



# Pavement preservation + life extension

EnviroShield is a high-performance surface treatment designed to extend the life of ageing asphalt and chip seal surfaces that are beginning to fret and ravel. Over time, bituminous surfaces oxidise due to heat, sunlight, and oxygen. EnviroShield is a low-viscosity emulsion spray that replenishes aged and embrittled binder at the surface. The low viscosity of EnviroShield enables the product to fill the voids and microcracks of the aged seal, re-establishing waterproofing, while a specially formulated low-penetration pre-aged binder gives the treatment superior oxidation resistance. The result is a low-tack finish, offering a smoother ride with similar aesthetics to freshly laid asphalt (depending on the texture of the surface its applied to).

Pavement preservation sealing is suitable where the pavement is structurally sound; however, the seal is aged, oxidised and embrittled, posing a risk of chip loss, ravelling and microcracking. If left untreated, the surface will continue to deteriorate, developing significant pavement distress leading to increased maintenance costs.

9 December 2025

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# A smarter way to preserve pavement

Smooth, quiet, + aesthetically pleasing.





## 1. Overview

EnviroShield is a pavement preservation seal designed to extend the life of an aged surface by addressing oxidation, texture loss, waterproofing and embrittlement. 195 roads have been sealed with EnviroShield since 2020. This report explains the science behind why EnviroShield works and analyses the performance of treated sites to date. Performance will be assessed in 3 key areas:

- Skid resistance
- Macrotexture
- Faults

## 2. The science behind EnviroShield

Low-volume roads often fail due to aging. Over time, heat, sunlight, and air oxidises the bitumen, altering its properties, making the surface susceptible to faults. Oxidation leads to:

- embrittlement
- reduced cohesion (increases risk of material loss)
- loss of viscoelasticity
- increased modulus (increases risk of brittle failure)

The performance and durability of asphalt surfaces depend on the ratio of bitumen to aggregate. Bitumen provides cohesion and flexibility, while aggregate provides strength. When bitumen oxidises, it becomes brittle and loses cohesion, reducing the surface's ability to retain aggregate and resist cracking under load.

In most cases, the underlying pavement structure remains sound. However, surface deterioration leads to material loss, compromised waterproofing, and eventually pavement failure. To restore aged asphalt, we must prevent material loss, replace lost bitumen, and ideally provide an oxidation-resistant film to slow future ageing.

EnviroShield is a light application, low-viscosity emulsion applied with a skid-resistant sand that locks up the surface of the road and re-establishes cohesion and waterproofing. The bitumen in EnviroShield is a low penetration binder that has undergone controlled industrial oxidation and hardening. By pre-ageing the bitumen (simulating several years of ageing), the binder becomes highly resistant to further oxidation once applied to the road, significantly extending surface life.

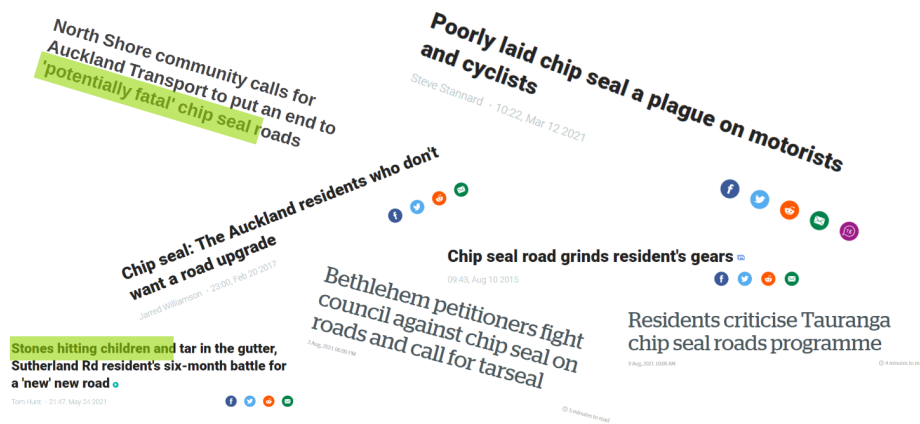
To validate EnviroShield's performance, we compared it against a Gilsonite blend, another common pavement preservation binder. EnviroShield demonstrated nearly half the percentage increase in modulus after ageing compared to the Gilsonite blend. This lower percentage change indicates superior resistance to ageing and better long-term stability.

**Comparison of GSB and EnviroShield Durability**

Property	GSB	EnviroShield
Penetration (mm)	48	20
% change in modulus	+82%	+48%

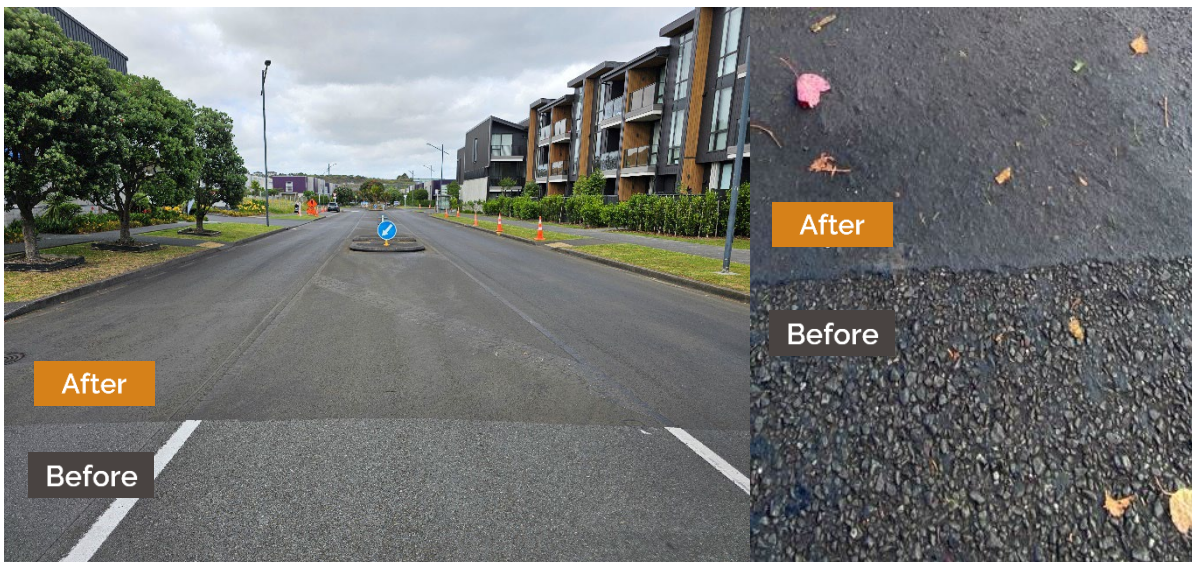
### 3. Chip seal outrage!

The traditional method of treating aged asphalt surfaces is to chip seal. While cost-effective compared to re-asphalting, it is often at the expense of the public who use the road day-to-day. Residents prefer a smooth uniform surface for their residential roads. A search of "chip seal" returns many examples of public outcry on the use of chip seals in a residential setting:



Despite its unpopularity, chip sealing does provide tangible benefits. It extends pavement life by sealing minor surface cracks and preventing water ingress that would otherwise accelerate base course deterioration. **However, it is not the only option available.**

Preservation sealing is an alternative, cost-effective treatment that offers comparable performance to chip sealing without sacrificing surface smoothness or public approval. EnviroShield preserves the appearance of asphalt surfaces while extending their service life and can also be used on existing chip seals to achieve a smoother finish.



### 4. Skid resistance

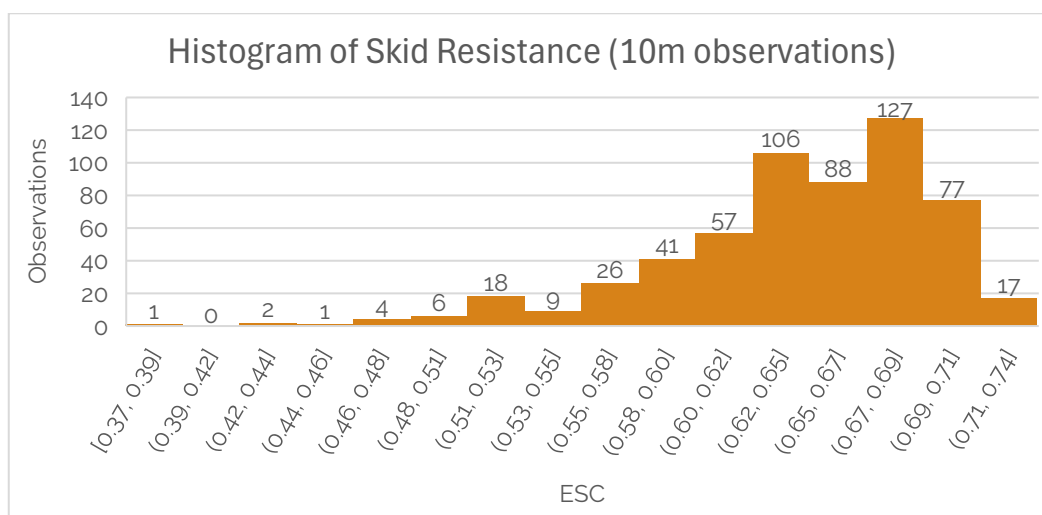
Skid resistance is fundamental to road safety and a key factor in treatment selection. EnviroShield incorporates high-polished stone value (PSV) aggregate applied over the fresh emulsion, functioning like a fine-textured chip seal.

British Pendulum testing demonstrated that EnviroShield maintains skid resistance equivalent to untreated asphalt in both wet and dry conditions.

#### British Pendulum - Skid resistance value corrected at 20degc

Sample	Dry Surface	Wetted surface
Asphalt (DG7) + EnviroShield + Sand	93	71
Asphalt (DG7)	93	74

Field validation from a recent urban road program (5.8 kms) showed that high skid resistance values are achievable with preservation sealing. The following skid resistance measurements were recorded one-month post-application, showing that 99% of observations exceeded the T10 Category 4 (undivided carriageways) threshold of 0.45 ESC.



## 5. Macrotexture

Macrotexture is a key indicator of surface deterioration:

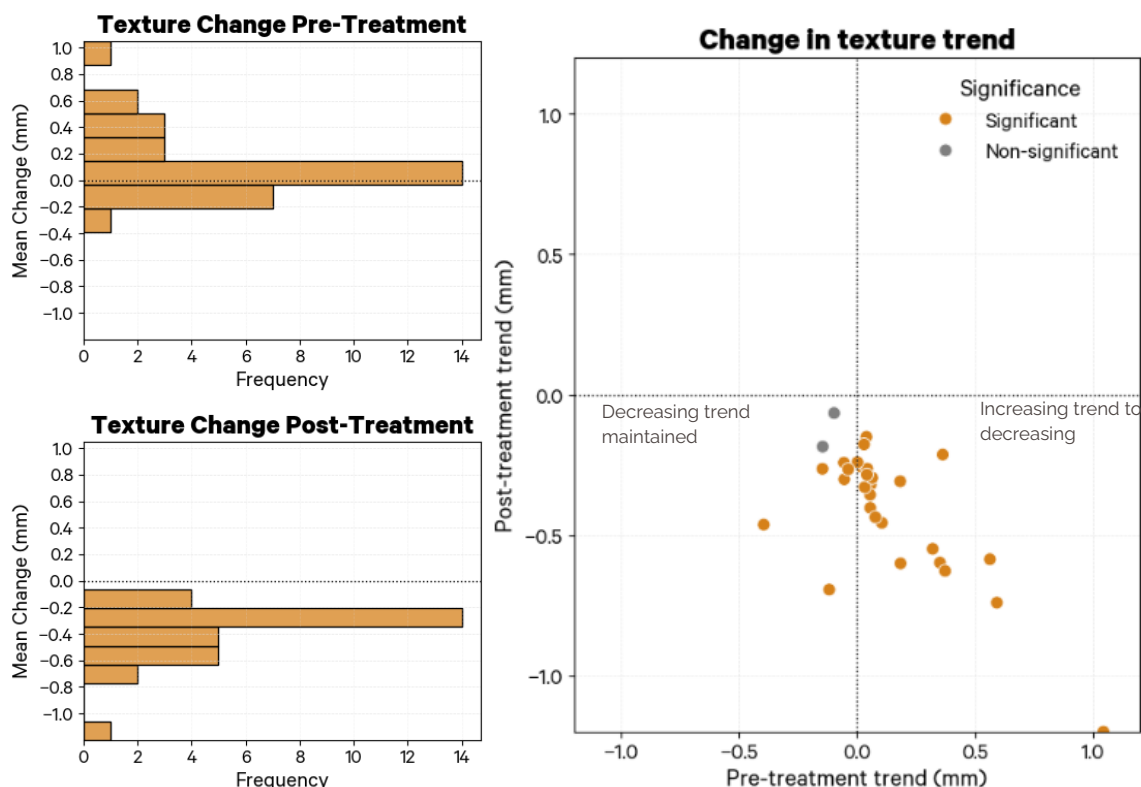
- A stable, well-performing surface typically shows a minor texture reduction over time due to polishing, aggregate embedment, binder rise, and sedimentation.
- Significant texture increases indicate material loss
- Significant decreases indicate flushing (not a concern given the light application rate of EnviroShield)

To assess the impact of EnviroShield on stabilising and preventing macrotexture loss, the texture trend was calculated both before and after treatment over a 3 - 5-year period (depending on the availability of texture surveys) to answer the following:

- Was the texture increasing or decreasing before treatment?
- Has treatment with EnviroShield impacted this trend?

Macrotexture trends shifted notably after EnviroShield was applied. Before treatment, 74% of sites showed increasing texture (indicating potential material loss) while 26% showed decreasing texture.

Post-treatment, this pattern reversed: 94% of sites showed decreasing texture (indicating a stable surface) and 6% showed no statistically significant change compared to the pre-treatment.



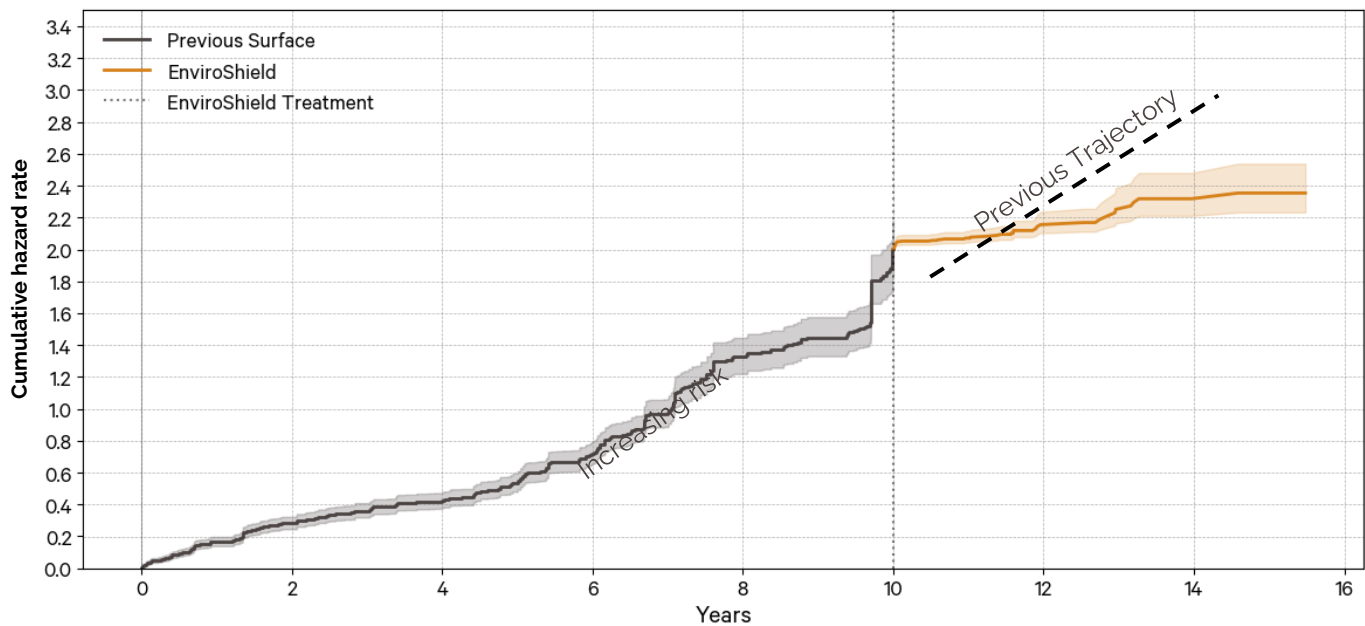
## 6. Fault analysis

Road deterioration is like human mortality. Just as human lifespan depends on a person's current health and past medical conditions, road longevity depends on both existing damage and accumulated stress over time. Pre-existing conditions are indicators of underlying vulnerability that accelerates future failures, exactly as chronic diseases compounds human mortality risk. Without addressing risk factors and root causes there is an increased risk to continued survival. EnviroShield is an early intervention to extend road life. Like preventive medicine, early intervention yields better outcomes.

We analysed 195 roads to compare how they wore down over 10 years before treatment versus after applying EnviroShield. Using cumulative hazard rate modelling, we analysed the total wear and tear that builds up over time, which helps us understand how quickly the average road in our sample develops faults and failures – and whether EnviroShield results in a noticeable difference.

- The accumulated wear and tear on the previous surface accelerate the longer it is in service
- The change in gradient after treatment demonstrates that EnviroShield slows the accumulation of wear and tear, changing the deterioration rate and extending functional service life

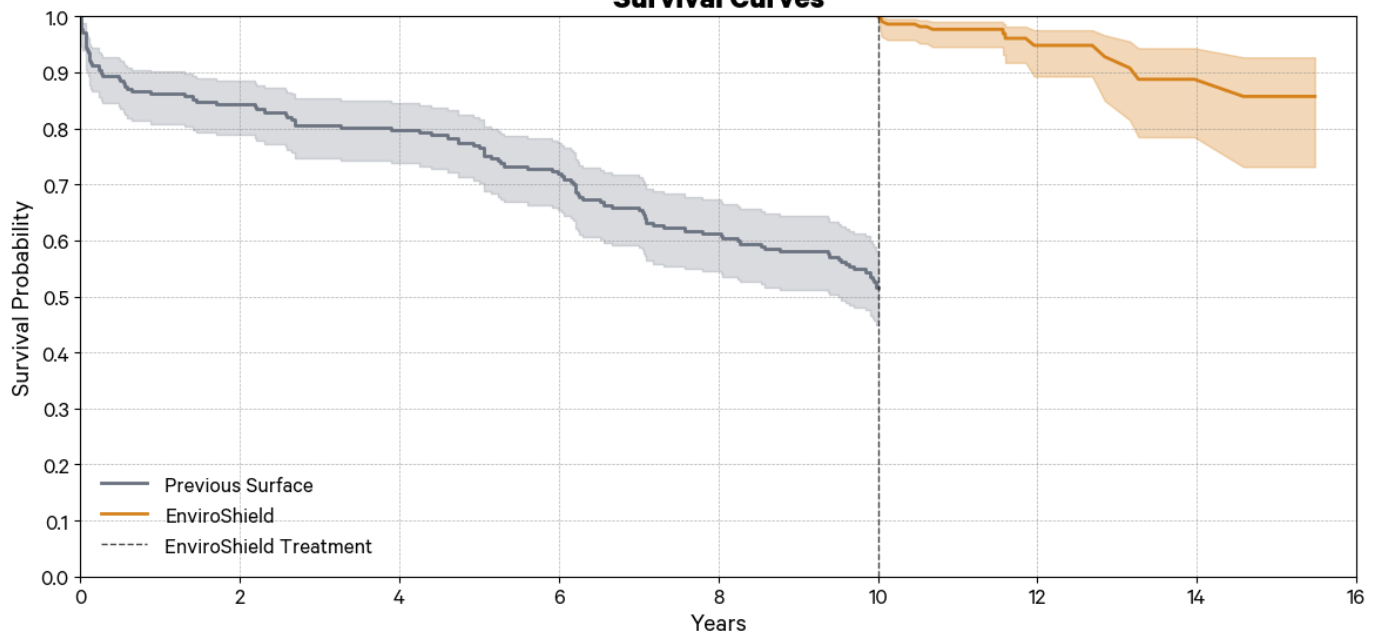
## Cumulative 'wear and tear'



Estimating the service life of new products is challenging, as most treated surfaces have not yet required resurfacing indicating product failure. Of the 195 roads monitored, none have undergone resurfacing to date. However, using faults as a failure criteria we can create a survival probability of time to first fault – this is quite conservative as the fault may be an isolated occurrence.

- After 5 years, 87% (CI 74% - 92%) of EnviroShield sites have not experienced a fault
- Prior to treatment with Enviroshield, approximately half of the roads were faulting, while the remainder have not. Using this threshold as an end-of-life criterion, current trends suggest that EnviroShield-treated surfaces are expected to reach a similar fault level within 8 to 10 years.

## Survival Curves





## 7. Summary

EnviroShield is a pavement preservation treatment designed to extend the life of aged bituminous road surfaces. The product addresses the key issues of surface oxidation, embrittlement, and texture loss, which are primary contributors to pavement deterioration and increased maintenance costs.

EnviroShield uses a low-viscosity emulsion with a low penetration binder, which penetrates the surface, replenishes lost binder, and restores waterproofing. This approach results in a durable, low-tack finish that closely resembles new asphalt (depending on the surface texture it is applied to) with a durable finish that is resistant to further oxidation, protecting the underlying surface.

### Performance Advantages

Unlike traditional chip sealing, EnviroShield maintains a smooth, almost asphalt-like appearance that satisfies residents while providing suitable performance. Laboratory, field testing and statistical analysis of performance reflect this:

- **Skid resistance:** British Pendulum testing and field measurements demonstrate that EnviroShield maintains high skid resistance in both wet and dry conditions, with 99% of treated sites exceeding the required specification
- **Macrotexture:** Macrotexture analysis identified a reversal in deterioration trends. 94% of treated sites showed decreasing texture compared to 74% showing increasing texture (material loss) before treatment
- **Faults:** Cumulative hazard analysis of 195 roads demonstrated that EnviroShield fundamentally changes deterioration patterns, significantly reducing fault rates and extending functional pavement life

EnviroShield offers councils and road owners a proven, cost-effective solution, delivering extended asset life while maintaining the smooth surface quality that communities expect. The combination of technical performance, public acceptance, and cost-viability makes EnviroShield an optimal maintenance solution for pavement preservation of aged asphalt and chip seal surfaces.

## Need more information?

At Road Science, we're committed to providing innovative solutions backed by engineering expertise. If you have any questions about this product, need technical guidance, or want to discuss how it fits your specific project needs, our team is here to help. Contact us today for expert advice and tailored support. Contact us via **0800 180 200** or visit our website at **[roadscience.co.nz](https://roadscience.co.nz)** to learn more.

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