



Town of Orleans

MASSACHUSETTS

Technical Review and Cost Analysis of Comprehensive Wastewater Management Plan Options

Final Report Public Presentation

Board of Selectmen's Meeting
July 18, 2012

Weston&Sampson

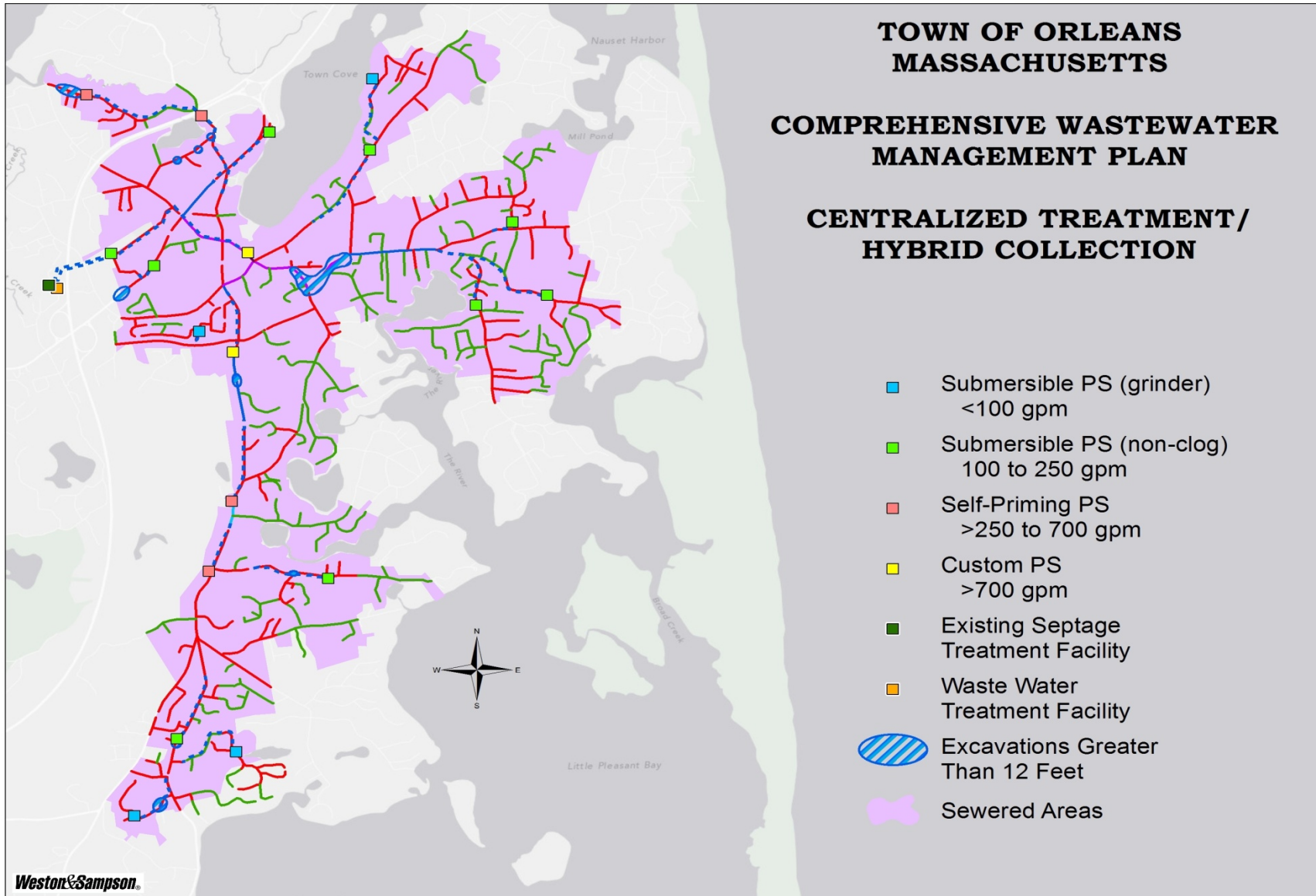
Project Goals

- Preliminary Engineering/Detailed Cost Analysis
- Develop/Refine Centralized System from CWMP
- Develop Alternative System
 - Septic Tank Effluent (STE) Concepts
- Develop Comprehensive Cost Estimates to Move Plan Forward
- Preliminary Design Report

Key Issues

- Defined System Layouts
- Clear Basis of Cost Estimates
- Transparent Cost Evaluation
- ‘Apples to Apples’ Comparisons
 - TMDL Equivalence
 - Cost Analysis of Entire Systems (including Private Property)

Recommended Centralized Hybrid System



Gravity Sewer Summary

- 175,000 Linear Feet (l.f.)
 - 6,000 l.f. Greater than 12 Feet Deep (3%)
 - All Less than 20 Feet Deep
- Diameters Ranging from 8- to 21-inches
 - 160,000 l.f. of 8-inch
 - 15,000 l.f. Greater than 8-inch
 - 14,000 l.f. of 12- and 15-inch
- Approximately 830 Manholes
- 19 Municipal Pump Stations

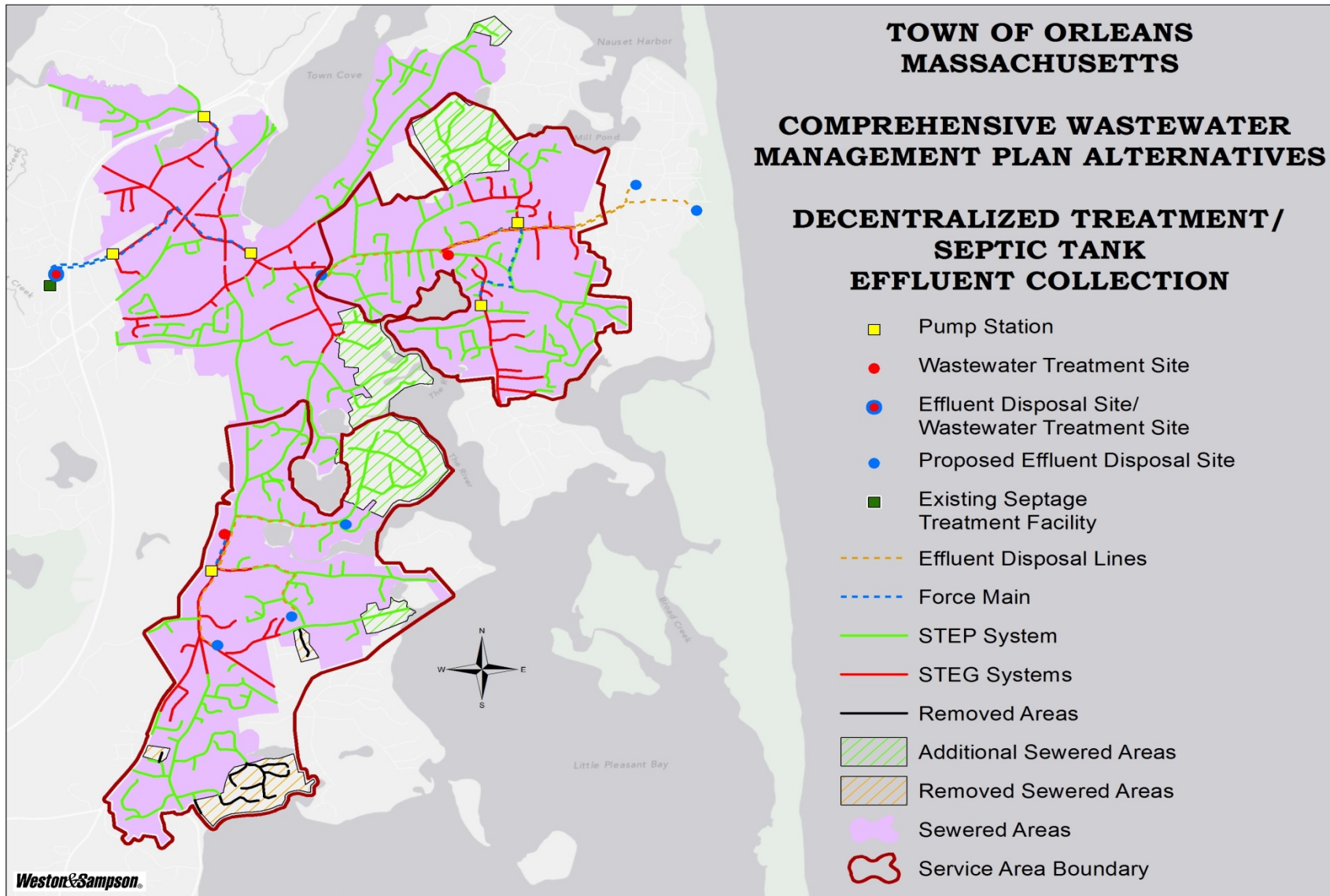
Low-Pressure Sewer Summary

- 116,000 l.f.
- Between 1 ½- and 3-Inch Diameter Pipe
 - Predominately 2-inch
- 290 Manhole Structures (Inline and Terminal)
- Approximately 1,100 Grinder Pumps (39%)
 - Operation & Maintenance Responsibilities
 - Grinder Pump Policy

Municipal Pump Station Summary

- 19 Wastewater Pump Stations
 - 1 Large Station (Greater than 700 gpm)
 - 5 Medium Stations (250 gpm to 700 gpm)
 - 13 Small Stations (50 gpm to 250 gpm)
- 50,000 l.f. of Force Main
 - Diameters Ranging from 2- to 15-inches
 - 100 Force Main Cleanout Manholes

Proposed STE Layout



Summary of STE Collection System Components

- Modified Service Area (Nitrogen Balance)
- 338,000 l.f. of Pipe
 - 80,000 l.f. of STEG System
 - 237,000 of STEP System
 - 21,000 l.f. of Force Main
- 2,300 STEP Pumps (75%)
- 6 Pump Stations
 - 1 Large Station (>700 gpm)
 - 3 Medium Stations (>250 gpm to 700 gpm)
 - 2 Small Stations (50 gpm to 250 gpm)

Collection System Comparison

Centralized Hybrid

- 2,830 Properties
- 341,000 l.f. of Pipe
- 19 Pump Stations
 - 1 Large Station
 - 5 Medium Stations
 - 13 Small Stations
- 1,100 Grinder Pumps

Decentralized STE

- 3,080 Properties
- 338,000 l.f. of Pipe
- 6 Pump Stations
 - 1 Large Station
 - 3 Medium Stations
 - 2 Small Stations
- 2,300 STEP Pumps

Collection System Cost Drivers

- Size and Depth of Pipe
 - Number of Manholes and Other Structures
 - Number and Size of Municipal Pump Stations
 - Number of Individual On-Lot Pumps/ STE Systems
- Subsurface Conditions
- Method of Installation
- Surface Restoration
- Public Safety
- Land and Legal

STEP & STEG Tanks

- New vs. Existing
 - Age, Size, Condition
 - Evaluations Required
 - Industry Practice
- Material of Construction
 - Concrete vs. PE vs. Fiberglass
- Frequency of Pumping

Collection System Capital Cost

	Centralized Hybrid	Decentralized STE
Public Way	\$58,145,000	\$36,070,000
On-Lot Costs	\$18,125,000	\$33,078,000
Construction Contingency (25%)	\$19,067,000	\$17,287,000
Engineering (25%)	\$19,067,000	\$17,287,000
Public Safety	\$4,100,000	\$3,100,000
Land & Legal	\$540,000	\$700,000
Total	\$119,044,000	\$107,522,000

Phase I Collection System Capital Cost

	Centralized Hybrid	Decentralized STE
Public Way	\$9,582,000	\$6,101,000
On-Lot Costs	\$1,721,000	\$3,259,000
Construction Contingency (25%)	\$2,826,000	\$2,340,000
Engineering (25%)	\$2,826,000	\$2,340,000
Public Safety	\$500,000	\$330,000
Land & Legal	\$95,000	\$65,000
Total	\$17,550,000	\$14,435,000

Road Way Infrastructure Costs

	Centralized Hybrid	Decentralized STE
Pipe & Appurtenances	\$24,545,000	\$16,096,000
Pump Stations & Force Mains	\$12,605,000	\$5,366,000
Subsurface Conditions	\$3,861,000	\$2,757,000
Surface Restoration	\$14,365,000	\$10,134,000
Mobilization	\$2,769,000	\$1,718,000
Subtotal	\$58,145,000	\$36,070,000

Average Cost per Property Served (Road Way Infrastructure)

	Centralized Hybrid	Decentralized STE
Total Cost	\$58,145,000	\$36,070,000
Number of Properties	2,830	3,080
Cost per Property	\$20,546	\$11,711

On-Lot (Private Property) Infrastructure Cost

	Centralized Hybrid	Decentralized STE
Pipe	\$10,200,000	\$9,825,000
Pumps/Tanks	\$7,925,000	\$23,253,000
Subtotal	\$18,125,000	\$33,078,000

Average Cost per Property Served (On-Lot Infrastructure Cost)

	Centralized Hybrid	Decentralized STE
Total Cost	\$18,125,000	\$33,078,000
Number of Properties	2,830	3,080
Cost per Property	\$6,404	\$10,740

Average Cost per Property Served (Total Collection System Costs)

	Centralized Hybrid	Decentralized STE
Total Cost	\$119,044,000	\$107,522,000
Number of Properties	2,830	3,080
Cost per Property	\$42,065	\$34,910

Wastewater Treatment Facility



Centralized Treatment Plant

- Approximate Volume to be Treated:
 - Average Daily Flow – 640,000 gpd
 - Maximum Daily Flow – 1,440,000 gpd
- Sequencing Batch Reactor (SBR) vs. Membrane BioReactor (MBR) Technology
- SBR Technology Recommended
 - Lower Life Cycle Cost
 - Greater Operational Flexibility
- Anticipated Effluent Nitrogen Limits – 3 mg/l
 - Rapid Infiltration

Conceptual Treatment Process - Centralized

- Primary Treatment (Screening & Grit Removal)
- SBR (Biological Treatment)
- Methanol Addition (Biological Nutrient Removal)
- Effluent Equalization
- Pressurized UV Disinfection
- Sludge Dewatering

Conceptual Site Plan - Centralized



Decentralized Wastewater Treatment



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Proposed Treatment and Disposal

Treatment Sites –

- Site 163 –
 - 165,000 gpd ADF
 - 330,000 gpd Maximum Daily Flow
- Site 111 –
 - 230,000 gpd ADF
 - 460,000 gpd Maximum Daily Flow
- Site 241 –
 - 150,000 gpd ADF
 - 300,000 gpd Maximum Daily Flow

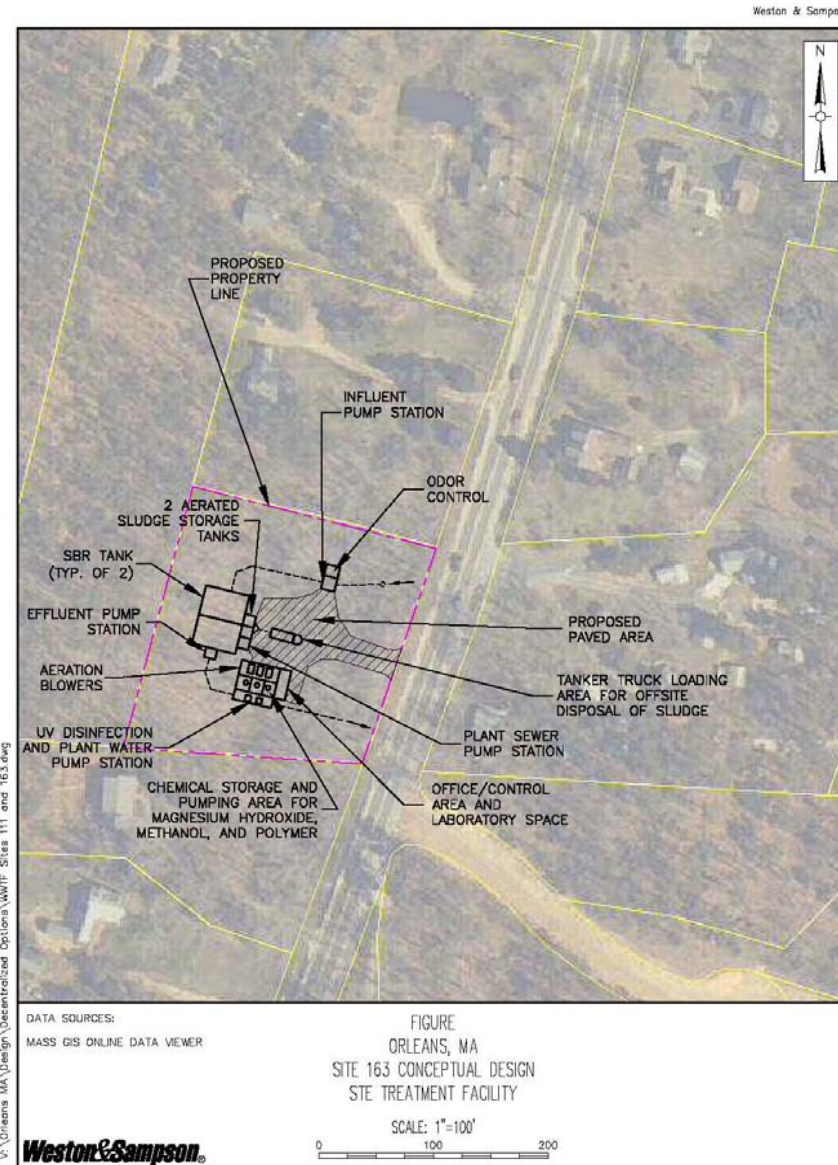
Disposal Sites –

- Site 172 – 140,000 gpd
- Site 173 – 50,000 gpd
- Site 181 – 140,000 gpd
- Site 321 – 235,000 gpd
- Site 322 – 150,000 gpd
- Site 112 – 75,000 gpd
- Site 241 – 300,000 gpd

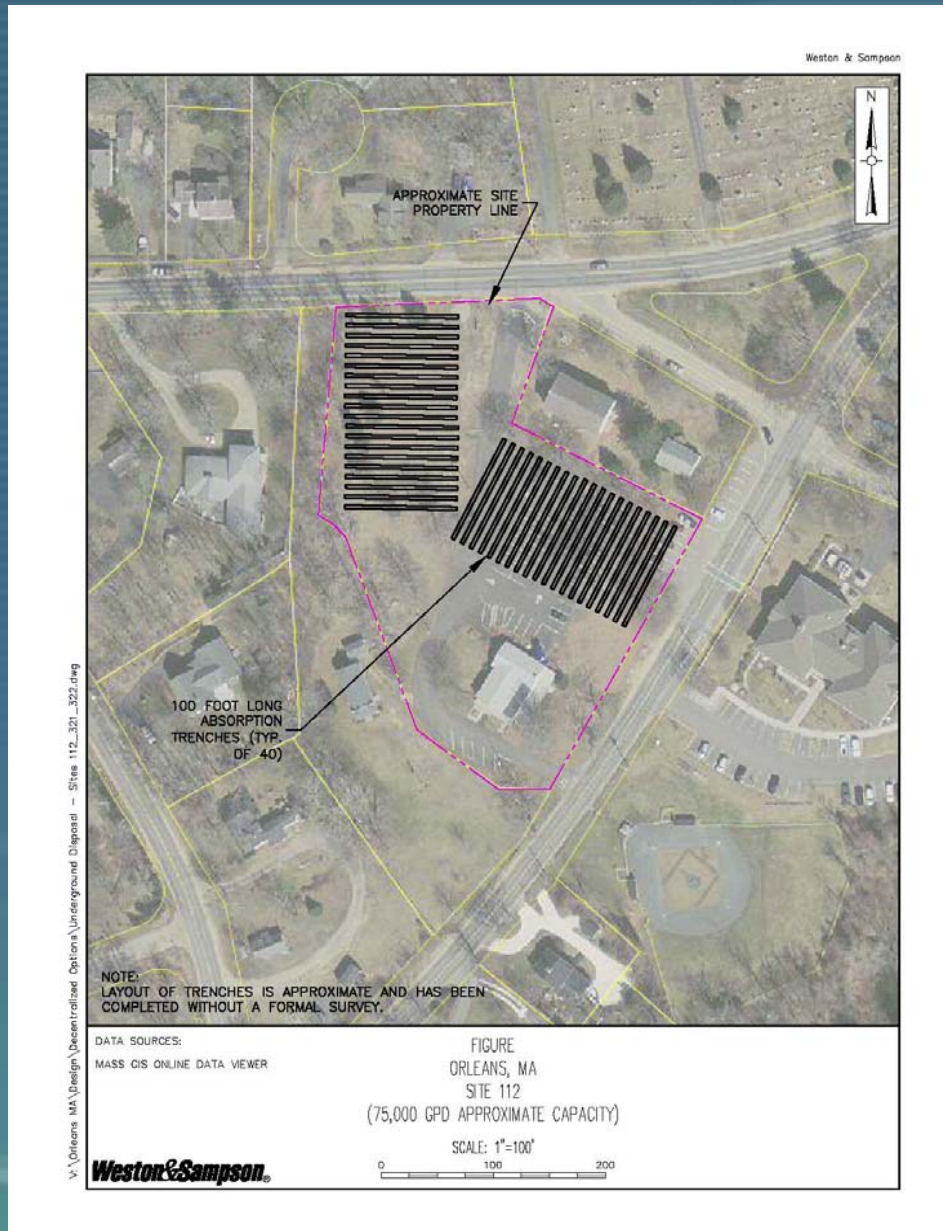
Conceptual Treatment Process - Decentralized

- SBR (Biological Treatment)
- Methanol Addition (Biological Nutrient Removal)
- Effluent Equalization
- Pressurized UV Disinfection

Conceptual Site Plan - Decentralized



Sample Subsurface Disposal Field



Wastewater Treatment Cost Summary

	Centralized	Decentralized			
		Site 163	Site 111	Site 241	Total
Construction Subtotal	\$16,155,000	\$5,673,000	\$6,321,000	\$8,824,000	\$20,818,000
Engineering, Permitting, Project Development	\$4,039,000	\$1,418,000	\$1,580,000	\$2,206,000	\$5,204,000
Construction Contingencies	\$4,039,000	\$1,418,000	\$1,580,000	\$2,206,000	\$5,204,000
Land and Legal	N/A	\$800,000	\$2,500,000	N/A	\$3,300,000
Total	\$24,240,000	\$9,310,000	\$11,990,000	\$13,240,000	\$34,540,000

Construction Cost Breakdown

	Centralized	Decentralized		
		Site 163	Site 111	Site 241
Primary Treatment	\$1,283,000	N/A	N/A	N/A
Septage Receiving	\$693,000	N/A	N/A	N/A
Biological Treatment	\$2,777,000	\$1,548,000	\$1,688,000	\$1,548,000
Chemical Addition	\$65,000	\$35,000	\$35,000	\$35,000
Solids Handling	\$424,000	\$25,000	\$25,000	\$25,000
Disinfection	\$260,000	\$131,000	\$131,000	\$131,000
Pumping	\$235,000	\$321,000	\$321,000	\$321,000
Odor Control	\$340,000	\$50,000	\$50,000	\$50,000
Wastewater Effluent Disposal	\$767,000	\$1,013,000	\$1,400,000	\$270,000
Site Work	\$2,588,000	\$163,000	\$163,000	\$968,000
Miscellaneous Work	\$3,702,000	\$1,326,000	\$1,326,000	\$1,326,000
Update Septage Treatment Plant	N/A	N/A	N/A	\$2,500,000
General	\$3,021,000	\$1,061,000	\$1,182,000	\$1,650,000

Total Estimated System Capital Costs

	Centralized Hybrid	Decentralized STE
Collection System	\$119,044,000	\$107,522,000
Treatment Plant(s)	\$24,240,000	\$34,540,000
Total	\$143,284,000	\$142,062,000
Number of Properties	2,830	3,080
Capital Cost per Property	\$51,000	\$46,000

Total Estimated System Capital Costs (Phase I Only)

	Centralized Hybrid	Decentralized STE
Collection System	\$17,550,000	\$14,434,000
Treatment Plant(s)	\$20,160,000	\$13,240,000
Total	\$37,710,000	\$27,674,000

Annual Operation & Maintenance Costs

	Centralized Hybrid	Decentralized STE
Collection System	\$736,000	\$654,000
Treatment Plant(s)		
Site 241	\$1,216,000	\$1,447,700
Site 163	N/A	\$548,700
Site 111	N/A	\$556,500
Total	\$1,960,000	\$3,210,000

Equivalent Uniform Annual Cost (EUAC)

	Centralized Hybrid	Decentralized STE
Collection System	\$8,762,000	\$7,914,000
Treatment Plant(s)	\$1,790,000	\$2,560,000
Operation & Maintenance	\$1,960,000	\$3,210,000
Total	\$12,512,000	\$13,684,000

Final Steps

- Review/Comment on Draft Report
 - Town Officials
 - Independent Cost Estimator
- Final Letter Report
 - Final Public Presentation – July 18th

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Questions & Discussion