FIELD PERFORMANCE WHITE PAPER

Access Road Construction

Pilot Case Study

Soil Stabilization & Structural Performance Evaluation

RoadPacker Plus Ionic Soil Stabilization Technology

KEY RESULT

Measured Bearing Capacity: **637 kPa**

+15.8% above the 550 kPa contractor target · Exceeds compacted gravel base performance

All three quality tests passed: FDT · PSI/DCP · Plate Load Test

LOCATION Papatahan, Paete, Laguna, Luzon, Philippines	TESTING PERIOD 1 February – 6 March 2026
PREPARED BY **Purlieu Management Inc.**	TECHNOLOGY RoadPacker Plus Ionic Soil Stabilizer *ASEAN Technical Team*

01 EXECUTIVE SUMMARY

This white paper documents the results of a field demonstration and structural performance evaluation of RoadPacker Plus soil stabilization technology, conducted in cooperation with a local site construction company at Papatahan, Paete, Laguna, Philippines in February 2026.

The pilot program evaluated the engineering performance of RoadPacker Plus stabilized soil under controlled field conditions across three independent quality tests: Field Density Test (FDT), Penetration Strength Index (PSI/DCP), and Plate Load Test (PLT).

100.7–101.8%	13,071 PSI	637 kPa
FDT COMPACTION ACHIEVED	PEAK PENETRATION RESISTANCE	MEASURED BEARING CAPACITY

KEY FINDINGS

- Compaction exceeded minimum 90% MDD threshold at all three test locations, reaching up to 101.8%
- Penetration resistance values ranged from 7,215 to 13,071 PSI, against a minimum requirement of 4,000 PSI
- Plate Load Test measured bearing capacity of 637 kPa — 15.8% above the contractor target of 550 kPa
- Stabilized soil outperformed conventional compacted gravel base in all structural metrics
- Surface desiccation cracking observed in high-temperature conditions was confirmed non-structural

◆ Significance for Renewable Energy Projects

This pilot provides a validated field case study demonstrating RoadPacker Plus as a viable alternative to imported aggregate base courses for solar farm and wind farm access road construction across Southeast Asia. The technology enables durable, all-weather access roads while materially reducing project costs and construction timelines.

02 PROJECT OVERVIEW

2.1 OBJECTIVE

The pilot demonstration was designed to generate field-validated performance data for RoadPacker Plus ionic soil stabilization technology applied to in-situ native soils representative of typical construction subgrade conditions in the Philippine archipelago.

Primary goals of the demonstration:

- Verify field application methodology under real site conditions
- Confirm compaction performance of RPPLUS-treated soil
- Quantify structural strength improvements via independent testing
- Evaluate suitability for heavy construction and operations & maintenance traffic loading

2.2 PROJECT DETAILS

PARAMETER	DETAIL
Project Type	Field Pilot Demonstration
Contractor	Philippines AAA Construction Company
Technology Applied	RoadPacker Plus (RPPLUS) Ionic Soil Stabilizer
Test Area	600 m² treatment zone
Treatment Depth	200 mm (in-situ mixing)
Date of Treatment	February 2026
Testing Period	1 February – 6 March 2026
Report Prepared by	Purlieu Management Inc. / Rhino Construction Inc.
Technology Principal	RoadPacker International — ASEAN Technical Team

2.3 SITE CONDITIONS

The demonstration area consisted of in-situ native soil, representative of typical construction subgrade conditions encountered in Laguna Province, Luzon.

Initial site conditions observed prior to treatment:

- Soft to moderately compacted in-situ soil with limited natural structural stability
- Variable moisture content across the treatment zone
- Heavy rain and elevated moisture conditions at the start of the test period, necessitating a two-week delay before treatment could commence
- Soil type and plasticity typical of tropical residual soils — responsive to ionic stabilization treatment

Site Condition Note

The wet-season conditions encountered during the test period represent a realistic worst-case scenario for Philippine construction. The successful performance of RoadPacker Plus under these conditions strengthens confidence in its applicability across the seasonal construction calendar.

03 SOIL STABILIZATION METHODOLOGY

3.1 SURFACE PREPARATION

The treatment area was prepared through standard grading and leveling to establish uniform surface conditions prior to stabilization. Proper preparation is critical to achieving uniform treatment penetration and consistent compaction performance across the full treatment zone.

- Removal of loose debris and organic material from the surface
- Surface leveling and grading to design template
- Moisture conditioning where required to approach Optimum Moisture Content (OMC)

3.2 ROADPACKER PLUS APPLICATION

RoadPacker Plus concentrate was diluted with clean water according to the manufacturer's prescribed dilution ratio and applied uniformly to the prepared soil surface using a calibrated water truck.

STEP	ACTIVITY	METHOD
1	Dilution	RPPLUS concentrate mixed with water in water truck at specified ratio
2	Surface Spray	Uniform application across treatment area via calibrated nozzle
3	Mechanical Mix	Rotavator / pulvimixer to ensure uniform penetration to 200 mm depth
4	Moisture Check	Verify moisture at OMC ± 2% before compaction
5	Compaction	Multiple passes with vibratory roller to achieve target density
6	Density Test	Field Density Test at representative points across treatment zone

3.3 STABILIZATION MECHANISM

RoadPacker Plus works by modifying the **electrostatic charge of clay and silt particles** within the soil matrix. This ionic reaction permanently reduces soil plasticity, expels inter-particle moisture, and promotes dense grain-to-grain contact — producing a stabilized layer with significantly improved structural characteristics without the need for aggregate import.

3.4 COMPACTION PROCEDURE

Following in-situ mixing, the treated soil was compacted using a vibratory drum roller in multiple overlapping passes to achieve maximum density and structural uniformity. Density was verified at multiple test points before the quality testing program commenced.

04 QUALITY CONTROL & TESTING PROGRAM

A multi-test quality control program was conducted following stabilization and compaction to verify construction quality and independently measure structural performance. Three complementary tests were applied, each validating a different aspect of the stabilized layer's performance.

TEST	WHAT IT MEASURES	RELEVANCE
Field Density Test (FDT)	Compaction density of treated layer	Confirms construction quality
PSI / DCP Test	Soil stiffness & penetration resistance	Confirms structural improvement
Plate Load Test (PLT)	Direct bearing capacity under applied load	Confirms structural sufficiency

05 FIELD DENSITY TEST (FDT)

PURPOSE

The Field Density Test verifies that the treated soil has been compacted to the required density. Adequate compaction is fundamental to structural performance — it increases stiffness, reduces settlement potential, and improves load distribution capacity.

RESULTS — MINIMUM PASSING THRESHOLD: 90% MDD

TEST POINT	% COMPACTION ACHIEVED	RESULT	MARGIN ABOVE MINIMUM
FDT-1	**100.7%**	✓ PASS	+10.7%
FDT-2	**101.4%**	✓ PASS	+11.4%
FDT-3	**101.8%**	✓ PASS	+11.8%

INTERPRETATION

All three FDT results exceeded the minimum 90% MDD threshold by a substantial margin, achieving compaction levels typically associated with high-quality engineered base layers. Achieving compaction above 100% MDD indicates that RoadPacker Plus treatment positively enhanced the compactability of the in-situ soil, allowing it to exceed the theoretical standard Proctor maximum under the application conditions.

✓ FDT Conclusion

Compaction quality confirmed at all test points. Stabilized layer achieved 100.7% to 101.8% MDD — well above the 90% minimum requirement and consistent with engineered structural fill standards.

06 PENETRATION STRENGTH INDEX (PSI / DCP)

PURPOSE

The Dynamic Cone Penetrometer (DCP) test measures the penetration resistance of the soil layer, providing an indication of stiffness and resistance to deformation under load. Higher PSI values correspond directly to improved structural performance and greater resistance to rutting under traffic.

RESULTS — MINIMUM REQUIRED: 4,000 PSI

TEST POINT	PSI RESULT	MINIMUM REQUIRED	FACTOR ABOVE MINIMUM
PSI-1	**7,215**	4,000	**1.80×**
PSI-2	**10,082**	4,000	**2.52×**
PSI-3	**10,923**	4,000	**2.73×**
PSI-4	**13,071**	4,000	**3.27×**

INTERPRETATION

PSI results exceeded the minimum requirement at every test point by a factor of 1.8 to 3.3 times. The progressive improvement in PSI values across test points (PSI-1 through PSI-4) suggests the stabilized layer achieved increasing structural integrity as the ionic bonding reaction matured — consistent with the known curing behavior of RoadPacker Plus.

✓ PSI/DCP Conclusion

Penetration resistance confirmed as substantially above minimum at all four test points. Peak resistance of 13,071 PSI is 3.27 times the minimum requirement — demonstrating a high-stiffness, deformation-resistant structural layer.

07 PLATE LOAD TEST (PLT)

PURPOSE

The Plate Load Test is the primary direct measure of soil bearing capacity — the maximum load per unit area a soil layer can support without failure. It is the most critical structural test for access road design and is the standard method for validating subgrade performance for construction and operations traffic.

RESULTS

PARAMETER	VALUE	STATUS
Contractor Target Bearing Capacity	550 kPa	Baseline Requirement
Measured Bearing Capacity	**637 kPa**	**✓ EXCEEDS TARGET**
Performance Margin	**+87 kPa / +15.8%**	Above Requirement

MEASURED BEARING CAPACITY

637 kPa

+15.8% above contractor target · Exceeds compacted gravel base performance

COMPARATIVE BEARING CAPACITY ANALYSIS

SURFACE TYPE / MATERIAL	TYPICAL BEARING CAPACITY	VS. RPPLUS RESULT
Untreated In-Situ Soil	100 – 200 kPa	3.2 – 6.4× lower
Compacted Gravel Base (G1/G2)	300 – 450 kPa	1.4 – 2.1× lower
RoadPacker Plus Stabilized Soil	**637 kPa ★ This Pilot**	**Benchmark Result**

INTERPRETATION

The measured bearing capacity of 637 kPa demonstrates that RoadPacker Plus stabilized soil delivers structural performance exceeding that of a conventional compacted gravel base course. This result validates the technology as a viable in-situ alternative to aggregate import — with material cost savings, reduced truck traffic, and faster construction as additional benefits.

✓ PLT Conclusion

Bearing capacity of 637 kPa confirmed — 15.8% above the 550 kPa target and substantially above the typical range for compacted gravel base. Stabilized soil is confirmed structurally suitable for heavy construction traffic and renewable energy operations & maintenance vehicles.

08 FIELD OBSERVATION: SURFACE DESICCATION CRACKING

Minor spider-web surface cracking was observed in portions of the stabilized soil layer following compaction. This section provides the geotechnical explanation for this phenomenon and confirms its classification as a non-structural curing artifact.

⚠ **Key Finding: Structural Tests Unaffected**

Despite the presence of visible surface cracking, all three structural quality tests — FDT, PSI/DCP, and PLT — passed with substantial margins above their minimum requirements. This confirms that the cracking is superficial and does not affect the structural integrity of the stabilized layer.

MECHANISM: DESICCATION SHRINKAGE

The spider-web cracking pattern observed is consistent with desiccation shrinkage cracking — a well-understood phenomenon in fine-grained and chemically stabilized soils exposed to rapid surface evaporation. The mechanism is identical to that observed in cement-treated bases, lime stabilization, drying clay soils, and mud flats after evaporation.

When RoadPacker Plus is applied and the soil is compacted, the stabilization reaction begins curing. If the surface dries faster than the subsurface, tensile stresses develop in the thin surface skin as it shrinks — producing the characteristic cracking pattern. The stable, moist structural layer below remains unaffected.

DEPTH OF THE PHENOMENON

LAYER	DEPTH	CRACKING OBSERVED?	STRUCTURAL IMPACT
Surface Skin	2 – 10 mm	**Yes — desiccation**	None — superficial only
Stabilized Layer	10 – 200 mm	**No**	Intact — full bearing capacity
Subgrade (below treat)	> 200 mm	**No**	Unaffected

WHY STRUCTURAL TESTS PASS DESPITE SURFACE CRACKING

- FDT (Field Density Test): measures compaction density below the surface skin — unaffected by shallow cracking
- PSI/DCP: the penetrometer passes through the thin cracked surface into the intact structural layer below
- Plate Load Test: loads the entire 200 mm stabilized layer — the surface film has negligible contribution to bearing capacity

CURING PRACTICE — RECOMMENDED PROTOCOL

DAY	RECOMMENDED ACTION	PURPOSE
Day 1 – 2	Light watering morning and afternoon	Slow surface evaporation; prevent rapid drying
Day 3 – 5	Light curing spray once daily	Allow controlled moisture dissipation
Day 5 – 7	Allow natural drying under shade if possible	Complete ionic bonding reaction
Day 7+	Open to construction traffic	Stabilized layer at design strength

◆ **Engineering Interpretation**

Surface desiccation shrinkage cracking is a recognised and non-structural curing phenomenon in chemically stabilised soils. The observation that the treated soil had developed sufficient cohesion to crack as a continuous plate — rather than deform plastically — is itself an indicator of successful stabilisation. Loose, unstabilised soils do not exhibit this behaviour.

09 CONCLUSIONS & RECOMMENDATIONS

SUMMARY OF TEST RESULTS

TEST	REQUIREMENT	ACHIEVED	VERDICT
FDT — Compaction	≥ 90% MDD	100.7 – 101.8% MDD	✓ **PASS — All Points**
PSI — Penetration	≥ 4,000 PSI	7,215 – 13,071 PSI	✓ **PASS — All Points**
PLT — Bearing Capacity	≥ 550 kPa	637 kPa	✓ **PASS — +15.8%**

KEY CONCLUSIONS

- RoadPacker Plus ionic soil stabilization significantly and measurably improved the structural capacity of in-situ native soil
- Compaction performance exceeded minimum requirements at all test points, confirming correct application methodology
- Penetration resistance values of up to 13,071 PSI — more than three times the minimum — confirm a high-stiffness structural layer
- Measured bearing capacity of 637 kPa exceeds both the contractor target and the typical performance of imported compacted gravel base
- Surface desiccation cracking is confirmed as a non-structural curing phenomenon with no impact on bearing capacity
- Performance under wet-season, high-moisture conditions validates applicability across the Philippine construction calendar

RECOMMENDATIONS

- Adopt RoadPacker Plus as the standard soil stabilization method for access road subgrade construction on solar and wind farm projects in the Philippines
- Implement the recommended curing protocol (Day 1–7 moisture management) to minimize surface shrinkage cracking
- Apply a gravel wearing course or bituminous seal over the stabilized subgrade to protect the surface skin and provide a durable all-weather running surface
- Conduct FDT verification at every 500 LM interval on linear road projects to ensure consistent compaction quality
- This pilot case study is approved for use as a reference document in client presentations and tender submissions

VALIDATED FIELD PERFORMANCE

This pilot case study confirms that RoadPacker Plus technology provides a practical, cost-effective, and field-proven solution for access road subgrade stabilization in renewable energy projects across Southeast Asia.

Purlieu Management Inc. · In association with Rhino Construction Inc. & RoadPacker International

APPENDICES

APPENDIX	TITLE	CONTENTS
Appendix A	Field Density Test Reports	Full FDT test sheets for FDT-1, FDT-2, FDT-3
Appendix B	PSI / DCP Test Results	DCP penetration logs for PSI-1 through PSI-4
Appendix C	Plate Load Test Report	PLT load-settlement curve and test data sheet
Appendix D	Site Photographs	Before/after site photos; surface condition documentation