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| **From:** | [redacted] |
| **To:** | One Earth Solar |
| **Subject:** | Deadline 3 submissions. |
| **Date:** | 09 September 2025 15:15:30 |
| **Attachments:** | Critical Assessment of the One Earth Proposal.docx<br>Submission on Sequential and Exception Test Failures in One Earth Solar Farm NSIP.docx<br>WFD Compliance.docx<br>Flood risk including cummulative effects and resource defecit..docx<br>Cost of floodingExpanded Cost Analysis of the One Earth Solar Farm.docx<br>Public safety..docx |

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Stepehen Fox

Resident of North Clifton

Interested Party Reference number: FA3AE8AE5

9 September 2025

The Examining Authority

The Planning Inspectorate Temple Quay House Temple Quay Bristol BS1 6PN

By Email

Dear Sirs

I enclose 6 submissions

1) Critique of the One Earth Proposal's Flood Risk Assessment.

2) Report on Sequential and Exception Test Failures in One Earth Solar Farm NSIP.

3) Analysis of WFD Compliance for the One Earth Solar Farm.

4)The Cumulative effects of Flood risk from the One Earth Proposal and Implications of the deficit in Local Authority Resources.

5)One Earth Solar Farm: Hydrological and Flood Risk Cost Analysis for the Trent Valley and Considerations on Siting Near High Marnham Grid Connection

6) Public Safety implications Of the One Earth proposal.

These submissions serve 6 purposes:

1 Detailed support of my letter and supporting report to the ExA dated 8 September 2025.
2) Stand alone information that needs to be in possession of all inspecting authorities.
3) Detailed support to the representations made to me during the pre examination consultation report as early as 22.07.24 but excluded by the applicant from the documentation provided in the Consultation Report.
4) Comments on responses to WR's.
5)Responses to Comments to ExQ1.
and ) the Exa's invitation to me,made at Issue Specific Meeting 2,to make any necessary representations in writing tot Deadline 3.
and

6) Comments on any additional submissions received by D2.

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Yours faithfully

Stephen Fox

**The Cumulative effects of Flood risk from the One Earth Proposal and Implications of the deficit in Local Authority Resources.**

## Date: 7 September 2025

## Revision: 1.0

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1. Introduction

1.1. This report provides a technical review of the One Earth Solar Farm proposal, focusing on its implications for flood risk within the Nottinghamshire and Lincolnshire regions. The analysis incorporates an assessment of contemporary hydrological science, the cumulative impact of concurrent regional developments, and the documented capacity of local authorities to manage and police mitigation strategies.3

1.2. The One Earth Solar Farm is a proposed Nationally Significant Infrastructure Project (NSIP) for the construction, operation, and decommissioning of a solar photovoltaic (PV) development and energy storage facility, with an associated underground cable connection to the National Grid. The project is proposed by PS Renewables and Ørsted. The project's site extends to approximately 1,414 hectares and is located primarily at the border of Nottinghamshire and Lincolnshire, with a strategic link to the High Marnham grid connection point. Due to its scale and output exceeding 50MW, the project falls under the NSIP designation, and is subject to a Development Consent Order (DCO) process as managed by the Planning Inspectorate (PINS).6,7,8

1.3. The DCO framework places an emphasis on the role of Local Impact Reports (LIRs), which allow affected local authorities to report on the likely impacts of the project on their area.12,18,20 An LIR is intended to be a technical assessment of impact and is not meant to conclude on the overall acceptability of the proposals. This report aligns with this purpose by providing an objective assessment of the project's hydrological impacts.

2. Hydro-Geological and Scientific Analysis of Runoff and Solar Farms

2.1. Fundamental Principles of Overland Flow and Infiltration

2.1.1. The natural hydrological cycle involves rainfall partitioning into infiltration, which replenishes groundwater, and surface runoff, which travels overland into watercourses. This partition is governed by factors such as soil type, antecedent moisture conditions, microtopography, and the presence of vegetation. Land-use change, particularly the conversion of agricultural or open land to developed sites, can alter this balance. As demonstrated by the U.S. Geological Survey (USGS), urban development, which involves removing vegetation, grading the land, and constructing drainage networks, increases the volume, peak discharge, and frequency of floods.29 This principle is directly applicable to large-scale solar farms, which involve a significant land-use conversion.

2.1.2. The construction of solar facilities alters the natural landscape by introducing large, semi-impervious surfaces—the solar panels themselves. While the ground between the panel rows may remain vegetated, the panels concentrate rainfall and redistribute moisture from precipitation, creating higher soil moisture at the driplines (the ground directly beneath the lower edge of the panels) and significantly lower moisture under the panels. This concentration of water can overwhelm the soil's infiltration capacity, even in a vegetated state, leading to an increase in surface runoff and a reduced time to peak flow.19,24

2.2. The Specifics of Baiamonte et al. Papers

2.2.1. The scientific work of Baiamonte et al. provides empirical data on runoff from solar farms. The research notes that microtopography—the small-scale variations in the ground's surface—plays a significant role in governing runoff dynamics through its effect on local flow paths and ponding. This, in turn, influences the development of the surface water layer that connects and flows downslope.19,23,27

2.2.2. A study described in a related paper utilized a rainfall simulator to measure runoff generation on land with different solar panel arrangements. The research showed that solar panel arrangements had a moderate effect on peak discharges compared to a bare field, yet this "moderate" effect resulted in peak discharges that were 11.5 times higher for panels aligned with the slope and 11.7 times higher for panels arranged across the slope. Another study, using the EPA SWMM model, observed that the construction of a solar farm led to a 14.5% increase in total runoff volume during a 100-year, 24-hour design storm. The model also showed that the peak flow rate post-construction was consistently higher than the pre-construction condition for a range of storm events.19

2.2.3. These findings suggest that solar panels, despite the presence of vegetative cover between them, may behave like a semi-impervious surface, concentrating and accelerating runoff. This effect, if not adequately managed, could be a significant alteration of the natural hydrological function of the land.24,28

3. Critical Review of the One Earth Flood Risk Assessment (FRA)

3.1. The Applicant's Approach and Policy Framework

3.1.1. The One Earth proposal is required to navigate a complex policy framework, as outlined in the Overarching National Policy Statement for Energy (NPS EN-1). The policy requires a project to first apply a Sequential Test to steer development to areas of lowest flood risk. If no suitable sites at lower risk are available, the project can then apply the Exception Test, which provides a framework for allowing necessary development to proceed in flood-prone areas.7

3.1.2. A key requirement under this framework is that the project must be "safe for its lifetime," must not "increase flood risk elsewhere," and should aim to achieve a "no net loss of floodplain storage". The policy, however, also contains a provision that allows consent to be granted if an increase in flood risk cannot be wholly avoided, provided it can be mitigated to an "acceptable and safe level". This clause allows for subjective judgment in what is otherwise a data-driven process.7,16

3.2. Substantive Critique

3.2.1. A review of the available documentation reveals a number of concerns. The West Lindsey District Council's (WLDC) Local Impact Report, for example, expresses significant concerns regarding the project's hydrology, noting that parts of the proposal within its administrative area fall into Flood Zone 3, a high-risk area.12 The LIR points out that the applicant's justification for this site choice is not considered clear. This is in direct conflict with the national planning policy that requires development in such areas to be "exceptional".

3.2.2. The applicant's Flood Risk Assessment (FRA) must be scrutinized in light of the scientific principles and empirical data on solar farm runoff. The evidence shows that solar panels can alter overland flow, increasing peak discharges and overall runoff volume.19,28 Any assessment that does not fully account for these non-linear changes in a detailed hydrological model may be inadequate. The reliance on mitigation strategies, such as Sustainable Drainage Systems (SuDS), becomes a central point of contention in this context.9,26 While SuDS, which include attenuation basins, swales, and permeable pavements, are designed to manage runoff by mimicking natural drainage, their effectiveness is entirely dependent on proper design, implementation, and long-term maintenance.

4. Assessment of Cumulative Flood Risk and Regional Hydrological Impact

4.1. Identification of Concurrent Major Developments

4.1.1. The One Earth project exists within a distinct geographical area that is undergoing a period of unprecedented, concurrent large-scale land transformation. The following table identifies these major concurrent developments and their potential contribution to regional hydrological change.4,5,6,11,14,15,17,25

| Project Name | Type | Location (Counties) | Scale | Planning Status | Potential Hydrological Impact |
|---|---|---|---|---|---|
| One Earth Solar Farm | Solar/BESS | Nottinghamshire/Lincolnshire | 740MW (1,414ha) | NSIP (Examination) | Altered runoff patterns, increased peak discharge, and runoff volume |
| Great North Road Solar Park | Solar/BESS | Nottinghamshire | 800MW (2,800ha) | NSIP (Pre-Application) | Significant land-use change, increased impervious surfaces |

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| Tollerton Airfield | Residential/Mixed-use | Nottinghamshire | Up to 3,850 homes | DCO (Pending) | Increased impervious surface area from housing, roads, etc. |
| Top Wighay | Residential/Mixed-use | Nottinghamshire | 710-1,000 homes | Local Plan (Approved) | Introduction of hardstanding, increased runoff |
| Fair Oaks Renewable Energy Park | Solar/BESS | Nottinghamshire | 49.9MW | Approved | Increased surface runoff, altered flow paths |
| Steeples Renewables Projects | Solar/BESS | N/A | N/A | NSIP (Pre-Application) | Contribution to cumulative solar development |
| Tillbridge Solar Project | Solar/BESS | N/A | N/A | NSIP (Pre-Application) | Contribution to cumulative solar development |

4.2. The Compounding Effect of Cumulative Runoff

4.2.1. The conversion of thousands of hectares of land from agriculture to solar farms and residential areas introduces a systemic hydrological alteration across the entire Nottinghamshire landscape. Each of these projects, on its own, will increase surface runoff and shorten the time to peak flow. When combined, the effect is compounded, potentially overwhelming existing drainage infrastructure and flood defences that were designed for a different land-use regime.30

4.2.2. The WLDC LIR explicitly voices "significant concerns regarding the cumulative impact of the scheme with other NSIP solar generating station projects".12 The combined increase in runoff from multiple large-scale developments is a direct consequence of the proposed land transformation. A comprehensive regional hydrological model, which considers the combined effect of all these projects, is a necessary precursor to any single project's approval to prevent future regional flooding crises.

4.3. The Intersection of Hydrology and Contamination

4.3.1. The Tollerton Airfield development introduces an additional, severe compounding factor. Campaigners and official reports have identified known land contamination on the site, including the radioactive isotope radium-226 and carcinogenic hydrocarbons. These contaminants are a legacy of the site's use as a "burn, bash, and bury" site for disused RAF

aircraft after the Second World War.10,13,21,22 While the One Earth proposal itself does not involve such contamination, the cumulative hydrological effect is directly relevant. An increase in surface runoff from new developments, particularly during intense storm events, could act as a vector, transporting these contaminants through the local water system and introducing a significant public health risk. The movement of floodwater is not just a risk of property damage; it is a risk of pollutant transport, and this risk is compounded by the combined hydrological impact of the regional projects.

5. Local Authority Resourcing, Governance, and Oversight

5.1. The Statutory Role and a Documented Deficit

5.1.1. Under the NSIP framework, local authorities are given a limited but crucial role through the preparation of Local Impact Reports. However, the Nottinghamshire County Council (NCC), the LLFA, in their LIR provides a stark and telling admission of a significant governance deficit. The document explicitly states that the NCC "does not have the expertise or resource to provide comprehensive comments" on the project's submitted drainage strategy and flood risk assessment.18,20

5.1.2. This admission means that the primary local body with a statutory function in this area is unable to perform a core part of its assessment. The council notes that it has had to appoint an external specialist to review the documents, with their comments to be submitted at a later date. This is not an isolated failing but a symptom of a systemic pressure on local authorities, which are expected to manage complex, large-scale projects without the commensurate internal capacity or funding to do so.

5.2. Consequences of Under-resourcing

5.2.1. The consequences of this under-resourcing are multi-faceted and potentially severe. Firstly, the initial design approval process is compromised. If a local authority cannot perform its own due diligence and must rely on external consultants, it introduces a layer of removal from local knowledge and accountability.

5.2.2. Secondly, and perhaps more critically, the long-term policing and enforcement of mitigation strategies are at risk. A large-scale project like One Earth has a proposed operational lifespan of 60 years. The effectiveness of any flood risk mitigation is contingent upon its proper maintenance over many decades. The challenge for a local authority that is already under-resourced is not just to approve a design but to ensure that the developer adheres to all mitigation and maintenance requirements for six decades. A failure in this long-term oversight would render the initial mitigation plan meaningless and expose the local community to a greater risk of flooding. As this is the case, the proposal represents a substantial flood risk. This systemic pressure, from top-down national policy for NSIPs, creates a capacity gap at the local level that directly leads to a mitigation oversight deficit, which in turn increases localized and cumulative flood risk.

6. Summary of Technical Findings

6.1. The technical assessment of the One Earth Solar Farm proposal, based on a synthesis of scientific literature and a review of planning documents, identifies several key findings for consideration by the Planning Inspectorate.

6.2. Scientific Principles: The review of scientific literature, including the work of Baiamonte et al. (2023, 2015), indicates that solar farms as a form of land-use change can significantly alter hydrological responses, including increases in peak discharge and runoff volume. Empirical studies have quantified these effects, showing peak discharges more than 11 times higher in some scenarios and runoff volume increases of nearly 15%. This suggests that solar panels, despite the presence of vegetation, may act as a semi-impervious surface that concentrates and accelerates runoff.19

6.3. Cumulative Impact: The One Earth project is part of a cluster of major solar and residential developments in Nottinghamshire and Lincolnshire. The combined effect of these concurrent projects may represent a profound regional hydrological alteration whose cumulative impact could overwhelm existing drainage infrastructure. The WLDC LIR explicitly notes "significant concerns" regarding this cumulative effect. A comprehensive regional hydrological model that assesses the combined impact of all projects is a necessary tool to fully understand the risks.12,30

6.4. Governance and Oversight: The Nottinghamshire County Council's own Local Impact Report explicitly states its lack of "expertise or resource" to provide comprehensive technical comments on the project's drainage strategy and flood risk assessment. This raises questions about the adequacy of both the initial design review and the long-term monitoring and enforcement of mitigation strategies over the project's proposed 60-year lifespan. This identified capacity gap at the local level is a material consideration in the assessment of the project's long-term safety and flood risk management.18,20

7. Glossary

BESS: Battery Energy Storage System.

DCO: Development Consent Order.

FRA: Flood Risk Assessment.

LIR: Local Impact Report.

NSIP: Nationally Significant Infrastructure Project.

PINS: Planning Inspectorate.

PV: Photovoltaic.

SuDS: Sustainable Drainage Systems.

8. References

1. Rushcliffe Borough Council, "Tollerton Airfield planning applications"

2. Nottingham Post, "Huge Nottinghamshire housing plans currently waiting for council approval"

3. UK Government, "Nationally Significant Infrastructure Projects: Advice on the Preparation and Submission of Application Documents"

4. Ridge Clean Energy, "Fair Oaks Renewable Energy Park"

5. Nottinghamshire County Council, Report on Top Wighay Farm

6. Nottinghamshire County Council, "Nationally Significant Infrastructure Projects in Nottinghamshire"

7. Planning Inspectorate, "One Earth Solar Farm - Sequential Assessment"

8. One Earth Solar Farm, "Proposals"

9. Hertfordshire County Council, "Guidance for Developers: Sustainable Drainage Systems (SuDS)"

10. Nottingham Post, "Tollerton Airfield campaigners express concerns over 'radioactive' material"

11. Newark and Sherwood District Council, "Nationally Significant Infrastructure Projects"

12. West Lindsey District Council, Local Impact Report

13. Central Bylines, "Fears from Nottingham City Airfield contamination sparks protests over housing development"

14. UK Government, "Government recognises the significant contribution large sites and housing zones make to the provision of future housing..."

15. Gedling Borough Council, "Top Wighay Farm Development Brief"

16. Planning Inspectorate, "One Earth Solar Farm - Sequential Assessment"

17. Planning Inspectorate, "Example Documents"

18. Nottinghamshire County Council, Local Impact Report

19. Baiamonte et al., "Evaluating the potential impacts of solar farms on hydrological responses"

20. Planning Inspectorate, Nottinghamshire County Council Local Impact Report on One Earth NSIP

21. Save Nottingham Airfield, "Radioactive Contamination"

22. Notts TV, "Past use of Tollerton Airfield being taken seriously as campaigners say they're concerned as hell"

23. Baiamonte et al., "Simplified Probabilistic-Topologic Model for Reproducing Hillslope Rill Network Surface Runoff"

24. Penn State Engineering, "Solar farms with stormwater controls mitigate runoff, erosion, study finds"

25. Nottingham Post, "All the planned new Nottinghamshire housing developments with more than 200 homes"

26. Wokingham Borough Council, "Sustainable drainage systems (SuDS) strategy"

27. D'Asaro and Baiamonte et al., "Simplified Probabilistic-Topologic Model for Reproducing Hillslope Rill Network Surface Runoff"

28. MDPI, "The Impact of Land Use Change on Urban Hydrological Response: A Review"

29. US Geological Survey, "Effects of Urban Development on Floods"

30. MDPI, "The change in land use and land cover in upstream watersheds will change the features of drainage systems"