

Maniototo Solar Farm

Glint and Glare - Traffic Effects Review

Prepared for	Helios Energy Limited
Project Number	HEL-J004
Revision	A
Issue Date	13 June 2025
Prepared by	Logan Copland, Principal Transportation Planner
Reviewed by	Mat Collins, Associate Transportation Engineer

1. Background

Helios Energy Limited (HEL) is proposing to develop a large solar farm located between Ranfurly-Naseby Road and Ranfurly Back Road near Naseby. Figure 1.1 illustrates the indicative layout of the site.

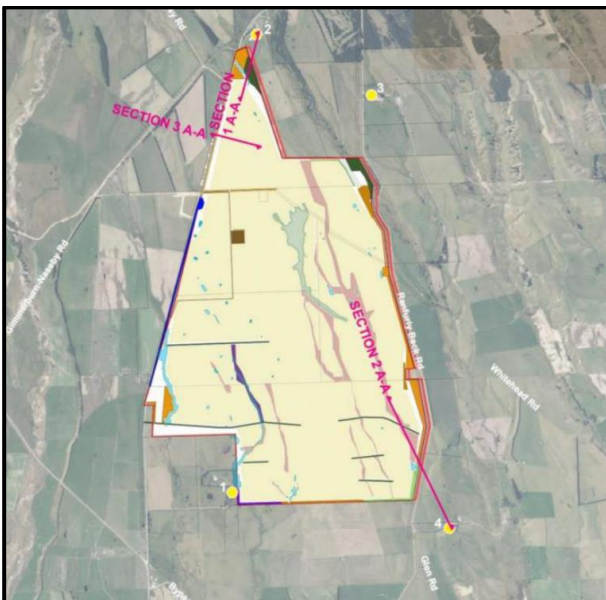


Figure 1.1 Site layout

Abley was engaged by HEL to prepare a Transport Assessment report in 2023 to support the resource consent application, which primarily focused on construction traffic impacts. We understand that following review of the resource consent application, Central Otago District Council (CODC) has requested an assessment of glint and glare effects on the safety of the adjacent transport network. This technical note describes a review of the actual and potential transportation related effects associated with glint and glare generated by the new solar panels.

1.1 Assessment method

Abley has been supplied with the following reports, prepared by others, on behalf of HEL:

- Naseby Glint and Glare study Rev 02, by ITP Renewables, dated September 2023
- Consultants' Advice Notice (CAN No. 001) - Glare Study Addendum, by ITP Renewables dated 24 June 2024
- Consultants' Advice Notice (CAN No. 001 v2) – Minimum Screening Analysis for Maniatoto Solar Farm, by ITP Renewables dated 30 April 2025.

The outputs of these reports have been reviewed insofar as they relate to potential traffic safety effects arising from glint and glare from the proposed solar panels. We have not peer reviewed these documents, as this is not within our expertise as transportation planners / engineers. In other words, we have taken the report outputs at 'face value'.

For completeness, we note that we have also been provided with (and have reviewed) the following documents.

- Further Information Required for RC 240065, from Central Otago District Council, dated 22 April 2024.
- Central Otago District Council, S95A-F Decision for RC240065, dated May 2024.
- Responses to Section 92 request for further information, by The Property Group, dated 10 May 2024
- Landscape Planting and Maintenance Plan, by Boffa Miskell, dated 28 May 2025.

2. Information Summary

Our summary of the relevant transport matters from each document is as follows:

Naseby Glint and Glare study Rev 02, by ITP Renewables, dated September 2023:

- Two mitigation options were considered
 - Option 1: backtracking rest angle limits and
 - Option 2: additional vegetation screening
- Option 1 demonstrated that a 10° rest angle fully eliminates yellow glare on all roads that were assessed
- Option 2 demonstrated that the proposed planting fully eliminates yellow glare on all roads that were assessed
- The report concludes that either Option 1 or Option 2 is suitable to mitigate yellow glare effects
- We note that the Section 3.2 of the report states that it was assumed that the height of the observation points for road users was 1.5m, however we note that driver eye heights should be assessed at 1.15m (car driver) and 2.5m (truck driver).

Consultants' Advice Notice (CAN No. 001) - Glare Study Addendum, by ITP Renewables dated 24 June 2024:

- In response to comments from Council, ITP confirmed that:
 - Only green glare effects were anticipated on roads, if the mitigation options were adopted
 - the maximum retinal irradiance caused by the green glare is less than one thousandth of viewing the sun directly
 - Green glare is considered an acceptable effect on the final approach flight path for major airports.

Consultants' Advice Notice (CAN No. 001 v2) – Minimum Screening Analysis for Maniatoto Solar Farm, by ITP Renewables dated 30 April 2025:

- ITP provided further assessment on the minimum vegetation screening extent and height that was required to avoid any yellow glare effects on roads
- It concluded that at least 3m vegetation height was required in the locations shown in Figure 2 of the report
- The assessment found that the vegetation screens (shown in Figures 1 and 2 of the assessment) need to:
 - Be at least 3m high in perpetuity, and
 - Have sufficiently dense foliage all year round to substantially interrupt the line of sight.
- It is unclear whether the Advice Note concludes that the landscaping is required in conjunction with a 10deg rest angle (Option 1 for the Naseby Glint and Glare study Rev 02, by ITP Renewables, dated September 2023).

3. Traffic Effects arising from Glint and Glare

We understand that glare effects are categorised as follows:

- Green glare, which has low potential to cause temporary after-image
- Yellow glare, which has potential to cause temporary after-image
- Red glare, which can cause retinal burn.

In our opinion, yellow glare on any part of the road network should be avoided because it results in a high risk of after-image – this is consistent with the approach taken by ITP. This means that yellow glare is a potential cause for distraction and/or visual impairment for drivers which is an obvious traffic safety risk. We recommend that all forms of yellow glare arising from the proposed solar farm on the transport network is avoided.

We understand that this will be achieved initially by ensuring that the panels are set at a rest angle of 10°, and subsequently by ensuring adequate vegetation screening is established, after which the rest angle of the panels may reduce to 0°. We are supportive of this approach. However, we note that:

- Section 3.2 of the Naseby Glint and Glare study Rev 02, by ITP Renewables, dated September 2023, states that it was assumed that the height of the observation points for road users was 1.5m, however as above we note that driver eye heights should be assessed at 1.15m (car driver) and 2.5m (truck driver). We recommend that ITP confirm whether this would change the conclusions of their assessment.
- It is unclear whether the Consultants' Advice Notice (CAN No. 001 v2) – Minimum Screening Analysis for Maniatoto Solar Farm, by ITP Renewables dated 30 April 2025 concludes that the landscaping is required in conjunction with a 10deg rest angle. Our understanding is that once the landscaping is established, there is no need to limit the rest angle. However, we recommend that ITP confirm this matter.

In our experience, from a traffic safety perspective, green glare is generally considered to be an acceptable form of residual glare particularly in non-complex transport environments. However we would typically recommend that a precautionary approach is taken to assessing the traffic safety effects of green glare in more complex traffic environments. In this regard, examples of complex traffic environments include:

- Intersections and other key road user decision-making points
- High volume roads
- Parts of the network that are prone to vehicle queuing
- Tortuous road alignments, such as vertical and horizontal curves

The estimated average annual daily traffic flows¹ and mean operating speeds² of roads affected by glare³ are detailed in Table 3.1.

Table 3.1 Estimated traffic flows on adjacent roads

Road	AADT/Year	Mean Operating Speed
Ranfurly Back Road	43vpd (estimate)/2024	87km/h
Ranfurly-Naseby Road	322vpd (estimate)/2024	33km/h
Bypass Road	162vpd (estimate)/2024	64km/h
Ranfurly-Wedderburn Road	981vpd (estimate)/2022	100km/h

Receptor	Location	Green glare (hr/yr)	Yellow glare (hr/yr)	Daily glare potential
RT01	Ranfurly Wedderburn Rd	15.8	0.0	Up to 29 minutes of green glare between 1:10 pm and 2:15 pm, from 27 May to 17 July.
RT02	Gimmerburn Naseby Rd	0.0	0.0	n/a
RT03	Brinsdon Rd	0.0	0.0	n/a
RT04	Naseby Link Rd	0.0	0.0	n/a
RT05	Fennessy Rd	0.0	0.0	n/a
RT06	Ranfurly Naseby Rd	5.6	0.0	Up to 17 minutes of green glare between 1:15 pm and 2:20 pm, from 25 May to 18 July.
RT07	Bypass Rd	15.1	0.0	Up to 37 minutes of green glare between 11:10 am and 12:00 pm, from 3 June to 10 July.
RT08	Ranfurly Back Rd	22.6	0.0	Up to 37 minutes of green glare between 11:00 am and 12:25 pm, from 18 May to 26 July.
RT10	Glen Rd	4.0	0.0	Up to 13 minutes of green glare between 11:10 am and 11:45 am, from 3 June to 9 July.
Total		82.3	0.0	

Figure 3.1 Extent of glare on road network once vegetation is fully established⁴

In our opinion, the traffic related effects of green glare on the affected roads are acceptable. In the case of Ranfurly Back Road, Ranfurly-Naseby Road and Bypass Road, all of these roads are low volume roads with generally gentle alignments, low intersection density, and good safety records⁵. Although Ranfurly-Wedderburn Road is a state highway, it similarly is not considered particularly complex, and still has relatively low traffic flows.

On that basis, we expect that the effects of green glare are unlikely to be noticeable and in any event are unlikely to adversely affect the safety performance of the surrounding transport network.

We understand that there are uncertainties in accurately predicting glare impacts ahead of time and therefore consider that a condition of consent that allows an adaptive approach is appropriate. We recommend that the following condition of consent is applied:

¹ Sourced from MobileRoad <https://www.mobileroad.org/desktop.aspx>

² Sourced from MegaMaps

https://spatial.nzta.govt.nz/apps/megamaps/?data_id=widget_105_output_config_2%3A0%2CdataSource_2-SpeedManagementFramework-MeanOperatingSpeeds-Operating_Speeds%3A67231

³ Note that we have included those roads listed in Table 2 of the 2025 ITP addendum, as those are roads that are understood to receive green glare when the vegetation is fully established, and the panels are reverted to a 0° rest angle.

⁴ ITP Consultants, Consultant's Advice Note, 30 April 2025, pp 1

⁵ Refer to our 2023 Transportation Assessment.

Glint and Glare Adaptive Management Plan

The Consent Holder must prepare and implement a Glint and Glare Adaptive Management Plan (GGAMP) to address any substantiated adverse glint and glare impacts on affected parties and/or the surrounding road network as identified in the Naseby Glint and Glare study Rev 02, by ITP Renewables, dated September 2023. The GGAMP must include the following:

- (a) Details of mitigation to be established in line with the Naseby Glint and Glare study Rev 02, by ITP Renewables, dated September 2023 and updated by the following documents:*
 - i. Consultants' Advice Notice (CAN No. 001) - Glare Study Addendum, by ITP Renewables dated 24 June 2024*
 - ii. Consultants' Advice Notice (CAN No. 001 v2) – Minimum Screening Analysis for Maniatoto Solar Farm, by ITP Renewables dated 30 April 2025.*
 - iii. Landscape Planting and Maintenance Plan, by Boffa Miskell, dated 28 May 2025*
- (b) Contact Information: The GGAMP must provide contact details for the Consent Holder and their agent responsible for addressing glint and glare complaints, ensuring that affected parties have a direct line of communication for reporting issues.*
- (c) Reporting Procedures: The plan must include procedures for reporting glint and glare issues by affected parties, including Road Controlling Authorities for any road network affected by "Yellow glare" or "Green glare". This includes:*
 - i. The process for lodging a complaint.*
 - ii. The timeline within which the Consent Holder must acknowledge receipt of the complaint.*
 - iii. A detailed timeline for the investigation and response process, ensuring that any substantiated glare issues reported are addressed promptly and effectively within a specified timeframe.*
 - iv. Adaptive Management Strategies: The GGAMP should detail a range of possible mitigation solutions to address reported glint and glare issues. These solutions may include but are not limited to, physical alterations to the solar farm setup, installation of screening or landscaping to block or diffuse glare, and adjustments to the operational procedures of the solar farm (such as tracking management).*
- (d) Monitoring and Evaluation: The Consent Holder must implement a monitoring regime to assess the effectiveness of the mitigation measures implemented under the GGAMP, including any road affected by "Yellow glare" or "Green glare". This includes feedback from affected parties on the resolution of reported glare issues.*
- (e) Duration of the Plan: Unless otherwise authorised by the Consent Authority, the GGAMP must be implemented for whichever is the greater duration of the following:*
 - i. A period of three years following the mitigation planting obtaining the minimum height required by (a) above; or*
 - ii. For a year following any remedial action undertaken.*

During this period, the Consent Holder is obligated to respond to and manage glint and glare complaints as per the procedures outlined in the GGAMP.
- (f) Review and Reporting: The Consent Holder must submit an Annual Report to the Consent Authority if requested, summarising the glint and glare complaints received,*

actions taken, and the effectiveness of the mitigation measures implemented. The Annual Report may also recommend whether ongoing management of glint and glare issues is required along with any relevant supporting information.

Advice Note

An adaptive management plan offers a flexible and responsive approach to managing glint and glare that may arise from the approved solar farm, recognising the inherent challenges and uncertainties in accurately predicting glare impacts ahead of time. This approach allows for real-time monitoring and addressing of actual impacts as they occur, rather than relying solely on predictive models that may not fully capture the dynamic and variable nature of sunlight and its interactions with the environment. By focusing on adaptive measures, the plan can more efficiently respond to affected parties' concerns, ensuring that mitigation strategies are directly tailored to the specific conditions and experiences of those impacted

4. Summary

We have reviewed the information relating to the likely extent of glint and glare arising from the proposed Maniototo Solar Farm on the surrounding road network. In our opinion, yellow glare effects should be avoided within the road network, and we understand that the mitigation proposed by ITP achieves this outcome. We have assessed the green glare effects within the road and consider these to be acceptable.

However, we note that:

- Section 3.2 of the Naseby Glint and Glare study Rev 02, by ITP Renewables, dated September 2023, states that it was assumed that the height of the observation points for road users was 1.5m, however we note that driver eye heights should be assessed at 1.15m (car driver) and 2.5m (truck driver). We recommend that ITP confirm whether this would change the conclusions of their assessment
- It is unclear whether the Consultants' Advice Notice (CAN No. 001 v2) – Minimum Screening Analysis for Maniototo Solar Farm, by ITP Renewables dated 30 April 2025 concludes that the landscaping is required in conjunction with a 10deg rest angle. Our understanding is that once the landscaping is established, there is no need to limit the rest angle. However, we recommend that ITP confirm this matter.

If the panel is of a mind to grant consent, we recommend that a condition of consent be imposed that requires the Consent Holder to prepare and implement a Glint and Glare Adaptive Management Plan, to address the uncertainties in accurately predicting glare impacts ahead of time and allow further mitigation measures to be undertaken should unacceptable glare effects arise.

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Mānīatoto Solar Farm Glint and Glare - Traffic Effects Summary

1 message

Logan Copland <logan.copland@abley.com>

Tue, Jul 1, 2025 at 3:57 PM

To: Sarah Brooks <sbrooks@heliosenergy.co.nz>

Cc: Mat Collins <mat.collins@abley.com>, Mishka Banhidi <mbanhidi@propertygroup.co.nz>

Hi Sarah

I have reviewed the 'Response to Mānīatoto Solar Farm Glint and Glare Traffic Effects Review' prepared by ITP Renewables dated 01 July 2025. Following this, I now understand that the 10-degree limitation on backtracking and the areas/heights of planting as shown in Figure 2 of the ITP Minimum Screening Assessment for Maniatoto Solar Farm (dated April 2025) are required to eliminate all forms of yellow glare from the road network. However, in other areas, I understand that once the vegetation reaches a certain height, the 10-degree rest angle restriction may not be required to achieve that outcome. I am not sure what that height is, but consider it is appropriate from a transport perspective for consent conditions to enable a pathway that enables the applicant flexibility to demonstrate this at some stage in the future (via an appropriate modelling methodology).

I understand that during construction the solar panels will be stowed, and it is therefore from the first date of operation that the panels will begin tracking the sun and the limitation on backtracking/landscaping must be implemented to avoid yellow glare on the road network.

Based on this understanding, from a transport perspective, I recommend conditions of consent that require:

- Prior to the commencement of operation of the solar farm, the planting as shown in Figure 2 of the Minimum Screening Analysis for Maniatoto Solar Farm dated 30 April 2025 are implemented at a height of at least 3m, and
- A rest angle of 10 degrees must be implemented until such time the applicant can sufficiently demonstrate the vegetation / landscape screening has established to a point that is sufficient to eliminate yellow glare from the road network.

I hope that this is helpful.

Regards
Logan

Logan Copland BA, MPlan, MNZPI

Principal Transportation Planner



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