

Lake Granbury WPP Alternatives Analysis

3 - ALTERNATIVES ANALYSIS:

Rolling Hills Shores and Oak Trail Shores
Stakeholder Meeting
June 23, 2009

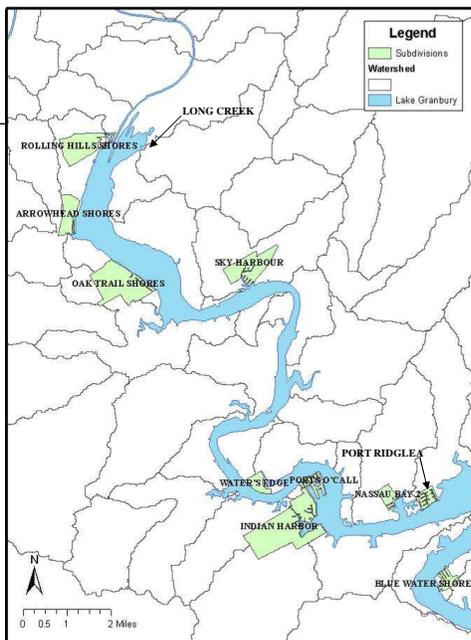
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Today's Outline

- Item 1 – Review Alternative Management Measures
 - Objective: Identify appropriate management measures
 - General description of alternatives } DONE
- LUNCH
- Item 2 – Framework for Alternatives Analysis
 - Evaluation Criteria
 - Ranking system } DONE
- Item 3 - Site-specific example evaluating alternatives
 - Use evaluation criteria
 - Use a ranking system
 - Take steps to identify management measures
 - Example: Rolling Hills Shores and Oak Trail Shores
- Next steps

Watershed
Protection Plan
Focus Areas



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Site-specific Evaluation of Management Measures

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SITES

- ❑ Rolling Hills Shores
 - ❑ Oak Trail Shores
 - ❑ Long Creek
 - ❑ Sky Harbor
 - ❑ Port Ridglea East
 - ❑ Indian Harbor
 - ❑ Nassau Bay II
- } DISCUSSION TODAY
- } ADDITIONAL DISCUSSION

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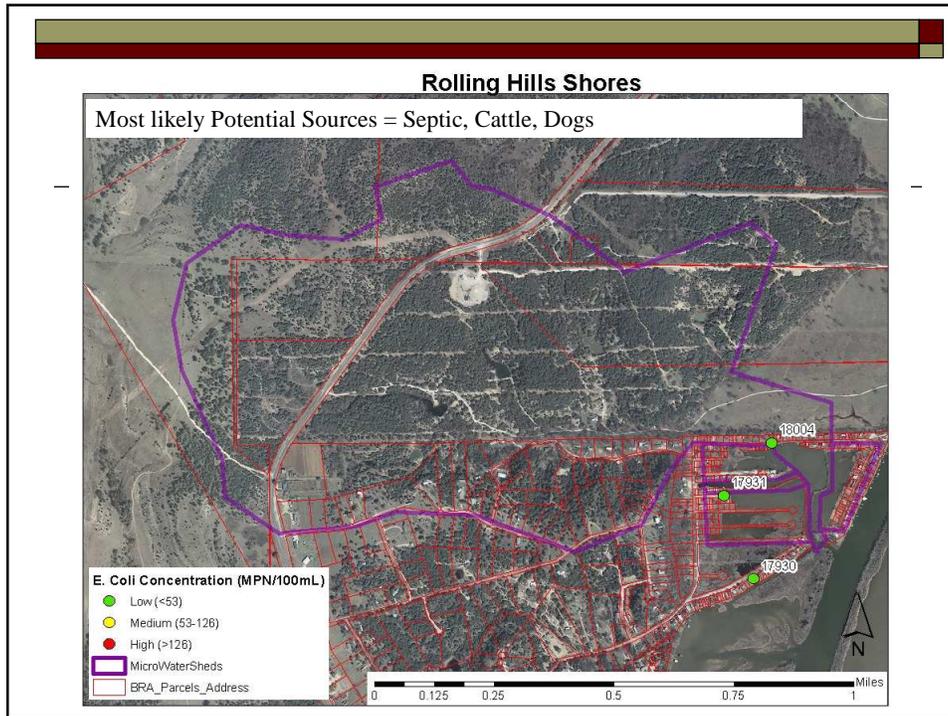
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Site-specific Evaluation of Management Measures:

Rolling Hills Shores

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On-site Sewage Facilities (OSSF) Replacement

Considerations:

- Soil Suitability
 - Depth to Bed Rock
 - Minimum Depth to Restrictive Layer
- Applicable treatment methods
 - 30 TAC §285.91 Table 13
 - Septic or Aerobic Pretreatment
 - Spray Distribution, Drip Emitters, Leaching Chambers, limited conventional systems

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On-site Sewage Facilities (OSSF) Replacement

Calculations:

- ❑ Estimate required area for disposal
(30 TAC §285)
 - Design Discharge 240 gpd
 - Conventional Drainfield on Sand (0.38 gpd/ft²) to Sandy Clay (0.20 gpd/ft²) [Q/R]
 - ❑ 631 ft² to 1200 ft²
 - Spray Irrigation on Clay (Application rate 0.064 gpd/ft²) [1.6Q/R]
 - ❑ 3750 ft²
 - Drip Emitter (Irrigation) (0.2 gpd/ft²) [Q/R]
 - ❑ 1200 ft²
 - Leaching Chamber (0.2 gpd/ft²) [Q/R]
 - ❑ 1200 ft², some reduction allowed for water saving devices

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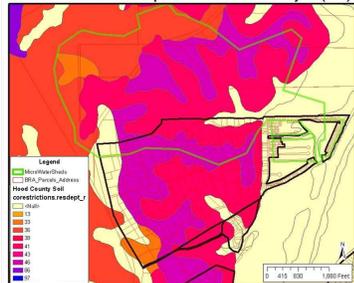
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Rolling Hills Shores Subdivision On-site Sewage Facilities (Septic)

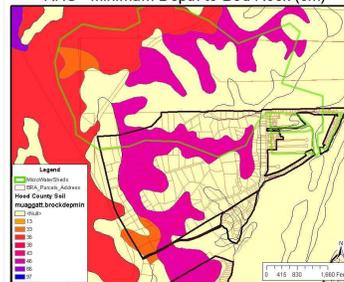
Considerations:

- ❑ Avg. lot size on cove < 6,000 ft²
- ❑ Soil Suitability
 - Depth to Bed Rock
 - Minimum Depth to Restrictive Layer
 - Soil Type
- ❑ Applicable treatment methods
30 TAC §285.91 Table 13

RHS - Minimum Depth to Restrictive Layer (cm)



RHS - Minimum Depth to Bed Rock (cm)



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Rolling Hills Shores Subdivision

On-site Wastewater Treatment Systems (Septic)

- Failing systems need to be replaced to meet current standards
 - Along cove and lake
 - **Not feasible for residences in floodplain**
 - Holding Tanks are only allowed where other disposal methods are not feasible

Annualized Cost Index = 0.32

- Remaining lots within the subdivision, on top of hill
 - conventional systems may be appropriate for some sites
 - ET bed or Spray Application
- Percent reduction = 46%
- 25 year life cycle



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Rolling Hills Shores Subdivision

Local Centralized Wastewater Treatment – Floodplain Only

Low Pressure System + Package WWTP Plant

- 103 residences in floodplain
(103 grinder pump units)
- Avg. lot size: 0.1 acres
- Volume treated 0.031MGD
- WWTP to discharge into lake
- 25 year life cycle
- Potential load reduction = 62%
- EAC Index = 0.31



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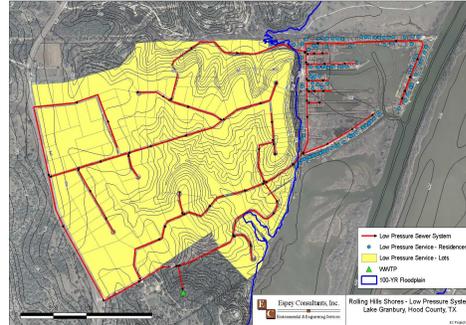
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Rolling Hills Shores Subdivision

Local Centralized Wastewater Treatment – Whole, LP

Low Pressure System + Local Package WWTP Plant

- Lot sizes: 0.03 to 5.6 acres
- 299 grinder pumps (connections)
 - Along Cove:
 - 103 floodplain residences
 - Uphill of Cove: 196 lots
- Volume Treated 0.09 MGD
- WWTP discharge to lake
- 25 year life cycle
- Potential load reduction = 62%
- EAC Index = 0.3



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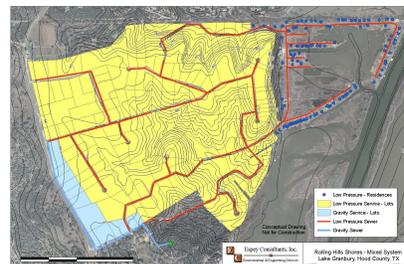
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Rolling Hills Shores Subdivision

Local Centralized Wastewater Treatment – Whole, Mixed

Mixed Collection System + Local WWTP Package Plant

- Low Pressure collection
 - 288 lots (grinder pumps)
 - 185 Uphill lots
 - 103 Floodplain residences
- Gravity collection
 - 11 lots
- 299 connections
- Volume Treated 0.09 MGD
- WWTP discharge into Lake
- 25 year life cycle
- Potential load reduction = 62%
- EAC Index = 0.32



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Rolling Hills Shores Subdivision

Cove Dynamics: Dredge/Fill

1 - Fill Cove

- 4' fill depth: 223,574 cy
- Fill & compaction
- Haul fill to site
- 299 lots/residences in subdivision
- 100 year life cycle
- Potential concentration reduction
 - Displaces load to land surface, still available for runoff flush to canal downstream
- EAC Index = 0.3



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Rolling Hills Shores Subdivision

Cove Dynamics: Dredge/Fill

2 - Partial Fill

- 4' fill depth: 187,800 cy
- Fill & compaction
- Haul fill to site
- 299 lots/residences in subdivision
- 75 year life cycle
- Change in Concentration = 0%
 - Increased concentration from direct (septic) discharge b/c reduced volume of water results
 - Load source must be reduced for reduced concentration in this alternative
 - Decreased concentration from flushing of NPS loads
- EAC Index = 0.25



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Rolling Hills Shores Subdivision

Cove Dynamics: Dredge/Fill

3 – Dredge

- 3' depth, 20' width, 1190 ft length
- Remove 2,650 cy
- Haul fill from site
- Purchase 1 acre spoil site
- 299 lots/residences in subdivision
- 5 year life cycle
- Percent concentration reduction = 4%
 - Greater reduction if direct discharge source reduced
- EAC Index = 1.0



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Rolling Hills Shores Subdivision

Cove Dynamics: Dredge/Fill

4- Dredge & Partial Fill

Dredge

- 3' depth, 20' wide channel
- Remove 2,650 cy
- Haul fill from site
- Purchase 1 acre spoils site

Partial Fill

- 4' fill depth
- Fill 187,800 cy
- Fill & Compaction
- Haul to site

299 lots/residences in subdivision
 10 year life cycle
 Net Concentration Change = 0%
 EAC Index = 0.73



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Rolling Hills Shores Subdivision

Cove Dynamics: Dredge/Fill

Partial Fill, Dredge and Additional Outlet

Dredge

- 3' depth, 20' wide channel
- Remove 2,650 cy
- Haul from site
- Purchase 1 acre spoil site

Partial Fill

- 4' fill depth
- Fill 187,800 cy
- Haul to site

Additional Outlet

- Excavation 1,111 cy
- Culvert
- Road Removal and Repair
- Land Acquisition

299 lots/residences in subdivision
 10 year life cycle
 Percent concentration reduction = 86%
 EAC Index = 0.76



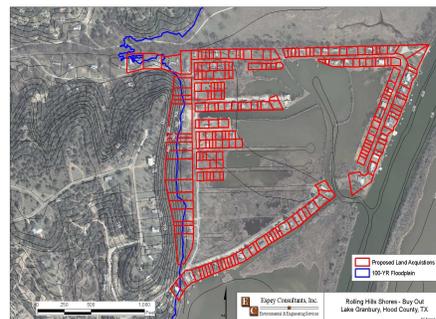
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Rolling Hills Shores Subdivision

Property Buy Out in Floodplain

- Purchase 213 lots within the floodplain
- 100 year life cycle
- Concentration Reduction = 62%
- EAC Index = 0.15



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Rolling Hills Shores Subdivision

Vegetative Filter Strips

- Average Life Span 10 years
- 50 ft long x 120 ft wide
- Place north of subdivision across drainage path
- Cost
 - Capital cost minimal construction/grading, seeding
 - O&M cost mowing and general cleanup
 - 10 year life cycle
 - 299 lots/residences in subdivision
 - Annualized cost index = 0.02
- 5.1% Pollutant Removal
 - 67% Trapping Efficiency for Sediment
 - ~50% of bacteria from trapped sediment removed
 - ~40% of watershed runoff treated

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Rolling Hills Shores & Oak Trail Shores

Regional (Centralized) Wastewater Treatment-Aggregation



- 2451 lots served
- 5.2 mi interceptor
 - Layout represents broad location potential for infrastructure
- Assumed 2 lift stations
- Volume treated 0.74 MGD
- 25 year life cycle
- IN-PROGRESS – City Of Granbury to provide info on proposed plant and collector location

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Rolling Hills Shores to Oak Trail Shores Regional (Centralized) Wastewater Treatment-Aggregation

- 5961 lots served
- 5.2 mi interceptor
 - Layout represents broad location potential for infrastructure
- Assumed 4 lift stations
- Volume treated 1.79 MGD
- 25 year life cycle
- Potential load reduction
 - RHS = 62%
 - OTS = 54%
- EAC Index = 0.19



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Example of Ranking System for Alternatives Evaluation

Stakeholder Input

Quantitative

Factor Weight	Factor	Rating Scale					Score	
		0	1	2	3	4		5
1	Watershed %Reduction	0%	1-20%	21-40%	41-60%	61-80%	80-100%	3
1	Time to Implement	>15 years	10-15 years	5-10 years	2-5 years	1-2 years	<1 year	4
1	Annual Cost Index	0.65-1.0	0.35-0.64	0.27-0.34	0.19-0.26	0.07-0.18	<0.06	2

Total Score **9**

Qualitative

	Feasibility (Constraints/Considerations)	Not Feasible Alternative	Severe Constraints	Significant Constraints	Some Constraints	Few constraints	Negligible constraints
	Funding	None available	Limited Funding	Partial Funding	Some Funding	Significant Funding Available	Full Funding

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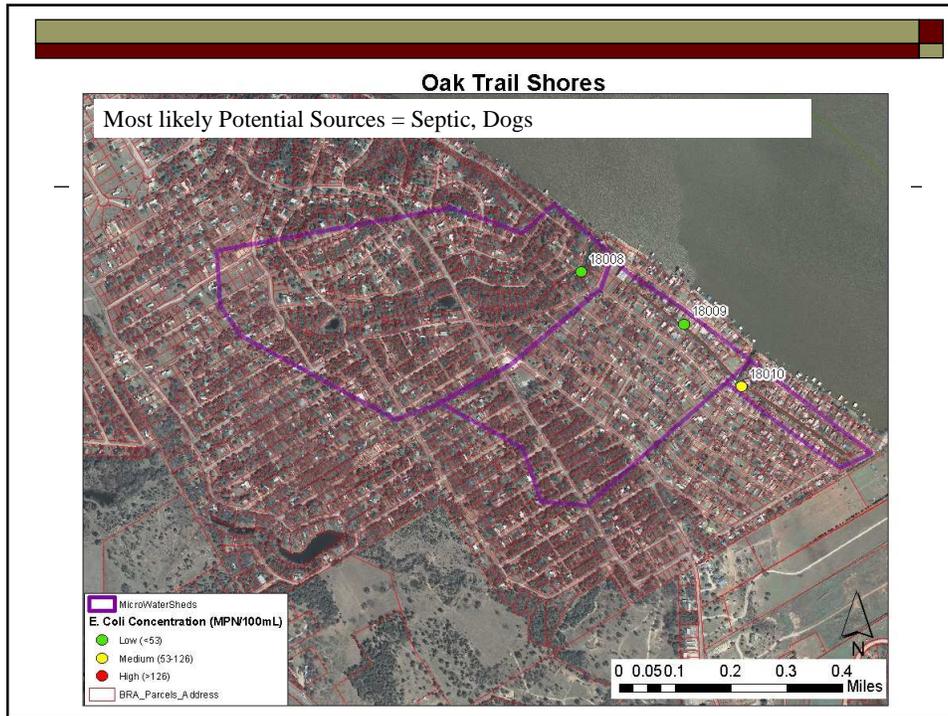
Rolling Hills Shores Subdivision

Alternatives Ranking

BMP Alternative	Not Calculated		In Progress			Score	Feasibility (Constraints/ Considerations)	Funding
	Watershed % Reduction	Time to Implement	Equivalent Annual Cost index					
	Weighting -> 1		1		1			
Septic System Replacement along Cove	46%	3 <1 yr	5	0.32	2	10	future repairs, floodplain, limited to holding tanks	25
Septic System Replacement Uphill	46%	3 <1 yr	5	0.22	3	11	future repairs	
Local Centralized Wastewater Treatment - Independent	62%	4 2-5 yrs	3	0.30	2	9		
Local Centralized Wastewater Treatment-Aggregate	62%	4 5-10 yrs	2	0.19	3	9		
Regional Wastewater Treatment	62%	4 10-15 yrs	1					
Property Buy-Out	62%	4 1-2 yrs	4	0.15	4	12	Public Opinion, Removal of Tanks	
Fill	0%	0 1-2 yrs	4	0.30	2	8		
Partial Fill	0%	0 1-2 yrs	4	0.25	3	7	Does not address	
Dredge	4%	1 1-2 yrs	4	1.00	0	5	source(s);	
Partial Fill & Dredge	0%	0 2-5 yrs	3	0.73	0	3	Flood storage, Property Rights	
Dredge, Partial Fill, Add Outlet	88%	5 2-5 yrs	3	0.76	0	8		
Vegetative Filter Strips	5%	1 <1 yr	5	0.02	5	11		

Site-specific development of Alternatives:

Oak Trail Shores



Oak Trail Shores Subdivision

OWTS (Septic)

OTS - Minimum Depth to Restrictive Layer (cm)

- 589 permits
- Avg. Lot
 - Section 1 ~14,000 ft²
 - Section 2 ~10,000 ft²
 - Section 3 ~ 10,000 ft²
- Replace Malfunctioning Systems

Legend

- BRA_Parcels_Address
- Head County Soil
- restrictions.resdept_r

0 500 1,000 2,000 Feet

Section	Type of System	Equivalent Annual Cost Index
1	conventional septic/drainfield	0.17
	septic tanks with Spray Distribution	0.33
2	aerobic tanks with drip emitters	
3	conventional septic/drainfield in NW	0.23
	septic tanks with spray distribution or leaching chamber,	
	aerobic tanks with drip emitters	

- 25 year life cycle
- % Reduction = 41%

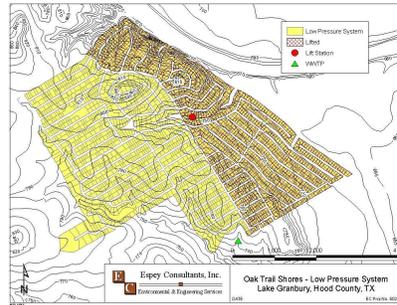
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Oak Trail Shores Subdivision

Centralized local wastewater treatment

Low Pressure System + Local WWTP Package Plant

- 2045 residential lots
(2045 grinder pump units)
- Average Lot Size 0.2 acres
- 1 lift station
- Volume treated 0.614 MGD
- WWTP discharge into lake
- 25 year life cycle
- Potential load reduction = 54%
- EAC Index = 0.25



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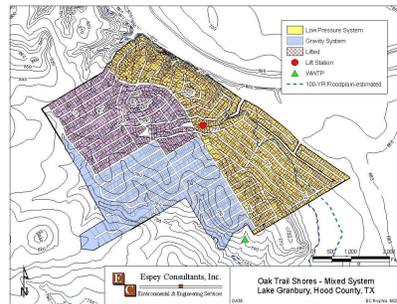
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Oak Trail Shores Subdivision

Centralized local wastewater treatment

Mixed System + Local WWTP Package Plant

- Low Pressure
 - 875 lots
- Gravity
 - 1170 lots
- 1 lift station
- Volume treated 0.614 MGD
- WWTP discharge into lake
- 25 year life cycle
- Potential load reduction = 54%
- EAC Index = 0.16



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Oak Trail Shores Subdivision

Cove Dynamics

1-Fill Cove

- 3-5' fill depth: 20,100 cy
- Fill & compaction
- Haul soil to site
- 2045 lots in subdivision
- 100 year life cycle
- Potential concentration reduction = %
- EAC Index = 0.01



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Oak Trail Shores Subdivision

Cove Dynamics

2- Partial Fill of Cove

- 3-5' fill depth: 7,780 cy
- Haul to Site
- Fill & Compaction
- 2045 lots in subdivision
- 75 year life cycle
- Percent concentration reduction = 0%
- EAC Index = 0.01



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Oak Trail Shores Subdivision

Cove Dynamics

3- Dredge

- Dredge 3' depth, 20' width: 6,260 cy
- Haul up to 10 miles
- Purchase 1 acre spoil site
- 2045 lots in subdivision
- 5 year life cycle
- Potential concentration reduction = 30%
- EAC Index = 0.99



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Oak Trail Shores Subdivision

Cove Dynamics

4 - Dredge and Additional Outlets

Dredge

- 3' depth, 20' width: 6,260 cy
- Haul
- Purchase 1 acre spoil site

Outlets

- Excavate 3155 cy
- Remove and Repair Roadway
- Culverts
- Land Acquisition and structure location

2045 lots in subdivision

10 year life cycle

Potential concentration reduction = 65%

EAC Index = 0.35



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Oak Trail Shores Subdivision

Offsite Drainage Bypass

- Drainage ditch along east side of Greenbrook St routes runoff away from canal
- V-shaped channel: 2' depth, 12.5' top width, 3,933' length
- Captures more frequent events (up to the 5-yr rainfall event)
- Excavation, drainage pipes under driveways, culvert pipes under Pecan Valley and Valley Ridge, revegetation
- 2045 lots in subdivision
- 50 year life cycle
- Potential concentration reduction = 51%
- EAC Index = 0.03



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Oak Trail Shores Subdivision

Alternatives Ranking

BMP Alternative	Weighting ->	Not Calculated		In Progress		Score	Feasibility (Constraints/ Considerations)	Funding
		Watershed % Reduction	Time to Implement	Equivalent Annual Cost index	Score			
Septic System Replacement	1	1	1	1				
Section 1				0.17				
Section 2				0.33				
Section 3	41%	3	<1 yr	5	0.23	4	12	
Local Centralized Wastewater Treatment - Independent		54%	3	2-5 yrs	3	0.16	4	10
Local Centralized Wastewater Treatment - Aggregate		54%	3	5-10 yrs	2	0.19	3	8
Regional Wastewater Treatment		54%	3	10-15 yrs	1			
Cove Dynamics:	Fill	0%	0	1-2 yrs	4	0.01	5	9
	Partial Fill	0%	0	1-2 yrs	4	0.01	5	9
	Dredge	30%	2	1-2 yrs	4	0.99	0	6
	Dredge, Add Outlet	65%	4	2-5 yrs	3	0.35	1	8
Drainage Re-route		51%	3	<1 yr	5	0.03	5	13

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Alternatives Evaluation

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Load Reduction Comparison

Conceptual Design Best Estimates											
Location	Septic System Replacement (annually - 20 years)	Septic Maintenance Pump-out Pilot Program	Local Centralized Wastewater Treatment - Independent	Local Centralized Wastewater Treatment - Aggregate	Regional Wastewater Treatment	Cove Dynamics: Dredge, Fill	Drainage Re-route	Cove Circulation Systems (Fountains, etc)	Catchment Basin	Property Buy Out	Filter Strips for Livestock
Rolling Hills Shore	46%		62%	62%	62%	86%				62%	5%
Long Creek	75%		100%								
Oak Trail Shores	41%		54%	54%	54%	65%	51%				
Sky Harbor	9%		13%	13%	13%			39%	65%		
Nassau Bay II			98%	98%	98%						
Waters Edge					0%						
Indian Harbor			100%	100%	100%			33%			
Port Ridgela East	75%		100%	100%	100%			30%			
Blue Water					0%						
Lake-Wide											

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Time Comparison

Location	Septic System Replacement (annually - 20 years)	Septic Maintenance Pump-out Pilot Program	Local Centralized Wastewater Treatment - Independent	Local Centralized Wastewater Treatment - Aggregate	Regional Wastewater Treatment	Cove Dynamics: Dredge, Fill	Drainage Re-route	Cove Circulation Systems (Fountains, etc)	Catchment Basin	Property Buy Out	Filter Strips for Livestock
Rolling Hills Shores	1 yr		4-5 yrs	5 yrs	5-10 yrs	2-3 yrs				1 yr	
Long Creek	1 yr		4-5 yrs	5 yrs	5-10 yrs						1 yr
Oak Trail Shores	1 yr		4-5 yrs	5 yrs	5-10 yrs	2-3 yrs	2 yrs				
Sky Harbor	1 yr		4-5 yrs	5 yrs	5-10 yrs			1 yr	3-5 yrs		
Nassau Bay II			4-5 yrs	5 yrs	5-10 yrs						
Waters Edge					5-10 yrs						
Indian Harbor			4-5 yrs	5 yrs	5-10 yrs			1 yr			
Port Ridglea East	1 yr	1-2 yrs	4-5 yrs	5 yrs	5-10 yrs			1 yr			
Blue Water					5-10 yrs						
Lake-Wide					5-10 yrs						1 yr

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Cost Comparison

Conceptual Design Equivalent Annual Cost Index Summary											
Location	OSSF (Septic System) Replacement	Septic Maintenance Pump-out Pilot Program	Local Centralized Wastewater Treatment - Independent	Local Centralized Wastewater Treatment - Aggregate	Regional Wastewater Treatment	Cove Dynamics: Dredge, Fill	Drainage Re-route	Cove Circulation Systems (Fountains, etc)	Catchment Basin	Property Buy Out	Filter Strips for Livestock
Rolling Hills Shores (Uphill/Cove)	0.22/0.32		0.30	0.19		0.25 - 1.0				0.15	0.02
Long Creek	0.36		0.28								
Oak Trail Shores	Section 1	0.17									
	Section 2	0.33	0.16	0.19		0.01-0.99	0.03				
	Section 3	0.23									
Sky Harbor	0.26		0.18					0.11	0.48		
Nassau Bay II			0.28	0.28							
Waters Edge											
Indian Harbor			0.24					0.10			
Port Ridglea East	0.45		0.28	0.28				0.14			
Blue Water											
Lake-Wide											

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Constraints

- Rolling Hills Shores
 - Topography, soils, floodplain
- Oak Trail Shores
 - Number of waterfront residences, compared to overall subdivision
- Sky Harbor
 - Topography, soils
 - Proximity of existing sewer service
- Port Ridglea
 - Existing lot size

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Potential Funding Sources

- State-administered funding - Texas Water Development Board
 - CWSRF – Clean Water State Revolving Fund
 - EDAP – Economically Distressed Areas Program
- Federally-administered funding, Rural Development
 - EPA
 - USDA
- Self-financing
 - Bonds
 - Loans

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Alternatives Ranking

Rolling Hills Shores Subdivision

BMP Alternative	Not Calculated		In Progress		Score	Feasibility (Constraints/ Considerations)	Funding	
	Watershed % Reduction	Time to Implement	Equivalent Annual Cost	index				
	Weighting -> 1	1	1	1				
Septic System Replacement along Cove	46%	3 <1 yr	5	0.32	2	future repairs, floodplain, limited to holding tanks	43	
Septic System Replacement Uphill	46%	3 <1 yr	5	0.22	3	future repairs		
Local Centralized Wastewater Treatment - Independent	62%	4 2-5 yrs	3	0.30	2	9		
Local Centralized Wastewater Treatment-Aggregate	62%	4 5-10 yrs	2	0.19	3	9		
Regional Wastewater Treatment	62%	4 10-15 yrs	1					
Property Buy-Out	62%	4 1-2 yrs	4	0.15	4	12 Public Opinion, Removal of Tanks		
Cove Dynamics:	Fill	0%	0 1-2 yrs	4	0.30	2		6
	Partial Fill	0%	0 1-2 yrs	4	0.25	3		7 Does not address source(s);
	Dredge	4%	1 1-2 yrs	4	1.00	0		5
	Partial Fill & Dredge	0%	0 2-5 yrs	3	0.73	0		3 Flood storage, Property Rights
	Dredge, Partial Fill, Add Outlet	86%	5 2-5 yrs	3	0.76	0		8
Vegetative Filter Strips	5%	1 <1 yr	5	0.02	5	11		

Next steps

Next Steps

- This is the hard part!
- Stakeholders:
 - Evaluate and rank alternative management measures for each area
 - Identify constraints
- Potential subcommittee groups?
- Reconvene to discuss and make recommendations

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Questions or Comments?

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