North Rural Unsealed Road Improvement Programme (URIP)

PolyCom Stabilising Agent Evaluation

Auckland Transport

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1. Executive Summary

- This report evaluates the use of the PolyCom Stabilising Agent for the renewal and strengthening of the unsealed pavement is now being practised in the North Rural Contract
- Results show substantial performance improvements on treated pavement with cost savings compared to traditional gravel overlay methods.
- Across multiple projects, PolyCom-treated roads required 60–70% lower materials cost (e.g. Wright Road saved $207K, 63%) and far fewer truck trips hauling aggregate.
- Pavement life was extended – treated roads remain in good condition up to 4–6 times longer than untreated sections,
- Dust generation and water ingress were markedly reduced, enhancing durability and environmental performance

2. Background and Need

Objectives and guiding principles

This section outlines the objectives and guiding principles when considering surfacing and alternative treatments of unsealed roads across Auckland.

Section 39 of the *Local Government (Auckland Council) Act 2009* (LGA) mandated and guided Auckland Transport purpose "to contribute to an effective, efficient, and safe Auckland land transport system in the public interest". In addition, Section 10(1)(b) of the *Local Government Act 2002* identifies AT's obligation to "promote the social, economic, environmental and cultural wellbeing of communities in the present and for the future".

Correspondingly, the overarching document that provides direction and guidance on the management and investment for the unsealed road network in Auckland is outlined/summarized in the Unsealed Road Improvement Framework.

Vision and objectives

The vision and objectives for unsealed roads in Auckland are consistent with and are an extension of the objectives in AT's Asset Management Plan 2018.

The intent is for the Auckland Transport's (AT) legacy 'Seal Extension' budget to be expanded to make it available for a wider range of improvement investments. This requires consideration of a broader criteria, which includes strategic fit, safety, public health, natural environment, climate change and cost, on which unsealed roads are considered for seal extension or other improvement.

Background and Need

Vision

AT's vision for the unsealed road network is to promote the social, economic, environmental and cultural wellbeing for all users of unsealed roads as well as those who live or work near them.

Objectives

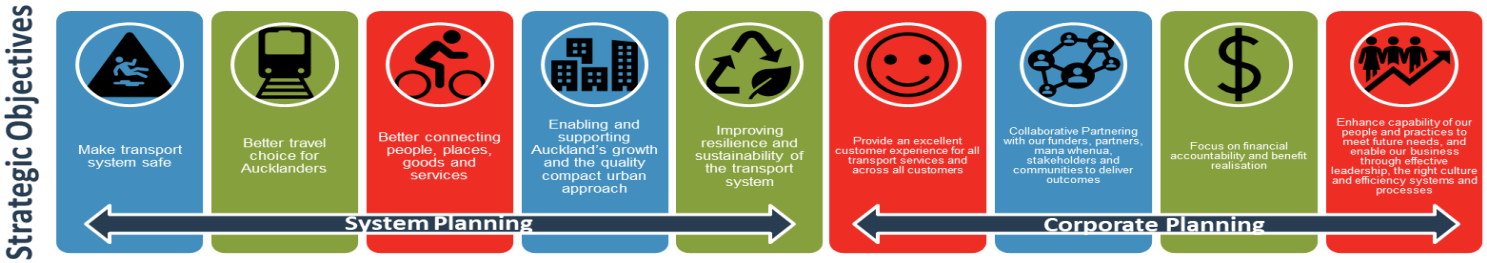
AT's objectives for unsealed roads in Auckland are to:

1. Promote environmentally, socially and economically sustainable practices
2. Promote reasonable cost of treatment to unsealed roads
3. Have a safe network free of death and serious injury
4. Have a network that considers and proactively avoids the effects on public health

The vision and objectives also correspond to AT's strategic objectives as set out in AT's Enterprise Business Plan and Performance Management Framework, specifically supporting population growth, improving resilience and sustainability, safety, customer experience, and financial accountability.

Background and Need

Figure 3.1 AT's strategic objectives



Decision-making and governance

This section outlines the decision-making process and governance to address the vision, objectives and guiding principles for unsealed roads in Auckland.

Decision-making process

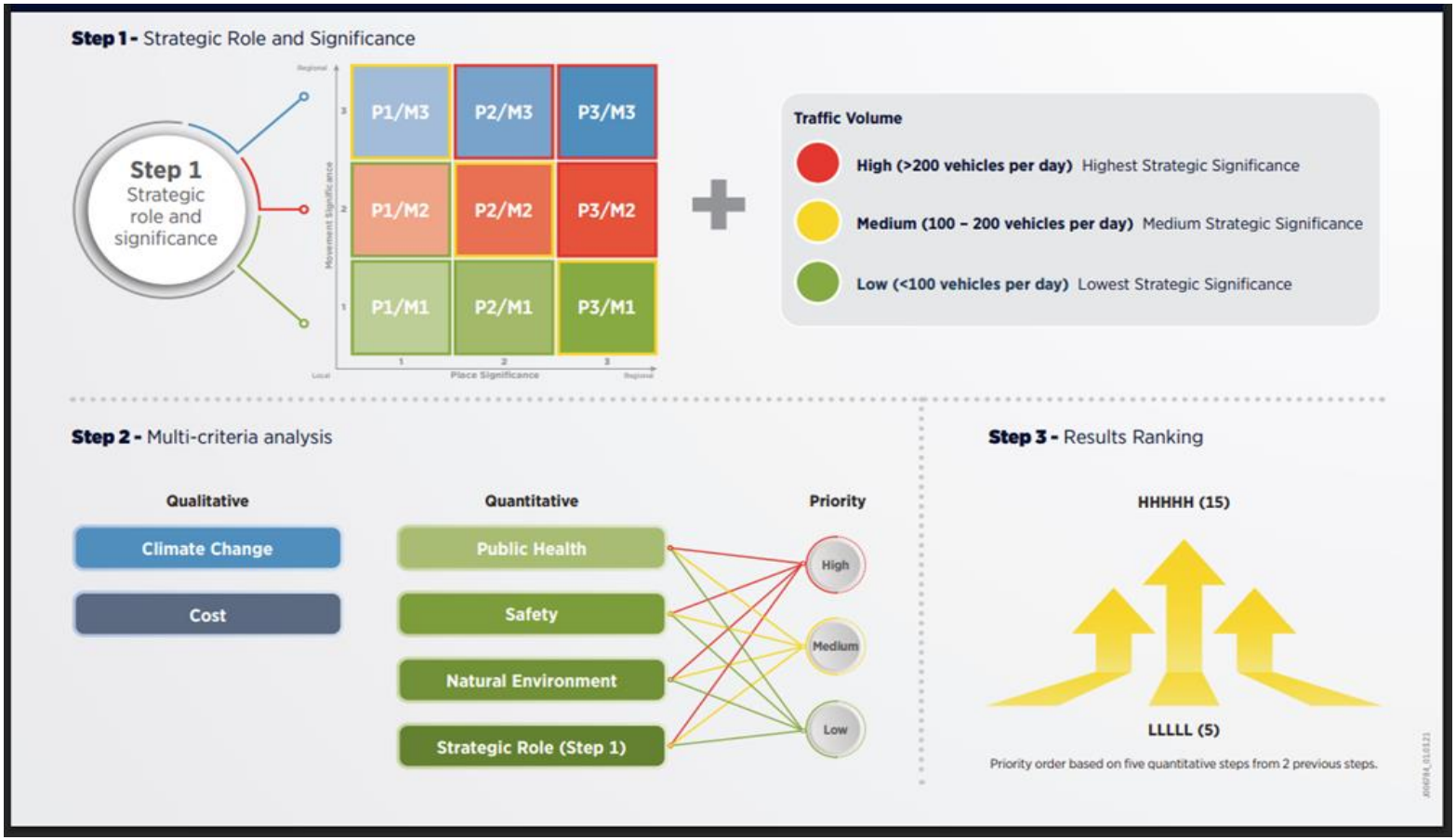
The decision-making process is a two-part process that assesses the need for unsealed road improvement work through prioritization, then selects an appropriate treatment option for each unsealed road and allocates funding to complete the work.

The entire decision-making process is shown in Figure 5.1. This shows the breakdown of each step and the order in which each step will be completed. The following sections provide detail on each step.

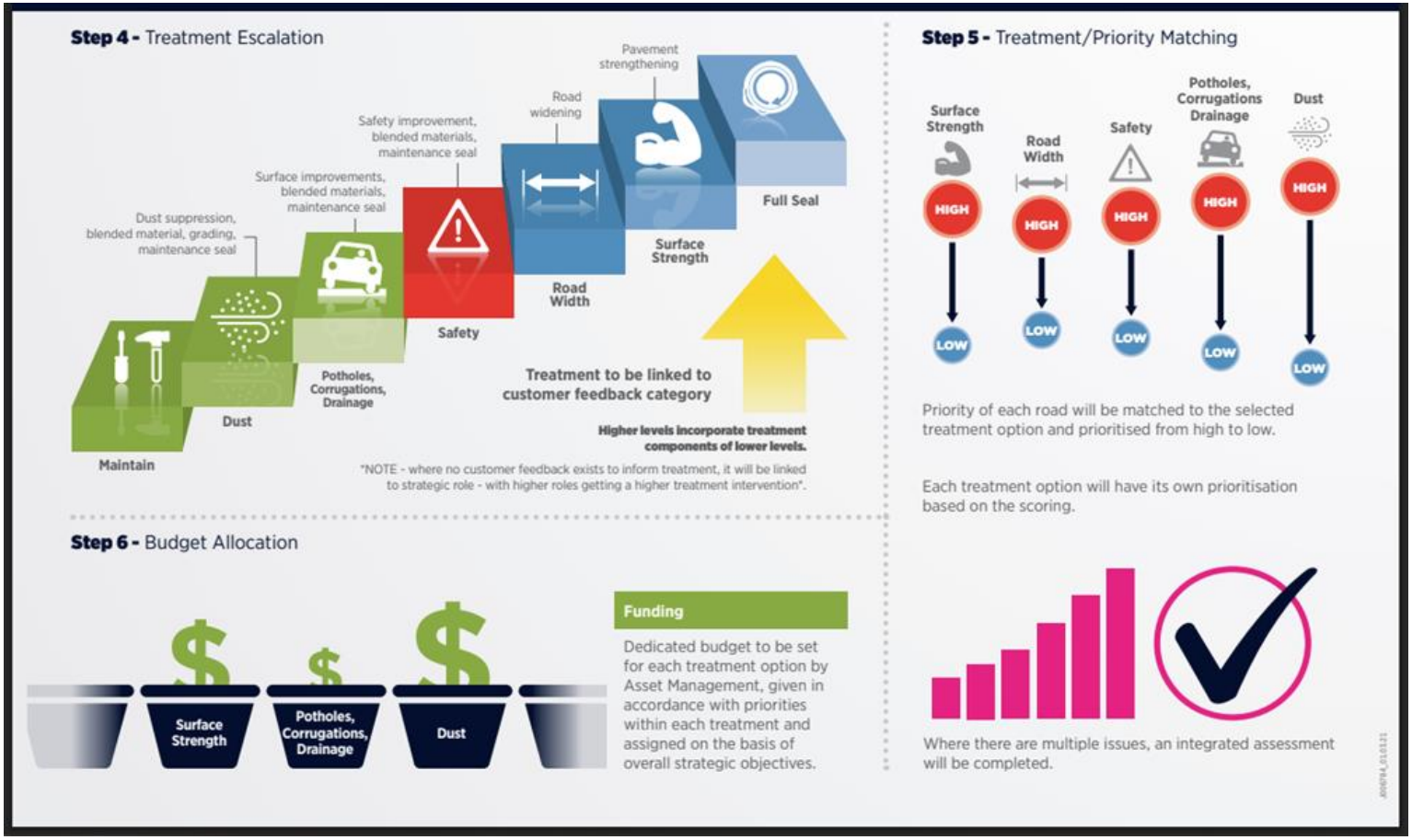
The decision-making process is adapted to the Auckland context, using 'Surfacing Alternatives for Unsealed Rural Roads' (Henning et al., 2005) as a guide.

The vision, objectives and guiding principles are woven throughout and are to be used to guide decisions on treating unsealed roads in Auckland.

Background and Need



Background and Need



Background and Need

An NZTA paper on “Managing unsealed road dust in NZ” stated that there are **30,900 km of unsealed rural roads** managed by local councils knowledgehub.transport.govt.nz.

These gravel roads serve sparsely populated areas and require frequent maintenance (grading, reshaping, re-metalling) to remain serviceable. Traditionally, many unsealed roads were graded several times per year to maintain required standards contractormag.co.nz. This practice is **expensive and resource-intensive** – high volumes of quarried metal must be hauled to the site, causing fuel costs, machine wear, traffic disruption, and dust pollution.

In sensitive rural environments, road dust can affect health and ecosystems, and sediment can reach waterways. Councils face budget pressures to reduce **ongoing maintenance costs** (material haulage, equipment use, labour) while delivering reliable, durable road surfaces.

The North Rural Maintenance contract was led on the principle of “Collaboration” to enable AT and the supplier to work collaboratively for the betterment of the network. A shift in thinking was than necessary as a continuous improvement in managing the unsealed network.

We believe that managing of unsealed road is an “art” with good understanding of engineering principles.

3. Historical Standard Practices

Historically, our standard practice involved

- **Gravel Re-sheeting & Grading:** Regularly adding quarry aggregate and reshaping the existing pavement to maintain ride quality.
- **HML Roads (Heavy Metal Lime):** A 3:1 blend of blue metal and lime rock applied to higher-volume sections. Initially effective, but became less sustainable as traffic and dust issues increased.
- **Thick Aggregate Overlays:** Importing 100–150 mm of virgin aggregate to strengthen pavements. Effective short-term, but prone to washout during heavy rainfall, leading to material loss into waterways.
- **Stabilizing the Traditional Way:** Importing 100–150 mm of virgin aggregate, Lime, and cement to strengthen pavements is effective in the short term but prone to slabbing and cannot be graded without re-ripping the surface and re-stabilizing it again.

These methods proved adequate for low-traffic rural roads but struggled under rising traffic volumes and environmental constraints, prompting the exploration of polymer stabilization.

4. Introduction to PolyCom Stabilising Agent

PolyCom Stabilizing Agent was presented at a conference on Low Volume Roads workshop August 2022 at New Plymouth attended by both our AT staff and Downer.

The North Rural Contract team in collaboration with AT decided to take on board the idea to trial this stabilizing agent on the NR Unsealed network.

Downer Operations manager, then (Mark Taylor) initiated the process by inviting the TPMS (supplier of the PolyCom Stabilizing agent for New Zealand) to provide us a presentation on “PolyCom”

With positive expectation and complete buy in from Downer, a trail was arranged for Wright Rd Matakana with Mark heading a dedicated team to undertake the trail with TPMS personnel on site working and guiding the trial.

The results over the past 24 months have demonstrated that we are not only reducing our maintenance cost, but a significant reduction in complaints from the public. Compliments now becomes part of the norm.

4. Introduction to PolyCom Stabilising Agent

PolyCom Stabilising Agent is a granular polymer-based additive (polyacrylamide) that is mixed into the existing road materials during routine maintenance. When applied and compacted, it **binds the soil and aggregate particles**, producing a "tighter", stronger pavement tpms.co.nztpms.co.nz. In strength it is comparable to traditional stabilizers, but critically it also **improves water resistance and flexibility** tpms.co.nztpms.co.nz. PolyCom is **highly cost-effective** and requires *no cure time*: pavements can be re-worked immediately if needed earthcoprojects.com.au. Because it is additive to in-situ materials, it dramatically cuts the need for imported gravel contractormag.co.nz.

After treatment, roads exhibit enhanced durability; one study noted treated pavements can last **up to six times longer** before intervention is needed contractormag.co.nz. The technology has won sustainability awards (Banksia 2014) and has been adopted by progressive councils in NZ and Australia as a "smarter, more efficient" maintenance solution contractormag.co.nz. PolyCom applications yield a strong, dust-suppressing surface with a greatly reduced ecological impact tpms.co.nztpms.co.nz

5. Application Methodology

Treatment with PolyCom is incorporated into a standard road maintenance cycle. First, the existing pavement is **graded and reshaped**. Next, a measured amount of PolyCom is **sprayed evenly** onto the road surface using a watercart or sprayer system. Water is added to activate the polymer, and the pavement is **ripped/mixed** and re-graded so that the PolyCom thoroughly integrates into the material. Finally, the entire layer is **compacted** with a roller to achieve the desired density. This "rip–blend–compact" process uses ordinary road construction equipment (grader, water-cart, roller) contractormag.co.nztpms.co.nz.

5. Application Methodology

Figure: PolyCom stabilisation being applied. A water-cart sprays the PolyCom solution (top left), the surface is mixed with a grader (bottom right) and compacted with rollers (bottom left), producing a tight, dust-suppressed pavement contractormag.co.nz tpms.co.nz.

Key steps include:

- **Spraying** – Distribute PolyCom liquid uniformly on the damp road surface.
- **Mixing** – Use a grader or mixing blade to blend the material to the required depth (e.g. 150mm).
- **Compaction** – Roll the treated layer with smooth-drum rollers to bond particles and eliminate voids.

PolyCom requires no specialised machinery: any road crew using standard stabilisation equipment can apply it during a maintenance cycle contractormag.co.nz earthcoprojects.com.au. Typical dosage rates are very low (around 0.002% by volume) so one 2kg bottle treats about 50 m^3 of compacted material. The process is fast, with no waiting period for curing, and the new pavement can be opened to traffic almost immediately.

6. Results and Cost Analysis

The application of PolyCom Stabilising Agent consistently yielded **dramatic cost savings** compared to traditional road metal overlays. Analysis of multiple projects shows that the material and hauling cost for PolyCom-treated sections is roughly 30–40% of the cost for an equivalent 150mm crushed-rock overlay. In practical terms, **project savings were typically around 60%**, as illustrated below:

Figure: Comparative costs of traditional metal overlay vs PolyCom in-situ stabilization across sample projects. PolyCom treatment (green bars) required significantly less expenditure than a 150mm gravel overlay (orange bars), yielding ~60–70% cost savings. All projects showed a lower total cost with PolyCom. (Chart data derived from project estimates.)

6. Results and Cost Analysis

Consider representative case data: Wright Road's 3.223 km URIP project had a **traditional overlay cost of $328K** versus **$121K with PolyCom**, saving $207K (63%). Across all trials, savings ranged from roughly 49% to 72% (Burnside Rd 72%, Ireland Rd 49%, etc.). These reductions stem from using the existing material (less quarried gravel) and reduced haulage. In addition to cost, PolyCom treatment cut **heavy truck movements** dramatically – for example, Wright Road avoided about *161 truck trips* (~4,122 km) of aggregate delivery compared to the overlay option. This lowers fuel and haulage expenses and reduces road wear. Table 1 summarises key cost metrics for selected projects.

Road (Project)	Metal-Only 150mm Overlay Cost ($)	PolyCom In-Situ Cost ($)	Savings (%)
Wright Road (Matakana)	328,351	121,237	63%
Burnside Road	380,652	105,115	72%
Ireland Road	101,840	51,925	49%
Underwood Road	126,430	47,461	62%

The **maintenance interval** improvements amplify value. Untreated gravel roads typically need re-grading every year; PolyCom-treated roads can go *4–6 years* before intervention roadmaker.com.au. One source notes treated pavements last **up to six times longer** than conventional ones, contractormag.co.nz. Consequently, ongoing grading and re-metalling costs drop precipitously – one council reported "significant financial savings" from much less frequent maintenance contractormag.co.nz. Less frequent repairs also mean fewer disruptions to the public.

In summary, PolyCom treatment provided all projects with a strong, durable surface using mostly existing material. Road resilience was enhanced (higher strength, better water resistance) tpms.co.nztpms.co.nz, while initial capital and lifecycle costs fell markedly contractormag.co.nzroadmaker.com.au.

7. Case Study: Wright Road (Matakana)

The Wright Road (Matakana) rehabilitation illustrates the PolyCom benefits in detail. This 3.223 km, 6.5 m wide rural road was upgraded under the URIP (Unsealed Road Improvement Programme). Traditionally, this project would have called for importing new aggregate and placing a 150 mm metal overlay at an estimated cost of $328,351. Instead, crews treated the in-situ gravel with PolyCom, ripping and mixing to a 150 mm depth.

Key outcomes: The PolyCom method cost **$121,237**, representing a **$207,114 savings (63% less)**. No quarry material was imported, eliminating *161 truckloads* (~4,122 km) of heavy hauling. After treatment, the pavement formed a tight, cohesive surface with minimal rutting or dust. Based on performance monitoring, no major interventions were needed for several years.

Parameter	Traditional (Overlay)	PolyCom Treatment	Improvement
Project Cost ($)	328,351	121,237	63% reduction
Truckloads (to site)	161	0	161 fewer loads (100%)
Haul Distance (km)	4,122	0	100% reduction
Maintenance Frequency	~1 per year	~1 per 4–6 years	4–6× longer interval roadmaker.com.au

This case confirms the broad trends: large cost savings, drastically reduced haulage, and extended service life. A strong, dust-suppressed road was achieved using existing materials and standard council equipment.

8. Challenges and Limitations

While PolyCom stabilization offers many benefits, several considerations must be noted:

- **Soil conditions:** Polymer stabilizers are less effective in *very fine, high-clay* soils substrata.us. Careful pre-treatment testing should confirm compatibility.
- **Longevity:** Like many polymer products, PolyCom may slowly degrade under UV exposure and heavy rainfall. Some studies note polymers sometimes last only a few years in road use substrata.us. Long-term performance monitoring is recommended to determine if/when retreatment is needed.
- **Application control:** Uniform mixing is critical. Crews must ensure correct polymer dosage, even application, and adequate compaction, which may require training. Weather (rainfall soon after application) can affect curing if not accounted for.
- **Initial cost:** There is a per-project cost for the PolyCom additive itself. Though small relative to overall savings, this requires upfront budgeting and procurement coordination.
- **Regulatory and community factors:** In some cases, specifications or guidelines may need updating. Stakeholders should be informed about the environmental and health benefits (less dust, no toxic runoff) to gain support.

Most challenges can be managed through pilot trials, proper mix design, and crew training. Overall, no major safety or equipment issues have been reported – PolyCom is non-toxic when applied correctly and integrates with standard roading plant tpms.co.nz earthcoprojects.com.au.

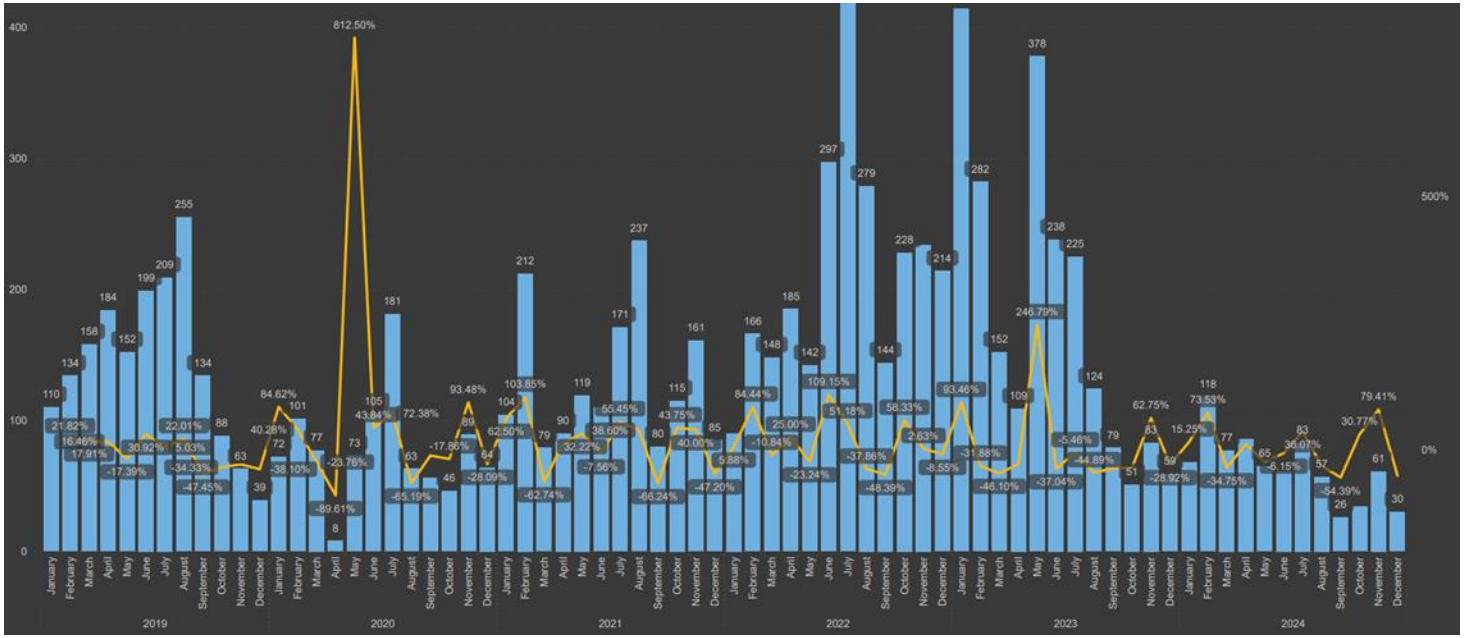
9. Conclusions and Recommendations

PolyCom stabilization has proven to be a **robust, cost-saving alternative** for rural road upgrades. Key conclusions:

- **Significant savings:** Material and haulage costs dropped by roughly 60–70% on treated projects. Combined with extended intervals between grades, lifecycle expenses are much lower contractormag.co.nzroadmaker.com.au.
- **Durable performance:** Treated roads gain enhanced strength, water resistance, and dust control. Performance analyses indicate minimal degradation for 4–6 years, reducing maintenance frequency substantially contractormag.co.nz tpms.co.nz.
- **Environmental benefits:** By using in-situ material and avoiding repeated aggregate haulage, PolyCom lowers emissions and road damage. The tighter surface also significantly cuts dust and sediment runoff tpms.co.nztpms.co.nz.
- **Practical deployment:** Implementation uses existing equipment and does not require specialised plants contractormag.co.nztpms.co.nz. After training, council crews can integrate PolyCom into normal maintenance schedules.

PolyCom stabilization is now part of our maintenance and strengthening program of our LV unsealed roads, particularly longer rural sections and access routes.

10. Customer Requests & Feedback

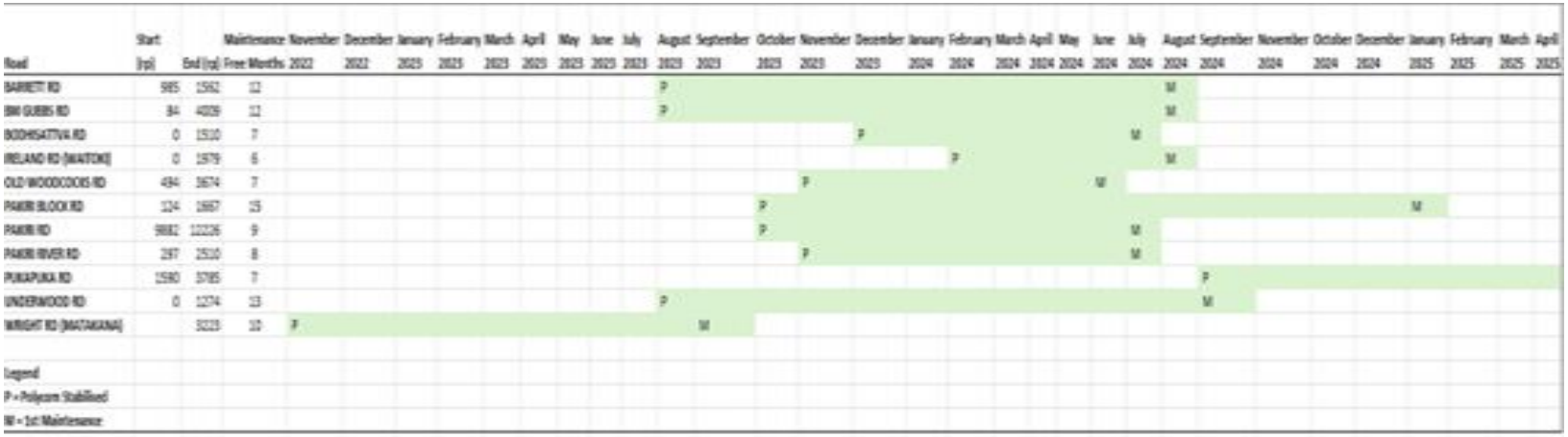


Specifics	2019	2020	2021	2022	2023	2024	Total
⊟ **Unsealed Road Surface**	**1725**	**935**	**1563**	**2576**	**2194**	**766**	**9759**
Rodney	1725	935	1563	2576	2194	766	**9759**
Total	**1725**	**935**	**1563**	**2576**	**2194**	**766**	**9759**

Maintenance Frequency (Stabilised Sites)

Case Study - Strengthening Sites (2022 to 2025)

Road	Start (RP)	End (RP)	Maintenance Free Months	Traffic Count Data
BARRETT RD	985	1562	12	106 ADT / 30% HV
BM GUBBS RD	84	4009	12	No ADT Data
BODHISATTVA RD	0	1510	7	No ADT Data
IRELAND RD (WAITOKI)	0	1979	6	200 ADT / 12% HV
OLD WOODCOCKS RD	494	3674	7	151 ADT / 16% HV
PAKIRI BLOCK RD	124	1667	15	97 ADT / 10% HV
PAKIRI RD	9882	12226	9	515 ADT / 16% HV
PAKIRI RIVER RD	297	2510	8	73 ADT / 21% HV
PUKAPUKA RD	1590	3785	7	136 ADT / 20% HV
UNDERWOOD RD	0	1274	13	203 ADT / 14.8% HV
WRIGHT RD (MATAKANA)		3223	10	165 ADT / 6% HV



10. Customer Feedback

From: Tara Harvey (AT) <Tara.Harvey@at.govt.nz>
Sent: Monday, 22 January 2024 3:24 pm
To: Mark Taylor <mark.taylor@downer.co.nz>; Christine Green (AT) <Christine.Green@at.govt.nz>
Cc: Henry Cheung (henry.cheung@downer.co.nz) <henry.cheung@downer.co.nz>; Bernard Pang (AT) <Bernard.Pang@at.govt.nz>
Subject: Compliment for works on Wilson Rd in South Head

Hi team,

As advised this morning, compliment received below for what I assume to be the Polycom added to this road last year.

Good to have some positive feedback come through. Please share with the crew who carried out the work.

What would you like to tell us? : A COMPLIMENT regarding Wilson Road, South Head, Helensville and the grading work carried out last year. The latest works undertaken have held up remarkably well, with pot-holes only reappearing at the beginning of Wilson Road where the tar-seal meets the metal. All work undertaken on Wilson Road in the last 10 years has deteriorated quickly after completion - usually within a matter of weeks and even quicker if rain has occurred. Perhaps new contractors were engaged? (as we noted a concrete-type material was included in places that has not been used previously) In any event, qudos and compliments for this work and the lack of pot-hole re-emerging. The concrete-type material was used in places that were notorious for re-emerging pot-holes, and none have been seen in these places to date. Very much appreciated by the residents - thank you :)
Maureen Burton

Tara Harvey | Customer Relationship Specialist – North
Road Asset Maintenance & Renewals| Integrated Networks
tara.harvey@at.govt.nz | www.at.govt.nz

Auckland Transport
An Auckland Council Organisation
Let's go there

10. Customer Feedback

From: Warwick Rhodes <warwick@rhodesforroads.co.nz>
Sent: Tuesday, April 30, 2024 11:19 AM
To: Peter Scott (AT) <Peter.Scott@at.govt.nz>
Cc: Bernard Pang (AT) <Bernard.Pang@at.govt.nz>
Subject: FW: Sealing of Anderson road , Thank you to AT & Downers

Hi Peter

As a resident of Anderson road , like to say a Big thank you to AT & Downers , Wow very exciting and pleasing to see the dust gone .
The Teams have made a good job of it followed by the sealing crew . also have very happy neighbours .
Bill has done a great job on the Grader , I saw the surface pre it been sealed and looked good .
And well done to Rupert , dealing with it , & having to put up with one difficult resident .

Regards Warwick & Katie Rhodes .

Warwick Rhodes | Managing Director

Rhodes for Roads
T 09 425 8454 | M 027 494 7439
14 Hudson Road, PO Box 476, Warkworth 0941, New Zealand
warwick@rhodesforroads.co.nz | www.rhodesforroads.co.nz

Auckland Rescue Helicopter Trust
Corporate Supporter

11. Appendices

Completed Sites (without sealing)

A). Fowler Access Rd, Puhoi - Strengthening

- RP0 to RP1066 (1,066km)
- Polycom stabilisation Cost ($56,497.09) 20mm Overlay/In situ Materials
- Traditional 150mm Overlay Cost ($110,056.77)
- Cost Savings - $53,559.68 **(49%)**

Money

Refresh | Filter | Bulk Change | Export | Add Estimate | Add Claim | Columns | Groups | Settings | Auto Resize Columns | Move | Actions

					Estimate			Claim		
	Status	Item	Item Description	Units	Quantity	Rate	Amount	Quantity	Rate	Amount
		3223	Supply, Spread & Co...	cubic ...				19.46	$105.89	$2,060.62
		3223	Supply, Spread & Co...	cubic ...	147.86	$105.89	$15,656.90	147.86	$105.89	$15,656.90
		3224	Supply, Spread & Co...	cubic ...	0	$108.65	$0.00	0	$108.65	$0.00
		3225	Unsealed road stabili...	cubic ...	959.4	$18.23	$17,489.86	959.4	$18.23	$17,489.86
		3226	Stabilisation Agent (...	litre	39	$545.89	$21,289.71	39	$545.89	$21,289.71
							$54,436.47			$56,497.09

Construction Photos

Completed Photos

11. Appendices

Austin Rd, Dairy Flat - Strengthening

- RP358 to RP3530 (3,172km)
- Polycom stabilisation Cost ($152,550.97) 20mm Overlay/In situ Materials
- Traditional 150mm Overlay Cost ($327,486.00)
- Cost Savings - $174,935.03 **(53%)**

Money

Refresh | Filter | Bulk Change | Export | Add Estimate | Add Claim | Columns | Groups | Settings | Auto Resize Columns | Move | Actions

					Estimate			Claim		
	Status	Item	Item Description	Units	Quantity	Rate	Amount	Quantity	Rate	Amount
		3226	Stabilisation Agent (...	litre	124	$545.89	$67,690.36	114	$545.89	$62,231.46
		3225	Unsealed road stabili...	cubic ...	3,092.7	$18.23	$56,379.92	2,854.8	$18.23	$52,043.00
		3224	Supply, Spread & Co...	cubic ...	123.85	$108.65	$13,456.30	94.93	$108.65	$10,314.14
		3223	Supply, Spread & Co...	cubic ...	348.92	$105.89	$36,947.14	264.07	$105.89	$27,962.37
							$174,473.72			$152,550.97

Construction Photos

Completed Photos

11. Appendices

PukaPuka Rd, Mahurangi - Strengthening

- RP1590 to RP3785 (2,195km)
- Polycom stabilisation Cost ($111,374.96) 20mm Overlay/In situ Materials
- Traditional 150mm Overlay Cost ($226,618.37)
- Cost Savings - $115,243.41 **(51%)**

Money

Refresh | Filter | Bulk Change | Export | Add Estimate | Add Claim | Columns | Groups | Settings | Auto Resize Columns | Move | Actions

					Estimate			Claim		
	Status	Item	Item Description	Units	Quantity	Rate	Amount	Quantity	Rate	Amount
		3226	Stabilisation Agent (...	litre	85.605	$545.89	$46,730.91	79	$545.89	$43,125.31
		3225	Unsealed road stabili...	cubic ...	2,140.12...	$18.23	$39,014.48	2,140.12...	$18.23	$39,014.48
		3223	Supply, Spread & Co...	cubic ...	241.45	$105.89	$25,567.14	276.09	$105.89	$29,235.17
		3224	Supply, Spread & Co...	cubic ...	85.7023	$108.65	$9,311.55	0	$108.65	$0.00
							$120,624.08			$111,374.96

Construction Photos

Complete Photos

11. Appendices

FWD Results (Pavement Improvement):
Anderson Rd, Matakana
Pre-Construction Test

GEOSOLVE

FWD Pavement Structural Evaluation
PROJECT: Anderson Rd (matakana) 0.238 - 0.930 (10023)
SUBTITLE: (10023) End Of Seal to Edge Of Seal (-27 M)

Job Number: 240182
Test Date: 4/04/2024
Overlay: Granular (mm)

Ave Surf Temp (°C): 18°C
WMAPT (°C): 23.00
Isotropic Modulus: 330 MPa

Layering Data Source: Analyst Inferred
Traffic Data Source: RAMM C/Way Table
Distress Data Source: Operator Severity

Pavement Model

Chainage From (km)	Chainage To (km)	Surfacing Type	Surfacing Thick. (mm)	Layer Types / Thicknesses 1	1 (mm)	2	2 (mm)	3	3 (mm)	4	4 (mm)	Traffic Parameters AADT	ESA$_0$	Grow. (%)	Design Life (yrs)	Design Traffic (ESA)
0.245	0.950	US	0	MB	100	UB	100	UB	100			268	2.E+03	3.0	25	8.73E+04

Structural Evaluation (ELMOD) & Sub-Sectioning of Uniform Treatment Intervals

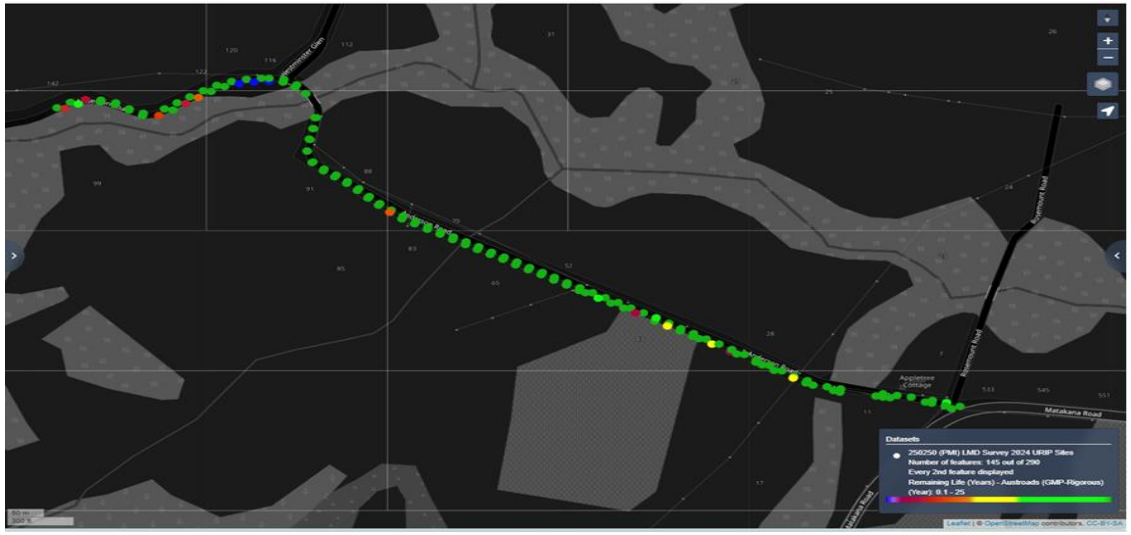
Chainage From (km)	Chainage To (km)	Layer 1 Mod. 50% (MPa)	Layer 1 Mod. 10% (MPa)	Subgrade Mod. 50% (MPa)	Subgrade Mod. 10% (MPa)	Subgrade CBR 50%	Subgrade CBR 10%	Central Defl. 50% (mm)	Central Defl. 90% (mm)	Curv. Func. 50% (mm)	Curv. Func. 90% (mm)	Life 50% (yrs)	Life 10% (yrs)	SNP 50%	Critical Layer
0.245	0.3125	1700	832	78	60	6.4	5.9	0.746	1.262	0.204	0.46	99	35	310%	5
0.3125	0.3625	503	243	46	41	5	4.4	1.7	1.769	0.704	0.805	7.1	6.7	210%	5
0.3625	0.7875	1140	427	80	51	8	3.9	0.856	1.439	0.3	0.366	84	15	290%	5
0.788	0.950	263	163	72	52	7.5	5.8	1.215	2.020	0.491	0.875	34	3.5	2.5	5

Recommendations for Rehabilitation
Strain Criteria: Austroads GMP-Rigorous (All Layers)

#	Chainage From (km)	Chainage To (km)	Length (km)	CS Overlay (mm)	Minimum Reconstruction or Widening Depth (mm)
1	0.245	0.313	0.068	35	640
2	0.313	0.363	0.050	68	640
3	0.363	0.788	0.425	50	640
4	0.788	0.950	0.163	84	640

Notes:
1. The diameter of the FWD loading plate is 300 mm.
2. Central deflection is the deflection measured at the centre of the loading plate (ie. d0).
3. Curvature is the difference between the central deflection and the deflection measured at a 200mm offset from the centre of the load plate (ie. d0 - d200).
4. Central Deflection and Curvature have been standardised to a 40 kN load, and the reported values have not been corrected for temperature.
5. Resilient moduli are isotropic, and any thick AC moduli have been temperature corrected in accordance with Austroads AGPT05-19 Eqn 15.
6. Overlay thickness is determined as 90 percentile strengthening for each section to accommodate the design traffic, but greater thicknesses may be required for shape correction or to meet minimum basecourse thickness and subbase drainage requirements.

Post Construction Test - Improved Remaining Life
 # Green dots indicate a remaining life of 25years+



11. Appendices

Anderson Road
RP238 to RP930 **(930m)**
Total Estima $ 174,295.49

ENGINEER'S ESTIMATE
Anderson Rd RP238-RP930
Unsealed Upgrade Pavement Strenghtening, Chipsealing and Drainage improvements

Date: April 2024
Manager: Rupert Bronkhorst

Site Measurements	
Site RP Start:	238
Site RP End :	930
Treatment Depth (150mm)	0.14
Site Length (m):	692
Average Width (m):	7.1
Total treatment Area (m2):	4890
Total treatment Area (m3):	706

ITEM	SCHEDULE	DESCRIPTION	UNIT	QYT	RATE	AMOUNT	
A		EARTHWORKS					
A1	3221	Cut to waste	m3	49	$ 68.58	$ 3,360.42	
A2	5407	Supply & Place GAP 100 Hardfill	m3	6.73	$ 92.21	$ 620.57	
							$ 3,980.99
B		PAVEMENT CONSTRUCTION & STABILIZATION					
B1	3223	Unsealed - S&S running course AP20	m3	43	$ 104.49	$ 4,517.10	
B2	3223	Unsealed - GAP40 **(Sub Base Improvement)**	m3	589.8	$ 101.84	$ 60,065.23	
B3	3222	Unsealed - GAP65 **(Sub Base Improvement**	m3	6.7	$ 98.96	$ 663.03	
B4	3226	Stabilisation Agent (Polycom or equivalent)	ltrs	32	$ 525.00	$ 16,800.00	
B5	3225	Unsealed Road Stabilization (Excluding materials	m3	706	$ 17.53	$ 12,371.10	
							$ 94,416.46
C		DRAINAGE WORKS					
C1	7225	Excavate, Reshape & Clear Surface Water Chann	m	500	$ 11.28	$ 5,640.00	
C2	20205	Vibrating Plate Compactor	Hour	10	$ 48.58	$ 485.80	
							$ 6,125.80
		PAVEMENT (CHIPSEAL)					
D1	2285	Supply & Place Two Coat Chipseal (>100m2)	m2	4890	$ 9.56	$46,748.40	$ 46,748.40
D2	2286	E/O For Items 2283 - 2285 For Emulsion Seal	m2	4890	$ 0.21	$1,026.90	$ 1,026.90
							$ 47,775.30

ITEM		DESCRIPTION	AMOUNT
A		EARTHWORKS	$ 3,980.99
B		PAVEMENT CONSTRUCTION & STABILIZATION	$ 94,416.46
C		DRAINAGE WORKS	$ 6,125.80
D		PAVEMENT (CHIPSEAL)	$ 47,775.30
		Sub Total	$ 152,298.56
		Cost Flux (3%)	$ 4,568.96
		11.1%	$ 17,427.98
		Construction Total (Excl. GST)	$ 174,295.49

11. Appendices

FWD Results (Pavement Improvement):
Omaha Valley Rd
Pre- Construction Test

GEOSOLVE

FWD Pavement Structural Evaluation
PROJECT: Omaha Valley Rd 2.148 - 3.159 (10704)
SUBTITLE: (10704) End Of Seal (-13 M) to Cattle Stop (-25 M)

Job Number: 240182
Test Date: 4/04/2024
Overlay: Granular (mm)

Ave Surf Temp (°C): 17°C
WMAPT (°C): 23.00
Isotropic Modulus: 330 MPa

Layering Data Source: Analyst Inferred
Traffic Data Source: RAMM C/Way Table
Distress Data Source: Defaults Only

Pavement Model

Chainage From (km)	Chainage To (km)	Surfacing Type	Surfacing Thick. (mm)	Layer Types / Thicknesses 1	1 (mm)	2	2 (mm)	3	3 (mm)	4	4 (mm)	Traffic Parameters AADT	ESA$_D$	Grow. (%)	Design Life (yrs)	Design Traffic (ESA)
2.150	2.161	US	0	MB	100	UB	150	UB	150			336	1.E+04	3.0	25	4.57E+05
2.161	3.150	US	0	MB	100	UB	100	UB	100			136	1.E+04	3.0	25	5.45E+05

Structural Evaluation (ELMOD) & Sub-Sectioning of Uniform Treatment Intervals

Chainage From (km)	Chainage To (km)	Layer 1 Mod. 50% (MPa)	Layer 1 Mod. 10% (MPa)	Subgrade Mod. 50% (MPa)	Subgrade Mod. 10% (MPa)	Subgrade CBR 50%	Subgrade CBR 10%	Central Defl. 50% (mm)	Central Defl. 90% (mm)	Curv. Func. 50% (mm)	Curv. Func. 90% (mm)	Life 50% (yrs)	Life 10% (yrs)	SNP 50%	Critical Layer
2.150	2.161	58373	58373	146	146	17.5	17.5	0.189	0.189	0.017	0.017	99	99	5.1	5
2.161	2.613	3152	1436	100	65	11.6	7.9	0.586	1.008	0.153	0.278	95	18	3.8	5
2.613	2.813	1814	353	40	30	4.8	3.5	1.296	2.802	0.310	0.928	3.8	0.016	2.4	5
2.813	3.150	1690	552	181	130	23.4	16.3	0.441	0.653	0.138	0.258	99	83	4.1	5

Recommendations for Rehabilitation
Strain Criteria: Austroads GMP-Rigorous (All Layers)

#	Chainage From (km)	Chainage To (km)	Length (km)	CS Overlay (mm)	Minimum Reconstruction or Widening Depth (mm)
1	2.150	2.161	0.011	0	790
2	2.161	2.613	0.452	50	810
3	2.613	2.813	0.200	206	810
4	2.813	3.150	0.338	0	810

Notes:
1. The diameter of the FWD loading plate is 300 mm.
2. Central deflection is the deflection measured at the centre of the loading plate (ie. d0).
3. Curvature is the difference between the central deflection and the deflection measured at a 200mm offset from the centre of the load plate (ie. d0 - d200).
4. Central Deflection and Curvature have been standardised to a 40 kN load, and the reported values have not been corrected for temperature.
5. Resilient moduli are isotropic, and any thick AC moduli have been temperature corrected in accordance with Austroads AGPT05-19 Eqn 15.
6. Overlay thickness is determined as 90 percentile strengthening for each section to accommodate the design traffic, but greater thicknesses may be required for shape correction or to meet minimum basecourse thickness and subbase drainage requirements.

Post Construction Test - Improved Remaining Life
 # Green dots indicate a remaining life of 25years+

11. Appendices

Omaha Valley Road
RP2148 to RP3159 (1011m)
Total Estimate $ 218,849.39

ENGINEER'S ESTIMATE
Omaha Valley Rd RP2148 to RP31
Unsealed Upgrade Pavement Strenghtening, Chipsealing and Drainage improvements

Site Measurements	
Site RP Start:	2148
Site RP End :	3159
Treatment Depth (150mm)	0.17
Site Length (m):	1011
Average Width (m):	6.5
Total treatment Area (m2):	6521
Total treatment Area (m3):	1102

Date: May 2024
Manager: Rupert Bronkhorst

ITEM	SCHEDULE	DESCRIPTION	UNIT	QYT	RATE	AMOUNT	
A		EARTHWORKS					
A1	5301	Cut to waste	m3	199.5	$ 52.49	$ 10,471.76	
A2	5302	E/O for Item 5301 for Disposal to Managed Landfill	m3	199.5	$ 40.53	$ 8,085.74	
A3	5407	Supply & Place GAP 100 Hardfill	m3	40.08	$ 92.21	$ 3,695.78	
							$ 22,253.27
B		PAVEMENT CONSTRUCTION & STABILIZATION					
B1	3223	Unsealed - S&S running course AP20	m3	12	$ 104.49	$ 1,203.72	
B2	3223	Unsealed - GAP40 (Sub Base Improvement)	m3	406.3	$ 101.84	$ 41,374.54	
B3	3226	Stabilisation Agent (Polycom or equivalent)	ltrs	54	$ 525.00	$ 28,350.00	
B4	3225	Unsealed Road Stabilization (Excluding materials	m3	1137	$ 17.53	$ 19,938.27	
							$ 90,866.53
		PAVEMENT (CHIPSEAL) & Miscellaneous					
C1	2285	Supply & Place Two Coat Chipseal (>100m2)	m2	6491	$ 9.56	$62,053.96	$ 62,053.96
C2	2286	E/O For Items 2283 - 2285 For Emulsion Seal	m2	6491	$ 0.21	$1,363.11	$ 1,363.11
C3	9247	Supply & Install Edge or Culvert Marker Post	each	4	$ 22.74	$90.96	$ 90.96
C4	4401	Falling Weight Deflectometer (FWD) Testing	Km	1	$ 1,371.88	$1,386.97	$ 1,386.97
C5	20301	Materials Direct Cost (Sight Rails)	PS	1	$ 13,070.95	$13,214.73	$ 13,214.73
							$ 78,109.73

ITEM		DESCRIPTION	AMOUNT
A		EARTHWORKS	$ 22,253.27
B		PAVEMENT CONSTRUCTION & STABILIZATION	$ 90,866.53
C		PAVEMENT (CHIPSEAL) & Miscellaneous	$ 78,109.73

Sub Total	$ 191,229.53
Cost Flux (3%)	$ 5,736.89
11.1%	$ 21,882.97
Construction Total (Excl. GST)	$ 218,849.39

Completed Sites (with sealing) – 24/25 FY

A.) Ararimu Valley Rd\

Pre-Construction Test

GEOSOLVE

FWD Pavement Structural Evaluation
PROJECT: Ararimu Valley Rd 7.060 - 10.122 R1 (10028)
SUBTITLE: (10028) End Of Seal to Start Of Seal

Job Number: 240182
Test Date: 12/08/2024
Overlay: Granular (mm)

Ave Surf Temp (°C): 10°C
WMAPT (°C): 23.00
Isotropic Modulus: 330 MPa

Layering Data Source: Analyst Inferred
Traffic Data Source: RAMM C/Way Table
Distress Data Source: Defaults Only

Recommendations for Rehabilitation

Strain Criteria: Austroads GMP-Rigorous (All Layers)

#	Chainage From (km)	Chainage To (km)	Length (km)	CS Overlay (mm)	Minimum Reconstruction or Widening Depth (mm)
1	7.035	7.060	0.025	50	690
2	7.060	7.850	0.790	155	690
3	7.850	8.100	0.250	0	690
4	8.100	8.400	0.300	140	690
5	8.400	8.850	0.450	0	690
6	8.850	9.400	0.550	220	690
7	9.400	9.600	0.200	271	690
8	9.600	10.000	0.400	213	690
9	10.000	10.100	0.100	125	690
10	10.100	10.302	0.202	0	690
11	10.302	10.325	0.023	0	620

Notes: 1. The diameter of the FWD loading plate is 300 mm.
2. Central deflection is the deflection measured at the centre of the loading plate (ie. d0).
3. Curvature is the difference between the central deflection and the deflection measured at a 200mm offset from the centre of the load plate (ie. d0 - d200).
4. Central Deflection and Curvature have been standardised to a 40 kN load, and the reported values have not been corrected for temperature.
5. Resilient moduli are isotropic, and any thick AC moduli have been temperature corrected in accordance with Austroads AGPT05-19 Eqn 15.
6. Overlay thickness is determined as 90 percentile strengthening for each section to accommodate the design traffic, but greater thicknesses may be required for shape correction or to meet minimum basecourse thickness and subbase drainage requirements.

Recommendations for Rehabilitation

Strain Criteria: Austroads GMP-Rigorous (All Layers)

#	Chainage From (km)	Chainage To (km)	Length (km)	CS Overlay (mm)	Minimum Reconstruction or Widening Depth (mm)
1	7.000	7.060	0.060	126	690
2	7.060	7.225	0.165	146	690
3	7.225	7.525	0.300	0	690
4	7.525	7.825	0.300	95	690
5	7.825	8.025	0.200	0	690
6	8.025	9.025	1.000	135	690
7	9.025	9.775	0.750	224	690
8	9.775	10.075	0.300	125	690
9	10.075	10.225	0.150	0	690
10	10.225	10.295	0.070	50	690

Notes: 1. The diameter of the FWD loading plate is 300 mm.
2. Central deflection is the deflection measured at the centre of the loading plate (ie. d0).
3. Curvature is the difference between the central deflection and the deflection measured at a 200mm offset from the centre of the load plate (ie. d0 - d200).
4. Central Deflection and Curvature have been standardised to a 40 kN load, and the reported values have not been corrected for temperature.
5. Resilient moduli are isotropic, and any thick AC moduli have been temperature corrected in accordance with Austroads AGPT05-19 Eqn 15.
6. Overlay thickness is determined as 90 percentile strengthening for each section to accommodate the design traffic, but greater thicknesses may be required for shape correction or to meet minimum basecourse thickness and subbase drainage requirements.

11. Appendices

Post Construction Test - Improved Remaining Life

 # Green dots indicate a remaining life of 25years+

Overlay Pavement Design (Ararimu Valley Rd

GEOSOLVE

FWD Pavement Structural Evaluation
PROJECT: Ararimu Valley Rd 7.060 - 10.122 L1 (10028)
SUBTITLE: (10028) End Of Seal to Start Of Seal

Start RP: 6999 — End of seal — Width: 6.5

RR #	Treatment	Surface Treatment Length (m)	Width (m)	Depth (mm)	Lane	Start RP	End RP	Area (sqm)	Volume (m3)	Density (t/m3)	Tonnage (tonne)
1	Stabilisation (unsealed)	60.0	3.8	126	Left	7000	7060	225.0	28.35	1.50	42.53
3	Stabilisation (unsealed)	165.0	3.8	146	Left	7060	7225	627.0	91.54	1.50	137.31
5	Stabilisation (unsealed)	300.0	3.8	0	Left	7225	7525	1140.0	0.00	1.50	0.00
7	Stabilisation (unsealed)	300.0	3.8	95	Left	7525	7825	1140.0	108.30	1.50	162.45
9	Stabilisation (unsealed)	200.0	3.8	0	Left	7825	8025	760.0	0.00	1.50	0.00
11	Stabilisation (unsealed)	1000.0	3.8	135	Left	8025	9025	3800.0	513.00	1.50	769.50
13	Stabilisation (unsealed)	750.0	3.8	224	Left	9025	9775	2850.0	638.40	1.50	957.60
15	Stabilisation (unsealed)	300.0	3.8	125	Left	9775	10075	1140.0	142.50	1.50	213.75
17	Stabilisation (unsealed)	150.0	3.8	0	Left	10075	10225	570.0	0.00	1.50	0.00
19	Stabilisation (unsealed)	70.0	3.8	50	Left	10225	10295	266.0	13.30	1.50	19.95

GEOSOLVE

FWD Pavement Structural Evaluation
PROJECT: Ararimu Valley Rd 7.060 - 10.122 R1 (10028)
SUBTITLE: (10028) End Of Seal to Start Of Seal

Start RP: 6999 — End of seal — Width: 6.5

RR #	Treatment	Surface Treatment Length (m)	Width (m)	Depth (mm)	Lane	Start RP	End RP	Area (sqm)	Volume (m3)	Density (t/m3)	Tonnage (tonne)
2	Stabilisation (unsealed)	25.0	3.8	50	Right	7035	7060	95.0	4.75	1.50	7.13
4	Stabilisation (unsealed)	790.0	3.8	155	Right	7060	7850	3002.0	465.31	1.50	697.97
6	Stabilisation (unsealed)	250.0	3.8	0	Right	7850	8100	950.0	0.00	1.50	0.00
8	Stabilisation (unsealed)	300.0	3.8	140	Right	8100	8400	1140.0	159.60	1.50	239.40
10	Stabilisation (unsealed)	450.0	3.8	0	Right	8400	8850	1710.0	0.00	1.50	0.00
12	Stabilisation (unsealed)	550.0	3.8	220	Right	8850	9400	2090.0	459.80	1.50	689.70
14	Stabilisation (unsealed)	200.0	3.8	271	Right	9400	9600	760.0	205.96	1.50	308.94
16	Stabilisation (unsealed)	400.0	3.8	213	Right	9600	10000	1520.0	323.76	1.50	485.64
18	Stabilisation (unsealed)	100.0	3.8	125	Right	10000	10100	380.0	47.50	1.50	71.25
20	Stabilisation (unsealed)	225.0	3.8	0	Right	10100	10325	855.0	0.00	1.50	0.00

B.) Fordyce Rd

Pre- Construction Test

GEOSOLVE

FWD Pavement Structural Evaluation
PROJECT: Fordyce Rd (parakai) 2.861 - 5.365 (10309)
SUBTITLE: (10309) End Of Seal to End Of Road

Job Number: 240182
Test Date: 12/08/2024
Overlay: Granular (mm)

Ave Surf Temp (°C): 11°C
WMAPT (°C): 23.00
Isotropic Modulus: 330 MPa

Layering Data Source: Analyst Inferred
Traffic Data Source: RAMM C/Way Table
Distress Data Source: Defaults Only

Pavement Model

Chainage From (km)	Chainage To (km)	Surfacing Type	Surfacing Thick. (mm)	Layer Types / Thicknesses 1	1 (mm)	2	2 (mm)	3	3 (mm)	4	4 (mm)	Traffic Parameters AADT	ESA_0	Grow. (%)	Design Life (yrs)	Design Traffic (ESA)
2.875	5.350	US	0	UB	125	UB	100					243	1.E+03	3.0	25	4.20E+04

Structural Evaluation (ELMOD) & Sub-Sectioning of Uniform Treatment Intervals

Chainage From (km)	Chainage To (km)	Layer 1 Mod. 50% (MPa)	Layer 1 Mod. 10% (MPa)	Subgrade Mod. 50% (MPa)	Subgrade Mod. 10% (MPa)	Subgrade CBR 50%	Subgrade CBR 10%	Central Defl. 50% (mm)	Central Defl. 90% (mm)	Curv. Func. 50% (mm)	Curv. Func. 90% (mm)	Life 50% (yrs)	Life 10% (yrs)	SNP 50%	Critical Layer
2.875	3.063	444	195	98	66	15.4	7.0	1.017	1.480	0.428	0.849	45	25	2.8	5
3.063	3.113	539	345	46	37	6.1	4.7	1.645	1.712	0.589	0.614	4.1	3.1	2.0	5
3.113	3.188	279	227	100	99	15.1	14.9	1.077	1.150	0.619	0.648	32	25	2.8	5
3.188	3.288	186	106	44	41	5.4	4.8	2.055	2.360	1.004	1.236	0.63	0.21	1.7	5
3.288	3.488	400	137	88	60	13.6	9.0	1.214	1.669	0.563	0.782	30	9.1	2.6	5
3.488	3.588	258	222	49	42	6.4	4.9	1.722	2.160	0.810	0.934	3.6	0.39	2.0	5
3.588	3.963	331	140	108	75	15.7	10.3	1.079	1.371	0.586	0.746	35	15	2.8	5
3.963	4.063	338	170	64	54	11.1	9.0	1.381	1.531	0.666	0.738	13	6.8	2.5	5
4.063	4.163	823	348	101	80	17.0	14.3	0.791	0.891	0.351	0.490	85	62	3.2	5
4.163	4.263	114	89	48	26	7.0	3.2	2.421	4.390	1.316	1.946	0.51	0.67	1.8	5
4.263	4.438	305	166	123	84	19.1	13.9	0.925	1.116	0.549	0.628	56	31	2.9	5
4.438	4.588	608	329	48	36	7.2	4.4	1.324	1.776	0.440	0.644	15	4.9	2.4	5
4.588	4.838	338	190	38	21	6.4	1.7	1.678	3.539	0.841	1.223	3.2	0.81	2.2	5
4.838	4.913	858	412	80	62	8.9	8.2	0.998	1.138	0.415	0.530	40	29	2.7	5
4.913	5.350	370	114	38	21	5.1	2.2	1.913	3.791	0.810	1.655	2.4	0.84	1.9	5

Recommendations for Rehabilitation

Strain Criteria: Austroads GMP-Rigorous (All Layers)

#	Chainage From (km)	Chainage To (km)	Length (km)	CS Overlay (mm)	Minimum Reconstruction or Widening Depth (mm)
1	2.875	3.063	0.188	27	600
2	3.063	3.113	0.050	68	600
3	3.113	3.188	0.075	0	600
4	3.188	3.288	0.100	114	600
5	3.288	3.488	0.200	56	600
6	3.488	3.588	0.100	98	600
7	3.588	3.963	0.375	30	600
8	3.963	4.063	0.100	50	600
9	4.063	4.163	0.100	0	600
10	4.163	4.263	0.100	194	600
11	4.263	4.438	0.175	0	600
12	4.438	4.588	0.150	75	600
13	4.588	4.838	0.250	173	600
14	4.838	4.913	0.075	0	600
15	4.913	5.350	0.438	183	600

Notes:
1. The diameter of the FWD loading plate is 300 mm.
2. Central deflection is the deflection measured at the centre of the loading plate (ie. d0).
3. Curvature is the difference between the central deflection and the deflection measured at a 200mm offset from the centre of the load plate (ie. d0 - d200).
4. Central Deflection and Curvature have been standardised to a 40 kN load, and the reported values have not been corrected for temperature.
5. Resilient moduli are isotropic, and any thick AC moduli have been temperature corrected in accordance with Austroads AGPT05-19 Eqn 15.
6. Overlay thickness is determined as 90 percentile strengthening for each section to accommodate the design traffic, but greater thicknesses may be required for shape correction or to meet minimum basecourse thickness and subbase drainage requirements.

Overlay Pavement Design (Fordyce Rd)

GEOSOLVE

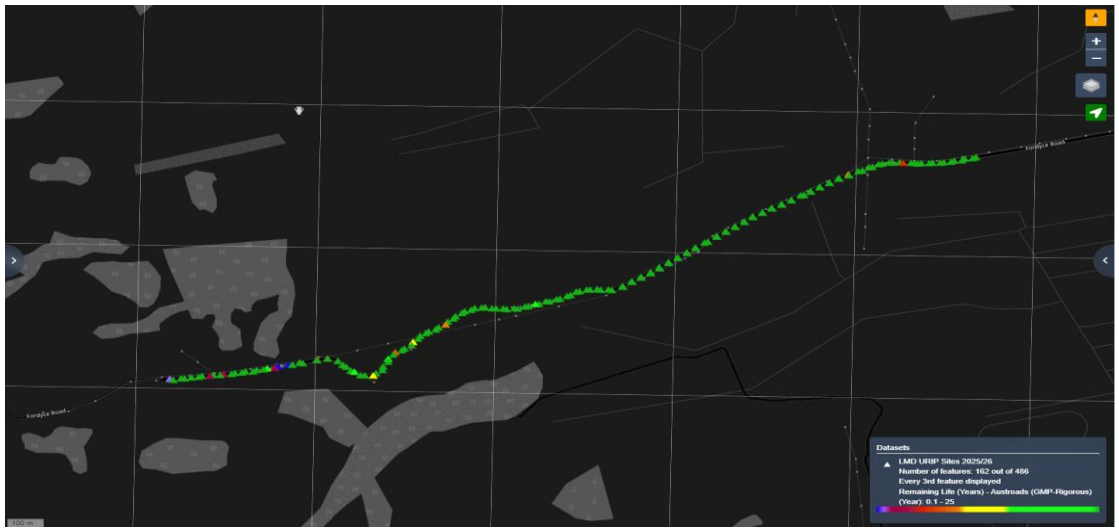
FWD Pavement Structural Evaluation
PROJECT: Fordyce Rd (parakai) 2.861 - 5.365 (10309)
SUBTITLE: (10309) End Of Seal to End Of Road

Start RP: 2874 | End of seal | Width: 6.5 | Start od bridge | End RP: 5352

Surface Treatment

RR #	Treatment	Length (m)	Width (m)	Depth (mm)	Lane	Start RP	End RP	Area (sqm)	Volume (m3)	Density (t/m3)	Tonnage (tonne)	Joint Seal Done	Joint Seal (m)	Dispatch ID
1	Stabilisation (unsealed	188.0	6.5	27	Full Width	2875	3063	1222.0	32.99	1.50	49.49			
2	Stabilisation (unsealed	50.0	6.5	68	Full Width	3063	3113	325.0	22.10	1.50	33.15			
3	Stabilisation (unsealed	75.0	6.5	0	Full Width	3113	3188	487.5	0.00	1.50	0.00			
4	Stabilisation (unsealed	100.0	6.5	114	Full Width	3188	3288	650.0	74.10	1.50	111.15			
5	Stabilisation (unsealed	200.0	6.5	56	Full Width	3288	3488	1300.0	72.80	1.50	109.20			
6	Stabilisation (unsealed	100.0	6.5	98	Full Width	3488	3588	650.0	63.70	1.50	95.55			
7	Stabilisation (unsealed	375.0	6.5	30	Full Width	3588	3963	2437.5	73.13	1.50	109.69			
8	Stabilisation (unsealed	100.0	6.5	50	Full Width	3963	4063	650.0	32.50	1.50	48.75			
9	Stabilisation (unsealed	100.0	6.5	0	Full Width	4063	4163	650.0	0.00	1.50	0.00			
10	Stabilisation (unsealed	100.0	6.5	194	Full Width	4163	4263	650.0	126.10	1.50	189.15			
11	Stabilisation (unsealed	175.0	6.5	0	Full Width	4263	4438	1137.5	0.00	1.50	0.00			
12	Stabilisation (unsealed	150.0	6.5	75	Full Width	4438	4588	975.0	73.13	1.50	109.69			
13	Stabilisation (unsealed	250.0	6.5	173	Full Width	4588	4838	1625.0	281.13	1.50	421.69			
14	Stabilisation (unsealed	75.0	6.5	0	Full Width	4838	4913	487.5	0.00	1.50	0.00			
15	Stabilisation (unsealed	438.0	6.5	183	Full Width	4913	5351	2847.0	521.00	1.50	781.50			

Post Construction Test - Improved Remaining Life
 # Green dots indicate a remaining life of 25years+



11. Appendices

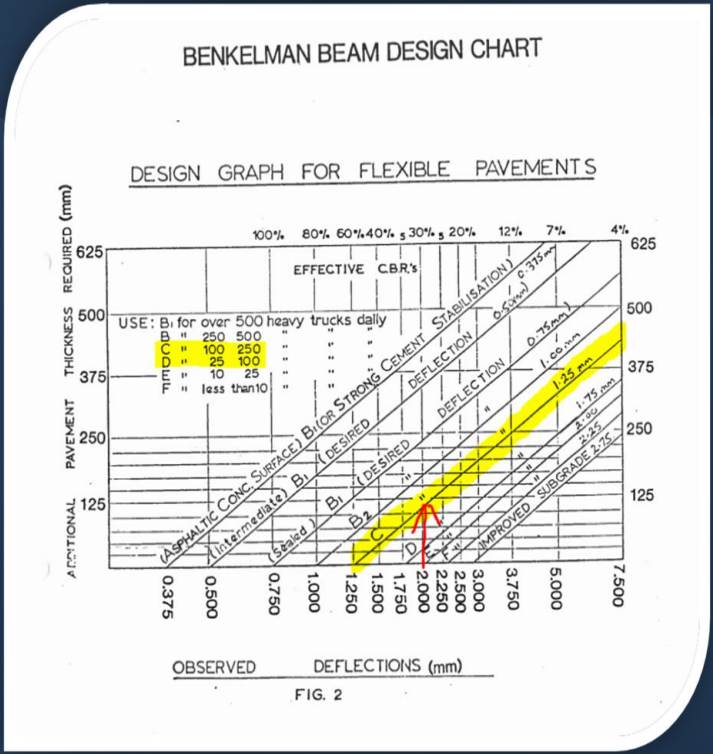
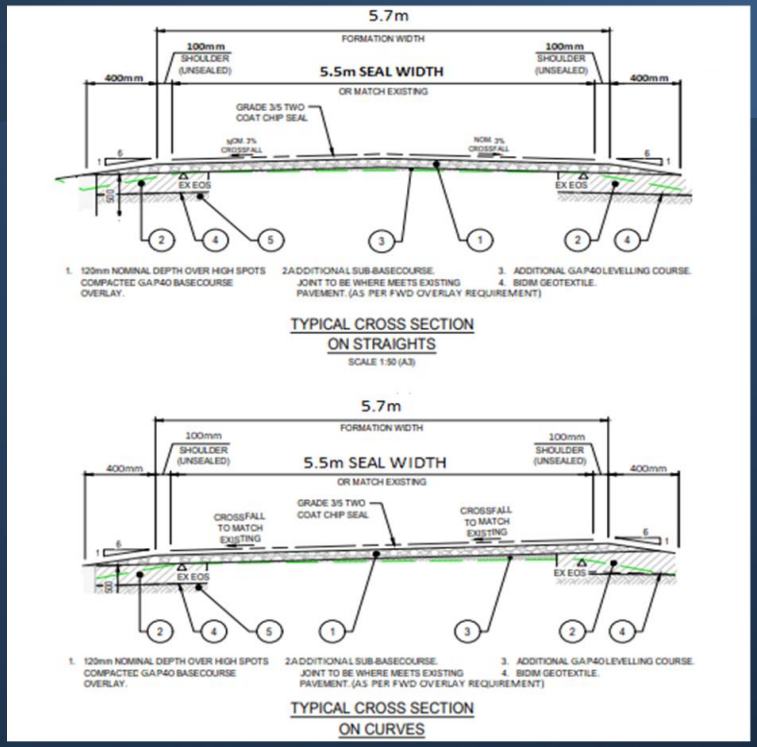


FIG. 2

Typical Pavement Design



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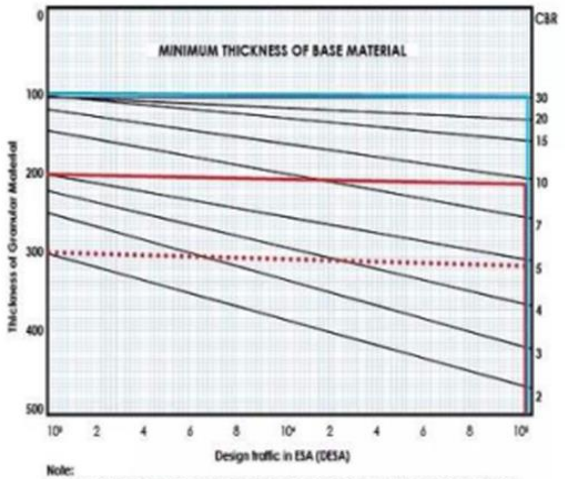
Subgrade Stabilisation

PolyCom Stabilising Aid introduces water resistance, improved workability and increased strength, delivering a stronger, more resilient and environmentally sustainable platform for your project. Strengthened sub-grades deliver huge cost advantages by allowing more economic pavement designs and drainage options. Sub-grade capping substantially reduces, and can even eliminate, re-work from weather or traffic damage in cut to fill operations, again reducing project costs.

Adopting a PolyCom Stabilisation treatment with subgrade formation will increase the pavement Subgrade CBR which can be adopted for a rationalised pavement design. The ARRB mechanistic pavement design table for standard pavements suggest with a subgrade CBR of 9 a pavement thickness of minimum 200mm is required. The blue line indicates the PolyCom treated subgrade with an adopted CBR of 30 can adopt a minimum 100mm pavement. A minimum 50% material saving.



Note:
1. Appropriate local conditions, environment and drainage issues must be considered in using these design curves.
2. Thin asphalt surfacings may be included in total granular thickness. However, the minimum, thickness of the granular base is 100mm.

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Polycom Stabilisation Process

Equipment Required:

- Modern well-maintained Grader and "full set" of rear mounted scarifies capable of ripping 200mm depth. I.e., Cat grader 12M size or bigger.
- 10,000 L water cart with fan sprays.
- 1 x 14-16 tone PTR roller.
- Steel vibrating roller 10-12 tone, single or double drum.

- Scarify with Grader in 500m sectional road lengths to the required depth.
- Apply moisture to just under OMC (Optimum Moisture content) with water cart if needed. This will be advised by our TPMS representatives when on site.
- Once confirmed, a TPMS representative will spread the PolyCom evenly to total area using our applicator unit. (This is completed as part of the supply price – However machinery operators when fully competent can do this themselves)
- Re-scarify the specified area once again with the Grader. Once this is completed, please wait approx. fifteen minutes for the PolyCom to react.
- Then commence cross-blending of material using the grader to form a homogenous mixture across the surface pavement.
- Once this is completed, TPMS Staff will advise if further moisture is needed, to maintain the OMC as required. Compaction with the PTR can commence at this stage. Use the Steel roller in addition, particularly if there are large aggregates showing on the surface.
- Continue to Grade to required cross fall levels. Compact to maximum using the specified rollers.
- The contractor should include all other equipment deemed necessary to complete to job.
- Each site is accessed and the above may vary slightly to meet site conditions.

Thank you Questions