GULF REEF REHABILITATION

A Project of the
Coastal Management Program Cycle 27
Contract No. 22-131-008-D571

Final Report
April 2026

Prepared by:

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and
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Friends of Rio Grande Valley Reef

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In memory of Gary Glick, founder of FRGVR

Project Background

Decades of commercial trawl fishing has stripped bottom flora and degraded delicate, low-relief nursery reef in many areas. According to Texas' Conservation Action Plan, an area that is subject to bottom trawling one time suffers productivity reduction for six months to five years; an area that is trawled multiple times suffers for a minimum of ten years but may never recover its productivity. Artificial reefs can help to make up for this loss in habitat. However, most of the artificial reefing in the Gulf of Mexico uses oil platforms or monocultures of prefabricated, high-relief pyramids in dense small reefs, which do not adequately provide nursery protection for juvenile fish or the base productivity improvement.

The 1,650-acre Rio Grande Reef was established in 2016, and deployment of artificial reef structures began the next year in an attempt to reverse some of the damage that was threatening fisheries in the Brownsville-Harlingen Coastal Zone Area. Friends of The Rio Grande Valley Reef (FRGVR) began raising money and forming strategic partnerships with other non-profits, local governments, businesses, and the Port of Brownsville to begin "putting fish back into the Gulf." After years of successfully raising hundreds of thousands of dollars in private donations, Gary Glick applied in 2021 for funding to enhance FRGVR's efforts to build the largest single artificial reef system in Texas waters. In the summer of 2022 FRGVR was awarded a Coastal Management Program Project of Special Merit grant under the Gulf of Mexico Energy Security Act of 2006 and administered by the General Land Office.

For this restoration artificial reef project, FRGVR deployed 9,250 tons of contaminant-tested and inspected recycled concrete, adding substantially to the large, low-relief nursery reef off the coast of South Padre Island. Materials were composed of concrete railroad ties donated by the Burlington Northern and Santa Fe (BNSF) Railway and broken or off-spec concrete from the local economy. The major goal of this project was to provide complex, low-relief, hard substrate reef and the graduated steppingstones of habitat to increase juvenile reef fish survivability to adulthood. It was also [intended/expected] to provide habitat for all life stages for multiple species of microbes, invertebrates, crustaceans, crabs, forage, and other fish. The reef materials were placed in an area known to have the densest population of juvenile Red Snapper in the entire Gulf of Mexico. By enhancing survivability for Red Snapper as well as other biota using durable concrete materials, FRGVR hoped to provide long-term economic and ecological benefit both locally and regionally.

Due to a lack of coordination between the U. S. Army Corps of Engineers and the National Marine Fisheries Service, the reefing permit that Texas Parks and Wildlife had tried to renew in early 2022 was not actually in place until July 2024. The resulting delay in deployment and deposition of reefing materials not only increased costs significantly but also caused the project timeline to be extended by two years. The project was divided into four major tasks, which will be described in detail in the rest of this report.

Task 1: Reefing Material Accumulation

FRGVR accumulated sufficient donated concrete materials (e.g., worn out concrete railroad ties from BNSF Railway and broken concrete from local government and private road repair) on deep water port frontage in the Brownsville Ship Channel. The Port of Brownsville allowed FRGVR to store the accumulated materials rent-free, which was essential to the completion of the project.

Through a competitive bidding process FRGVR identified and selected a qualified contractor to unload the donated reefing materials from the railroad cars onto the storage site. The contractor, Bryant Industrial Services, Inc. (BIS), unloaded 9,250 tons of concrete using equipment owned and rented by, or donated to FRGVR. In addition to unloading the concrete, BIS maintained the equipment and the grounds where the reefing material was being stored.

Photographs of accumulated reefing material as of April 2023 are presented in Appendix 1.

Task 2: Reefing Material Deployment

More than two years after its expected renewal, the reefing permit was approved by the U. S. Army Corps of Engineers in July 2024. FRGVR's contract with BIS included loading the reefing material onto the deployment vessel prior to marine transport. For a variety of reasons, suitable marine transport was not found until late 2024.

Task 3: Marine Transport and Deposition of Nursery Reef Materials

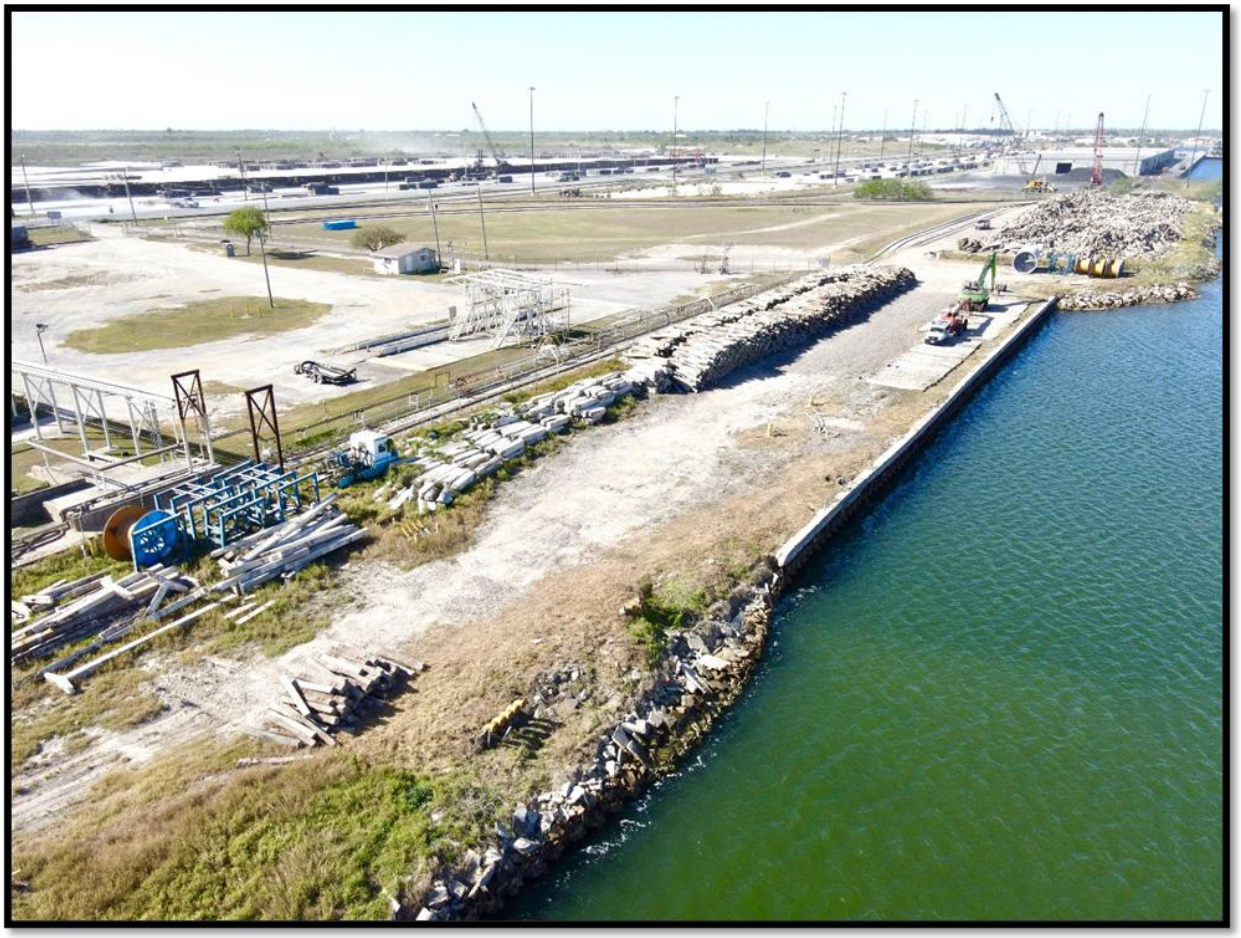
In October 2024 FRGVR requested proposals for the marine transport portion of the project but received only one bid from Romeo Papa LLC. In February and March 2025, Romeo Papa provided marine transport services with a 170-foot dynamic positioning vessel and placed approximately 9,250 tons of reefing material on the seafloor at precise locations using coordinates approved by TPWD for this project. In accordance with TPWD, FRGVR coordinated the deployment date with TPWD to allow a TPWD staff member or observers approved by TPWD to be on the vessel during material deposition. FRGVR also installed temporary CMP signage on the deployment boat and posted CMP funding acknowledgement on the FRGVR website. Photographs of the material deployment and signage are presented in Appendix 2.

Task 4: Reefing Material Documentation

Following reef deployment, FRGVR contracted with researchers from the University of Texas Rio Grande Valley (UTRGV) to verify correct placement of reefing materials according to the coordinates approved by TPWD. The original contract called for a sidescan SONAR survey to confirm the newly deployed materials, but the researchers had a unique opportunity to utilize a multibeam SONAR unit to conduct this portion of the project. This fortuitous turn of events allowed for more precise imaging and more detailed mapping of the 53 reef patches deployed in the summer of 2025, which can be seen in Appendix 3.

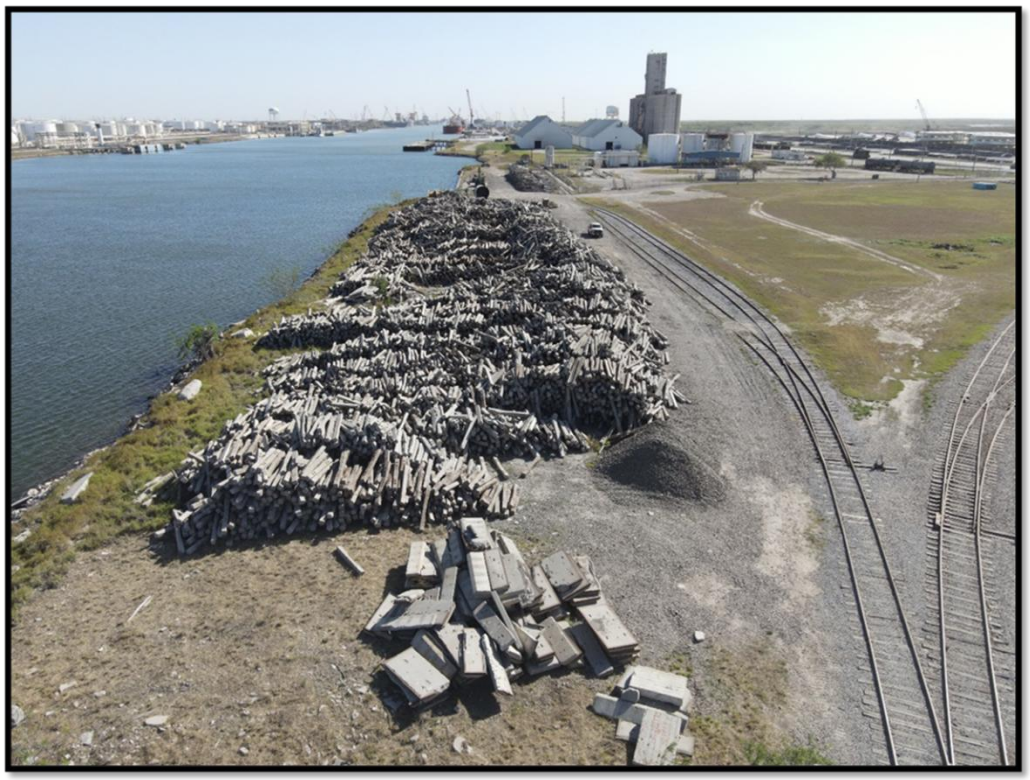
Appendix 1

Photos courtesy of Curtis Hayungs, Port of Brownsville, April 2023



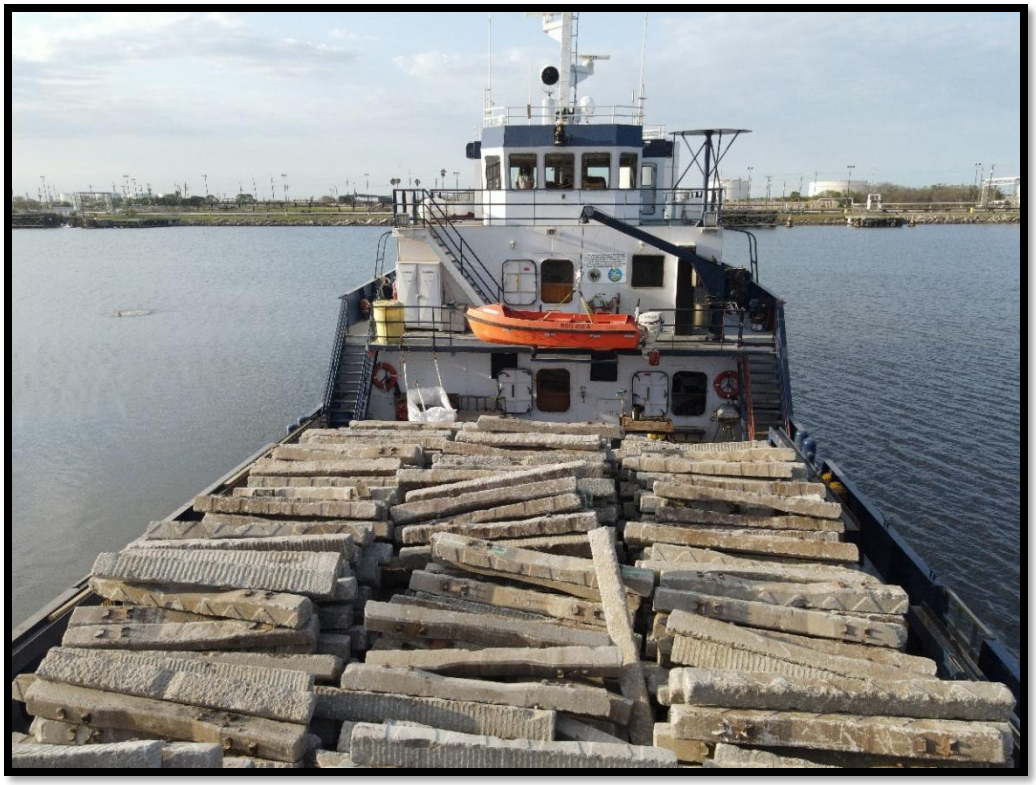
Drone image of stacked railroad ties

Drone image of stacked railroad ties, material handler at left



Drone image of stacked railroad ties and concrete blocks

Appendix 2 Photos courtesy of Curtis Hayungs, Port of Brownsville and Gulf of Mexico (RGV Reef), February/March 2025

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Appendix 3

Final Report
For
Marine Multibeam Sonar Survey of the RGV Reef PS-1105

Date of Report: 12/31/25

Project PI:
Dr. Richard Kline UTRGV

Goals and Objectives:

A marine multibeam sonar survey was conducted to confirm the placement of the newly deployed concrete reefing materials in the Rio Grande Valley Reef (PS-1105). The Rio Grande Valley Reef (PS-1105) is a 1,650-acre reef located 7.4 nautical miles offshore and 13.9 nautical miles from the Port Isabel Jetties. The water depth ranges from 55 to 75 feet. Reef materials previously deployed in the reef included shrimp boats and tugboats, concrete railroad ties, broken concrete, concrete pyramids, and low-profile modules. The survey focused on areas of recent deployment in the RGV Reef (Figure 1).

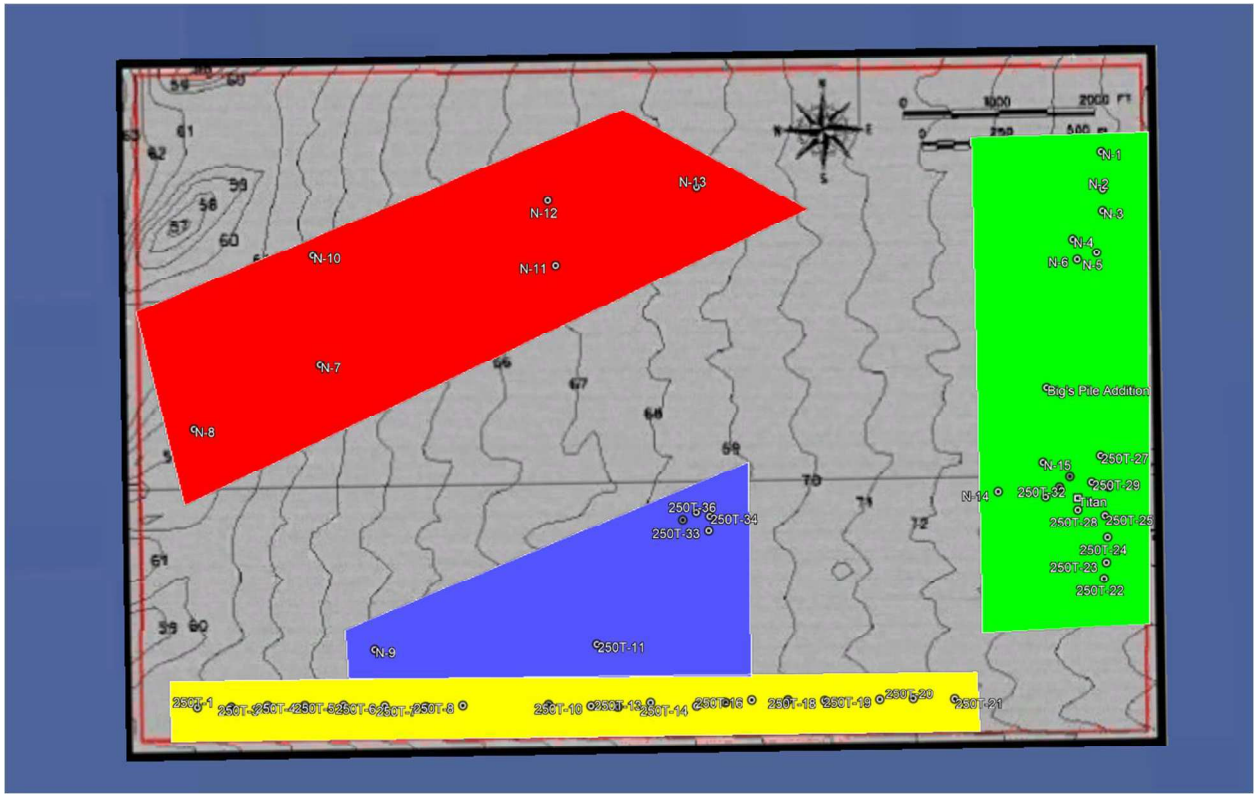


Figure 1. Survey focus areas of recently deployed materials in the Rio Grande Valley Reef (PS-1105).

Methods:

The R/V Vaquero II was utilized to survey the Rio Grande Valley Reef. The Vaquero II is a 38-foot aluminum-hulled utility vessel, powered by twin Mercury 300 outboard motors. A Norbit Integrated WINGHEAD "S" series Multibeam Echo Sounder at 400kHz frequency was used to collect bathymetric data of the reef area. This sonar was equipped with 0.5-degree x 0.9-degree resolution at 400 kHz providing active roll and pitch stabilized bathymetry. An integrated Applanix OceanMaster positioning system recorded heave pitch, roll and heading data. The sonar head was mounted to the side of the vessel using the Norbit carbon fiber Portis pole. Trimble GNSS antennas were mounted directed above the sonar head on the mounting pole. The survey for the RGV Reef (PS-1105) was conducted August 19-21, 2025. A patch test was performed once offshore before data collection began. Transects were collected over the entire reefing areas at 250-foot swath spacing with the aid of an autopilot and Garmin Chartplotter. Post-processing of bathymetric data was conducted in QPS Qimera 2.7.6 multibeam data processing and analysis software. All transects were compiled in a single large map of the area. Corrections for latency, roll, pitch and yaw were input using the specific patch test files and patch test function in the software. RTK tide correction was used and a static offset from the ellipsoid of 22.5 m was applied. The minimum depth to the seafloor was calculated over structures at Mean Low Level Water (MLLW) using the profile view in Qimera and measuring the highest point on the reef structure.

Results:

All newly deployed reefing materials were identified within the permitted reef boundaries of the RGV Reef (Figure 2). Mean Low Level Water was measured for all newly deployed reefing materials in the RGV Reef (Table 1; Figures 18-24). All MLLW depths above the materials were below the permitted clearance limit of 30 feet. All materials were found very near to the approved deployment locations provided to TPWD. Fifty-three (53) reef patches were located during the survey, two of which were not in the original list. Two additional 250-ton patches were located, one under the Titan Tug and one to the left of it (250T-31).

The measured height of 250T-9 was 2.5 meters (8.2 feet). The measured height of Big Pile was 11.3 meters (36.9 feet). The measured height of the Titan Tug was 10 meters (32.8 feet). The measured height of the 3500-ton pile was 7.2 meters (23.6 feet). The maximum measured height of the nursery patch (N-2) was 0.45 meters (1.5 feet). The measured height of the 250T-5 patch was 2.1 meters (6.9 feet) and the measured height of the 250T-6 patch was 1.7 meters (5.6 feet).

Table 1. Locations and MLLW Depths of the newly deployed boat and concrete reefing materials in the Rio Grande Valley Reef (PS-1105). "250T" indicates 250-ton piles and "N" indicates nursery patch composed of broken and complete railroad ties.

Name	Latitude	Longitude	MLLW Depth (m)	MLLW Depth (ft)
Titan Tug	26.27460259	-97.03530478	12.175	39.944227
Big Pile	26.27850176	-97.03700308	10.703	35.11483052
3500 ton	26.26989065	-97.05409768	12.748	41.82414832
250T-1	26.27004775	-97.06411184	16.508	54.16010672
250T-2	26.26999624	-97.06305079	17.521	57.48359764
250T-3	26.27011983	-97.06193381	17.089	56.06627476
250T-4	26.27003855	-97.06074062	16.851	55.28543484
250T-5	26.27002182	-97.05948624	17.948	58.88451632
250T-6	26.27000032	-97.0581131	17.468	57.30971312
250T-7	26.26991059	-97.05689501	17.673	57.98228532
250T-8	26.26990674	-97.0557241	17.941	58.86155044
250T-9	26.2715296	-97.05140288	17.866	58.61548744
250T-10	26.26985978	-97.05298746	18.18	59.6456712
250T-11	26.26982655	-97.05159859	18.717	61.40748228
250T-12	26.26973052	-97.05079117	18.882	61.94882088
250T-13	26.26991548	-97.049769	18.528	60.78740352
250T-14	26.26977467	-97.04834426	18.919	62.07021196
250T-15	26.26986231	-97.04741023	19.087	62.62139308
250T-16	26.26990564	-97.04656531	19.154	62.84120936
250T-17	26.26988967	-97.04543131	18.752	61.52231168
250T-18	26.2698324	-97.04425115	19.404	63.66141936
250T-19	26.26983717	-97.0425009	19.288	63.28084192
250T-20	26.26983945	-97.04144836	19.541	64.11089444
250T-21	26.2697807	-97.04015557	19.849	65.12139316
250T-22	26.27312341	-97.03532149	20.762	68.11680008
250T-23	26.27356709	-97.03519577	20.261	66.47309924
250T-24	26.27428779	-97.035145	20.156	66.12861104
250T-25	26.27483699	-97.03524895	20.77	68.1430468
250T-26	26.27561331	-97.03508071	20.12	66.0105008
250T-27	26.27648125	-97.03530794	20.476	67.17847984
250T-28	26.27495248	-97.03604708	20.517	67.31299428
250T-29	26.27572586	-97.03563418	19.69	64.5997396
250T-30	26.27590346	-97.03630616	20.552	67.42782368
250T-31	26.27561912	-97.03663427	19.981	65.55446404
250T-32	26.27459493	-97.03570643	20.087	65.90223308
250T-34	26.27535755	-97.03708736	19.728	64.72441152
250T-35	26.27461528	-97.04775913	18.174	59.62598616
250T-36	26.27509076	-97.04764995	18.686	61.30577624
250T-37	26.27498925	-97.04857892	19.07	62.5656188

250T-38	26.27520305	-97.04814772	18.404	60.38057936
N-1	26.28511713	-97.03507922	22.223	72.91010732
N-2	26.28405013	-97.03492417	22.068	72.40157712
N-3	26.28341906	-97.03497249	21.665	71.0793986
N-4	26.28265015	-97.03588508	21.744	71.33858496
N-5	26.28222617	-97.035321	21.735	71.3090574
N-6	26.28205512	-97.03584551	21.414	70.25590776
N-7	26.27968232	-97.05998258	18.228	59.80315152
N-8	26.27800513	-97.06388861	17.337	56.87992308
N-9	26.27152471	-97.05848881	18.614	61.06955576
N-10	26.28279881	-97.06009843	18.368	60.26246912
N-11	26.28234666	-97.05243569	19.401	63.65157684
N-12	26.2841876	-97.05261778	19.684	64.58005456
N-13	26.28444963	-97.0477859	20.279	66.53215436

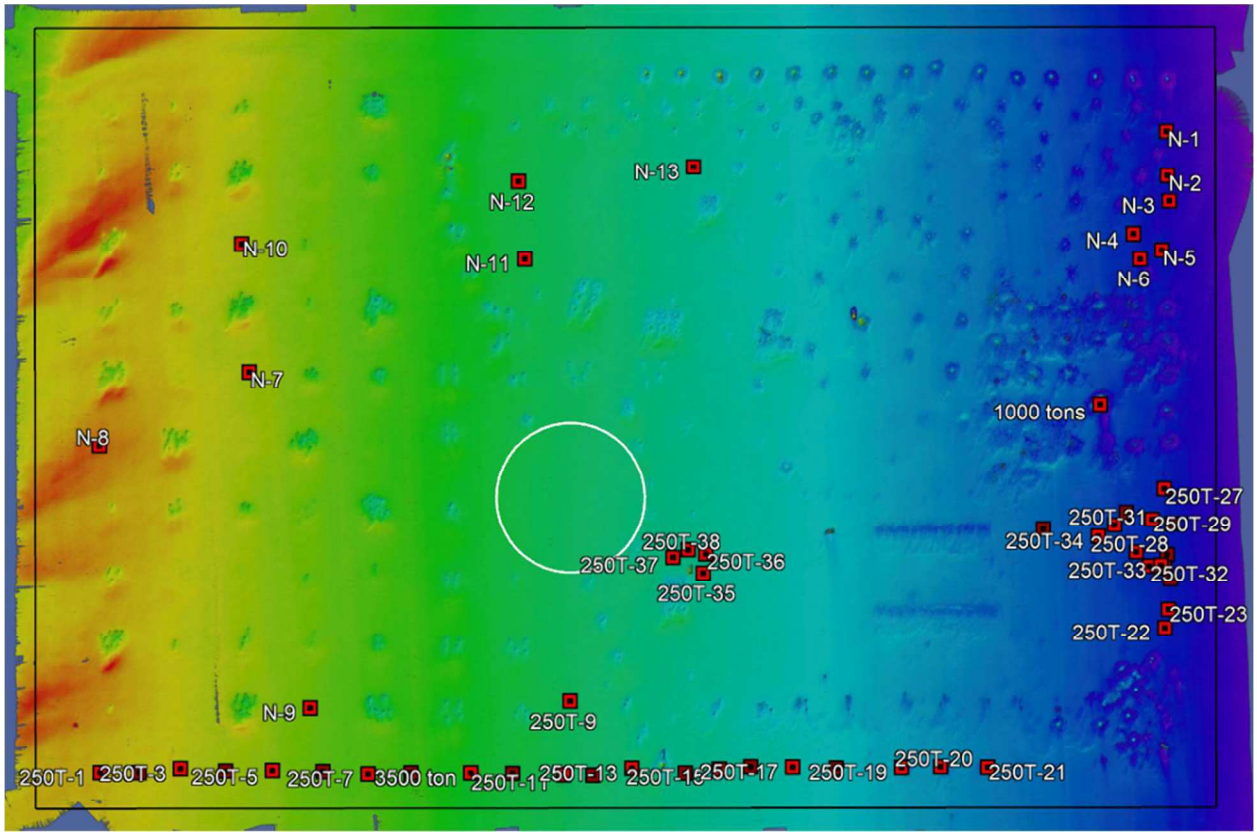


Figure 2. Overview of the Rio Grande Valley Reef (PS-1105) showing the deployed material locations. The black box is the perimeter of the permitted reefing area. Image was generated from 400 kHz multibeam recordings in August 2025.

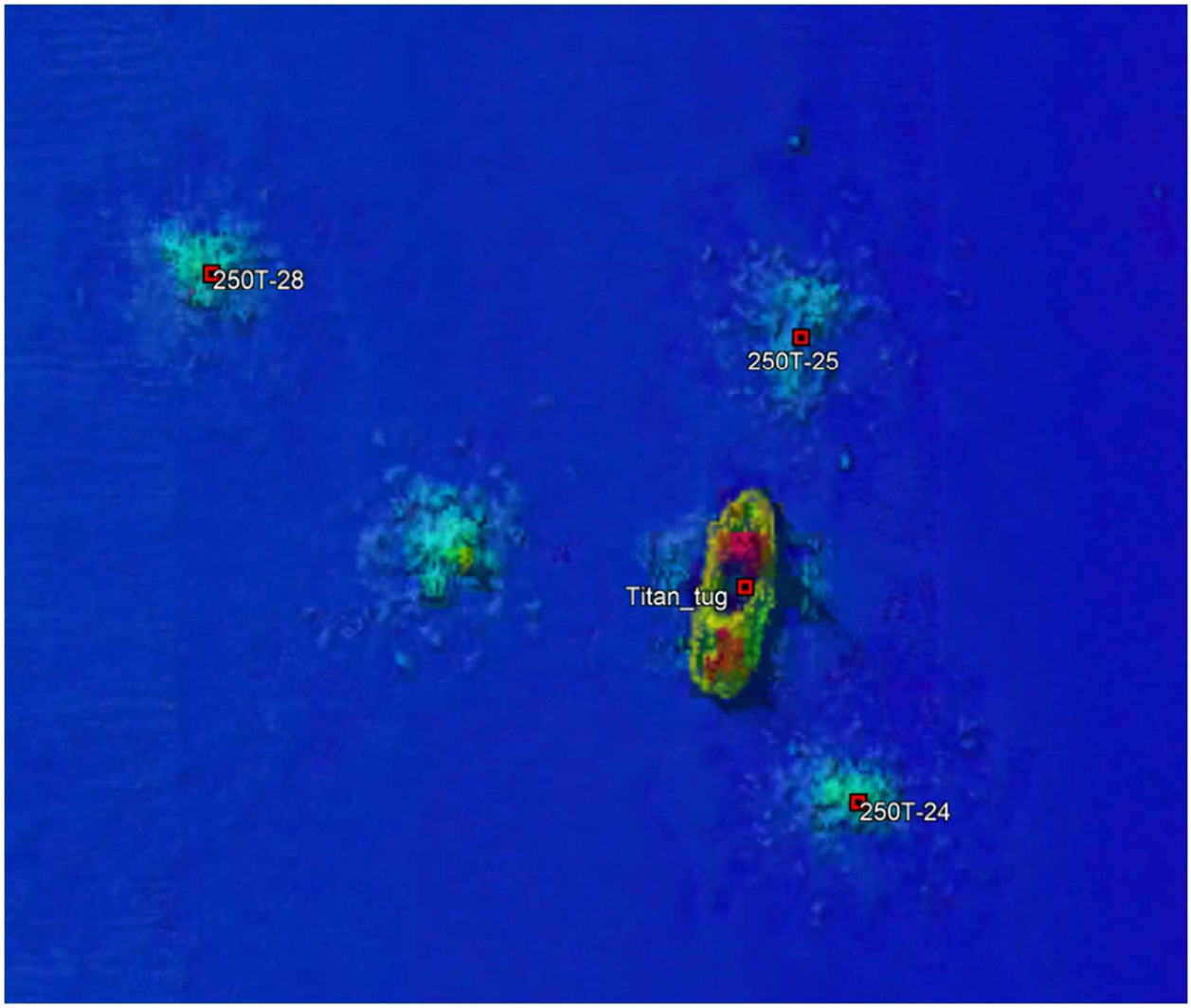


Figure 3. Overview of the Titan Tug and several 250-ton railroad tie deployments at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

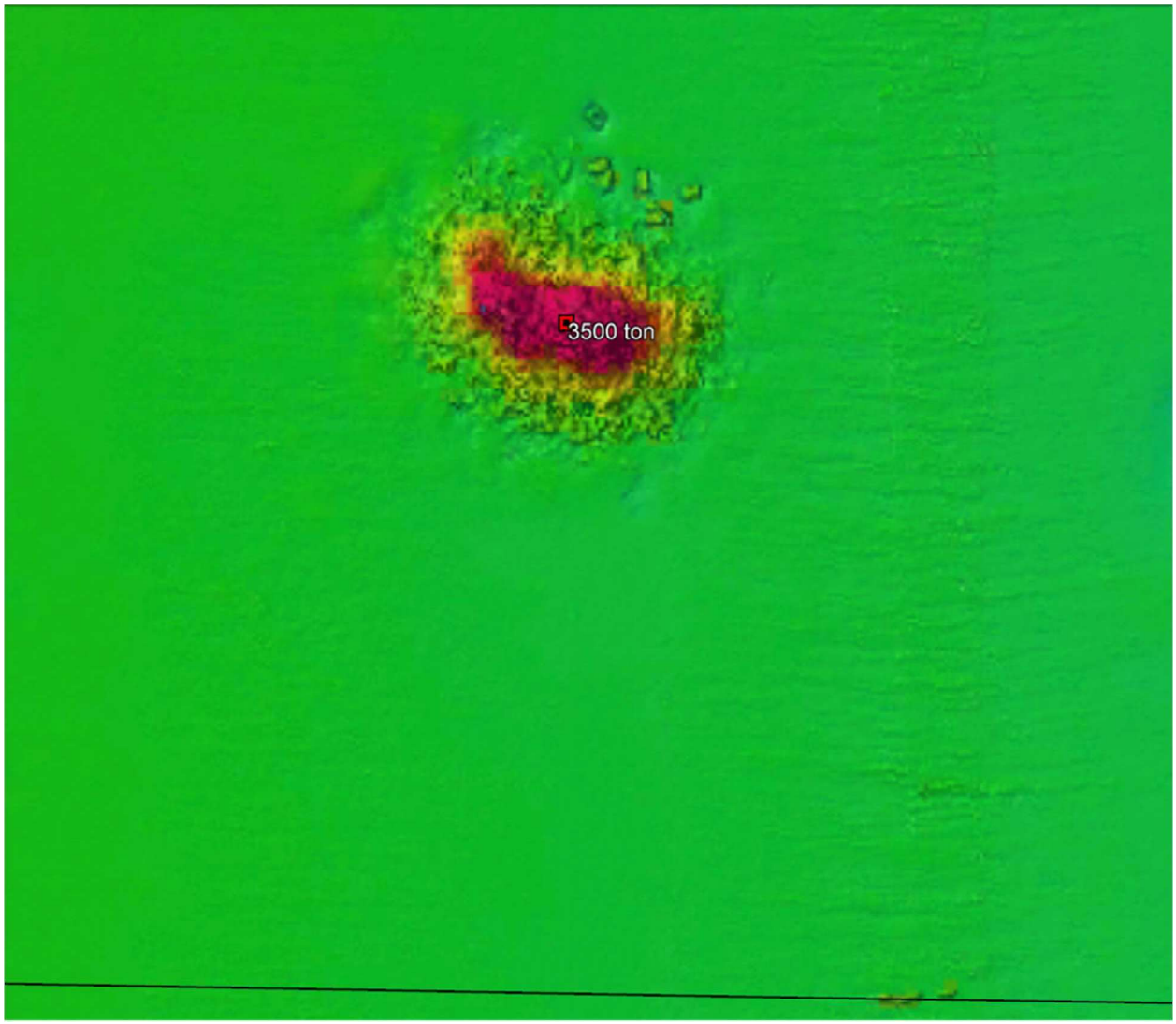


Figure 4. Overview of the 3500-ton railroad tie patch location at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

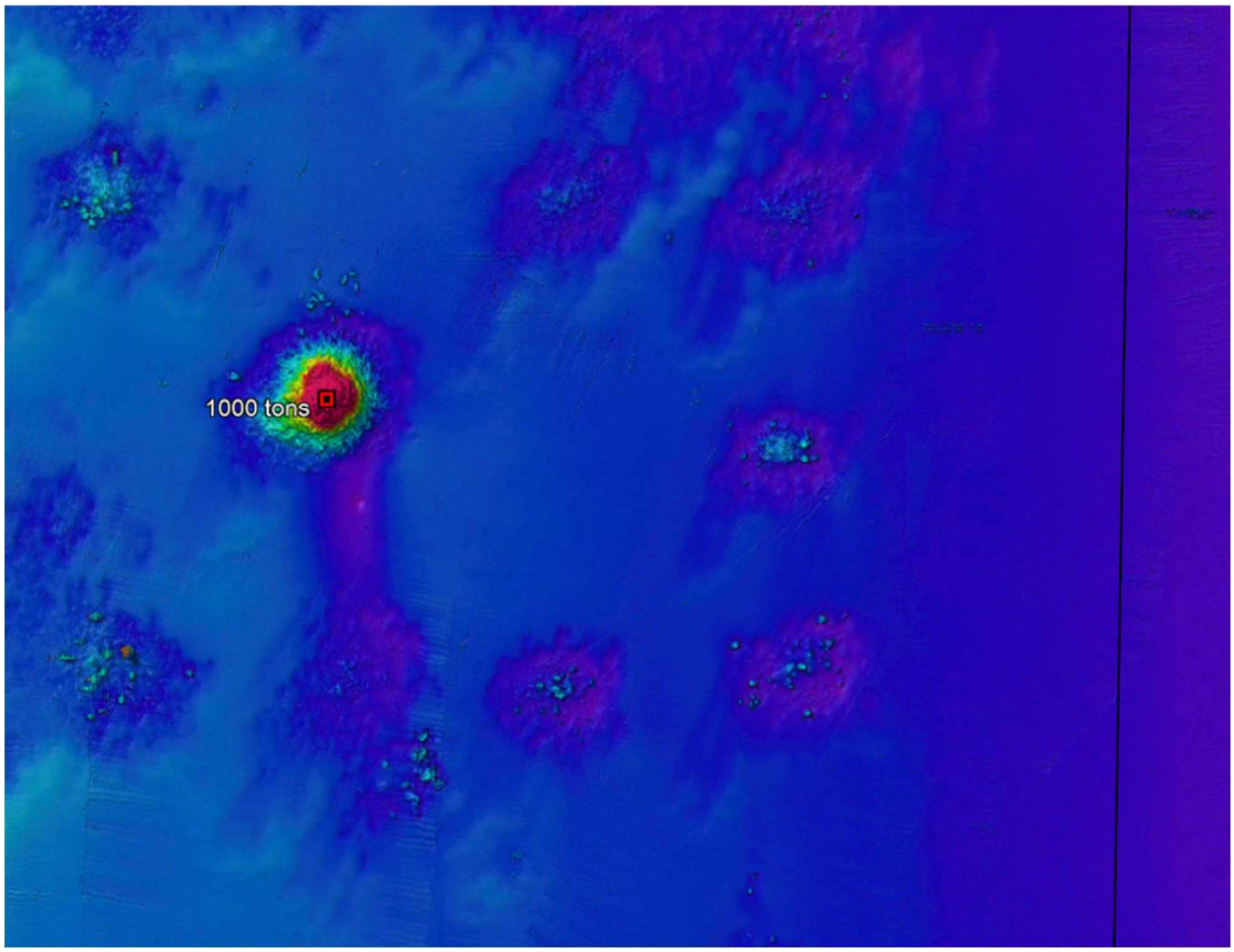


Figure 5. Overview of the 1000-ton railroad tie addition to Big's Reef at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

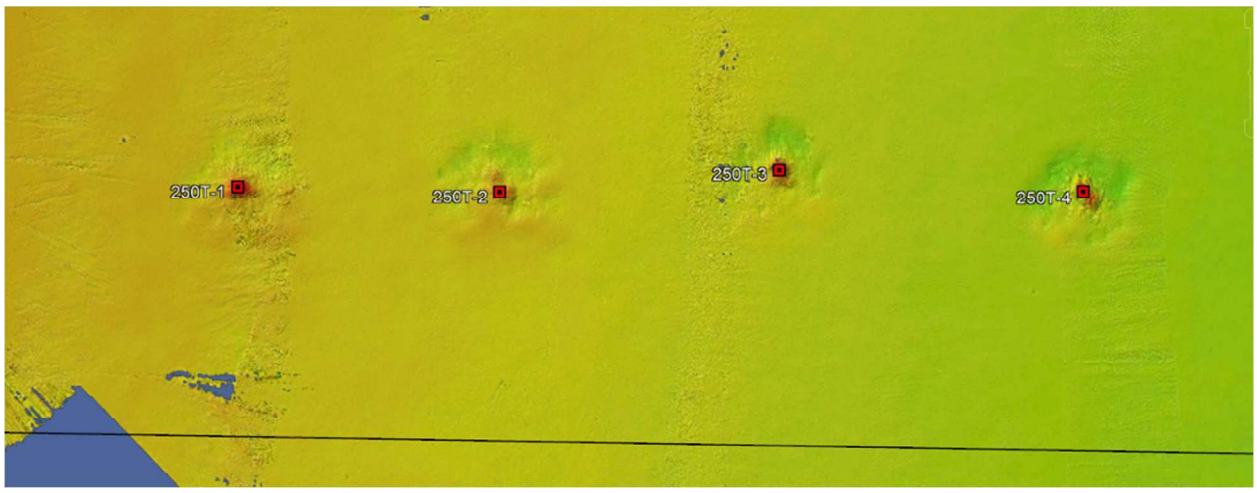


Figure 6. Overview of the 250-ton railroad tie patches (1-4) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

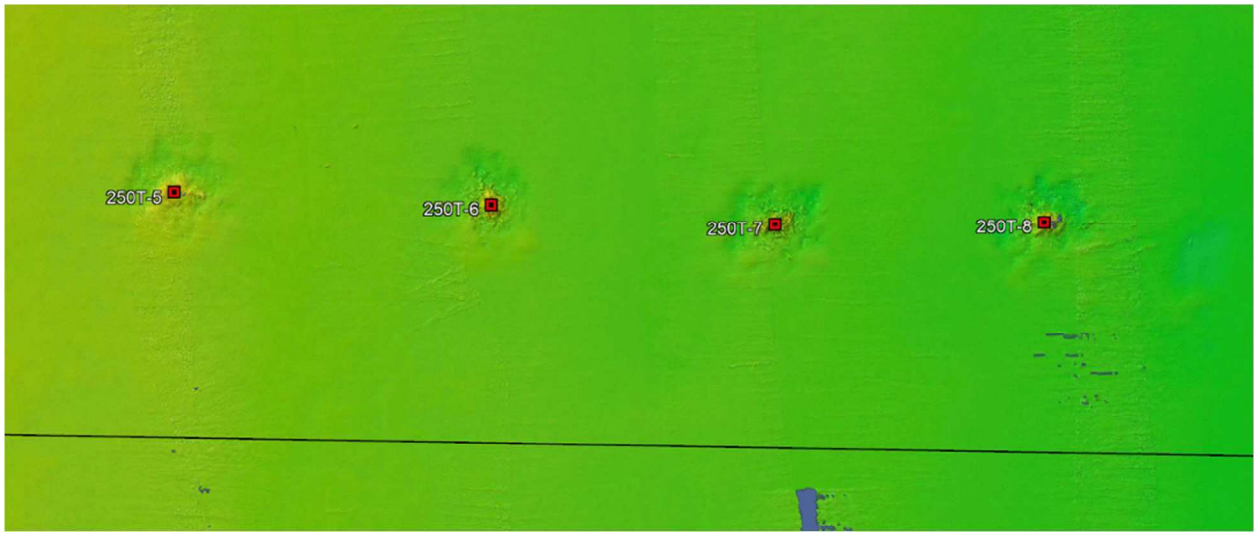


Figure 7. Overview of the 250-ton railroad tie patches (5-8) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

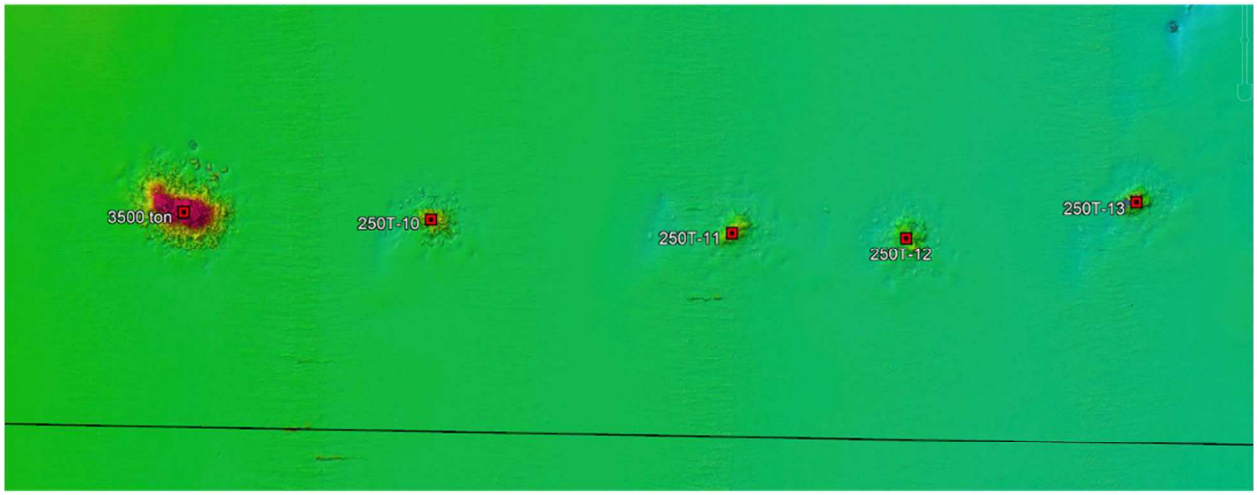


Figure 8. Overview of the 250-ton railroad tie patches (10-13) and the 3500-ton pile at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

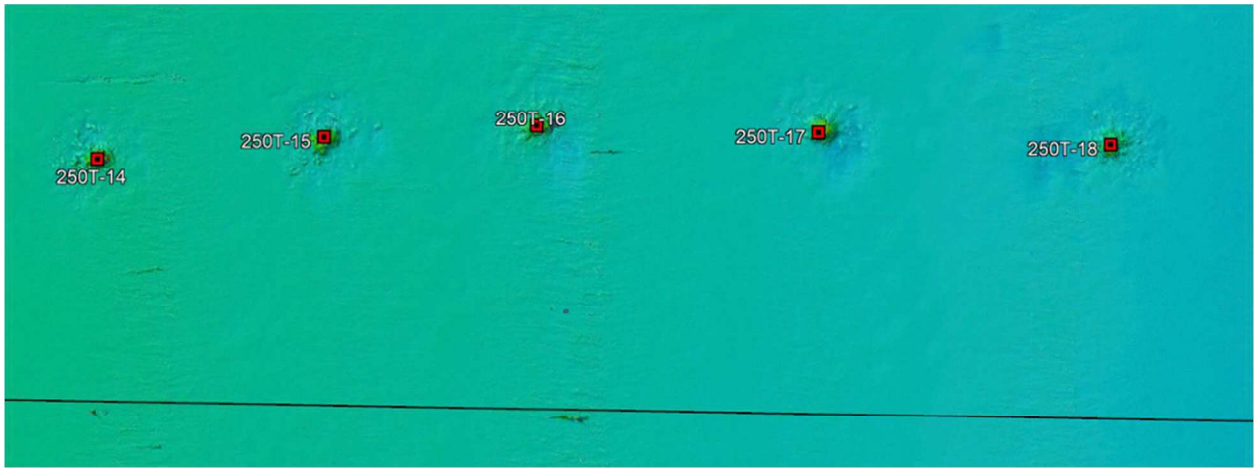


Figure 9. Overview of the 250-ton railroad tie patches (14-18) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

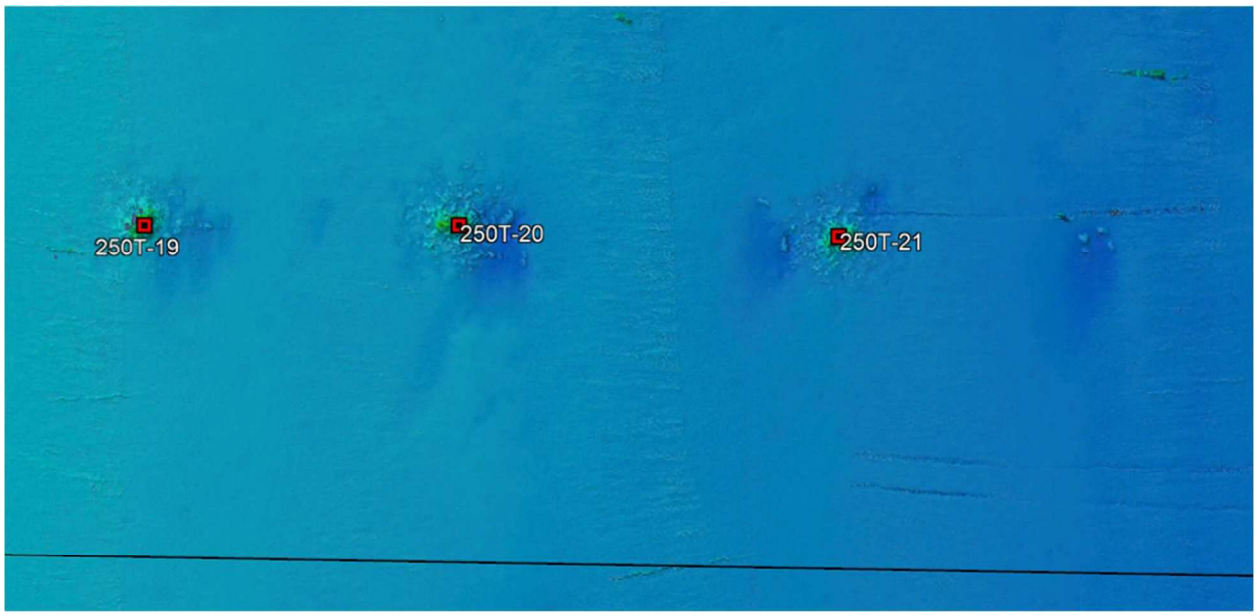


Figure 10. Overview of the 250-ton railroad tie patches (19-21) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

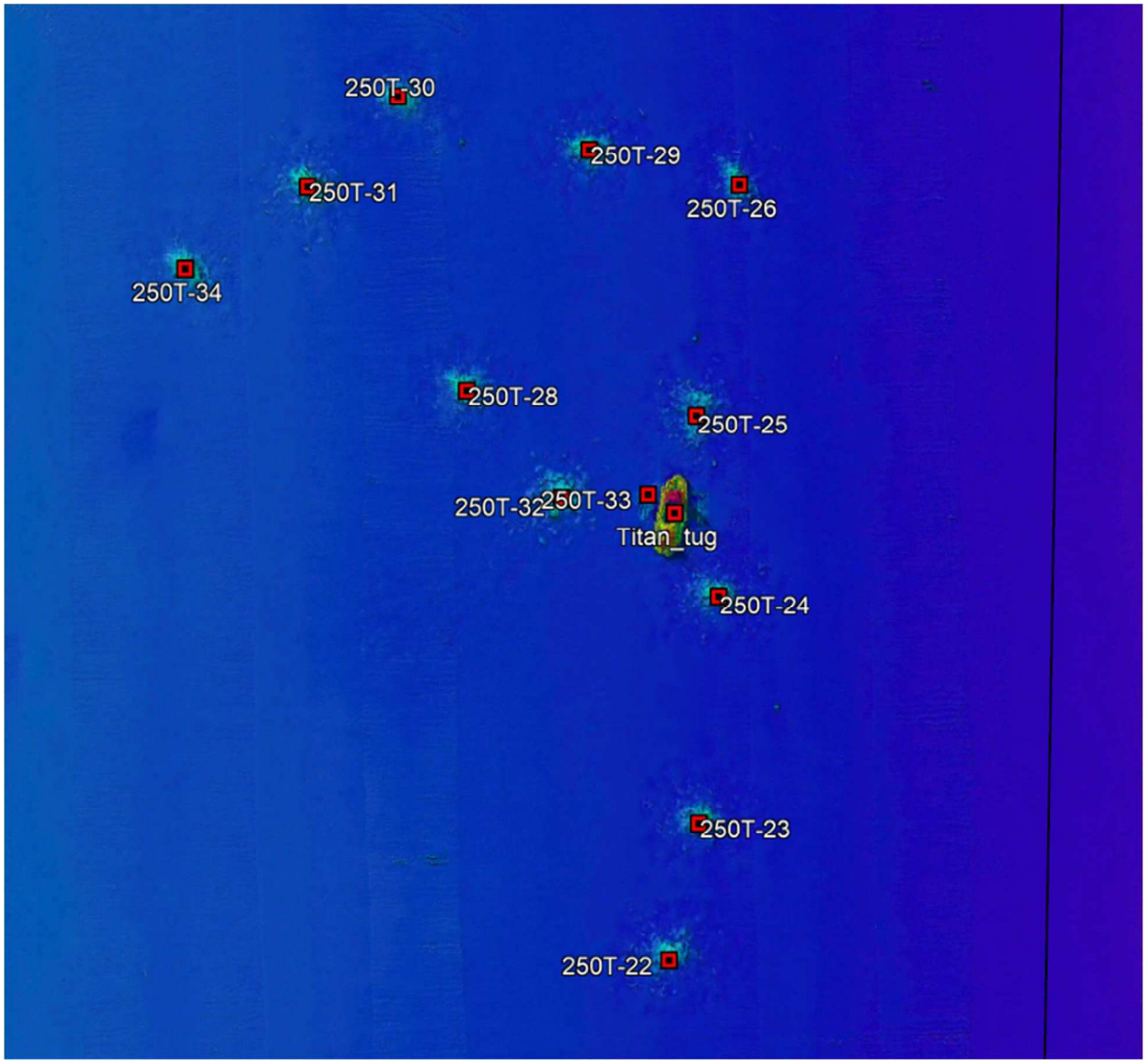


Figure 11. Overview of the 250-ton railroad tie patches (22-34) and the Titan tug at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

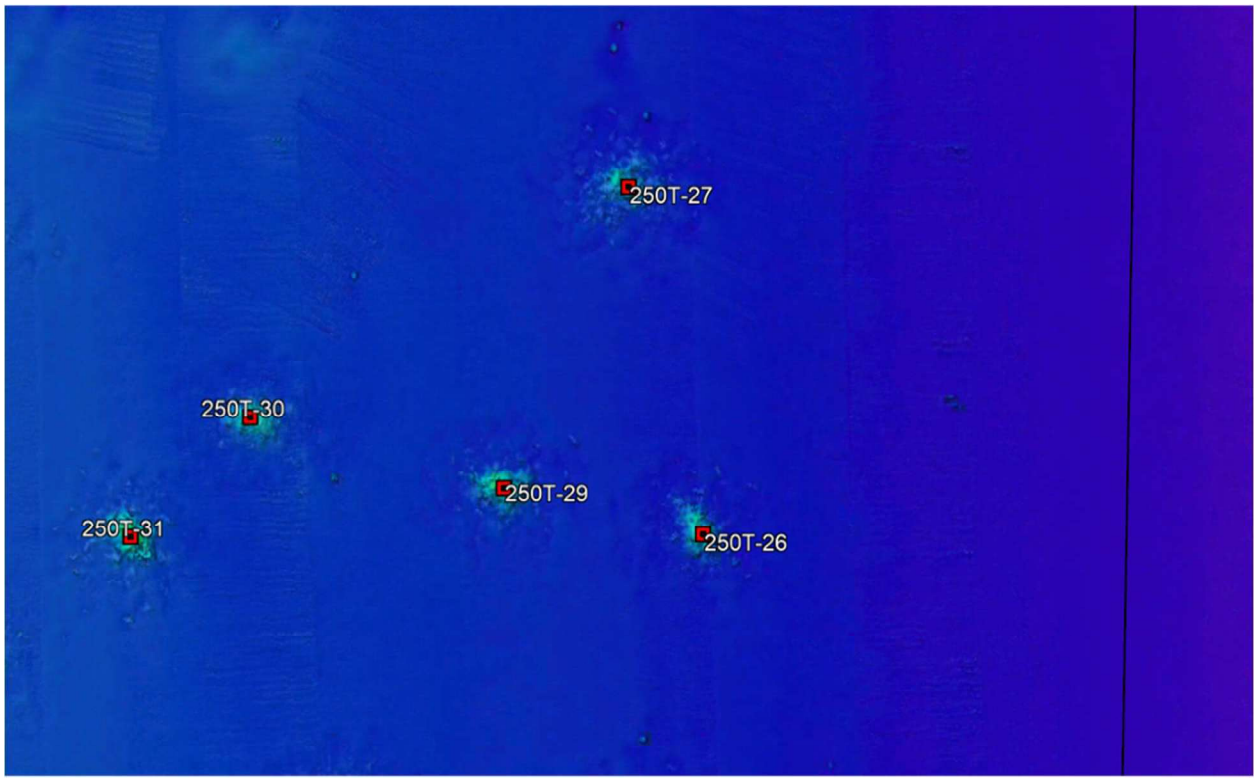


Figure 12. Overview of the 250-ton railroad tie patches (26, 27, 29, 30, 31) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

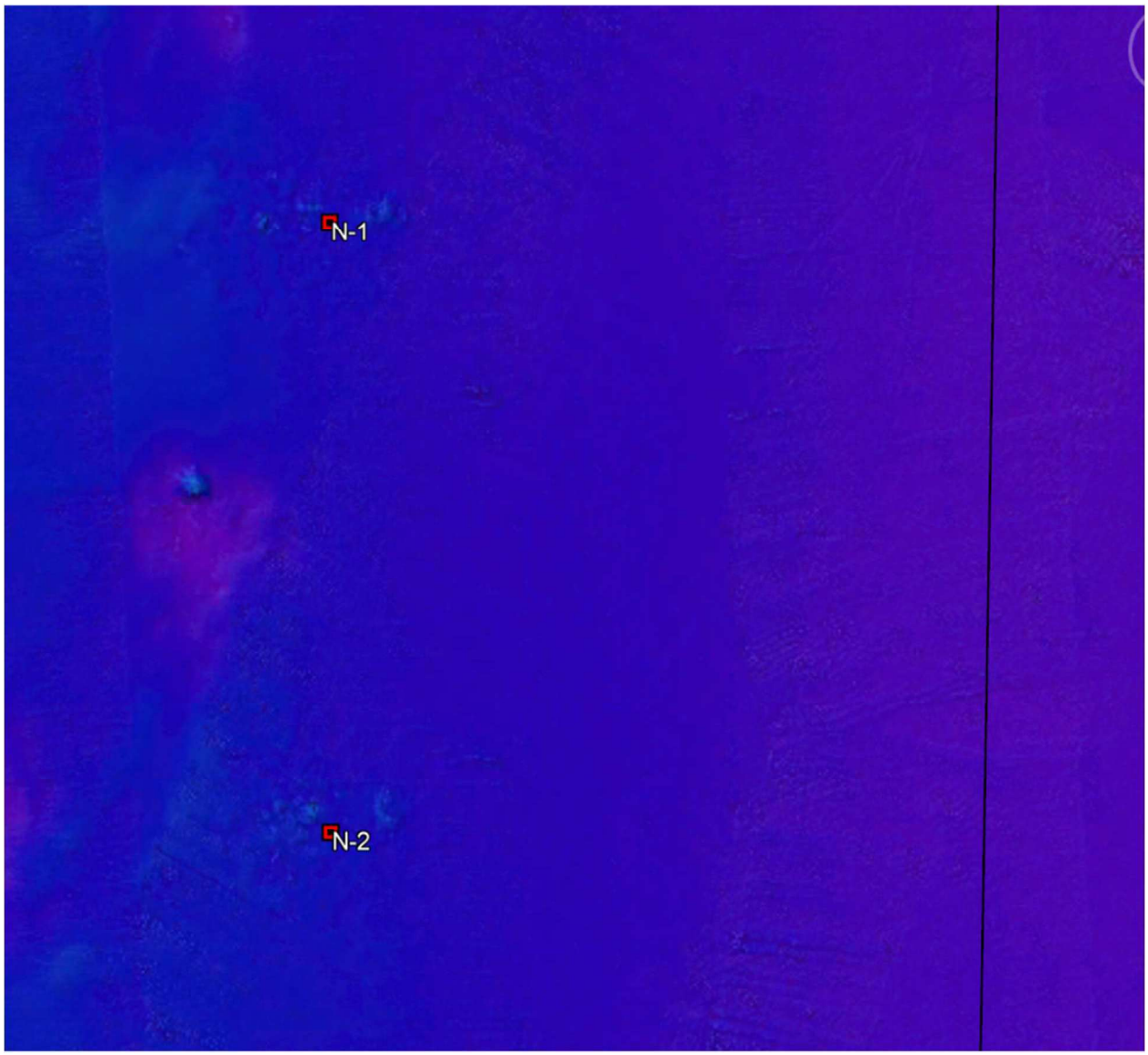


Figure 13. Overview of the nursery railroad tie patches (1, 2) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

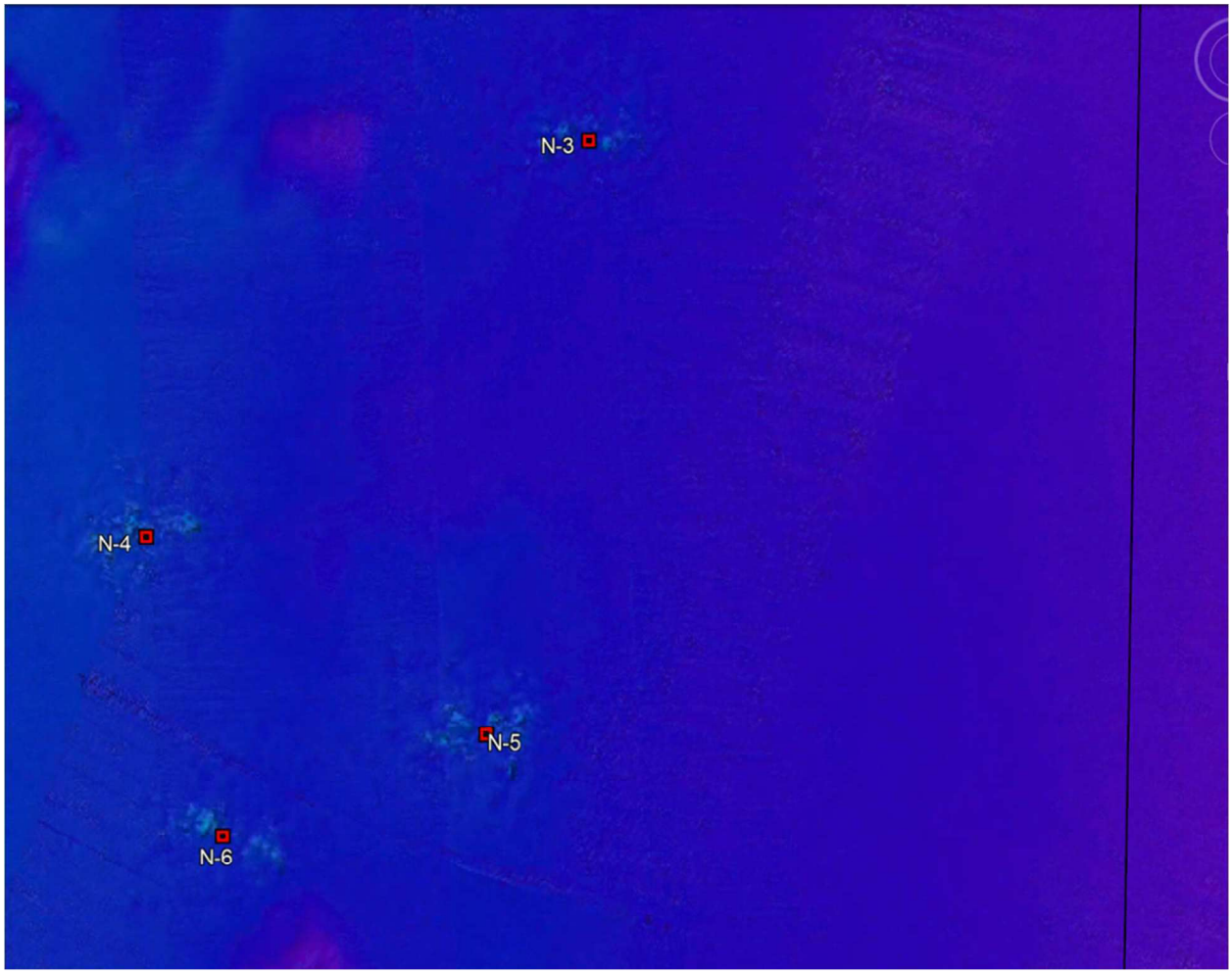


Figure 14. Overview of the nursery railroad tie patches (3-6) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

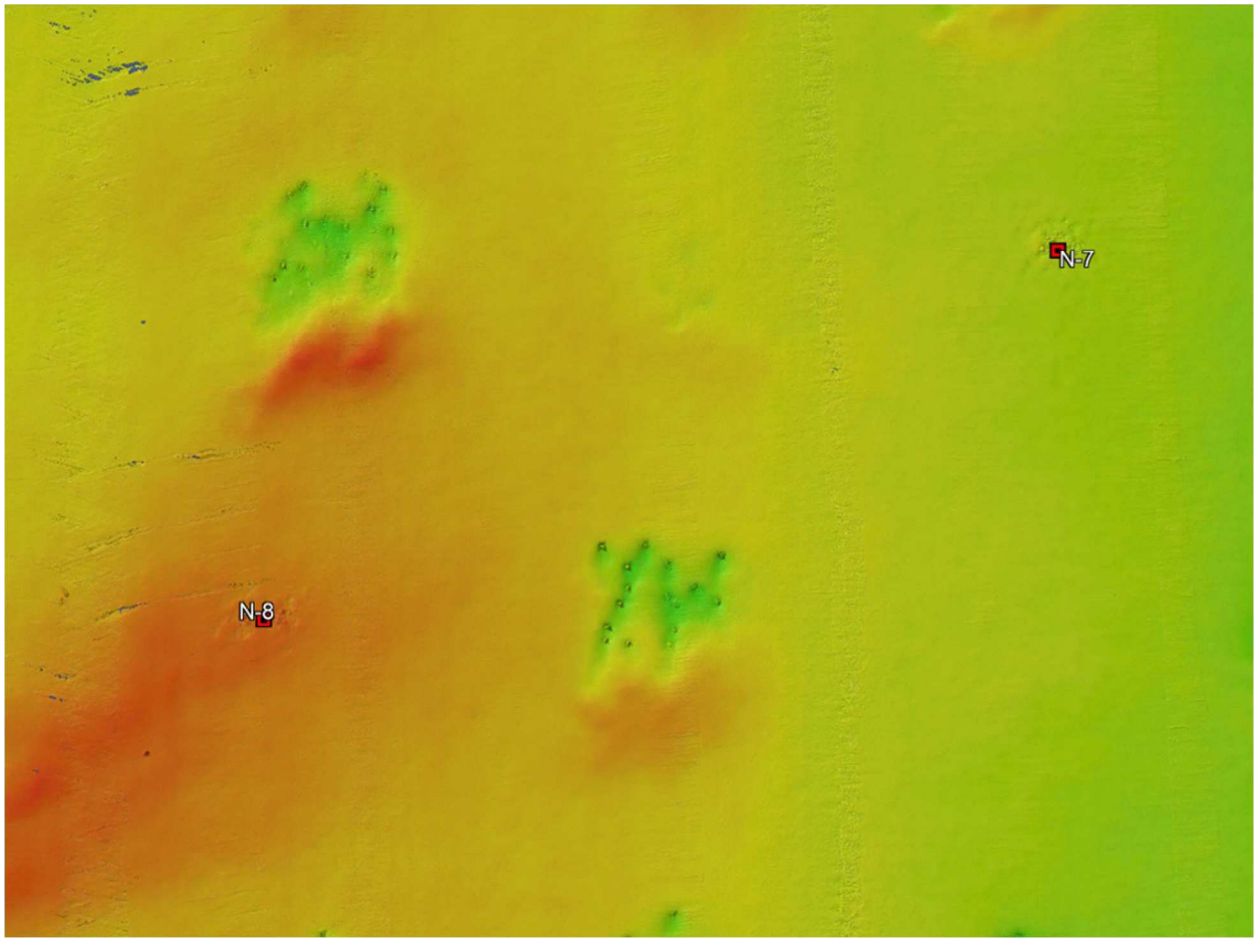


Figure 15. Overview of the nursery railroad tie patches (7, 10, 11) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

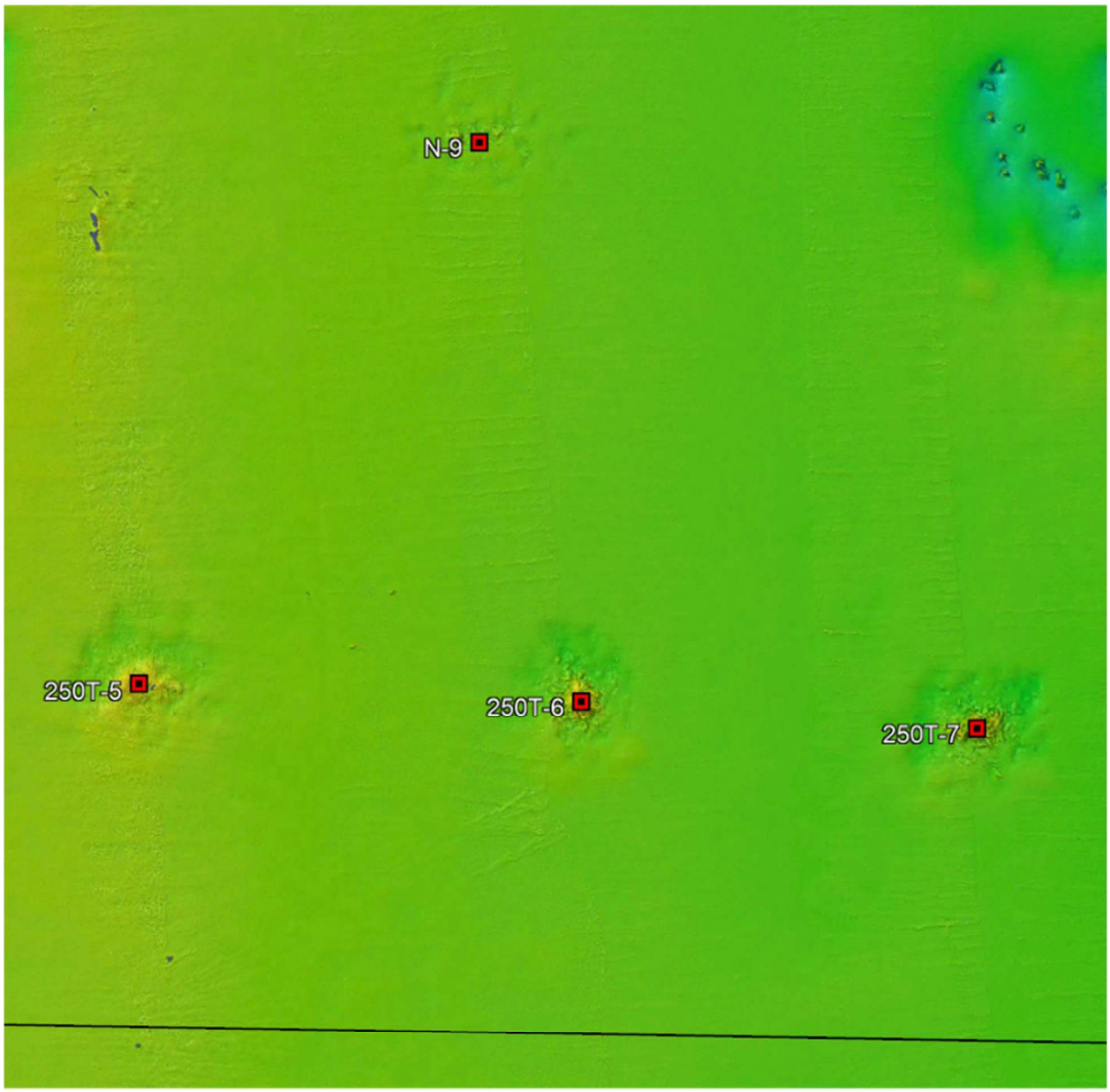


Figure 16. Overview of the nursery railroad tie patches (9) and several 250-ton patches at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

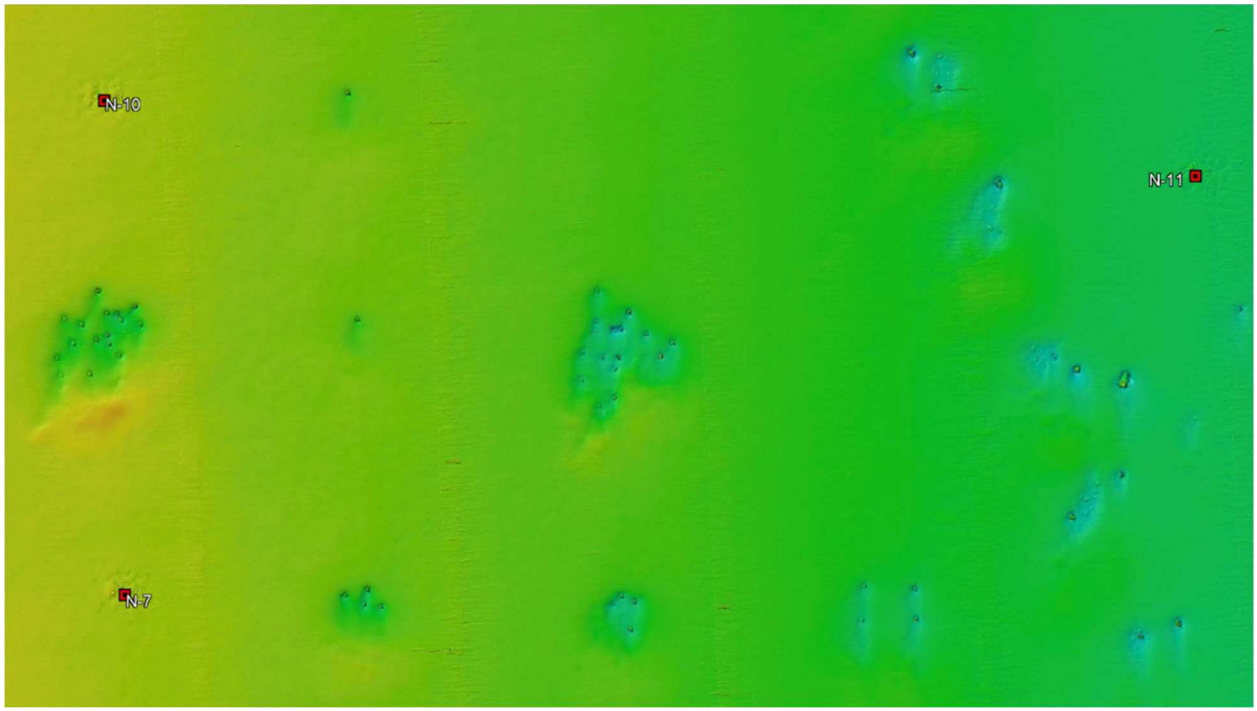


Figure 17. Overview of the nursery railroad tie patches (7, 10, 11) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

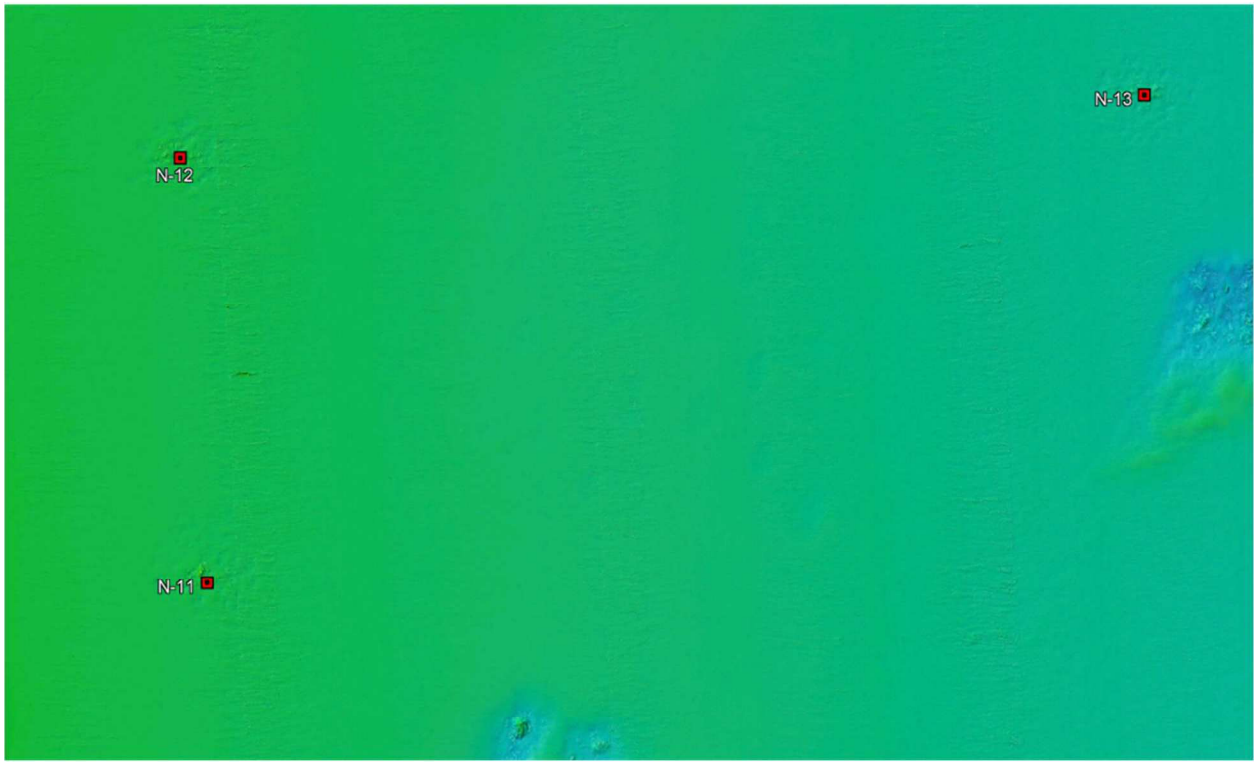


Figure 18. Overview of the nursery railroad tie patches (11-13) at the Rio Grande Valley Reef (PS-1105). Image was generated from 400 kHz multibeam recordings in August 2025.

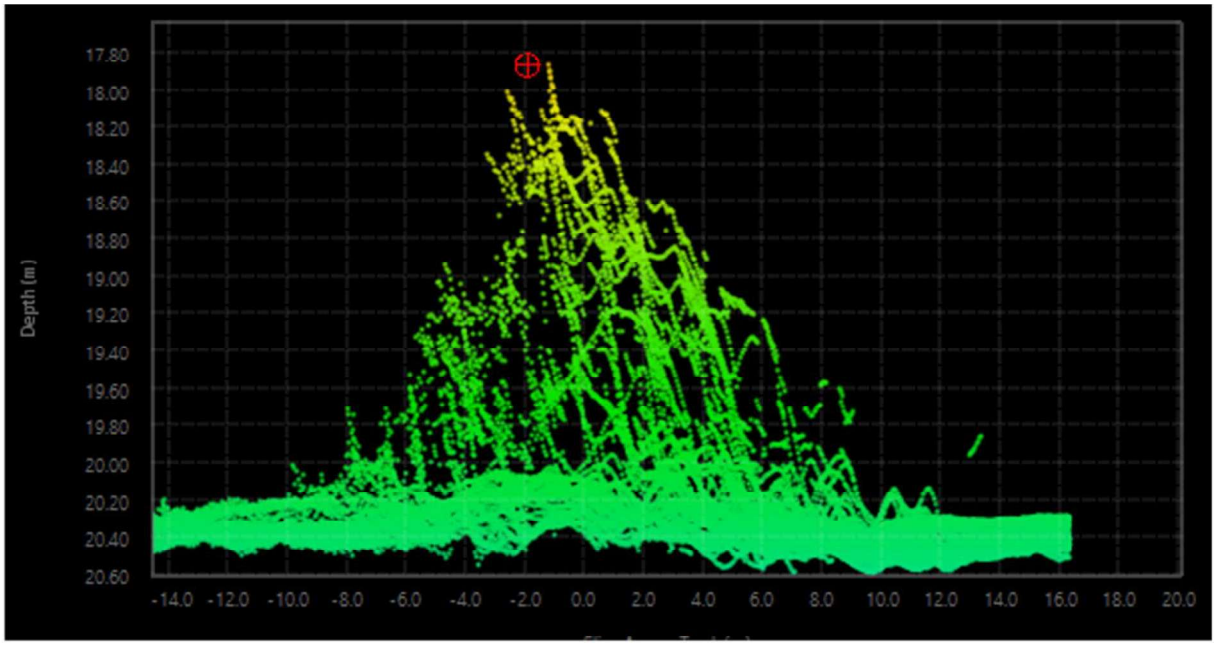


Figure 19. Profile view of 250-ton railroad tie patch (9) at the Rio Grande Valley Reef (PS-1105). Minimum depth clearance was 17.9 meters (58.7 ft). The measured height of 250T-9 was 2.5 meters (8.2 ft). Image was generated from 400 kHz multibeam recordings in August 2025.

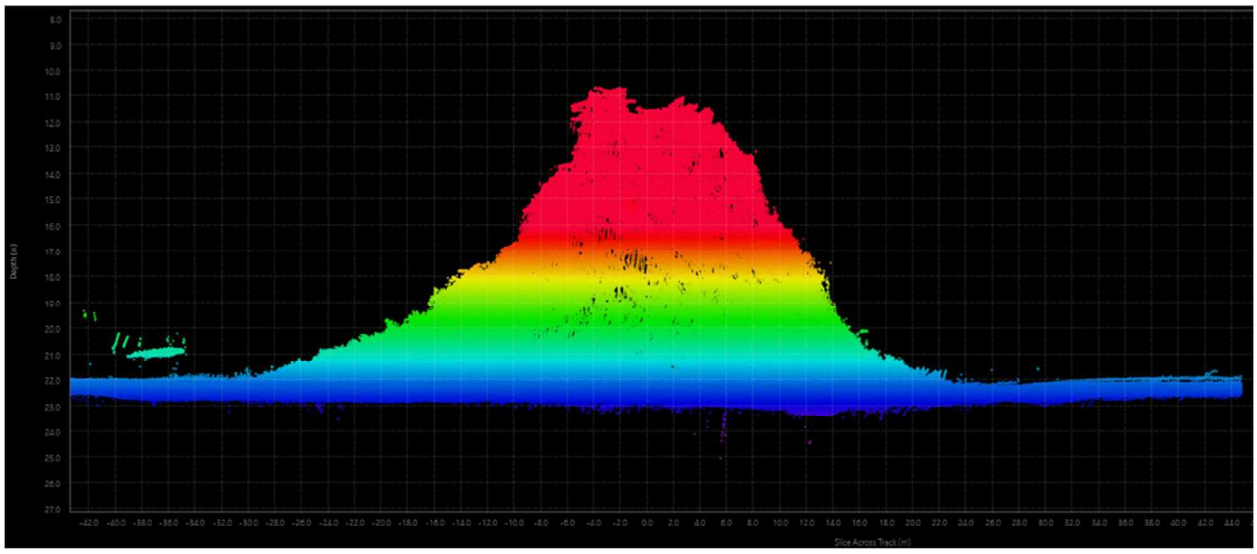


Figure 20. Profile view of Big's pile addition at the Rio Grande Valley Reef (PS-1105). Minimum depth clearance at MLLW was 10.7 meters (35.11 ft). The measured height of Big Pile was 11.3 meters (36.9 ft). Image was generated from 400 kHz multibeam recordings in August 2025.

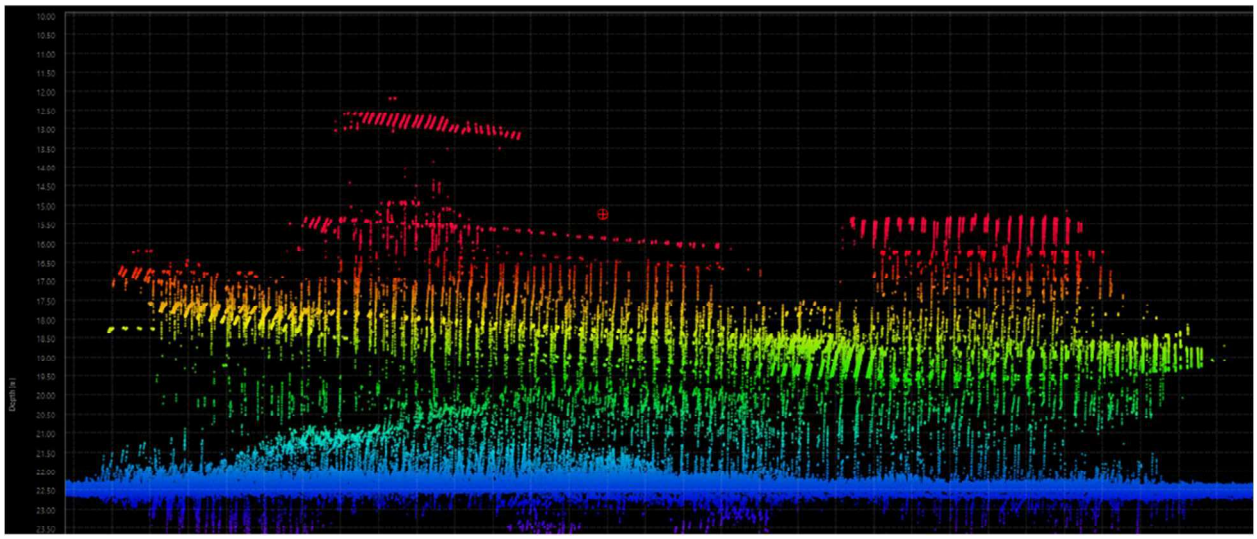


Figure 21. Profile view of the Titan Tug at the Rio Grande Valley Reef (PS-1105). Minimum depth clearance at MLLW was 12.2 meters (39.9 ft). The measured height of the Titan Tug was 10 meters (32.8 ft). Image was generated from 400 kHz multibeam recordings in August 2025.

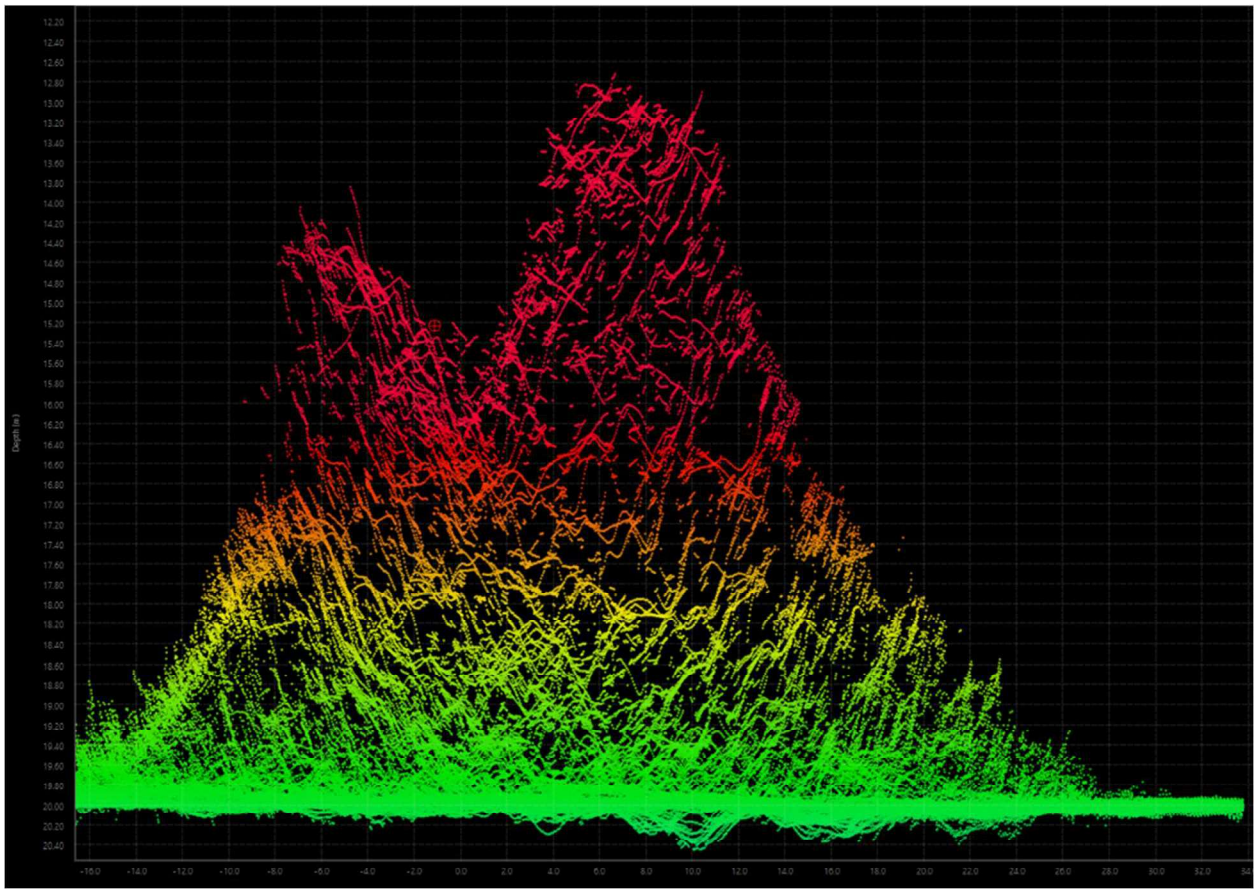


Figure 22. Profile view of the 3500-ton pile at the Rio Grande Valley Reef (PS-1105). Minimum depth clearance at MLLW was 12.7 meters (41.8 ft). The measured height of the 3500-ton pile

was 7.2 meters (23.6 ft). Image was generated from 400 kHz multibeam recordings in August 2025.

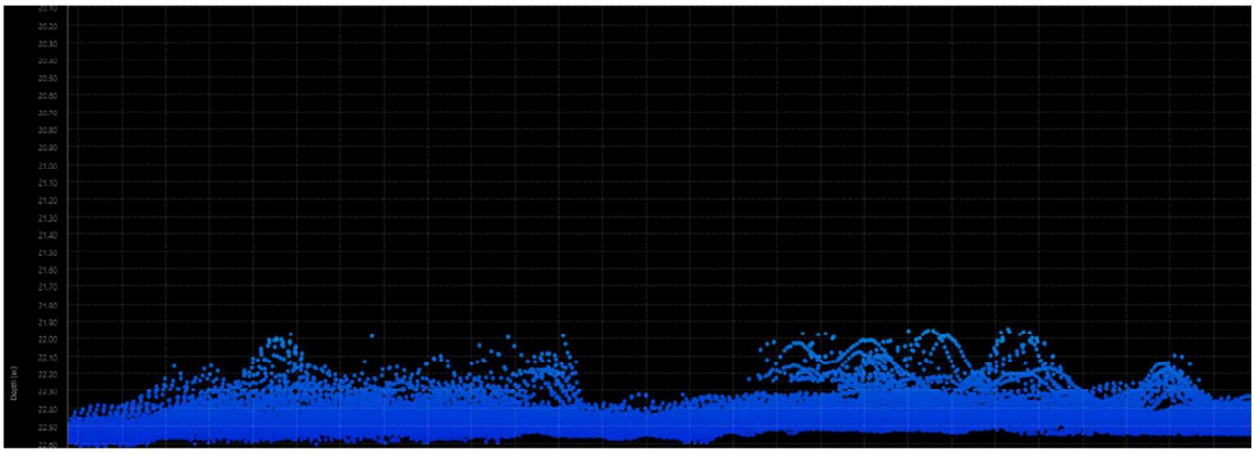
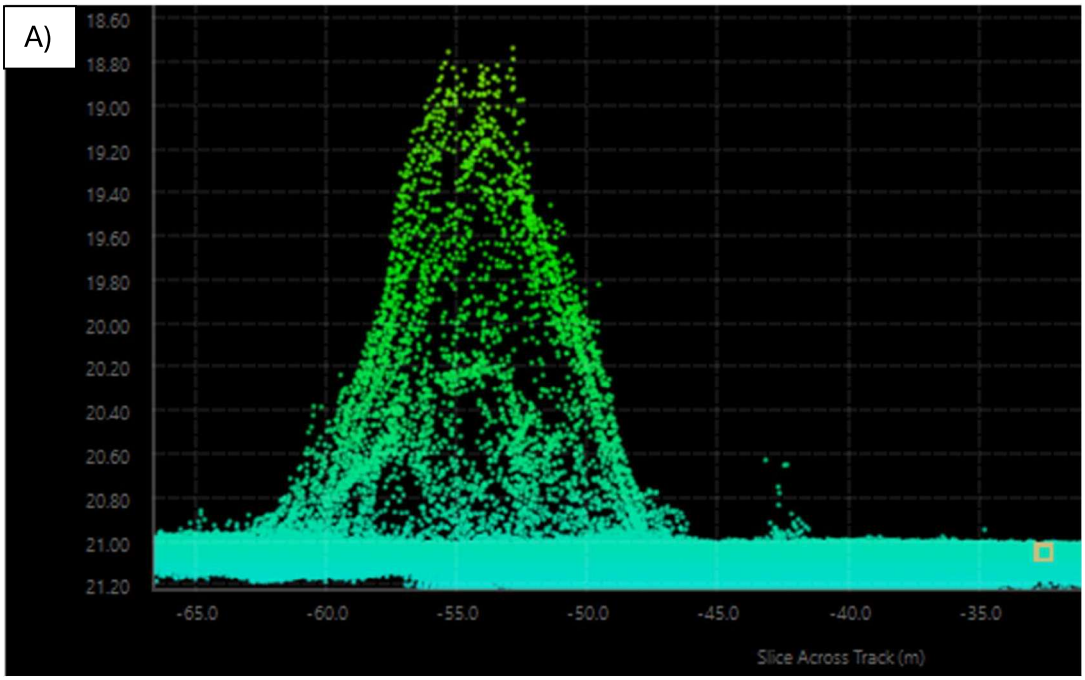


Figure 23. Profile view of a nursery patch (N-2) at the Rio Grande Valley Reef (PS-1105). Minimum depth clearance at MLLW was 22.1 meters (72.4 ft). The maximum measured height of the nursery patch (N-2) was 0.45 meters (1.5 ft). Image was generated from 400 kHz multibeam recordings in August 2025.



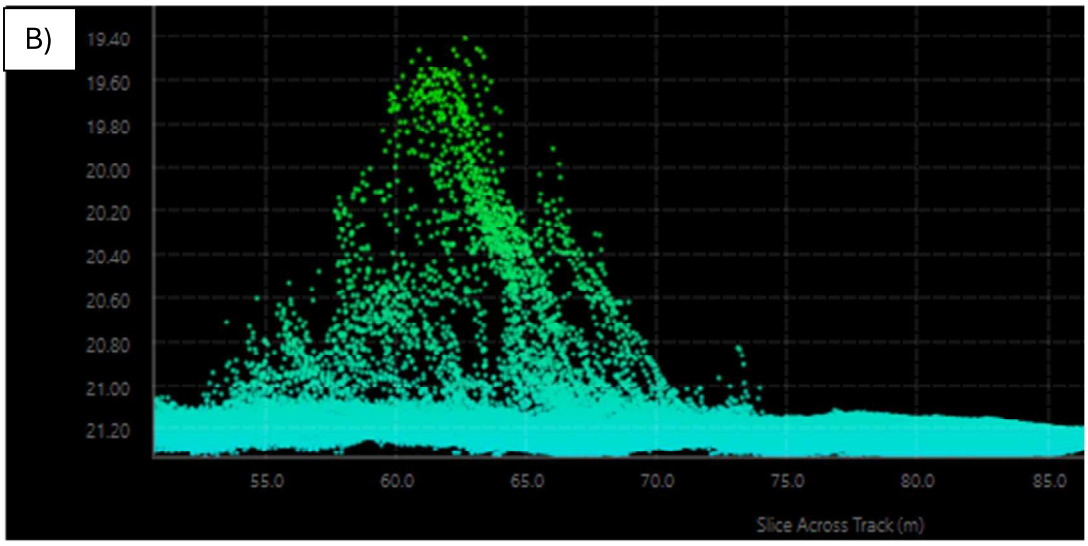


Figure 24. Profile views of 250-ton patches A) 250T-5 and B) 250T-6 at the Rio Grande Valley Reef (PS-1105). Minimum depth clearance at MLLW was 18.8 (61.7 ft) to 19.4 meters (63.6 ft). The measured height of the 250T-5 patch was 2.1 meters (6.9 ft) and the measured height of the 250T-6 patch was 1.7 meters (5.6 ft). Image was generated from 400 kHz multibeam recordings in August 2025.

Equipment List:

Survey Vessel: 38’ Munson Landing Craft R/V Vaquero II

Positioning and motion control: Garmin Chartplotter and depth sounder, Applanix OceanMaster positioning system, Trimble GNSS antennas

Imaging: Norbit Integrated WINGHEAD “S” series Multibeam Echo Sounder

Image processing: QPS Qimera 2.7.6