

Replacement of Coastal Resort's On-Site Wastewater System Is Hugh Success

NOWRA 2025 Onsite Wastewater Mega-Conference
Sandusky, Ohio

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

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



Presentation Overview

- ❁ Coastal Resort in North Carolina
- ❁ Failing On-Site Wastewater System
- ❁ Aggressive Time Constraints
- ❁ Challenging Site Conditions
- ❁ Appropriate Technologies



Sea Ranch
RESORT

A stylized orange sun with horizontal rays.
BEACHSIDE
bistro

**PARDON OUR
CONSTRUCTION
BISTRO IS OPEN**

Coastal Resort in North Carolina

- ❁ Sea Ranch Resort
- ❁ Kill Devil Hills, NC
- ❁ Oceanfront of Outer Banks
- ❁ Original Building Constructed in 1963
- ❁ Two Expansions in Next Two Decades
- ❁ Several Upgrades and Renovations

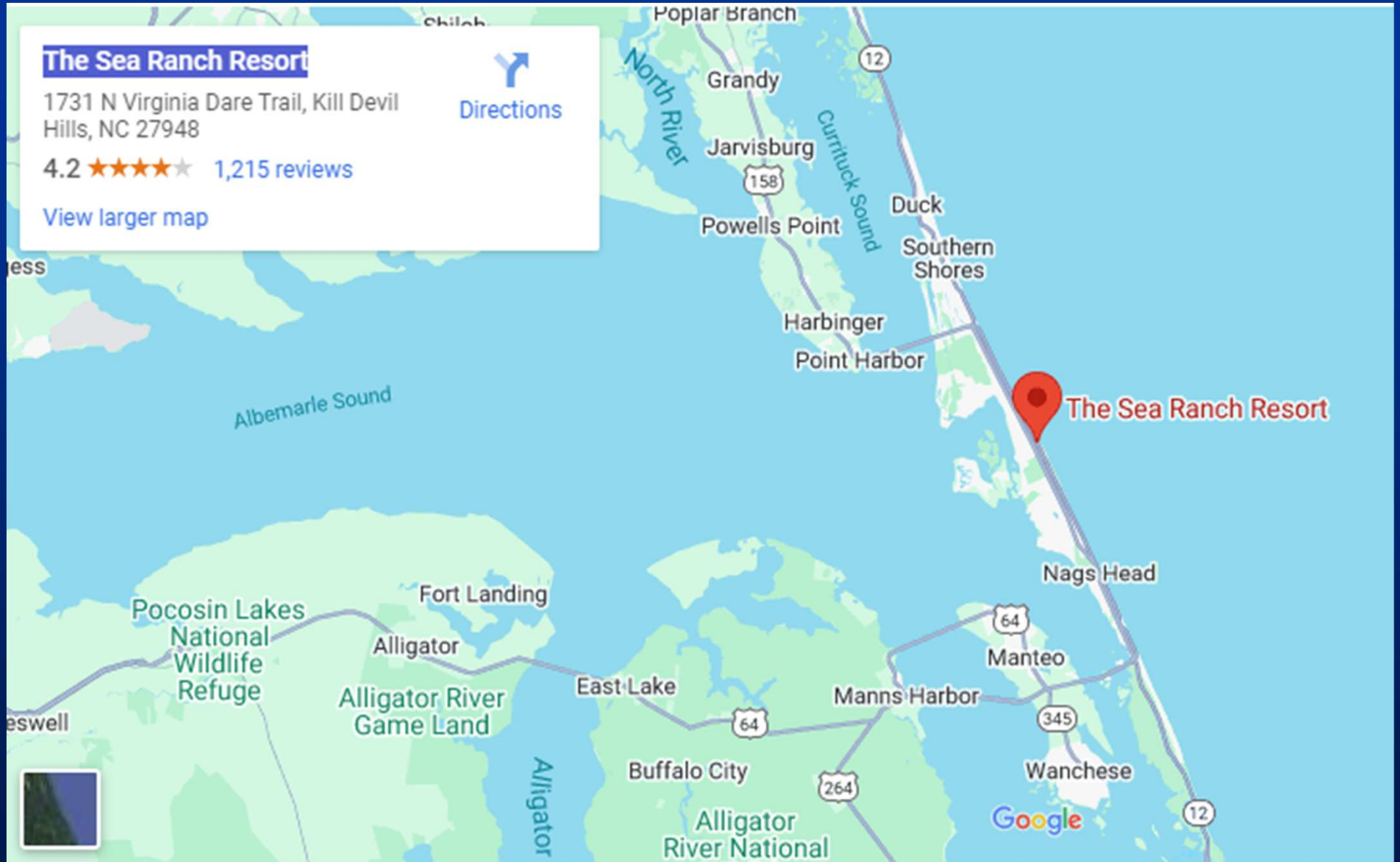
The Sea Ranch Resort

1731 N Virginia Dare Trail, Kill Devil Hills, NC 27948

4.2 ★★★★★ 1,215 reviews

[View larger map](#)


[Directions](#)





Kitty Hawk

Kitty Hawk Bay

The Sea Ranch Resort

Kill Devil Hills

Wright
Brothers
National
Memorial

ach, Inc

Ocean Sands K-9 Resort

158

Nags Head
Woods
Preserve



Sea Ranch
RESORT

Sea Ranch – Original System

- ❖ 19,000 GPD
- ❖ Combined Domestic and Grease Trap Wastewater
- ❖ Treatment – Septic Tanks and Grease Trap
- ❖ No Advanced Treatment
- ❖ Two LPP Drainfields Across Street
- ❖ Drainfields in “Dredged” Material
- ❖ Drainfields Failing



Sea Ranch – Repair System

- ❁ Engineer Option Permit
- ❁ Separate Domestic and Grease Trap Wastewater
- ❁ Grease Trap – Micro-Bubble Aeration – New Drainfield
- ❁ Domestic – Septic Tanks - Packed Bed Media with UV – Repair One Drainfield Lower LPP to Parent Material
- ❁ Eliminate One Drainfield (Develop)
- ❁ Design, Permit, and Construction in 7-Months

Engineer Option Permit

- Unique to North Carolina
- Engineer, Soil Scientist, and Installer take liability through insurance.
- County and State have no liability.
- Local Health Department/NCDHHS-On-Site Water Protection Branch only evaluates for completeness, no detailed review.
- Permit issued upon submittal.

Factors to Address?

- ❁ Soils
- ❁ Seasonal High Groundwater
- ❁ Street Between Resort and Drainfield(s)
- ❁ Vegetative Cover
- ❁ Limited Space / Setbacks / Access
- ❁ Regulatory Constraints
- ❁ Aesthetic Concerns
- ❁ Odors
- ❁ Time Off Line

High Groundwater

- ❁ CAMA – No Beach Discharge
- ❁ Well Points with Pump System
- ❁ Route to Stormwater System with Pond
- ❁ Street Crossing



Sea Pines
BEACHSIDE
BREAKFAST
SUNDAY THRU SAT
730 | 2





Kitchen/Restaurant Wastewater

- ✿ Existing Grease Trap – Next to Foundation – Use Existing Grease Trap
- ✿ Need to Pump to New Treatment and Drainfield – Use Pre-Assembled Fiberglass Pump Tank
- ✿ High Groundwater – Install Quickly
- ✿ Limited Space / Setbacks / Access – Experienced Crew







Kitchen/Restaurant Wastewater Treatment

- ❁ Existing Grease Trap
- ❁ Micro-Bubble Aeration/Precast Tank
- ❁ Grease Filter







Kitchen/Restaurant Drainfield

- ❖ Low Pressure Pipe (LPP)
- ❖ Gravel Bed with Geo-Textile



HITACHI

HOTEL LOBBY

EX-50 LC
50 LC
EX-50 LC



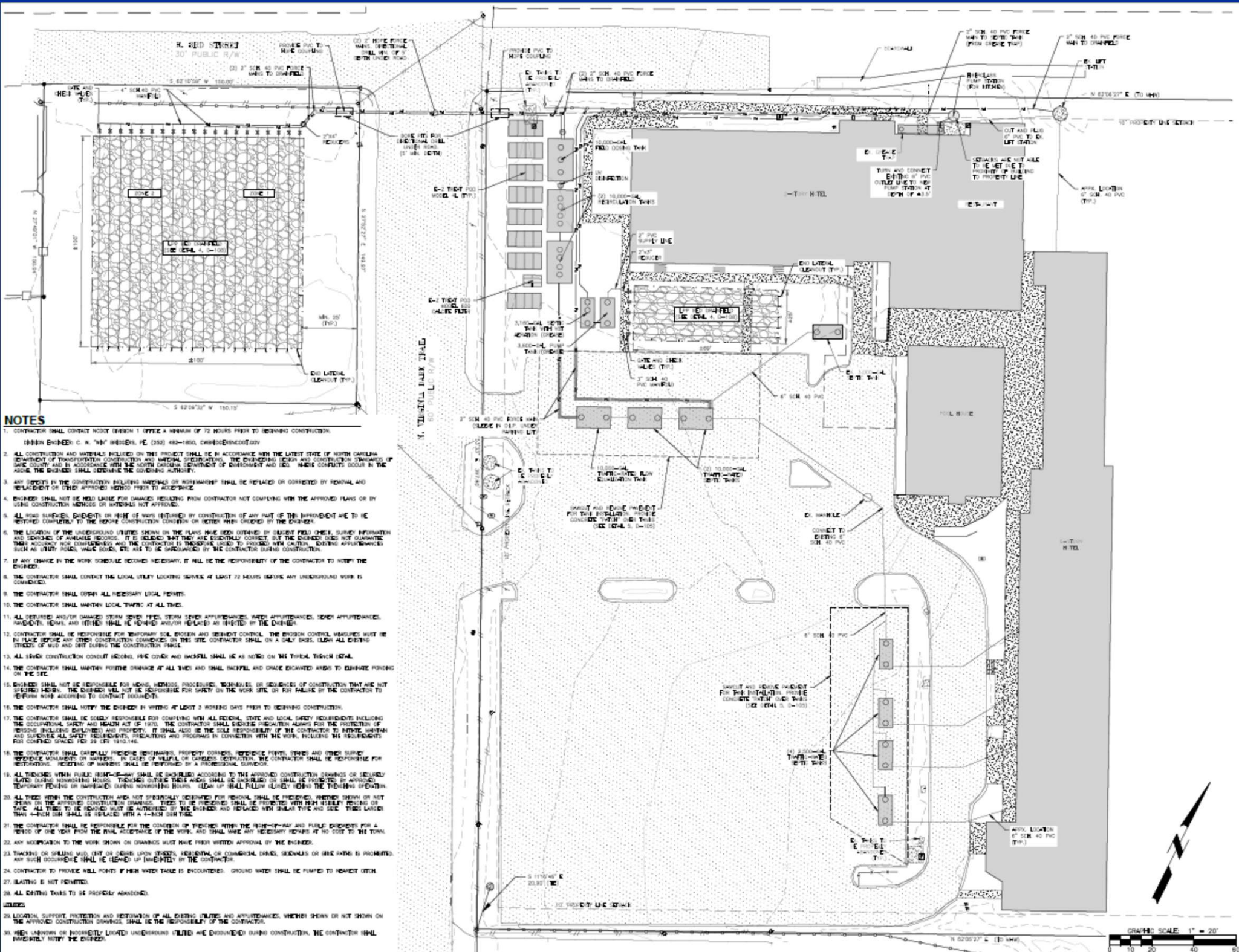






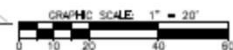
Domestic Wastewater

- ❁ New Septic Tanks
- ❁ Flow Equalization Tanks
- ❁ Recirculating Media Filters With Nitrogen Removal
- ❁ Low Pressure Pipe (LPP) Disposal



NOTES

1. CONTRACTOR SHALL CONTACT NORTH CAROLINA OFFICE A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION.
ENGINEER: C. N. WATKINS, P.E. (252) 482-1800, CWATKINS@COMcast.net
2. ALL CONSTRUCTION AND MATERIALS INCLUDED ON THIS PROJECT SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION CONSTRUCTION AND MATERIAL SPECIFICATIONS. THE ENGINEERING DESIGN AND CONSTRUCTION CHANGES OF THIS COUNTY AND IN ACCORDANCE WITH THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES. MAJOR CONFLICTS OCCUR IN THE AREA, THE ENGINEER SHALL DETERMINE THE GOVERNING AUTHORITY.
3. ANY DEFECTS IN THE CONSTRUCTION INCLUDING MATERIALS OR WORKMANSHIP SHALL BE REPAIRED OR CORRECTED BY REPAIRAL AND RECONSTRUCTION OR OTHER APPROVED METHOD PRIOR TO ACCEPTANCE.
4. ENGINEER SHALL NOT BE HELD LIABLE FOR DAMAGES RESULTING FROM CONTRACTOR NOT COMPLYING WITH THE APPROVED PLANS OR BY USING CONSTRUCTION METHODS OR MATERIALS NOT APPROVED.
5. ALL ROAD SURFACES, DRIVEWAYS OR HIGHWAYS RETURNED BY CONSTRUCTION OF ANY PART OF THE IMPROVEMENT ARE TO BE RESTORED COMPLETELY TO THE ORIGINAL CONSTRUCTION CONDITION OR BETTER WHEN ORDERED BY THE ENGINEER.
6. THE LOCATION OF THE UNDERGROUND UTILITIES SHOWN ON THE PLANS HAVE BEEN OBTAINED BY GROUND PENETRATION RADAR, SURVEY INFORMATION AND SERVICES OF AVAILABLE RECORDS. IT IS BELIEVED THAT THEY ARE ESSENTIALLY CORRECT, BUT THE ENGINEER DOES NOT GUARANTEE THEIR ACCURACY NOR COMPLETENESS AND THE CONTRACTOR IS TO PROCEED AT HIS OWN RISK. EXISTING APPROVED UTILITIES SUCH AS UTILITY POLES, WATER MAINS, ETC. ARE TO BE MAINTAINED BY THE CONTRACTOR DURING CONSTRUCTION.
7. IF ANY CHANGE IN THE WORK SCHEDULE BECOMES NECESSARY, IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE ENGINEER.
8. THE CONTRACTOR SHALL CONTACT THE LOCAL UTILITY LOCATING SERVICE AT LEAST 72 HOURS BEFORE ANY UNDERGROUND WORK IS COMMENCED.
9. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY LOCAL PERMITS.
10. THE CONTRACTOR SHALL MAINTAIN LOCAL TRAFFIC AT ALL TIMES.
11. ALL EXISTING AND/OR DAMAGED STORM SEWER PIPES, STORM SEWER APPURTENANCES, WATER APPURTENANCES, SEWER APPURTENANCES, SIDEWALKS, DRIVEWAYS, AND CURBS SHALL BE REPAIRED AND/OR REPLACED AS DIRECTED BY THE ENGINEER.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY SOIL EROSION AND SEDIMENT CONTROL. THE EROSION CONTROL MEASURES MUST BE IN PLACE BEFORE ANY OTHER CONSTRUCTION COMMENCED ON THIS SITE. CONTRACTOR SHALL ON A DAILY BASIS, CLEAN ALL EXISTING STREETS OF MUD AND DEBRIS DURING THE CONSTRUCTION PHASE.
13. ALL EXISTING CONSTRUCTION CONDUIT INCLUDING PVC CONDUIT AND MANHOLE SHALL BE AS NOTED ON THE TYPICAL TRIPPER DETAIL.
14. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AT ALL TIMES AND SHALL BACKFILL AND GRADE EXCAVATED AREAS TO EXISTING FINISH ON THE SITE.
15. ENGINEER SHALL NOT BE RESPONSIBLE FOR MEANS, METHODS, PROCEDURES, TECHNIQUES, OR SEQUENCES OF CONSTRUCTION THAT ARE NOT SPECIFICALLY NOTED. THE CONTRACTOR SHALL NOT BE RESPONSIBLE FOR SAFETY ON THE WORK SITE, OR FOR INJURY TO THE CONTRACTOR TO REPAIR WORK ACCORDING TO CONTRACT DOCUMENTS.
16. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING AT LEAST 3 WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION.
17. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR COMPLYING WITH ALL FEDERAL, STATE AND LOCAL SAFETY REQUIREMENTS INCLUDING THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970. THE CONTRACTOR SHALL OBTAIN NECESSARY PERMITS FOR THE PROTECTION OF PERSONS INCLUDING ALL SAFETY REQUIREMENTS, PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK, INCLUDING THE REQUIREMENTS FOR CONFINED SPACES PER 29 CFR 1910.146.
18. THE CONTRACTOR SHALL CAREFULLY PROTECT EXISTING NEIGHBORING PROPERTY CORNERS, REFERENCED POINTS, STAKES AND OTHER SURVEY REFERENCE MARKERS OR MONUMENTS. IN CASE OF VANDALISM OR CARELESS DESTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECONSTRUCTING. RESETTING OF MARKERS SHALL BE PERFORMED BY A PROFESSIONAL SURVEYOR.
19. ALL TRENCHES WITHIN PUBLIC RIGHT-OF-WAY SHALL BE SHOULDERED ACCORDING TO THE APPROVED CONSTRUCTION DRAWINGS OR SECURELY SLOTTED DURING NONWORKING HOURS. TRENCHES OUTSIDE THESE AREAS SHALL BE SHOULDERED OR SHALL BE PROTECTED BY APPROVED TEMPORARY FENCING OR BARRICADES DURING NONWORKING HOURS. CLEAN UP SHALL FOLLOW CLOSELY BEHIND THE OPERATING OPERATION.
20. ALL TRENCHES WITHIN THE CONSTRUCTION AREA NOT SPECIFICALLY REFERENCED FOR PROTECTION SHALL BE PROTECTED WHETHER SHOWN OR NOT SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS. TRENCHES TO BE PROTECTED SHALL BE PROTECTED WITH HIGH VISIBILITY FENCING OR TRENCH SHIELDING TO BE APPROVED UNDER THE SUPERVISION OF THE ENGINEER AND REPLACED WITH SIMILAR TYPE AND SIZE. TRENCHES LARGER THAN 48 INCH DEEP SHALL BE REPLACED WITH A 48 INCH DEEP TRENCH.
21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF TRENCHES WITHIN THE RIGHT-OF-WAY AND PUBLIC EVIDENCE FOR A PERIOD OF ONE YEAR FROM THE FINAL ACCEPTANCE OF THE WORK AND SHALL MAKE ANY NECESSARY REPAIRS AT HIS OWN COST TO THE TOWN.
22. ANY MODIFICATION TO THE WORK SHOWN ON DRAWINGS MUST HAVE BEEN WRITTEN APPROVAL BY THE ENGINEER.
23. TRACKING OR SHEDDING MUD, OIL OR OTHER DEBRIS UPON STREETS, RESIDENTIAL OR COMMERCIAL DRIVEWAYS, SIDEWALKS OR PUBLIC AREAS IS PROHIBITED. ANY SUCH OCCURRENCE SHALL BE CLEANED UP IMMEDIATELY BY THE CONTRACTOR.
24. CONTRACTOR TO PROTECT WELL POINTS IF HIGH WATER TABLE IS ENCOUNTERED. GROUND WATER SHALL BE PUMPED TO NEAREST OPEN DRAINAGE.
25. BLASTING IS NOT PERMITTED.
26. ALL EXISTING TANKS TO BE PROPERLY ABANDONED.
27. LOCAL SUPPORT PROTECTION AND RESTORATION OF ALL EXISTING UTILITIES AND APPURTENANCES, WHETHER SHOWN OR NOT SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS, SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
28. WHEN UNKNOWN OR INADEQUATELY LOCATED UNDERGROUND UTILITIES ARE ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER.





Sea Ranch
RESORT

BEACHSIDE
bistro

BREAKFAST
SUNDAY THRU SAT
7:30 | 2

HOTEL LOBBY

NO PARKING
ANYTIME

Tank Installation Issues

- ❁ High Groundwater/Historic Riverbed
- ❁ Power Lines
- ❁ Some in Existing Parking Lot
- ❁ Limit Mobilization of Cranes
- ❁ Limited Amount of Precasters to Requirements















Link-Belt

Link-Belt

ROSE-CRANE

Sea Ranch

HITACHI



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.
- Low profile, odors and noise contained.
- Reuse quality with nutrient removal (Certified: NSF 40, 245, and 350), although not required for permit.

Standards NSF / ANSI

Test	NSF/ANSI 40	NSF/ANSI 245	NSF/ANSI 350
	Domestic	Nutrient	Reuse
CBOD 5-Day	25 mg/l		10 mg/l
TSS	30 mg/l		10 mg/l
Nitrogen Reduction		50 % Reduction	
Turbidity			5 NTU
Bacteria (e-coli)			14 CFU/100ml
Chlorine Residual			0.5 - 2.5 mg/l
pH	6 - 9		6 - 9



CALCITE
FILTER

Marble Rock
SANDERS
MARBLE ROCK

10/10/2024







Results

	mg/L	11/21/2023	7/29/2024
Influent	TKN	184	268
	NO2 - NO3	0.06	0.16
	TN	184	269
Effluent	CBOD	<2	2
	NH3	1.3	11.6
	TKN	<0.5	4.6
	NO2 - NO3	15.6	32.4
	TN	15.6	37

Domestic Wastewater Drainfield

- Original drainfields in dredged/fill soils.
- New LPP lines in non-dredged/fill soils.
- Repair not needed (Type I Soils).





Summary

- Design permitting and construction completed in 7-months.
- Treatment provided high quality effluent.
- Eliminated second drainfield which can be developed.
- Value of eliminated drainfield worth cost of new system and profit.

Questions?



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