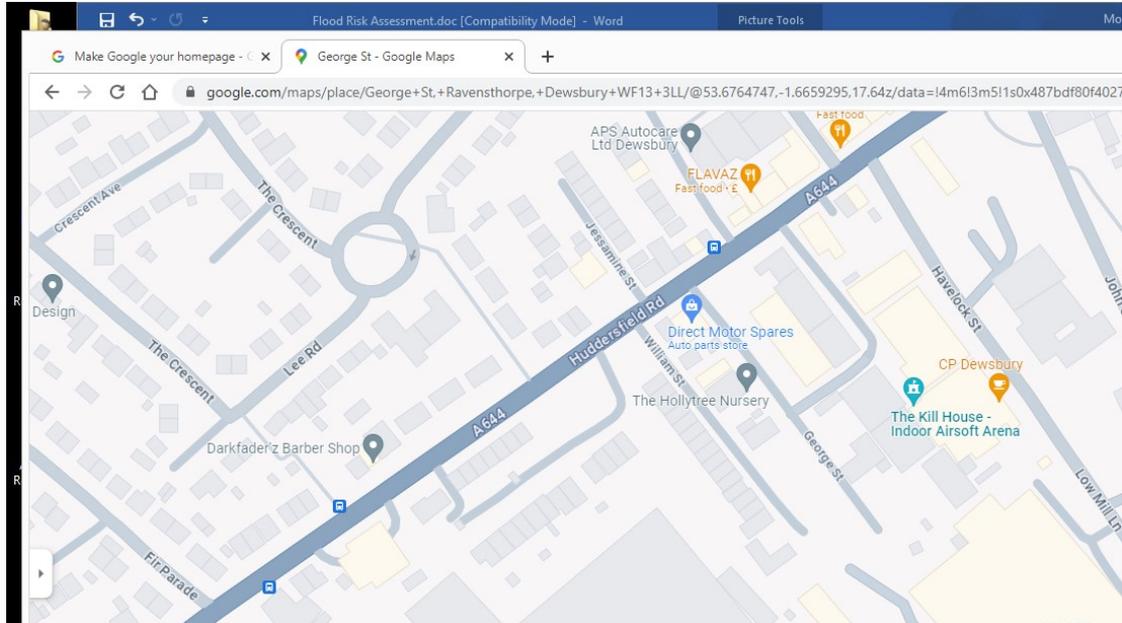


**T MOTORS
12 GEORGE STREET, RAVENSTHORPE
DEWSBURY, WF13 3LL**

Land at George Street/William Street, Dewsbury NPPF Flood Risk Assessment



Flood Risk Assessment



SCHEME:

Flood Risk Assessment for a development at George Street, Ravensthorpe, Dewsbury, WF13 3LL. The purpose of this report is to support the Planning Application.

INSTRUCTION:

The instruction to carry out this Flood Risk Assessment was received from of Insite Surveyors.

REPORT FORMAT:

This Flood Risk Assessment report has been prepared in accordance with the National Planning Policy Framework (NPPF) March 2012 and the associated Planning Practice Guidance (PPG) document: Flood Risk and Coastal Change. References in this report to sections, or tables, will relate to the PPG, unless otherwise noted.

1.0 Introduction

1.1 Project Background

1.11 Curtins have been appointed by Kirklees Council via their Physical Resources and Procurement Team, to undertake a Flood Risk Assessment to support and outline planning application for the development of land in Ravensthorpe, Dewsbury. The FRA provides information on the nature of flood risk at the site and follows Government planning guidance with regards to development and flood risk.

1.12 Proposals contained or forming part of this report represent the outline design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.13 Where the proposed works, to which this report refers, are undertaken more than twelve months following the issue of this report Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

1.2 Scope of Flood Risk Assessment & Drainage Impact Assessment

1.21 This report is prepared following the standing advice and requirements of the Environment Agency for Flood Risk Assessments as outlined in the Communities and Local Government National Planning Policy Framework (NPPF) in conjunction with the supporting Technical Guidance Document.

1.22 This takes into account the new SuDS guidance as of 6th April 2015 and the formation of Lead Local Flood Authorities (LLFA's) of which Dewsbury falls within Kirklees Council LLFA control.

1.23 On the basis this assessment is prepared to support an outline planning application for the area of land under consideration for development, the matters assessed forming the basis of this report are:

- Identifying the NPPF flood risk zone classification identified by Environment Agency flood mapping
- Identifying flood risk from other sources identified by Environment Agency flood mapping
- Investigating and reviewing of additional flood information available, for example from Local Authority Strategic Flood Risk Assessments, Surface Water Management Plans
- Considering Sequential and Exception Testing requirements if triggered
- Investigating any other secondary flood risks associated with the type of development
- Considering options to mitigate any flood risks identified
- Considering impacts that providing drainage to a new development will have on local flood risk.

1.3 Development Proposals

1.31 Outline development proposals for the area of land are for the provision of 5 number housing units consisting of a terrace of three units and one pair of semi-detached units.

1.32 Outline proposals also include providing vehicle turning facilities on George Street to mirror that of the existing facility on Willian Street, and the provision of off street parking spaces for the new properties.

2.0 Existing Site Details

2.1 Site Location and Current Use

2.11 The site is located in the Ravensthorpe area just to the west of Dewsbury. The River Calder is located just to the south of the site.

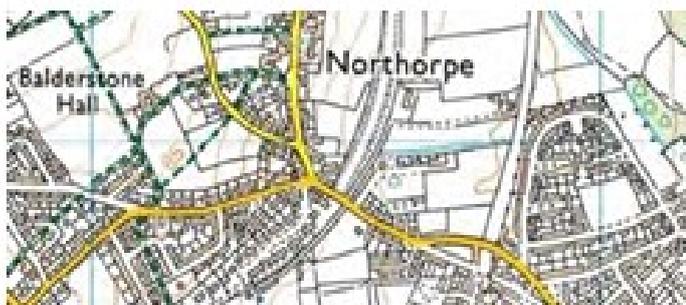
2.12 The site has an OS grid reference of SE2208520083 and has a postcode of WF13 3LQ. The site location is shown ringed red in figure 1 below.

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Figure 1. Location Plan



Land formerly occupied by car parking garages (one still present on GoogleEarth Streetview)

- An asphalt paved area service between the former garage areas
- A landscape area with mature trees and a narrow footway crossing
- Existing areas of George Street and William Street carriageway
- The turning head off William Street

2.14 A GoogleEarth image of the site is shown in Figure 2 following.

Figure 2. GoogleEarth Aerial Photograph.

2.14 A GoogleEarth image of the site is sh

Figure 2. GoogleEarth Aerial Photo



2.2 Existing Watercourses

2.21 No watercourses are evident from Ordnance Survey Mapping or GoogleEarth imagery in close proximity of the site.

2.22 The nearest watercourse is the River Calder approximately 300 metres to the south.

2.23 There is potentially a culverted watercourse (Canker Dyke) running just to the west of the site. This is explored further when the Kirklees Strategic Flood Risk Assessment is reviewed.

2.3 Existing Drainage

2.31 Yorkshire Water sewer plans have been obtained and 300 mm diameter combined sewage public sewers are shown in both William Street and George Street flowing in a northerly direction to a main 600 mm diameter combined sewer run in Huddersfield Road.

2.32 Sewer depths were also requested from Yorkshire Water/Safe Move but the only depths apparent are on two sections of branch sewers to existing properties. They have advised this is the only local depth information they hold.

2.33 As the sewers are falling in an opposite direction to the general land fall towards the River Calder, and that the pipes are of a large size, the depths are likely to be of a usable depth for the new development.

2.4 Topography

2.41 A full topographical survey has been carried out of the site area and adjacent roadways with ground levels referenced to Ordnance Survey Datum (OSDatum).

2.42 Levels to the south end of the site area are approximately 42.10 mAOD, and rise to approximately 44.40 mAOD at the northern boundary. The site can therefore be seen to be very flat in nature.

2.43 Contours visible on the Ordnance Survey mapping suggest the northern bank level of the River Calder for some distance from the upstream lock of the canal cut to the downstream lock is constant at approximately 40.0 mAOD

3.0 Development and Flood Risk

3.1 National Planning Policy Framework (NPPF)

3.11 In March 2012 the Department of Communities and Local Government superseded PPS 25 with the NPPF. A technical guidance report is provided covering flood risk and minerals policy. The NPPF has been revised as of April 2015 to promote the use of SuDS drainage within schemes of 10 or more houses and major development.

3.12 The NPPF sets out inappropriate development in areas at risk of flooding be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. For these purposes:

- areas at risk of flooding' means land within flood zones 2 and 3; or land within flood zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency
- 'flood risk' means risk from all sources of flooding – including from rivers and the sea, directly from rainfall on the ground surface and rising ground water, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.

3.13 The Sequential and Exception Test - The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The flood zones are the starting point for the sequential approach. These flood zones refer to the probability of sea and river flooding only, ignoring the presence of existing defences.

3.14 Strategic Flood Risk Assessments (SFRA) refine information on the probability of flooding, taking sources of flooding and the impacts of climate change into

account. These provide the basis for applying the Sequential Test on the basis of the flood zones in table 1. Where table 1 indicates the need to apply the Exception test, the scope of the SFRA will be widened to consider the impact of the flood risk management infrastructure on the frequency, impact, speed of onset, depth and velocity of flooding within flood zones considering a range of flood risk management maintenance scenarios. Where a SFRA is not available, the Sequential Test will be based on the Environment Agency flood zones.

3.15 The overall aim should be to steer new development to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, local planning authorities allocating land in local plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses (see table 2) and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (see table 3). Only where there are no reasonably available sites in Flood Zones 1 and 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception test if required.

Table 1 NPPF Flood Zones (NOTE: these flood zones refer to the probability of river and sea flooding ignoring the presence of defences)

Zone 1 Low Probability

Definition

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) Appropriate Uses All uses of land are appropriate in this zone

Zone 2 Medium Probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

Appropriate uses

Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses of land as set out in table 2, are appropriate in this zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.

Zone 3a High Probability

Definition

This zone comprises 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 Appropriate uses The water compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable uses and essential infrastructure 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 users in times of flood.

Zone 3b The Functional Flood Plain

Definition

This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRA areas of functional flood plain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional flood plain should take account of local circumstances and

not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood should provide a starting point for consideration and discussion to identify functional flood plain.

Appropriate uses

Only the water-compatible uses and essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood
 - result in no net loss of flood plain storage
 - not impede water flows, and
 - not increase flood risk elsewhere
- Essential infrastructure in this zone should not pass the Exception Test.

Table 2 NPPF Flood Risk Vulnerability Classification

Essential Infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly Vulnerable

- Police stations, Ambulance stations and Fire stations and command centres and telecommunications required during flooding.
- Emergency dispersal points.
- Basement dwellings,
- caravans, mobile homes and park homes intended for permanent residence.
- Installations requiring hazardous substance consent.

More Vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Police, ambulance and fire stations which 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 agriculture and forestry.

- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-Compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel workings.
- Docks, marinas and wharves.
- Navigation facilities.
- MOD defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to specific warning and evacuation plan.

Table 3 NPPF Flood Risk Vulnerability

Flood Risk

3.24 Referring to Table 1, NPPF Flood Zone Classifications, this site comprises land assessed as having:- between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

	Vulnerability classification	Exception test
Flood Zone	Zone 1	✓
	Zone 2	✓
	Zone 3a	Exception test Required
	Zone 3b functional floodplain	Exception test Required

✓ Development is appropriate

3.2 Site Specific NPPF Flood Risk C

3.21 To assess the NPPF flood risk classification web based flood mapping data. An extract of
Figure 3. Extract of Environment Agency



Appropriate uses

Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses of land as set out in table 2, are appropriate in this zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.

3.25 Referring to Table 2, NPPF Flood Risk Vulnerability Classification, the outline development proposed for new dwelling houses would constitute a More Vulnerable classification.

3.26 Therefore, in considering Flood Risk Vulnerability and Flood Zone 'Compatibility' in Table 3, and taking the flood risk of Flood Zone 2, the development is considered appropriate.

3.4 Environment Agency Product 4 Flood Mapping and Levels

3.41 With the proposed development land located within a Flood Zone 2 with Flood Zone 3 identified very close to the southern boundary which may not include allowances for climate change, the Environment Agency have provided Product 4 mapping and flood level data for the nearby River Calder. A copy is contained within

the appendix of this report suitably marked to show the site location. A review of the Product 4 data is carried out below:-

Map 1 – Flood Map for Planning

The mapping confirms the site area to be within a Flood Zone 2 (FZ2). The higher risk Flood Zone 3 (FZ3) is located close to the southern boundary. Data used to assess FZ3 may not include allowance for defences or climate change. The following maps consider this further.

Map 2 – 2d Modelled Flood Extents – 100yr Undefended Depth

The mapping shows modelled depths for the undefended 100 year event. The flood extent is less than the Planning Map FZ3 extent, and this is assumed to be as a result of flood waters being able to disperse out lower downstream.

Map 3 – 2d Modelled Flood Extents – 100yr Defended Depth

The mapping shows modelled depths for the defended 100 year event. The extent is still less than the Planning Map FZ3 extent, but greater than the undefended scenario, suggesting that flood defences downstream to protect Dewsbury influence higher flood levels upstream close to the site area.

Map 4 – 2d Modelled Flood Extents – 100yrCC Defended Depth

The mapping shows the 100 year plus climate change extents and reached almost to the southern boundary of the site area. It is assumed this is also based on the defended scenario where defences downstream have an influence on the upstream levels being greater than the undefended scenario.

Map 5 & 6 – 2d Modelled Flood Extents – 1000yr Undefended and Defended Depth

These maps show the 1000 year modelled flood extents for both undefended and defended scenarios. Both outlines mimic that of the FZ2 outline shown upon the planning map.

Map 7 – Asset location Map The mapping shows the river bank assets (e.g. defences). A supporting table is also provided which identifies embankments, walls and wash land, all being privately maintained. The standard of protection for all assets is given as 30 years.

Map 8 – Node Point Location Map The mapping shows the various node points along the River Calder and canal cut in relation to the modelled flood depths. CAHN05_302 and CAHN05_004 are considered most relevant to the site area. A table of modelled flood levels and flow rates are provided for the various node points for the 2, 5, 10, 25, 30, 50, 75, 100, 100+cc, 200 and 1000 year defended scenario and the 100 and 1000 year undefended scenario. The peak FZ2 and FZ3 flood levels are summarised below in relation to the lowest lying developable area ground level (e.g. Unit 5)

The mapping shows the river bank identifies embankments, walls and w for all assets is given as 30 years.

Map 8 – Node Point Location Map

Maps 9 & 10 – Flood History Maps

Map 9 shows the recorded flood outlines for the Autumn 200, February 2002 and January 2008 flood events and Map 10 the December 2015 event. For all events, the site area can be seen to be well clear of the mapped flood extents.

3.42 On this basis the Environment Agency mapping and modelled data would suggest the site is not a high risk of flooding being clear of the FZ3 and not being affected by any of the known major flood events of recent years.

3.43 The apparent risk would appear to be from the most extreme 1000 year FZ2 event where if such an event was to occur flood levels of around 1 metre could be experienced across the site area albeit this depth would reduce both with standard 150 mm floor above surrounding ground construction and the slight raise in levels for south to the north of the site area.

Raising floors above the 1000 yr level would be impractical. Setting a minimum floor level at 300 mm freeboard above the peak 100 yr climate change level would be more practical. For example, $42.060 + 0.3 = 42.360$ m

3.5 Flood Risk Environment Agency Surface Water Flood Risk Mapping

3.51 Environment Agency surface water flood risk mapping is shown in following figure 4. This medium risk map selected identifies the typical surface water flood expectations for a 100 year event.

Figure 4. Extract of Environment Agency Flood Risk from Surface Water

3.5 Flood Risk Environment Agency

3.51 Environment Agency surface water flood map selected identifies the typical surface

Figure 4. Extract of Environment Agen



Approximate site extents shown outlined **RED**.

3.52 Surface water risk can be seen to be low with only a small area of low risk identified at the end of the carriageway of George Street.

3.53 The risk is considered further in the following section where the Kirklees SFRA risk maps are assessed.

3.6 Kirklees Council SFRA Flood Risk Mapping

3.61 The Kirklees Council Strategic Flood Risk Assessment (SFRA) dated January 2010 has been reviewed in relation to the site location.

3.62 Various maps accompany the SFRA considering various element of flood risk. An extract of each map is shown following with a review of the site in relation to identified risks

Figure 5 - Kirklees Council SFRA - Floo

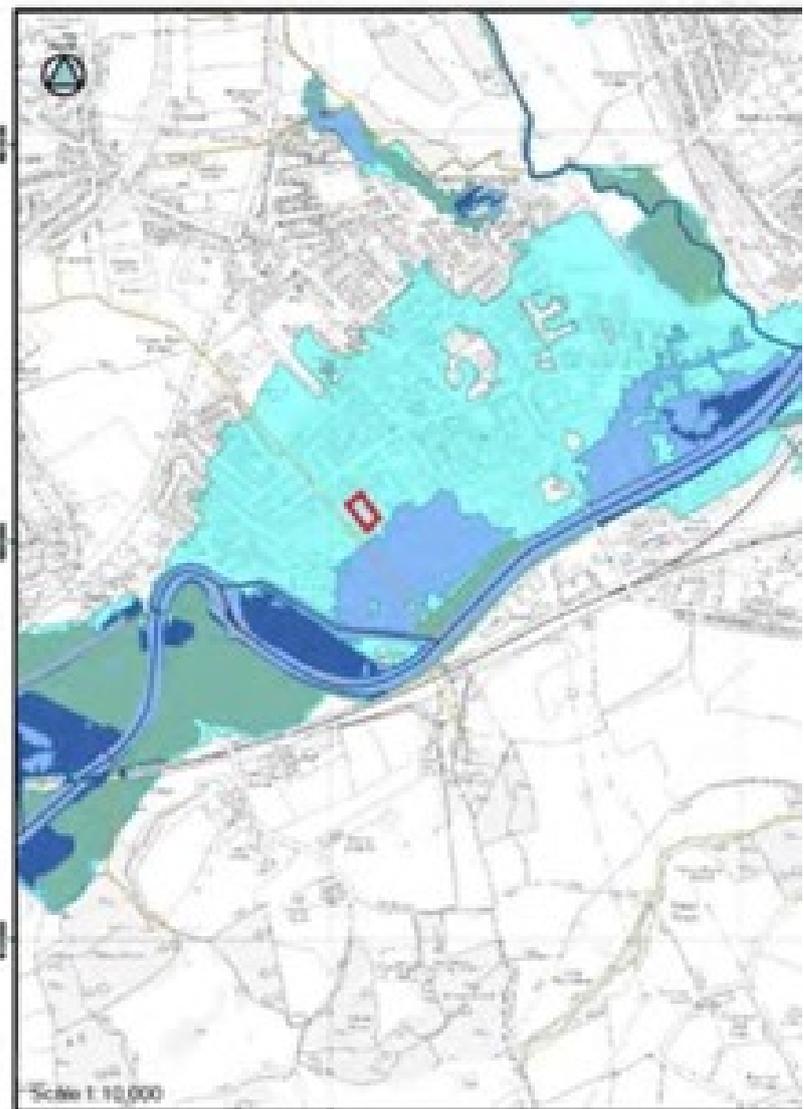


Figure 7 - Kirklees Council SFR

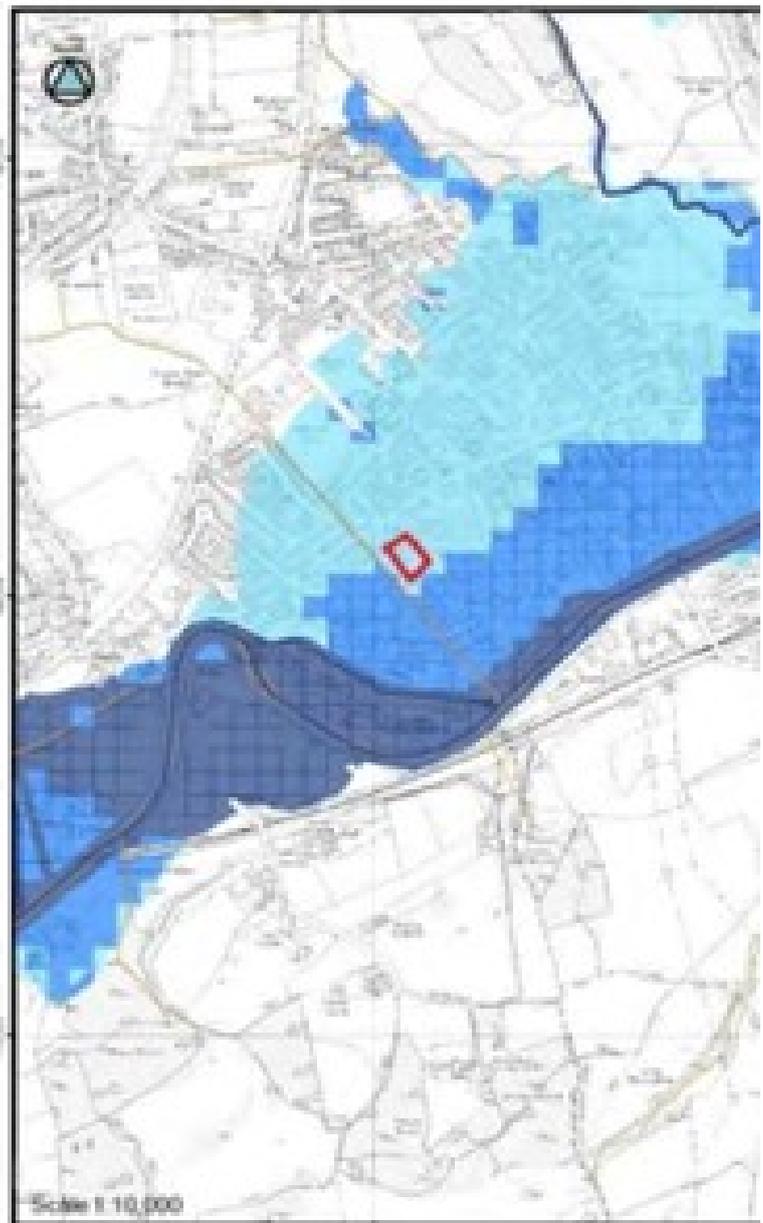
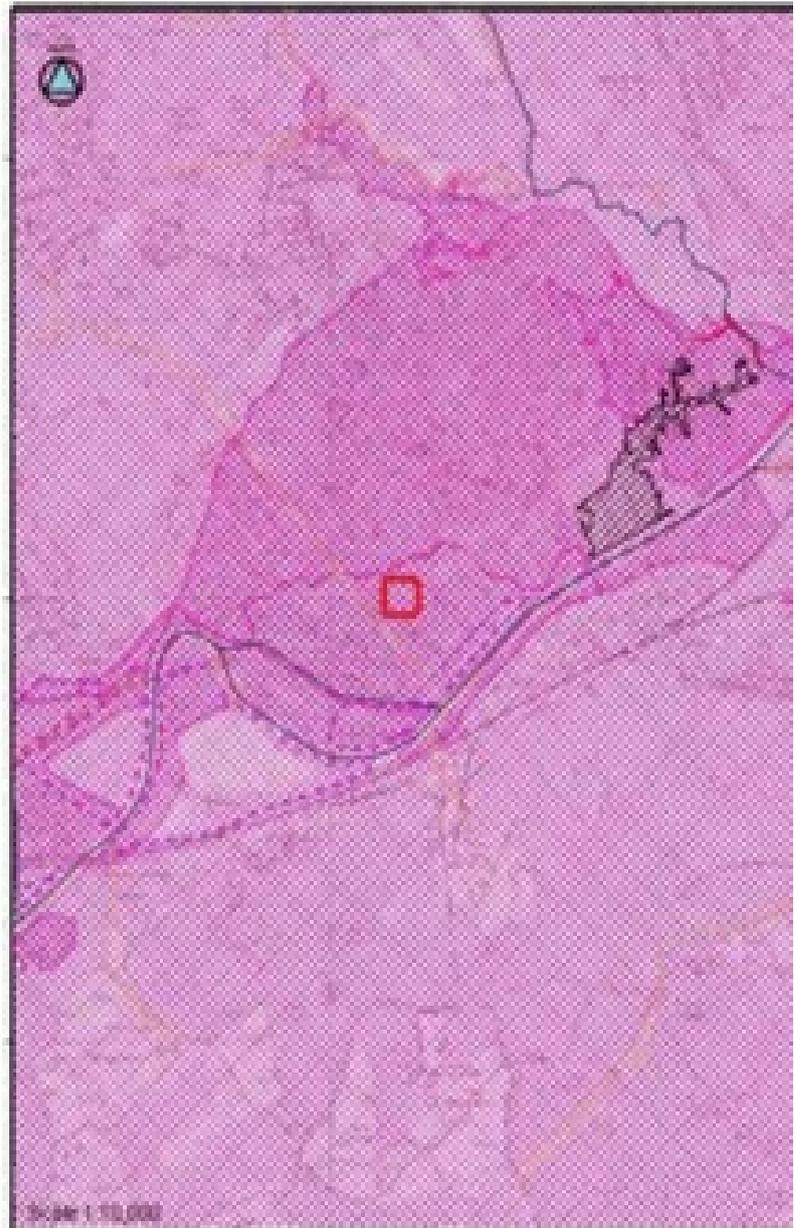


Figure 9 - Kirklees Council SFRA – Fig



The mapping identifies the Central Dulac

3.63 Generally the SFRA mapping confirms the MEDIUM risk of flooding associated with a Flood Zone 2.

3.64 Surface water risk is shown LOW, concurring with the Environment Agency mapping.

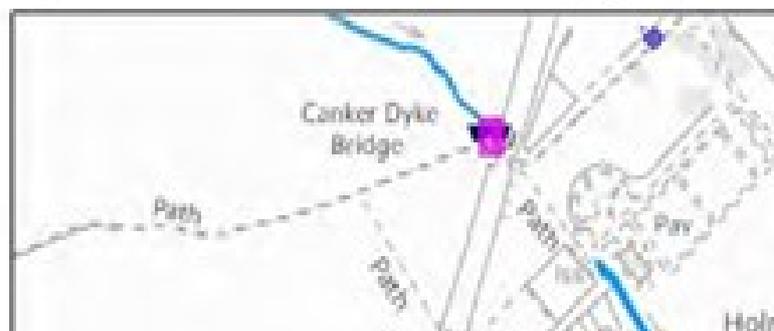
3.65 Dialogue with the LLFA at Kirklees Council has advised that there are no known issues with the Canker Dyke and that they understand the route assumed on the mapping to be incorrect and actually intercepted by other drainage systems. The risk is therefore assumed LOW. An extract of the mapping is shown below in figure 11

Figure 11. Kirklees LLFA Mapping showing Canker Dyke

3.64 Surface water risk is shown **LOW**, concu

3.65 Dialogue with the LLFA at Kirklees Coun
Dyke and that they understand the route a
by other drainage systems. The risk is the
in figure 11

Figure 11. Kirklees LLFA Mapping sho



3.66 The 75% + risk of groundwater is likely to be as a result of localised ground conditions and as such should be explored further as part of any ground investigation works.

3.7 Environment Agency Flood Warnings

3.71 The Environment Agency provide mapping identifying where flood warnings are given. An extract of the mapping is shown in figure 4 below showing the site location (ringed red) within an area where flood warnings and alerts are given: -

063732-FRA-SB Land at George Street

NPPF Flood Risk Assessment

Figure 12. Extract of Environment Ag



3.72 Registration to receive flood warnings/alerts is a free service offered by the Environment Agency. The process is simple, and warnings can be received by either text sms, or email.

3.73 Although flooding is only suggested for the extreme events and that flood depths are not likely to be excessive, it would still be recommended that residents are encouraged to register for receiving warnings so that necessary action can be taken if conditions dictate.

3.8 Secondary Flood Risks

3.81 It is an important part of a flood risk assessment to consider any other secondary flood risks not assessed in the preceding paragraphs.

3.82 Flooding from the existing drainage can present risk. A Yorkshire Water sewer plan has been acquired which shows 300 mm diameter combined sewage public sewers in both William Street and George Street flowing in a northerly direction to a main 600 mm diameter combined sewer run in Huddersfield Road. Sewer depths were also requested from Yorkshire Water/Safe Move but the only depths apparent are on two sections of branch sewers to existing properties. They have advised this is the only local depth information they hold. As the sewers are falling in an opposite direction to the general land fall towards the River Calder, and that the pipes are of a large size, the depths are likely to be of a usable depth for the new development. It is assumed if any sewer flooding does occur the carriageways of George street and

William Street will act as the main conduit conveying flows away from any proposed housing units. The risk is considered LOW

3.83 Flooding from the new drainage system can present risk. This can be mitigated by design to modern standards (Sewers for Adoption, British Standards and Building Regulations) and utilising appropriate SuDS measure that will ensure new development proposals do not increase flood risk either to itself or others. The risk is therefore considered LOW

3.84 Flooding from reservoir failure can present a flood risk. Observation of the Environment Agency mapping (as shown in Figure 12) shows the site area within a risk area albeit current mapping no longer identifies the reservoirs which present the risk. Generally, reservoirs in this area are maintained by Yorkshire Water as water supply assets and as such the risk of catastrophic failure is generally considered LOW.

standards (Sewers for Adoption, British Standards and Building Regulations) and utilising appropriate SuDS measure that will ensure new development proposals do not increase flood risk either to itself or others. The risk is therefore considered LOW

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Figure 13. Extract of Environment Agency Flood Risk Mapping



3.9 Flood Risk Summary

3.91 Generally flood risk is considered LOW other than the risk from the River Calder which presents a MEDIUM risk from the 1000 year FZ2 event, albeit site levels and standard floor level rises will provide a good level of protection against more likely events such as the 100 year plus climate change FZ3 event. The introduction of flood resilient measures at ground floor level will provide an added level of protection.

4.0 Drainage Impact Assessment

4.1 Existing Drainage

4.11 Yorkshire Water sewer maps do not identify any public sewers crossing the site or in close proximity which may affect outline devolvement proposals. 4.12 Observation of Google Street View would suggest there is no positive drainage present on the asphalt paved area centrally within the site, with levels suggest surface water is shed towards both roadways.

4.2 Surface Water Drainage Strategy

4.21 With development proposals consisting of 5 new housing units, it is unlikely there will be a need to comply with national SuDS standards and local LLFA (Lead Local Flood Authority) guidance to introduce SuDS to the any drainage proposals put forward for the development proposals.

4.22 Local ground conditions and the SFRA suggestion of 75% plus chance of groundwater issues would suggest infiltration is likely to be unviable.

4.23 However, with no apparent existing drainage present on site generating existing discharges, albeit with there being water run off to the adjacent roadways, it will still be a requirement to ensure new drainage provided to the proposed development does not increase flood risk to the site area or any other in the drainage catchment.

4.24 On this basis it is likely that both the LLFA ta Kirklees Council and Yorkshire Water whose combined sewers will receive surface water discharges from the site are likely to restrict flows to a maximum of 5 litres a second. NOTE: this will require confirming with the LLFA and Yorkshire Water via the PreDevelopment Enquiry process prior to a FULL planning plication.

4.25 Assuming 5 litres a second is agreed as the maximum discharge rate, given the impermeable area of the prosed development, it is likely that some volume of attenuation will be required.

5.0 Flood Risk Conclusion and Recommendations

5.1 Conclusion

5.11 A Flood Risk Assessment has been conducted to support an outline planning application for the provison of 5 residential units on land between George Street and William Street, in the Ravensthorpe area of Dewsbury. The FRA has been conducted in general accordance with the requirements of the NPPF and LLFA SuDS Design Guidance to provide sufficient detail on flood risk for the outline application.

5.12 The Environment Agency Planning Flood Map shows the site area to be located within a Flood Zone 2 (1000 year event outline) with the Flood Zone 3 (100 + year climate change event outline) just to the south of the site. With outline development proposals being residential housing, NPPF table 3 shows the development type of MORE VULNERABLE appropriate for the level of flood risk.

5.13 With the site area being outside of the Flood Zone 3 and the development proposal providing a benefit to the community outweighing the level of flood risk it is unlikely there will be need to provide Sequential Testing evidence.

5.13 Observation of modelled flood levels suggest the site is unlikely to be affected by flooding other than if an extreme 1000 year event was to occur. Study of historic flood event outlines are shown not to mimic modelled 100 year flood outlines, so risk from the 1000 year event may also be very cautionary.

5.14 Surface water risk has been assessed, and risk is identified as LOW.

5.13 Other secondary flood risks including reservoir flooding have also been assessed and the site is considered to be at LOW risk from all sources.

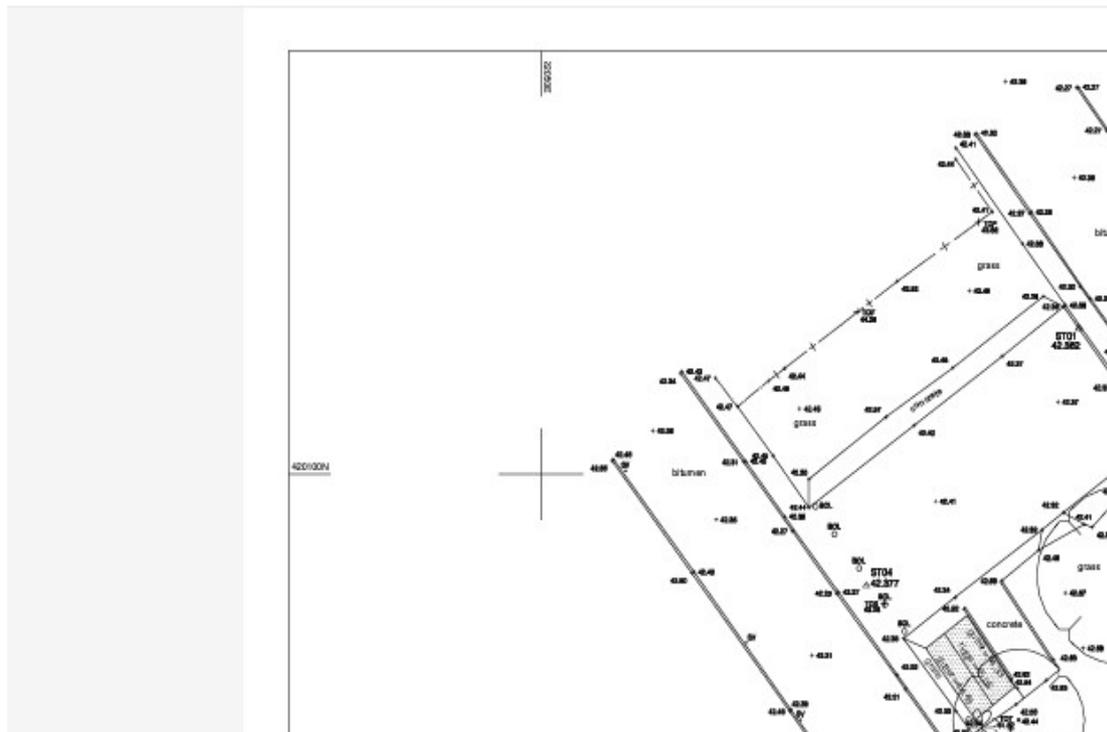
5.15 Risk from the provision of new surface water and foul water drainage is considered LOW.

5.2 Recommendations for Detail Design at Full Application Stage 5.21 Building levels are considered in relation to the 100 year plus climate change modelled flood level, setting a minimum 300 mm freeboard above the peak level e.g. 42.360 mAOD.

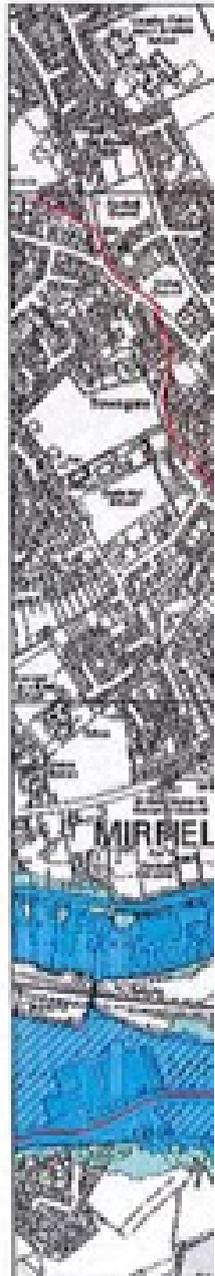
5.22 A further level of flood resilient construction is considered above ground floor level such as power fed from ceiling level, raised air bricks, plaster board laid horizontally and non return valves on ground floor drain connections.

5.23 residents are made aware of the flood warning and alerts available from the Environment Agency.

5.24 All new drainage is designed to British Standard and Building Regulation standards and where necessary public sewers are adopted by Yorkshire Water.



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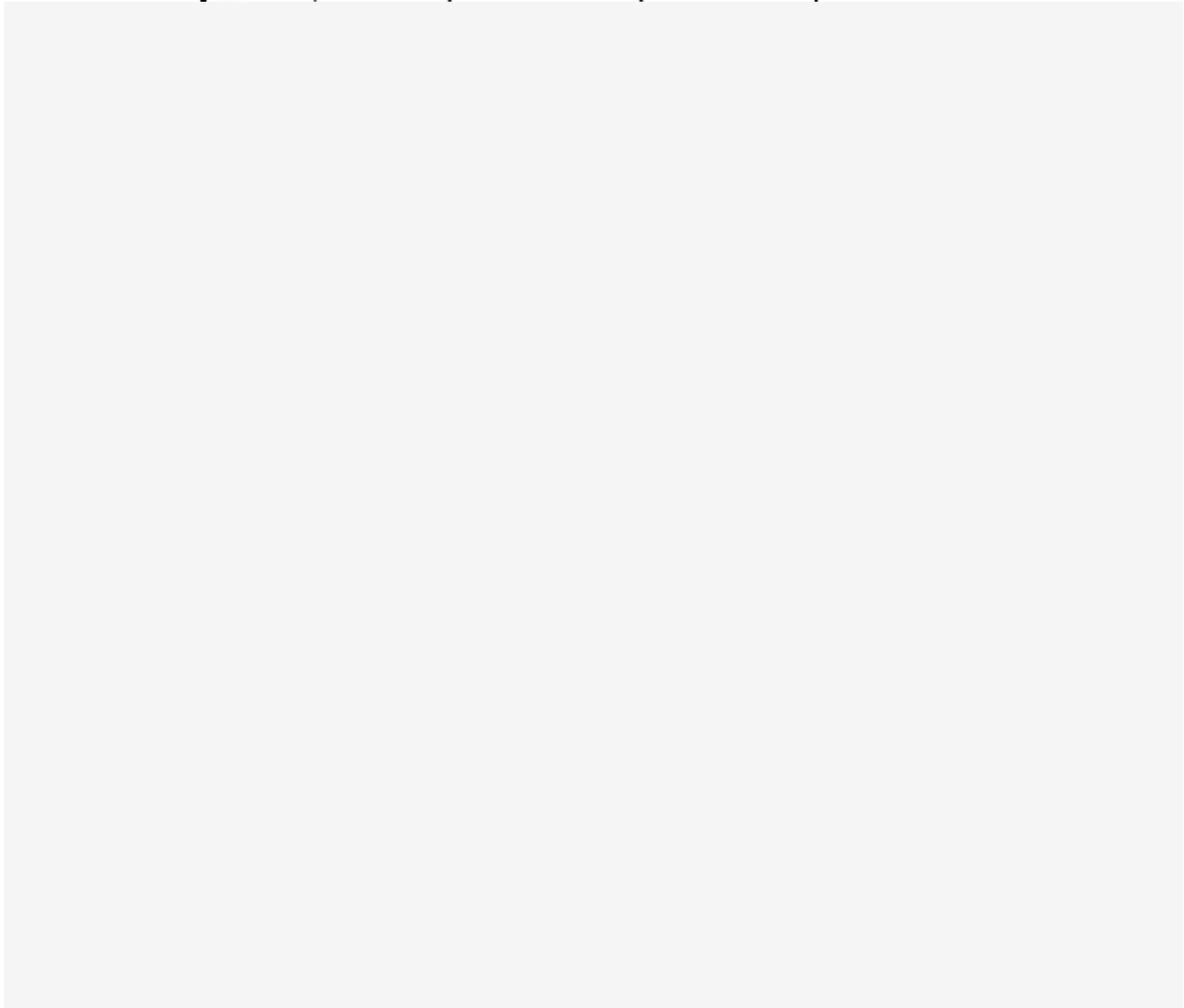


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Asset Information

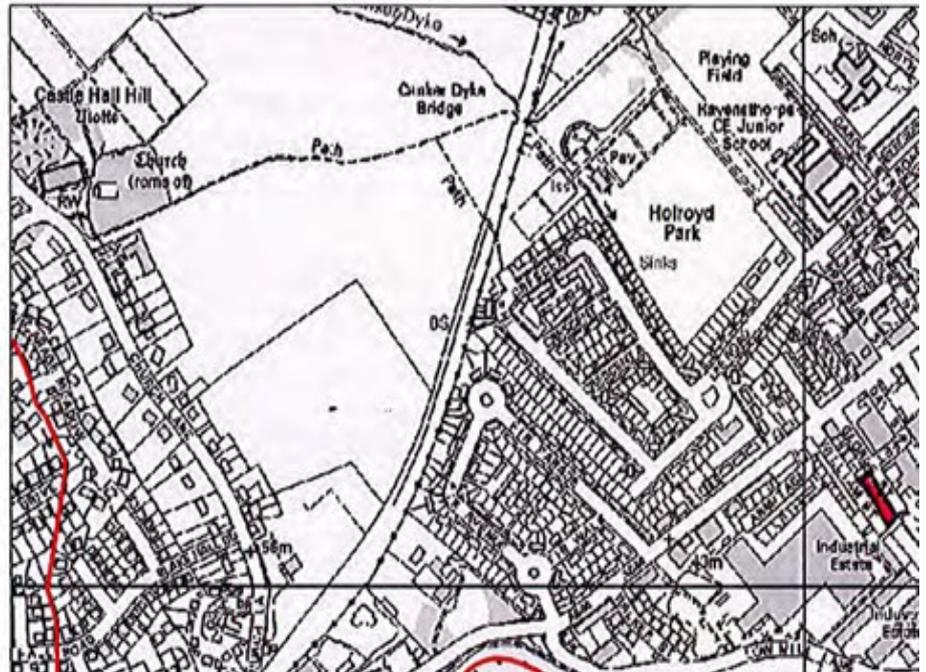
Asset	Asset	Asset	Maintainer	Descr
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Node Information – Calder & Canals 2015

Node Label	Defended :									
	2		5		10		25		30	
	Level (mAOD)	Flow (m/s)								
CALD09_0308	39.19	225.62	39.59	306.67	39.71	327.44	40.13	410.46	40.20	424.7
CALD09_2324	41.70	230.67	42.01	311.38	42.08	327.63	42.42	372.05	42.49	373.6
CALD09_1961	41.47	226.81	41.74	284.28	41.80	297.23	42.12	336.68	42.19	339.5
CALD09_1860	41.47	216.31	41.76	267.46	41.83	279.49	42.17	314.56	42.25	316.3
CALD09_1763	40.47	225.17	41.15	290.31	41.31	300.95	41.86	323.22	41.95	324.7
CALD09_0730d	39.54	225.63	40.08	306.76	40.21	327.51	40.67	410.49	40.75	424.5
CAHN05_0535	41.44	1.07	41.71	1.84	41.77	2.18	42.10	4.48	42.17	5.06
CAHN05_0302	40.89	0.85	41.24	1.83	41.28	2.17	41.44	4.47	41.48	5.05
CAHN05_0084	40.89	0.79	41.24	1.82	41.28	2.16	41.44	4.47	41.48	5.05
CAHN05_0027	39.90	0.80	40.53	1.47	40.67	1.46	41.17	1.49	41.25	1.46
CAHN05_0042	40.89	0.80	41.24	0.80	41.27	0.79	41.44	0.91	41.47	0.91
CAHN06_0035	41.59	0.96	41.89	0.95	41.96	0.95	42.29	1.01	42.35	1.01
CAHN06_0096	42.84	0.95	42.94	0.95	43.00	0.95	43.36	1.35	43.38	1.35

RFI: 35173 Flood History Map - G



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