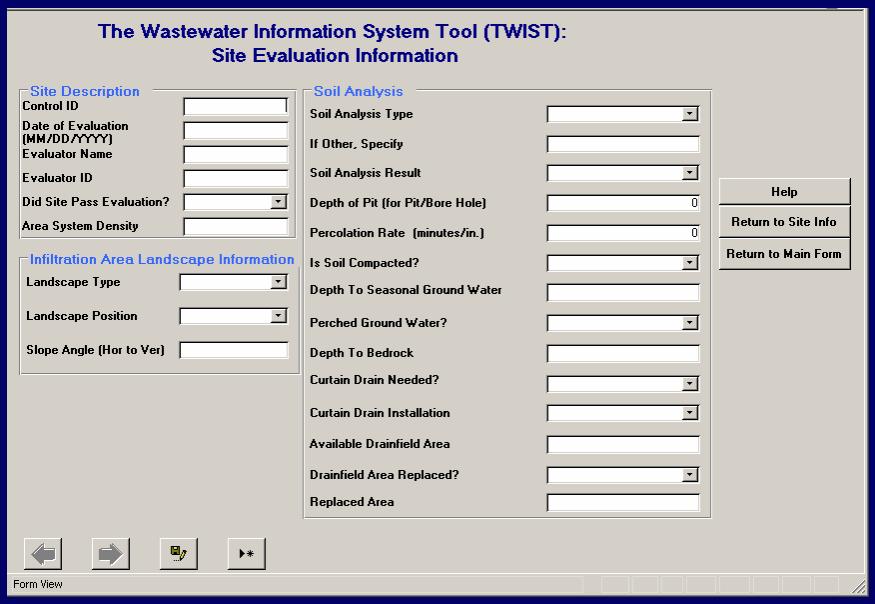
Site Evaluation Information



45

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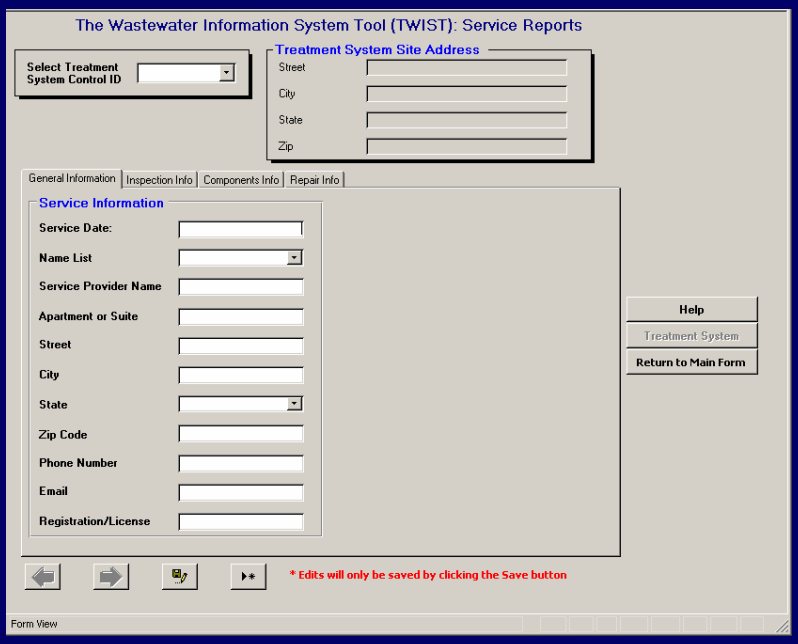
Service Reports – General Information



46

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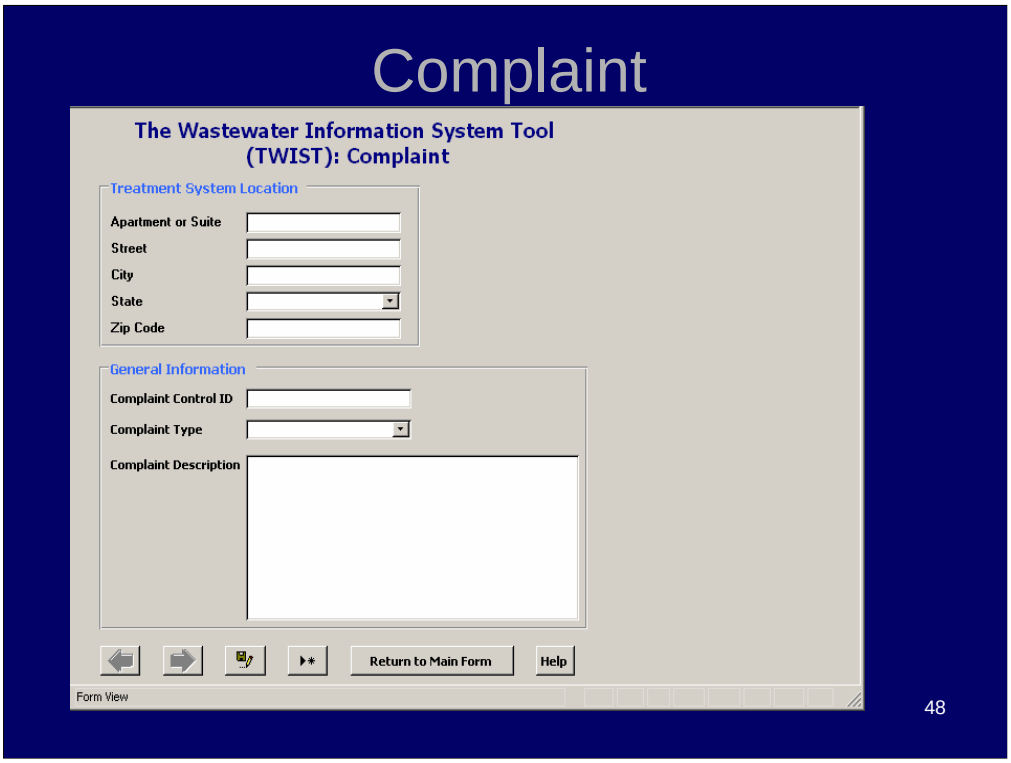

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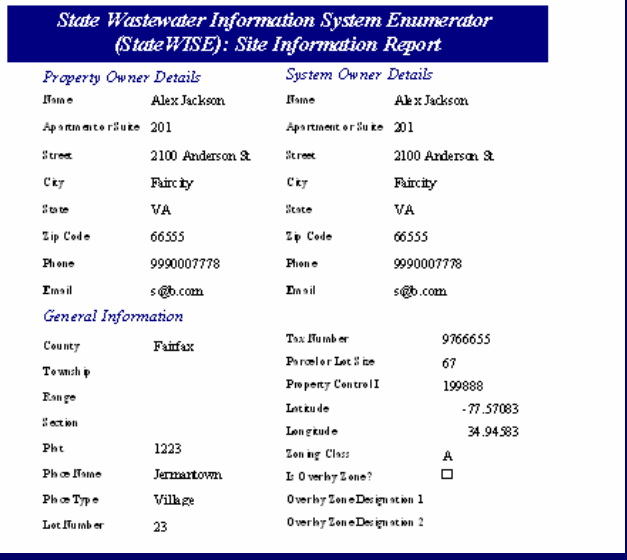
Site Information Report



State Wastewater Information System Enumerator (StateWISE): Site Information Report

Property Owner Details

Name	Alex Jackson
Apartment or Suite	201
Street	2100 Anderson St
City	Faircity
State	VA
Zip Code	66555
Phone	9990007778
Email	s@b.com

System Owner Details

Name	Alex Jackson
Apartment or Suite	201
Street	2100 Anderson St
City	Faircity
State	VA
Zip Code	66555
Phone	9990007778
Email	s@b.com

General Information

County	Fairfax
Township	
Range	
Section	
Plot	1223
Place Name	Jermantown
Place Type	Village
Lot Number	23
Tax Number	9766655
Parcel or Lot Size	67
Property Control I	199888
Latitude	-77.57083
Longitude	34.94583
Zoning Class	A
Is Overlay Zone?	☐
Overlay Zone Designation 1	
Overlay Zone Designation 2	

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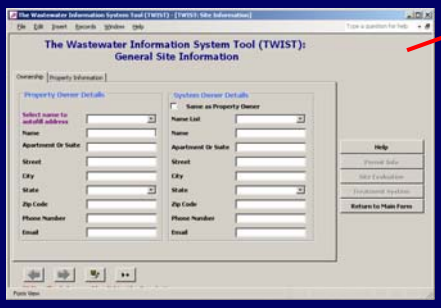
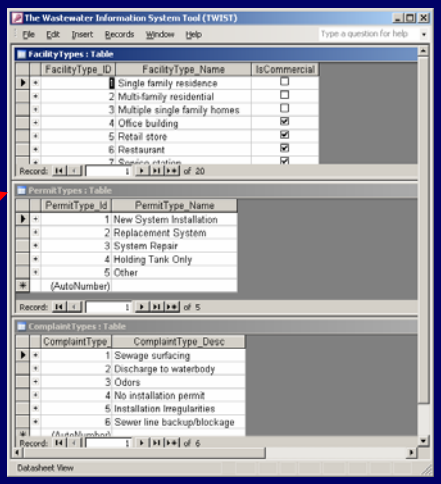
System Implementation

- Backend database
- Front-end data entry forms



Twist.mdb



Twist_data.mdb

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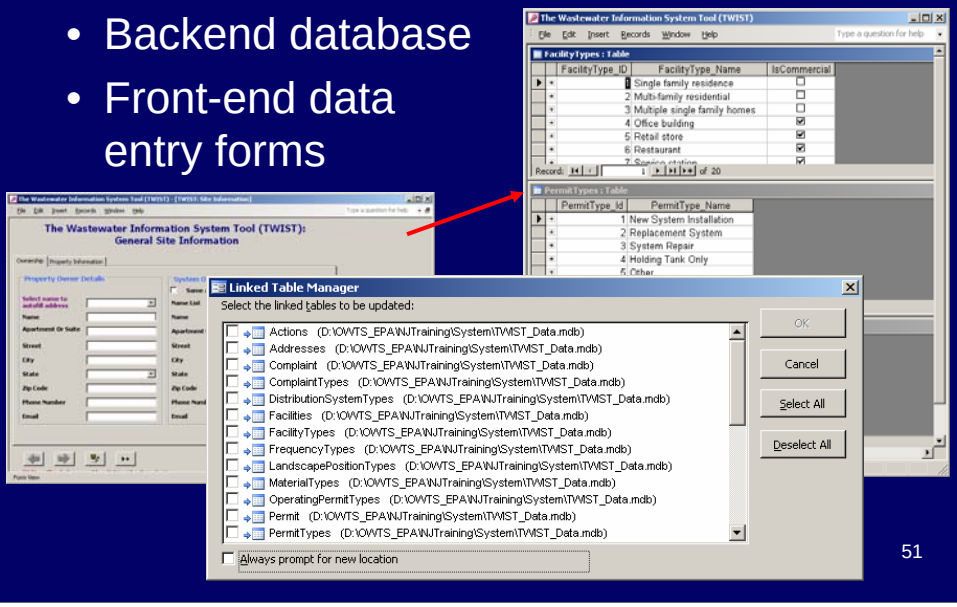
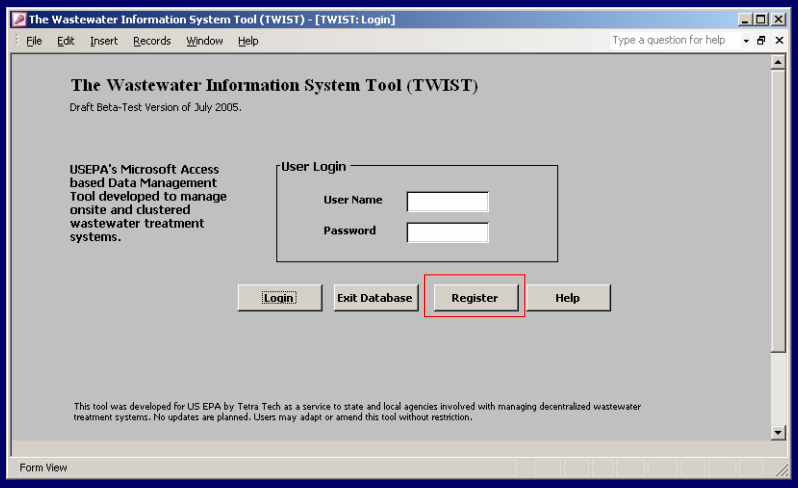
System Implementation – contd.

- Backend database
- Front-end data entry forms



User Authentication

- User validation



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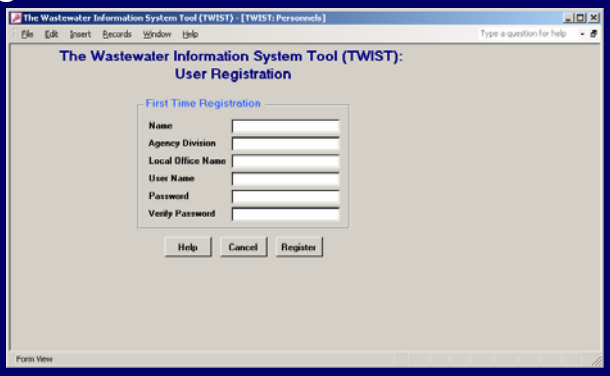
User Authentication

- User validation
- Registration
- Login



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Customizing the tool

- User Guide - Section IV
  - Data structure
  - Security

IV. Database Design

The regular menus and toolbars are disabled when the user opens the database. To be able to modify the database design or functionalities, press and hold the Shift key while opening the database. The database is in an editable mode when the screen shown in Figure 15 appears.

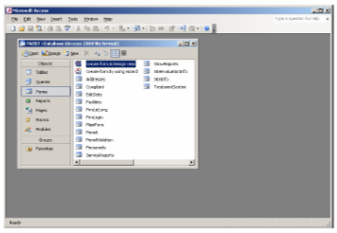

Figure 15. TWIST database window, showing the database's list of forms.

Adding New Data Fields or Modifying Fields

With the database in the "editable" mode and the screen in Figure 15 is showing, select **Tables** in the **Objects** list.

Right-click the table to be modified and then click on **Design View**. This will open the desired table in design view.

To add a new field move below the last existing field, type the field name in the *Field Name* column and select the field data type under the *Data Type* column (Figure 16). The user can optionally insert information about the newly-added field under the *Description* column.

How to get TWIST

- Download from EPA Website

  http://cfpub.epa.gov/owm/septic/septic.cfm?page_id=220

- In a CD from EPA

- User guide
  - PDF format

Questions?

Dr. Sabu Paul, Tetra Tech, Inc.

Join the Watershed Academy Webcast Team for Next Month's Webcast on:

Utilities and Watershed Management

Visit: epa.gov/watershedwebcasts

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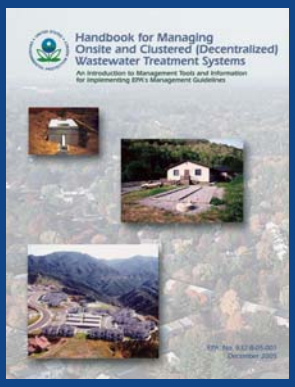
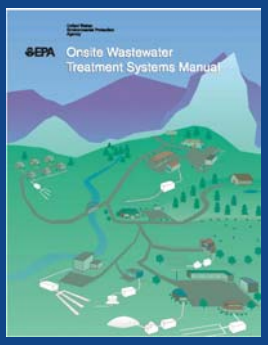
Other Tools for Managing Decentralized Systems





CUPSS

Check-Up Program for Small Systems

Fill Your CUPSS

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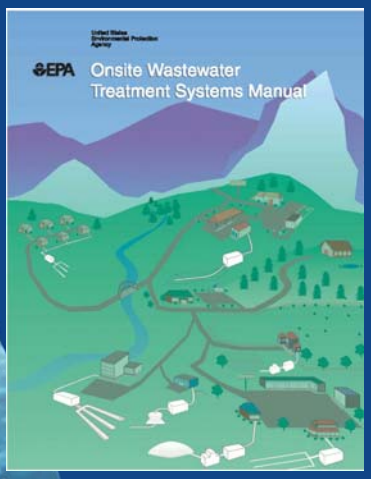
Onsite System Design Manual



- Management concepts
- Performance-based
- Cluster systems
- Technologies
- Fact sheets
- System Selection
- On EPA's Web site at: http://www.epa.gov/owm/septic/pubs/septic_2002_osdm_all.pdf

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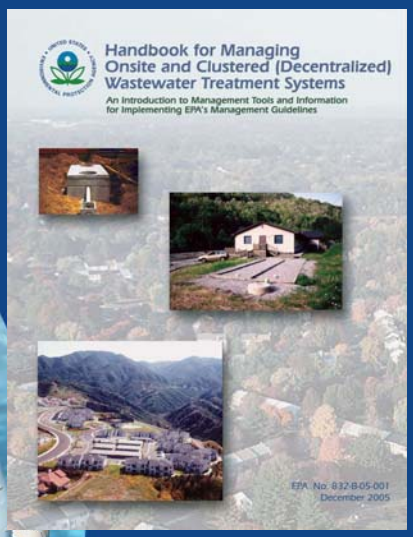
Management Handbook



- How to implement management guidelines
- Fact sheets on 13 elements
- 2005 Edition at: http://cfpub.epa.gov/owm/septic/septic.cfm?page_id=289

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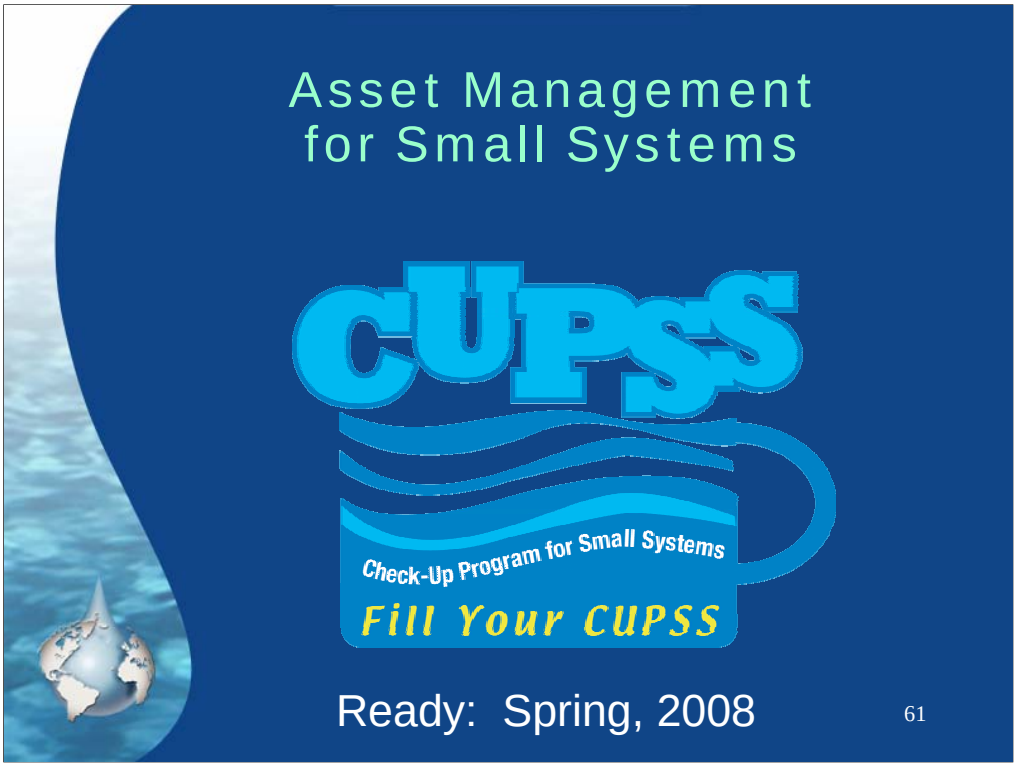
Asset Management for Small Systems



Ready: Spring, 2008

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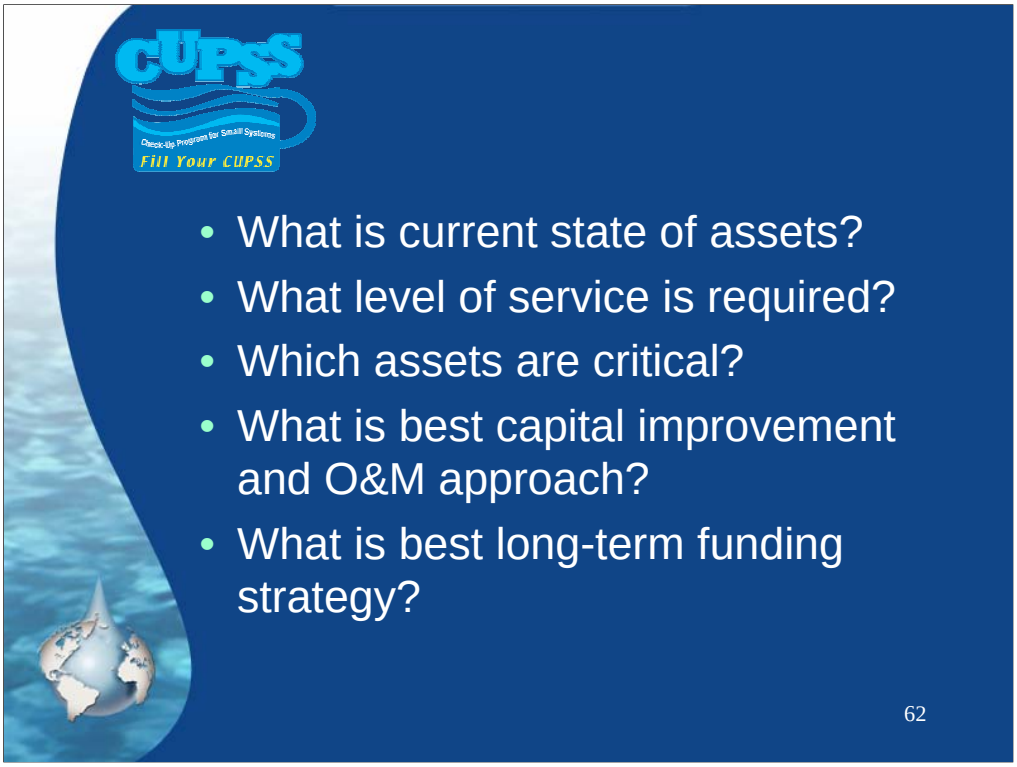
CUPSS
Check-Up Program for Small Systems
Fill Your CUPSS
• What is current state of assets?
• What level of service is required?
• Which assets are critical?
• What is best capital improvement and O&M approach?
• What is best long-term funding strategy?
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CUPSS
Check-Up Program for Small Systems
Set-up | Switch Utility | Create User | Help | Exit
Fill Your CUPSS
My Home
My Inventory
My O & M
My Finances
My Check-up
My CUPSS Plan
Welcome Back Joe, Asset Management for Virginia Water Authority
Welcome Back Joe. What would you like to do today?
Do Some Training
Enter a New Task or Work Order
Create or Update My Schematic
Search Asset and Maintenance Data
Create or Update My Inventory
Enter My Finances
Print My Check-Up Reports
Work on My CUPSS Plan
My Calendar
Mouse over the tasks to view information
August 2007
S M T W T F S
29 30 31 1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31 1
My Messages and Alerts
Pop-Up Messages Are Off Click To Turn On
CUPSS Plan Ticker 50%
Tasks Past Due 7
Assets Needing Update 5
A Work Order Due 2
EPA U.S. Environmental Protection Agency
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Other Tools Available

TEAMS
TOTAL ELECTRONIC ASSET MANAGEMENT SYSTEM

http://www.mcet.org/am/index.html

http://firehole.humboldt.edu/wawttar/

For More Information

Steve Hogye
USEPA
Office of Wastewater Management
hogye.stephen@epa.gov
202-564-0631
www.epa.gov/owm

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Questions?

Barry Tonning, Tetra Tech, Inc.

Dr. Sabu Paul, Tetra Tech, Inc.

Stephen Hogye, EPA's Office of Wastewater Management

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Check out our Additional Resources at:

http://www.cluin.org/conf/tio/owTWIST/resource.cfm

Please give us feedback on the Webcast at:

http://www.cluin.org/conf/tio/owTWIST/feedback.cfm

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