

Technical Note

Project name Gate Burton	Client Low Carbon	Subject Nursery House: Surface Water and Flood Risk Feedback	Date 19 May 2023
Prepared by Rob Sweet	Checked by Richard Moore	Approved by Will Barrett	

1. Overview

The purpose of this Technical Note is to provide the following:

- Identify the site location with respect to the proposed Gate Burton Solar Energy and Battery Storage Park;
- Assess the existing flood risk (fluvial, tidal, surface water, groundwater, reservoir and sewer) in the immediate vicinity of Nursery House;
- Provide the observations from the Site Visit in May 2022 as an appendix to the Technical Note;
- Set out potential options that may benefit Nursery House; and
- Present any limitations that the reader should be aware.

2. Site Location

The site of interest is Nursery House, Willingham Road, Marton, Lincolnshire DN21 5BQ. The approximate NGR for the centre of the site is SK860829. Figure 2.1 illustrates the boundary of the property and associated land.



Figure 2.1 – Indicative boundary around Nursery House and associated land

3. Flood Risk to Nursery House

As per the National Planning Policy Framework (NPPF)¹, the sources of flooding to Nursery House have been assessed and provided in Table 3.1. This summarises the existing (baseline) flood risk to Nursery House.

Table 3.1 - Assessment of flood risk sources to Nursery House

Source of flooding	Source of information	Assessment
Fluvial	Environment Agency Flood Map for Planning ²	A review of the Flood Map for Planning indicates that Nursery House is located in Flood Zone 1 (low annual probability of flooding from fluvial sources). It is noted that flood extents are only mapped from south of Willingham Road and is likely to be a function of the technique used to model the flood extents. Whilst the risk of flooding from this source is considered to be low based on the available mapping, the use of surface water flood mapping (see below) provides a surrogate for small catchments.
Tidal	Environment Agency Flood Map for Planning ²	A review of the Flood Map for Planning indicates that Nursery House is located in Flood Zone 1 (low annual probability of flooding from tidal sources). This risk of flooding from this source is considered low.
Surface Water	Environment Agency Long Term Flood Risk Mapping ³	A review of the Long Term Flood Risk Mapping indicates that Nursery House is susceptible to surface water flooding. The source of this flooding is from the adjacent ordinary watercourse located to the west of Nursery House (flowing in a north to south direction). The risk of flooding from this source is considered high.
Groundwater	British Geological Survey	Figure 9.5 accompanying the Environmental Statement relating to the solar farm scheme, indicates that Nursery House and the surrounding area have a limited potential for groundwater flooding to occur. This risk of flooding from this source is considered low.
Sewers	InfoTrack – Drainage and Water Search	There are no public sewers within the vicinity of Nursery House. The risk of flooding from this source is considered negligible.
Artificial sources (reservoirs, canals)	Environment Agency Long Term Flood Risk Mapping ³	Nursery House is not located within an area at risk of flooding from reservoir breach/failure. Foss Dyke is located approximately 5 km south of Nursery House and is not considered to represent a flood risk to the house from breach or failure. The risk of flooding from this source is considered negligible.

4. Site Observations

A site visit was undertaken in May 2022 to discuss and understand the historical flooding at Nursery House, the source, extent and frequency of flooding, existing mitigation measures and concerns in relation to the proposed Gate Burton Solar Energy and Battery Storage Park with respect to flood risk and drainage. Appendix A provides notes on the site visit and commentary from residents of Nursery House ([REDACTED]). This includes additional information from the residents on:

- Construction of banking/bund/berm (approximately 2000) and additional banking (approximately 2007 following extensive tree clearance).
- Small diameter pipe on northern edge of property is a 10” twin wall drainage pipe.
- Major concerns on flooding to west of Nursery House and to a lesser extent to the north.
- Maintenance concerns of existing dykes/watercourses.
- Concerns re potential increase in flood risk from solar panels and alterations to drainage

¹ Available at: <https://www.gov.uk/guidance/national-planning-policy-framework> (accessed May 2023)

² Available at: <https://flood-map-for-planning.service.gov.uk/> (accessed May 2023)

³ Available at: <https://check-long-term-flood-risk.service.gov.uk/> (accessed May 2023)

5. Potential Options

The outline Drainage Strategy (**Appendix 9-C: Outline Drainage Strategy [EN010131/APP/3.3]**) submitted as part of the Development Consent Order (DCO) application provides details of surface water management. In line with the NPPF, flood risk to and from a proposed development should not increase flood risk from any source including allowances for climate change up to and including the 1 in 100 year (1% Annual Exceedance Probability) event. This has been taken into account within the outline Drainage Strategy and demonstrates the principle that surface water management has been considered in line with relevant guidance and requirements considering the lifetime of the development.

If the DCO is granted, then further work will be undertaken through detailed design of surface water management and the relevant permits/consents will be required from the relevant authority (Internal Drainage Board, Environment Agency and/or Lead Local Flood Authority) as part of the 'requirements'.

At this stage, three potential options have been identified as part of this Technical Note. These may be explored further at detailed design stage to reduce surface water flood risk and provide additional benefits for the scheme and potentially neighbours. The potential options are:

Option 1 – lower area of land to the north of Nursery House (illustrated as a green polygon in Figure 5.1) boundary and reconnect existing ditch to channel (arrow). This would create additional storage, remove the potential for the 10" diameter twin wall drainage pipe to become blocked by using an open channel feature and also provide wider potential benefits (for biodiversity).



Figure 5.1 – Indicative area to north to lower/reprofile and reconnect existing ditch using open feature (arrow)

Option 2 – create a two-stage channel by lowering right hand bank of the channel to the west of Nursery House. Figure 5.2 presents a schematic of how the two-stage channel could be designed while Figure 5.3 shows the indicative location of where the two-stage channel could be located.



Figure 5.2 – Indicative lowering of right-hand bank (looking in a downstream direction) creating a two stage channel

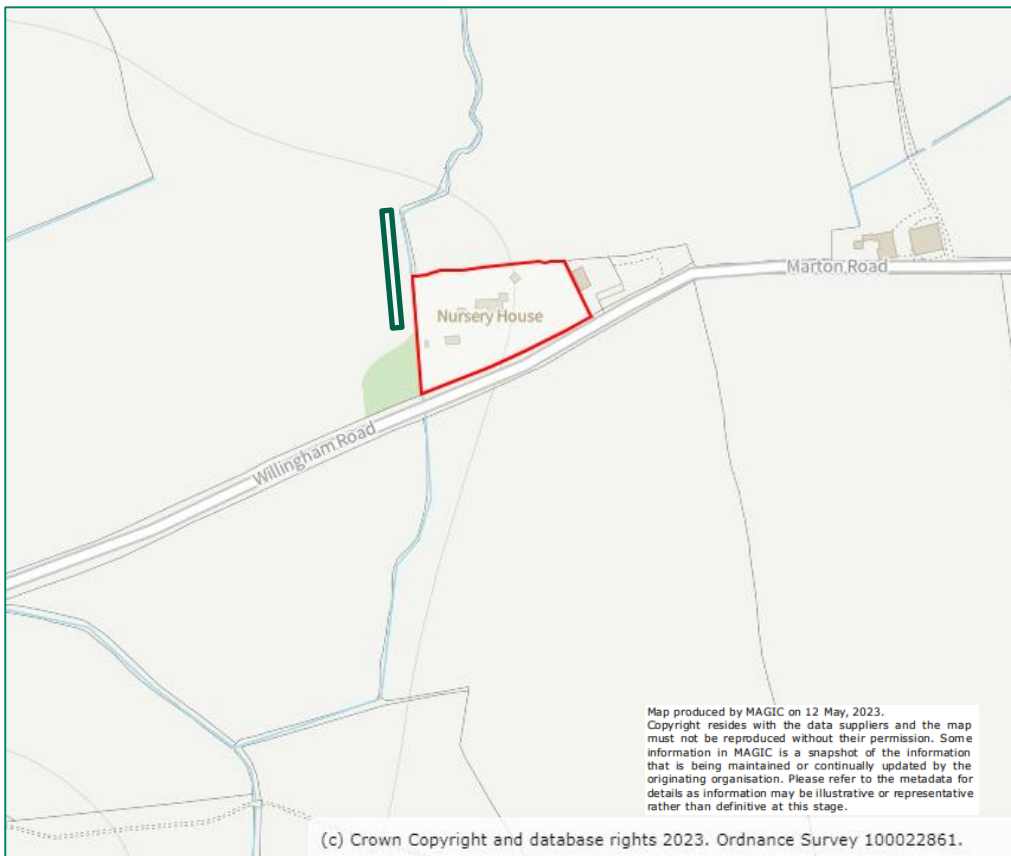


Figure 5.3 – Indicative reach for lowering right-hand bank

Option 3 – create flow path for lower return period events to connect the channel and ditch to west (appears to be an east west flow based on the 1% AEP surface water flood map) through reprofiling of existing ground levels. Indicative location of potential flow path shown by green arrow on Figure 5.4.

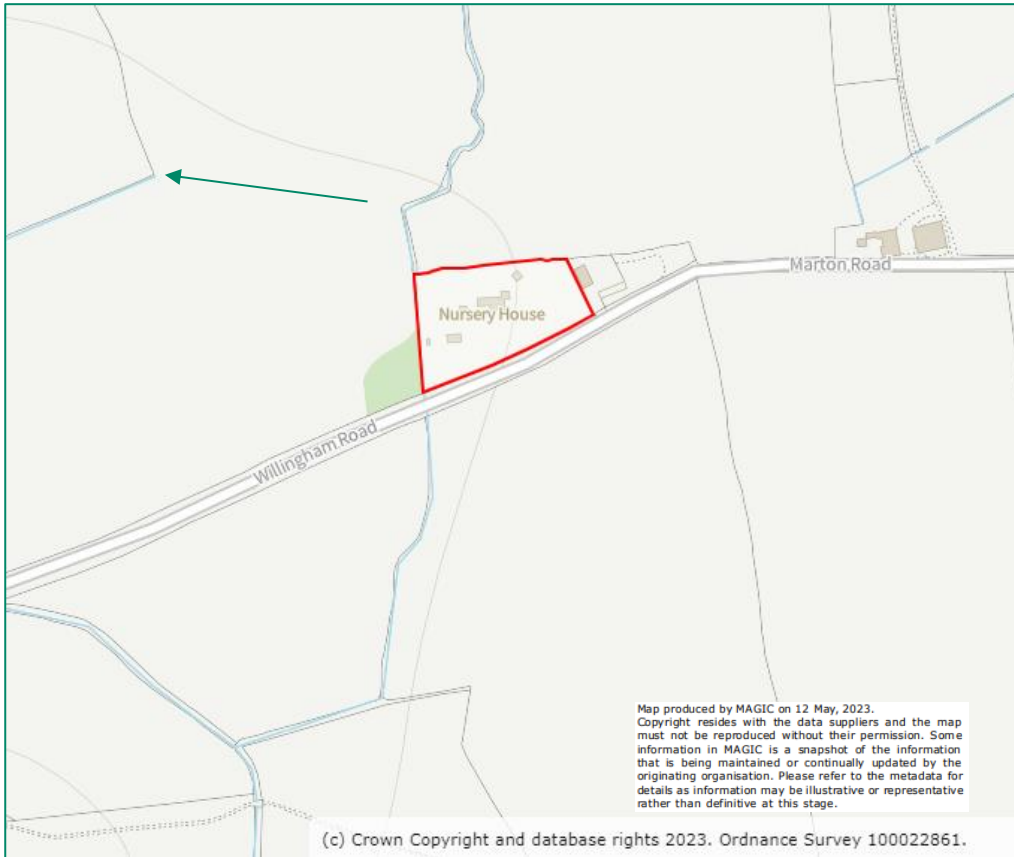


Figure 5.4 – Indicative location for connecting overland flows to existing ditch through reprofiling

6. Limitations

The following are limitations to this assessment as discussed within this technical note:

- Existing flood risk provided in Section 3 is for the present day and therefore does not include an assessment for climate change. The assessment is based on available information at the time of writing.
- The potential options identified have not been tested through hydraulic modelling, therefore their effectiveness to reduce flood risk to Nursery House is currently unknown.
- There is no guarantee that any of these potential options (or others) will be taken forward by Low Carbon in detailed design.

Appendix A – Site observations and comments

To:**CC:**

Memo

Subject: Near Neighbours Visit – Nursery House

In attendance:

Rob Sweet (AECOM), Tim Jones (AECOM), Nathan Mitchell (AECOM), Alistair Goodfellow (AECOM) and Andrew Thomassen (Low Carbon), [REDACTED] (residents of Nursery House)

This provides a summary of a meeting with the Hare's at Nursery House to understand:

- History of flooding at Nursery House and surrounding area;
- The source, extent (internal/external) and frequency of flooding;
- Existing mitigation measures; and
- Concerns with the proposed scheme in relation to flood risk and drainage.

Background

The [REDACTED] purchased the property in October 2015, a low level bund around the property was put in place by previous owners. The bund extends part way along the northern property boundary (western extent) and a small diameter pipe conveys flows from a ditch (eastern extent of northern boundary).

Using Google Earth, it is thought that the low level bund was put in place between approximately September 2008 and June 2011 based on a change in configuration of the previous and current driveway/approach to the property. In addition, between December 2003 and April 2005, there has been a reduction in tree cover and opening up to create grassed areas within the grounds.

Historical flooding

Whilst the low level bund has not overtopped since the Hare's have lived in the property, water levels in the adjacent watercourse, the field to the north and an area in the south west corner of the property boundary (outside of the bund) have risen close to the top of the bund in November 2019. Photos of the flooding have been shared with Low Carbon.

The areas of flooding correspond well with the indicative surface water flood maps produced by the Environment Agency both in depth and extent for the 3.3% Annual Exceedance Probability (1 in 30 year) event.

Source, extent and frequency of flooding

The source of flooding is from surface water where the infiltration capacity of the soils in the surrounding area is exceeded and either conveyed by overland flow and/or existing field drainage systems to receiving watercourses. The [REDACTED] indicated that flooding is generally worse during the winter period (October to March) when vegetation has died back and/or crop coverage is low with flooding taking 2-3 weeks to subside. The underlying soils are clay, this has been confirmed through review of information on the www.magic.gov.uk. This indicates that soils are 'Slowly permeable seasonally wet slightly acid but base-rich loam and clayey soils', therefore confirming onsite observations.

The [REDACTED] generally remain within their property during periods of bad weather, when they do leave the property, they tend to go eastwards along Marton Road and therefore couldn't confirm the extent/depth of flooding to the west where the main Internal Drainage Board drain passes beneath Willingham Road.

Existing mitigation measures

In addition to the low level bund that surrounds the property and a number of outbuildings, roof water is collected in a rainwater harvesting tank and is transferred to the pond via a pump. Furthermore, tree planting has been undertaken, in particular along the northern boundary and eastern part of the property to aid in screening the grounds and encourage uptake of water. However, it is noted that there mainly deciduous and therefore will have low rates of water uptake during the period October – March, plus these will take 10-15 years to fully establish.

Residents concerns

The main concerns with the proposed Solar and Energy Storage Park from a flood risk perspective for the [REDACTED] are:

- Potential for increased flooding that would affect their property and grounds;
- Change in surrounding land use may affect their ability to insure their property

It would be preferable for solar panels to be located away from their property and if there is potential for mitigation measures that would benefit/reduce their susceptibility to surface water flooding this would be welcomed i.e. pond/lake feature.

Comments – [REDACTED]

This is a fair summary of the matters discussed although we have some comments as follows: -

Background

The conclusion made that the banking/bund/berm was constructed some time between September 2008 and June 2011 is almost certainly incorrect, we believe it to be much older dating back to the period when the site was a garden nursery. The owner at that time built the house circa 1998 and we have always understood that the bund was constructed around that time to protect the house located as it is at the lowest point in the entire site. We suggest construction of the bund started in the early 2000's. When the business folded the nursery site was sold to [REDACTED] who subsequently made significant alterations not only to the house but the entire site. The original house had a straight drive leading to a double garage evidenced by the 2003 Google Earth photo where two cars can be see parked in front of it. After purchasing the property (sometime around 2006) the [REDACTED] started clearing the trees on the eastern part of the site (12/2007 photo) and in 2008 built an annex on the north-eastern side of the house and converted the garage into an orangery (sunroom) as it is today (9/2008 photo). Study of the Google Earth photo reveals how the roof of that garage (previously fully tiled) acquired a 'UPVC lantern'. From our conversations with the [REDACTED] we know the drive configuration was subsequently altered as part of a general landscaping project which included further tree clearance and enlargement of the pond.

The Google Earth photographs are not very clear and much of the detail is obscured by the many trees that were growing in the 'nursery' period. From the visit you will be aware that there is a track running east-west from the drive to the dyke (outside the bund) where we now have a blue storage container. That track is visible in the 12/2007 photo and it is also possible to see how that track turns to the north before stopping abruptly. That bend is the bund turning through 90 degrees to follow a north-south line parallel to the dyke. The same detail can be seen in the 4/2005 photo but unfortunately trees obscure detail in the 12/2003 photo. The only change made to the bunding during the [REDACTED] ownership, that we are aware of, was to add additional banking on the north-eastern dyke following extensive tree clearance in 2007.

The small diameter pipe referred to on the northern edge of the property is a 10" twin wall' drainage pipe,

Historical Flooding

We wish to stress that our major concerns over flooding are not the areas to the north or south-west but the west. The dyke/ditch runs north – south along our western border and following periods of heavy rainfall naturally overflows into surrounding farmland, essentially the farmer's field west of the dyke and to a lesser extent the field to our north adjacent to the dyke. The area on the south-west of our land is not protected by the bund and naturally floods along with the farmer's field to the west. This is almost certainly intentional providing an effective flood plain outside the bund. We

believe the flooding to the west has been exacerbated by the installation of field drains and removal of hedgerows. This small dyke is not maintained by the Drainage Board and has not been maintained during our ownership by the farmer.

Existing Mitigation Measures

There has been extensive tree planting on our side of the dyke running along our western border over many years. This includes tall leylandii and water loving deciduous trees such as willow and poplar. We have carried out some maintenance on these trees (removing tops of Leylandii, poplars etc) but not excessive cutting back as the trees draw off a lot of water and help to retain the integrity of the banking. We have recently added to this tree line with planting of western red cedars and more will be added to in coming months,

Tree planting in the area to the east (previously cleared by the [REDACTED]) will continue in coming years. This year we intend to plant western red cedars along the edge of the dyke. The problem with tree planting is that young trees need watering and care until they become established so planting over time is more practical for us. We also have problems with rabbits and deer as they seem to have an appetite for young trees.

Concerns

Insurance

In order to get appropriate insurance cover, we provided our insurer with extensive information on the site including photographs of the banking (bundling) protecting the house. Cover has been provided on the understanding that a) suitable defences are in place and b) surrounding land is used for agricultural purposes where the land itself will retain rainwater. If the land to the north and west of us is covered with solar panels with modified land drainage, then the insurer will naturally be concerned which is why we/you must be able to demonstrate that nothing Low Carbon does will increase the possibility of flooding on our property. Once the Low Carbon project is approved by the Secretary of State, we will need to advise our insurers accordingly and it would be more than helpful if we could demonstrate that Low Carbon's plans will demonstrably reduce the potential for flooding rather than the opposite.

The increase in abnormal periods of rainfall in recent years (climate change?) potentially increases insurers' concerns so we trust that drainage plans for the solar park will incorporate an element of future proofing,

Potential for Increased Flooding

There are several elements to our concerns

- a) Historically the dyke on the west of our land was nothing more than a field ditch which joined the main dyke in the area outside Low Carbon's current interest. In recent times this ditch has taken more rainwater due to the installation of land drains and other activities undertaken by the farmer. It is critical that this waterway is not incorporated in drainage planning as a key component. Even if it was dredged it seems unlikely that water would clear any better.
- b) The area to be covered by solar panels is extensive to the north and west of our property. We trust that drainage plans will divert rainwater to the main dykes currently maintained by the Drainage Board rather than unmaintained ditches/small dykes.
- c) The installation of drainage around the solar panels seems likely to increase both the volume of water carried into the waterways and the rate of discharge into them. If the land is no longer retaining excess rainwater this will simply pass on the flooding risk to the farms and land outside Low Carbon's area.
- d) If the dykes and land to the south of Willingham Road/Marton Road (outside Low Carbon's area) cannot deal with the quantity of rainwater in the area it seems likely that water will back up into the dykes near us increasing the likelihood of flooding. So, planning must consider land drainage outside the Low Carbon area, not simply work out a way of getting water out of the area.
- e) Existing land drainage in the whole area (inside and outside the Low Carbon solar park) is extensive and complicated having developed over very many years. It seems inevitable that tinkering/making changes in one part could have serious implications elsewhere. It is not clear how any drainage plans are to be policed by the Drainage Boards / Environment Agency.