

**FLOOD RISK ASSESSMENT
FOR A PROPOSED SOLAR ARRAY AT
MILL ROAD, MAGDALEN**

FINAL REPORT

ECL0747/REEVE DESIGN LTD

DATE APRIL 2022

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ATTACHMENT 1 – Proposed Solar Array (Dwg 2125.01A)

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1.0 INTRODUCTION

This Flood Risk Assessment has been prepared in accordance with National Planning Policy Framework (NPPF) and supporting planning practice guidance (PPG) on Flood Risk and Coastal Change.

In areas at risk of flooding or for sites of 1 hectare or more, developers are required to undertake a site-specific Flood Risk Assessment to accompany an application for planning permission. This Flood Risk Assessment has been produced on behalf of Mr & Mrs P Heyes in respect of a development that consists of a solar array at 61 Mill Road, Magdalen.

A planning application for the proposed development is to be submitted by Reeve Design Ltd. The level of detail within this Flood Risk Assessment reflects the type of the development.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

The site is at 61 Mill Road, Magdalen, King's Lynn, PE34 3BZ.

The location of the site is shown on Figure 1.



Figure 1 – Location Plan (© OpenStreetMap contributors)

2.2 Existing Site

The site is on the southern side of Mill Road. The site is agricultural land to the west of 61 Mill Road. The area of development is approximately 0.01 hectares.

The site is in the King's Lynn Internal Drainage Board's (IDB) area. Surface water at the site would naturally drain through soakaway and hence to the IDB drain system. There is an IDB watercourses on the northern boundary of the site alongside Mill Road.

2.3 Proposed Development

The proposed development consists of a solar array. The solar array will be 8.8m long and 3.2m wide. A Site Plan is provided in Attachment 1.

2.4 Local Development Documents

The King's Lynn & West Norfolk Borough Council Local Development Framework - Core Strategy is the adopted Local Plan for the district. Policy CS08 for Sustainable Development states the requirements for flood risk reduction.

The King's Lynn and West Norfolk Borough Council Level 1 Strategic Flood Risk Assessment (SFRA) was prepared in November 2018. The Level 2 SFRA was prepared in March 2019.

The Norfolk LLFA Statutory Consultee Guidance Document has been drafted to support the development of Norfolk County Council (NCC) as Lead Local Flood Authority's (LLFA) role as a statutory consultee to planning and to inform stakeholders in this process such as Local Planning Authorities (LPAs) and developers.

2.5 Available Flood Risk Information

The site is located within Flood Zone 3, an area with a high probability of flooding benefitting from defences, of the Environment Agency Flood Maps for Planning.

The Environment Agency Long Term Flood Risk maps show that:

- the site has a medium risk of flooding from rivers or the sea (annual probability between 1.0% and 3.3%);
- the site has a very low risk of surface water flooding (annual probability less than 0.1%) however the area to the east of the site is at risk; and
- the site is within an area at risk of reservoir flooding when there is also flooding from rivers.

The site is not within one of the settlements considered within the King's Lynn and West Norfolk Borough Council Level 2 SFRA. As such the Level 1 SFRA maps have been reviewed and they show that:

- the site is in Flood Zone 3a;
- the site is not at risk during a 1% annual probability (1 in 100 chance each year) fluvial event including allowance for climate change;
- the site is not at risk during a 0.5% annual probability (1 in 200 chance each year) tidal event including allowance for climate change;
- the site is not at risk of surface water flooding including allowance for climate change however the area to the east of the site is at risk;
- the site is not susceptible to groundwater flooding;
- the site is at risk from a tidal breach; and
- the site is not at risk from reservoir flooding.

Tidal Hazard Maps provided by the Environment Agency have been used to estimate the flood level during a breach.

3.0 FLOOD RISK VULNERABILITY

3.1 The Sequential and Exception Test

The NPPF requires the application of a Sequential Test to ensure that new development is in areas with the lowest probability of flooding.

The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

3.2 Vulnerability Classification

Table 2 of the PPG Flood Risk and Coastal Change categorises different types of uses and development according to their vulnerability to flood risk. The proposed development is classified as 'Less Vulnerable'.

Table 3 of the PPG Flood Risk and Coastal Change sets out Flood Risk Vulnerability and flood zone 'compatibility'. The site is in Flood Zone 3 and the development is 'Less Vulnerable' therefore it is not necessary to complete the Exception Test.

PPG Flood Risk and Coastal Change defines that the lifetime of the development in terms of flood risk and coastal change is 100 years.

3.3 Application of the Sequential Test

It is for the Local Planning Authority, using the evidence provided and taking advice from the Environment Agency as appropriate, to consider whether an application passes the Sequential Test.

The River Great Ouse has defences that provide protection during the 0.5% annual probability (1 in 200 chance each year) event including climate change. The 'actual risk' of flooding at the site is therefore low and the development is considered to pass the Sequential Test.

4.0 SITE SPECIFIC FLOOD RISK

4.1 Local Flood Assets

The site is 400m west of the River Great Ouse. The site is protected by the Great Ouse tidal defences. The River Great Ouse is the responsibility of the Environment Agency.

There is a long-term strategy for the maintenance of the Environment Agency defences which is reviewed and updated periodically.

There is an extensive local drainage network managed by King's Lynn IDB. There is an IDB Watercourse on the northern boundary of the site. The site, and surrounding land, is part of the Mary Magdalen catchment which drains by gravity to the Crabbs Abbey Pumping Station which discharges to the River Great Ouse.

During the operation and maintenance of its pumping stations, associated structures, and channel systems, the IDB seeks to maintain a general standard capable of providing flood protection to its district. A routine maintenance programme is in place to ensure that the Boards assets are commensurate with the standard of protection that is sought.

The site is approximately 2.1km east of the Middle Level Main Drain, an embanked channel which flows to St German Pumping Station to discharge to the tidal River Great Ouse. The Middle Level Main Drain is the responsibility of the Middle Level Commissioners.

Current maintenance standards of the King's Lynn IDB's, the Middle Level Commissioners and the Environment Agency's defences are generally good.

4.2 Sources of Flooding

The potential sources of flooding that have been identified during this assessment are:

- local blockages in the drainage system;
- an event in the local drainage network that exceeds the standard of protection;
- failure of the outfall to the Crabbe Abbey Pumping Station;
- overtopping and/or breaching of the River Great Ouse tidal defences; and
- overtopping and/or breaching of the Middle Level Main Drain.

The likelihood of overtopping and/or breach of the Middle Level Main Drain is considered less likely and less significant than a tidal breach. As such it has not been considered further in this assessment.

4.3 Probability of Flooding

The probability of flooding associated with blockages in the IDB's drainage system is low due to the maintenance standards already achieved and managed by the IDB.

The standard of drainage provided by King's Lynn IDB is assessed at 1% annual probability (1 in 100 chance each year) in line with their target standard of protection to residential properties. This exceeds the Department of the Environment, Food and Rural Affairs (DEFRA) target level of service for rural drainage and flood defence works. The risk associated with flooding due to events greater than 1% annual probability (1 in 100 chance each year) is lowered due to the King's Lynn IDB main drains incorporating freeboard. This provides storage during events greater than 1% annual probability (1 in 100 chance each year).

St Germans Pumping Station offers protection against the 1% annual probability (1 in 100 chance each year) fluvial event with an allowance for climate change. The St German Pumping Station was replaced in 2011 so that a standard of protection against the 1% annual probability (1 in 100 chance each year) event could be maintained.

The site benefits from defences on the River Great Ouse that provide protection during an event with a 0.5% annual probability (1 in 200 chance each year).

4.4 Historic Flooding

During the preparation of this assessment, no evidence was discovered of the site being flooded.

4.5 Climate Change

Climate change is likely to impact the site through increased rainfall intensity and duration affecting the local drainage network and increased flood levels in the River Great Ouse.

The SFRA maps show that the site is not at risk during the 0.5% annual probability (1 in 200 chance each year) tidal event with climate change. When this event is considered in the River Great Ouse it is likely to lead to some overtopping of the defences. However, the level of overtopping is such that it would not affect the site.

In summary the existing systems and defences are appropriate for the design life of the development (i.e., 100 years).

4.6 Residual Risk

The SFRA indicates that there is a residual risk of flooding at the site during a breach.

The Environment Agency Hazard Mapping indicates the maximum flood depths in the event of a combined breach. The maximum flood depth at the site for the 0.5% annual probability (1 in 200 chance each year) event with climate change is 2.0m as shown in Figure 3.

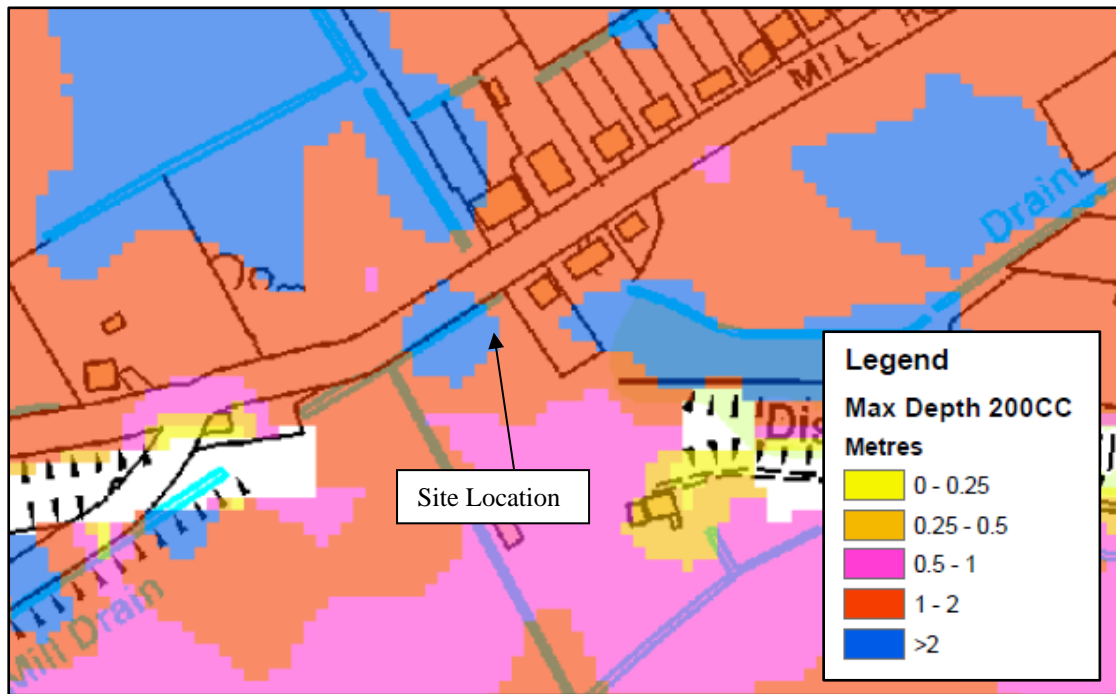


Figure 3 – Environment Agency Hazard Map Maximum Flood Depth

5.0 FLOOD RISK MITIGATION

5.1 Summary of Risks

The probability of this development flooding from localised drainage systems is low. Failure of Crabbe Abbey Pumping Station could lead to an increased level of risk at the site.

The probability of the site flooding from any Environment Agency system is less than 1% annual probability (1 in 100 chance each year) because of the standards of the existing flood defence systems. Over time there will be a gradual increase in risk to the site due to climate change. During the design life of the development, it is not anticipated that the site would flood.

There is a residual risk to the site should there be a breach of the Environment Agency tidal defences. The peak flood depth at the site is estimated to be 2.0m.

5.2 Mitigation Measures

Considering the development is a solar array there are no specific mitigation measures proposed associated with the design.

The developer should ensure that the owner of the solar array is sufficiently aware of the risk of flooding, and the standard of the existing defences. The Environment Agency provides a Flood Warning Service which includes Flood Warning Codes and uses direct warning methods where the risks and impacts of flooding are high.

In addition to direct and indirect flood warnings, the Environment Agency operates a 24 hour a day Floodline Service providing advice and information on flooding. The owner of the solar array should register with the Floodline Direct Warnings Service to receive any future flood warnings.

Failure of Crabbe Abbey Pumping Station may occur. However, in these circumstances, if conditions were such to put properties and land at risk of flooding, the Internal Drainage Board would take emergency action to maintain the drainage level of service by utilising temporary pumping equipment.

6.0 CONCLUSIONS

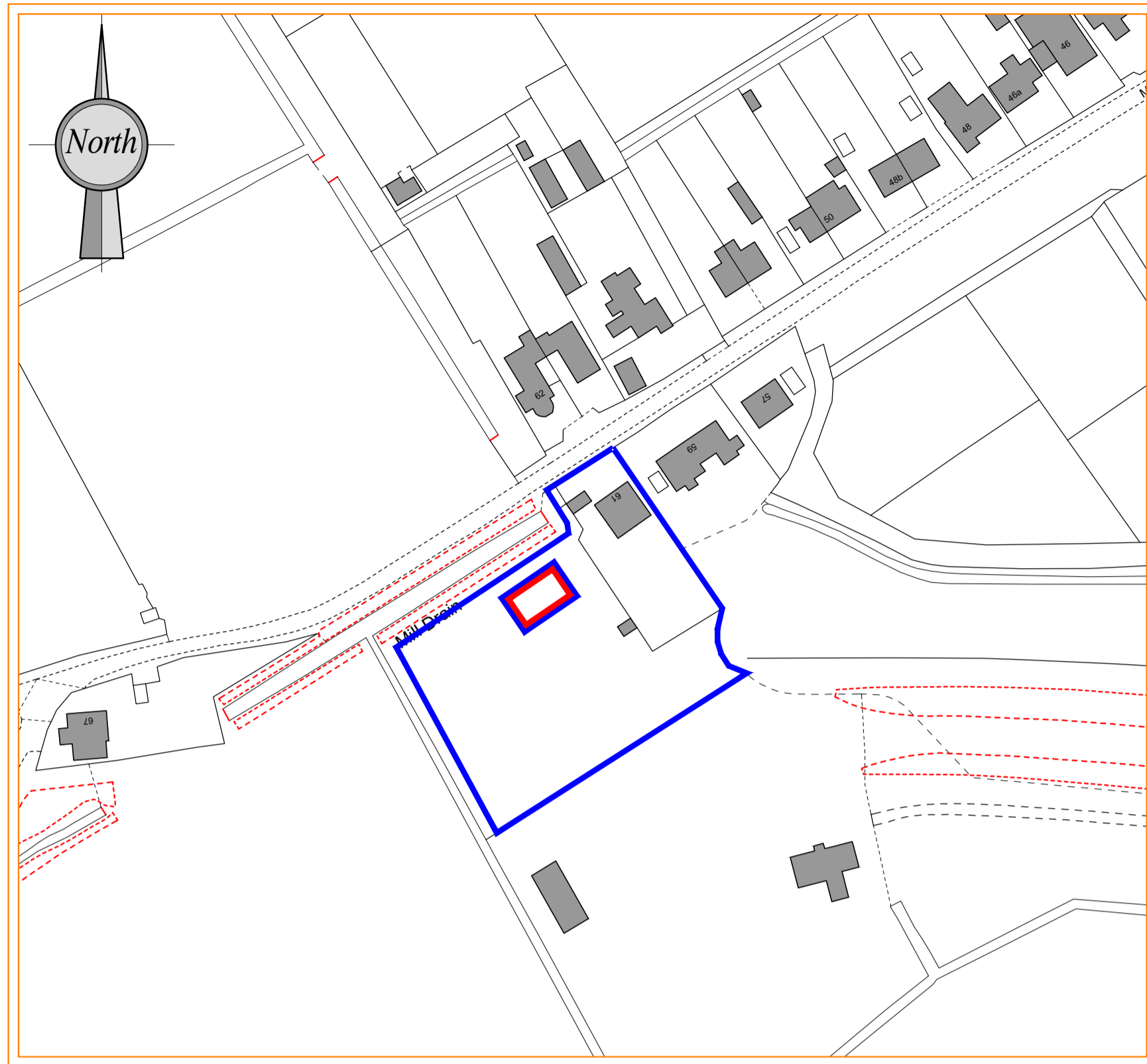
As a result of the assessment, the following conclusions have been reached.

- The proposed development consists of a solar array on Mill Road, Magdalen.
- The site is located within an Internal Drainage Board catchment with a minimum standard of drainage of 1% annual probability (1 in 100 chance each year) which exceeds the DEFRA target level of service for rural drainage and flood defence works. The risk of flooding is lowered further due to the King's Lynn IDB main drains incorporating freeboard. This provides storage during events greater than 1% annual probability (1 in 100 chance each year).
- The proposed development is in Flood Zone 3. The site benefits from defences on the Tidal River Great Ouse that provide protection against the 0.5% annual probability (1 in 200 chance each year) event including climate change.
- The site at risk during a tidal breach with depths up to 2m.
- There are no specific recommendations associated with the proposed development to reduce the risk of flooding.
- The development passes the Sequential Test and is therefore suitable for the proposed location.

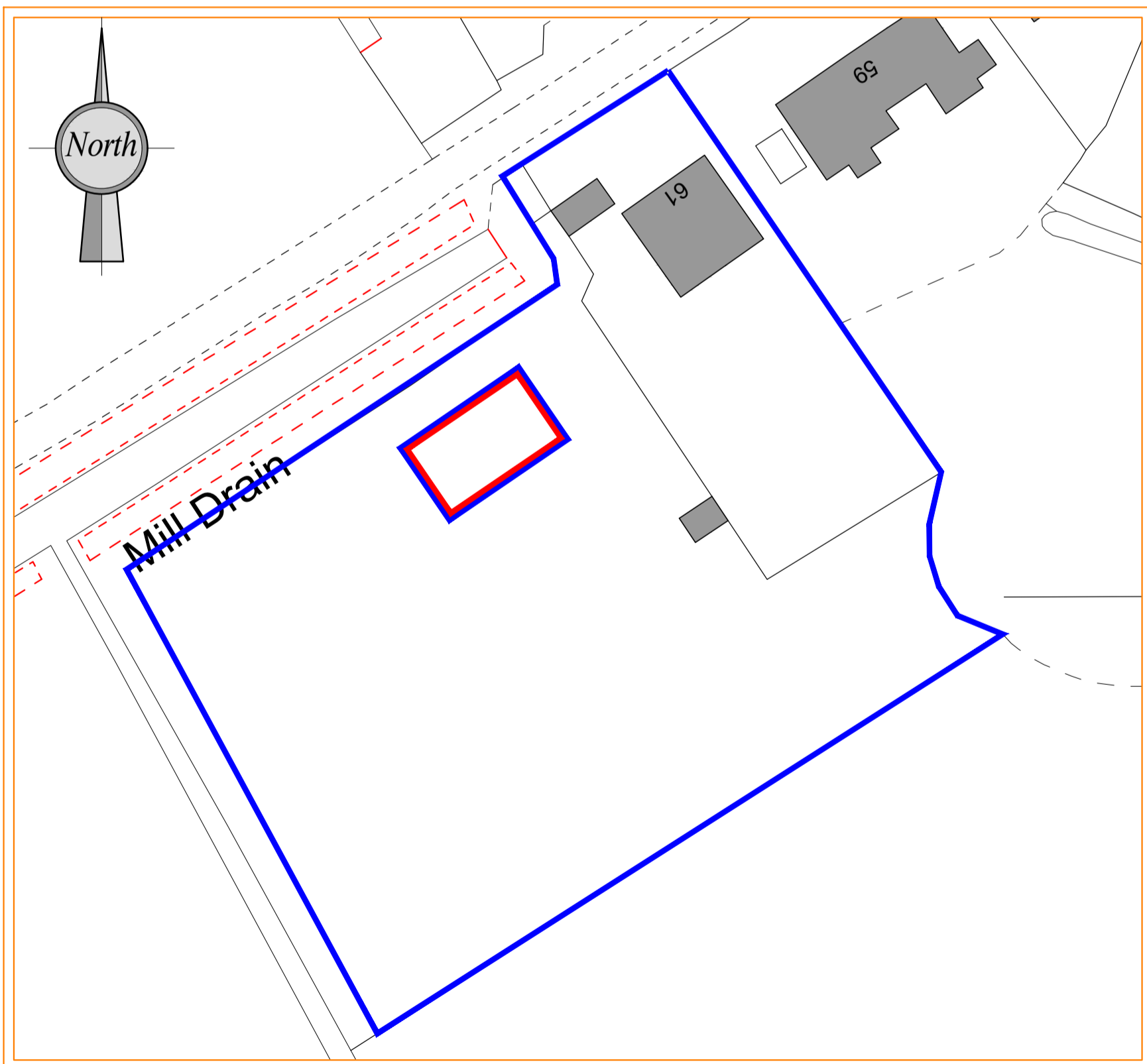
ATTACHMENT 1

**PROPOSED SOLAR ARRAY
(Dwg 2125.01A)**

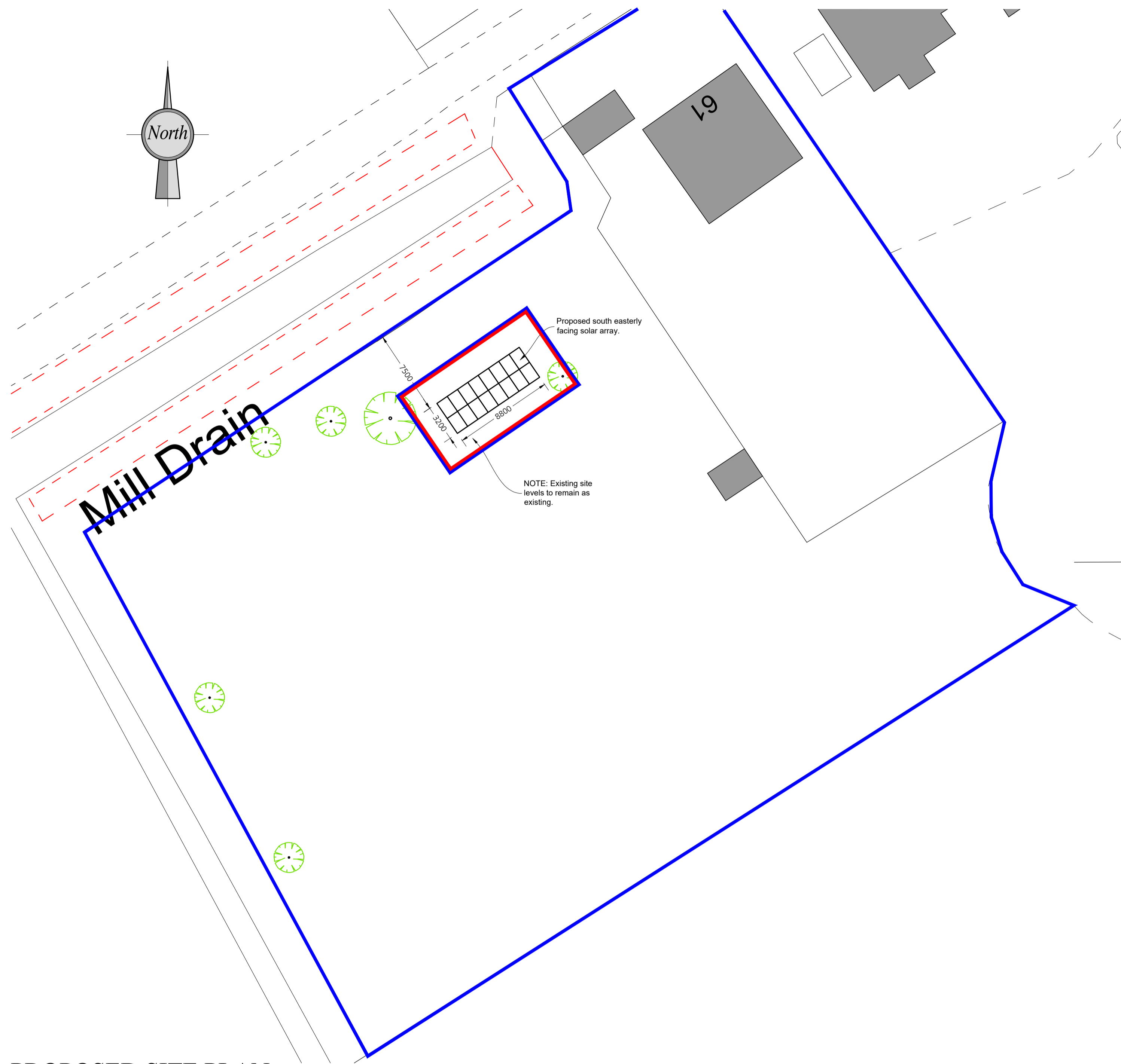
PROPOSED SOLAR ARRAY



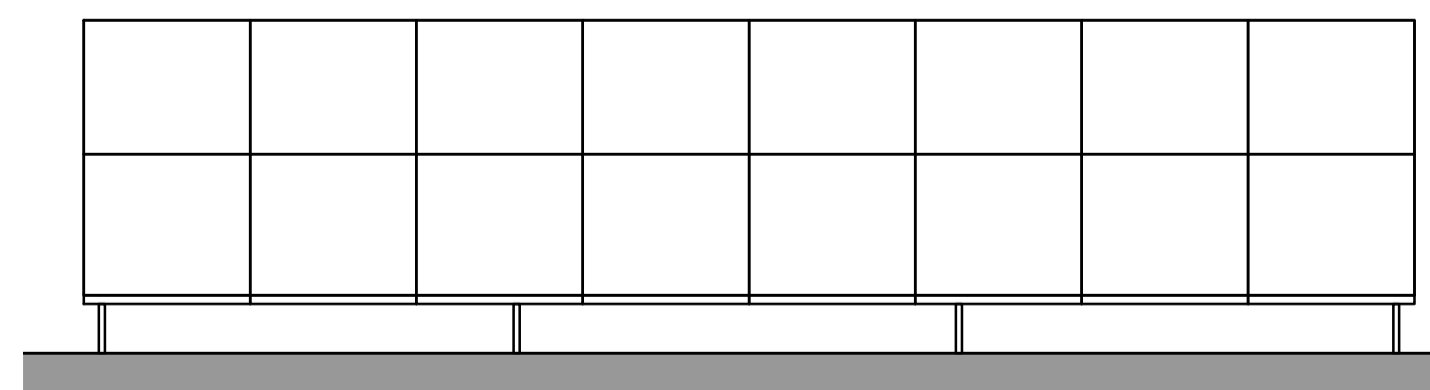
LOCATION PLAN
SCALE 1:1250



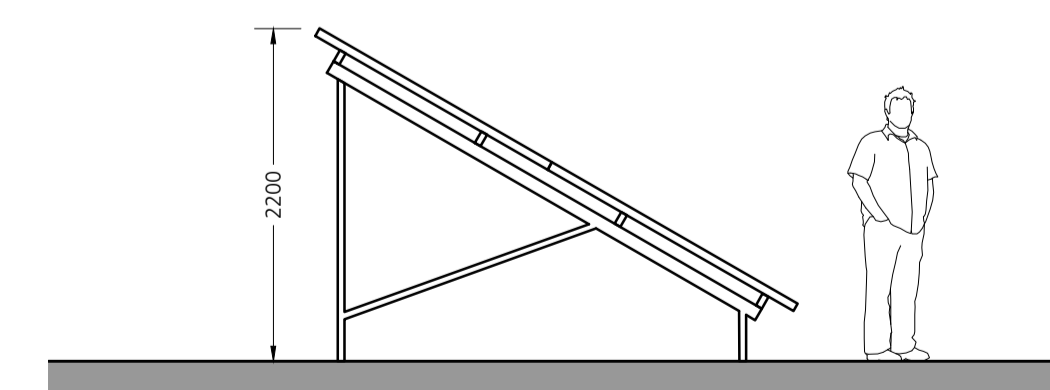
BLOCK PLAN
SCALE 1:500



PROPOSED SITE PLAN
SCALE 1:250



SOLAR ARRAY FRONT ELEVATION
SCALE 1:50



SIDE ARRAY SIDE ELEVATION
SCALE 1:50

NOTES:

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All dimensions to be checked before site or off-site fabrication by the Contractor, his Sub-contractor or Supplier.

Structure, structural members & geotechnical investigations are to be carried out & approved by the appointed Structural Engineer. Any deviations to these elements are to be reported to the appointed consultant immediately.

IF IN DOUBT ASK !



INDICATIVE ILLUSTRATION
OF A PARK TEGRA SOLAR
MOUNTING SYSTEM
SCALE NTS



BUILDING DESIGN CONSULTANTS

Project :
Proposed Solar Array at 61 Mill Road, Magdalen, PE34 3BZ

Client : Mr & Mrs Heyes
Issue Date : 27/04/2021

Title :
PROPOSED SOLAR ARRAY

Revision Details :
N/A

Drawing number : 2125.01
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