The information detailed in this Case Study has been provided by RSI ‘Panos Mylonas’. National Road NR-7 is located in Peloponnese, which comprises the south part of the mainland in Greece. It connects Corinth with Kalamata, through Nemea, Argos, Tripoli and Megalopolis. Before the new motorway was built, it was the main access road to Kalamata, now commonly called ‘old National Road’ and has a total length of 196km.

The road is a single carriageway with at-grade intersections, passing through villages and built-up areas.

The point of interest is located 3km from the city of Kalamata (Asprohoma), where the Annual Average Daily Traffic (AADT) in 2018 was 28,500 vehicles. Due to the city of Kalamata’s expansion, Asprohoma is considered to belong at the Kalamata greater area. Figures 1 and 2 show the location and an aerial view of the road section under consideration.
Case Study

Crash Data History

The road in this case study has been characterised as a hazardous location and has a long history of crashes. A considerable number of crashes have been concentrated on this section over recent years, the majority of which involve vulnerable road users (mostly pedestrians), often leading to serious injuries and fatalities.

The current mixture of land uses (commercial, small industries and public services – see Figure 3) attract substantial pedestrian flows along and across the road, especially during the business operating hours. This, combined with the lack of suitable pedestrian facilities and the high operating speeds of vehicles, is considered to be the main factor associated with the high road safety risk in the area.

Design of Countermeasures

The designed countermeasures included:

- Addition of traffic signals to control the pedestrian crossing
- Road narrowing (through an island at one side of the carriageway) to reduce the available road width
- Parking prohibition along the carriageway edge
- Reinstatement or addition of road markings
- Pavement rehabilitation

The new design is shown in Figure 4.
**Case Study**

### Star Rating for Designs

Star Ratings are based on road inspection data and provide a simple and objective measure of level of safety which is ‘built-in’ to the road for vehicle occupants, motorcyclists, bicyclists and pedestrians. Five-star roads are the safest while one-star roads are the least safe. Improving the Star Rating by one star is associated on average with a halving in the crash costs per kilometre travelled for vehicle occupants and step-changes in safety benefits too for other road users.

The Star Ratings for Designs (SR4D) web app has been developed with the aim of enabling Star Rating to be easily incorporated into the road design process. The app empowers designers to assess the safety of a road design and improve its star rating before the road is constructed, thus saving lives and preventing serious injury from the outset. In this process, the road is rated as it is at present in order to provide a baseline Star Rating. The plans for the road are then examined to see which attributes of the coding will change. The coding can be changed for the entire subsection using the iRAP software platform ViDA, by using the SR4D app or by using the iRAP Demonstrator on particular parts of the sub-section to illustrate the process.

In the present case study the SR4D has been applied at the design stage in order to assess what the safety performance of the road section under design would be after the implementation of the proposed countermeasures.

Therefore, Star Rating Score (SRS – a measurement of the component parts of the risk in the iRAP model, where the higher the score, the higher the risk) has been analysed for the specific road location.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Coding in “before” situation</th>
<th>Coding from new design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder rumble strips</td>
<td>Not present</td>
<td>Present</td>
</tr>
<tr>
<td>Paved shoulder – driver-side</td>
<td>None</td>
<td>Narrow (&gt;= 0m to &lt;1.0m)</td>
</tr>
<tr>
<td>Paved shoulder – passenger-side</td>
<td>None</td>
<td>Narrow (&gt;= 0m to &lt;1.0m)</td>
</tr>
<tr>
<td>Centreline rumble strips</td>
<td>Not present</td>
<td>Present</td>
</tr>
<tr>
<td>Road condition</td>
<td>Medium</td>
<td>Good</td>
</tr>
<tr>
<td>Skid resistance / grip</td>
<td>Sealed –medium</td>
<td>Sealed - adequate</td>
</tr>
<tr>
<td>Delineation</td>
<td>Poor</td>
<td>Adequate</td>
</tr>
<tr>
<td>Pedestrian crossing facilities – inspected road</td>
<td>Unsignalised marked crossing</td>
<td>Signalised without refuge</td>
</tr>
<tr>
<td>Pedestrian crossing quality</td>
<td>Poor</td>
<td>Adequate</td>
</tr>
</tbody>
</table>

*(Table 1. Attributes coding in “before” situation and from new design)*

(Please note that in the “before” situation the pedestrian Star Rating Score is beyond the upper limit of the chart scale and so does not fully convey the risk and potentially omits some of the elements of that risk).

![Figure 5. Risk in “before” situation and from new design](image-url)

Table 1 and the “before and after” list the road attributes that have been changed in the coding and the influence (Figure 5) that these have had on various elements of the risk.
Before the application of the designed countermeasures, the Star Rating Score was 17.55 for vehicle occupants, 22.83 for motorcyclists, 1,656.77 for pedestrians and not applicable for bicyclists. The Star Rating (the simplified assessment of risk where the higher the number of stars, the safer the road) was 2 stars for vehicles occupants and 1 star for motorcyclists and pedestrians.

After the completion of the new road design, the Star Rating Score was 7 for vehicle occupants, 8.98 for motorcyclists, 66.26 for pedestrians and not applicable for bicyclists. Thus, due to the updated design of the road segment, the Star Rating was increased for all road users significantly (3 stars for vehicle occupants, 3 stars for motorcyclists and 2 stars for pedestrians).

Conclusions

In this Case Study, the Star Rating for Designs is used to illustrate how the safety performance of a specific road location can be assessed when countermeasures are proposed at the design stage. It is also proved that it is not mandatory to rely upon crash data to demonstrate a potential safety improvement.

The SR4D carried out improved the infrastructure road safety substantially and the Star Ratings were increased by one or two stars. Thus, the proposed countermeasures for the road spot under design are considered very effective.

In addition, it is concluded that Star Rating for Designs strengthens the road safety audit process, complementing it with an objective and repeatable quantification of road user risk (without the need for a high level of experience), and supports the wider potential of Star Ratings as a safety performance metric.

Therefore, any suitably trained engineer or road safety practitioner is able to carry out a design Star Rating, ensuring improved safety at the design phase of new road builds worldwide and maximized safety in road infrastructure investment.