

Cornwall County Council

Applications for Funding Transport Asset Management

Element 2 – Innovative use of data in making investment and maintenance decisions on the highway

Executive Summary

This is a bid for £1.21m from the Element 2 *'innovative use of data in making investment and maintenance decisions on the highway'* fund which the Department for Transport announced to local authorities in July 2008.

The County Council's Local Transport Plan 2 (LTP2) identified five key aims each with visions linking to the Cornwall Community Strategy and local consultation priorities, and each contributing to the national 'shared' priorities for transport. One of these aims is to improve local safety for all who travel in Cornwall. Due to the cross cutting nature of highway maintenance and asset management, an additional theme was included in the LTP2 outlining how effective maintenance management of the highway infrastructure can support and deliver the overarching priorities. This bid demonstrates the direct link between highway asset management and the aim to improve road safety.

The bid describes how Cornwall County Council has used road condition and collision data to investigate the relationship between the occurrence of wet collision accidents and skidding resistance, as measured using SCRIM, and then developed bespoke standards based on Cornwall's unique data. The analysis then goes on to show the economic rate of return available through targeted investment to increase the characteristic SCRIM values on sites where a strong relationship between SCRIM and collision rates is exhibited.

The funding would be used to accelerate the treatment of SCRIM deficient sites for the remaining 2 years of the LTP2 period, using the principles of casualty reduction engineering; targeting those deficient sites where the benefits would be greatest. In addition, it develops the principle of using SCRIM as a predictive tool for accident risk and effectively treating sites before accidents happen, as well as applying the investigatory process advocated in the Highways Agency guidance.

Background

The Highways Agency skidding standard HD28/04 sets out investigatory levels for use on the trunk road network. The new standard was developed after research by the TRL into collision and skidding data on the trunk road network in England. Traditionally local highway authorities have adopted the Highways Agency standard for use on their own A and B road network, with limited modification. The new standard made some significant changes to the recommended Investigatory Levels (IL's), and changed the way that bends were characterised. It should be noted that the national trunk road network is largely made up of improved roads, with occasional events. Cornwall's road network is largely unimproved, and characterised by 'events' i.e. junctions, bends and gradients. Initial analysis demonstrated that if the Cornwall County Council adopted HD28/04 without modification, it would have resulted in a significant increase in the length of road characterised as SCRIM deficient, primarily due to the change in categorisation of bends within HD28/04. To address this deficiency through maintenance interventions could require the unsustainable use of imported high PSV aggregate. Cornwall County Council's LTP2 sets out safety as a key consideration in the Surface Treatment Strategy adopted by the Council. In addition, the Cornwall Casualty Reduction Strategy sets ambitious targets to reduce Killed and Seriously Injured (KSI) numbers in the county, and endorses a more predictive approach to casualty reduction, rather than the traditional approach of treating sites with significant casualties, as this approach has brought diminishing returns over the last 5 years.

To understand the relationship between SCRIM and collisions better, a review of 10 years collision, traffic data and SCRIM data was undertaken. This review identified that there was a strong correlation between wet collision rates and SCRIM data for a number of site categories. It also demonstrated that some modifications to the HD28/04 standard were justified, and that a different categorisation of bends was appropriate for the county road network. The analysis also indicated that accident rates increased significantly as SCRIM values decreased, for example on 'minor and major junctions' as shown in Figure 1.

Cornwall County Council uses a maintenance hierarchy and carries out SCRIM on the following road categories

2a – strategic routes

2b – principal A roads

3a – main distributor roads (made up of B and C roads)

Strong relationships, with high levels of confidence, between SCRIM and collision data were found for the following categories:

- Approach to minor / major junctions
- Single carriageway bends
- Approaches to roundabouts

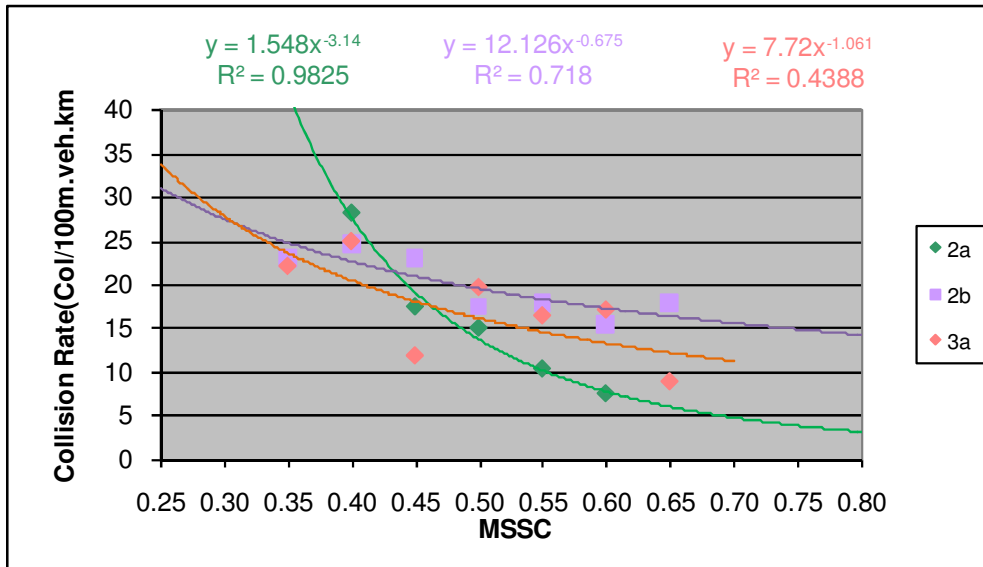


Figure 1: MSSC (SCRIM) and collision rates for minor and major junctions

LTP2 investment priorities and deterioration model

Cornwall County Council set out in its LTP2 investment priorities for surface treatment based on the indicative funding levels outlined in the relevant guidance. Cornwall is in the top quartile for the National Indicators (NI's) 168 and 169 and through the formulaic allocation will receive less than originally set out in the LTP2 guidance for 2007/08 to 2010/11. As a consequence, Cornwall's investment priority is to address sites with skidding resistance below investigatory level where there is evidence of related wet weather/loss of control injury collisions. In order to monitor the impact of this strategy on road condition and depreciation in condition (as measured by NI168 and 169) a backlog deterioration model for Cornwall's road has been developed that maps out condition, investment and deterioration. Setting out 10 year targets for performance, the model shows that to improve SCRIM deficiency to the national average for A roads (as reported in the National Road Condition Survey Report NRMCS), and to hold condition at current levels for national indicators, approximately £20m per year would need to be invested in surface treatment. Current capital and revenue budgets for surface treatment are £12m per year. With the approved strategy to address skidding resistance sites this would result in slippage from top quartile to third quartile for both national indicators over the next 10 years. This would also result in the depreciated replacement cost reducing by £300m. In carrying out this analysis it is apparent that more robust condition data is required on the unclassified road network. The County Council has decided to collect Scanner data, using WDM's mini scanner, the details of which are set out in the accompanying bid for funding under Element 1 – data collection.

Collision analysis

Through analysis of the same SCRIM and collision data it was possible to determine 'wet collision densities' for the lengths of network identified above. This allows the analysis to be based on numbers of collisions, and therefore an assessment of the economic benefits available through increasing the SCRIM values. Figure 2 illustrates this principle for bends with a radius less than 100m.

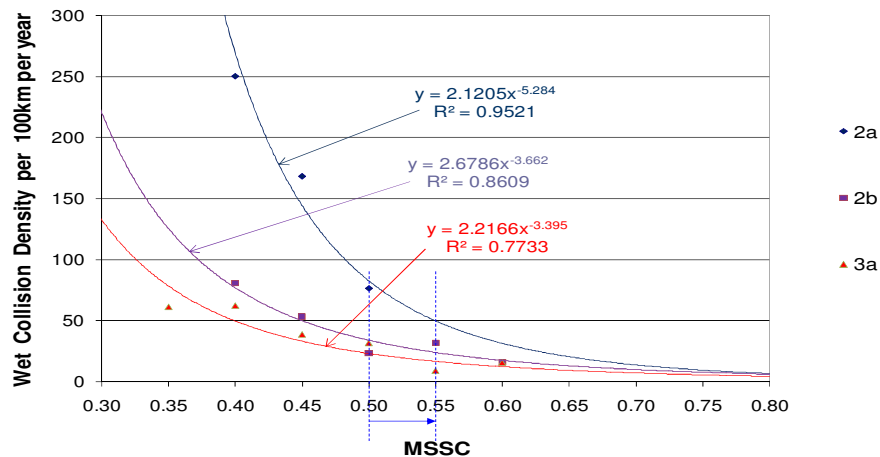


Figure 2: MSSC (SCRIM) v collision rates for <100m radius bends.

Achieving Higher SCRIM

The analysis has shown the theoretical reduction in collision rates through improving SCRIM. In practice this can be achieved through the specification of higher Polished Stone Value (PSV) aggregates that have proved to provide higher skidding resistance levels in service in Cornwall. In 2000, the County Council undertook a trial of different aggregates on a section of the A390 on the approach to Truro. This trial has demonstrated that local aggregates will reach equilibrium SCRIM values of 0.45. The same trial demonstrated the need for careful selection of high PSV aggregate so that the required in-service performance can be achieved. These higher PSV materials come at a premium of £1 and £5 per square metre for surface dressing and surfacing respectively. To consistently achieve SCRIM > 0.55 calcined bauxite materials are required. Surface treatment options for specific sites depend on site constraints and other condition characteristics, but typically to improve skidding resistance in line with Figure 2, a system of double surface dressing would be used on rural roads, and a thin surfacing on urban roads. These surface options are considered to provide the best performance in terms of durability, noise and other environmental constraints. To provide the desired performance at the approaches to pedestrian crossings and roundabouts calcined bauxite is specified.

Assuming that the skidding life of a new surface is 10 years, it is possible to set out the cost over 10 years of improving the skidding resistance in line with the principles set out above. The cost of a uniform programme over 10 years would be £608,000 per year (in 2008 prices), and the Net Present Value (NPV) is £5.1m. See Appendix 1.

Economic Analysis

The Highway Economic Note no 1, published in 2007 sets out the cost of road collisions by severity in 2005 prices. Considering the entire A and B road network in Cornwall and taking into account the actual severity split it is possible to assess the economic benefits of improving the SCRIM through the economic analysis used in local safety schemes; however as this programme is envisaged as a 10 year programme, investment over the 10 year period is used to demonstrate the rate of return, with discounting as appropriate. This was done for all the road categories as shown in Table 1.

Road Category	Investigatory level (IL)		Collision savings		Additional costs: PV (10 year)	Economic indicators	
	Current	Prop	Number (annual)	Present Value (10 year)		NPV (10 years)	BCR (Benefit Cost Ratio)
Approaches to minor / major junctions							
2a	0.45	0.50	6.1	£4.58m	£0.552m	£4.02m	8.3
2b	0.45	0.50	5.2	£3.91m	£1.187m	£2.72m	3.3
3a	0.45	0.50	3.3	£2.46m	£2.268m	£0.19m	1.1
Approaches to roundabouts							
2b	0.45	0.60	3.0	£1.77m	£0.097m	£1.668m	18.1
Single carriageway beds <100m radius							
2a	0.50	0.55	1.3	£1.221m	£0.114m	£1.107m	10.7
2b	0.50	0.55	1.5	£1.416m	£0.433m	£0.983m	3.3
3a	0.50	0.55	0.9	£0.852m	£0.403m	£0.448m	2.1
All networks			21.3	£16.198m	£5.055m	£11.142m	3.2

Table 1; Analysis of cost and benefits through improving SCRIM on road categories.

Discussion

The above analysis shows that a targeted programme of investment in improving the SCRIM on the identified road categories will have a positive economic return through delivering a reduction in predicted collisions, and that investment on the 2a and 2b networks (all A roads) in particular will have a significant impact on the NPV.

At present, Cornwall County Council is systematically amending the investigatory levels within the Pavement Management System following the review described earlier. Based on 2007 surveys the deficiency across the hierarchy is shown in Table 2.

Road category	Length (lane km)	Deficiency
2a	407	57%
2b	657	34%
3a	1350	25%

Table 2: SCRIM deficiency by road category.

Using the surfacing costs set out previously the cost of removing the SCRIM backlog can be calculated and is shown in Table 3. Given the high cost of treating all deficient sites, it also shows the cost of a more selective programme.

Road category	Backlog scenario and cost		
	1 (SCRIM<= IL)	2 (SCRIM=IL-0.05)	3 (SCRIM=>0.05)
2a	£7.087m	£4.347m	£2.107m
2b	£8.640m	£5.038m	£2.118m
3a	£12.243m	£5.025m	£1.574m
Total	£27.970m	£14.411m	£5.709m

Table 3: Cost of addressing all deficient sites

From this analysis it can be shown that the SCRIM backlog is significant and there are different strategies to address the backlog. The cost of removing the entire backlog is unachievable without a huge financial commitment to the detriment of other measures of condition. A more conservative approach that accepts some reduction in SCRIM below investigatory levels may be achievable, but it cannot be demonstrated that this will bring economic benefits through collision reduction. Through carrying out the work to establish relationships between SCRIM and collision rates it can be shown that a targeted approach to increase SCRIM on some site categories will bring economic benefits through reducing casualties.

Whilst this approach could be funded from LTP capital and other revenue monies, the deterioration model illustrates that this can only be achieved by allowing national indicators 168 and 169 to fall, and the condition of the unclassified road network to deteriorate further. Whilst the impact of this in the short term will be limited, the incremental impact will become significant resulting in a greater backlog that will need to be addressed in the future. Whilst Cornwall County Council has not included road condition indicators in its Sustainable Community Strategy, they are used for quality cross check purposes in efficiency statements.

Delivery of the bid

In 2007 Cornwall County Council created a 'policy and assets' team with a remit is to use condition data to develop highway maintenance policy and make decisions about the priorities for maintenance work considering condition data and other indicators of need. This team is also responsible for the development of highway maintenance policy, strategies and procedures including the Highway Maintenance Plan, Transport Asset Management Plan, Surface Treatment Strategy and Inspection Manuals. The delivery of the programme will be through this team, and therefore not involve in a substantial process of change in the County Council. The bid will be spent on the delivery of an enhanced works programme in 2009/10 and 2010/11. As much of the SCRIM deficiencies will be addressed through surface dressing, and the likely timescale for any allocation under Element 2, these sites will be programmed for the 2010/11 year to ensure that treatments are carried out at the optimum time. The 2009/10 programme will be made up of thin surfacing and calcined bauxite works.

In 2007/08 Cornwall County Council worked with the County Surveyors Society (CSS) Highway Condition Assessment Group in delivering 2 seminars on skidding policy, the London Technical Advisors Group Roads 2000 event, and the inaugural Aggregate Industries Christmas seminar to disseminate the work carried out described in this bid. This resulted in invites for speakers from the County Council to deliver 3 papers at the International Safer Roads Conference in May 2008. In October 2006 a paper was included in Surveyor magazine describing the first phase of this work.

Monitoring the outcome of the project

Cornwall County Council has invested a significant resource in understanding the relationships between SCRIM and collision data. It is intended to review this work and progress made since 2006, and in particular the impact of investment to address SCRIM deficiencies on collision data. This review will also consider the use of contributory factors in STATS19 returns since 2005, which may represent a better correlation between data collected at the time of collisions, and the ability to prevent injuries through data led maintenance interventions.

Conclusion

This bid has the aim of improving the skidding resistance of the road network in Cornwall specifically to reduce the occurrence of collisions. The analysis demonstrates that the proposal has the potential to reduce the number of injurious skidding collisions on Cornwall's roads by up to 21 per year.

The economic analysis sets out the benefits of the approach and demonstrates that benefits will be sustained after the current LTP2. Through the development of a deterioration model, and review of investigatory levels it will also enable informed decisions to be made about investment priorities, and the consequence of any strategy developed. This in turn will enable service levels to be developed that balance safety, structural and functional requirements of the road network against an established road hierarchy.

Cornwall County Council has already disseminated the principles and benefits of the approach adopted, and is committed to sharing best practice regionally and nationally.