FLOOD RISK ASSESSMENT

PROPOSED CEMETERY& PUBLIC RECREATION AREA.
BLUE GOWT LANE,
PINCHBECK,
SPALDING,
LINCOLNSHIRE.



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FLOOD RISK ASSESSMENT FOR PROPOSED CEMETERY & PUBLIC RECREATION AREA, BLUE GOWT LANE, PINCHBECK, SPALDING.

INTRODUCTION

The Government has placed increasing priority on the need to take full account of the risk associated with flooding at all stages of the planning and development process. This seeks to reduce the future damage to property and the risk to life from incidents of flooding. Their expectations relating to flooding are contained in the National Planning Policy Framework Feb 2019, (NPPF), which identifies how the issue of flooding is dealt with in the drafting of planning policy and the consideration of planning applications by avoiding inappropriate development in areas at risk from flooding and to direct development away from areas at highest risk.

The NPPF provides that development in areas at risk of flooding should be avoided and seeks to direct development away from areas at highest risk. There is a sequential, risk-based approach to the location of development avoiding where possible, flood risk to people and property managing any residual risk and taking account of the impacts of climate change.

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APPLICATION SITE

The site is located on land off Blue Gowt Lane, Pinchbeck, Spalding, within the South Holland District Council's administrative area. The National Grid Reference is TF 23402 24661**. Plan 1**

The flood risk assessment has been prepared to accompany a full planning application for a cemetery with 625 burial plots, associated parking, a small storage building (12m x 6m) and the use of the remaining land as a public recreation area. **Plan 2**

The existing cemetery is close to capacity and with the rising population and growing settlement, there is the need for a new cemetery to facilitate the demand.

From the topographical survey the site is reasonably level, the levels vary from 3.30mODN to 2.78mODN averaging

3.00m ODN. The road level at the site entrance, is 3.28mODN. **Plan 3**

The proposed development site is shown to be within Flood Zone 3a 'High Probability' as detailed on the Environment Agency's Flood Zone Maps without defences, and as defined in Table 1 of NPPG. Map**1**

Table 1: Flood Zones Definition (Ignoring the presence of defences)

Flood Zone 3- High Probability
Definition Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for uses in times of flood **Flood Risk Assessments requirements** All proposals in this zone should be accompanied by a Flood Risk Assessment. **Policy aims** Developers and local authorities should seek opportunities to: • reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; • relocate existing development to land with a lower probability of flooding; • create space for flooding to occur by allocating and safeguarding open space for flood storage.

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPG the proposed cemetery development is classified as "Less Vulnerable", with Table 1 of NPPG stating that such uses are appropriate in this zone.

Table 2: Flood Risk Vulnerability Classification

Less Vulnerable
• Police ambulance and fire stations that are not required to be operational during flooding • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non- residential institutions not included in "more vulnerable" and assembly and leisure. • Land and buildings used for agricultural and forestry. • Waste treatment (except land fill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works that do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flood events are in place).

DRAINAGE AUTHORITIES

Environment Agency

The Environment Agency is responsible for reducing the risk of flooding from designated main rivers and from the sea.

The following potential sources of flooding affecting the development site have been identified as:

- From the River Welland (Tidal)
- The River Glen (Fluvial)
- Welland & Deepings Internal Drainage Board system

The Flood Zone Maps identify river catchments over 3 sq. km. These maps are a theoretical estimate of areas that could be inundated should no defence exist. In practice, current standards of protection would result in flood envelopes substantially less than shown by these maps. The maps make no allowance for local, site specific features.

The flood zone maps show that the site of the proposed development is considered at risk from flooding. These maps indicate that the area would be flooded without flood defences, which are in place, (with an annual probability of more than 0.5% i.e. return frequency of less than 1 in 200 years for tidal flooding or more than 1.33% return frequency of less than 1 in 100 years for fluvial flooding). **Map 1**

The Risk of Flooding from Rivers and Sea Map shows that the site is at Very Low risk of flooding. Very low means that each year, this area has a chance of flooding of less than 1 in 1000 (0.1%). This takes into account the effect of any flood defences that may be in this area. Flood defences reduce, but do not completely stop the chance of flooding as they can be overtopped or fail. **Map 2**

River Welland

The River Welland lies some 2.03Km to the south-east of the site and is tidal down stream of Marsh Lane Sluice, the present day 1 in 200-year tide flood level is 5.98mODN. The tidal flood defences of the tidal River Welland consist of earth embankments which are in good condition and the crest heights are circa 7.00mODN.

From Lincolnshire & Northamptonshire Area, Tidal Modal Analysis (June 2006) **Map 3**
Peak tide levels Present Day (2006) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN
Peak tide levels (2116) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN plus climate change allowances from Table 3 of 1.21mm = 7.11mODN

Taking the precautionary approach, the Hazard Rating following a breach which in Flood Risk Assessment (FD 2320) Guidance for New Development Phase 2 R& D Technical Report these are classified as low <0.75, moderate 0.75-1.25, significant 1.25-2.50 and extreme >2.50 based upon an empirical measure of velocity and depth.

HR = d x (v + 0.5) +DF
Where V = Flood flow velocity (m/sec) D = Flood depth (m)
DF = A debris factor included to represent the greater damage, or risk of injury to people, that can occur if debris is swept along with the water. = 0.5 for depths <0.25 or 1.0 for depths.

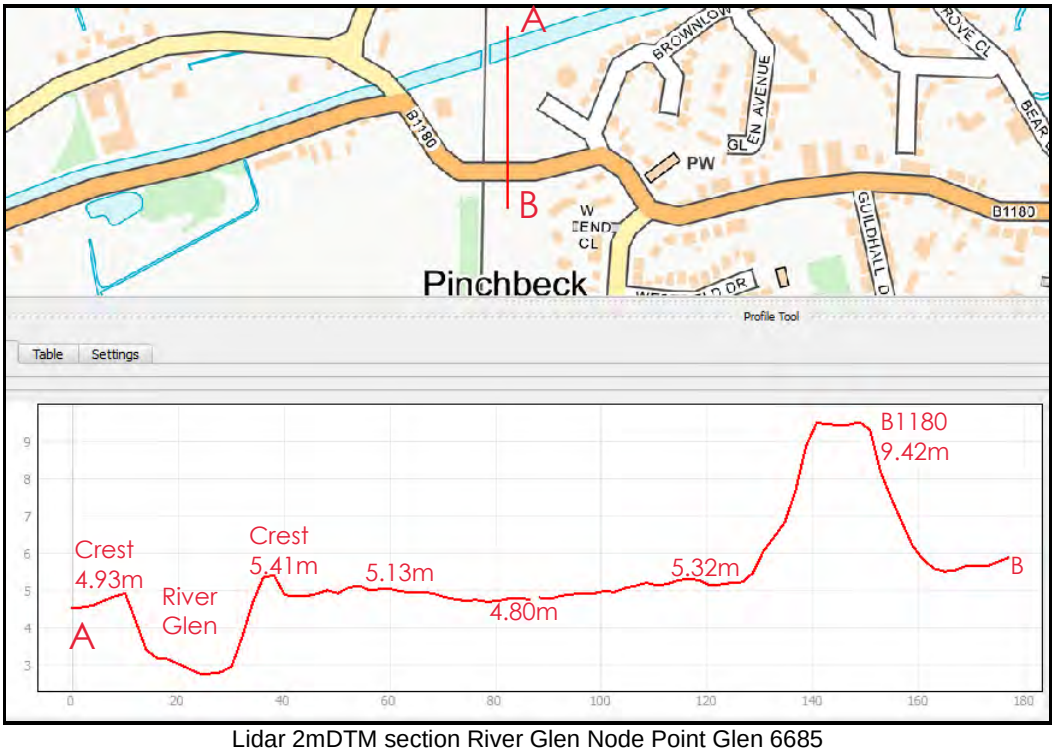
For the degree of Flood Hazard to be classified as low HR must be <0.75

Flood Hazard			Description
	<0.75	Low	**Caution –** Flood Zone with shallow flowing water or deep standing water.
	0.75 – 1.25	Moderate	**Danger for Some -** (i.e. children) Danger Flood Zone with deep or fast flowing water.
	1.25 – 2.0	Significant	**Danger for Most –** Danger Flood Zone with deep fast flowing water.
	>2.0	Extreme	**Danger for All** – Extreme Danger Flood Zone with deep fast flowing water.

The 2017 Update to SHDC, SFRA has carried out a Tidal & Fluvial Hazard Mapping, for Spalding following a breach to the defences. The present-day Residual Flood Hazard, Depth and Velocity Spalding - Year 2115 1% fluvial and 0.5%Tidal Event Probability Maps show that the site where the proposed cemetery to be located is not affected. The Hazard, Velocity and Depth Maps, for year 2115, shows that part of the site is within a Low hazard area, less than 0.75 and part within a hazard rating area of 0.75 – 1.25 (Danger for Some), depth 0 - 0.5m and velocity 0 –0.3m/sec **Maps 4, 5 & 6.**

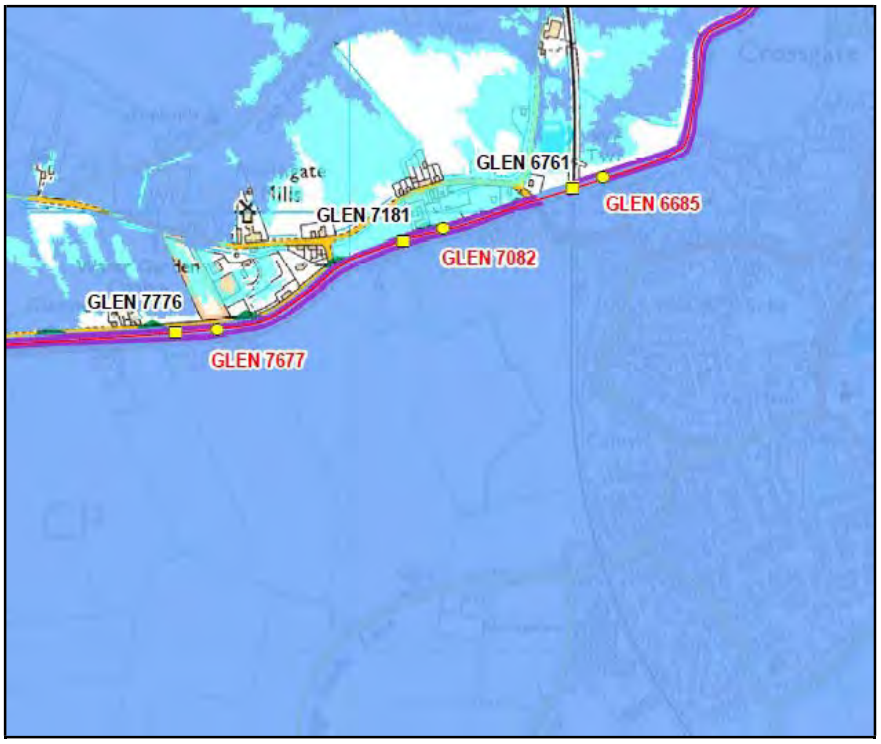
River Glen

The River Glen lies some 1.3km to the north of the site and the present day 1 in 100-year flood level with 20% climate change at Node Glen 6685 is 4.84mODN. The flood defences of the River Glen between Herring Bridge and the A151 bridge consist of the B1180 road which are in good condition and the crest heights for the right bank along this stretch of river are circa 5.90mODN. (SHDC SFRA). To the east of the railway bridge, the Lidar 2mDTN section, shown below, reveals that the right bank crest level is 5.41mODN and land levels average 5.20mODN. The left bank level is much lower at 4.93mODN.



Lidar 2mDTM section River Glen Node Point Glen 6685

The fluvial flood data for the model nodes shown on the map are set out in the tables below.



Node Map

Fluvial Flood Levels (mODN)

The fluvial flood levels for the model nodes shown on the attached map are set out in the table below. They are measured in metres above Ordnance Datum Newlyn (mODN).

			Annual Exceedance Probability - Maximum Water Levels (mODN)										
Node Label	Easting	Northing	50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
GLEN 6685	523603	326081	4.01	4.16	4.23	4.31	4.34	4.35	4.38	4.84	4.44	4.60	4.94
GLEN 7082	523224	325963	4.04	4.17	4.25	4.32	4.36	4.39	4.41	4.87	4.49	4.70	5.01
GLEN 7677	522687	325733	4.06	4.20	4.28	4.35	4.41	4.43	4.45	4.91	4.54	4.79	5.07

Fluvial Flood Flows (m³/s)

The fluvial flood flows for the model nodes shown on the attached map are set out in the table below. They are measured in metres cubed per second (m³/s).

			Annual Exceedance Probability - Maximum Flows (m³/s)										
Node Label	Easting	Northing	50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
GLEN 6761	523531	326057	25.95	29.44	31.06	33.13	34.59	35.32	35.84	43.56	38.87	48.22	56.95
GLEN 7181	523130	325934	25.69	29.20	30.85	32.93	34.37	35.09	35.60	43.18	38.62	48.05	56.90
GLEN 7776	522589	325726	25.40	29.03	30.65	32.71	34.14	34.86	35.37	42.73	38.33	48.07	56.87

This data is taken from the Welland Model (2016) and are the most up-to date currently available. The Environment Agency aim to review the models on a regular basis.

These levels are “in-channel” levels and therefore may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences.

The site lies within the Anglian River Basin District, Peak River flows should be adjusted to reflect the latest climate change allowances. It must also be assumed, to provide a worst-case scenario, that flood defences have been raised

during this period to cater for the rise in river level.

Using the Peak River Flows from the NPPG Climate change allowances shown in Table 1 in the spread sheet. The graph and data show a prediction for the increase in river levels for the 35% and 65% increase in river level.
Document 1

EXTRAPOLATED WATER LEVEL OUTPUTS AT NODE Glen 6761		
Upper End Scenario	4.98	mODN
Higher Central Scenario	4.74	mODN
Central Scenario	4.65	mODN

With the crest level of the right bank at Node point Glen 6761 bring 5.41mODN, the climate change river levels for the Higher Central (35%) and Upper End (65%) would remain in channel. Based upon the crest heights of the flood defence the proposed site is protected with a freeboard of over 400mm.

The greatest risk of flooding of the site would therefore be from a breach to the tide earth embankments for the River Welland.

The Environment Agency standing advice recommends that for “Less Vulnerable” developments in Flood Zone 3a, the floor level of buildings should be raised as high as practicable (minimum of 300mm above existing ground level).

The amenity building is located on the highest point of the site averaging 3.30mODN, the floor level will be set at 3.60mODN.

South Holland District Council

In order to inform the process of risk assessment and site selection the District Council commissioned Haskoning UK Ltd Consultants to prepare a Strategic Flood Risk Assessment in December 2002.They have carried out an update of this report and this report was published in January 2010 and this was further updated in February 2017.

This Flood Risk Assessment has taken the results of the (2017) updated South Holland Strategic Flood Risk Assessment (SHSFRA) into account in its findings.

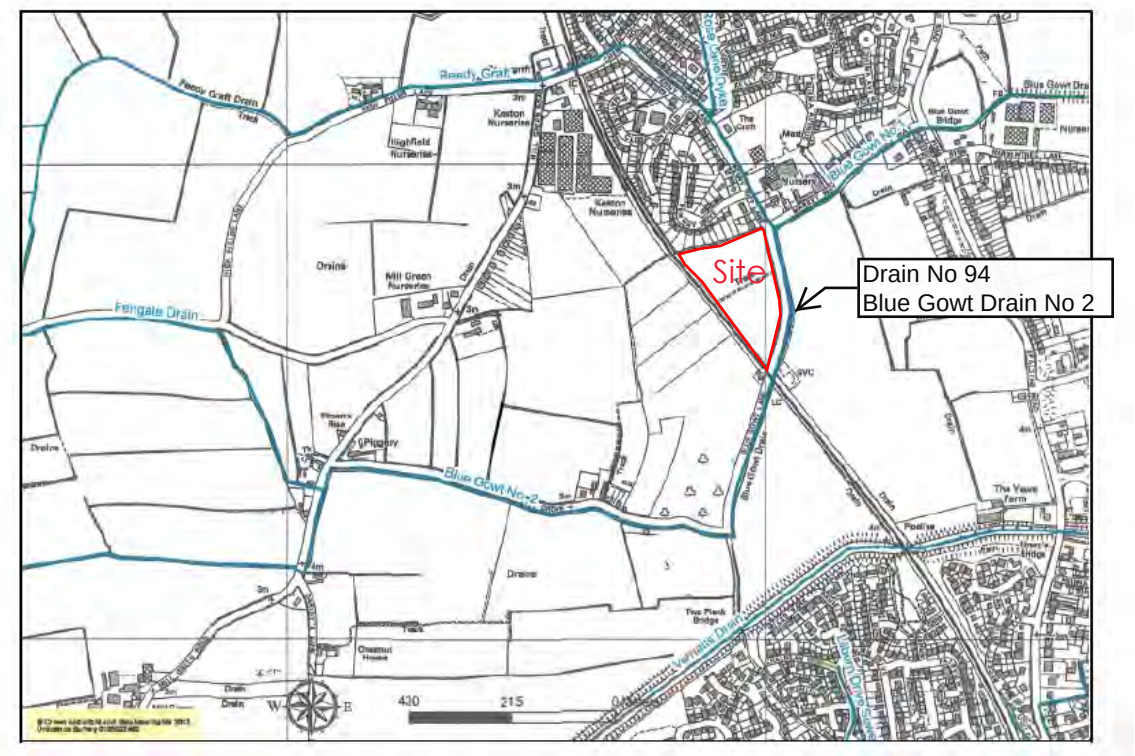
The whole of the tidal flooding information has been replaced by the mapping from the latest Environment Agency Tidal Hazard mapping. Where the mapping for an area contains both fluvial and tidal components, the more severe of the two has been presented.

Welland & Deepings Internal Drainage Board

The proposed development site is located within the catchment area of Welland & Deepings Internal Drainage Board. The Board is responsible to operate and maintain the arterial fluvial system.

The site is within Board’s catchment No 6 Fourth District and the nearest watercourse to the site is Drain No 94 Blue

Gowt Drain No 2 located 10m to the east of the site.



Welland & Deepings Drainage Map

Surface Water Flooding

Most the site is shown to be at no risk from surface water with an isolated small area at risk up to 300mm deep. The site is, there considered to be at low risk. Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. **Map 7**

Unlike the fluvial mapping, which is based on a detailed hydraulic model, this mapping is based purely on applying rainfall to a digital terrain model.

FLOODING FROM OTHER SOURCES

Flooding is a natural process and can happen at any time from sources other than watercourses and the sea.

- Flooding from land can occur from intense rainfall, often over short duration of time that is unable to soak into the ground or enter the drainage system. However, with the natural topographic nature of the ground being flat, with no high ground around the site this will not cause any rapid inundation of the site and is likely only lead to local ponding of shallow depth and low velocity following the natural land contours. The updated SFRA concluded that flooding from this source is limited to minor isolated cases and is not of strategic significance as regards to flood risk.

- The area is not known to suffer from any groundwater problems and therefore is taken as having no

strategic significance as regards to flood risk.

- Flooding from sewers can occur from over loading from heavy rainfall caused by blockages or having inadequate capacity. The resulting back pressure could cause foul sewage to flow from manholes which would flow over areas of the carriageway at a lower level and be contained within the confines of the kerb lines following the natural land contour to the south-west. The Updated SFRA concluded that flooding from sewers is limited to minor isolated cases and is not of strategic significance as regards to flood risk.

- Non-natural or artificial sources of flooding such as reservoirs, lakes or canals where water is stored above natural ground level could cause flooding if the structure fails or is over topped.

SEQUENTIAL APPROACH

When applying the sequential approach for flood risk in accordance NPPF the site would fall into Zone 3a (High Probability) as the site is shown to be within the tidal flood plain as shown on the Environment Agency's Flood Map without defences in place.

However, the results of the updated SHSFRA shows that the site is located within a low/medium probability flood zone, but the area is reliant on protection by flood defences providing a standard of protection of 1 in 100 years return period.

TABLE 3: Flood risk vulnerability and flood zones 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Flood Zone 1	✓	✓	✓	✓	✓
	Flood Zone 2	✓	✓	Exception Test Required	✓	✓
	Flood Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Flood Zone 3b Functional Floodplain	Exception Test Required	✓	✗	✗	✗

Sequential & Exception Test

NPPF Guidance Paragraphs 155 - 165 requires development within high areas of flood risk be determined using a sequential risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account the impacts of climate change.

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The NPPF states that development should not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. It is important to note that the Sequential Test does not specifically mean that sites such as this cannot be developed, rather that sites at less risk should be developed first. The whole of the village of Pinchbeck is shown on the Flood Map for Planning to be located in

Flood Zone 3 and there are no other sites in a lower flood zone.

The proposal is for a change of use of agricultural land to a cemetery and recreational area, the NPPG (para.164), states that a *change of use* should not be subject to the sequential and exception tests but will still need to meet the requirements of a site-specific flood risk assessment.

ENVIRONMENT AGENCY GUIDANCE ON CEMETERIES

The Environment Agency has published guidance on cemeteries and burials to ensure groundwater pollution does not occur, the main points are: -

A burial site must be:

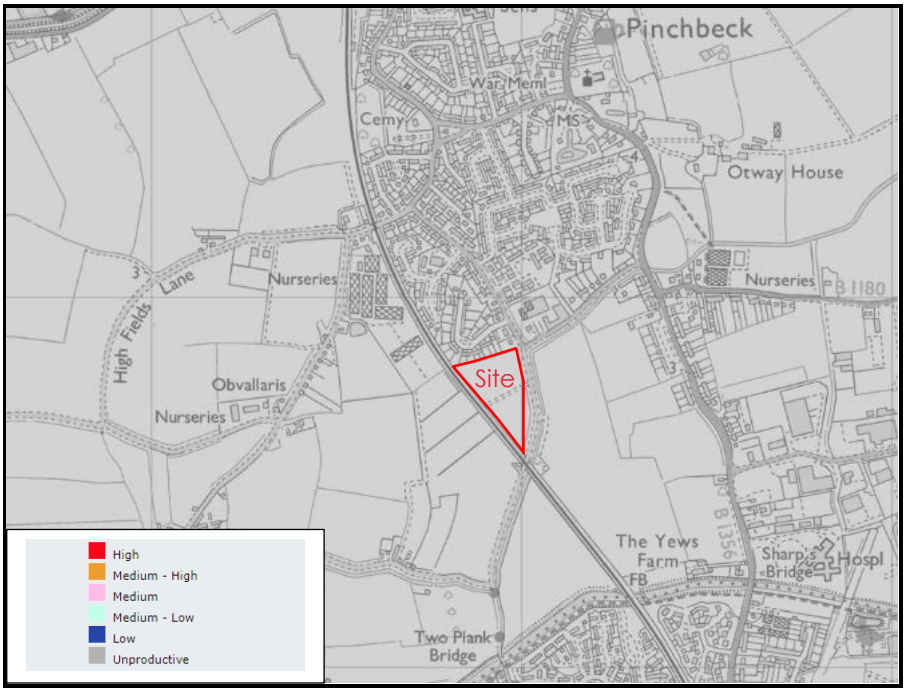
I. • at least 250 metres from any well, borehole or spring supplying water for human consumption or used in food production – for example at farm dairies

II. • at least 30 metres from any spring or watercourse not used for human consumption or not used in food production

III. • at least 10 metres from any field drain, including dry ditches

IV. • have at least 1 metre clearance between the base of the grave and the top of the water table – they shouldn't have any standing water in them when dug.

The geology of this area consists of tidal flat deposits- clay & silt, overlying the Oxford clay formation – Mudstone. At this location, see map below, the superficial deposits are classified as an Unproductive Aquifer: These rocks have negligible significance for water supply or baseflow to rivers, lakes and wetlands. They consist of bedrock or superficial deposits with low permeability that naturally offer protection to any aquifers that may be present beneath.



Extract from DFRA Magic Map

With the site being over a nonproductive aquifer and therefore is outside Source Protection Zone 1 and any other

designated SPZ. The proposed cemetery, therefore, poses no unacceptable risk to groundwater used for drinking water and food production purposes. No burial plots will be located within 30m of the Blue Gowt Drain No 2 or any other watercourse.

DRAINAGE STATEMENT

This drainage statement, for the site, proposes to utilise infiltration techniques to reduce the storm water discharge from the proposed development and to minimise the impact of the development on the surrounding area and to comply with guidelines, which require at least one workable solution for managing surface water.

In accordance with recognised guidance, National Planning Policy Framework 2012, there is a hierarchy of where surface water should discharge. This hierarchy should be followed where practicable, and is as follows:

1) Infiltration
2) Watercourse
3) Public sewer

Infiltration

The car park and access road and footways will have an informal layout and will be constructed with permeable construction such as hardcore with a granite chipping surface rolled into the top surface. The roof water from the amenity building will discharge to soakaways designed in accordance with BRE digest 365.

As there is a positive drainage system capable of receiving flows from the development there is no likely impact on neighbouring property.

Pinchbeck Parish Council will be responsible for the maintenance of the entire surface water drainage system.

CLIMATE CHANGE

Global warming is now recognised that it is likely to affect the frequency and severity of extreme events as both tidal and fluvial flooding. The Climate change allowances in the NPPF Guidance was updated on the 19th February 2016 and again on the 17th December 2019.

The site is located within the Anglian River Basin, for sites within Flood Zone 3a and for “Less Vulnerable” land uses the Higher Central and Central river flow allowances figures in Table 1 should be used.

Table 1 Peak river flow allowances by river basin district (1961 to 1990 baseline)

River basin District	Allowance category	Total potential change anticipated for ‘2020s’ (2015 to2039)	Total potential change anticipated for ‘2050s’ (2040 to2069)	Total potential change anticipated for ‘2080s’ (2070 to2115)
Anglian	Upper End	25%	35%	65%
	Higher Central	15%	20%	35%
	Central	10%	15%	25%

The effect of global warming on peak rainfall allowances is given in Table 2.

Table 2 Peak rainfall intensity allowance in small and urban catchments (1961 to 1990 baseline)			
Applies across al of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Higher Central	5%	10%	20%

The annual sea rise due to climate change is given in NPPF and the recommended contingency allowances are stated in Table 3

Table 3 Peak sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 1981to 2000 baseline)						
Area of England) (Use River Basin	Allowance	2000 to 2035	2036 to 2065	2066 to 2095	2096 to 2125	Cumulative Rise 2000 to 2125 (m)
Anglian	Higher Central	5.8 (203mm)	8.7 (261mm)	11.6 (348mm)	13 (390mm)	1.20m
Anglian	Upper End	7 (245mm)	11.3 (339mm)	15.8 (474mm)	18.1 (543mm)	1.6m

Higher Central

Base year 2006 – 2035 @ 5.8mm/year (29 years x 5.8mm) = 783mm
2036 – 2055 @ 8.7mm/year (30 years x 8.7) = 261mm
2066 – 2095 @ 11.6mm/year (30 years x 11.6) = 348mm
2096 – 2120 @ 13mm/year (24 years x 13) = 312mm
Overall total = **1089mm**

Peak tide levels Present Day (2006) at Marsh Lane 0.5% (1 in 200) = 5.98mODN and for year 2120 = 7.07mODN

Pre 17 December 2019 (Used in Breach hazard mapping)

Table 3 Peak sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)					
Area of England) (Use River Basin maps	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative Rise 1990 to 2115 (m)
East, Midlands, London, South East	4 (140mm)	8.5 (212.5mm)	12 (360mm)	15 (525mm)	1.24m

Base year 2006 – 2025 @ 4mm/year (19 years x 4mm) = 76mm
2026 – 2080 @ 12mm/year (30 years x 11.3) = 212.5mm
2081 – 2115 @ 15.0mm/year (30 years x 15.8) = 360mm
2096 – 2120 @ 18.1mm/year (24 years x 18.1) = 525mm
Overall total = **1174mm**

Peak tide levels Present Day (2006) at Layers Sluice 0.1% (1 in 200) = 5.98mODN and for year 2115 = 7.15mODN

It is therefore concluded, that until the Environment Agency undertake new modelling for the Coastal Hazard

Mapping, that the current breach mapping for this site can be used for determining finished floor levels for residential development.

The tidal flood defences of the tidal River Welland consist of earth embankments which are provided with a soak dyke on the landward toe, they are in good condition and the minimum crest heights are 7.57mODN, this provides a protected freeboard of 360mm.

FLOOD PROTECTION

Any impact of damage to the properties can be foreseen and mitigated against by relatively simple design and construction techniques. There are two forms of flood protection works: -

- **Flood-resistance or proofing works**: - these try to reduce the amount of water entering a building.
- **Flood-resilient works: -** these reduce the amount of damage caused by water entering the building.

The proposed amenity building will have the following resilient measures incorporated in the construction in accordance with “Improving the flood performance of new buildings” CLG (2007).

- The ground floor level for the amenity building is to be raised 300m above existing average ground level with the proposed level being 3.30mODN.

- Arrange for all service circuits to be routed at high level and where practical socket outlets and switchgear. to be a minimum of 1.2m above the raised ground floor level.

- The construction of the building will be a traditional brick and block walls.

CONCLUSION

- The proposed development site is shown to be within Flood Zone 3a ‘High Probability' as detailed on the Environment Agency's Flood Zone Maps without defences.

- The site does have the protection of both tidal and fluvial flood defences which are well maintained by the Environment Agency.

- The site is within Flood Zone 3 according to the Environment Agency maps. The NPPF adopts a Sequential approach to flood risk with the overall aim of directing development to areas at the lowest risk of flooding (Flood Zone 1). However, paragraph 164 of the NPPG states that applications for a change of use (to which this application would be) should not be subject to the sequential or exception tests but should still meet the requirements for site specific flood risk assessments.

- The use of land for burials is required to meet strict environmental conditions established by the

Environment Agency in order to safeguard against groundwater pollution. The site is located in an area classified as an Unproductive Aquifer and therefore is outside the Source Protection Zone1 and any other designated SPZ.

- The 2017 Update to SHDC, SFRA has carried out a Tidal Hazard Mapping, River Welland upstream of Welland Bridge, following a breach to the defences. The Tidal Hazard, Velocity and Depth Maps, year 2115, for the 1 in 1000-year event, shows that the site for the proposed cemetery is located within an area affected by flooding from a breach to the tidal flood defences where the depth of flooding could be 0.5m.

- The Flood Risk Vulnerability Classification in Table 2 of NPPG the proposed cemetery is classified as “Less Vulnerable”, with Table 1 of NPPG stating that such uses are appropriate in this zone.

- The ground floor level for the amenity building is to be raised 300m above the existing average ground level with the proposed level being 3.60mODN.

- Any impact of damage to the property can be foreseen and mitigated against by relatively simple design and construction techniques. They will be constructed using materials which are flood resilient construction as outlined in the report.

- Flooding from other sources is unlikely to affect the site.

Site Name	**Pinchbeck**
Date	**Apr-20**
Comments:	**FRA**
Environment Agency CCN Number	**58571**

INPUT DATA TO BLUE CELLS ONLY

Model Information

Model Name	**Welland Model**
Date of Model	**2016**
Model Node	**Glen 6761**

OUTPUTS IN YELLOW CELLS

Modelled Results

Re-order based on Flow	FLOW	LEVEL
2	25.95	4.01
5	29.44	4.16
10	31.06	4.23
20	33.13	4.31
50	34.59	4.34
75	35.32	4.35
100	35.84	4.38
200	38.87	4.44
100+20	43.56	4.84
1000	48.22	4.60
1000+20	56.95	4.94

Attenuation Factor

-1.27 % FOR 1:100

1.60 % FOR 1:1000

Note: Higher attenuation factors mean results through extapolation will be over estimated

River Basin	Anglian	
Time Horizon	Upto 2115	
AEP Scenario	100	AEP

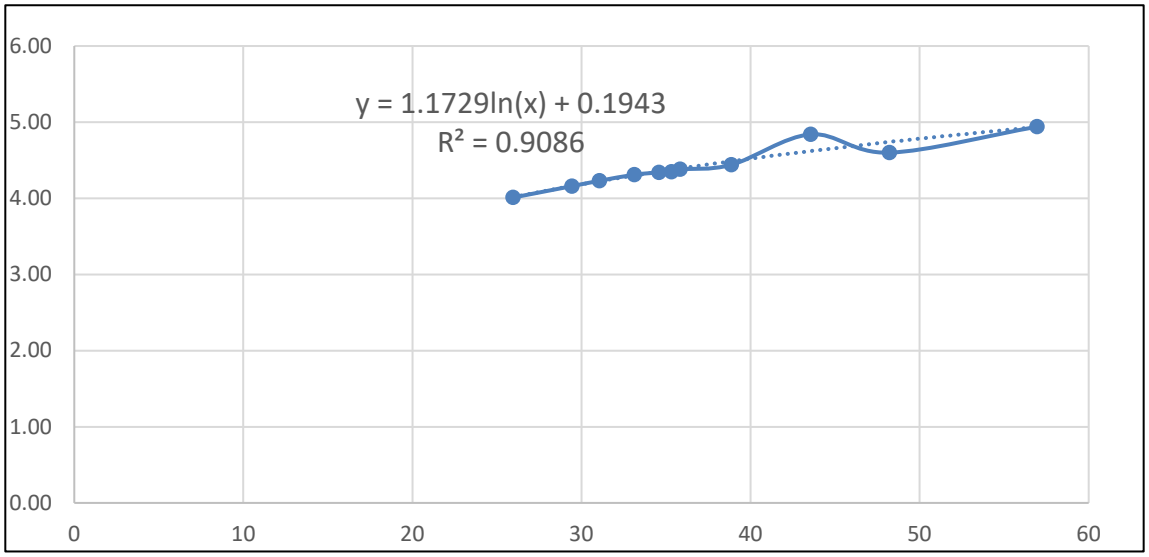
MAKE SURE YOU COPY THE FORMULA VARIABLES AND R2 ON THE GRAPHS TAB !

EXTRAPOLATED WATER LEVEL OUTPUTS AT NODE Glen 6761		
Upper End Scenario	**4.98**	mODN
Higher Central Scenario	**4.74**	mODN
Central Scenario	**4.65**	mODN

Log Interpolation

EQUATION > | **1.1729** | **0.1943** | < include sign ie +/-

	1 in 100		1 in 1000	
	FLOW	**LEVEL**	**FLOW**	**LEVEL**
65%	59.14	4.98	79.56	5.33
35%	48.38	4.74	65.10	5.09
25%	44.80	4.65	60.28	5.00



R2 value **0.9086**

Flood map for planning

Your reference	Location (easting/northing)	Created
Pinchbeck	**523946/324755**	**3 Apr 2020 14:07**

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/



Environment Agency

Flood map for planning

Your reference
Pinchbeck

Location (easting/northing)
523946/324755

Scale
1:2500

Created
3 Apr 2020 14:07

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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Extent of flooding

Pinchbeck

Map 2



Extent of flooding from rivers or the sea

High Medium Low Very low

Tidal Level Location Map
Lincolnshire & Northamptonshire Area

Environment Agency



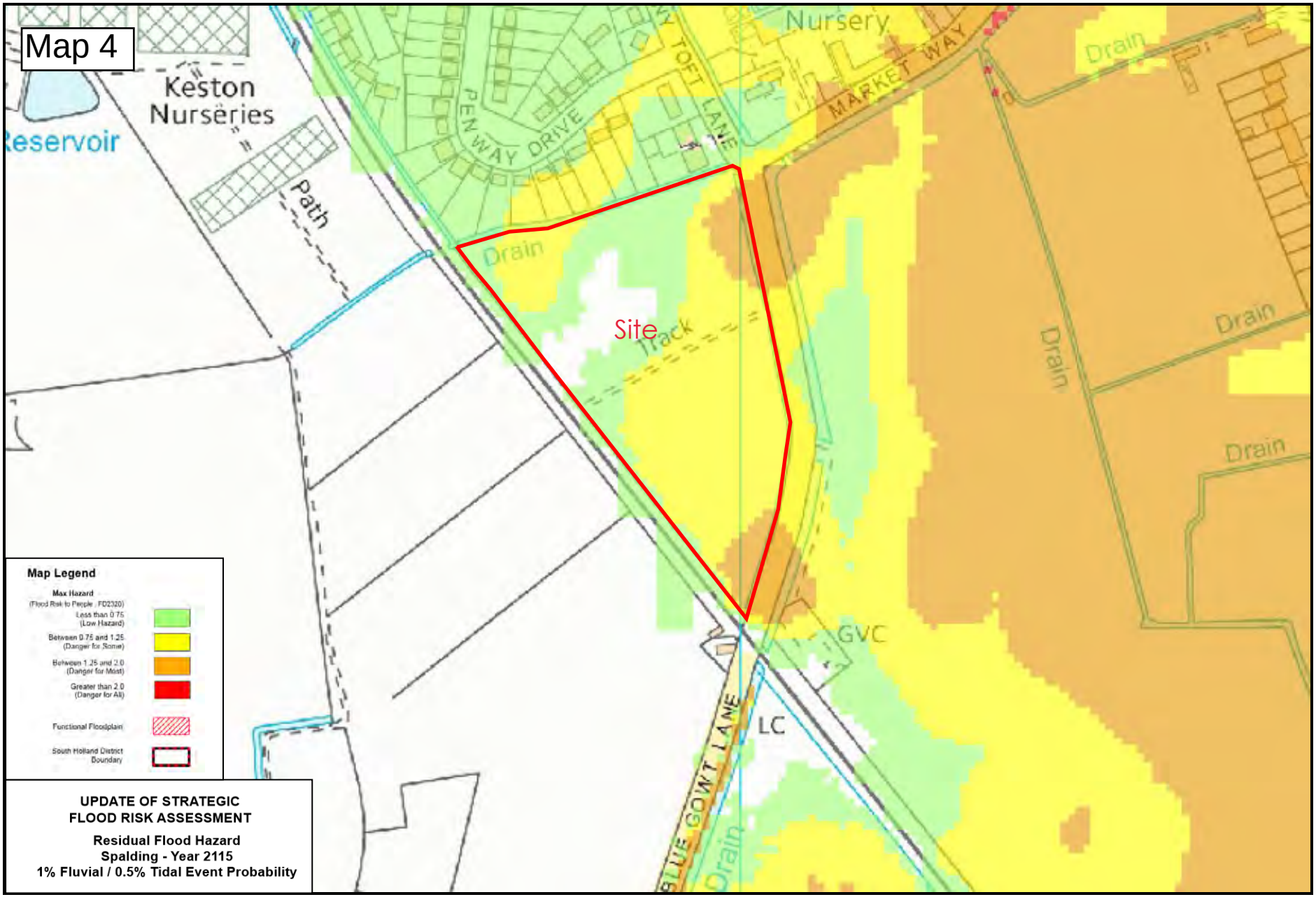
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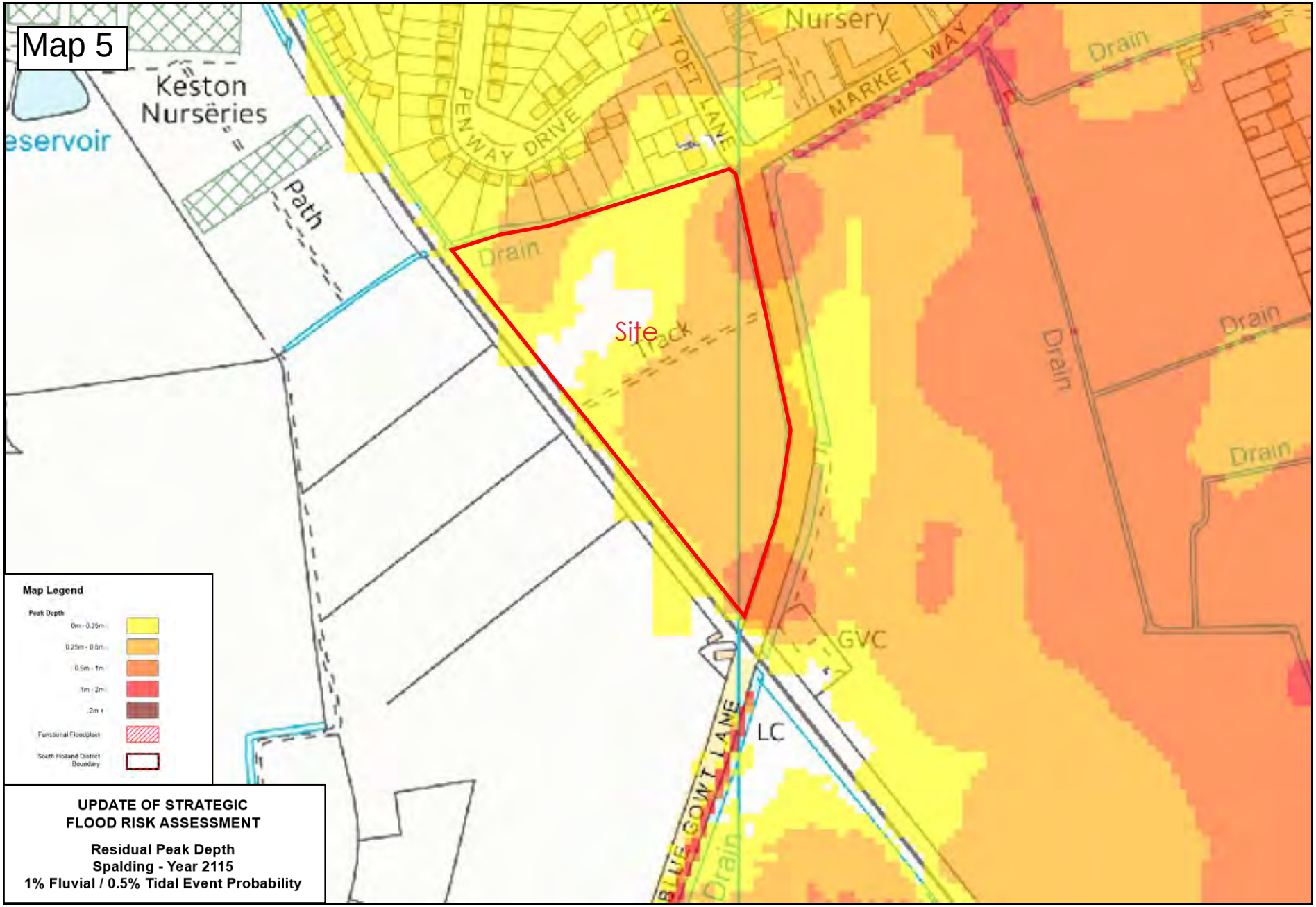
Tidal Water Levels for the South Humber, East Coast and The Wash

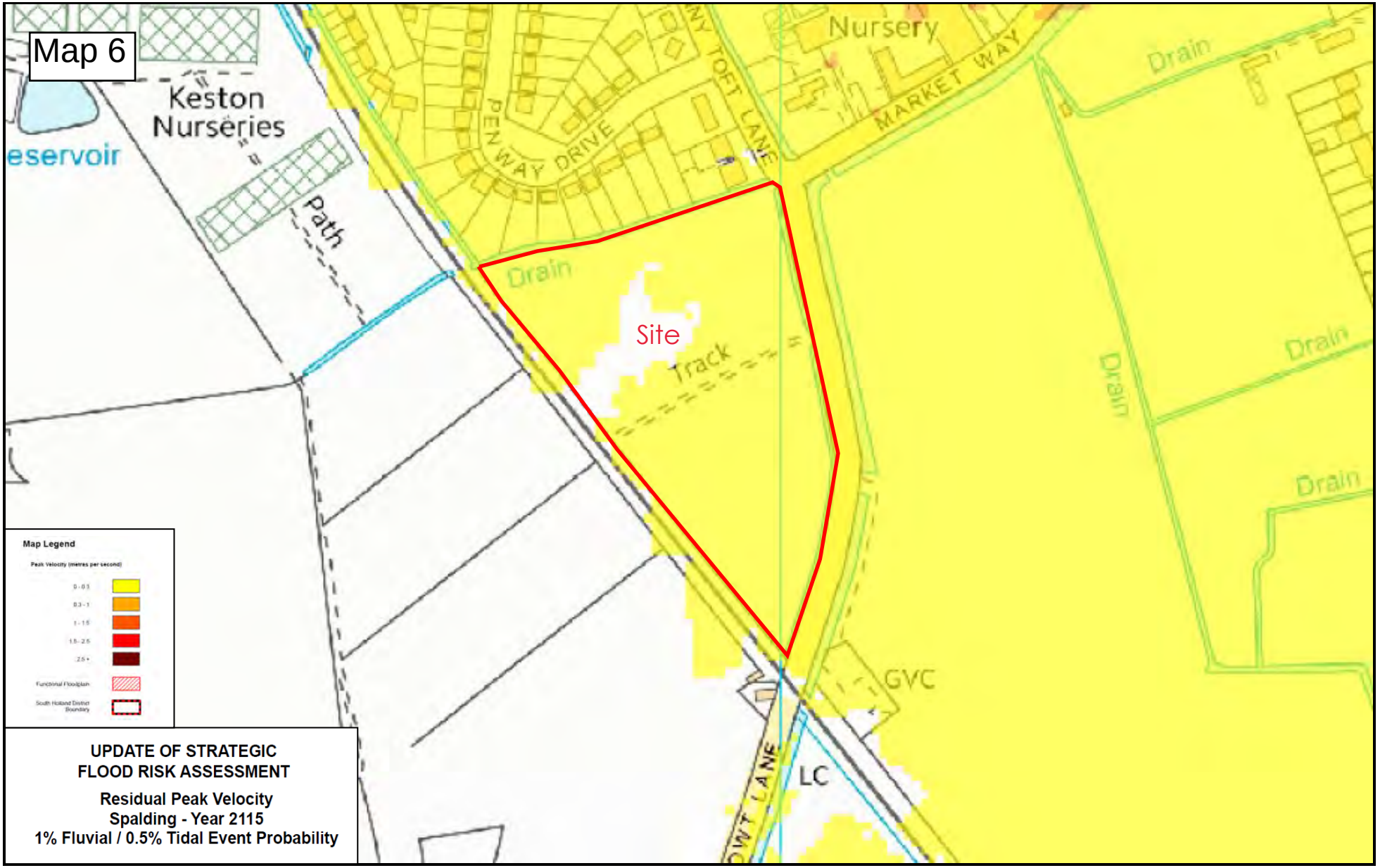
The table below shows still water levels for locations, from the above location map, around the South Humber Estuary, East Coast and The Wash. It is important to note the following:

- The base date for the data is 2014 for the South Humber and 2006 for the East Coast and The Wash.
- The data are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- The water level quoted is the 'Best Estimate' water level. Depending on the use of the data it may be necessary to carry out sensitivity testing. Upper and Lower 95% confidence bandings are available upon request.
- Levels for other annual chance scenarios are available if required.

Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level					
				metres ODN					
				1	10	50	100	200	1000
HUMBER									
H030	Tetney	535420	403180	3.94	4.29	4.56	4.69	4.82	5.15
H050	Buck Beck	532700	406580	4.03	4.36	4.62	4.74	4.87	5.18
H060	Grimsby	527878	411346	4.10	4.43	4.70	4.82	4.95	5.27
H080	Haborough Marsh	520790	415740	4.26	4.61	4.88	5.01	5.14	5.47
H090	Immingham	519141	417449	4.26	4.61	4.88	5.01	5.14	5.47
H100	South Killingholme	518700	417120	4.41	4.77	5.05	5.18	5.32	5.66
H130	North Killingholme	516530	420000	4.51	4.87	5.15	5.28	5.42	5.77
H150	East Halton	514450	422870	4.59	4.96	5.25	5.39	5.53	5.89
H170	Goxhill	511970	425440	4.67	5.04	5.34	5.47	5.61	5.95
H200	New Holland	508020	424330	4.87	5.26	5.55	5.68	5.81	6.12
H210	Barrow Haven	506380	422620	4.92	5.31	5.60	5.73	5.86	6.17
H220	Ferriby	497550	421150	5.04	5.42	5.67	5.77	5.86	6.04
H230	Winterton	493420	422830	5.14	5.51	5.74	5.83	5.90	6.02
H250	Blacktoft	484247	424190	5.25	5.62	5.83	5.90	5.96	6.04
H270	Goole	474857	422960	5.46	5.85	6.07	6.15	6.21	6.29
East Coast									
~	Great Eau	545500	393800	3.80	4.19	4.46	4.57	4.69	4.96
~	Boygrift	553300	379800	3.84	4.24	4.53	4.65	4.77	5.05
~	Burgh Sluice	555190	358620	4.26	4.45	4.76	4.90	5.03	5.34
Wash									
~	Hobhole	536610	339940	4.82	5.30	5.64	5.78	5.93	6.27
~	Lawyers Sluice	540750	334550	4.84	5.32	5.66	5.80	5.95	6.29
~	West Lighthouse	549150	325750	4.88	5.37	5.71	5.86	6.01	6.35
~	Grand Sluice	532400	344500	4.88	5.33	5.65	5.78	5.93	~
~	Fosdyke Bridge	531700	332200	4.91	5.38	5.71	5.85	5.99	~
~	Marsh Road	526000	324000	5.04	5.44	5.73	5.85	5.98	~
~	Wisbech	546100	310000	4.83	5.25	5.53	5.66	5.78	~
~	Dog In Doublet	527300	299300	3.67	4.00	4.22	4.32	4.42	~


Map 4
Keston Nurseries
Reservoir
Path
PEN WAY DRIVE
TOFT LANE
Nursery
MARKET WAY
Drain
Drain
Site
Track
Drain
Drain
Drain
GVC
LC
BLUE GOWT LANE
Drain
Map Legend
Max Hazard
(Flood Risk to People : FD2320)
Less than 0.75 (Low Hazard)
Between 0.75 and 1.25 (Danger for Some)
Between 1.25 and 2.0 (Danger for Most)
Greater than 2.0 (Danger for All)
Functional Floodplain
South Holland District Boundary
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Flood Hazard
Spalding - Year 2115
1% Fluvial / 0.5% Tidal Event Probability


Map 5
Keston Nurseries
eservoir
Path
PENWAY DRIVE
TOFT LANE
Nursery
MARKET WAY
Drain
Drain
Site
Track
Drain
Drain
Drain
GVC
LC
BLUE COWT LANE
Drain
Map Legend
Peak Depth
0m - 0.25m
0.25m - 0.5m
0.5m - 1m
1m - 2m
2m +
Functional Floodplain
South Holland District Boundary
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Peak Depth
Spalding - Year 2115
1% Fluvial / 0.5% Tidal Event Probability


Map 6
Keston Nurseries
eservoir
Path
PEN WAY DRIVE
NY TOFT LANE
Nursery
MARKET WAY
Drain
Drain
Site
Track
Drain
Drain
Drain
GVC
LC
OWT LANE
Map Legend
Peak Velocity (metres per second)
0 - 0.3
0.3 - 1
1 - 1.5
1.5 - 2.5
2.5 +
Functional Floodplain
South Holland District Boundary
UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
Residual Peak Velocity
Spalding - Year 2115
1% Fluvial / 0.5% Tidal Event Probability

Low risk: depth

Pinchbeck



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm



Notes

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625 burial plots
1 burial plot = 1.5m x 2.7m

Rev	Description	Date
-	-	-

rdc
Robert Doughty Consultancy

32 High Street, Helpringham
Sleaford, Lincolnshire, NG34 0RA

Tel: 01529 421646
Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client
Pinchbeck Parish Council

Project
Proposed Cemetery
Blue Gowt Drove, Pinchbeck

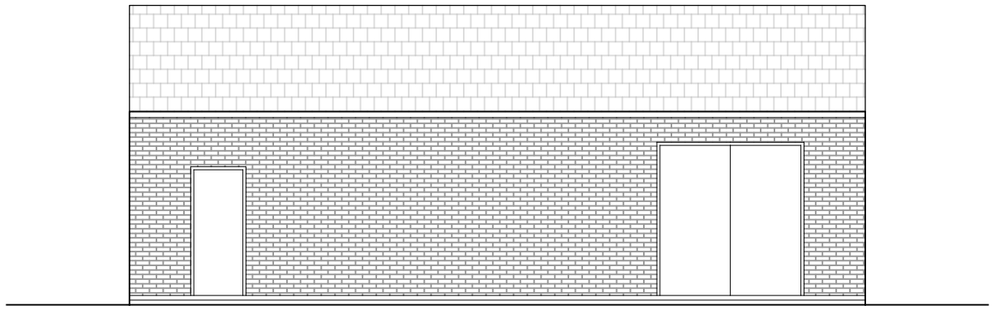
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Scale @ A2	Date
1: 1000	04/05/20

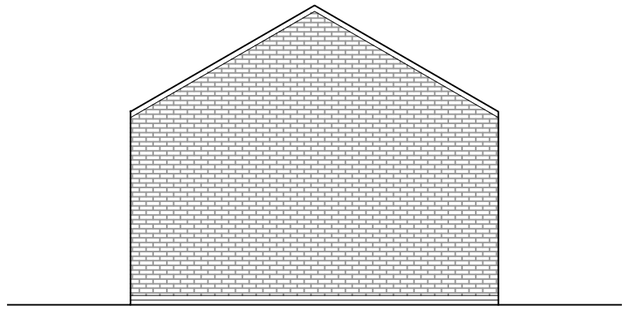
Drawn By	Checked By
WW / CH	LMS

Job Number	Status	Purpose of Issue
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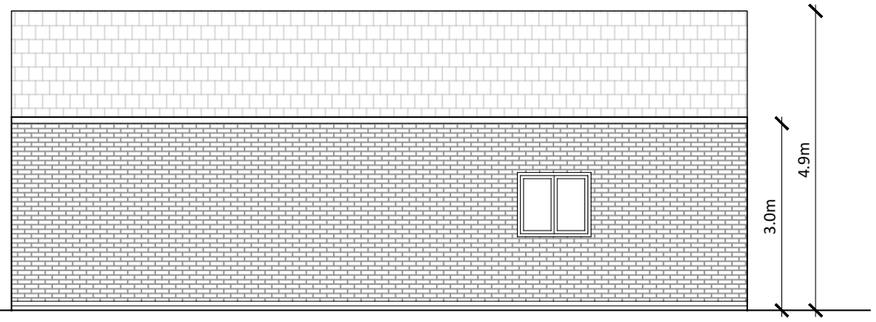
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1356-1_PL_SP01



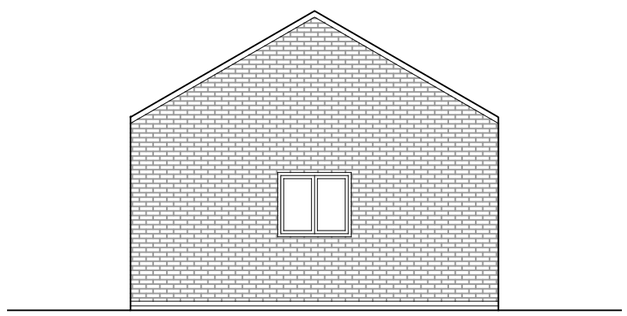
Front Elevation



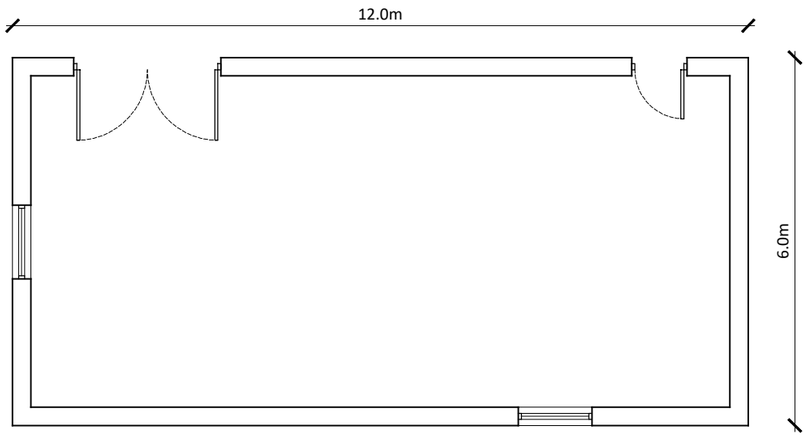
Side Elevation



Rear Elevation



Side Elevation



Floor Plan



Roof Plan

0 1 2 3 4 5m

Notes

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Dimensions
All dimensions shown are for the purposes of obtaining the relevant planning permission only.

Rev	Description	Date
-	-	-

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32 High Street, Helpringham
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Tel: 01529 421646
Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client
Pinchbeck Parish Council

Project
Proposed Cemetery
Blue Gowt Drove, Pinchbeck

Drawing
Amenity Building Floor Plans and Elevations

Scale @ A3	Date
1: 100	04/05/20

Drawn By	Checked By
CH	LMS

Job Number	Status	Purpose of Issue
1356-1	PL	Planning

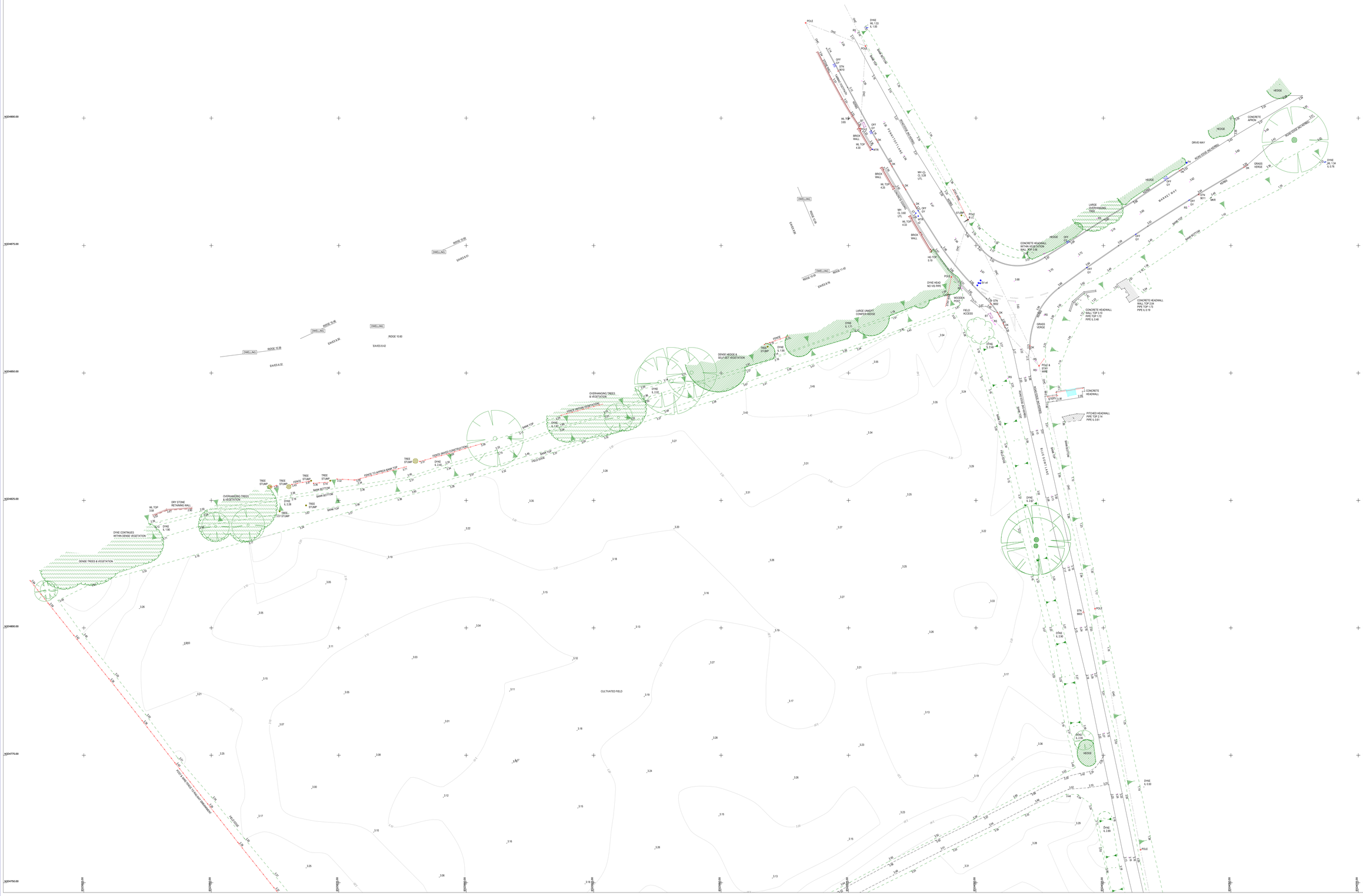
Drawing No.	Rev
1356-1_PL_GA01	-

Plan 4

Surveys Ltd

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N:524900.00 N:524875.00 N:524850.00 N:524825.00 N:524800.00 N:524775.00 N:524750.00



NOTES

ABBREVIATIONS & SYMBOLS

AV	AIR VALVE	OHC	OVERHEAD CABLE
BH	BOREHOLE	PC	PEDESTAL
BOL	BOLLARD	PINV	PIPE INVERT LEVEL
CATV	CABLE TV MH	PM	PARKING METER
CCTV	SECURITY CAM	PO	POST
CL	CENTRE LINE	PT	POLE TOP LEVEL
CH	COVERING LEVEL	PTR	POST & RAIL FENCE
COL	COLUMN	PTW	POST & WIRE FENCE
DC	CABLE TV LID	RD	EDGE OF ROADMD KERB
DH	DRAINAGE	RP	REFLECTIVE POINT
DR	DRAIN	RL	RIDGE LEVEL
EL	EAVES LEVEL	RP	REFLECTIVE POST
ER	ELECTRIC LID	SIGN	SIGN POST
ER	EARTH ROD	SLVL	STONE LEVEL
FB	FLOWER BED	SOFF	SOFFIT LEVEL
FH	FIRE HYDRANT	SV	VALVE
FFL	FINISHED FLOOR LEVEL	SW	SURFACE WATER
FL	FLOOR LEVEL	TB	TELEGRAPH BOX
FW	FOUL WATER	TH	TRIAL HOLE
GV	GAS VALVE	TL	TRAFFIC LIGHTS
HG	HAND GRATE	TP	TELEGRAPH POLE
IC	INSPECTION COVER	TOW	TOP OF WALL LEVEL
IL	I NVERT LEVEL	TP	TELEGRAPH POLE
KB	KERB BOTTOM	UC	UNKNOWN
KD	KERB DIP/CUT	UTL	UNABLE TO LIFT
KT	KERB TOP	VP	VENT PIPE
LP	LAMP POST	WL	WATER LEVEL
LC	LIGHT COLUMN	WLVL	WATER LEVEL
MH	MANHOLE	WP	WATER POLE
MP	MARKER POST	WO	WASH OUT POINT

FENCE
HEDGE
ELECTRIC
BANK EDGE
STORM LINE
FOUL LINE
TELECOM LINE
GAS LINE
LARSEN PILES
CHANNELS
WATER MAIN

TREE
BOREHOLE
STATION
TBM
MANHOLE
GULLY
BATTER
WATER VA
GATE

1. THE POSITION OF THIS SURVEY IS BASED ON GPS OSTN15 GRID.

2. ALL LEVELS RELATE TO GPS DATA ACQUIRED WITH TRIMBLE VRS.

3. TREES SPREADS ARE DRAWN TO SCALE AND SHOW THE GENERAL/AVERAGE CANOPY SPREAD.

4. ALL BELOW GROUND LEVEL INFORMATION INCLUDING VOIDS, DRAINAGE & SERVICES HAVE BEEN IDENTIFIED FROM THE RECORDS OF THE VARIOUS UNDERTAKERS AND ARE GIVEN AS ESTIMATIONS ONLY. ALL CRITICAL DIMENSIONS SHOULD BE CHECKED PRIOR TO THE COMMENCEMENT OF ANY SITE WORKS

5. EVERY EFFORT HAS BEEN MADE TO LOCATE AND SURVEY ALL VISIBLE FEATURES. IT SHOULD BE NOTED THAT SOME ITEMS MAY HAVE BEEN OBSCURED AT THE TIME OF THE SURVEY AND THEREFORE NOT SHOWN ON THIS DRAWING.

6. PHYSICAL BOUNDARY FEATURES SHOWN ON THIS DRAWING DO NOT NECESSARILY REPRESENT THE ACTUAL LEGAL BOUNDARIES. BOUNDARIES SHOULD BE CONFIRMED WITH THE RELEVANT DOCUMENTATION.

7. THE CONTRACTOR MUST CHECK AND VERIFY ALL SITE LEVELS, DIMENSIONS, UTILITIES AND DRAINAGE DETAILS PRIOR TO THE COMMENCEMENT OF ANY SITE WORKS. ANY DISCREPANCIES MUST BE NOTIFIED TO DANIEL CHARLES SURVEYS LTD.

8. ALL SURVEY STATION CONTROL POINTS MUST BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING ANY SITE WORKS.

SURVEY CONTROL POINT INFORMATION.

Point	Easting	Northing	Elevation
9002	524002.896	324863.563	3.625
9003	524021.073	324803.064	3.155
9004	524039.216	324718.075	3.248
9010	523973.002	324909.274	3.219
9011	524043.733	324885.002	3.539

SURVEY DATE	01-04/03/19	INITIALS	CLR/MJW

Rev.	Amendments	Drn	Date

Client:
RDC

Project Title:
LAND OFF -
BLUE GOWT LANE
PINCHBECK - SOUTH LINCS

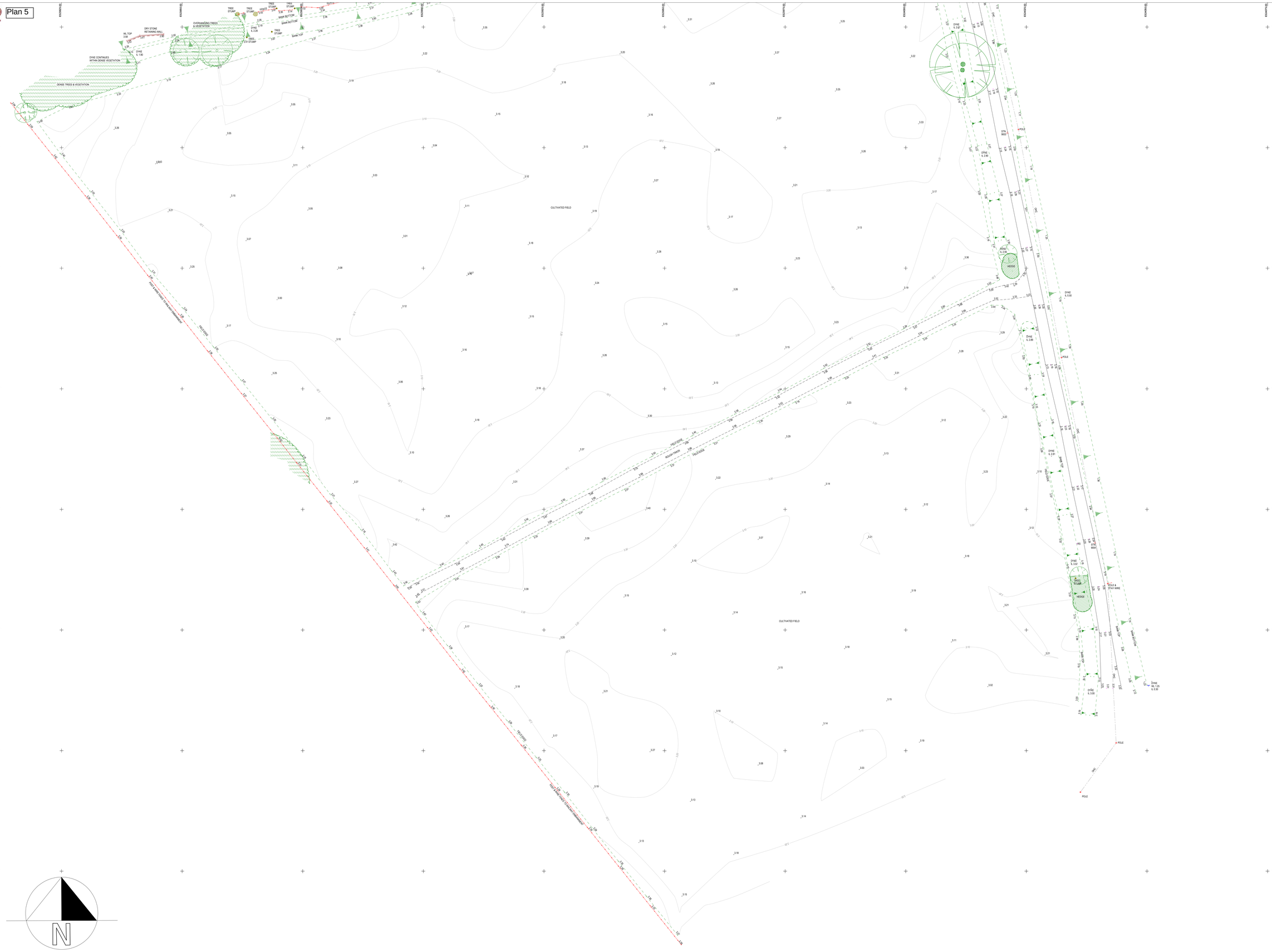
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TOPOGRAPHICAL SURVEY 1 of 2

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Drawing No: 19 - 52 - 01	Rev:
C.A.D.Title: rdc blue gowt lane pinchbeck\master topo (19-52-01-r02).mjo	
Drawn By: MJW	Checked By: SRW

Daniel Charles Surveys Ltd
Land Surveying & Engineering Services
Honeywood Barn, Honeyholes lane,
Dunholme, Lincoln, LN2 3SU
Tel : 01673 860444 Fax : 01673 863362
Email : info@daniel-charles.co.uk
Website : www.daniel-charles.co.uk

Plan 5

Surveys Ltd



NOTES

ABBREVIATIONS & SYMBOLS

AV	AIR VALVE	OHC	OVERHEAD CABLE
BH	BOREHOLE	PC	PARKING
BOL	BOLLARD	PINV	PIPE INVERT LEVEL
CATV	CABLE TV MH	PM	PARKING METER
CCTV	SECURITY CAM	PO	POST
CL	CENTRE LINE	PT	POINT
CN	COVERING	PTP	POST & RAIL FENCE
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DR	DRAIN	RL	RIDGE LEVEL
EL	EAVES LEVEL	RP	REFLECTIVE POST
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FH	FIRE HYDRANT	SV	VALVE
FFL	FINISHED FLOOR LEVEL	SW	SURFACE WATER
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FW	FOUL WATER	TH	TRIAL HOLE
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HH	HAND HOLE	TP	TELEGRAPH POLE
IC	INSPECTION COVER	TOW	TOP OF WALL LEVEL
IL	I NVERT LEVEL	TP	TELEGRAPH POLE
KB	KERB BOTTOM	UP	UTILITY POLE
KD	KERB DIP/CUT	UTL	UNABLE TO LIFT
KT	KERB TOP	VR	VENT PIPE
LP	LAMP POST	WL	WATER LEVEL
LC	LIGHT COLUMN	WLVL	WATER LEVEL
MH	MANHOLE	WP	WATER POLE
MP	MARKER POST	WO	WASH OUT POINT

FENCE
HEDGE
ELECTRIC
BANK EDGE
STORM LINE
FOUL LINE
TELEDOM LINE
GAS LINE
LARSEN PILES
CHANNELS
WATER MAIN
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9011	524043.733	324885.002	3.539

SURVEY DATE	01=04/03/19	INITIALS	CLRMJW

Rev	Amendments	Drn	Date

Client:
RDC

Project Title:
LAND OFF -
BLUE GOWT LANE
PINCHBECK - SOUTH LINCS

Drawing Title:
TOPOGRAPHICAL SURVEY 2 of 2

Scale @ A0:	Date:
1:250	05/03/2019
Drawing No: 19 - 52 - 02	Rev:
C.A.D.Title: rdc blue gowt lane pinchbeck\master topo (19-52-01+02).mjo	
Drawn By: MJW	Checked By: SRW

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