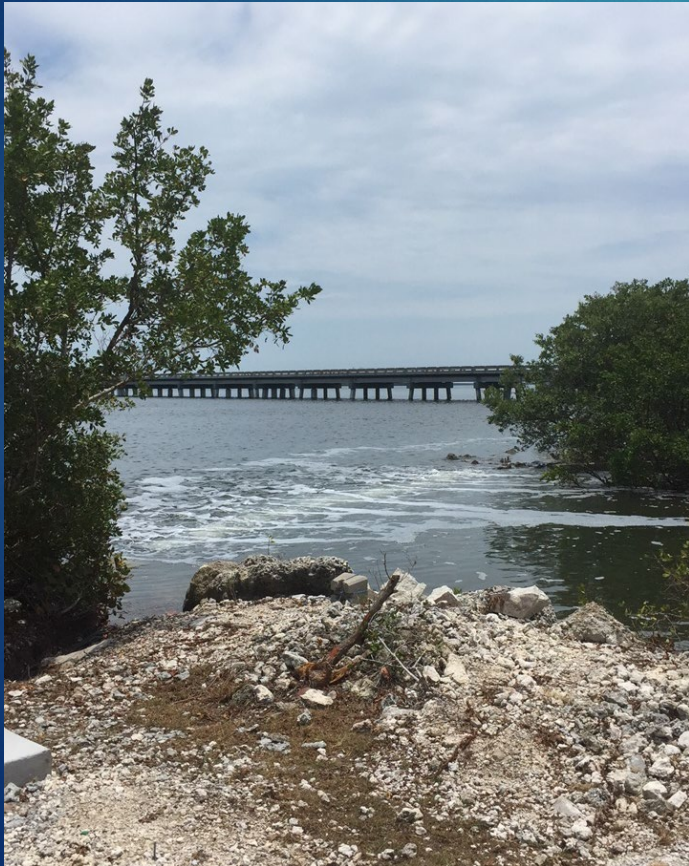


**Florida Keys
Canal Restoration
Program Update
EPA Grant #03D09924
FKNMS WQPP Steering
Committee
March 4, 2026**



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Rhonda Haag



Greg Corning

Agenda

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Task 1

- Canal Water Quality Monitoring

Task 2

- Canal Technology Cost Reduction and Effectiveness Evaluation

Task 3

- Geographical Grouping of Canal Restoration Projects to Increase Effectiveness of Nearshore Water Quality

Task 4

- Florida Keys Injection Well Pilot Project

Task 5

- Mitigation Credit Ledger

Task 6

- Canal Restoration Program Public Outreach

Florida Keys Canal Restoration Program

- Continued planning and implementation efforts

Task 1– Water Quality Monitoring

- Completed two semi-annual water quality monitoring events for the residential canals within the County and municipalities.
- The sampling events were conducted in March 2025 and November 2025.
- FDEP sample location was set at center of canal with an average of the profile
- March 2025 results exhibited a mean DO concentration of 67.5%, the target concentration is 42% Dissolved Oxygen (DO).
- November 2025 results exhibited a mean DO concentration of 49%.

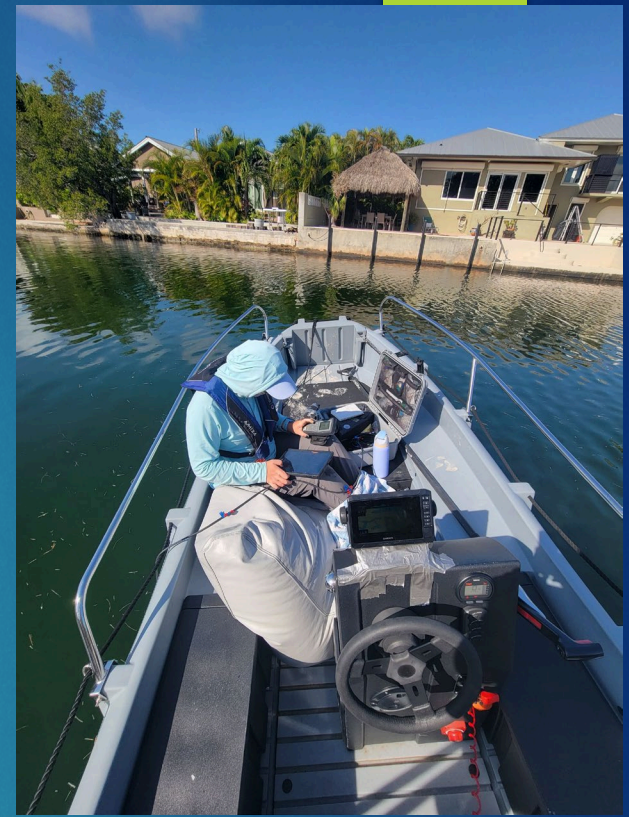


Table 1: Statistical Summary

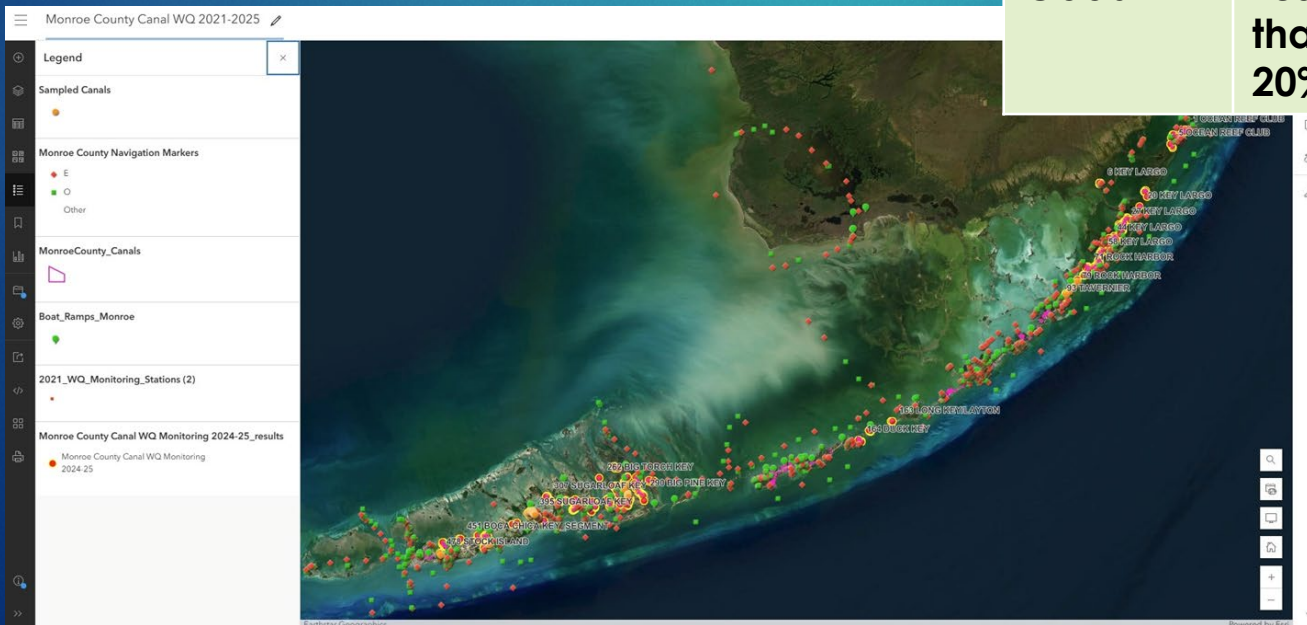
Parameter	Nov-25	Mar-25	Dec-21	Mar-17	Jun-13
Min	-0.3	0.0	-2.4	5.0	6.0
Max	83.9	118.0	116.5	115.9	120.5
Mean	48.9	67.5	61.2	81.5	50.6
Q1	40.6	53.7	47.6	72.0	37.6
Q3	59.3	84.7	77.4	98.0	64.3
STDEV	14.7	23.4	21.5	21.8	19.9
Count<42	71	37	45	13	32
Total Count	272	276	243	224	99
%<42	26.1%	13.4%	18.5%	5.8%	32.3%

Task 1– Water Quality Monitoring

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- Pursuant to FDEP 62-303, canals were compared to the criteria of less than 3 samples out of 10 exhibiting a DO below 42 percent.
- Since most canals don't have 10 samples, a z-score was calculated for each canal that has over three sampling events to compare to the criteria.

WQ Summary	Z Score	2025 Count	2017 Count
Poor	Greater than 33%	55	14
Fair	Between 20% and 33%	32	71
Good	Less than 20%	185	187



Task 2 – Canal Technology Cost Reduction and Effectiveness Evaluation

- Evaluate Canal Restoration List containing 96 projects for \$538 Million.
- We used \$5 Million as a cap to determine stand alone technologies to prioritize canal restoration such as using, backfill / capping, culverts and injection wells.
- Technology selection strategy adapted to the size of the canals to minimize total costs.

Table 1- Unit Rate Comparison

Scenario	Culvert (\$/LF)	Backfill (\$/CY)	Org Removal (\$/CY)	Injection Well (\$/EA)
2021 Rates	\$1,783	\$51	\$215	--
2025 Rates	\$3,674	\$106	\$239	\$400,000
Percent Increase	106.1%	107.9%	11.1%	--

Figure 1 - 2021 Project Selection - Poor & Fair Canals

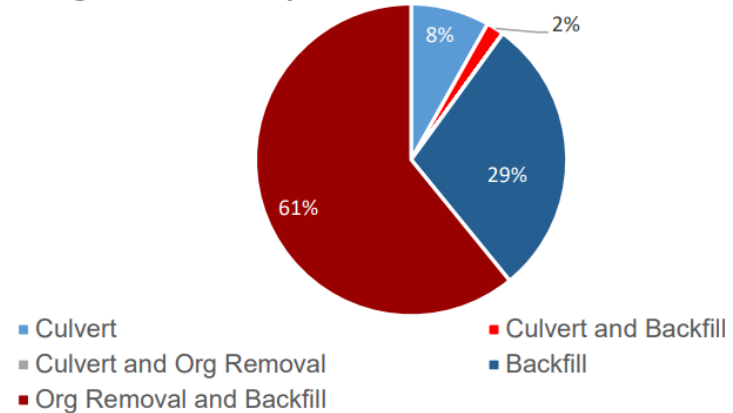
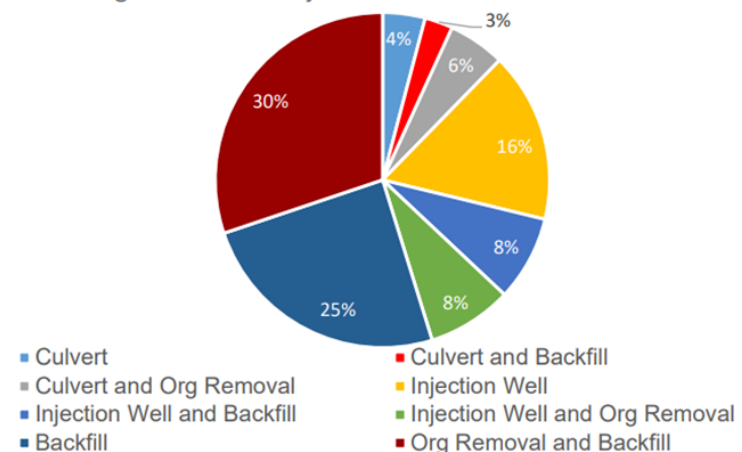


Figure 2 - 2025 Project Selection - Poor & Fair Canals



Task 2 – Canal Technology Cost Reduction and Effectiveness Evaluation

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Cost by Project Type for Poor or Fair Canals						
Technology	2021 Database			2025 Database		
	Project Count	Total Cost by Technology	Average Cost Per Project	Project Count	Total Cost by Technology	Average Cost Per Project
Culvert	9	\$6,649,715	\$738,857	3	\$2,406,388	\$802,129
Culvert and Backfill	2	\$21,304,088	\$10,652,044	2	\$9,380,575	\$4,690,288
Culvert and Org Removal	0	--	--	4	\$8,736,837	\$2,184,209
Injection Well	--	--	--	12	\$12,309,058	\$1,025,755
Injection Well and Backfill	--	--	--	6	\$19,410,266	\$3,235,044
Injection Well and Org Removal	--	--	--	6	\$16,023,825	\$2,670,638
Backfill	32	\$163,754,140	\$5,117,317	18	\$20,667,367	\$1,148,187
Org Removal and Backfill	67	\$298,436,902	\$4,454,282	22	\$19,960,327	\$907,288
Total	110	\$490,144,845	\$4,455,862	73	\$108,894,644	\$1,491,707

- A 65-percent decrease is observed from the average project cost for the 2021 project database to the 2025 project database; from \$4.5 Million per project to \$1.5 Million per project.



AIR CURTAIN AND SEAWEED BARRIERS



- ▶ Easements
- ▶ Long Term use of property
- ▶ MSBUs (operation and maintenance)
- ▶ Storm hardening (raise compressors)
- ▶ Wind vanes to control on/off schedules



INJECTION WELLS

- ▶ Easements
- ▶ Long Term use of property
- ▶ MSBUs (operation and maintenance)



2:57:06 PM



CULVERTS

- Easements



MUCK REMOVAL / CAPPING / BACKFILLING

- ▶ Easements
- ▶ Dewatering and Disposal costs

Task 3 – Canal Restoration – Geographical Grouping of Canal Restoration Projects to Increase Effectiveness of Nearshore Water Quality

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- Using the University of Miami nearshore study data, we identified canals within close proximity of each other, and used the associated water quality of the adjacent canals for prioritization of water quality restoration projects.
- The GIS database of residential canals was reviewed, and every canal within 200 meters of an adjacent canal was attributed with the name of the adjacent canal and the offset distance.
- A water quality restoration prioritization score of 0, 2, 3, and 5 was assigned to each canal based on its grouping.

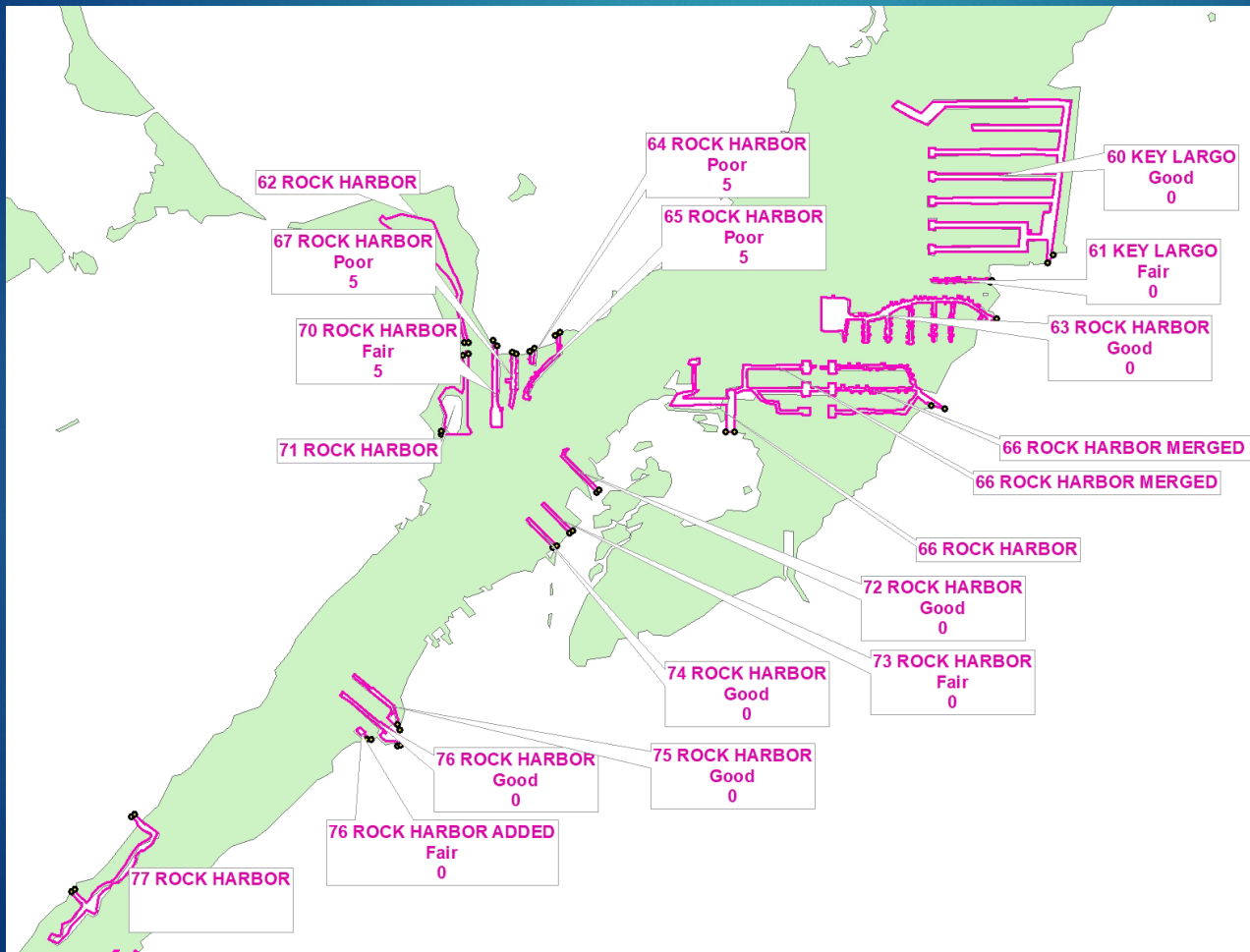
Attachment B
EPA FY 2024 South Florida Grant
Task 3: Canal Grouping Criteria
Monroe County Canal Restoration Program
WSP Project No. G684.5684

CANAL	Criteria Score	GROUP DISTANCE	CANAL WATER QUALITY CLASSIFICATION	Z-SCORE PERCENT DO LESS THAN 42%
56 KEY LARGO	5	590	Poor	36.8%
54 KEY LARGO	5	590	Fair	23.92%
53 KEY LARGO	5	590	Fair	28.21%
52 KEY LARGO	5	590	Poor	53.07%
57 KEY LARGO	0	520		
55 KEY LARGO	2	520	Fair	20.36%
51 KEY LARGO	2	520	Fair	25.80%
59 KEY LARGO	3	530	Poor	65.9%
58 KEY LARGO	3	530	Poor	41.15%
63 ROCK HARBOR	0	693	Good	3.6%
61 KEY LARGO	0	693	Fair	27.97%
60 KEY LARGO	0	693	Good	1.14%
70 ROCK HARBOR	5	535	Fair	30.7%
67 ROCK HARBOR	5	535	Poor	49.51%
64 ROCK HARBOR	5	535	Poor	41.79%
65 ROCK HARBOR	5	535	Poor	42.33%
74 ROCK HARBOR	0	538	Good	16.5%
73 ROCK HARBOR	0	538	Fair	23.55%
72 ROCK HARBOR	0	538	Good	10.41%
76 ROCK HARBOR ADDED	0	445	Fair	28.5%
76 ROCK HARBOR	0	445	Good	3.56%
75 ROCK HARBOR	0	445	Good	13.96%

Task 3 – Canal Restoration – Geographical Grouping of Canal Restoration Projects to Increase Effectiveness of Nearshore Water Quality

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Example of the canal grouping rankings and water quality.



Task 3 – Canal Restoration – Geographical Grouping of Canal Restoration Projects to Increase Effectiveness of Nearshore Water Quality

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- Of the 333 unincorporated canals within Monroe County, 272 (81.7%) are located within 200 meters of another canal. Of the 272 grouped canals:
 - Criteria Score 0
220 canals (80.9%)
 - Criteria Score 2
Four canals (1.5%)
 - Criteria Score 3
Twenty canals (7.4%)
 - Criteria Score 5
Twenty-eight (10.3%)
- This information was added as part of the ranking data to support prioritization of adjacent canals at improving nearshore water quality



Criteria Score:

0 = canal groups that did not have at least two fair or poor canals

2 = canal groups of two fair canals

3 = canal groups of a fair and poor canal or of two poor canals

5 = canal groups of more than two fair and poor canals

Revised Ranking Criteria

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Canal Water Quality Ranking Criteria		Score Range	Weighting Factor
1) Water Quality (scored from 0 to +5) Scoring is based on observed water quality degradation and monitoring conducted by the County.	If less than three samples have been collected, and the mean dissolved oxygen (DO) is greater than 60 percent, then the score is 0 (Limited Data - Good). If more than three samples have been collected and the percent of samples for a comprehensive dataset (determined by the z-score) is less than 20 percent, then the score is 0 (Good).	(0 to +5)	10
	If less than three samples have been collected, and the mean DO is less than 60 percent, then the score is 1 (Limited Data - Fair).		
	If less than three samples have been collected, but at least one sample exhibited DO less than 42 percent, then the score is 2 (Limited Data - Poor).		
	If more than three samples have been collected, and the z-score indicates that between 20 percent and 33 percent of the sample set will exhibit DO less than 42 percent, then the score is 3 (Fair).		
	If more than three samples have been collected, and the z-score indicates that more than 33 percent of the sample set will exhibit DO less than 42 percent, then the score is 5 (Poor).		
2) Evidence of Nutrient Accumulation (scored from 0 to +5) Scoring is based on the potential discharge of nutrient rich waters from the canals.	For canals that do not receive seaweed loads or do not exhibit elevated nutrient concentrations (evident through slime growth and reduced water clarity); the score is 0.	(0 to +5)	3
	For canals with moderate seaweed loading, moderate slime growth, moderate water clarity, or moderate reduction in fish habitat; the score is 3.		
	For canals with heavy seaweed loading, significant visual degradation, and lack of fish habitat; the score is 5.		
3) Likelihood of toxicity (scored from 0 to +5) Scoring is based on the likelihood of hydrogen sulfide production based on canal bathymetry.	For canals with an average depth less than 10 feet; the score is 0.	(0 to +5)	3
	For canals with an average depth between 10 feet and 20 feet; the score is 3.		
	For canals with an average depth greater than 20 feet; the score is 5.		
4) Connectivity to Nearshore Waters (scored from 0 to +5) Scoring is based on the potential of the canal to degrade the water quality in nearshore waters.	For canals that are connected to semi-enclosed waters such as harbors and inlets; the score is 0.	(0 to +5)	2
	For canals that are connected to open water, but are a sufficient distance away from high flow areas such as tidal channels; the score is 3.		
	For canals that are connected to open water, and are close to high flow areas such as tidal channels; the score is 5.		
5) Continuous Nearshore Impact Grouping (scored from 0 to +5) The potential nearshore impact is based on degraded water quality in adjacent canals. The intent is to identify degraded canals within 200 meters of each other for restoration to mitigate expansive impact to nearshore waters.	For canals that have good water quality and are adjacent to canals with good water quality; the score is 0.	(0 to +5)	5
	For canals that have fair or poor water quality and are adjacent to another canal with fair or poor water quality the score is 2		
	For a pair of canals that have fair or poor water quality with at least one canal having poor water quality the score is 3		
	For canals that are adjacent to more than one canal with fair or poor water quality; the score is 5		
6) Public Benefit (scored from 0 to +5)		(0 to +5)	2

Revised Ranking Criteria

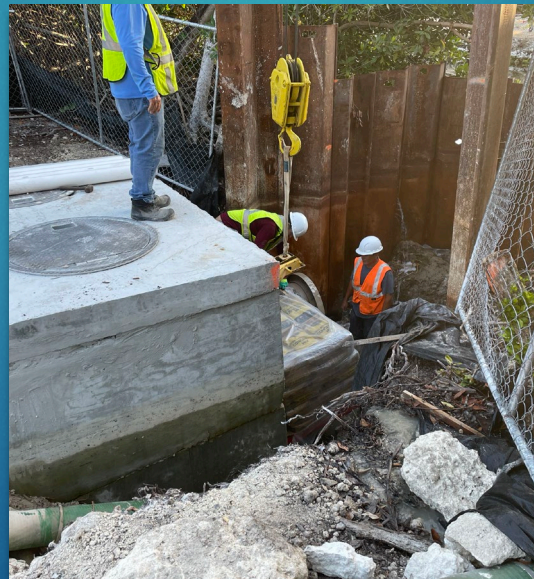
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Canal Restoration Ranking List

Canal Name	2025 Ranking	2025 Water Quality Summary	2025 Technology Recommendation	Restoration Cost	2020 Ranking	2020 Water Quality Summary	2020 - Technology Recommendation	Restoration Cost
300 BIG PINE KEY	1	Poor	Org Removal and Backfill	569,584	7	Limited Data - Fair	Organic Removal, Capping and Weedgate	1,490,926
356 SUMMERLAND KEY	2	Poor	Backfill	474,988	Not Ranked	Not Ranked	Not Ranked	Not Ranked
287 BIG PINE KEY	3	Poor	Org Removal and Backfill	1,022,667	13	Limited Data - Fair	Organic Removal, Capping and Weedgate	2,942,881
283 BIG PINE KEY	4	Poor	Org Removal and Backfill	468,158	19	Limited Data - Fair	Organic Removal, Capping and Weedgate	1,325,647
438 BIG COPPITT KEY	5	Poor	Backfill	2,419,533	Not Ranked	Not Ranked	Not Ranked	Not Ranked
333 SUMMERLAND KEY	6	Poor	Backfill	941,936	Not Ranked	Not Ranked	Not Ranked	Not Ranked
78 ROCK HARBOR	7	Fair	Injection Well and Backfill	2,422,538	48	Fair	Organic Removal, Backfill and Weedgate	7,634,773
323 SUMMERLAND KEY	8	Poor	Injection Well and Org Removal	1,927,448	37	Fair	Organic Removal, Backfill and Weedgate	4,499,037
49 KEY LARGO	9	Poor	Backfill	510,729	24	Limited Data - Fair	Backfill and Weedgate	417,519
476 GEIGER KEY	10	Poor	Backfill	322,445	20	Limited Data - Fair	Backfill and Weedgate	318,145
456 GEIGER KEY	11	Fair	Culvert and Org Removal	338,000	33	Fair	Organic Removal, Backfill and Weedgate	799,817
326 CUDJOE KEY	12	Fair	Injection Well	800,000	Not Ranked	Not Ranked	Not Ranked	Not Ranked
70 ROCK HARBOR	13	Fair	Culvert and Org Removal	2,812,266	90	Fair	Organic Removal, Culvert and Weedgate	8,897,468
258 BIG PINE KEY	14	Fair	Injection Well	1,200,000	26	Fair	Backfill and Weedgate	1,062,541
265 No Name Key	15	Poor	Org Removal and Backfill	1,666,367	22	Poor	Backfill and Weedgate	641,268

Task 4 - Pre and Post Water Quality Monitoring

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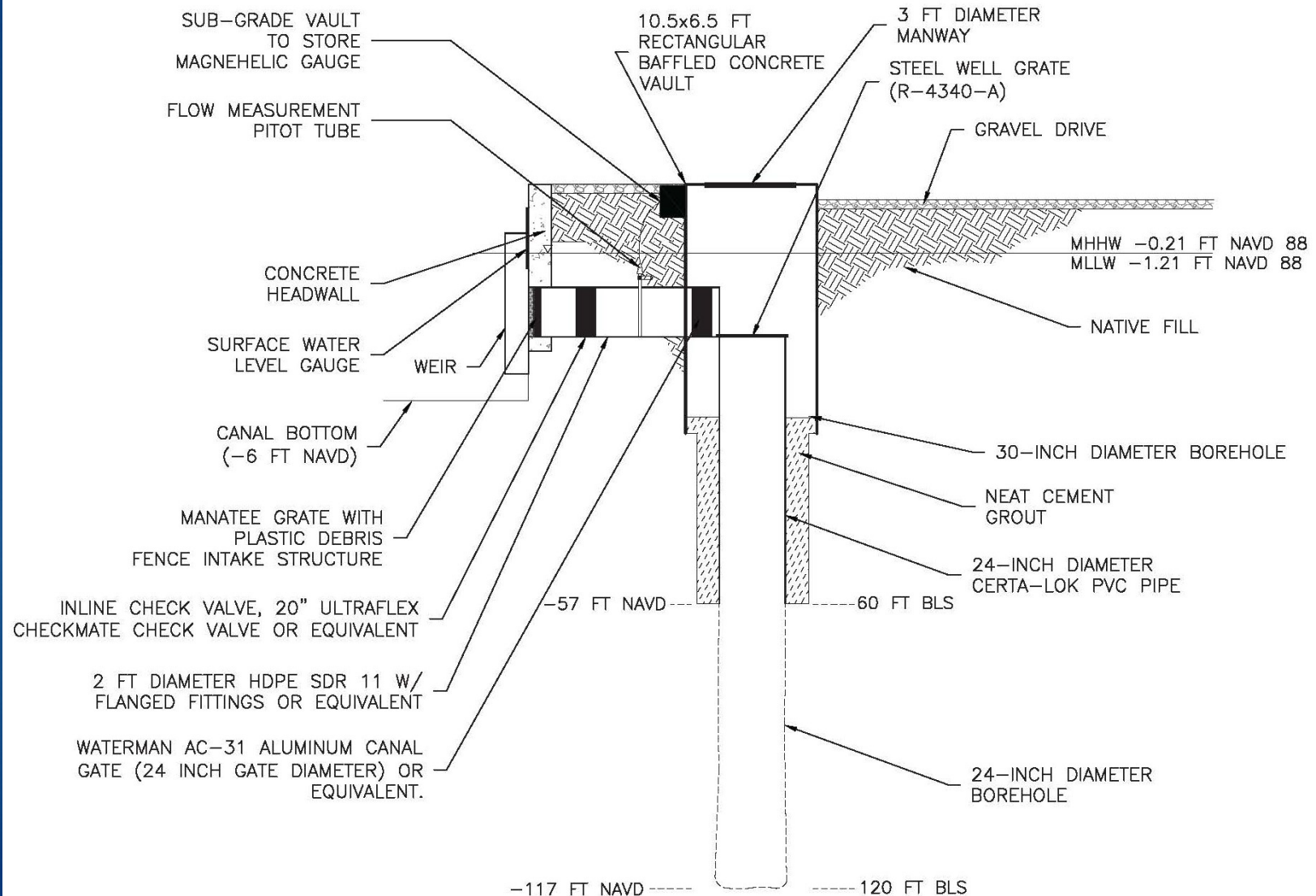


Canal #278
Big Pine Key

Gravity
Injection Well

Overview of the Gravity Injection Well Design

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Monitoring Methodology

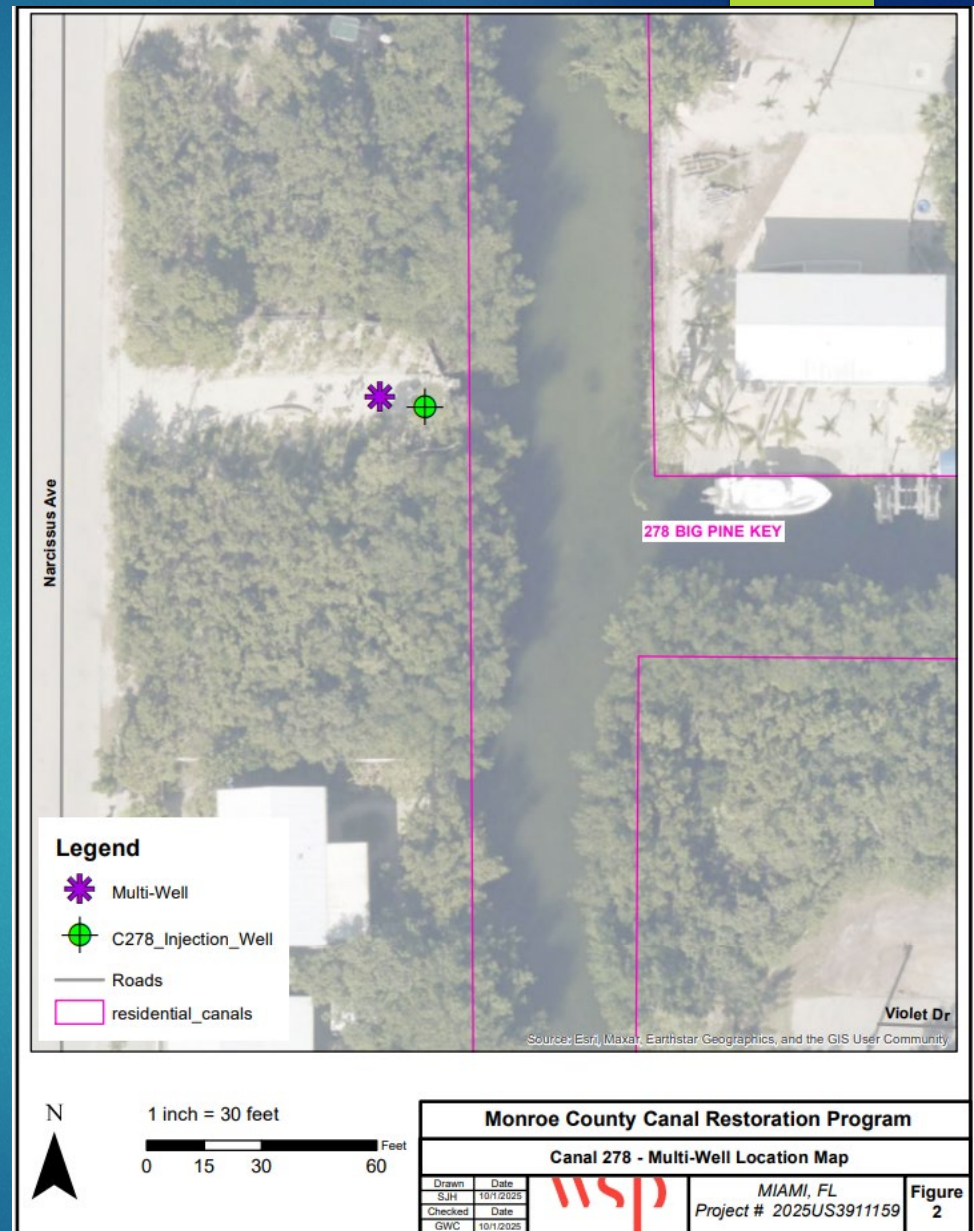
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- Upon recommendation of the gravity injection well technology, concerns arose that the infiltrated canal water could migrate into sensitive nearshore resources and cause negative impacts.
- Based on these concerns a study was undertaken to determine the transport and fate of the canal water infiltrated into the subsurface through the infiltration well.
- To characterize the aquifer within the vicinity of the infiltration well, a multi-well was installed to characterize the water quality.

Water Quality & Transport Evaluation

- The multi well had 7 discrete depth sampling channels every 10 feet from 55 feet bls to 115 feet bls.
- Geochemical water quality field parameters measurements were collected between June 26 - July 3, 2025.
- Water quality parameters temperature, dissolved oxygen, conductivity, salinity, and pH were measured on June 26, June 28, and June 30, 2025.
- Water level readings were collected daily at each sampling interval of the multi-well between June 26 - July 3, 2025.



Water Quality & Transport Results

- Transport calculations demonstrate that the vertical pathway, downward thirty feet, is expected to be traveled in approximately 0.2 days under typical conditions. The horizontal pathway, approximately 10 miles to the south, is expected to be traveled in approximately 324 days (0.9 years).
- The estimated infiltration rate of per year represents 0.2 percent of the pore volume of the transport domain.
- The average dissolved oxygen in the canal is approximately 52 percent of saturation and the average dissolved oxygen in the subsurface is approximately 13 percent of saturation.
- Results indicate the infusion of canal water with the seepage discharge into the open ocean at 120 feet below sea level will not be significant nor detrimental and occur approximately 10 miles offshore.



Task 5 – Mitigation Credit Ledger

- Currently, there is a lack of State approved mitigation banks within the Florida Keys. Mitigation has been achieved through either onsite or in-kind benefits to the sanctuary.
- Numerous projects have been implemented throughout the Florida Keys that have improved the water quality and benthic resources and could be utilized within the mitigation bank program.
- We are working on creating a mitigation bank program which will enhance and create mangrove and seagrass habitat, which can be utilized to offset unavoidable impacts for other restoration efforts.



Task 6 – Canal Restoration – Public Outreach

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- **Public Outreach video in progress**
 - [Florida Keys Canal Restoration Project](#)
- **Virtual Public Meetings to be held the week of March 16th**



Florida Keys Canal Restoration Program

- Continued Water Quality monitoring under EPA Grant #05D37325
- Continued implementation of Canal Water Quality Restoration Projects
- Evaluation of reconvene of canal subcommittee to support continued restoration efforts

Thank You!

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