

SH73 CHIPSEAL NOISE TRIAL

Planning

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References

- “Chipseal trial strategy”, WSP Research (30 June 2020)
- “Kirwee Straight Chipseal Noise Trial Site”, Waters Surfacing (5 October 2021)

Trial location

The SH73 Kirwee site was selected from the list of FY2021/22 reseal sites.

There were four reseal sites in the FY2021/22 programme that were long enough to accommodate six trial sections. Of these the Kirwee site had the most favourable conditions for the surface noise trial:

- Straight and level with wide shoulders, minimal shading from trees and a posted speed limit of at least 80 km/h.
- Consistent underlying surface with no obvious pavement issues.
- Driveways and intersections that will not influence the trial sections.

Trial plan

In their 2020 chipseal trial strategy WSP Research proposed four trial plans based on the following three trial themes:

- Surface type – focus on trialling single-coat, two-coat and racked-in seals.
- Chip size and shape – focus on trialling seals with grade 2/4, 3/5, 3 and 5 chips. Investigate whether the largest chip size in a multi-chip seal dominated noise. Investigate the effect of chip shape if data allows.
- Construction effects – trial the effect of rolling the first-coat of multi-chip surfaces. Trial the effect of using self-propelled chip spreaders.

Following discussions between the reference group and research team members during the second half of 2020 the decision was made to focus on the “surface types” theme as a first step towards investigating chipseal tyre/road noise.

A preliminary trial plan was developed based on trial plan “C” from the WSP report.

There was interest in including a multi-coat grade 2/4/6 surface in the first round of trial surfaces as these surfaces have been used as a short-term alternative to porous

asphalt (albeit with significantly higher noise levels). There was also an opportunity to include a single-coat grade 2 and a racked-in grade 2/4 surface (to go alongside the two-coat grade 2/4) after the single-coat grade 5 surface had to be abandoned due to its low expected lifespan (based on traffic volumes at the trial location).

Table 1 contains the final list of trial surfaces and proposed locations of each section within the trial area. A map of the trial sections provided in Appendix A.

Table 1 Proposed trial surfaces on SH73 (Rs: 073-0015) and approximate section start and end locations.

Section	Surface Type	Start [m]	End [m]	Length [m]
1	Single coat grade 3	15,317	15,880	563
intersection	Single coat grade 3	15,880	15,980	100
2	Two-coat grade 3/5	15,980	16,250	270
3	Single-coat grade 2	16,250	16,520	270
4	Racked-in grade 2/4	16,520	16,790	270
5	Two-coat grade 2/4	16,790	17,060	270
6	Multi-coat grade 2/4/6	17,060	17,330	270

The single coat grade 3 section will be constructed at the eastern end of the site. This surface was the “initial treatment” selected by the maintenance contractor for the entire site. The reasons for locating this surface at the eastern end and having a longer treatment length are as follows:

- The presence of a dwelling means that surface changes should be avoided in this area due to the possibility of increased noise from surface joints.
- There is increased damage to the existing surface across the eastern half of this section due to the presence of three driveways, meaning that the affected area may not be representative of a typical single-coat grade 3 as time goes by.
- A local road intersects the site at chainage 15,930 m and the maintenance contractor may choose to use a difference surface around the intersection due to the higher wear.

The result is a usable section of around 250 m long (see Figure 1).

Construction data

Pre-construction measurements

Surface texture profiles were taken on the underlying surface on 5 and 10 August 2021 using the CAPTIF Stationary Laser Profilometer (SLP). The readings were taken every 10 metres in alternating wheel paths (both lanes). The location of each reading was recorded using a high-accuracy GPS. At the eastern end of the site readings were only taken on the usable section (see Figure 1).



Figure 1 Constraints at the eastern end of the trial site.

The mean profile depth (MPD) was calculated from each profile and averaged across each trial section length to provide a measure of the surface macrotexture (see Table 2).

Sand circles were also taken at two locations in each trial section. Each location included a reading in the shoulder, left wheel path, mid-lane, right wheel path and centreline. The texture depth is calculated from the sand circle results to provide a second measure of the surface macrotexture.

Seal designs

Copies of the seal designs have been collected and stored on the CAPTIF network store.

Table 2 Mean profile depth of existing surface (before trial construction).

Section	Direction	Number of readings	Mean profile depth	
			<i>average</i>	<i>stdev</i>
1	D	35	1.22	0.21
	I	34	1.33	0.27

Section	Direction	Number of readings	Mean profile depth	
			<i>average</i>	<i>stdev</i>
2	D	27	1.34	0.18
	I	27	1.18	0.09
3	D	27	1.21	0.25
	I	27	1.19	0.20
4	D	26	1.25	0.20
	I	26	1.01	0.18
5	D	27	1.15	0.17
	I	26	1.07	0.26
6	D	26	1.00	0.23
	I	26	1.17	0.21

Construction monitoring

Construction of the trial sections is planned for 17 to 19 January 2022.

GPS logging

GPS loggers will be installed on the spray truck and roller to allow speeds and number of roller passes to be calculated.

Manual data collection

The following will be collected manually:

- Spraying and chip application times.
- Trafficking times and speeds.
- Samples of the aggregate used.
- Manual GPS survey of start and end of each trial section.
- Surface and air temperature at spray-time.
- Photographs of chip application (with scale) at representative locations.
- Notes of any breakdowns, delays, etc.
- Spray sheets and any standard laboratory reports.

Measurement programme

Following construction of the trial sections periodic measurements will be taken over the next decade to monitor changes any in noise, macrotexture, flushing and general surface/pavement condition.

The trial sections may also be used to further refine the CPX to wayside (SPB/CPB/SEL) noise relationship and investigate differences in the spectral

characteristics of noise at the wayside vs CPX. An initial wayside measurement is planned for 3 months after construction; the timing of additional wayside measurements will be informed by the work streams that require them.

Table 3 Long-term measurement programme

Trial age (time since construction)	Financial year	Mean profile depth Macrotexture	Photo frames Flushing / chip loss	CPX noise Tyre/road noise	Wayside noise Tyre/road noise
4–6 weeks	2021/22	✓	✓	✓	
3 months	2021/22	✓	✓	✓	✓
6 months	2022/23	✓	✓	✓	
9 months	2022/23	✓	✓	✓	
12 months	2022/23	✓	✓	✓	
18 months	2023/24	✓	✓	✓	
2 years	2023/24	✓	✓	✓	
3 years	2024/25	✓	✓	✓	
4 years	2025/26	✓	✓	✓	
5 years	2026/27	✓	✓	✓	
6 years	2027/28	✓	✓	✓	
7 years	2028/29	✓	✓	✓	
8 years	2029/30	✓	✓	✓	
9 years	2030/31	✓	✓	✓	
10 years	2031/32	✓	✓	✓	

Costs

Manual readings

Two full days are needed to complete the texture profile readings along the entire trial site. The traffic management cost is currently \$3,000 per day. If the surfacing consultant is also required during the site visit there will be an additional cost of \$900 per day; however, following construction the surfacing consultant will generally not be required on site. The manual readings require two CAPTIF staff members for two days (although there is no additional cost for this).

The total cost for a full set of texture profiles and photo frames is \$6,000 assuming the surfacing consultant is not required on site.

The cost of the manual readings (by financial year) is summarised below.

Table 4 Cost of manual readings by financial year

Financial year	Number of site inspections	Total cost*
2021/22	2	\$12,000
2022/23	3	\$18,000
2023/24	2	\$12,000
2024/25 onwards	1 per year	\$6,000

* based on 2022 traffic management rates.

Tyre/road noise readings

CPX noise testing will be performed under the wider CPX testing contract so there will be no addition cost to Waka Kotahi provided a CPX testing contract is in place at the time. There is a CPX testing contract in place for the 2021/22 financial year.

The cost of any wayside noise testing will depend on the type of readings taken (SPB, CPB and/or SEL). This work will need to be performed by a suitably qualified acoustics specialist. There will be additional costs associated with any wayside noise testing.

Reporting

CAPTIF staff will be responsible to collating the construction data and reporting on the periodic manual readings. This will occur following construction and after each site inspection. The data will be stored on the CAPTIF network store.

The CPX testing contract includes a requirement to process the raw CPX readings and upload the results to the CPX database. CAPTIF staff will include the average results for each trial section in the annual noise trial summary.

No detailed analysis of the trial data is currently planned. The trial data will likely form part of future studies and detailed analysis will be conducted as part of those studies.

APPENDIX A

Trial section map

