

Interim Evaluation of the Victorian Safer Road Infrastructure Program Stage 3 (SRIP3)

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Abstract

The Safer Road Infrastructure Program Stage 3 (SRIP3) is a \$1b road infrastructure improvement program delivered over 10 years from 2007 aimed at reducing the incidence and severity of crashes at high risk locations across Victoria. This paper presents the results of an interim evaluation of 553 projects completed under SRIP3 up to 2014 at a cost of \$481M. Evaluation has been conducted in terms of the impact of the program on reducing the frequency and severity of crashes both for the program as a whole as well as for both broad and specific treatment types implemented under the program.

Background

Following on from the successful implementation of the Safer Road Infrastructure Program Stages 1 and 2, in May 2006 the Victorian Government announced the allocation of Transport Accident Commission funds to implement the third stage of the Safer Road Infrastructure Program. SRIP3 is a ten year program (2007-2017) with an indexed funding of \$722 million. Unlike stages 1 and 2, the third stage, SRIP3, not only addresses sites identified by high crash frequencies, but also includes safety upgrades at locations that do not necessarily have a current identified crash problem but are considered to have potential for high crash rates in the future (known as ‘Greyspots’) and 40 km/hr speed limit treatments along arterial shopping centre roads. SRIP3 also includes additional road segment treatment types not included in stages 1 and 2, such as mass action edge line installation on class C roads and tactile centrelines for class A roads. At the end of 2014, SRIP3 comprised 721 projects: 543 projects were at sites identified by high crash frequency with 375 of these at intersections and 168 along lengths of road, six were projects completed under a special Princess Highway East program, 148 were Greyspot projects located at intersections and the remaining 24 projects were 40km/h speed limit reductions at strip shopping centre sites.

Aims and Scope

The overall aim of this study was to undertake an evaluation of projects delivered under the SRIP3 program over the period January 2007 to December 2014. The evaluation aimed to measure the extent to which treatments were associated with reduced number of casualty crashes, serious casualty crashes, casualties, and serious casualties at treated sites which had sufficient after treatment history to be included in the analysis. A single generic null hypothesis was tested: that implementation of SRIP3 was not associated with a change in casualty crash frequency at project sites. This was assessed against a 2-sided alternative hypothesis allowing for the analysis to detect either increases or decreases in road trauma associated with the program. As well as providing program level estimates of effectiveness, where possible the study also estimated reductions in crash frequency for different broad and narrow types of treatments and for specific crash types, as well as reductions in injuries for specific road users. Estimates of the economic worth of the program were also derived.

Of the 721 projects approved under SRIP3 funding, crash data from 553 projects with sufficient after treatment history were used to determine the interim benefits of the program. 6 projects were excluded because the treatment had not been completed prior to 30/12/2014. A further 64 Greyspot

projects and 16 other projects were excluded because no crash data, either before or after treatment were available, or because of problems identifying required information on the treatments. In addition to the 553 high crash frequency site treatments, 82 Greyspot projects were analysed separately. The six projects identified by VicRoads on the Princess Highway East were not able to be analysed due to three being incomplete and because one of the incomplete projects completely confounded the after treatment period of the completed projects. The capital costs of implementing the 553 projects was \$481M (\$AUS 2015). The capital costs of the 82 Greyspot projects was \$23M.

Methods

The evaluation used a quasi-experimental study design where treated sites were matched with comparison sites in order to adjust estimates of SRIP program effectiveness for the effects of other influences on crash risk and injury outcome (Hauer, 1997). These factors include other road safety programs, changes in exposure and socio-economic measures. Sites where treatments were completed as part of Stages 1 and 2 of the SRIP program were excluded as potential comparison sites.

Once the location of each project had been identified, rather than choosing a single untreated site to contribute comparison data for each project, all non-treated sites with the same local government authority (LGA) served as potential comparison sites. Not all untreated sites in an LGA containing a SRIP3 site were selected to contribute comparison data. For intersection sites (including Greyspot sites), comparison sites were restricted to untreated sites that were intersections. If the treated intersection was signalised prior to treatment, comparison sites were further restricted to signalised intersections. Intersection sites that were not signalised prior to treatment were matched to non-signalised intersections within the group of potential comparison sites. For road segment and 40 km/h SSC treatments, comparison sites were not restricted to sites defined as road length: they could either be intersections of untreated roads, or untreated lengths of road. Generally only classified roads were eligible to be comparisons for road segment project sites. Furthermore, road segment project sites that were divided roads prior to treatment were only matched to comparison roads that were also divided. Similarly, road segment project sites that were undivided sections of road prior to treatment were only matched with undivided comparison sites. For road segment project sites that contained both divided and undivided sections of road, the dominating feature in terms of number of crashes in the before period was used to determine whether comparison sites should be divided sections of road. Comparison sites were further limited to classified roads (i.e. a highway, freeway, main road, forest road or tourist road). In addition to the matching by LGA, dividedness and signalisation, comparisons for 40 km/h SSC projects were also matched to the project before treatment speed zone. This was because this treatment was specifically testing reduced speed limits.

Where there were multiple project sites of similar type within the one LGA, these sites were matched to the same group of comparison sites (providing the treated sites were similar in terms of whether they were intersections, or occurred on divided roads, etc.). Generally, where a road segment project site passed through multiple LGAs, the pre- and post-treatment data at this site were matched to comparison sites in each LGA. Exceptions were made for some sites that passed through several LGAs, but for which relatively few crashes at the SRIP3 site occurred in one LGA compared to the others. Using these strategies for matching treated and comparison sites, the 553 projects included in the evaluation of SRIP3 and the 82 Greyspot projects, were matched to 224 distinct sets of comparison sites.

For each group of treated sites matched to the same group of comparison sites, the pre-treatment period was defined as the period beginning on the 1st of January 2000 to the day before the first commencement of works at any of the treated sites. The post-treatment period was defined, for each

group of treated sites matched to the same group of comparison sites, as the period from a day after the last treatment works had been completed at any of the treated sites to the 7th of February 2015. For the 553 high crash risk projects and for the 82 Greyspot projects, the earliest date on which treatment works commenced was the 11th of March 2007. The earliest date for a comparison group pre-treatment period to end was 10/03/07. Not all comparison group pre-treatment periods began January 1, 2000; the latest date for the pre-treatment period to start was the 1st of December 2012. Truncation was to avoid conflicts with SRIP1 and SRIP2 projects. Using this approach, 86% of project pre-treatment periods were 8 years or more; 4% had a period of 4.5 to 7.5 years and 7.6% had a period of 1.5 up to 4.5 years. 39% of the project post-treatment periods were more than 2.5 years long; 41% were 1.5 up to 2.5 years and 19% were 0.5 up to 1.5 years long

As noted, it is acceptable to have pre-treatment and post-treatment periods of differing durations as long as for each treatment-comparison pair, the pre-treatment period for the treated sites covers the same time-span as the pre-treatment period at the comparison sites and that the same applies for the post-treatment periods.

Poisson regression was used to estimate the percentage change in casualty crash frequency from before-treatment to after-treatment at the treated sites relative to that at the comparison sites. This methodology is well established in the literature for analysing quasi-experimental designs (Breslow & Day, 1987; Hosmer & Lemeshow, 1989).

Two important issues to be considered when using a quasi-experimental study design to evaluate road safety programs are *accident migration* and *regression-to-the-mean*.

Accident Migration

One possible outcome of treating sites on the road network is accident migration, which involves the casualty crash risk being moved, either entirely or partly, from the treated site to another site nearby by such mechanisms as changing exposure patterns or risk compensation behaviour by drivers after they have passed through a treated site (McGuigan, 1985). The most likely cause of an accident migration effect in this study would be through a treatment altering traffic volume at the treated site. However accident migration effects are unlikely to be large provided that treatments do not lead to substantial shifts in traffic volumes. Traffic volume data required to measure changes in traffic volume at treated sites and neighbouring sites were not available for the study since such data are not routinely collected for all treatment sites analysed and neighbouring sites to which traffic may have migrated. Furthermore, the types of treatments completed under SRIP3 were not those likely to significantly limit mobility at treated sites hence it is considered unlikely that traffic migration was a likely outcome from the program.

Regression-to-the-Mean

Regression-to-the-mean is caused by selecting sites for treatment from a set with the same underlying crash rate that have a high casualty crash frequency measured over a narrow window in time, due to the expression of an extreme in random variation. Selecting sites for treatment on such a basis means that the likelihood of the casualty crash frequency at the selected site reducing in the immediate next period, merely due to chance, is high. If the treatment effect at the site is evaluated using the same inadequate casualty crash data from which the site was selected for treatment, the results of the evaluation will be spurious.

One way of minimising the effect of regression-to-the-mean is the use of adequate pre-treatment casualty crash histories to give an accurate estimate of the true pre-treatment casualty crash frequency at the chosen site. Simulation of crash count data (Nicholson, 1986) suggested that the effects associated with regression-to-the-mean are only very small when five years of pre-treatment

data are available. For this study, most treated sites that were evaluated had more than 5 years of pre-treatment casualty crash data. Furthermore, an analysis technique was used that properly recognised the level and distribution of random variation in the data and that computed confidence limits and significance probability levels that properly reflected this variation. Furthermore, the distribution of crashes per site in the before treatment period for comparison sites were compared to treatment sites. The distributions for the treatment and comparison sites were found to be similar. In addition, analysis of pre-treatment differences in crash histories were carried out using propensity scores (Sasidharan & Donnell, 2013), which were, for each comparison group, the odds of a higher crash frequency per intersection in treatment sites obtained through logistic regression. The propensity scores showed that for 81% of comparison groups, there was no evidence of a significant difference in pre treatment crash histories between treatment and comparison sites.

Evaluation Output Measures

In order to test the primary null hypotheses of the evaluation, the percent reduction in crash or injury frequencies at treated sites in the post-treatment period compared with the pre-treatment period adjusted for parallel changes at the comparison sites were estimated. Net percent changes in crash or injury frequencies were measured for casualty crashes, serious casualty crashes, specific crash types, casualty injuries, serious casualty injuries and specific injury types for the whole program, and by region, program type, by region and program type, by two levels of aggregated treatment types and by project. Measures of economic worth considered were: benefit-cost ratio (BCR) and cost-effectiveness of preventing a casualty or serious casualty crash over the treatment life. All measures of cost and savings were based on year 2015 Australian dollar values and BCR was estimated using a discount rates of 5%.

Data

VicRoads provided data on all SRIP 3 projects completed to mid 2015 including description of treatment type, location of treatment, installation start and completion dates, capital cost of works and treatment life. Using the description of treatment types, treatments were classified into groupings for analysis at various levels including intersection versus midblock treatments, metropolitan Melbourne versus regional treatments as well as specific treatment type categories (e.g. signal installation, guard rail, shoulder sealing etc). Each treatment location was mapped using a GIS system in order to match police reported crashes occurring at each treatment site. Data on the 226,132 police-reported casualty crashes that occurred during the period 1st of January 2000 to 31st December 2014 were provided for the evaluation. This data was linked to TAC claims data to verify hospital admission status for the purposes of defining serious injury. Of the 226,132 crashes, 70,321 were used in the analysis due to occurring in either a treatment or control area in the defined before or after study periods. Crash cost data for the economic analysis was taken from the Bureau of Infrastructure, Transport and Regional Economics estimates based on the human capital valuation approach (BITRE, 2010).

Results

Overall Results

Implementation of the SRIP3 program was estimated to be associated with a 21% reduction in the number of casualty crashes and a 26% reduction in the number of serious casualty crashes relative to crash frequency changes at matched comparison sites ($p < 0.0001$). Corresponding reductions in casualties and serious casualties were estimated at 25% and 29%. All of these results were highly statistically significant. The overall casualty crash reduction estimated is slightly smaller than that

previously estimated for the SRIP1 (24%, $p < 0.0001$, (L. Budd, Scully, J., Newstead, S., 2011)) and the SRIP2 evaluation (33%, $p < 0.0001$, (L. Budd, Newstead, S., Scully, J., 2011)).

Across the 553 projects evaluated in the Phase 2 evaluation, a 21% reduction in casualty and a 26% in serious casualty crashes translates to an estimated saving of 377 casualty crashes (resulting in 630 injuries) and 169 serious casualty crashes (resulting in 238 serious injuries) per annum and a saving of 6,440 casualty crashes (resulting in 10,819 injuries) and 2,927 serious casualty crashes (resulting in 4,133 serious injuries) over the life of the program. The average life of the 553 SRIP3 treatments was 17 years. This translates to an estimated present value of savings in community costs from reduced road trauma estimated over the life of the program of \$1,815M (using a discount rate of 6.5%), with a 95% confidence interval of \$1,362M to \$2,239M. When compared to the cost of completing and maintaining the 553 projects (\$507M), the program is estimated to deliver a benefit-cost ratio of 3.6 (95% confidence interval of 2.7 to 4.4). The estimated BCR shows that the total benefits that the program provides by reducing injury and death statistically significantly exceed costs of completing and maintaining the treatments.

Results by Location, Treatment and Crash Type

The evaluation also provided separate estimates of crash savings associated with the program for sites located in metropolitan Melbourne and sites located in rural areas. It was estimated that the treatment of sites located in Melbourne were associated with an 18% reduction in casualty crashes and a 24% reduction in serious casualty crashes ($p < 0.0001$). The treatment of rural sites was associated with a 31% reduction in casualty and in serious casualty crashes ($p < 0.0001$).

The evaluation also considered the associated effectiveness of different broad types of treatments. There was strong evidence that implementation of both road segment and intersection treatments were associated with reduced casualty and serious casualty crashes, and that intersection treatments had statistically larger casualty crash reductions. Serious casualty crash reductions for intersections were greater than 40%. Road segment serious casualty crash reductions were less than half that for intersection treatment types (21%). It was estimated that casualty crashes were reduced by 37% (95% C.L. 32% to 42%) for intersection treatments compared with 13% (95% C.L. 6% to 20%) for road segment treatments. Due to limited data at Greyspots and 40 km/h strip shopping centre treatments and difficulties with the evaluation design for these projects, the evaluation was generally unable to draw conclusions about the effectiveness of these treatments

Road segment treatments were found to be more effective at reducing casualty and serious casualty run-off crashes than at reducing casualty and serious casualty on-path/overtaking/head-on crashes. The most effective road segment treatments for casualty crashes were shoulder sealing with safety barriers and tactile edge or centre lines without shoulder sealing or safety barriers, with significant casualty crash reductions greater than 50%. Run-off road casualty and serious casualty crashes were best reduced by shoulder sealing with safety barriers without delineation and non-tactile line marking without safety barriers or shoulder sealing. On-path/head-on/overtaking casualty and serious casualty crashes were most improved by safety barrier treatments without shoulder sealing or tactile lines but with culvert extensions/end walls. Furthermore there was some evidence that road segment treatments of this evaluation were associated with a greater (16 percentage unit) reduction in serious casualty crashes than those of SRIP1.

Intersection treatments were more effective at reducing opposite and adjacent style (47%) crashes than same direction (16%). The most effective treatments for preventing casualty crashes were hazard removal, installation or modification of splitter islands, control of left turn with signals, installing or extending right turn lanes with or without fully controlled right turn, new traffic signals and new roundabout installations, all with significant casualty crash reductions greater than 50%.

The most effective treatment at improving opposite and adjacent intersection casualty and serious casualty crash outcomes were roundabout installations and installation of both fully controlled right turn and installing/extending the right turn lane. The most effective for same direction serious casualty crash reduction was skid resistance surfaces with or without other treatments and traffic signal treatments.

Table 1 summarises the key overall estimates of effectiveness of the program and their 95% confidence limits:

Table 1. Estimated crash and injury reduction effects of SRIP3 overall and by major treatment groupings

Program Level	Casualty Crash Reduction	Serious Casualty Crash Reduction	Casualty Reduction	Serious Casualty Reduction	BCR
Whole Program	21% (16%, 26%)	26% (18%, 32%)	25% (19%, 30%)	29% (21%, 36%)	3.6 (2.7, 4.4)
Intersection Treatments	37% (32%, 42%)	41% (32%, 50%)	42% (35%, 49%)	46% (35%, 55%)	6.1 (5.2, 7.0)
Road Segment Treatments	13% (6%, 20%)	21% (10%, 30%)	14% (4%, 24%)	23% (11%, 34%)	2.0 (0.9, 3.0)
Metropolitan	18% (14%, 23%)	24% (15%, 31%)	23% (19%, 27%)	28% (21%, 35%)	4.1 (3.0, 5.1)
Rural	31% (22%, 29%)	31% (19%, 41%)	30% (23%, 36%)	31% (19%, 41%)	3.2 (2.3, 3.9)

Results by Road User

The program and region level analyses showed no significant associations of casualty or serious casualty reductions of injured pedestrians. However the treatments involving installation of both fully controlled right turns and installing or extending the right turn lane were found to be associated with a 90.3% reduction in casualty pedestrian injuries ($p=0.017$).

For bicyclists a strongly significant 46% (95% C.I. 28%, 59%) casualty reduction was associated with intersection treatments. A significant reduction of 44% was associated with metropolitan intersection treatments; no significant reductions in bicyclist injuries were observed for rural intersections. However significant reductions for the program as a whole and on road segment treatments were observed for cyclists in rural areas: 66% (95% C.I. 12%, 87%) and 89% (95% C.I. - 3%, 99%) respectively. No significant reductions in bicyclist serious casualty injuries were found due to limited data on bicyclist serious casualties. The specific intersection treatments that were associated with measurable reductions in casualty bicyclist injuries were of the traffic signal type and right turn modification type, particularly those involving new installations, modifications such as LED upgrades, right turn bans and fully controlled right turns. Lane modifications which included bus and bicycle lane installations at intersections also proved effective at reducing bicyclist injuries (78%, $p=0.006$).

The program and region level analyses showed no significant associations with casualty reductions of injured motorcyclists. A reduction in serious motorcyclist casualties was associated with the whole program (37%, $p=0.0002$) and with intersection treatments (63%, $p=0.0003$). Intersections

treatments associated with large significant reductions in serious casualty motorcycle injuries were new traffic signals and right turn modifications, particularly those involving fully controlled right turns with extended right turn lanes.

Crash Savings and Economic Benefits

Economic analysis showed that SRIP3 is expected to return favourable economic benefits over the life of the treatments implemented. Specifically, it was estimated that the reduction in casualty crashes associated with the 553 SRIP3 projects considered in this evaluation would result in an annual saving of \$118M. The present value of future savings expected based on treatment lifetime and the estimated annual crash cost savings at treated sites was estimated to be \$1,815M. The capital expenditure required to complete the 553 treatments was \$434M, and when future maintenance costs are added to this value, the present value of completing and maintaining treatments using a discount rate of 6.5% was estimated to be \$507M. This equates to an estimated net present worth of the program which is significantly greater than zero dollars (\$1,308M, varying from \$856M to \$1,732M with 95% certainty) and a benefit-cost ratio significantly greater than one (3.6, varying from 2.7 to 4.4 with 95% certainty). Furthermore, the internal rate of return of SRIP3 was estimated to be 23%, varying from 17% to 29% with 95% certainty.

It was estimated that the 21% (16%, 26%) estimated casualty crash reduction associated with the 553 SRIP3 projects evaluated will prevent 6,440 casualty crashes and 10,819 casualties over the life of treatments, with this estimate ranging from 4,835 to 7,944 casualty crashes with 95% certainty. This translated to a cost effectiveness of \$78,660 spent per casualty crash saved, ranging from \$63,767 to \$104,771 with 95% certainty.

Statistically significant economic worth as a result of associated casualty crash reduction was observed for regional and program level aggregations including intersection and road segment treatments. Intersection treatments exhibited a greater economic worth than road segment treatments with three times the BCR of road segment treatments (6.1 c.f. 2.0) and slightly higher %IRR (22 c.f. 20) and a four times better cost effectiveness (\$40,320 c.f. \$164,844). Although exhibiting only a slightly higher BCR (4.1 c.f. 3.1), metropolitan treatments proved their economic worth over rural treatments with more than double the %IRR (31.1 c.f. 12.7) and almost double the cost effectiveness (\$64,686 c.f. \$109,833). The trend to greater economic worth in metropolitan treatments was observed through both intersection and road segment treatments reflecting the higher crash numbers at metropolitan treatments.

Discussion

There was strong evidence that the overall effect of SRIP3 was an associated reduction in the number of casualty and serious casualty crashes at treated sites. There was strong evidence ($p < 0.001$) that both road segment and intersection projects were associated with reductions in casualty crashes. Statistical evidence for the effectiveness of 40km/h SSC projects and Greyspot treatment was less certain. This largely shows a need to further evaluate these treatment types after full implementation of the SRIP3 program and when more post implementation crash data are available. Methodology for evaluation Greyspot type treatments might also need to be reconsidered considering the primary purpose of such treatments is to prevent the development of future crash problems at sites where traffic volume and subsequent crashes are expected to increase dramatically. A methodology for accurately estimating the likely future crash problem based on this growth is necessary to properly evaluate the effectiveness of these treatments. The question the SRIP3 program poses in this area is how to effectively balance the treatment of anticipated problem areas through a Greyspot program against the treatment of the many site with current crash problems identified and treated under SRIP3.

It was estimated that road segment treatments were associated with a 13% (95% CI: 6%, 20%) reduction in casualty crashes at the 164 project sites where they were employed. The estimated effectiveness for the 365 intersection projects was significantly more with a reduction in casualty crashes by 37% (95% CI: 32%, 42%). The difference was found to stem from differences in metropolitan regions, where small insignificant crash reductions were associated with road segment treatments and intersection treatments were associated with a crash reduction of 38% (32%, 43%). The difference between intersection and road segment associated casualty crash reductions was not evident in rural regions.

Both the 311 SRIP3 treatments completed in metropolitan Melbourne and the 242 treatments located in rural areas were associated with reduced casualty and serious casualty crashes ($p < 0.0001$). Based on the degree of overlap of that the 95% confidence intervals have for the metropolitan and rural serious casualty crash reduction rate estimates, it was found that there was no statistical evidence for a difference between them. For casualty crashes, the overlap was small providing some weak evidence of a true difference. This difference is evidenced in the road segment program which is significantly lower (by 30% units) in metropolitan regions. A statistically significant difference of 30% units was also observed for road segment treatments between metropolitan and rural regions for serious casualty crashes.

Metropolitan projects were associated with an estimated reduced casualty crash rate of 18% (varying from 14% to 23% with 95% certainty) and rural projects by an estimated 31% (95% CI: 22% to 39%). Metropolitan projects were associated with an estimated reduced serious casualty crash rate of 24% (varying from 15% to 31% with 95% certainty) and rural projects by an estimated 31% (95% CI: 19% to 41%).

Road segment treatments were more effective at reducing run-off road casualty and serious casualty crashes than on-path/overtaking/head-on casualty crashes. Intersection treatments were more effective at reducing opposite and adjacent style (47%) casualty crashes than same direction (16%). There associated effects were similar for serious casualty crashes. Intersection treatments were associated with greater serious crash reductions in the key crash types in metropolitan compared to rural regions. Road segment treatments showed similar crash type reductions in metropolitan and rural regions.

Implications of results on project selection for future infrastructure improvement programs

Where there are finite funds available to make improvements to road infrastructure with the aim of reducing casualty crashes, treatments that are known to be highly effective should be applied at sites where the annual number of crashes is high or where the crashes are most frequently of high severity. Furthermore, treatments involving the lowest possible implementation costs applied to these sites will ensure maximisation of the economic benefits of the program. If future road infrastructure programs are to be evaluated with respect to their contribution to achieving targets defined in terms of reductions in casualty crashes, prioritising sites to be treated in terms of predicted cost effectiveness is an important indicator of which mix of projects will deliver the greatest savings. In order to predict the cost-effectiveness of different projects, it is necessary to: (1) accurately estimate the cost of a potential project; (2) accurately measure the casualty crash problem at potential sites to be treated, and (3) as accurately as possible estimate how the project is likely to reduce serious casualty crashes at the site as a result of the treatment.

This study supports the finding from the previous SRIP evaluations that intersection projects have been more cost-effective than road segment treatments. This evaluation of SRIP 3 has estimated that the average expenditure of \$95,973 was required to prevent one serious casualty crash at an intersection site compared with \$120,619 at road segment treatments. Intersection projects were estimated to be more cost-effective than road segment projects because of the higher crash densities

at intersections compared to road lengths and because the average cost of intersection treatments was less than that of road segment treatments (\$448,546 per project compared to \$1,899,825). However, this should not be interpreted as meaning that intersection treatments should be applied in preference to road segment treatments. Instead it supports the principles of treatment site selection outlined above where the lowest cost treatments should be implemented at sites with the largest crash problem, whether that problem is one of high frequency or one of high fatalities or serious injuries. In the case of the SRIP treatments, it is intersection treatments that meet this criterion better than road segment treatments. This may not always be the case depending on whether new, lower cost road segment treatments can be developed and whether in the future intersection crash densities continue to be higher than those on the highest risk rural road segments.

Conclusions

Evaluation of the implementation of SRIP3 clearly demonstrated an association between program implementation and reduced casualty and serious casualty crashes and the resulting casualties and serious casualties at treated sites. It also suggests the program has been cost effective producing benefits to the community in terms of reduced road trauma costs that outweigh the costs of implementing and maintaining treatments implemented under the program.

Final evaluation of SRIP 3 is planned once all treatments have been completed. Further evaluation will allow all sites that will ultimately be treated under the SRIP 3 program to be evaluated in terms of crash effects and economic worth rather than just the sites treated under the program that were evaluated in this study.

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