



Lime Down

Solar Park

Applicant's Response to Lead Local Flood Authority on Hydraulic Modelling Requirements

**May 2026
Revision 1**

Planning Inspectorate Reference: EN010168

Document Reference: EXAM/9.28

The Infrastructure Planning (Examination Procedure) Rules 2010

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1 Introduction

- 1.1.1 The following report has been produced in response the **Statement of Common Ground (SoCG) with Wiltshire Council (Rev 1) [EN010168/EXAM/8.2]** in their position as Lead Local Flood Authority (LLFA) which requests further field-scale quantitative hydrological assessment to demonstrate flood risk outcomes. The Applicant has engaged with Wiltshire Council on multiple occasions as to why this is not considered appropriate nor proportionate for the Scheme and details these records of engagement below for consideration by the Examining Authority.
- 1.1.2 It is noted that the approach reported in the submitted application documents was the agreed approach that was discussed with and supported in principle by the LLFA's technical adviser at the meetings on 27 February 2025 and 27 May 2025 and that the first request for field-scale quantitative hydrological assessment was not raised with the Applicant until February 2026 following the submission of the application documents in September 2025.
- 1.1.3 **Section 2** responds to an action from the meeting held between the Applicant and the LLFA held 12 February 2026 which requested "LDSP to provide Wiltshire Council with research and evidence supporting the Environmental Statement conclusions on solar development and runoff."
- 1.1.4 **Section 3** responds to 'LLFA Hydraulic Modelling Requirement – Lime Down Solar Park note' received from the LLFA on 24 March 2026 provided in **Annex A**.

2 Letter Dated 20 February 2026

20th February 2026

Dear [REDACTED]

- 1.1.1 Thanks again for the helpful discussion on 12 February. As agreed under Action 1, I have set out the relevant national policy position, the peer reviewed evidence base, and how we have applied this within the Lime Down ES and FRA suite.
- 1.1.2 You asked, in effect, whether larger panels could “channelise” runoff and whether this should be demonstrated through numerical modelling for the panel fields. The key point from both policy and the literature is that panels can redistribute rainfall locally (drip-lines), but whether that translates to a meaningful change at field boundary is governed by ground condition (cover, compaction, connectivity), which is controlled through scheme design and secured management measures, rather than by treating panel rows as a connected impermeable surface.
- 1.1.3 National policy position (NPS EN-3 and EN-1)
- 1.1.4 NPS EN-3 (January 2024) includes solar-specific drainage text at paragraphs 3.10.75 to 3.10.77. Paragraph 3.10.75 states: “As solar PV panels will drain to the existing ground, the impact will not, in general, be significant.”
- 1.1.5 Paragraph 3.10.76 then points to permeable access tracks and localised SuDS “where recommended”, and paragraph 3.10.77 emphasises the temporary nature of solar PV farms and the importance of configuring sites to avoid impacts on existing drainage systems and watercourses.
- 1.1.6 NPS EN-1 sets the decision-making outcome test, namely that surface water runoff should be managed so that volumes and peak rates leaving the site are not increased compared with the pre-development condition (accounting for climate change), with the approach proportionate to the nature and risk profile of the scheme.
- 1.1.7 How this is applied at Lime Down (i.e. what is assessed quantitatively, and what is controlled through secured measures)
- 1.1.8 At Lime Down we have separated genuinely impermeable or engineered infrastructure from panelled fields, because the mechanisms and risk controls are different.

Panelled fields

- Panels are mounted above ground and drain to the ground beneath rather than being sealed into a drainage network, consistent with the EN-3 premise and the scheme design parameters.
- The principal risk pathway for panel fields is soil and vegetation condition (construction compaction, bare ground, preferential flow connectivity). That pathway is managed through secured measures rather than by assuming the panelled areas behave like a connected hardstanding.

Hardstanding infrastructure

- Substations, BESS, permanent hardstanding, access tie-ins and any other genuinely impermeable areas are treated as discrete catchments and are subject to quantitative drainage design within the FRA and Drainage Strategy suite (including attenuation and controlled discharge where required).

Baseline context

- The baseline across much of the order limits is agricultural arable land. That baseline includes regular trafficking, seasonal bare ground and tramlines, which are recognised controls on runoff generation and connectivity. The FRA appendices describe the existing land use and flood risk context at each parcel.

Embedded Mitigation

- Construction phase: controls on plant/trafficking and working practices, plus post-construction remediation where required, targeting the compaction pathway (this is consistent with the approach previously discussed with EA on proportionality and the limits of blanket modelling).
- Operational phase: establishment and maintenance of permanent ground cover beneath and between arrays, avoiding sustained bare soil conditions and maintaining infiltration capacity.
- Layout and access: permeable track construction and cross-drainage to avoid creating connected preferential flow paths, consistent with EN-3.

Peer reviewed evidence base (summary table)

1.1.9 The table below focuses on studies that directly address runoff response under solar arrays and, importantly, identify what actually drives increased peak flow when it occurs.

| Study | Conclusions and implications for Lime Down |
|------------------------|--|
| Cook & McCuen (2013) | Under maintained grass cover, modelled changes in runoff volume and peak discharge were negligible (generally sub-1%). Where ground cover degraded to gravel or bare soil, peak flows increased substantially. For Lime Down this supports the position that ground condition controls the outcome, so the correct control is permanent vegetation and avoiding compaction and bare ground, not treating arrays as connected impermeable area. |
| Yavari et al. (2022) | Impacts are site-specific and management dependent. Emphasises minimising compaction and maintaining perennial cover and notes evidence gaps. For Lime Down this supports presenting the conclusion as conditional on secured construction and operational controls (CEMP, soil management, vegetation establishment), rather than an absolute “no effect” statement. |
| Gullotta et al. (2023) | Minimal change under maintained conditions. Peak flow increases were associated with reductions in surface roughness, consistent with vegetation degradation and compaction. For Lime Down this reinforces that the risk pathway is deterioration in ground condition over time and should be addressed through enforceable maintenance and soil and vegetation controls rather than a one-off hydraulic model. |
| Elamri et al. (2018) | Identifies sheltered zones and drip-line concentration zones; bare soil at drip-lines increases erosion and runoff risk. For Lime Down this supports avoiding bare ground and maintaining grass cover, including at drip-lines, which is secured through the operational land management approach. |
| Wang & Gao (2023) | Panels did not materially increase runoff volume or peak flow under the tested conditions and reduced erosion due to interception effects. While soil types differ to the UK, for Lime |

| | |
|-------------------------|---|
| | Down it supports the point that panels do not automatically behave like conventional hardstanding and that runoff and erosion response is not inherently worse where vegetation is maintained. |
| Baiamonte et al. (2023) | Concentrated drip-line flow on bare soil generated substantially higher peak discharge than a vegetated comparator. For Lime Down this is best treated as a warning case showing why bare and compacted ground must be avoided. It is not representative of a grassed, gently sloping UK operational condition and reinforces the importance of vegetation establishment and maintenance. |

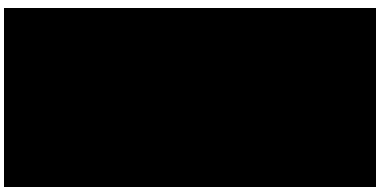
1.1.10 A bespoke field-scale hydrological model for the panel fields would require assumed values for runoff coefficients, surface roughness, soil compaction and flow connectivity across the operational lifetime. The evidence summarised above shows that these management-dependent parameters are the primary drivers of any change in runoff response. In that context, model outputs would be highly sensitive to assumed future ground condition and could imply a level of certainty that is not supported by the underlying mechanism.

1.1.11 For Lime Down, the proportionate approach is therefore to secure the variables that govern runoff response in practice. The Application does this through embedded mitigation and requirement-led control of construction and operation, including soil protection and reinstatement measures set out within the Outline CEMP and Outline Soil Resources Management Plan, and permanent ground cover establishment and maintenance beneath and between arrays through the Outline LEMP. In parallel, impermeable infrastructure, including substations, the BESS and hardstanding, is treated separately as impermeable catchment and subject to quantitative drainage design within the FRA and Drainage Strategy suite.

1.1.12 This approach and the associated development of mitigation and reporting of effects has previously been discussed and agreed with Wiltshire Council in meetings held between 11 November 2024 to DCO submission in September 2025. This risk-led approach is also consistent with established solar NSIP practice, where panel areas are typically assessed qualitatively with secured land management controls, and quantitative drainage design is focused on hard infrastructure and any defined, location-specific risk drivers or sensitive receptors.

1.1.13 The Applicant considers the assessment approach within the ES and FRA suite to be proportionate, policy-aligned and technically robust, consistent with NPS EN-3 paragraphs 3.10.75 to 3.10.77.

Kind Regards,



Associate Director, Environmental Assessment

3 Applicant response to 'LLFA Hydraulic Modelling Requirement – Lime Down Solar Park note' dated 24 March 2026

Lime Down Solar Park

Applicant's Response to Wiltshire Council
Lead Local Flood Authority Note on
Hydraulic Modelling Requirements

Prepared by: Arthian
For: Lime Down Solar Park Ltd
Site: Lime Down

Date: 30/04/2026
Document Ref: EN010168
Issue-01

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1. Introduction

- 1.1.1 This note has been prepared by Arthian on behalf of Lime Down Solar Park Limited (“the Applicant”). It responds to the note issued by Wiltshire Council Lead Local Flood Authority (LLFA) on 24 March 2026, titled Limedown Solar Park’s hydraulic modelling requirements (“the LLFA Note”). The LLFA Note was authored by Rohit Singh, Principal Technical Officer Drainage Planning, and was issued in response to the Applicant’s Action 1 submission of 20 February 2026.
- 1.1.2 The LLFA Note concludes that the LLFA requires “full field-scale hydrological modelling of panel areas, ground conditions, access tracks and connectivity pathways” to demonstrate compliance with National Policy Statement EN-1. It relies on four propositions: that the Applicant has selectively interpreted NPS EN-3 and ignored NPS EN-1; that UK-specific evidence contradicts the Applicant’s approach; that UK case studies demonstrate real-world runoff issues at solar farms; and that NSIP precedent establishes modelling of panel areas as normal practice.
- 1.1.3 The Applicant does not accept these propositions. The position set out in this note is that:
- The requested modelling is not required by national policy. NPS EN-1 requires a flood risk assessment that is proportionate to the risk and appropriate to the scale, nature and location of the project. It does not prescribe any specific assessment methodology. NPS EN-3 confirms that solar PV panels drain to the existing ground and the impact on drainage will not, in general, be significant;
 - The requested modelling is not supported by the evidence cited in the LLFA Note. None of the ten sources referenced by the LLFA establishes a requirement for field-scale hydraulic modelling of solar panel areas. Three of the four cited local authority guides treat panel areas as effectively permeable. The two NSIP precedents relied upon do not include hydraulic modelling of panel areas. Two of the four case studies are mischaracterised. One cited academic reference has not been located;
 - The requested modelling is not necessary to achieve the outcome required by policy. The factors that control surface water runoff from panel areas (soil compaction, vegetation cover, and flow connectivity) are management-dependent variables, not fixed design parameters. They are addressed through embedded mitigation secured by DCO Requirement. Modelling these factors would rely on assumed inputs and would not materially improve the assessment; and
 - The requested modelling is not consistent with the consultation record. The assessment approach was discussed with the LLFA and its technical adviser at meetings held on 5 November 2024, 27 February 2025, and 27 May 2025. At each of those meetings, the approach was supported in principle. Field-scale modelling of panel areas was not identified as a requirement.



2. Policy and Assessment Framework

2.1 The versions of the National Policy Statements designated in January 2024 apply to the Scheme, with the revised versions designated in January 2026 an important and relevant consideration. Except where otherwise stated, any references to the NPSs below are to the January 2024 versions.

2.2 NPS EN-1

2.2.1 The Overarching NPS for Energy (EN-1), sets the decision-making framework for flood risk at energy NSIPs at Section 5.8. EN-1 paragraph 5.8.14 requires the Flood Risk Assessment to “identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account.”

2.2.2 EN-1 paragraph 5.8.15 sets out the minimum requirements for a Flood Risk Assessment. The first of these is that the assessment must:

“be proportionate to the risk and appropriate to the scale, nature and location of the project.”

2.2.3 Further requirements at paragraph 5.8.15 address climate change allowances, the vulnerability of site users, the quantification of different flood types, residual risk, and surface water drainage. On surface water specifically, the paragraph requires the FRA to “set out proposals for managing and discharging surface water from the site using sustainable drainage systems and accounting for the predicted impacts of climate change.”

2.2.4 EN-1 Section 5.8 does not prescribe any specific assessment methodology. It does not refer to hydraulic modelling, hydrological modelling, or field-scale modelling as a condition of a compliant FRA. The policy requirement is an outcome: that the development is safe, that it will not increase flood risk elsewhere, and that residual risk is managed. The choice of method by which that outcome is demonstrated is a matter for the applicant to justify on a proportionate basis.

2.3 NPS EN-3

2.3.1 The NPS for Renewable Energy Infrastructure (EN-3) provides technology-specific policy for solar PV within the EN-1 framework. The relevant surface water provisions for solar PV are at paragraphs 2.10.84 to 2.10.88. Paragraph 2.10.84 states:

“Where a Flood Risk Assessment has been carried out this must be submitted alongside the applicant’s ES. This will need to consider the impact of drainage. As solar PV panels will drain to the existing ground, the impact will not, in general, be significant.”

2.3.2 Paragraph 2.10.85 directs that permeable tracks should be used and that localised Sustainable Drainage Systems should be used to control runoff where recommended. Paragraph 2.10.78 provides that, given the temporary nature of solar PV farms, sites should be configured to avoid the need to impact existing drainage systems and watercourses. Paragraphs 2.10.87 and 2.10.88 address the avoidance of culverting.

2.3.3 The LLFA Note cites “EN-3 paragraph 3.10.75” as the source of the Applicant’s reliance on the “impact



will not, in general, be significant” position. No version of the designated NPS EN-3 uses Section 3.10 numbering for solar PV provisions. The relevant provisions are at Section 2.10, as set out above.

2.3.4 **Note on paragraph numbering in submitted documents:** The FRA and Drainage Strategy Covering Report [APP/6.3, Appendix 11-1, Section 2.2.25] references these provisions as paragraphs 2.10.84 to 2.10.88. On review, the Applicant confirms that the correct paragraph references in the designated January 2024 EN-3 are paragraphs 2.10.84 to 2.10.88. The quoted policy text in the submitted documents is accurate. It is only the paragraph numbers that require correction, and this will be addressed through the Examination process.

2.3.5 NPS EN-3 does not prescribe hydraulic modelling of panel areas. Paragraph 2.10.84 establishes, as a matter of national policy, that solar PV panels drain to the existing ground and the impact will not, in general, be significant. This establishes the policy context within which the proportionality of any additional assessment of panel areas is judged.

2.4 Environment Agency Guidance on Modelling for FRAs

2.4.1 The Environment Agency’s published guidance Using modelling for flood risk assessments (GOV.UK, December 2023) states:

“You may need to use hydraulic modelling to produce a detailed FRA, depending on the scale, type, vulnerability classification and location of your development.”

2.4.2 The guidance advises applicants to check what existing data and models are available before commissioning new modelling. The operative language is “may need” and “depending on.” The guidance does not establish a blanket requirement for hydraulic modelling at large developments. The need for modelling is conditional on the scale, type, vulnerability classification, and location of the specific development. It must be proportionate to the risk.

2.5 Summary of Policy Position

2.5.1 The policy framework applicable to the Scheme therefore comprises:

- a requirement at EN-1 paragraph 5.8.15 for a proportionate FRA demonstrating no increase in flood risk elsewhere;
- a policy position at EN-3 paragraph 2.10.84 that solar PV drainage impacts will not, in general, be significant; and
- EA guidance confirming that the need for hydraulic modelling is conditional and proportionate, not absolute. Nothing in this framework prescribes, requires, or establishes as expected practice the field-scale hydraulic modelling of solar panel areas.



3. Assessment Approach

3.1 The Three-Part Framework

3.1.1 The assessment approach adopted at Lime Down Solar Park distinguishes between three categories of flood risk and surface water consideration, each of which is addressed through a method proportionate to the mechanism involved:

- **Fluvial flood risk to the Scheme** (the risk to the development from watercourse flooding) is assessed using published Environment Agency flood mapping across the Order Limits, supplemented by site-specific hydraulic modelling at the Gauze Brook corridor (Lime Down D), and Manning's open-channel flow calculations for minor watercourses where no modelled EA data is available;
- **Surface water drainage from impermeable infrastructure** (the risk posed by genuinely impermeable elements of the Scheme) is assessed quantitatively. Greenfield runoff rates are calculated using the ReFH2 method. Attenuation storage is sized for all return periods up to and including the 1 in 100 year plus climate change event. Discharge rates are restricted to 70% of the equivalent greenfield rate, in line with Wiltshire Council's betterment policy; and
- **Surface water runoff response of panel areas** is managed through embedded mitigation controlling the actual risk pathways of soil compaction, vegetation cover, and flow connectivity. These are secured by DCO Requirement through the Outline CEMP [APP/7.12], the Outline SRMP [APP/7.15], the Outline LEMP [APP/7.18], and the Outline OEMP [APP/7.13].

3.1.2 This three-part framework is reported in full in ES Chapter 11: Hydrology, Flood Risk and Drainage [APP/6.1] and in the FRA and Drainage Strategy suite [APP/6.3, Appendices 11-1 to 11-9].

3.2 Technical Basis for the Treatment of Panel Areas

3.2.1 Solar PV panels are elevated on frames above ground level. They intercept vertical rainfall and redistribute it spatially, concentrating some precipitation at drip-line locations along panel edges and reducing direct rainfall beneath the panels themselves. Approximately the same total volume of precipitation reaches the ground within the site boundary. Panels are not sealed into a drainage network. They do not function as impermeable hardstanding. They do not obstruct horizontal surface water flow across the ground surface. This physical reality is the basis for the policy position at NPS EN-3 paragraph 2.10.84.

3.2.2 Whether spatially redistributed rainfall generates any increase in runoff compared to the agricultural baseline depends on four factors. These are:

- **ground cover condition:** whether permanent vegetation is established and maintained beneath and between arrays, preventing bare soil exposure and absorbing drip-line energy;
- **soil structure and compaction:** whether construction activity has degraded the soil's infiltration capacity, and whether any such degradation has been remediated;
- **flow connectivity:** whether access tracks, infrastructure bases, or other elements have created preferential flow paths connecting panel areas to the wider drainage network; and
- **existing baseline conditions:** the current agricultural land use of the Order Limits, which includes



regular trafficking by farm machinery, seasonal bare ground, ploughed surfaces, and tramlines, all of which influence runoff generation in the pre-development scenario.

3.2.3 Each of these four factors is a management-dependent variable. None is a fixed physical property of the Scheme that can be modelled as a static input. Ground cover will vary according to the vegetation establishment and maintenance regime. Soil compaction will vary according to construction practice, the specification of plant, and post-construction remediation. Flow connectivity will depend on the detailed design of tracks and infrastructure. Baseline conditions will vary seasonally and over the lifetime of the Scheme.

3.2.4 The Applicant's approach targets these four factors directly through embedded mitigation secured by DCO Requirement:

- Soil protection and post-construction remediation are secured through the Outline CEMP [APP/7.12] and Outline SRMP [APP/7.15]. The specification includes light plant and low ground pressure vehicles, confined trafficking routes, temporary drainage during construction, and post-construction soil remediation where compaction has occurred.
- Permanent ground cover beneath and between arrays is secured through the Outline LEMP [APP/7.18]. The specification includes wildflower and grass planting at drip-line locations to absorb concentrated rainfall energy and to maintain infiltration capacity.
- Access tracks are specified as permeable, constructed at existing ground level, with cross-drainage to prevent the creation of preferential flow paths. Track specification is secured through the Outline CEMP [APP/7.12].
- Overland flow paths are preserved through at-grade design. No bunding or obstruction of surface water flow routes is proposed.

3.3 Why Field-Scale Modelling of Panel Areas is Not Considered Necessary or Proportionate

3.3.1 A hydrological or hydraulic model of solar panel fields would require assumed input values for runoff coefficients, surface roughness, soil infiltration rate, and flow connectivity, applied across the operational lifetime of the Scheme. These are the same four management-dependent variables identified at paragraph 3.4 above. They are not fixed design parameters of the development in the way that pipe diameter, storage volume, or controlled discharge rate are fixed parameters of a drainage system.

3.3.2 A model of panel fields would therefore not represent a physical property of the Scheme. It would represent an assumed future ground condition. The model outputs would be sensitive to the modeller's assumptions about the effectiveness of management measures over time, rather than to any independent feature of the development. Modelling would not materially improve the assessment of flood risk beyond what is achieved by securing and enforcing the management measures themselves through DCO Requirement.

3.3.3 This is not a "qualitative-only" approach. It is a risk-led approach that targets the controlling mechanism directly. Quantitative assessment has been undertaken where the mechanism supports it: at Gauze Brook, where site-specific hydraulic modelling has been completed; for minor watercourses, where Manning's open-channel calculations have been applied; and for all genuinely impermeable infrastructure within the Scheme, where ReFH2-based drainage design has been undertaken with attenuation and controlled discharge.



3.3.4 The assessment approach is internally consistent across the submitted application suite. It is set out in ES Chapter 11 [APP/6.1], in the FRA Covering Report [APP/6.3, Appendix 11-1], and in each of the site-specific FRA and Drainage Strategy appendices. It is supported by and secured through the Outline CEMP [APP/7.12], Outline SRMP [APP/7.15], Outline LEMP [APP/7.18], and Outline OEMP [APP/7.13].



4. Consultation History

4.1.1 The Applicant has engaged with Wiltshire Council LLFA on flood risk, drainage, and surface water matters through a series of meetings and consultation exchanges from October 2024 to February 2026. The assessment approach for panel areas was discussed in full at those meetings. The position now advanced in the LLFA Note of 24 March 2026 was not raised at any of the earlier meetings and represents a departure from positions supported in principle at that time.

4.1.2 The relevant consultation history is summarised in Table 4-1 below.

Table 4-1: Consultation History

| Date | Forum | Key Outcomes |
|-------------|--------------------------------------|--|
| 11 Oct 2024 | EA meeting | Environment Agency agreed that blanket modelling across the entire Scheme was not required. Modelling to be targeted to specific areas of identified risk. |
| 5 Nov 2024 | LLFA meeting | Scoping discussion with ██████████ (Atkins, for LLFA), and ██████████. The approach to targeted modelling, proportionate assessment, and reliance on embedded mitigation for panel areas was outlined. No requirement for panel-field modelling was raised by the LLFA. |
| 27 Feb 2025 | LLFA meeting | ██████████ (Atkins, for LLFA) stated that it was “not sensible to request modelling for whole site.” The literature position that solar panels do not cause detrimental runoff impact where properly managed was supported. The Applicant’s soil compaction management approach was supported in principle. |
| 27 May 2025 | LLFA meeting | ██████████ (Atkins, for LLFA) supported the passive infiltration approach for panel areas. The LLFA confirmed that further testing or interim remediation detail was not needed at this stage and that the approach was proportionate. The 70% betterment approach for impermeable infrastructure was supported. |
| 12 Feb 2026 | LLFA Relevant Representation meeting | ██████████ attended on behalf of Wiltshire Council. Action 1 agreed: Applicant to provide the supporting evidence base for the ES conclusions on solar development and runoff. |
| 20 Feb 2026 | Action 1 response | Applicant submitted its Action 1 response, setting out the national policy position, the peer-reviewed evidence base, and the application of these to the Lime Down ES and FRA suite. |
| 24 Mar 2026 | LLFA Note | ██████████ issued the LLFA Note requiring “full field-scale hydrological modelling of panel areas.” This represents a departure from positions supported in principle at the 27 February 2025 and 27 May 2025 meetings. |

4.1.3 The approach reported in the submitted application documents is the same approach that was discussed with and supported in principle by the LLFA’s technical adviser at the meetings on 27 February 2025 and 27 May 2025. No new site-specific information, no new evidence, and no new policy



development has been identified by the LLFA in the March 2026 Note as prompting the change in position.



5. Applicant's Response to the LLFA Note

This section provides the Applicant's response to each of the substantive points raised in the LLFA Note. The LLFA's comment is reproduced in full or in substance. The Applicant's response follows.

5.1 Interpretation of NPS EN-3 and NPS EN-1

LLFA Comment:

5.1.1 *The Applicant selectively interprets EN-3 and ignores EN-1. The Applicant relies heavily on EN-3 paragraph 3.10.75 ('in general...the impact will not be significant'). However, they ignore the binding requirement in EN-1, which states that developers must demonstrate that surface water runoff rates and volumes will not increase following development.*

Applicant's Response:

5.1.2 This characterisation of the Applicant's position is not accepted.

5.1.3 The Applicant has not ignored NPS EN-1. ES Chapter 11 [APP/6.1] addresses EN-1 Section 5.8 directly. The FRA and Drainage Strategy Covering Report [APP/6.3, Appendix 11-1, Section 2.2] addresses each EN-1 requirement in turn, including paragraphs 5.8.14 and 5.8.15. The consultation summary at ES Chapter 11 Table 11-1 records the Applicant's responses to LLFA comments on EN-1 compliance including the Sequential Test, surface water management, climate change allowances, and quantitative drainage design for impermeable infrastructure.

5.1.4 The Action 1 response of 20 February 2026 cited NPS EN-3 because the LLFA's specific question at the 12 February 2026 meeting concerned the runoff behaviour of panelled areas. NPS EN-3 provides the relevant technology-specific policy for that question. Citing EN-3 in answer to a question about panel drainage does not constitute ignoring EN-1.

5.1.5 The LLFA Note cites "EN-3 paragraph 3.10.75" as the source of the "not, in general, be significant" statement. No version of the designated NPS EN-3 uses Section 3.10 numbering for solar PV provisions. The relevant provisions are at paragraphs 2.10.84 to 2.10.88 of the January 2024 EN-3.

5.1.6 EN-1 does not prescribe the means by which the outcome of no increase in flood risk must be demonstrated. EN-1 paragraph 5.8.15 requires the FRA to be "proportionate to the risk and appropriate to the scale, nature and location of the project." The Applicant demonstrates compliance through (i) quantitative drainage design for impermeable infrastructure with attenuation and controlled discharge; (ii) secured management of the factors that govern runoff response in panel areas; and (iii) preservation of existing overland flow paths through at-grade permeable track design. This is a complete and policy-compliant response to EN-1 Section 5.8.

5.2 The "Qualitative-Only" Characterisation

LLFA Comment:



5.2.1 *The Applicant asserts that modelling is not typical NSIP practice and that a qualitative approach is proportionate. This assertion is incorrect.*

Applicant's Response:

5.2.2 The characterisation of the Applicant's approach as "qualitative-only" is not accurate and is not accepted.

5.2.3 Quantitative assessment has been undertaken throughout the Scheme. Greenfield runoff rates have been calculated using the ReFH2 method. Attenuation storage has been sized for all return periods up to and including the 1 in 100 year plus climate change event. Post-development discharge rates have been restricted to 70% of the equivalent greenfield rate for all return periods, in line with Wiltshire Council's betterment policy [APP/6.3, Appendix 11-6, Table 1]. Site-specific hydraulic modelling has been undertaken at the Gauze Brook corridor [APP/6.3, Appendix 11-6, paragraph 2.3.8]. Manning's open-channel flow calculations have been applied to minor watercourses where no EA modelled data is available [APP/6.3, Appendix 11-6, paragraph 2.3.11].

5.2.4 The distinction drawn by the Applicant is between the assessment methods appropriate to different categories of risk pathway. For defined watercourse corridors and impermeable infrastructure, quantitative design has been undertaken. For panel areas, where the risk pathway is the management-dependent condition of the ground surface, the controlling variables are secured through enforceable management measures rather than modelled using assumed inputs. This is a risk-led approach that targets the mechanism. It is not the absence of quantitative assessment.

5.3 The Cited Local Authority Guidance (Doncaster, Essex, Norfolk)

LLFA Comment:

5.3.1 *LLFA Guidance shows modelling IS required. Doncaster LLFA explicitly requires modelling where slopes or large site areas are present. The Essex Design Guide confirms that solar farms require SuDS and drainage modelling. Norfolk County Council LLFA warns that hydrological assessment is required for PV arrays.*

Applicant's Response:

5.3.2 None of the three cited local authority guidance documents establishes a requirement for hydraulic modelling of solar panel areas. Each is addressed at Section 6 below and in summary here.

5.3.3 **Doncaster Council LLFA Solar Farm Drainage Strategy Advice (2024).** This document is a twelve-point advisory note. It requires a drainage strategy, vegetation maintenance, and consideration of slopes and soil types. It does not require, mention, or refer to hydraulic modelling at any point. Point 4 of the document requires developers to "consider the soil type and slope angle" of a proposed site. The operative word is "consider," not "model." The characterisation in the LLFA Note is not supported by the text of the Doncaster document. The document is local standing advice issued by Doncaster Council for development within its own administrative area. It has no application in Wiltshire.

5.3.4 **Essex Design Guide, Solar Array Development (2025).** The Essex Design Guide recognises, citing Cook



and McCuen (2013), that the introduction of solar panel cover results in a runoff increase of 0.35%. It describes solar farms as “relatively low risk in relation to surface water flooding” subject to appropriate mitigation. It recommends a surface water drainage strategy and a land management plan. It does not require hydraulic modelling of panel areas. Its substantive recommendations (SuDS, vegetation maintenance, land management) are consistent with the approach adopted at Lime Down. The document is local design guidance applicable within Essex.

5.3.5 **Norfolk County Council LLFA Standing Advice for Solar Farm Development Sites.** Norfolk’s Standing Advice states expressly that solar panel areas are “not considered impermeable” and that “the impact is assumed to be nil.” Sites are treated as 95% permeable, with formal drainage design required only for the genuinely impermeable infrastructure elements (substations, transformer pads, access roads). For residual drip-line risk, Norfolk recommends only “simple shallow features” such as swales. It does not require hydraulic modelling. The characterisation in the LLFA Note (“hydrological assessment is required for PV arrays”) does not reflect the content of the Norfolk document, which adopts the opposite position. Norfolk’s position is the Applicant’s position at Lime Down.

5.3.6 None of the three cited local authority documents has any statutory weight in the determination of a Nationally Significant Infrastructure Project in Wiltshire. All three are local guidance applicable within their issuing authority’s administrative area only. All three, when read in full, support an approach to panel area drainage that is substantially consistent with the approach adopted at Lime Down.

5.4 **Green Hill Solar Farm (EN010170)**

LLFA Comment:

5.4.1 *Green Hill Solar Farm engineering reports observed channelised flows forming under rows, rill and gully erosion at panel driplines, and increased runoff velocity on slopes even where vegetation was intact. Modelling was required at Green Hill for cable routes, panel areas, access tracks, and catchment connectivity.*

Applicant’s Response:

5.4.2 The characterisation of Green Hill Solar Farm in the LLFA Note is not supported by the submitted technical documents for that project.

5.4.3 **The Applicant is in a position to address the Green Hill hydrology documents with direct knowledge on the basis that both Lime Down Solar Park Limited and Green Hill Solar Farm Limited are subsidiaries of Island Green Power.** The hydrology, flood risk and drainage assessment for Green Hill Solar Farm (EN010170), including **Environmental Statement Chapter 10: Hydrology, Flood Risk and Drainage [EN010170/APP/6.1]** and the **Flood Risk Assessment and Drainage Strategy suite [EN010170/APP/6.3]**, was prepared by Arthian (previously Mabbett). Those documents adopt the same framework as Lime Down. Panels are treated as draining to the existing ground, consistent with NPS EN-3 paragraph 2.10.84. The controlling risk pathway for panel areas is identified as soil compaction and vegetation condition, which is managed through secured embedded mitigation. Quantitative drainage design is applied to impermeable infrastructure. Manning’s open-channel calculations are used for minor watercourses. No field-scale hydraulic modelling of panel areas has been undertaken or



recommended at Green Hill.

- 5.4.4 The PEIR Chapter 10 for Green Hill states expressly that “no new hydraulic modelling has been undertaken as part of this study” in relation to the panel areas. Targeted hydraulic modelling has been undertaken at Green Hill for the BESS compound at Grendon Brook. This modelling relates to fluvial flood processes within defined watercourses and was undertaken to test and refine the Environment Agency Flood Map for Planning where required for site layout. It is therefore a watercourse-specific assessment for a discrete impermeable infrastructure element, not a field-scale assessment of surface water runoff from panel areas.
- 5.4.5 No hydraulic modelling of surface water runoff from panelled fields was undertaken at Green Hill. Panel areas were treated as draining to ground and assessed using planning-level datasets and embedded mitigation.
- 5.4.6 At Lime Down, the same distinction is applied. Fluvial hydraulic modelling has been undertaken where interaction with a watercourse justifies it, including at Gauze Brook (FRA Appendix 11-6, EN010168/APP/6.3), to understand flood behaviour and confirm the appropriateness of Environment Agency mapping. However, there is no requirement to model surface water runoff from solar panel areas, and no such modelling has been undertaken.
- 5.4.7 Accordingly, the Green Hill modelling approach does not support the need for hydraulic modelling of field-scale runoff from solar arrays.
- 5.4.8 The observations attributed to Green Hill in the LLFA Note (channelised flows, rill and gully erosion, increased runoff velocity) originate not from the submitted technical documents for that scheme but from a report prepared by Mark Shepherd (2025) and submitted to the Green Hill Examination as an interested party Written Representation on behalf of local objectors. That report is not an independent peer-reviewed engineering assessment. It is a third-party representation. It has not been accepted by the Green Hill applicant or by the Examining Authority as an agreed technical position.
- 5.4.9 The Green Hill applicant’s response to the Shepherd report maintains the position that the submitted assessment, which treats panel areas as draining to existing ground with negligible hydrological impact, is sound.
- 5.4.10 The LLFA Note cites “Mabbett (2024)” in its Claim vs Reality table as a source for the proposition that Green Hill required full hydrological modelling. The Applicant (Arthian, previously Mabbett) prepared the Green Hill hydrology documents referred to. Those documents do not support the proposition attributed to them. To the extent that the LLFA’s characterisation of Green Hill is drawn from the Shepherd report rather than from the submitted technical documents, the LLFA should note that the Shepherd report is a contested interested party representation, not a statement of the Green Hill applicant’s position.

5.5 Longfield Solar Farm (EN010118)

LLFA Comment:

- 5.5.1 *Longfield’s FRA and drainage strategy included quantitative hydrological modelling, climate-change sensitivity testing, modelled rainfall scenarios, and LLFA acceptance after the modelling was updated to*



address concerns.

Applicant's Response:

- 5.5.2 Longfield Solar Farm is a consented 500 MW solar NSIP in Essex. The Development Consent Order was granted by the Secretary of State on 26 June 2023.
- 5.5.3 The LLFA Note does not identify which specific element of the Longfield FRA it considers to constitute field-scale hydraulic modelling of panel areas. The quantitative elements of the Longfield drainage assessment relate to impermeable infrastructure (substations, inverter stations, BESS, access roads). That is the same approach adopted at Lime Down for impermeable infrastructure. It is not a model of panel areas.
- 5.5.4 The Examining Authority's Recommendation Report for Longfield addressed the water environment in approximately three pages of a 386-page report. Flood risk was not identified as a principal issue. The Environment Agency's Written Representation confirmed that flood risk modelling of the relevant watercourses did not need to be undertaken. A Statement of Common Ground was agreed between the applicant and the EA. No conditions beyond those proposed by the applicant were imposed in relation to flood modelling methodology.
- 5.5.5 Longfield does not establish a precedent for the field-scale hydraulic modelling of solar panel areas. If that were an expected NSIP practice, it would have been required at this 500 MW scheme. It was not.

5.6 Case Studies (Basildon and Hockliffe)

LLFA Comment:

- 5.6.1 *UK case studies show real-world runoff issues. Basildon Solar Farm drainage strategy acknowledged that runoff coefficient changes require assessment. Hockliffe Solar Farm is a real UK 43 hectare solar farm that required complex hydrological modelling, access track and ground compaction modelling, slope-sensitive SuDS design, and routing of concentrated panel runoff.*

Applicant's Response:

- 5.6.2 **Basildon Solar Farm (2022).** The three statements attributed to the Basildon drainage strategy (that runoff coefficient changes require assessment, that ground conditions and slopes must be quantified, and that vegetation assumptions cannot be taken as guaranteed) are generic observations applicable to any drainage assessment. They do not establish a requirement for field-scale hydraulic modelling of panel areas. The Applicant's approach at Lime Down addresses each of those matters: runoff coefficients are relevant to impermeable infrastructure, for which quantitative drainage design has been undertaken; ground conditions are characterised in the FRA appendices; and vegetation establishment and maintenance are secured through the Outline LEMP [APP/7.18] and Outline OEMP [APP/7.13].
- 5.6.3 **Hockliffe Solar Farm (Autodesk, 2024).** The source cited in the LLFA Note is a promotional case study published on the Autodesk Water Infrastructure Blog in May 2024. It was written to promote Autodesk's InfoDrainage software product. It is not an independent engineering report, a regulatory decision, or a policy document. It does not establish any requirement or expected practice.



5.6.4 Hockliffe is a consented 20 MW solar farm in Central Bedfordshire (planning reference CB/21/00437/FULL) with a site area of approximately 37 hectares. The drainage modelling described in the Autodesk blog post was undertaken for the access road and associated impermeable infrastructure elements, not for the solar panel array. That is consistent with the approach adopted at Lime Down for impermeable infrastructure.

5.6.5 The host LLFA for Hockliffe (Central Bedfordshire Council) publishes its own solar farm flood guidance. That guidance states that the surface area of a photovoltaic array “is not considered to act as an impermeable area and the impact is assumed to be nil.” That is the same position as the Norfolk LLFA and the same position adopted by the Applicant at Lime Down. When properly examined, the Hockliffe reference supports the Applicant’s approach rather than the LLFA’s.

5.7 Cited Academic Reference: Burch, Armstrong and Maslen (2014)

LLFA Comment:

5.7.1 *Somerset Flood Research (2014). Hydrologists Burch, Armstrong & Maslen demonstrated that rural land compaction significantly increases local flooding, that soil structure degradation is a primary cause, and that solar farm construction replicates these mechanisms.*

Applicant’s Response:

5.7.2 The LLFA Note cites “Burch, T., Armstrong, A. & Maslen, S. (2014) Impact of Solar Parks on Runoff Generation and Associated Land Drainage/Flood Risk Consequences. British Hydrological Society.”

5.7.3 The Applicant has been unable to locate this publication. Searches have been undertaken across academic databases (Scopus, Web of Science, Google Scholar), the British Hydrological Society’s published symposium proceedings, the programme of the 12th BHS National Symposium held at the University of Birmingham in September 2014, and general literature searches. None returns a result matching the citation. The URL fragment cited in the LLFA Note’s reference list does not resolve to an active web page. No other paper in the published solar farm hydrology literature cites Burch, Armstrong & Maslen (2014).

5.7.4 The Applicant is unable to respond to the substance of a publication that cannot be identified or retrieved. The reference does not support the LLFA’s position in its current form

5.8 Consultation Record

LLFA Comment:

5.8.1 *The LLFA requires full field-scale hydrological modelling of panel areas, ground conditions, access tracks and connectivity pathways.*

Applicant’s Response:

5.8.2 The position now advanced in the LLFA Note represents a departure from positions supported in principle at earlier meetings between the parties.



- 5.8.3 At the meeting on 27 February 2025, Ben Wilding of Atkins (acting for Wiltshire Council LLFA) stated that it was “not sensible to request modelling for whole site.” The literature position that panels do not cause detrimental runoff impact where properly managed was supported at that meeting, and the Applicant’s soil compaction management approach was supported in principle.
- 5.8.4 At the meeting on 27 May 2025, Ben Wilding supported the passive infiltration approach for panel areas. The LLFA confirmed at that meeting that further testing or interim remediation detail was not needed at this stage and that the approach was proportionate.
- 5.8.5 The approach now described by the LLFA as insufficient is the same approach that was discussed with and supported in principle by the LLFA’s technical adviser at those two meetings. No new site-specific information, no new evidence, and no new policy development has been identified by the LLFA as prompting the change in position between May 2025 and March 2026.



6. Review of Source and Precedent Cited by the LLFA

- 6.1.1 The LLFA Note relies on ten sources in support of its position. These comprise three items of local authority guidance (Doncaster, Essex Design Guide, Norfolk), two NSIP precedents (Longfield and Green Hill), four case studies or examples (Green Hill engineering reports, Somerset flood research, Basildon, Hockliffe), and the Environment Agency’s published guidance on modelling for flood risk assessments.
- 6.1.2 The Applicant has reviewed each of these sources against the characterisation in the LLFA Note. Table 6-1 below sets out, for each source: the citation in the LLFA Note; the LLFA’s characterisation of what the source says or establishes; what the source in fact says; and why it does not support the requirement for field-scale hydraulic modelling of solar panel areas.
- 6.1.3 On review, none of the ten sources establishes, requires, or demonstrates as expected practice the field-scale hydraulic modelling of solar panel areas at a solar NSIP. Three of the four cited local authority guides expressly treat panel areas as permeable or as having negligible runoff impact. The two NSIP precedents do not include panel-area hydraulic modelling. One case study is a promotional software blog. One academic reference cannot be located. No comparable application has been subject to the requirement now being advanced by the LLFA.

Table 6-1: Review of Sources and Precedent Cited by the LLFA Note

| Source | LLFA’s Characterisation | What the Source Actually Says | Why It Does Not Support the LLFA’s Position |
|---|--|--|---|
| Doncaster Council LLFA (2024), Solar Farm Drainage Strategy Advice | Explicitly requires modelling where slopes or large site areas are present. | A twelve-point advisory note requiring a drainage strategy, vegetation, SuDS, and consideration of slopes and soil types. The document does not mention, require, or refer to modelling at any point. Point 4 requires developers to “consider” slope angle, not to model it. | Does not contain any requirement for modelling. The characterisation is not supported by the text. Local standing advice applicable within Doncaster Council only. No statutory weight in Wiltshire or at NSIP level. |
| Essex Design Guide (2025), Solar Array Development | Confirms that solar farms require SuDS and drainage modelling demonstrate no increase in runoff. | Reports that solar panel cover contributes a 0.35% increase in total runoff, citing Cook and McCuen (2013). Describes solar farms as “relatively low risk in relation to surface water flooding” subject to mitigation. Recommends a surface water drainage strategy and land management plan. Does not mention modelling. | Does not require hydraulic modelling. The substantive recommendations (SuDS, vegetation, land management) are consistent with the Applicant’s approach. Local design guidance applicable within Essex only. |
| Norfolk County Council LLFA, | Warns that bare or compacted soils can significantly increase | States expressly that solar panel areas are “not | Adopts the opposite position to that attributed to it. |



| | | | |
|---|--|---|---|
| <p>Standing Advice for Solar Farm Development Sites</p> | <p>peak discharge, and that hydrological assessment is required for PV arrays.</p> | <p>considered impermeable” and that “the impact is assumed to be nil.” Sites are treated as 95% permeable. Formal drainage is required only for genuinely impermeable infrastructure. Residual drip-line risk is addressed by “simple shallow features” such as swales.</p> | <p>Expressly supports the treatment of panel areas as effectively permeable. This is the Applicant’s position at Lime Down. Local standing advice applicable within Norfolk only.</p> |
| <p>Longfield Solar Farm (EN010118), Examination Library</p> | <p>500 MW NSIP whose FRA included quantitative hydrological modelling, climate change sensitivity testing, modelled rainfall scenarios, and LLFA acceptance following modelling updates.</p> | <p>Consented 500 MW solar NSIP; DCO granted 26 June 2023. Quantitative drainage design undertaken for impermeable infrastructure. Water environment addressed in approximately three pages of the 386-page ExA Recommendation Report. EA confirmed in its Written Representation that flood risk modelling was not required. SoCG agreed with no outstanding issues.</p> | <p>The LLFA Note does not identify what specific element of the Longfield FRA is said to constitute panel-area modelling. The quantitative work at Longfield relates to impermeable infrastructure, which is the same approach adopted at Lime Down. Longfield does not establish a precedent for panel-area modelling.</p> |
| <p>Green Hill Solar Farm (EN010170), Technical Documents</p> | <p>Modelling was required at Green Hill for cable routes, panel areas, access tracks, and catchment connectivity.</p> | <p>Hydrology documents prepared by Arthian (previously Mabbett). PEIR Chapter 10 states: “no new hydraulic modelling has been undertaken as part of this study” in relation to panel areas. Panels treated as draining to existing ground, consistent with EN-3. Manning’s calculations used for minor watercourses. Targeted hydraulic modelling undertaken at the BESS compound at Grendon Brook (watercourse-specific, not a panel model).</p> | <p>The submitted Green Hill technical documents (authored by the Applicant) do not support the characterisation in the LLFA Note. The approach at Green Hill is the same as the approach at Lime Down. No field-scale panel modelling was undertaken.</p> |
| <p>Green Hill Engineering Reports, Shepherd (2025)</p> | <p>Independent engineering assessments showing channelised flows, rill and gully erosion, and increased runoff velocity at Green Hill.</p> | <p>A report prepared by Mark Shepherd (2025) and submitted to the Green Hill Examination as an interested party Written Representation on behalf of local objectors. Not an independent peer-reviewed engineering assessment. Not endorsed by the Green Hill applicant or the Examining Authority. Site-specific</p> | <p>A contested third-party representation is not an independent engineering finding and does not establish expected practice or policy requirement. The observations relate to a specific downstream catchment at Lavendon and do not represent the behaviour of solar panel areas generally.</p> |



| | | | |
|--|---|---|---|
| | | to Lavendon village (a Critical Drainage Catchment downstream of one Green Hill parcel). | At Green Hill, hydraulic modelling was undertaken to assess fluvial flood processes associated with defined watercourses and to inform the design of discrete infrastructure, not to model surface water runoff from panelled fields. The Shepherd report does not demonstrate that field-scale runoff from solar arrays requires hydraulic modelling. Site-specific conditions at one catchment do not translate to a requirement for modelling at a different scheme in a different catchment. The Green Hill Applicant has not adopted the Shepherd report conclusions. |
| Somerset Flood Research, Burch, Armstrong & Maslen (2014) | Hydrologists demonstrated that rural land compaction increases local flooding and that solar farm construction replicates these mechanisms. | The cited publication cannot be located. Searches of academic databases, the British Hydrological Society’s symposium proceedings, the 12th BHS National Symposium programme (September 2014), and the wider literature return no matching result. The URL fragment in the LLFA Note’s reference list does not resolve. | An unverifiable reference cannot support the proposition for which it is cited. The Applicant is unable to respond to the substance of a publication that cannot be identified. |
| Basildon Solar Farm (2022), Drainage Strategy | Drainage strategy acknowledged that even small changes in runoff coefficients require assessment and that vegetation assumptions cannot be guaranteed. | Generic statements of good drainage assessment practice. They address runoff coefficients for impermeable areas, quantification of ground conditions, and the limits of vegetation assumptions. | The cited statements are applicable to any drainage assessment and do not establish a requirement for field-scale modelling of panel areas. The Applicant’s approach at Lime Down addresses each of them through the FRA, ground condition characterisation, and secured vegetation management. |
| Hockliffe Solar Farm Case Study (Autodesk 2024) | A real UK 43 hectare solar farm that required complex hydrological modelling, access track modelling, slope-sensitive SuDS, and routing of concentrated panel runoff. | A promotional case study on the Autodesk Water Infrastructure Blog (May 2024) promoting Autodesk’s InfoDrainage software. Hockliffe is a consented 20 MW solar farm in Central Bedfordshire (approximately 37 ha). The drainage modelling | Software marketing material does not establish policy or expected practice. The modelling described was for impermeable infrastructure, which matches the Applicant’s approach. The host LLFA’s own published |



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|---|--|--|--|
| | | described related to the access road and impermeable infrastructure, not panel areas. Central Bedfordshire Council’s own solar farm flood guidance states that panel areas are “not considered to act as an impermeable area and the impact is assumed to be nil.” | guidance adopts the same position as the Applicant. |
| Environment Agency (December 2023), Using modelling for flood risk assessments | Guidance establishing that hydraulic modelling is required for FRAs for large or complex developments. | States: “You may need to use hydraulic modelling to produce a detailed FRA, depending on the scale, type, vulnerability classification and location of your development.” Advises applicants to check what existing data and models are available before commissioning new modelling. Conditional and proportionate, not absolute. | Uses conditional language (“may need,” “depending on”). Does not establish a blanket requirement for hydraulic modelling of solar panel areas or any other category of development. Consistent with the proportionate approach adopted at Lime Down. |

6.1.4 The Applicant is not aware of any comparable solar NSIP application for which field-scale hydraulic modelling of panel areas has been required by an LLFA, an Examining Authority, or the Secretary of State. The position advanced in the LLFA Note is not supported by the sources cited in it, is not supported by the policy framework under which the Scheme is being examined and is not established by NSIP precedent.



7. Conclusions

- 7.1.1 The LLFA Note requires field-scale hydraulic modelling of solar panel areas, ground conditions, access tracks, and connectivity pathways at Lime Down Solar Park. The Applicant has considered this requirement against national policy, the published evidence base, NSIP precedent, the physical mechanism by which solar panels interact with rainfall and surface water, and the consultation record between the parties. The Applicant's conclusions are as follows.
- 7.1.2 **The requirement is not supported by national policy.** NPS EN-1 Section 5.8 requires a Flood Risk Assessment that is “proportionate to the risk and appropriate to the scale, nature and location of the project.” It does not prescribe any specific assessment methodology. NPS EN-3 paragraph 2.10.84 confirms that “as solar PV panels will drain to the existing ground, the impact will not, in general, be significant.” Neither policy document requires the hydraulic modelling of solar panel areas. The Environment Agency's published guidance confirms that the need for modelling is conditional and proportionate.
- 7.1.3 **The requirement is not supported by the LLFA's own cited sources.** The Applicant has reviewed each of the ten sources relied upon in the LLFA Note. As set out in Section 6 and Table 6-1 above, none of them establishes a requirement for field-scale hydraulic modelling of solar panel areas. Three of the four cited local authority guides treat panel areas as effectively permeable or as having negligible runoff impact. The two NSIP precedents do not include panel-area hydraulic modelling. One case study is a promotional software blog. One academic reference cannot be located. The characterisation of several of the cited sources in the LLFA Note is not accurate.
- 7.1.4 **The requirement is not established by NSIP precedent.** No comparable solar NSIP application has been subject to the requirement now advanced by the LLFA. The Applicant is in a position to address the Green Hill Solar Farm (EN010170) position with direct authority: the hydrology documents for that scheme were prepared by Arthian (previously Mabbett), they adopt the same framework as Lime Down, and they do not include field-scale hydraulic modelling of panel areas. The Longfield Solar Farm (EN010118) DCO was granted on the basis of a Flood Risk Assessment that did not include field-scale hydraulic modelling of panel areas. No consented or in-examination solar NSIP has been identified that adopts the approach now being required.
- 7.1.5 **The requirement is not necessary to achieve the outcome required by policy.** The factors that control surface water runoff response in panel areas (ground cover condition, soil structure and compaction, flow connectivity, and baseline conditions) are management-dependent variables. They are not fixed design parameters of the development. They are controlled through embedded mitigation secured by DCO Requirement through the Outline CEMP [APP/7.12], Outline SRMP [APP/7.15], Outline LEMP [APP/7.18], and Outline OEMP [APP/7.13]. Modelling those variables would rely on assumed inputs about the future effectiveness of the management measures. It would not materially improve the assessment of flood risk beyond what is achieved by securing and enforcing the management measures themselves.
- 7.1.6 **The requirement is not consistent with the consultation record.** The assessment approach now described by the LLFA as insufficient is the same approach that was discussed with the LLFA's technical adviser at meetings on 27 February 2025 and 27 May 2025. At those meetings, the approach was



supported in principle. Field-scale hydraulic modelling of panel areas was not identified as a requirement. At the meeting on 27 February 2025, the LLFA's technical adviser stated that it was "not sensible to request modelling for whole site." No new site-specific information, no new evidence, and no new policy development has been identified by the LLFA as prompting the departure from that position.

7.1.7 The research, guidance, and policy referenced in the Applicant's submitted documents have been correctly interpreted and correctly applied. The assessment approach at Lime Down Solar Park applies quantitative drainage design to impermeable infrastructure using ReFH2, restricts post-development discharge to 70% of the greenfield rate for all return periods up to the 1 in 100 year plus climate change event, undertakes site-specific hydraulic modelling at the Gauze Brook corridor, applies Manning's open-channel calculations to minor watercourses, and secures the management of soil, vegetation, and flow connectivity in panel areas through enforceable DCO Requirements. This framework is consistent with NPS EN-1 Section 5.8, with NPS EN-3 paragraphs 2.10.84 to 2.10.88, with the Environment Agency's published guidance, and with the approach adopted at other consented and in-examination solar NSIPs.

7.1.8 The Applicant will continue to engage constructively with Wiltshire Council LLFA and is committed to working towards a Statement of Common Ground on hydrology, flood risk and drainage matters. That engagement should focus on any specific technical concerns that remain outstanding and the most proportionate means of addressing them.

7.1.9 The Applicant considers the current approach to surface water assessment and management at Lime Down Solar Park to be robust, proportionate, policy-compliant, and appropriate for Examination.



Appendices

Appendix A- Limitations

Limitations

This report contains recommendations from Arthian, which are based on the information listed in the report and reflect the professional opinions of an experienced Environmental Consultant. Arthian obtained, reviewed, and evaluated information from the Client and others to prepare this report. The conclusions, opinions, and recommendations presented in this report are based on this information. However, Arthian does not guarantee the accuracy of the information provided and will not be held responsible for any opinions or conclusions reached based on information that is later proven to be inaccurate.

This report was prepared exclusively for the Client and for the specific purpose for which Arthian was instructed. It is not intended for use by anyone other than the Client without Arthian's written consent. Any unauthorized use of this report is at the sole risk of the user. Anyone using or relying on this report, other than the Client, agrees to indemnify and hold harmless Arthian from any claims, losses, or damages arising from the performance of the work by the Consultant.



**Annex A LLFA Hydraulic Modelling Requirement – Lime
Down Solar Park note 24 March 2026**

Limedown Solar Park's hydraulic modelling requirements

Service : Highway Assets and Commissioning
Further Enquiries to: ██████████, Principal Technical Officer Drainage Planning
Email: ██████████@wiltshire.gov.uk
Date Prepared: 24th March 2026

1. Introduction

This LLFA rebuttal responds to the Limedown Solar Park Applicant's Action 1 submission, which asserts that quantitative hydrological modelling of panel fields is unnecessary and that qualitative reasoning and management plans alone are adequate to demonstrate compliance with NPS EN-1.

The LLFA has reviewed:

- The Applicant's Action 1 letter, and
- The latest peer-reviewed hydrology research, UK local authority (LLFA) guidance, and Planning Inspectorate (PINS) evidence, including Doncaster LLFA guidance, the Essex Design Guide, Norfolk LLFA Standing Advice, Green Hill Solar Farm engineering studies, and modelling case studies such as Hockliffe.

The evidence shows the Applicant's position is:

- **Incomplete**
- **Contradicted by published UK hydrological evidence**
- **Not aligned with LLFA practice across England**
- **Not aligned with NSIP precedent**
- **Not compliant with EN-1's evidential requirements**

2. Core Rebuttal

2.1 Applicant selectively interprets EN-3 and ignores EN-1

The Applicant relies heavily on EN-3 paragraph 3.10.75 ("in general...the impact will not be significant"). However, they ignore the binding requirement in EN-1, which states that developers must demonstrate that surface water runoff rates and volumes will not increase following development.

This obligation exists regardless of the general position EN-3 takes on typical PV layouts.

Multiple UK authorities confirm that large solar farms can materially alter hydrology, especially where slopes, compaction, or flow connectivity are present:

- The **Essex Design Guide (2025)** states that while panel cover alone may result in small increases for small sites, large solar farms can "amplify this into significant downstream impacts", especially via channelisation and vegetation degradation.

- **Doncaster Council LLFA** warns that solar farms “**can increase peak runoff, create concentrated flow channels and intensify erosion between panel rows,**” necessitating a drainage strategy and modelling.

Accordingly, EN-3 cannot be used to justify omitting hydrological modelling at a multi-hundred-hectare NSIP.

2.2 UK-specific evidence contradicts the Applicant’s “qualitative-only” position

The Applicant asserts that modelling is not typical NSIP practice and that a qualitative approach is proportionate. This assertion is **incorrect**.

LLFA Guidance shows modelling *IS* required

- **Doncaster LLFA (2024)** emphasises that slope, soil type and panel orientation govern increased runoff risk and explicitly **requires modelling** where slopes or large site areas are present.
- The **Essex Design Guide** confirms that solar farms interrupt overland flow, increase kinetic energy, generate erosion, and **require SuDS and drainage modelling** to demonstrate no increase in runoff.
- **Norfolk County Council LLFA** warns that bare or compacted soils can “significantly increase peak discharge”, and that **hydrological assessment is required** for PV arrays.

Thus, qualitative assertions are insufficient.

2.3 UK case studies show real-world runoff issues—even where vegetation is present

The Applicant argues that maintaining ground vegetation mitigates risk. However, **multiple UK case studies** contradict this.

Green Hill Solar Farm – Engineering Reports (EN010170)

Independent engineering assessments for Green Hill observed:

- Channelised flows forming under rows
- Rill and gully erosion at panel driplines
- Increased runoff velocity on slopes, *even where vegetation was intact*
- Amplification of risk where construction compaction or wheel tracks intersected natural flow routes

Somerset Flood Research (2014)

Hydrologists Burch, Armstrong & Maslen demonstrated:

- Rural land compaction significantly increases local flooding
- Soil structure degradation is a primary cause
- Solar farm construction replicates these mechanisms (track formation, repeated trafficking, rutting)

Basildon Solar Farm (2022)

The drainage strategy acknowledged:

- Even small changes in runoff coefficients require assessment

- Ground conditions and slopes must be quantified
- Vegetation assumptions *cannot be taken as guaranteed*

Hockliffe Solar Farm Case Study (Autodesk 2024)

A real UK 43ha solar farm required:

- Complex hydrological modelling
- Access track and ground compaction modelling
- Slope-sensitive SuDS design
- Routing of concentrated panel runoff

These examples directly contradict the Applicant's "no need to model" position.

2.4 NSIP precedent establishes modelling as normal practice

The Applicant claims qualitative assessment is standard NSIP practice. Evidence shows otherwise.

Longfield Solar Farm (500 MW NSIP)

Longfield's FRA and drainage strategy included:

- Quantitative hydrological modelling
- Climate-change sensitivity testing
- Modelled rainfall scenarios
- LLFA acceptance **after** the modelling was updated to address concerns

This is documented in PINS Examination Library Book 6.

Green Hill Solar Farm (EN010170)

Modelling was required for:

- Cable routes
- Panel areas
- Access tracks
- Catchment connectivity

Thus, the Applicant's claim that modelling is not typical is factually incorrect in the NSIP context.

3. Claim vs Reality Table (UK Solar Farms Evidence)

| Applicant Claim | Reality at UK Solar Sites | Sources |
|---|---|--|
| Panels “do not significantly change runoff” | UK studies show channelisation, dripline runoff, erosion and flow concentration—even with vegetation. | Shepherd (2025); Mabbett (2024); Essex County Council (2025). |
| Modelling unnecessary | Doncaster, Essex and Norfolk LLFAs explicitly require modelling for slopes and large sites. | Doncaster Council (2024); Essex County Council (2025); Norfolk CC LLFA (2025). |
| Qualitative assessment is standard NSIP practice | Longfield and Green Hill NSIPs required full hydrological modelling, climate-change testing and drainage-connectivity analysis. | Planning Inspectorate (2023–2026); Mabbett (2024). |
| Vegetation alone controls risk | Rill and gully erosion documented even in fully vegetated UK sites. | Shepherd (2025). |
| Panel drainage “drips to ground without issue” | Essex Design Guide notes driplines generate high kinetic energy, soil erosion and channelised flow. | Essex County Council (2025). |
| Tracks & infrastructure separate from panel hydrology | Tracks act as drains and create preferential flow paths, requiring integrated hydrological modelling. | Autodesk (2024); Green Hill Engineering Reports (2025). |

4. Summary – LLFA Position

Based on UK national guidance, peer-reviewed research, LLFA best practice and NSIP precedent:

- The Applicant’s conclusion is **technically incorrect**
- **EN-3 cannot be used to avoid modelling** at Lime Down
- EN-1 **requires** quantitative demonstration of **no increase in runoff**
- UK evidence shows **runoff increases, channelised flow and erosion risks**
- Large UK solar farms are **routinely required to model panel-dripline hydrology**

Therefore:

The LLFA requires full field-scale hydrological modelling of panel areas, ground conditions, access tracks and connectivity pathways to robustly demonstrate compliance with EN-1.

References

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