

On-Site Community Wastewater Systems Offer an Environmentally Friendly Alternative to POTWs

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By

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I know we would all rather be
fishing, but.....



- “The comments and opinions made in this presentation are those of the presenter and not of NOWRA or the Mega-Conference sponsors”

POTW: Publicly Owned Treatment Works

- Publicly owned.
- Often larger WWTPs with various disposal methods (often direct discharge to surface waters).
- Able to get government funding (loans & grants).
- Suited for relatively dense development with contiguous service areas.
- Long lead times to design, permit and construct.

On-Site Community Wastewater Systems

- Privately owned & operated (developer, HOA, or private utility) with little difference to customer.
- Often smaller WWTPs with primarily surface and subsurface use/disposal.
- Private funding.
- Suited for both sparse and dense development when POTW capacity is not available.
- Shorter lead times to design, permit, and construct.

Municipal Water Cycle

- Water removed from groundwater and surface waters.
- Treated wastewater often discharged to surface waters.



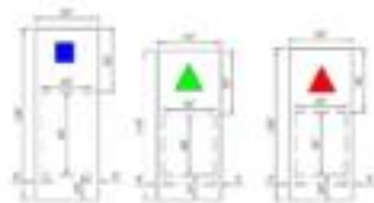
Contained On-Site Systems

- Typically, a well system.
- Wastewater collection system (may be, gravity, STEP system or other).
- Treatment System (conventional gravity septic system, up to reuse quality system).
- Treated wastewater (eventually recharged groundwater and/or is beneficially (re)used..
- Disposal maybe subsurface, surface (spray or drip), and/or other.

Why On-Site Community System

- POTW is not available.
- Often preferred over individual on-site systems.
- Allows for concentrated development (cluster, conservation, etc.) .
- Maximizes open or natural areas.
- Environmentally friendly (groundwater recharge, irrigation of natural or landscaped areas, other).

PROPOSED LOT TYPES



TYPE 1: 20' x 100' = 2,000 sq ft
 TYPE 2: 15' x 100' = 1,500 sq ft
 TYPE 3: 10' x 100' = 1,000 sq ft

IMPERVIOUS AREA CALCULATIONS

Lot Type	Number of Lots	Lot Area (sq ft)	Impervious Area (sq ft)	Total Impervious Area (sq ft)	Total Area (sq ft)	% Impervious Area
Type 1	20	20,000	10,000	200,000	2,000,000	10.0%
Type 2	15	15,000	7,500	112,500	1,500,000	7.5%
Type 3	10	10,000	5,000	50,000	1,000,000	5.0%
Building	50	50,000	25,000	1,250,000	5,000,000	25.0%
Total	95	95,000	47,500	1,812,500	9,500,000	19.1%

PERMEABLE IMPERVIOUS AREAS: 0.0% (0.0%)



SITE DATA SUMMARY

PROJECT NAME: [REDACTED]
 CLIENT: [REDACTED]
 ADDRESS: [REDACTED]
 CITY: [REDACTED]
 COUNTY: [REDACTED]
 STATE: [REDACTED]
 ZIP: [REDACTED]
 DATE: [REDACTED]
 DRAWN BY: [REDACTED]
 CHECKED BY: [REDACTED]
 APPROVED BY: [REDACTED]

Category	Item	Value	Notes
TOTAL SITE AREA	ACRES	21.5	
	SQ FT	930,000	
	PERMITS	100	
	PERMITS	100	
TOTAL IMPERVIOUS AREA	ACRES	4.1	
	SQ FT	1,750,000	
	PERMITS	100	
	PERMITS	100	
TOTAL PERMEABLE IMPERVIOUS AREA	ACRES	0.0	
	SQ FT	0	
	PERMITS	100	
	PERMITS	100	
TOTAL PERMEABLE IMPERVIOUS AREA	ACRES	0.0	
	SQ FT	0	
	PERMITS	100	
	PERMITS	100	

WATER SYSTEM NOTES

1. COMMUNITY WATER SHALL BE PROVIDED BY A COMMUNITY WELL SYSTEM APPROVED BY THE STATE OF NORTH CAROLINA.
2. THE WELLS SHOWN ON THIS PLAN HAVE BEEN PRELIMINARY TESTED AND ARE PROPOSED AS THE SOURCE FOR WATER DISTRIBUTION ON-SITE. AT THE TIME OF CONSTRUCTION DRAWINGS, FULL DETAILS WILL BE PROVIDED FOR THE TREATMENT AND DISTRIBUTION OF WATER FROM THE PROPOSED WELLS TO EACH HOUSE.
3. THE EXISTING WELLS SHALL HAVE A 10'-0" BUILD SETBACK PROVIDED AROUND EACH LOCATION.
4. THE CONTRACTOR SHALL COORDINATE THE CONSTRUCTION OF UNDERGROUND UTILITIES (WATER, SEWER, STORM, ELECTRICAL, GAS OR OTHER). THE UTILITY CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR THE INSTALLATION OF ALL UTILITY SERVICES TO THE EDGE OF THE RIGHT-OF-WAY.
5. ELEVATIONS AND UTILITIES ARE GIVEN TO THE EXTENT OF INFORMATION AVAILABLE, WHERE ELEVATIONS ARE NOT GIVEN AT POINTS OF EXISTING UTILITY CROSSINGS, SUCH ELEVATIONS SHALL BE DETERMINED BY THE CONTRACTOR AND REPORTED TO THE ENGINEER. WHEN UNKNOWN LINES ARE EXPOSED, THEIR LOCATIONS AND ELEVATIONS SHALL ALSO BE REPORTED TO THE ENGINEER.
6. CONTRACTOR MAY REPURPOSE EXISTING METERS AND APERTANCES TO NEW LOCATION.

WASTEWATER SYSTEM NOTES

1. COMMUNITY WASTEWATER SHALL BE PROVIDED BY A COMMUNITY DRAINFIELD SYSTEM. ALL WASTEWATER IMPROVEMENTS SHALL MEET COUNTY OF DURHAM ENVIRONMENTAL HEALTH REQUIREMENTS.
2. THE PROPOSED LOTS HAVE BEEN GROUPED INTO SEVERAL COLLECTION SYSTEMS. EACH COLLECTION SYSTEM WILL CONTAIN A GRAVITY CONVERGENCE FROM THE PROPOSED LOT TO A SEPTIC PUMP TANK THAT WILL THEN PUMP THE WASTE TO A CENTRALIZED TREATMENT SYSTEM. THE TREATED EFFLUENT WILL THEN BE PUMPED TO VARIOUS DRAINFIELDS THROUGHOUT THE SITE. THE DETAILS OF THE PUMPS, LINES, TREATMENT, TANKS, AND FIELDS WILL BE PROVIDED IN THE CONSTRUCTION DOCUMENTS.
3. EACH LOT HAS 3-4 BEDROOMS. REFER TO THE PLAN FOR THE NUMBER OF BEDROOMS FOR EACH LOT. THE CALCULATION OF EXPECTED GALLONS PER DAY IS BASED ON 120 GPD PER BEDROOM. THE DRAINFIELD IS SIZED BASED ON 90 GPD PER BEDROOM (PER APPROVED 25% FLOW REDUCTION).
4. THE PROPOSED LOCATION OF INITIAL AND REPAIR DRAINFIELDS IS BASED ON REPORTS BY DON WELLS L.L.S. OF SKEC.
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PROPOSED UTILITY SEPARATION

1. WATER MAINS SHALL BE LAD AT LEAST 10 FEET HORIZONTALLY FROM EXISTING OR PROPOSED SEWERS, UNLESS LOCAL CONDITIONS OR BARRIERS PREVENT A 10-FOOT SEPARATION IN WHICH CASE:
 - 1.1. THE WATER MAIN IS LAD IN A SEPARATE TRENCH WITH THE ELEVATION OF THE BOTTOM OF THE WATER MAIN AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER, OR
 - 1.2. THE WATER MAIN IS LAD IN THE SAME TRENCH AS THE SEWER WITH THE WATER MAIN LOCATED AT ONE SIDE OF A BENCH OF UNDISTURBED EARTH AND WITH THE ELEVATION OF THE BOTTOM OF THE WATER MAIN AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER.
2. CROSSING A WATER MAIN OVER A SEWER: WHENEVER IT IS NECESSARY FOR A WATER MAIN TO CROSS OVER A SEWER, THE WATER MAIN SHALL BE LAD AT SUCH AN ELEVATION THAT THE BOTTOM OF THE WATER MAIN IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER. IF LOCAL CONDITIONS OR BARRIERS PREVENT AN 18 INCH VERTICAL SEPARATION, BOTH THE WATER MAIN AND SEWER SHALL BE CONSTRUCTED OF FERROUS MATERIALS WITH JOINTS THAT ARE EQUIVALENT TO WATER MAIN STANDARDS FOR A DISTANCE OF 10' ON EACH SIDE OF THE POINT OF CROSSING.
3. CROSSING A WATER MAIN UNDER A SEWER: WHENEVER IT IS NECESSARY FOR A WATER MAIN TO CROSS UNDER A SEWER, BOTH THE WATER MAIN AND SEWER SHALL BE CONSTRUCTED OF FERROUS MATERIAL AND WITH JOINTS EQUIVALENT TO WATER MAIN STANDARDS FOR A DISTANCE OF 10' FEET ON EACH SIDE OF THE POINT OF CROSSING. A SECTION OF WATER MAIN PIPE SHALL BE CENTERED AT THE POINT OF CROSSING.

SEPARATION OF SANITARY SEWERS AND STORM SEWERS

1. A 24" VERTICAL SEPARATION SHALL BE PROVIDED BETWEEN STORM SEWER AND SANITARY SEWER LINES OR BOTH THE SANITARY AND THE STORM LINES SHALL BE CONSTRUCTED OF FERROUS MATERIALS.
2. AN 8" HORIZONTAL SEPARATION SHALL BE PROVIDED BETWEEN STORM SEWER AND SANITARY SEWER LINES.



Wastewater System Design Components

- **Collection System:** Modified STEP System with multiple lots on one offsite STEP tank.
- **Wastewater Treatment System:** Recirculating Media Filter with UV-Disinfection, proprietary system.
- **Effluent Disposal:** Subsurface Drip Irrigation.

Collection System: Modified STEP System

- Private 6-inch collection sewer with cleanouts in lieu of manholes
- Allows for a couple of emergency generators to be cycled in an emergency.
- Ensures proper O&M through private utility.
- Works well with topography.
- No tanks on lots.
- Reduces O&M with respect to pumping and pump replacement.



Wastewater Treatment System: Recirculating Media Filter

- Technology based on recirculating sand filter.
- Uniform plastic media.
- Only moving parts are pumps.
- UV Disinfection.
- Simple to operate and maintain.
- Expandable, can be phased.
- Reuse quality with nutrient removal (Certified: NSF 40, 245, and 350), although not required for permit.

Wastewater System Design Criteria

Criteria	Influent	Permit Effluent	Design Effluent
3-4 Bedroom Homes	141		
ADF GPD	60,960		
Adjusted ADF (75%)	45,720		
BOD ₅ (mg/l)	250	30.0	15.0
TSS (mg/l)	250	30.0	15.0
Ammonia (mg/l)	25.0		1.00
Nitrate/Nitrite (mg/l)	0.00	13.0	12.3
Total N (mg/l)	40.0	14.0	13.3
Total P (mg/l)	11.0		8.9
Fecal Coliforms (G.M #/200ml)	10 ¹⁰	200	10







ADDITIONAL
PARTS INSIDE

Effluent Disposal: Subsurface Drip Irrigation

- Aesthetically pleasing, no visual impact.
- Fencing not required.
- Many zones with ability to modify dosing regimes.
- Dosing based on soils, lateral flow, and modeling.
- Forests and open fields.
- Alternate initial and repair fields.

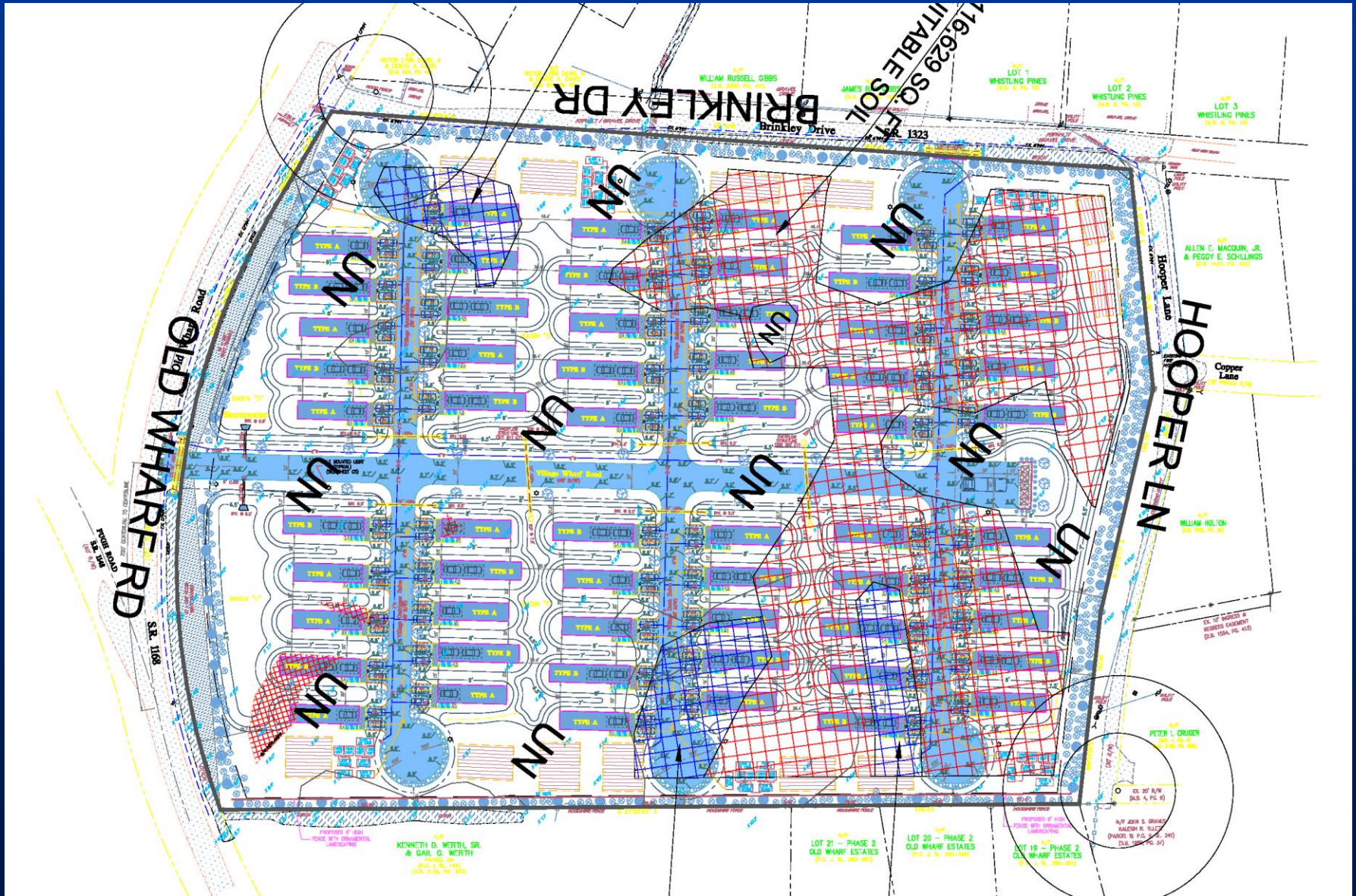
Steps in Planning a Community System “PPPPPPP”

- Get “Preliminary Soils Report” of property (defines capacity of site).
- Get preliminary well site approval and possibly drill well.
- Layout site plan with respect to soils, wells, buffers, setbacks, etc.
- Do design and Permitting.
- Construction.
- Start-up.

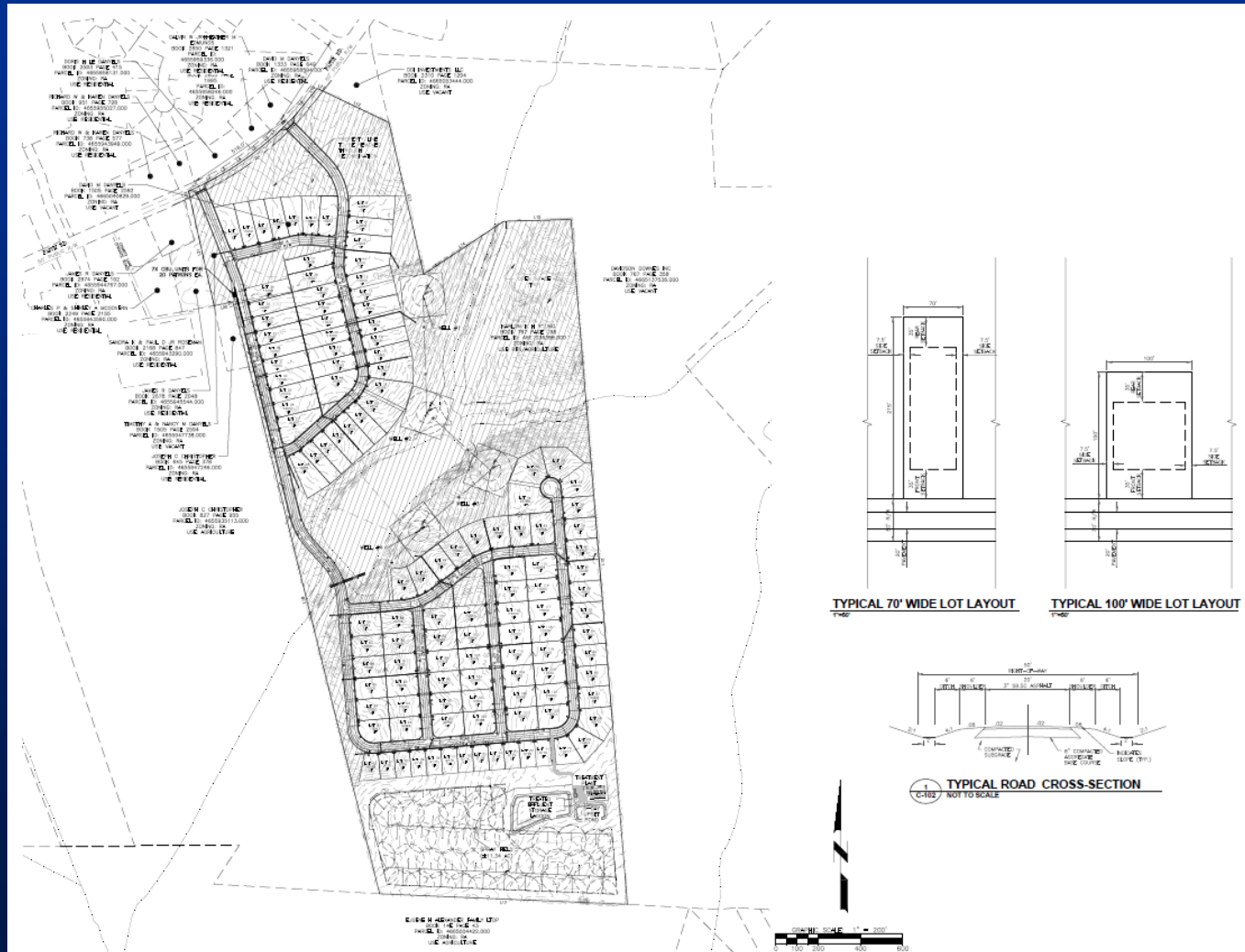
Proposed Site Plan



Site Plan with Soils



Subdivision with On-Site Community Wastewater System



Questions?



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