Blackpool Council

Blackpool SWMP

Blackpool SWMP Risk assessment report

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Contents

1 Introduction

A Surface Water Management Plan (SWMP) for Blackpool is being developed to understand and communicate surface water flood risk and to develop solutions to manage this risk. The Risk Assessment phase of the study aims to 1) undertake a strategic council-wide assessment of surface water flood risk; and 2) identify high risk areas and properties as potential candidates for further analysis and scoping of mitigation options where appropriate.

This document describes a quantitative assessment of surface water flood risk and identification of high risk areas and properties for SWMP. This work follows hydraulic modelling of surface water flooding, which is described elsewhere[1].

A risk assessment has been undertaken to quantify the risk of surface water flooding to receptors in Blackpool Council. This assessment, which follows the SWMP technical guidance (Defra, 2010) includes an estimation of flood damages to property and people. The assessment uses the outputs from the hydraulic modelling undertaken for the Blackpool SWMP (Arup, 2013). High risk areas and properties have also been identified as potential candidates for further analysis and scoping of mitigation options where appropriate.

[1] Blackpool SWMP Modelling Report, Arup (2013).

2 Receptor data

2.1 Types of receptor

For the purposes of the SWMP, a receptor is something that can be affected by surface water flooding. The risk of surface water flooding has been assessed for the following receptors in Blackpool Council:

- People
- Residential properties
- Non-residential properties including (industrial, commercial and public buildings)
- Critical infrastructure
- Emergency services disruption
- Road network

Given Blackpool Council is predominantly urban; a risk assessment of agricultural land has not been undertaken as part of this study.

The Environment Agency's National Receptor Dataset (NRD) has been used to define receptors in Blackpool Council. This dataset comprises a number of Geographical Information System (GIS) layers containing spatial and textual data for receptors.

2.2 Properties

The NRD Property data (points) were reviewed and the following modifications were made before it was used in the subsequent risk assessment:

- The extent of the data was trimmed to the Blackpool Council boundary.
- The data was found to be missing Multi Coloured Manual (MCM) property codes for all residential properties. However, the NRD Property data did include the house type (Detached/Semi/Terrace/Flat) so this information was used to generate generic MCM codes appropriate to the type of residential property. Accordingly, the subsequent economic assessment of flood damage (Chapter 3) was set up to apply depth-damage relationships representing an average Detached/Semi/Terrace/Flat residential property.
- Approximately 10% of properties in the NRD data were classified as "uncaptured" and did not have any attribute data (except an MCM code of 999). Uncaptured properties with area smaller than 40m^2 were removed as these were generally found to represent garages. Approximately 16% of residential properties are smaller than 40m^2 but a similar proportion of garages were found to be greater than 40m2 so this cut-off is deemed appropriate.
- An MCM Code for uncaptured properties greater than 40m^2 was applied initially based on individual inspection of the receptors with largest area, in some situations the same code was set for groups of receptors likely to

have the same type/use, for example multiple buildings within an industrial estate. Buildings within the town centre were assumed to be commercial (shops). The remaining receptors with areas between 40 and $75m^2$ were assumed to be terraced houses (terraced is the most common house type in Blackpool) as only 16% of residential properties were found to be larger than $75m^2$.

- Receptors with MCM code = 91 were removed as these were found to be ponds and public telephones.
- All receptors described as shelters were found to have an MCM Code = 519 (beach hut), these were changed to MCM Code = 999 so that they would be ignored in the subsequent risk assessment.
- A small number of residential properties (approximately 30) were removed where the Accuracy attribute was given as "Postcode Unit Mean" as the real location of these was not known.
- Receptors with the incomplete MCM Code of 21 and Area > $1000m^2$ were manually assigned a full MCM code based on individual inspection of the receptor using mapping and Google Street View photography where they were shown to be flooded in the baseline model results.
- Receptors with the incomplete MCM Code of 21 and Area < $1000m^2$ were automatically assigned a full MCM code based on Area: receptors between 500 and $1000m^2$ were assumed to be offices (MCM Code 310), receptors < $500m^2$ were assumed to be high street shops 211.
- A total of 734 duplicate entries were identified and removed from the property data.

2.3 Road network

The NRD Road network data was reviewed and found to be complete with no modifications required aside from trimming the data to the Blackpool Council boundary.

3 Economic assessment of flood damages

3.1 Calculation of flood depths

The maximum surface water flood depth at each property and critical infrastructure receptor was calculated using the flood depth results from the hydraulic model for each return period for both present day and future scenarios.

The modified NRD property points, previously described, represent arbitrary points within each building footprint. As such, properties would not be shown as being flooded if the flood extent did not cover the point itself regardless of whether other parts of the building footprint are flooded. Therefore, the modified NRD property points were spatially joined to the Ordnance Survey MasterMap polygon representing the associated property footprints. The resulting property polygon layer was used to extract maximum property depths from the results of the hydraulic model (see modelling report). The flood depth extracted for each property represents the maximum depth that occurs within the building footprint, which provides a conservative estimate of flood depth.

3.2 General assumptions

The threshold level for each property was assumed to be 0.3m above the minimum ground level at the property footprint. The depth-damage curves provided in the MCM and adopted in this analysis represent damages to properties starting to occur when the water level is within 300mm of the threshold level. However, damages have only been calculated for properties where the maximum water level exceeds the assumed threshold level, i.e. where the maximum flood depth within the property footprint is 0.3m or greater. This approach effectively removes properties from the flood damages calculation where the maximum water level does not exceed the assumed threshold level and is deemed appropriate for strategic scale surface water flooding assessment because:

- The flood depth results from the model include a portion arising from direct rainfall falling directly over the property footprint. Therefore all properties would be regarded as flooded if there wasn't some kind of filtering process applied.
- Flood depths of less than 0.3m, i.e. when the maximum water level is less than the assumed threshold level, only occur over part of the building footprint and/or along one edge of the building for the majority of properties. The assessment of flood damages including the associated MCM depth-damage curves has been primarily designed for fluvial and coastal flooding mechanisms where the source of flooding is remote from the receptor and where there is less potential for variation in water levels across a property footprint.

Given that the source of flooding is intense short duration rainfall events, it is assumed that the lead time for flood warning is less than 4 hours.

Given that the majority of surface water flooding to properties predicted by the model is due to ponding, it is assumed that the duration of flooding is greater than 12 hours.

A discount rate of 3.325% has been used, which is an approximation for the Treasury Green Book discount rates, based over a 100yr period.

3.3 Regional property data

Regional property data was used in the economic assessment to cap property Present Value (PV) damages so that they do not exceed the total value of the property. House prices for Blackpool were obtained from the official land registry service for England and Wales website (www.landregistry.gov.uk). Monthly house prices were extracted for February 2012 to January 2013 inclusive and averaged (Table 1).

Table 1: Regional house prices

House type	Average property price over the last year (£)
Detached	145,793
Semi-Detached	84,101
Terraced	64,043
Flat	58,368

Market value of commercial properties was calculated by multiplying the rateable value by the rental yield. Rateable value for commercial properties was obtained from the Valuation Office website (www.voa.gov.uk) and, for Warehouses, from statistics provided on the Government website (www.gov.uk/government/statistical-data-sets). Monthly rental yield for commercial properties was taken from the IPD website (www1.ipd.com/Pages) and converted into annual rental yield. The rateable value, annual rental yields and market value are shown in Table 2.

Table 2: Rateable value and annual rental yields

Type	Rateable value (£/m^2)	Rental yield (%)	Market value (£/m^2)
Retail	106	6.7	1,582.09
Offices	74	6.7	1,104.48
Factories	25	8.09	309.02
Other	55	6.7	820.90
Warehouses	31	6.7	462.69

Social equity was taken from the Office for National Statistics - Neighbourhood Statistics website (www.Neighbourhoodstatistics.gov.uk) and used to calculate a social equity weighting factor that has been used to refine the economic analysis, in line with Defra recommendations.

3.4 Damage calculation

The calculation of flood damages has been automated using an in-house spreadsheet. The following data was entered into the spreadsheet:

1. General assumptions and return periods assessed.
2. Regional property data and social equity data.
3. Property data including property ID, location, MCM code, footprint area, number of dwellings on ground floor and upper floors if a single receptor represents multiple dwellings, e.g. flats within a block of flats.
4. Maximum flood depths for each property for each return period.
5. Depth-damage relationships (curves) representing an average Detached/Semi/Terrace/Flat residential property were entered into the spreadsheet corresponding to the generic MCM codes attributed to the residential properties (Section 2.2).

The spreadsheet calculations follow the procedure given in FCERM Appraisal Guidance and also incorporate the 'The Benefits of Flood and Coastal Risk Management: A Handbook of Assessment Techniques - 2010' and the associated CD-ROM.

The 1:2 year return period property damages were deemed unrealistically high at 51% of the 1:100 year damages. This is likely due to the limitations of the modelling, which is not detailed enough to represent influential small scale features such as kerbs and gullies and may also be partly due to over-estimation of damages for larger properties where only a small part of a property may be affected. To improve the realism of the analysis, the 1:2 year return period flood depths have been re-defined as the 1:10 year return period flood depths. This has the effect of reducing Annual Average Damages (AADs) by 36%. The calculation of the annual average damage assumes that if a property floods in the 1:10 year return period flood depths then its damages linearly increase from zero for the 1:5 year return period to the 1:10 year return period flood damages. We are aware from other studies that there are flooding problems in Blackpool with a 1 in 5 year threshold frequency, so this assumption appears appropriate.

Properties with the largest annual average damages were identified where their average annual damage was greater than 0.5% of the total annual average damage of all properties. The resulting 32 properties were inspected in detail to determine whether the damage results were reasonable. For these properties, the MCM code, model results, flooding mechanisms and quality of input data such as the LiDAR, were checked. Out of the 32 properties identified, it was found annual average damages were over-estimated for all of the top 10 properties due to:

- Having an inappropriate MCM code assigned: In these cases a more appropriate MCM code was selected.
- Having a very large footprint area but with a relatively small part of this area likely to be affected by flooding: In these cases, the footprint area was scaled to represent the maximum area likely to be effected based on the 1:1000 year return period results.

- LiDAR filtering issues causing ground levels to be misrepresented leading to unrealistic flooding: In these cases the flood depths were set to zero where flooding was considered unrealistic.

Flooding and damages at most of the remaining 22 properties were considered to be reasonable.

3.5 Intangible impacts on people

Defra have produced guidance on the incorporation of stress-related impacts for fluvial and coastal flood risk, and the principles can be applied to surface water management. This estimates a value of approximately £200 for flooding per year per household.

For the present day scenario, the annual average number of residential properties affected by flooding, i.e. where the flood level exceeds the assumed threshold level, is calculated as 62.6. This gives an annual average value of £12,528 for intangible impacts to people.

3.6 Damage results

A summary of the results from the economic analysis of flood damages, including damages for each return period and annual average damages are shown in Table 3 for the present day scenario and Table 4 for the future scenario.

Present Value (PV) damage has been calculated assuming a linear increase in AAD between Year 0 (present day) and Year 99 (future) with a discount rate of 3.325%. The PV damage is calculated as £176.7M.

Table 3. Summary of economic analysis for present day scenario.

Return Period (Years)	**10**	**20**	**30**	**75**	**100**	**1000**	**Average Annual Damage (£K)**
Residential Properties							
No. of flooded properties	446	616	695	954	1077	3302	
Residential Direct Damages (£K)	12,510	16,110	18,050	25,290	28,586	97,873	2,006
Residential relocation costs (£K)	547	728	808	1,076	1,206	3,596	83
Total Residential Damages (£K)	13,057	16,838	18,858	26,366	29,792	101,469	2,090
Disallowed Annual Average Residential Damages (due to capping) (£K)							326
Total Allowable Residential damages (£K)							1,763
Non-Residential Properties							
No. of flooded properties	413	481	503	565	589	896	
Non-Residential Direct Damages (£K)	35,521	53,198	55,287	62,589	65,722	110,719	5,201
Commercial loss of business (£K)	0	0	0	0	0	0	0
Disallowed Annual Average NON-Residential Damages (due to capping) (£K)							1,367
Allowable NON-Residential damages (£K)							3,834
Totals							
Total allowable tangible damages (£K)							5,597
Emergency Services (£K)	2,690	3,881	4,107	4,921	5,281	11,681	313
							Total Allowable Annual Average Damage (£K)
Total damages (inc. damages in excess of capping (£K)	51,267	73,918	78,251	93,877	100,795	223,869	5,911

Table 4. Summary of economic analysis for future scenario.

Return Period (Years)	**10**	**20**	**30**	**75**	**100**	**1000**	**Average Annual Damage (£K)**
Residential Properties							
No. of flooded properties	453	788	904	1410	1667	4920	
Residential Direct Damages (£K)	12,794	20,518	23,880	36,925	43,839	147,788	3,287
Residential relocation costs (£K)	554	910	1,027	1,553	1,827	5,291	134
Total Residential Damages (£K)	13,348	21,428	24,907	38,479	45,666	152,779	3,420
Disallowed Annual Average Residential Damages (due to capping) (£K)							876
Total Allowable Residential damages (£K)							2,545
Non-Residential Properties							
No. of flooded properties	421	520	547	632	656	1048	
Non-Residential Direct Damages (£K)	36,987	57,681	61,208	72,339	76,142	134,753	5,783
Commercial loss of business (£K)	0	0	0	0	0	0	0
Disallowed Annual Average NON-Residential Damages (due to capping) (£K)							2,885
Allowable NON-Residential damages (£K)							4,747
Totals							
Total allowable tangible damages (£K)							7,292
Emergency Services (£K)	2,788	4,379	4,765	6,119	6,719	15,805	408
							Total Allowable Annual Average Damage (£K)
Total damages (inc. damages in excess of capping (£K)	53,124	83,487	90,880	116,936	128,527	303,337	7,700

4 Assessment of impacts on road network

Surface water flood depths were estimated for the road network using the results from the hydraulic model and NRD data. The lengths of road where the flood depth is predicted to exceed 0.15m were calculated for each return period. This depth was deemed appropriate to represent disruption to the road network and has been used when assessing impacts on road network in other studies. It should be noted that the values presented in Table 5 are indicative only as flooding may be over-estimated in some locations as small scale features such as kerbs and gullies are too small to be represented in the hydraulic model.

Table 5: Lengths of road disrupted by surface water flooding (km)

Return Period (Years)	**10**	**20**	**30**	**75**	**100**	**1000**	**100 + CC**
Motorway (km)	0.4	0.4	0.4	0.5	0.5	0.7	0.5
A Road (km)	2.1	3.4	3.8	4.8	5.1	9.7	6.1
B Road (km)	0.9	1.2	1.3	1.7	1.9	4.2	2.3
Local Streets and minor roads (km)	23.6	42.9	48.8	64.1	69.4	138.7	69.4
Private Roads (km)	5.8	6.8	7.2	8.1	8.6	13.8	9.8

5 High risk areas and properties

5.1 Identification of high risk areas

High risk areas have been identified as potential candidates for further analysis and scoping of mitigation options where appropriate. Given the limitations of the data and the modelling, it is recommended that the areas are screened to identify whether the flood risk and the mechanisms of flooding predicted by the model are realistic with reference to more detailed site knowledge and information.

There are many potential methods of identifying 'high risk areas' as this term is somewhat subjective. The results are also partly subjective based on how the underlying data has been interpreted. The high risk areas identified should therefore only be used to guide further analysis and not to discount other areas from further analysis. Indeed, there may be clear justification and/or evidence to consider other areas, e.g.:

- where observed flooding has been recorded
- where there are known deficiencies in drainage infrastructure
- where there are known flow routes that are not adequately represented in the model
- where proposed development is considered

The identification of high risk areas has focussed on areas containing clusters of properties predicted to be at risk at the 1:20 and 1:100yr return periods and where these clusters are affected by the same or similar flooding mechanisms. Areas have been identified where the number of properties in the cluster is relatively high by spatially analysing the number of properties at risk per 125m x 125m square area across Blackpool Council.

5.2 Flooding mechanisms to high risk areas

The model results, topography and mapping data have been used to estimate the most likely flow routes and flooding mechanisms for each area in this section. This data is also shown in the flood risk assessment maps described in Section 6.

<u>HRA-1:</u>

Location: Cranbrook Avenue

Flow routes/mechanisms: Runoff from Montgomery High School playing fields and Fairfax Avenue. Flow path from All Hallows Road past northern edge of Montgomery High School. Some flow also entering area through gardens of properties on Ashfield Road.

<u>HRA-2:</u>

Location: Montpellier Avenue and Red Bank Road area

Flow routes/mechanisms: Runoff from higher ground at Bispham to the west of this area. Main flow path is initially along England Avenue towards properties on Sandhurst Avenue. Some runoff also enters Montpellier Avenue from the higher ground to the north via Valler Avenue, Davenport Avenue, Rivington Avenue and Norcliffe Road.

HRA-3:

Location: Ingthorpe Avenue and Lentworth Avenue

Flow routes/mechanisms: Runoff from higher ground surrounding this area, particularly to the west along Red Bank Road and form the south along Bangor Avenue and from flow originating to the west of Fernleigh Close and Blackpool Road.

HRA-4:

Location: Warbeck Drive and Cranleigh Avenue area

Flow routes/mechanisms: Flow routes from the east via Northgate, from the west via Daventry Avenue and Cavendish Road and from runoff flowing towards Cranleigh Avenue from the high ground south of Countess Crescent.

HRA-5:

Location: Valentia Road and Limerick Road

Flow routes/mechanisms: Flow routes from higher ground surrounding this area, particularly to the west where overland flow may flow eastwards around properties along Fitzroy Road and via Galway Road. Runoff also enters from the south via Kylemore Avenue.

HRA-6:

Location: Handsworth Road and Enfield Road

Flow routes/mechanisms: Runoff from higher ground surrounding this area, flow routes from the north via Fairfield Road and Cromwell Road, flow routes from the west entering the area via Handsworth Road and Hawthorne Road.

HRA-7:

Location: Wall Street

Flow routes/mechanisms: Runoff from higher ground surrounding this area, flow routes from the north via Wall Street, flow routes from the west via Cocker Street and Banks Street.

HRA-8:

Location: Collingwood Avenue and Layton Road area

Flow routes/mechanisms: Runoff from higher ground to the east, west and south. Runoff from Birchway Avenue area flows around properties and through gardens in a westerly direction into Layton Road and eventually onto Collingwood Avenue. Some runoff also flows around properties and their gardens on Ascot Road in an easterly direction onto Collingwood Avenue. High flow velocities along Collingwood Avenue in a northerly direction.

HRA-9:

Location: Mere Road and Newcastle Avenue area

Flow routes/mechanisms: Runoff from higher ground to the north and west. The main flow route into the area appears to be from runoff entering the area from the north and west via the A583, Leamington Road and Leeds Road before flowing into Whitegate Drive and Mere Road before flowing through gardens and properties to reach Newcastle Avenue. Runoff also enters the area from the north via Forest Gate, Beech Avenue and Olive Grove and from the west via roads leading westwards off Whitegate Drive.

HRA-10:

Location: Albert Road and Charnley Road area

Flow routes/mechanisms: Runoff from higher ground to the north and east. The main flow route into the area appears to be from runoff entering the area from the north via Leopold Grove and Alfred Street. There is also some flow entering from the north west via Coronation Street and runoff from the Winter Gardens area as well as flow entering from the east around buildings on Hornby Road and Charley Road.

HRA-11:

Location: Coop Street and Kent Road Area

Flow routes/mechanisms: Runoff from higher ground to the east and west. In the west of the area, the main flow path appears to be via Shannon Street and York Street while in the east of the area the main flow path appears to be via Ribble Road and Belmont Avenue and then into Louise Street. There also appears to be some runoff from the embanked Seaside Way.

HRA-12:

Location: Tyldesley Road and Lonsdale Road area

Flow routes/mechanisms: Runoff from higher ground to the north and south with the main flow routes being along the B5262 and Tyldesley Road. The majority of properties at risk in this area appear to be basement properties.

HRA-13:

Location: Queen Victoria Road

Flow routes/mechanisms: Runoff from higher ground surrounding the area, particularly to the north east. The main flow routes into the area are from the north west via Central Drive (A5099) and form the north east via the roads that run directly downhill towards this area into Queen Victoria Road. Runoff also enters the area from the west along Rigby Road and the open land to the east of Sands Way.

HRA-14:

Location: Nuttall Road and Hodder Avenue

Flow routes/mechanisms: Runoff from higher ground to the north and east. The main flow path appears to be from the north east via the roads that run directly downhill towards this area into Ansdell Road and then into Threlfall Road and Nuttall Road.

HRA-15:

Location: Johnson Road and Falkland Avenue

Flow routes/mechanisms: Runoff from higher ground surrounding the area, particularly to the north and south. Model results indicate flow routes along Alisa Avenue and through gardens of properties on Alisa Avenue originating from north or the A583 dual carriageway. The results also indicate overland flow in a northerly direction through gardens on Newhouse Road into Falkland Avenue.

HRA-16:

Location: Pleasure Beach

Flow routes/mechanisms: Flooding in this area appears to be largely a result of the local ground levels, which vary significantly over short distances. This may cause significant local ponding. Flooding may be incorrectly predicted at some properties in this area due to the variability of ground levels in this area combined with the spatial resolution of the model.

5.3 High risk areas ordered by number of flooded properties

The high risk areas have been ranked by the estimated number of flooded properties within the area for the 1:20 year return period to provide an indicative prioritisation (Table 6). This list should be used in conjunction with other evidence, knowledge and experience to select areas to take forward for more detailed analysis and scoping of mitigation options.

Table 6: High risk areas ordered by number of flooded properties

			Estimated no. of flooded properties	
Rank	**Area**	**Location**	**1:20yr**	**1:100yr**
1	HRA-12	Tyldesley Road and Lonsdale Road area	70	87
2	HRA-10	Albert Road and Charnley Road area	63	88
3	HRA-9	Mere Road and Newcastle Avenue area	37	90
4	HRA-8	Collingwood Avenue and Layton Avenue area	36	40
5	HRA-16	Pleasure Beach	26	37
6	HRA-2	Montpellier Avenue and Red Bank Road area	22	28
7	HRA-11	Coop Street and Kent Road Area	20	30
8	HRA-4	Warbeck Drive and Cranleigh Avenue area	16	22
9	HRA-6	Handsworth Road and Enfield Road	14	36
10	HRA-15	Johnson Road and Falkland Avenue	13	29
11	HRA-7	Wall Street	11	19
12	HRA-13	Queen Victoria Road	7	27
13	HRA-14	Nuttall Road and Hodder Avenue	3	26
14	HRA-3	Ingthorpe Avenue and Lentworth Avenue	2	45
15	HRA-1	Cranbrook Avenue	0	21
16	HRA-5	Valentia Road and Limerick Road	0	15

5.4 High risk properties

High risk properties have also been identified where their estimated annual average damage is within the top 25 of all properties in Blackpool Council. As with the high risk areas, it is recommended that these properties are screened to identify whether the flood risk and the mechanisms of flooding predicted by the model are realistic with reference to more detailed site knowledge and information.

High risk properties are listed in Table 7, sorted by Annual Average Damage (AAD), and are shown on the risk assessment maps described in Section 6.

Table 7: Top 25 high risk properties ordered by estimated Annual Average Damage (AAD).

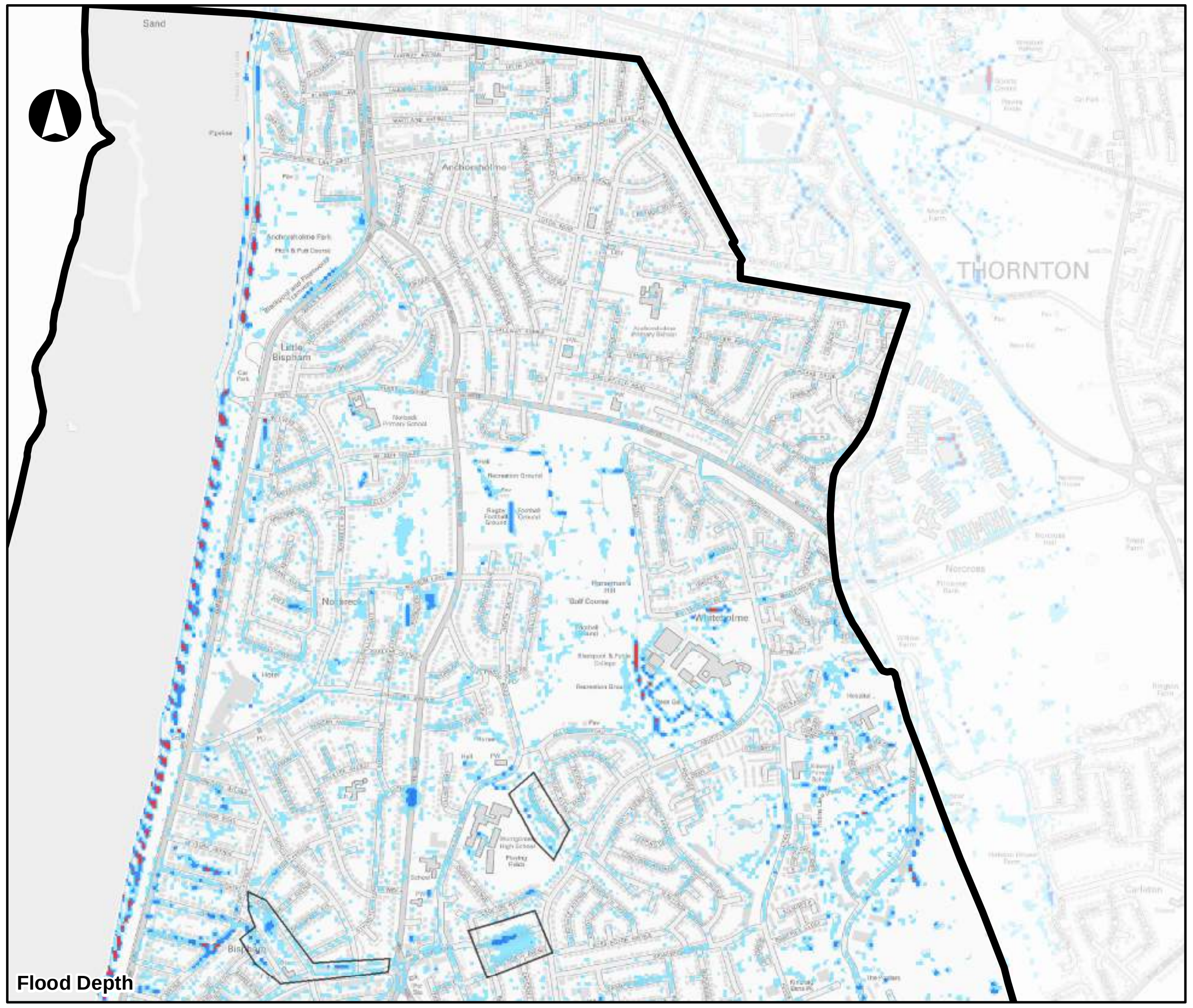
Rank	Description	AAD (£K)	Proportion of total AAD
1	Superstore	349	4.8%
2	School/College	322	4.5%
3	School/College	237	3.3%
4	Govt Buildings	209	2.9%
5	Govt Buildings	202	2.8%
6	Hotel	189	2.6%
7	Hotel	143	2.0%
8	Retail warehouse	126	1.8%
9	Workshop	116	1.6%
10	Amusement Arcade	106	1.5%
11	Retail warehouse	104	1.5%
12	School/College	99	1.4%
13	Retail warehouse	95	1.3%
14	Office	93	1.3%
15	Warehouse (inc. store)	73	1.0%
16	Factory/Works	70	1.0%
17	Factory/Works	70	1.0%
18	Factory/Works	69	1.0%
19	Shop	67	0.9%
20	Hotel	65	0.9%
21	Amusement Arcade	61	0.8%
22	Hospital	54	0.8%
23	School/College	52	0.7%
24	Flats	51	0.7%
25	Superstore	51	0.7%

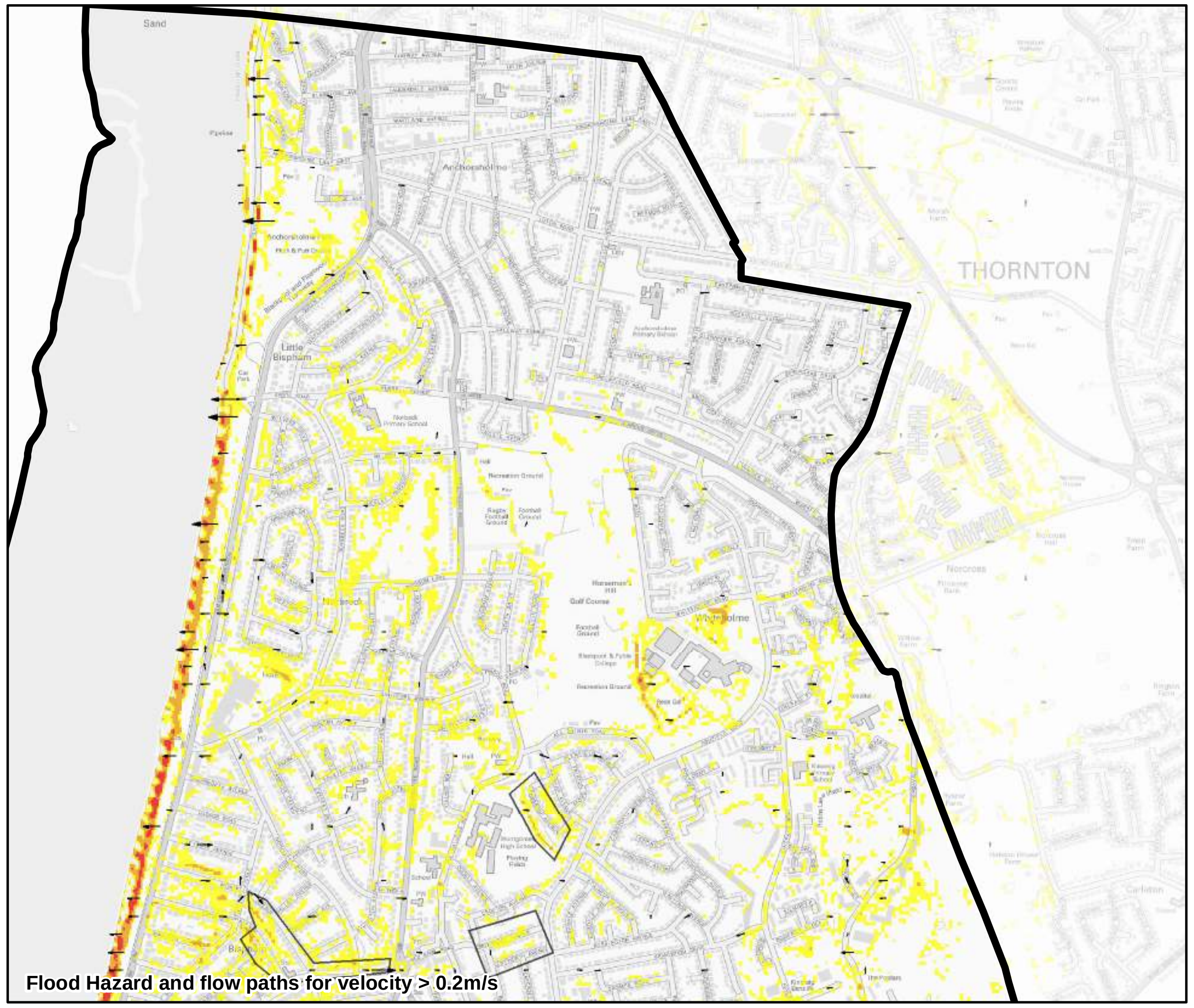
6 Risk assessment maps

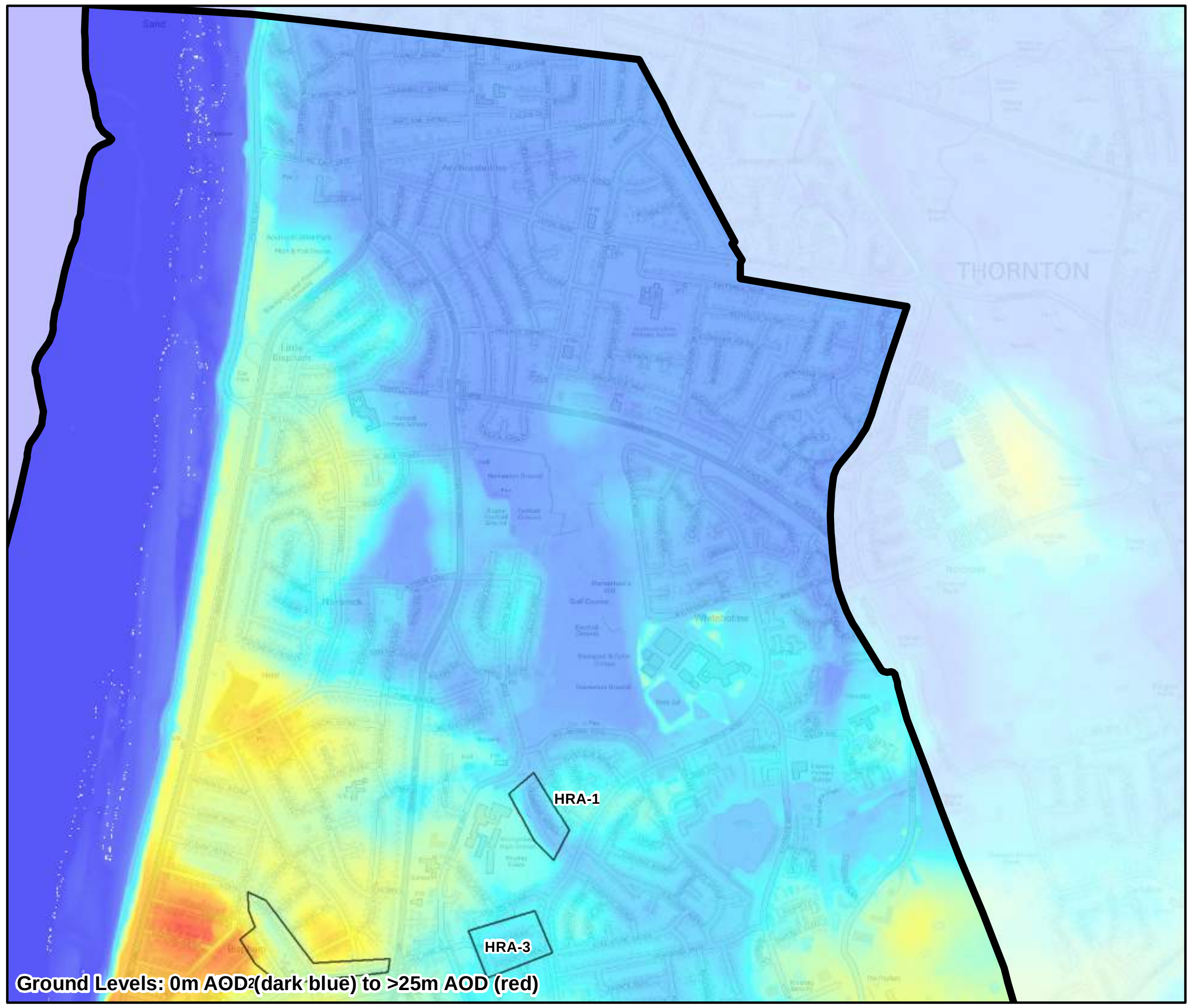
Results from the hydraulic model and the risk assessment have been presented on a set of flood risk assessment maps to clearly communicate surface water flood risk and locations of high risk areas and properties (Figures D1 to D7). These maps show the following information for the 1:20, 1:100, 1:100 future scenario and the 1:1000yr return periods.

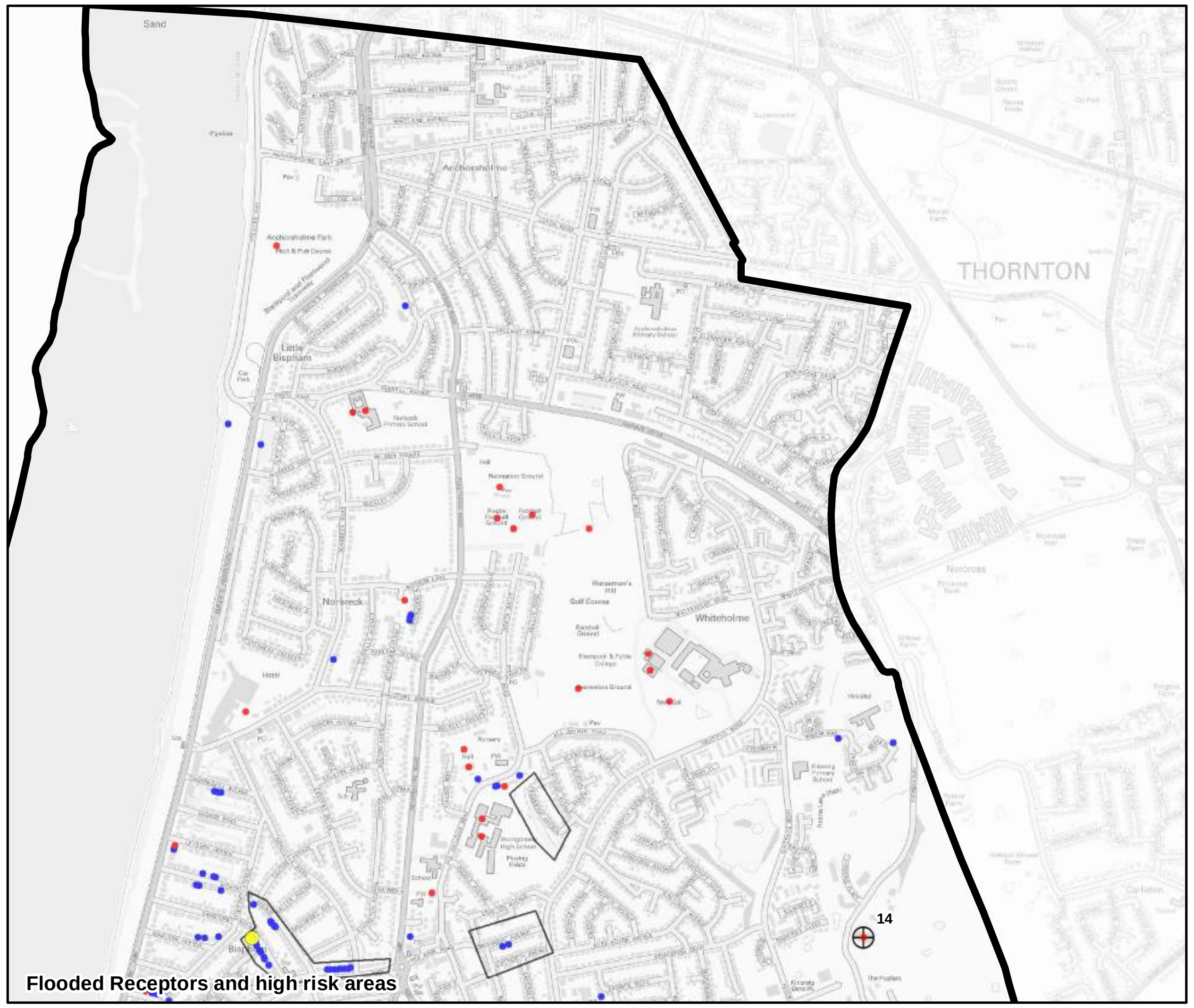
- Maximum flood depth classified as:
    - < 0.1m: This is not shown.
    - 0.1 – 0.3m: This is indicative of flood depth that is likely to cause disruption to pedestrians and traffic in some areas.
    - 0.3 – 0.6m: This is indicative of flood depth that is likely to cause internal flooding to properties.
    - > 0.6m: This is indicative of flood depth that could cause significant property damages.
- Maximum flood hazard classified as:
    - Danger to some
    - Danger for most
    - Danger to all
- Vectors showing flow direction scaled by maximum velocity where this is greater than $0.2ms^{-1}$.
- Ground levels taken from LiDAR data.
- Flooded Receptors classified as:
    - Critical infrastructure
    - Residential
    - Non residential
- High risk areas identified in Chapter 5 (labelled as “HRA”).
- Properties with the top 25 annual average damages (labelled by property type).

A3









Legend

Blackpool Council boundary

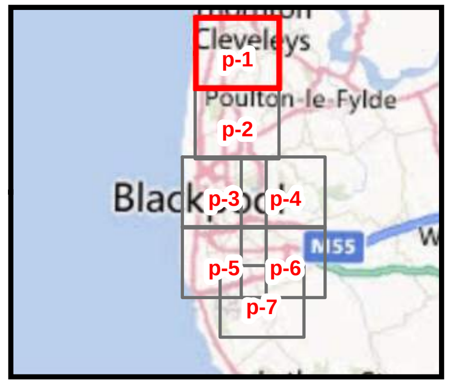
5% (1 in 20yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 20yr)
- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



D1	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Leeds LS9 8EE United Kingdom
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www.arup.com

Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 5% (1 in 20yr)

Scale at A3
1:20,000

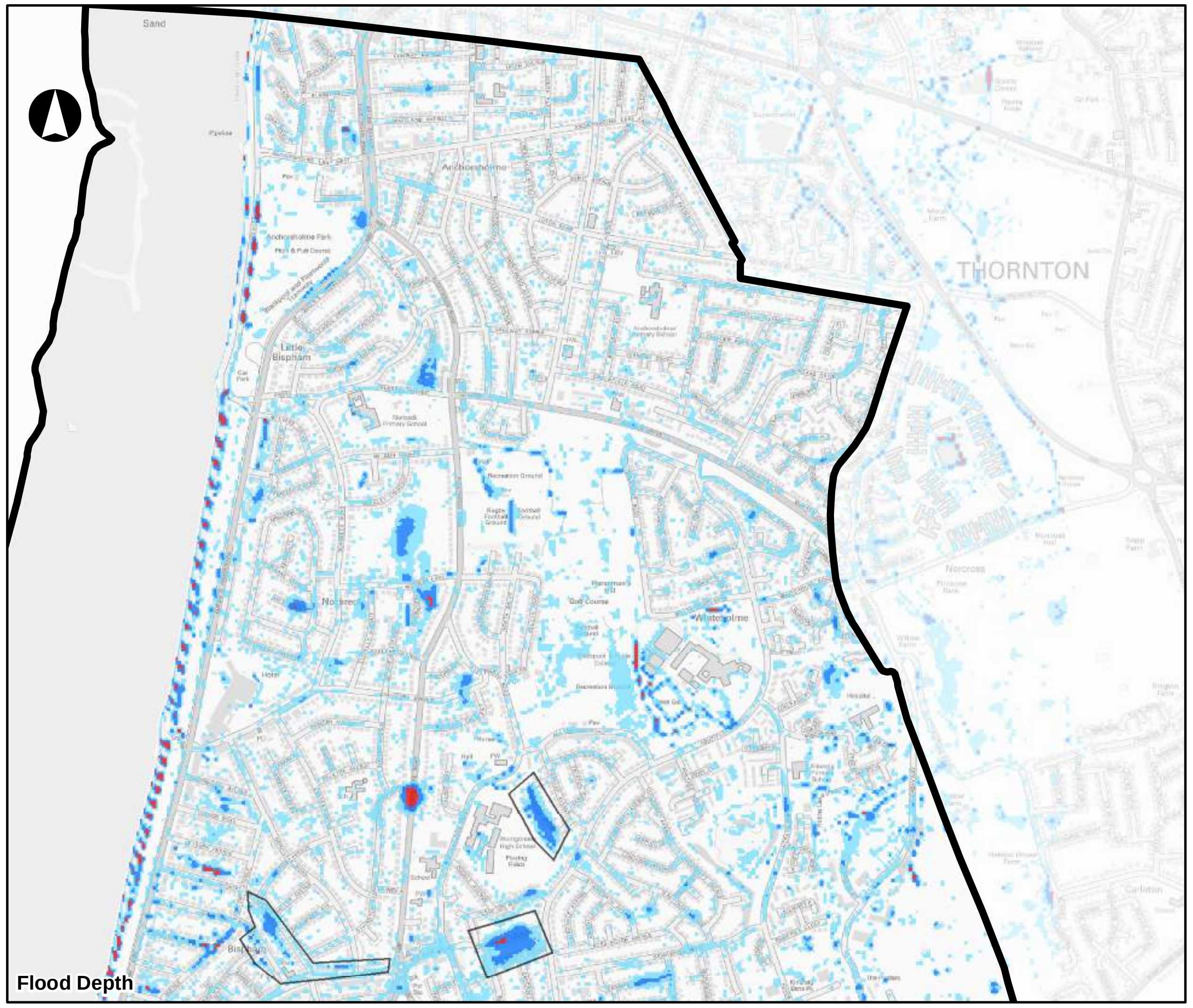
Job No	Drawing Status
227357	**Draft**

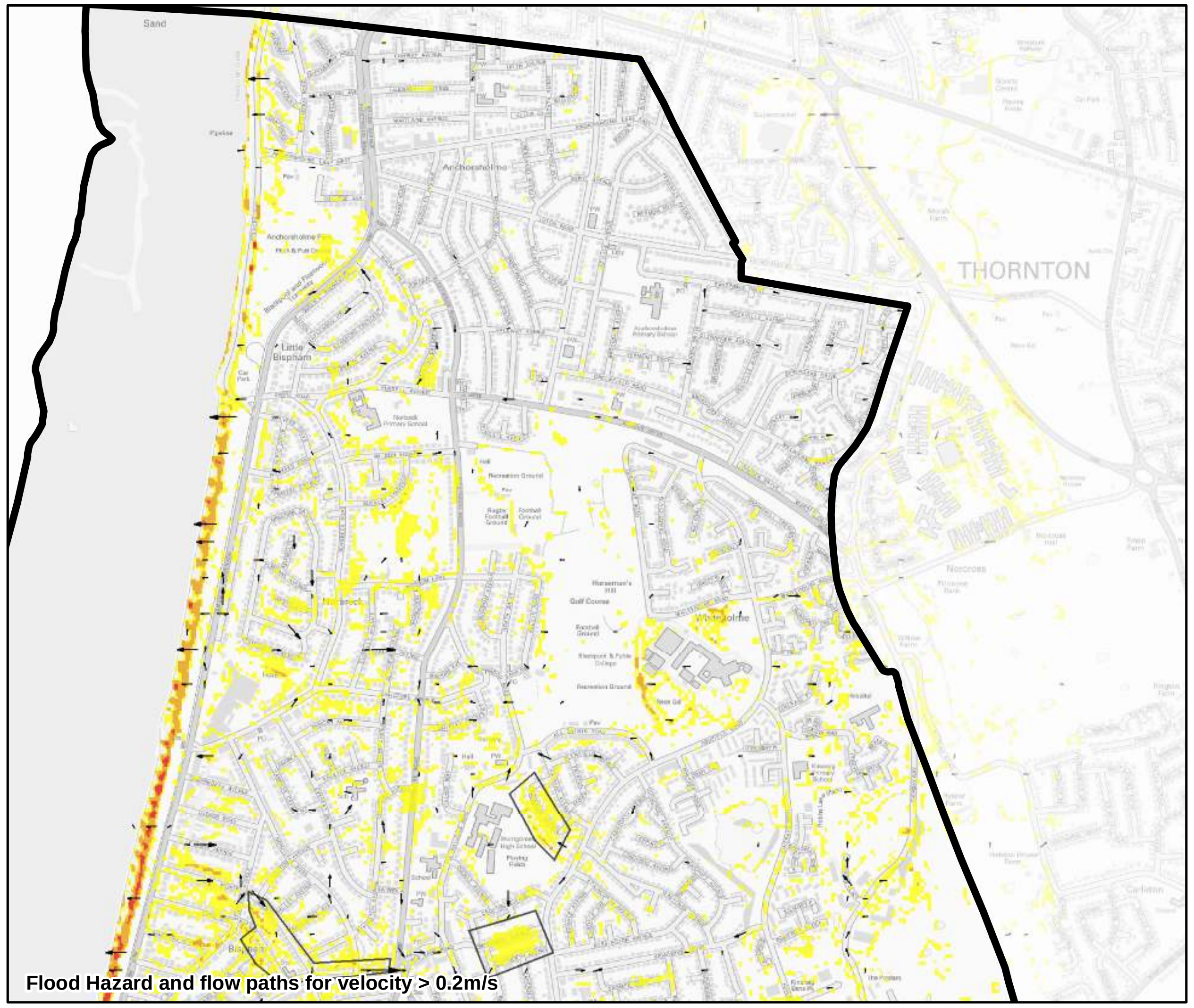
Drawing No	Issue
D1.1	**D1**

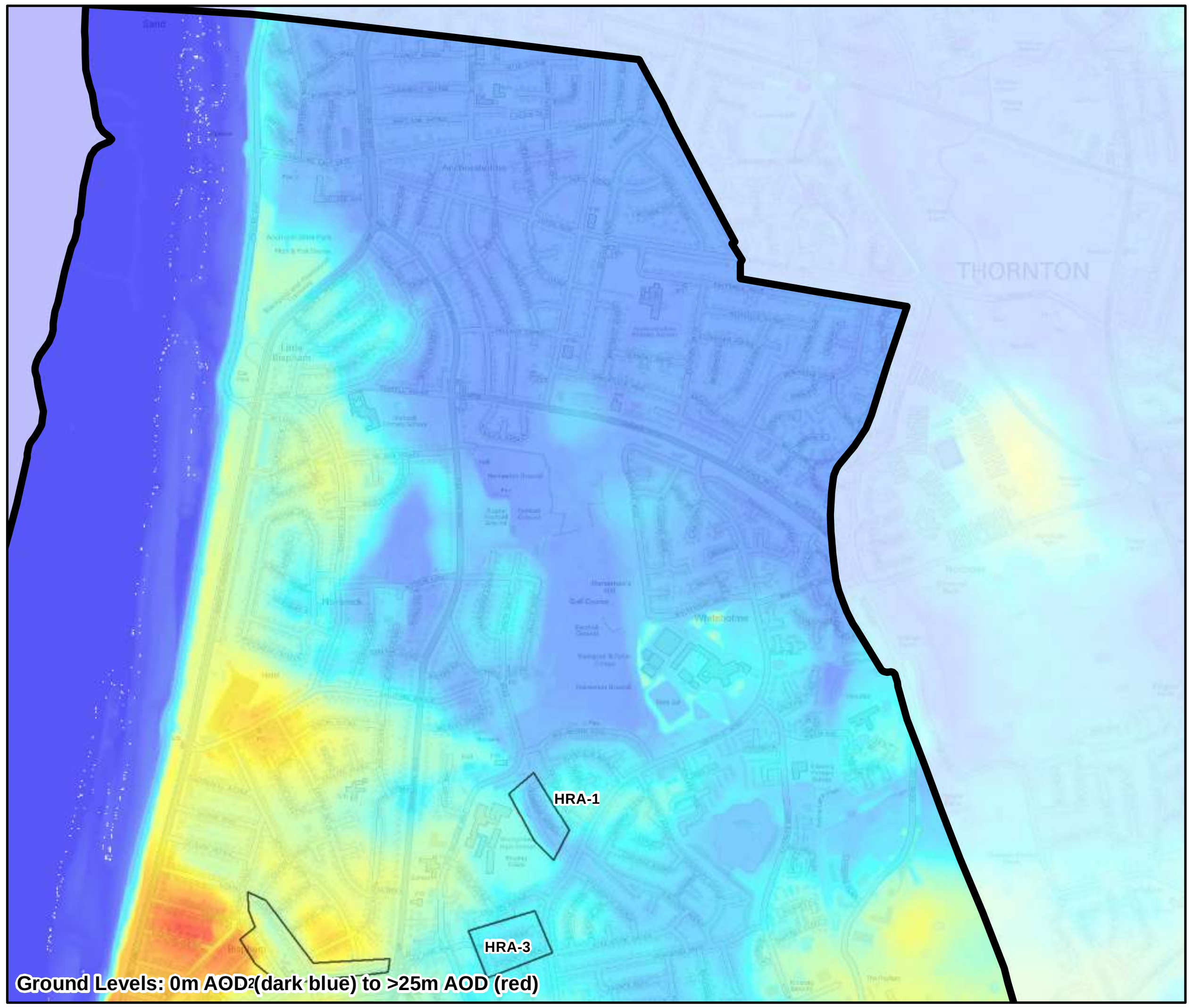
12/03/2013 13:32:38

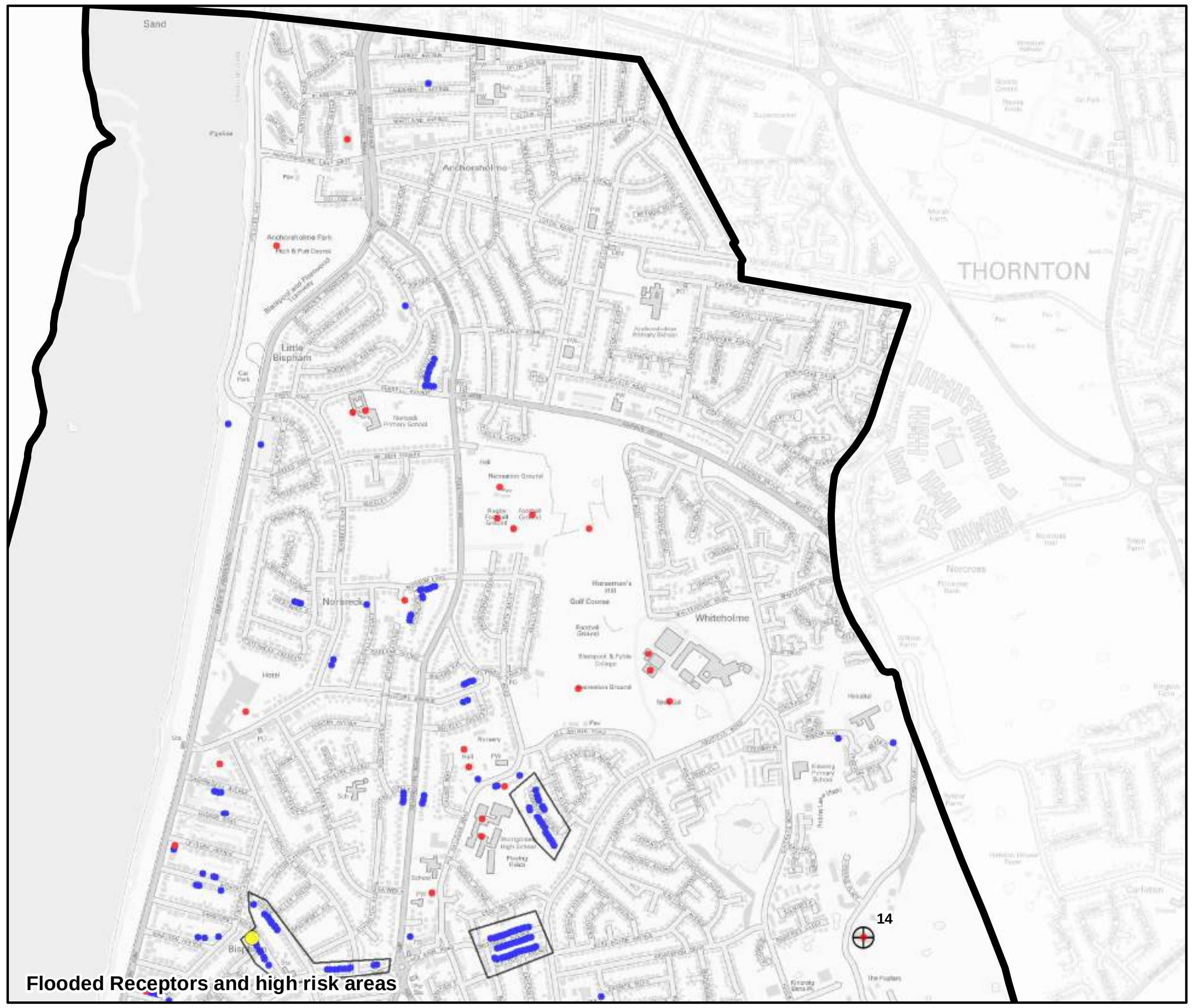
MXD Location

A3









Legend

Blackpool Council boundary

1% (1 in 100yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

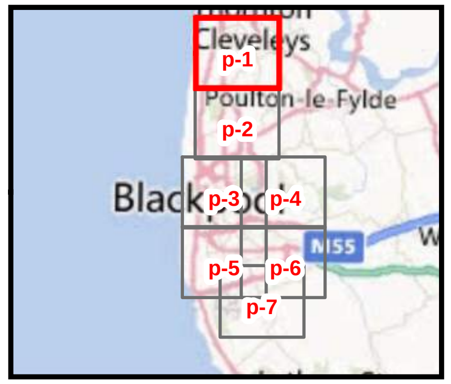
Flooded Receptors (1 in 100yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)

12/03/2013 13:32:51



Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 1% (1 in 100yr)

Scale at A3

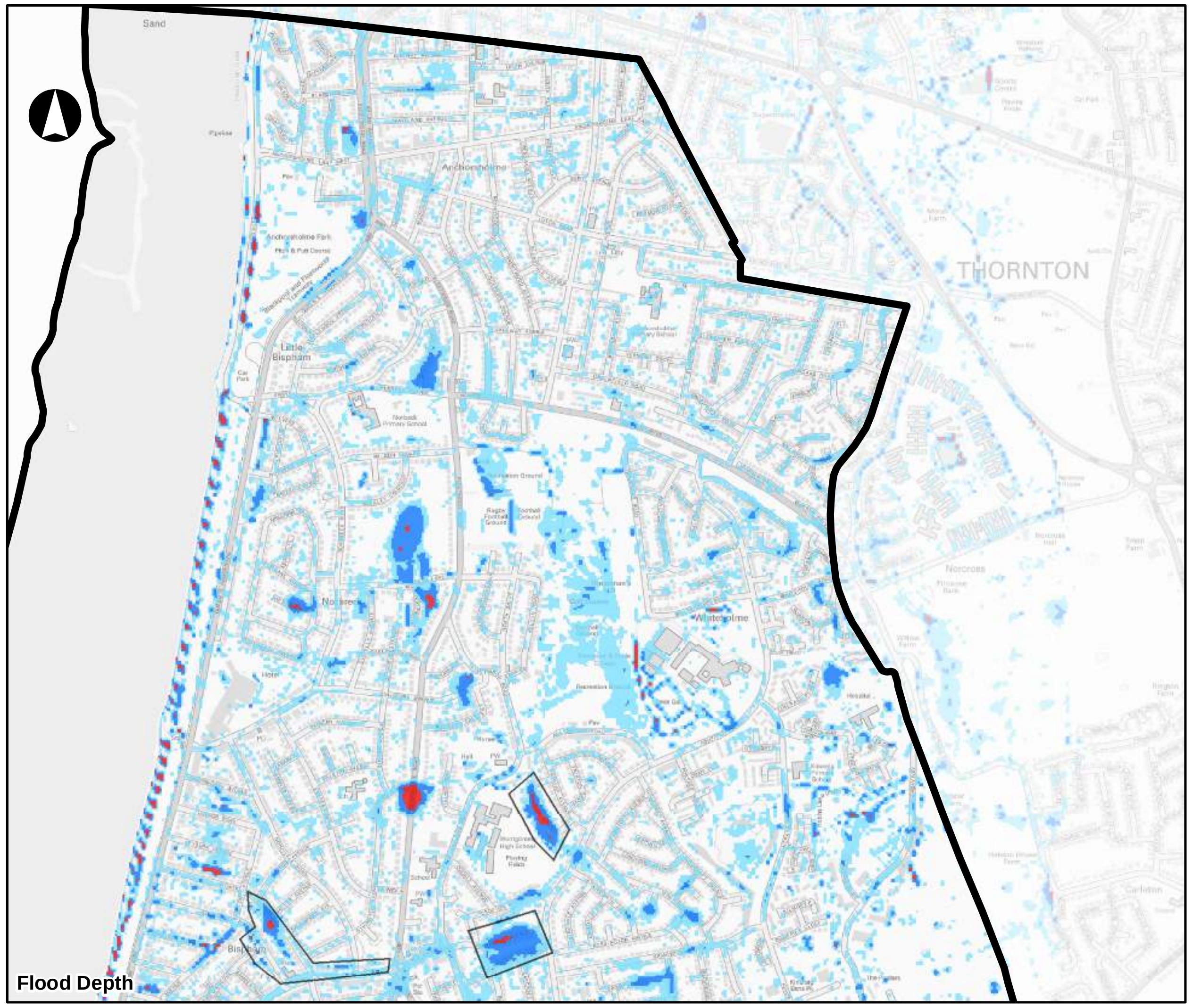
1:20,000

Job No	Drawing Status
227357	**Draft**

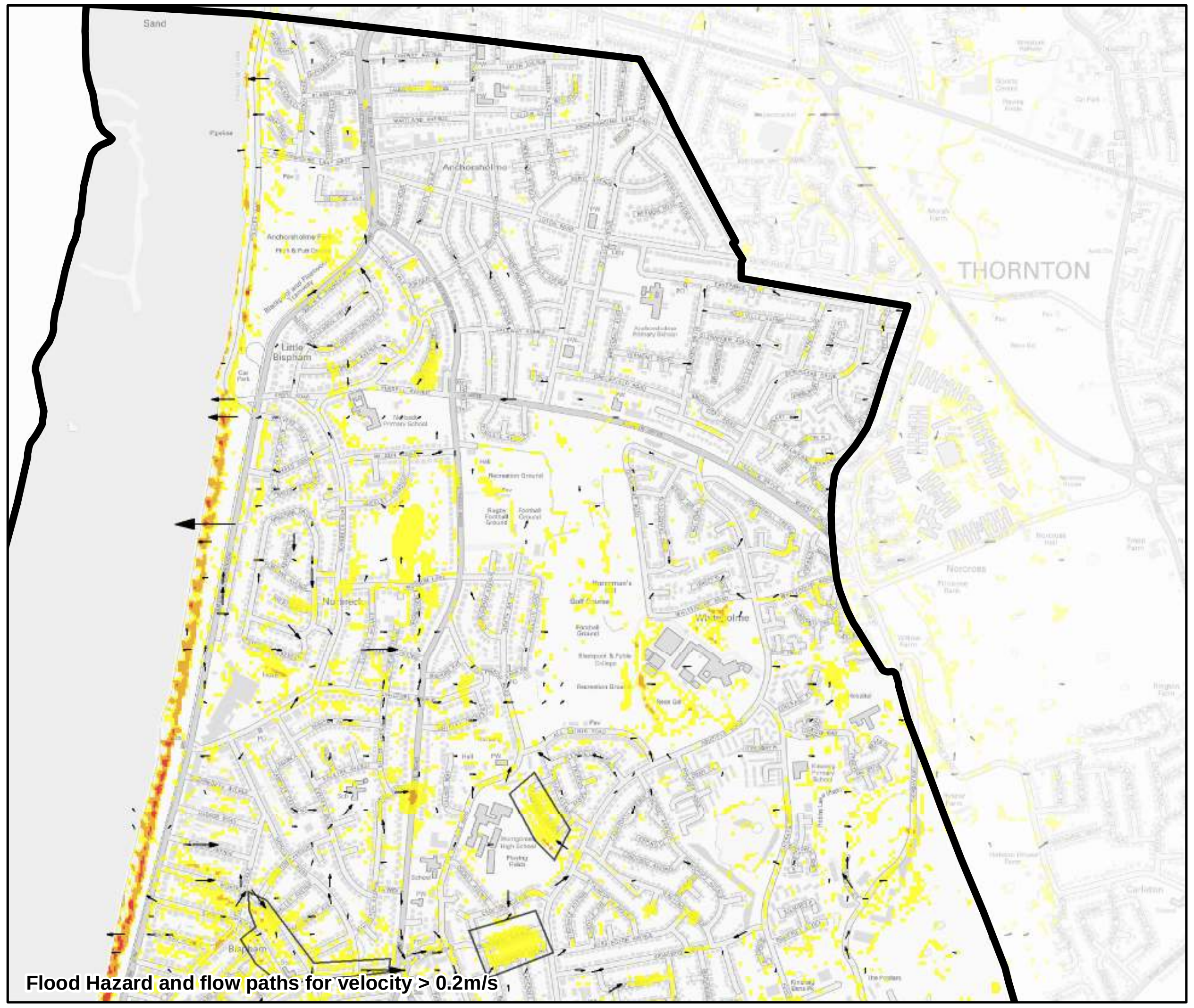
Drawing No	Issue
D1.2	**P0**

MXD Location

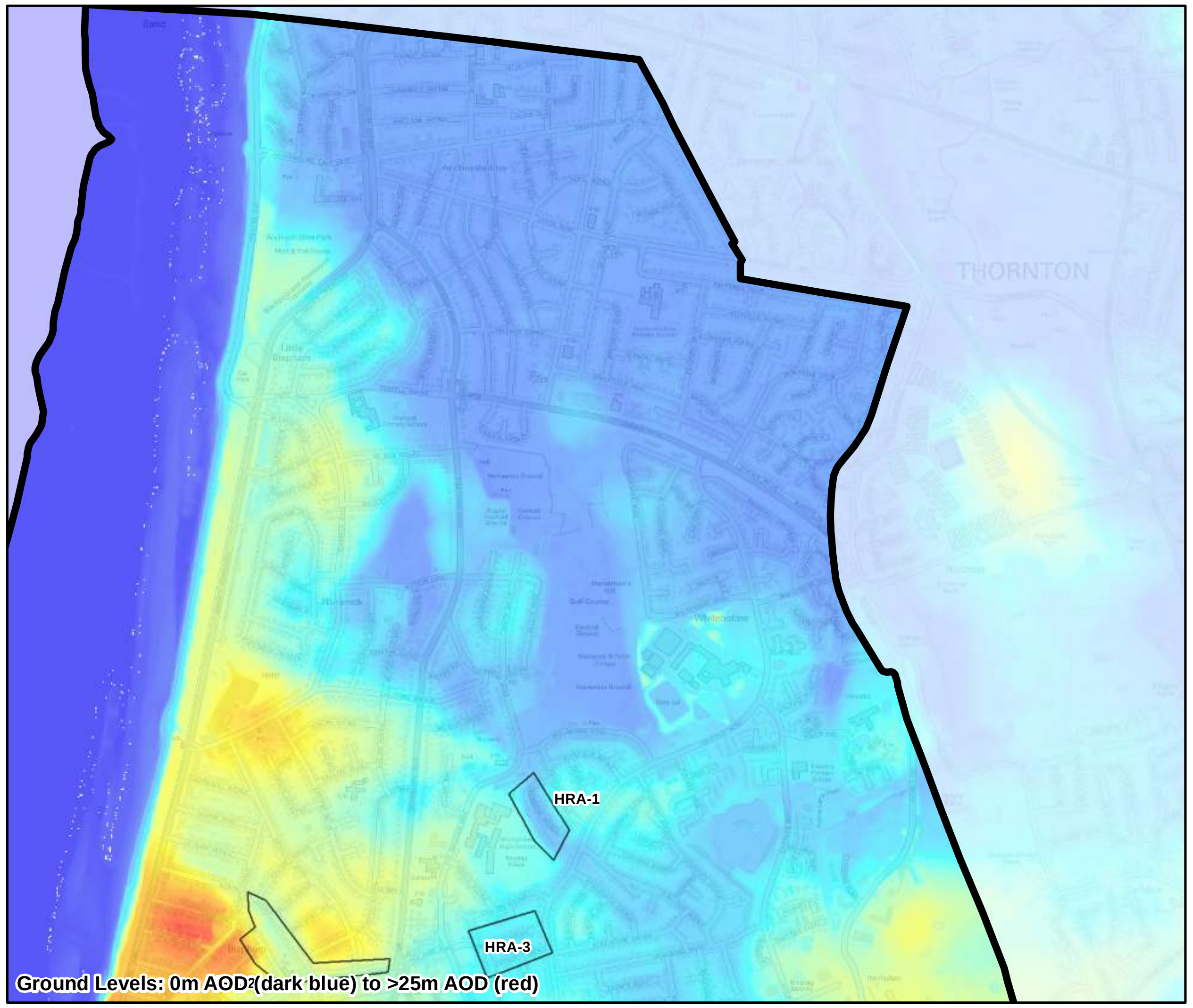
A3



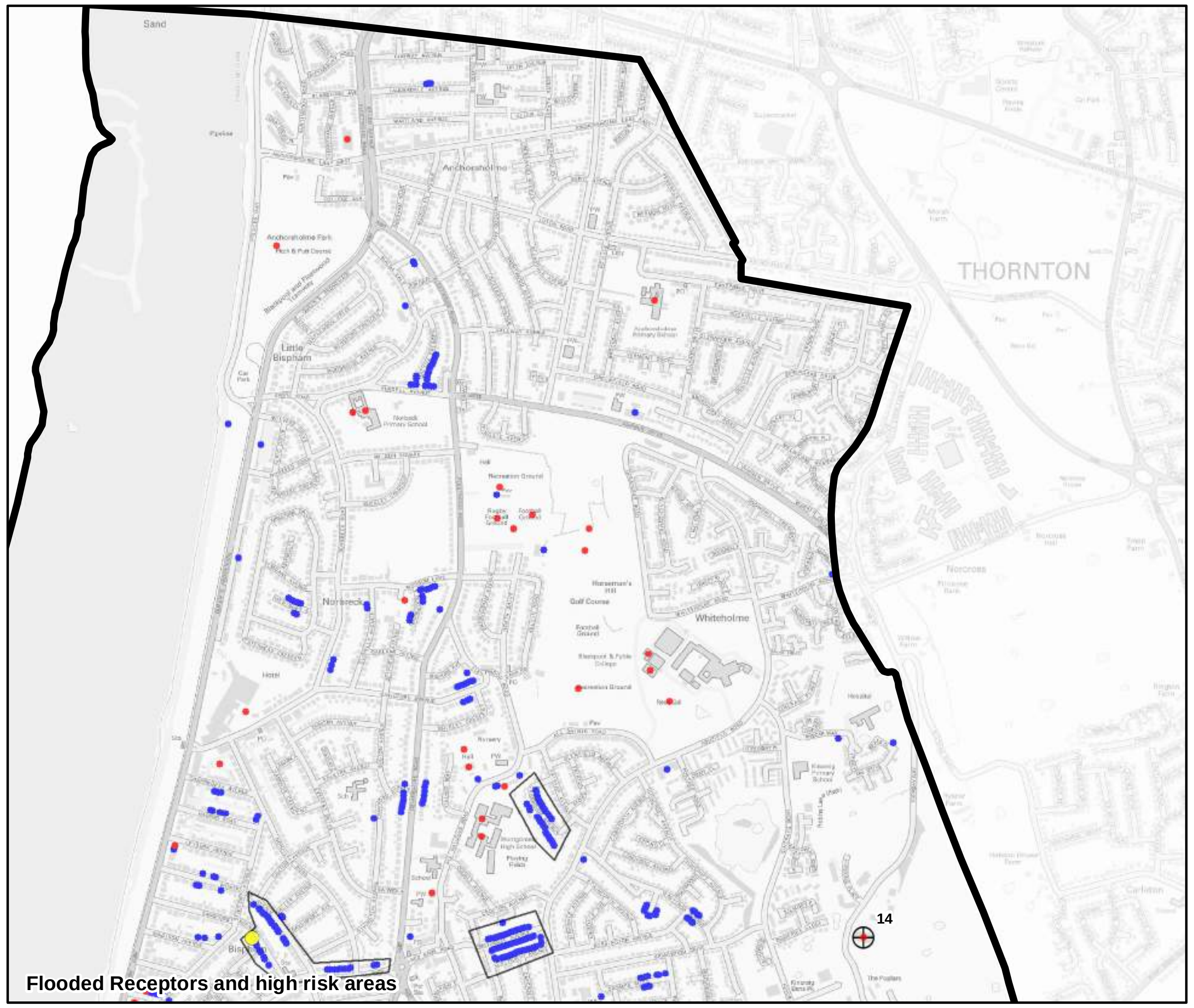
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

1% (1 in 100yr) future scenario

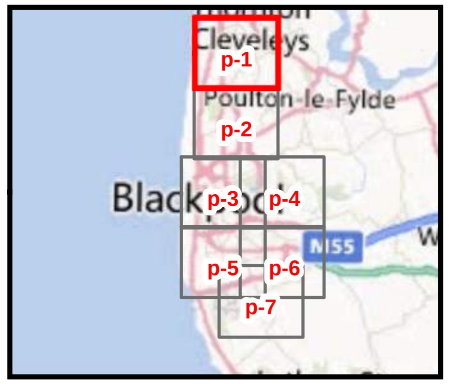
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr) future scenario

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors Future scenario 1% (1 in 100yr)

Scale at A3
1:20,000

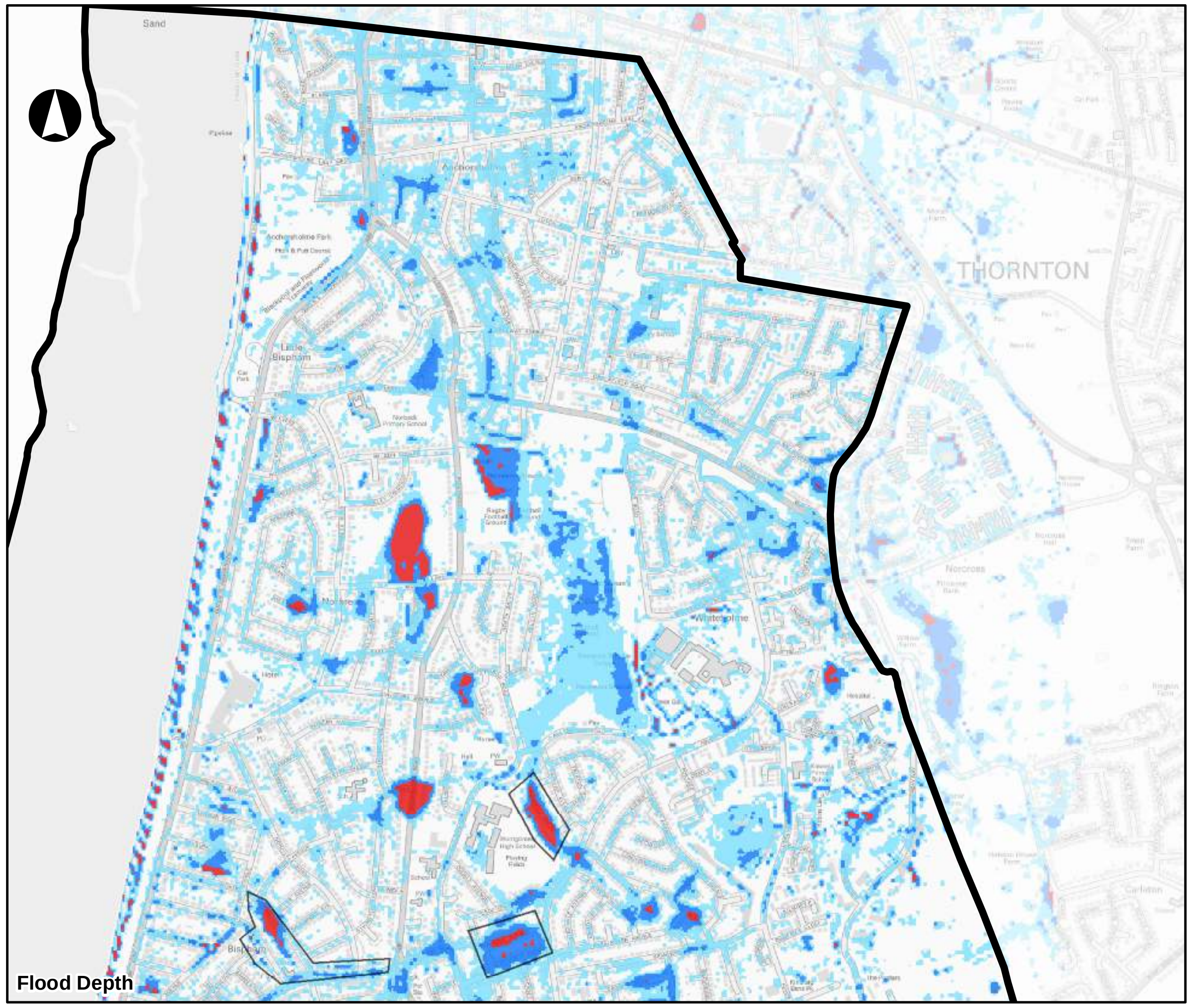
Job No	Drawing Status
227357	Draft

Drawing No	Issue
D1.3	P0

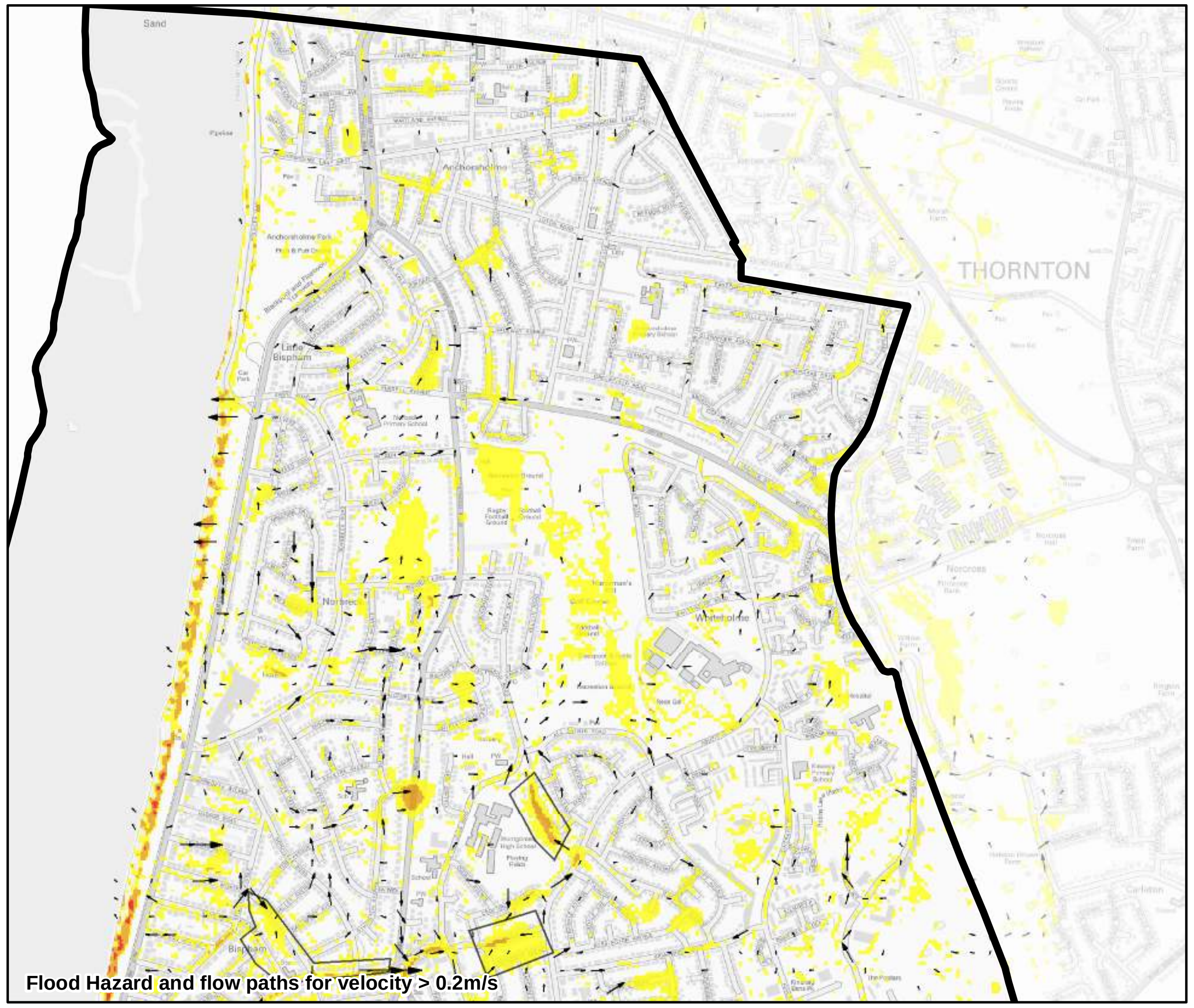
12/03/2013 13:33:01

MXD Location

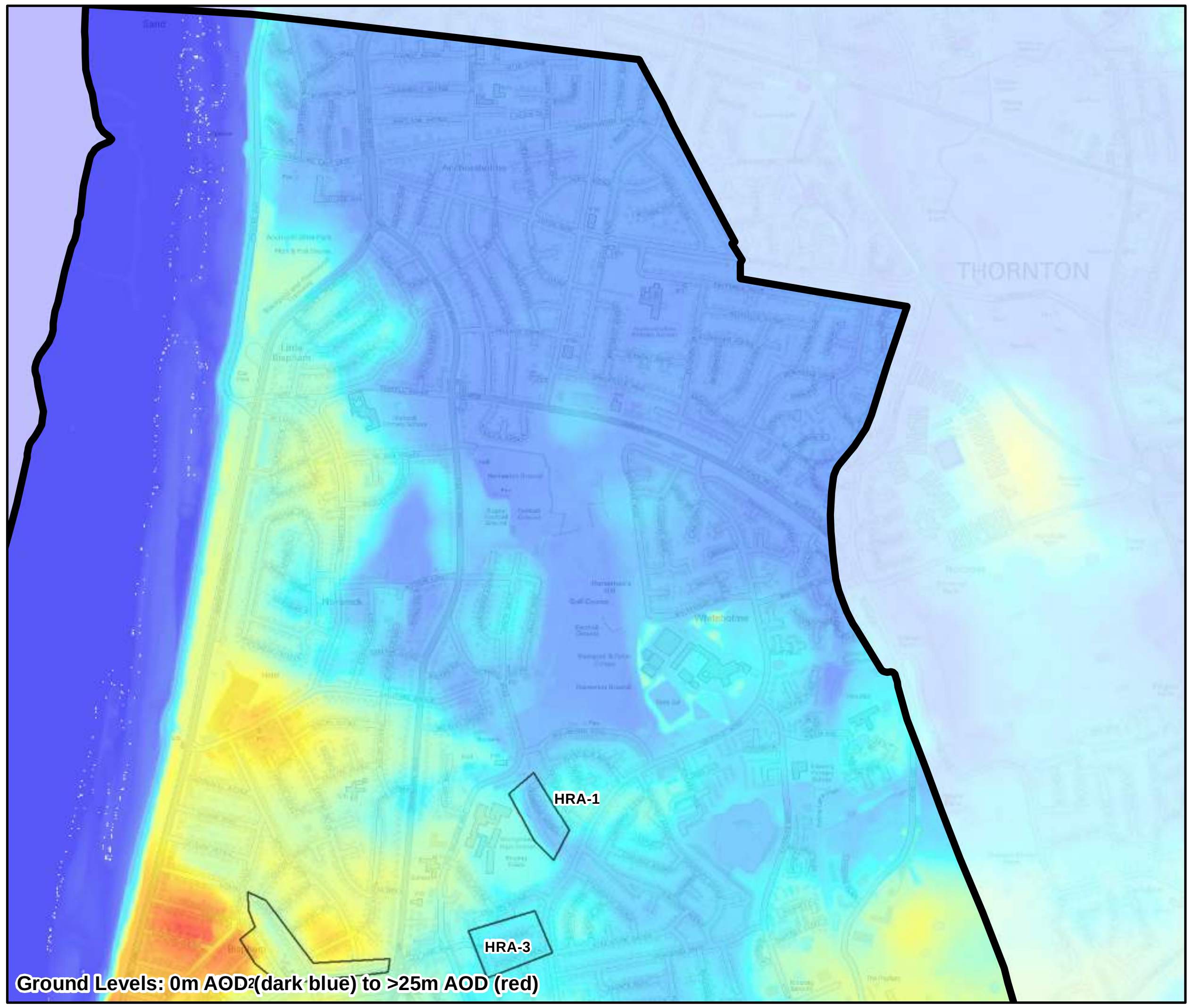
A3



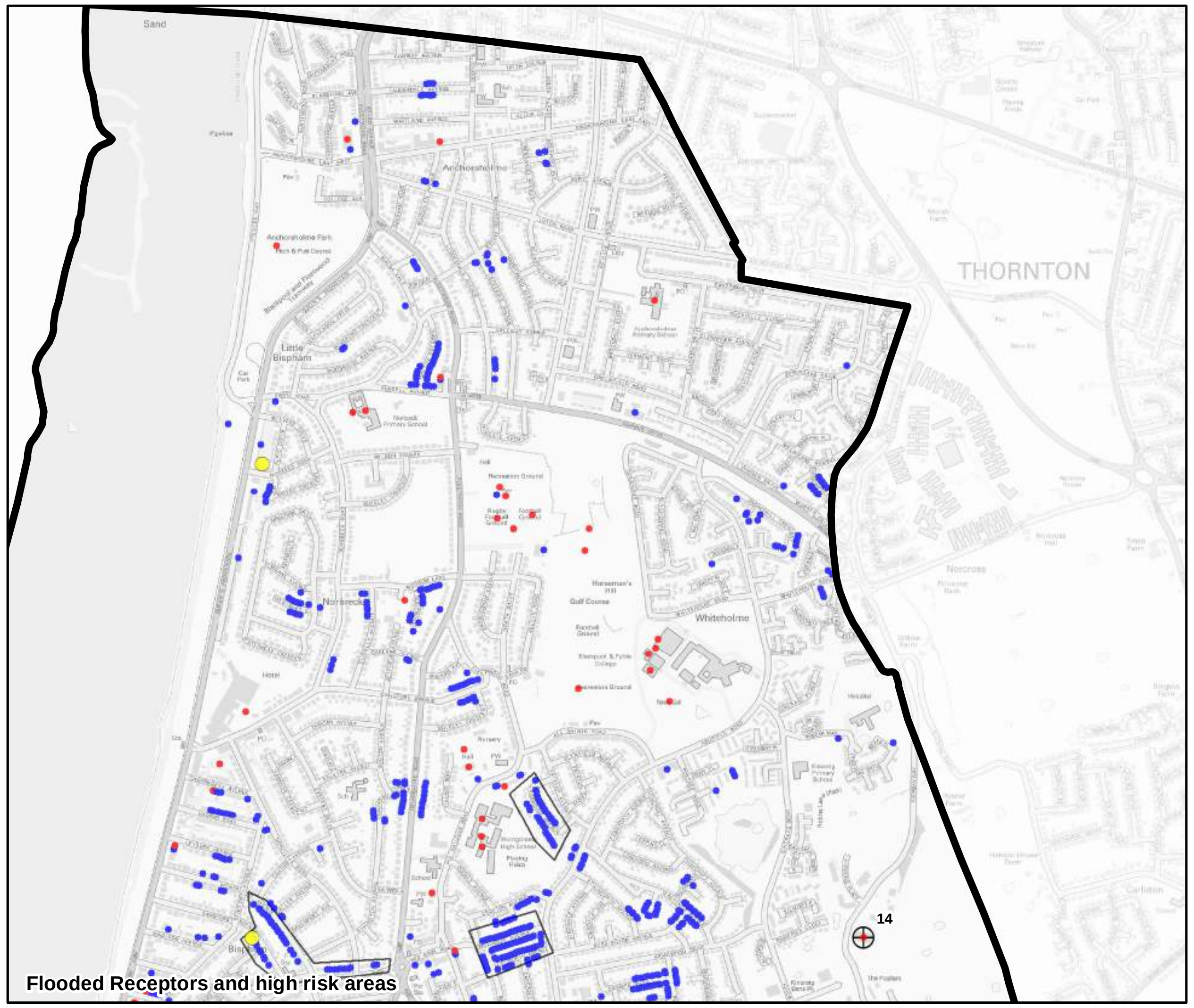
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

0.1% (1 in 1000yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

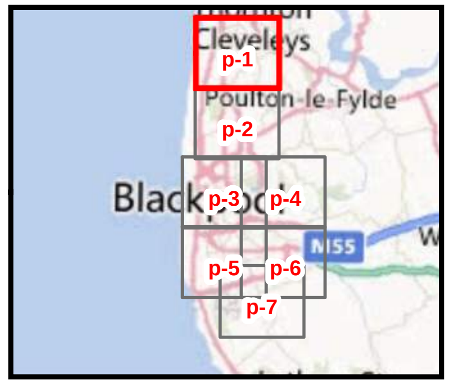
Flooded Receptors (1 in 1000yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)

12/03/2013 13:33:12



Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 0.1% (1 in 1000yr)

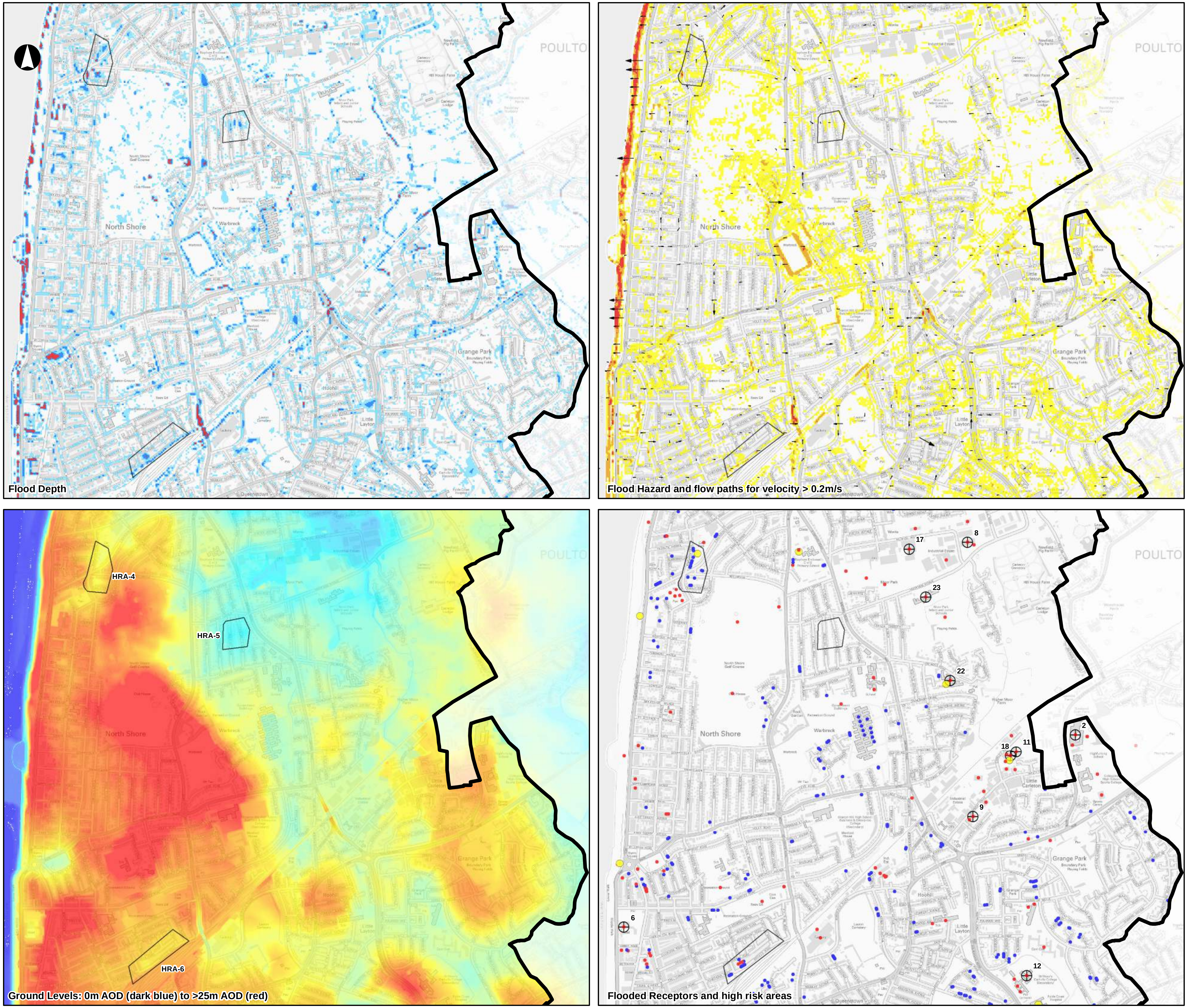
Scale at A3
1:20,000

Job No	Drawing Status
227357	Draft

Drawing No	Issue
D1.4	P0

MXD Location

A3



Legend

Blackpool Council boundary

5% (1 in 20yr)

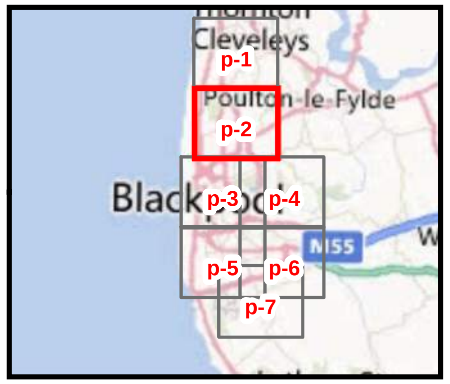
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 20yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



D1	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres

0 270 540 1,080

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Client

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Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 5% (1 in 20yr)

Scale at A3

1:20,000

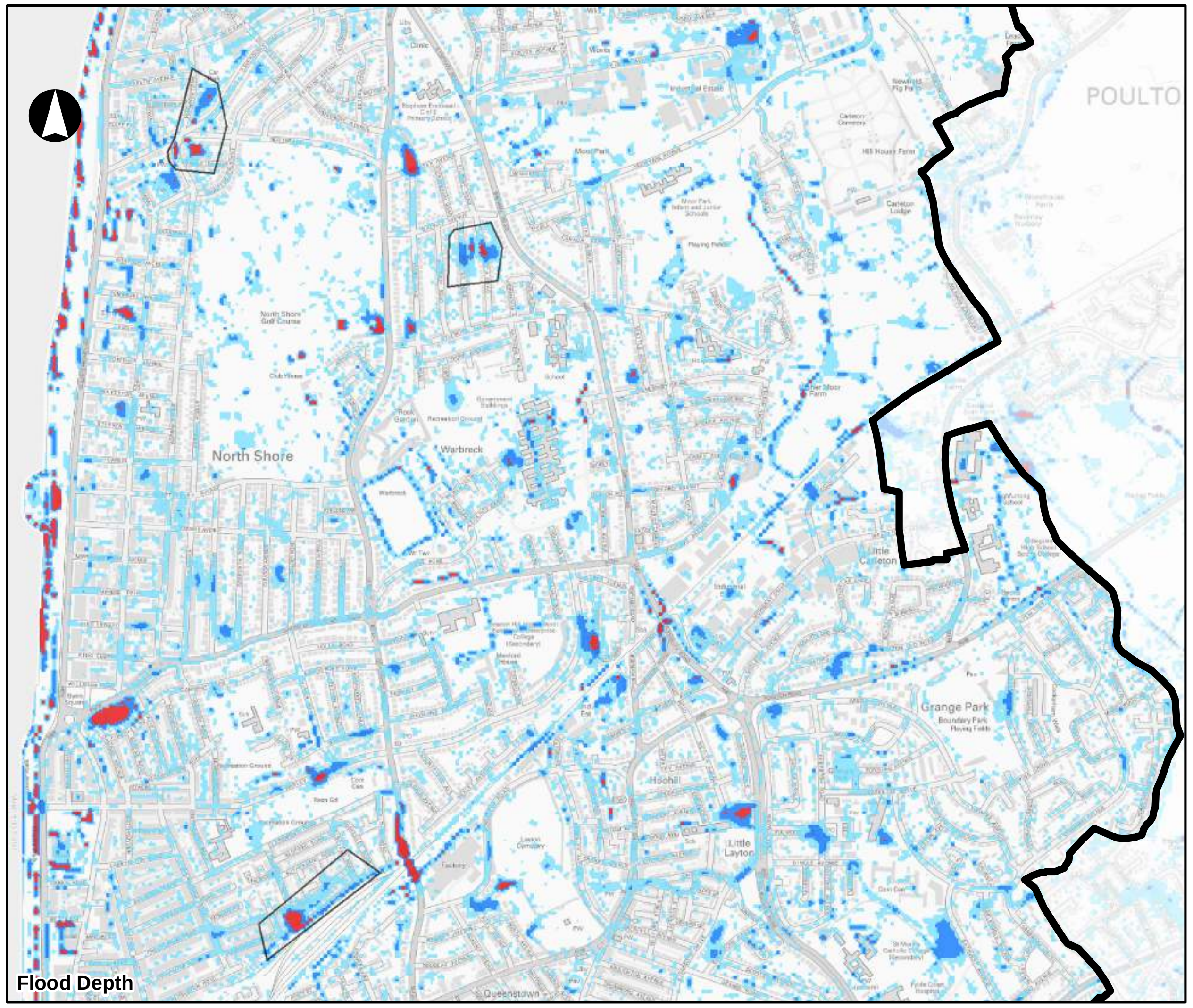
Job No	Drawing Status
227357	**Draft**

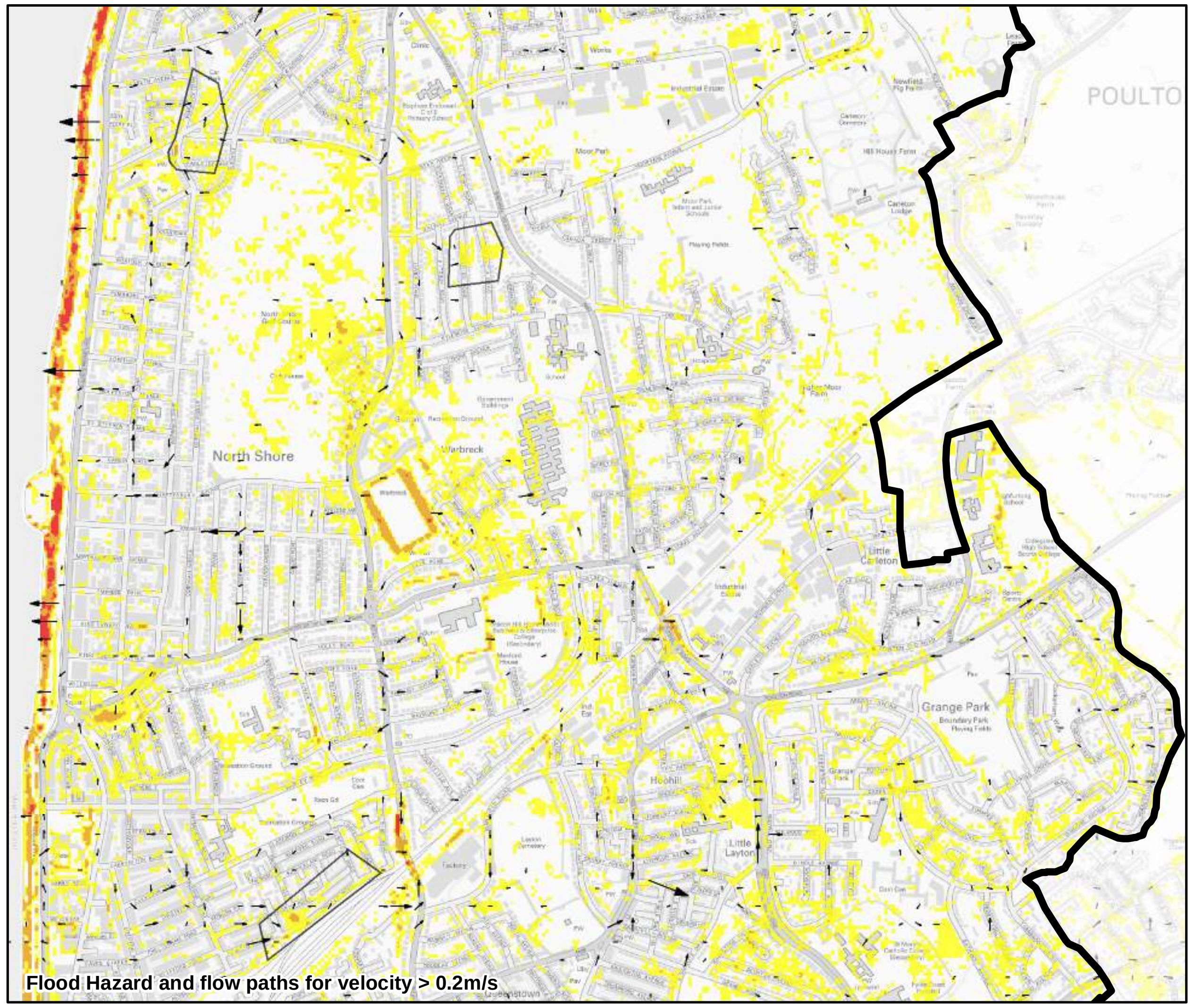
Drawing No	Issue
D2.1	**D1**

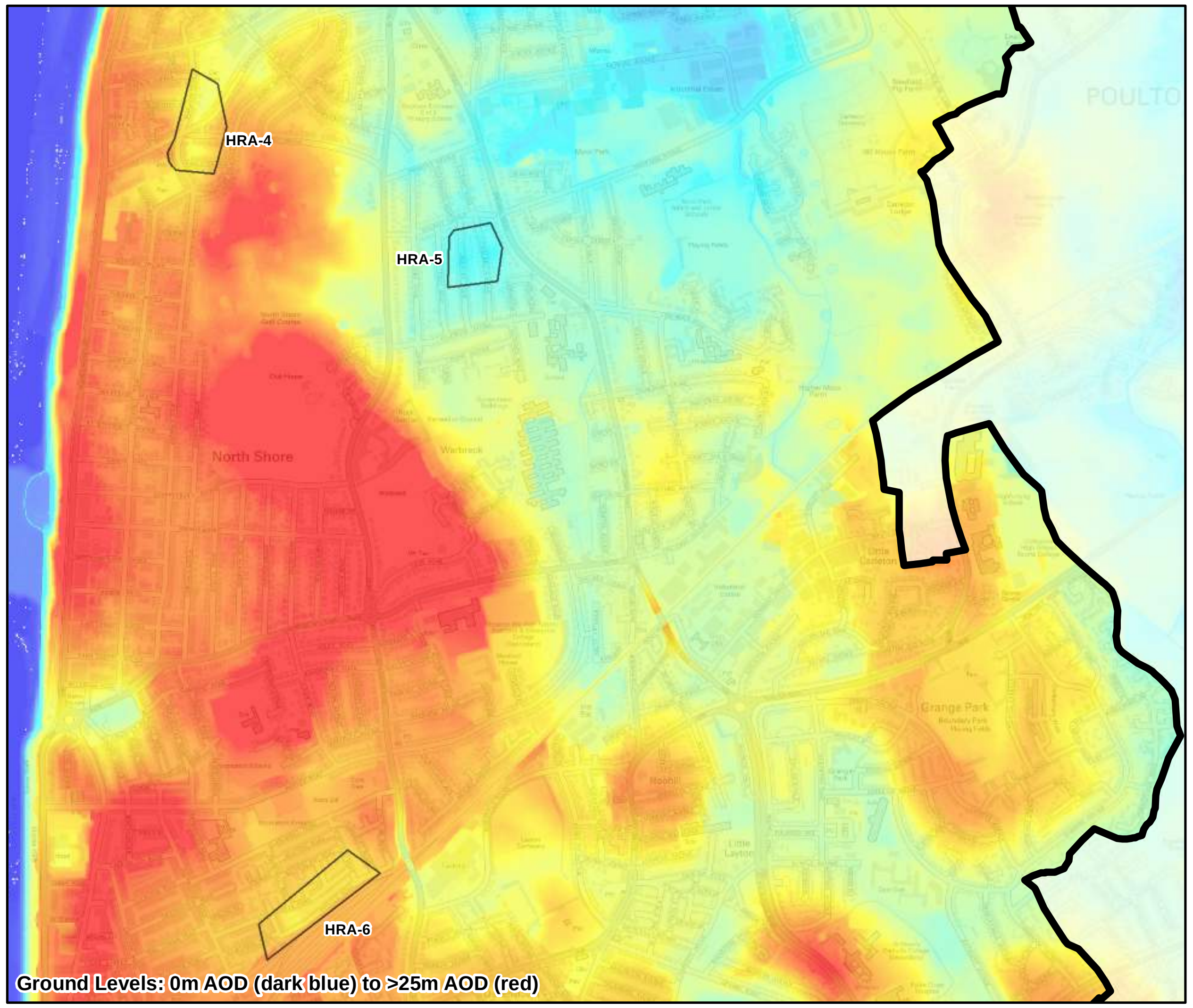
12/03/2013 13:33:23

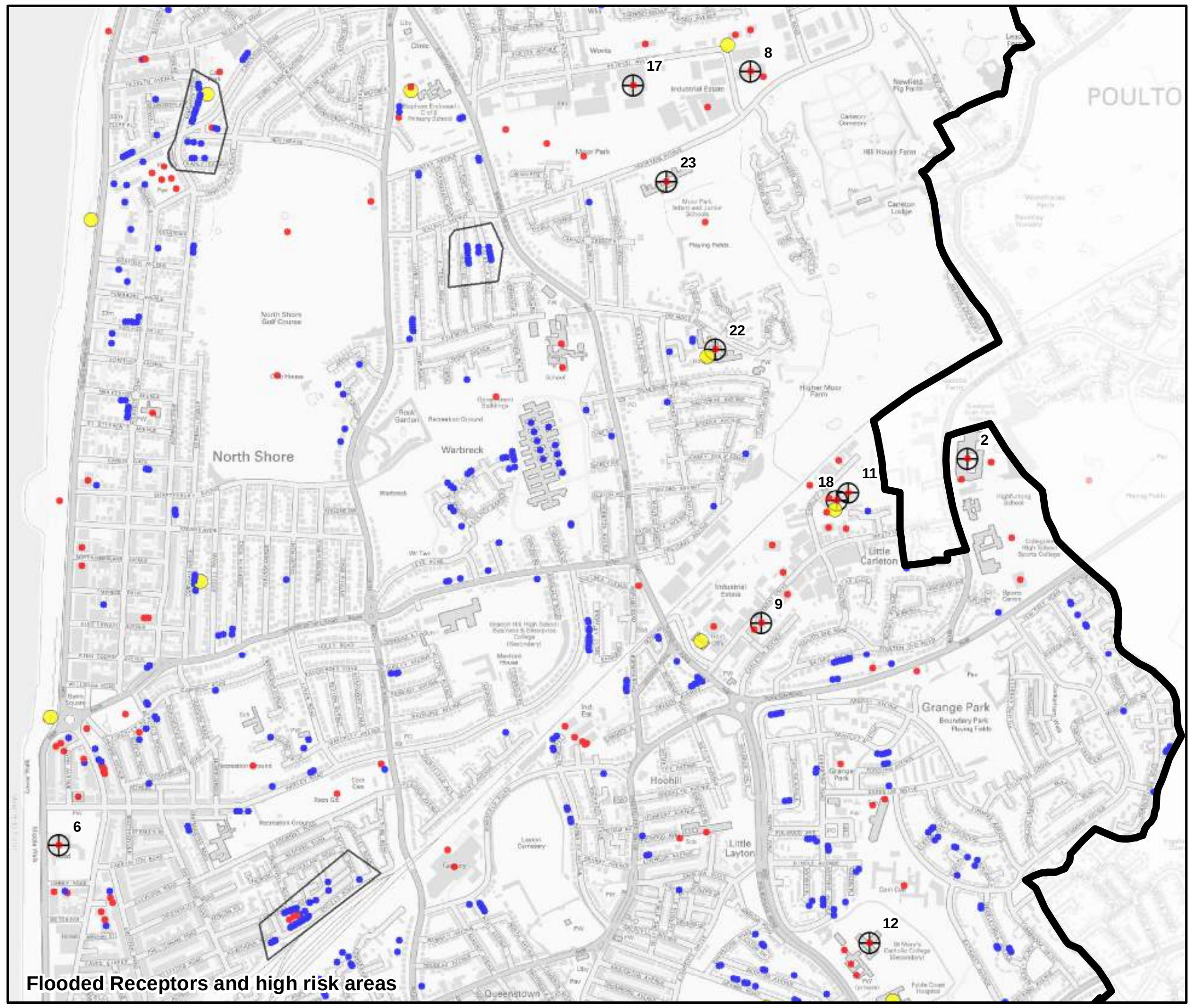
MXD Location

A3









Legend

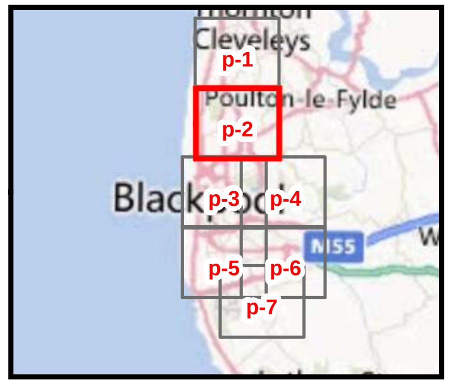
- Blackpool Council boundary

1% (1 in 100yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr)

- Critical Infrastructure
- Non Residential
- Residential
- Top25 damages labelled by rank
- High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 1% (1 in 100yr)

Scale at A3
1:20,000

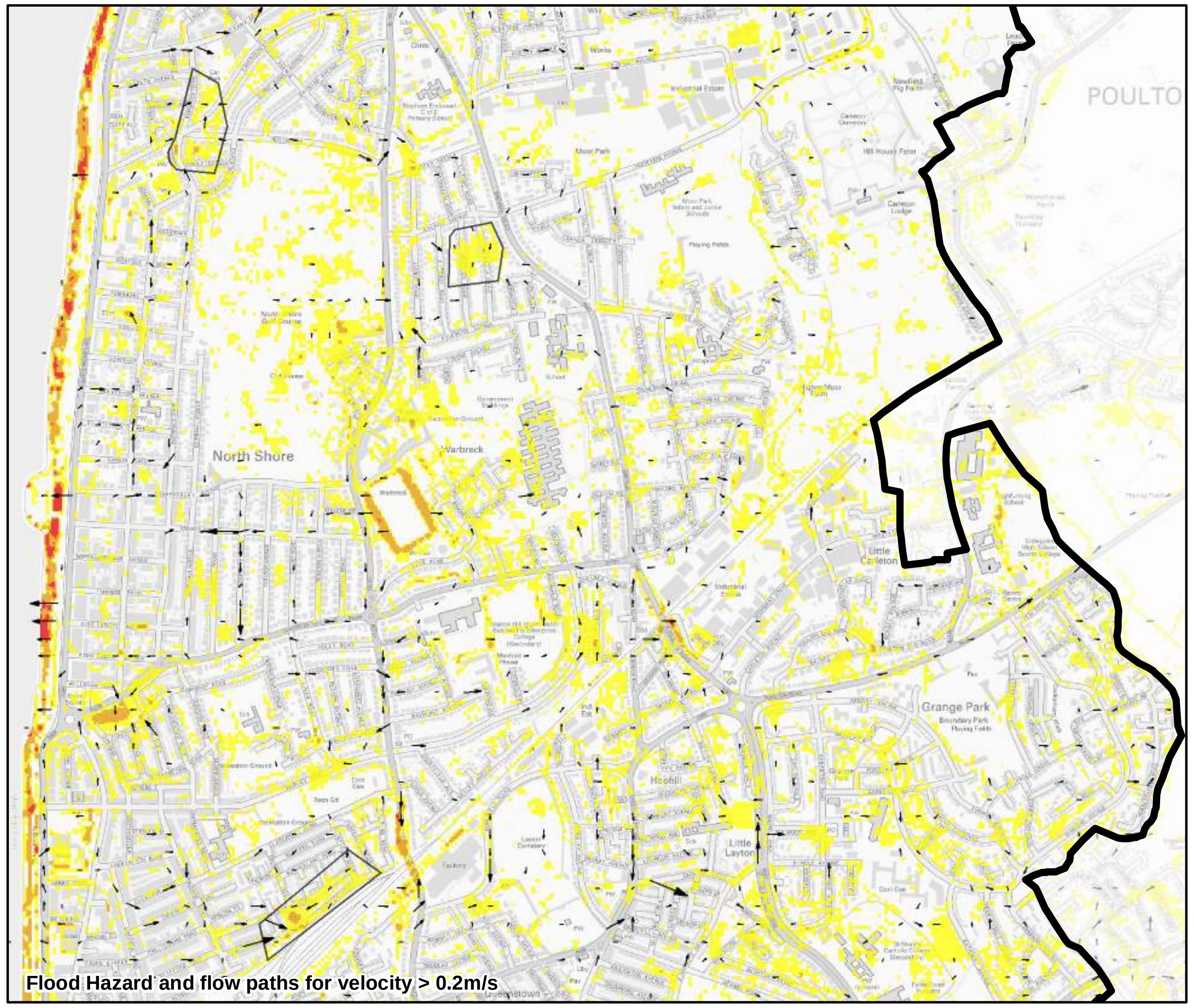
Job No	Drawing Status
227357	**Draft**

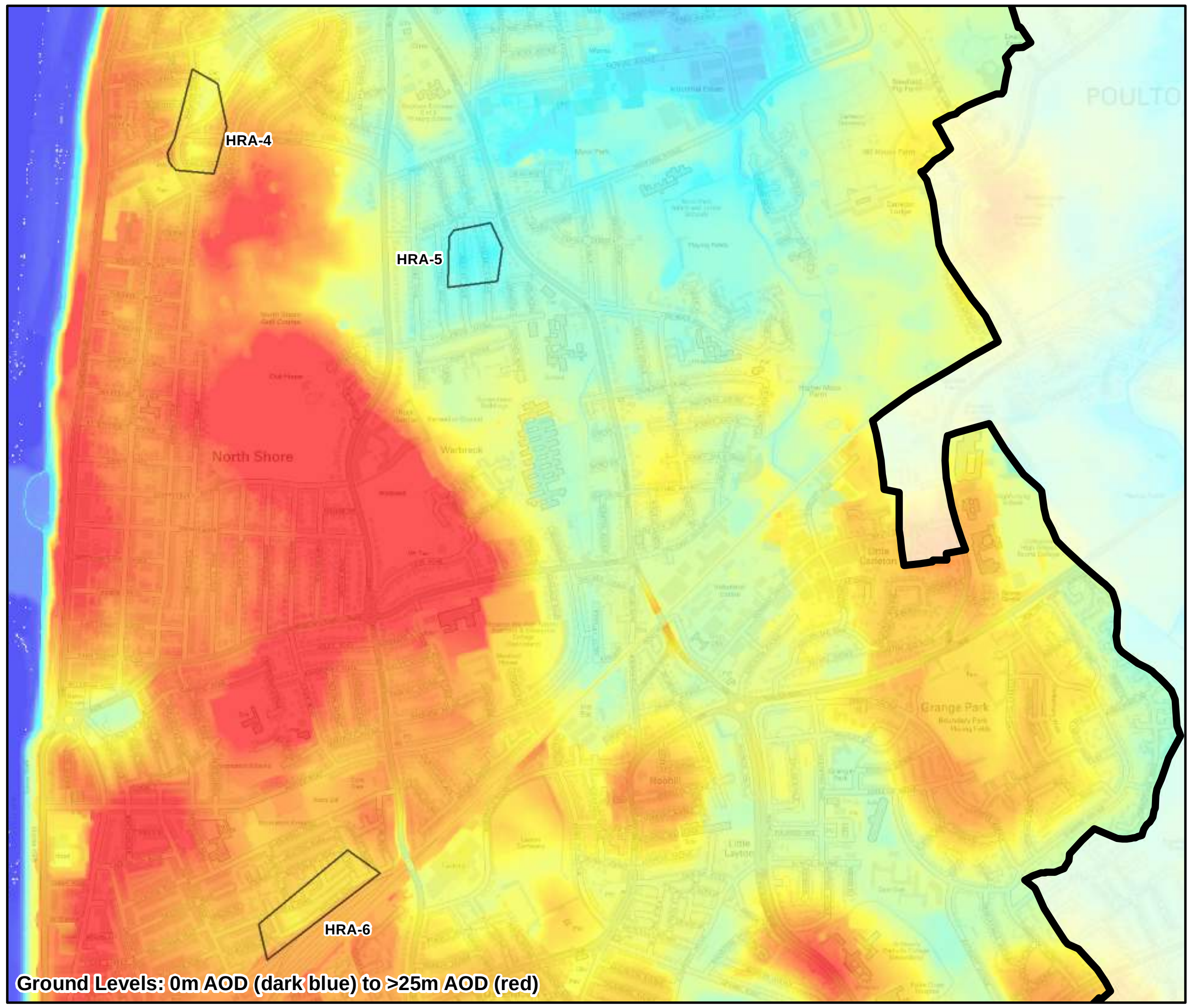
Drawing No	Issue
D2.2	**P0**

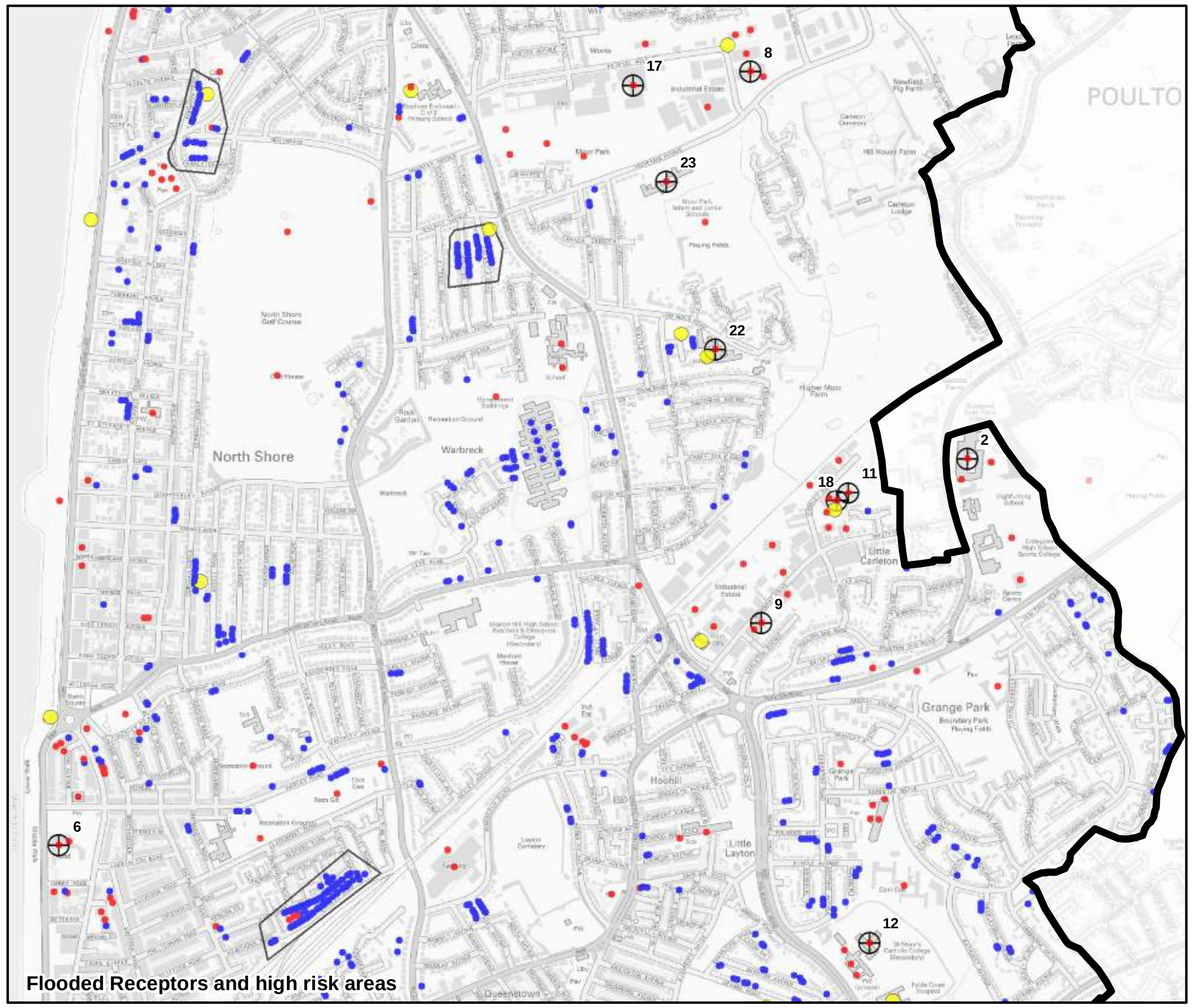
12/03/2013 13:33:35

MXD Location

A3







Legend

Blackpool Council boundary

1% (1 in 100yr) future scenario

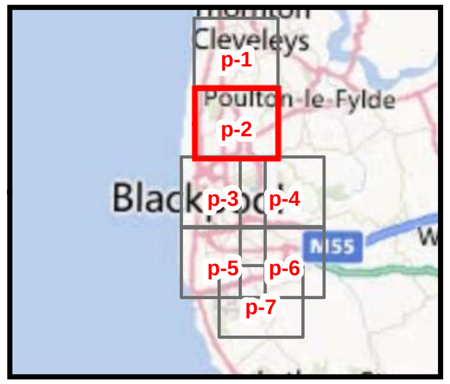
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr) future scenario

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



12/03/2013 13:33:45

P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Client

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Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors Future scenario 1% (1 in 100yr)

Scale at A3

1:20,000

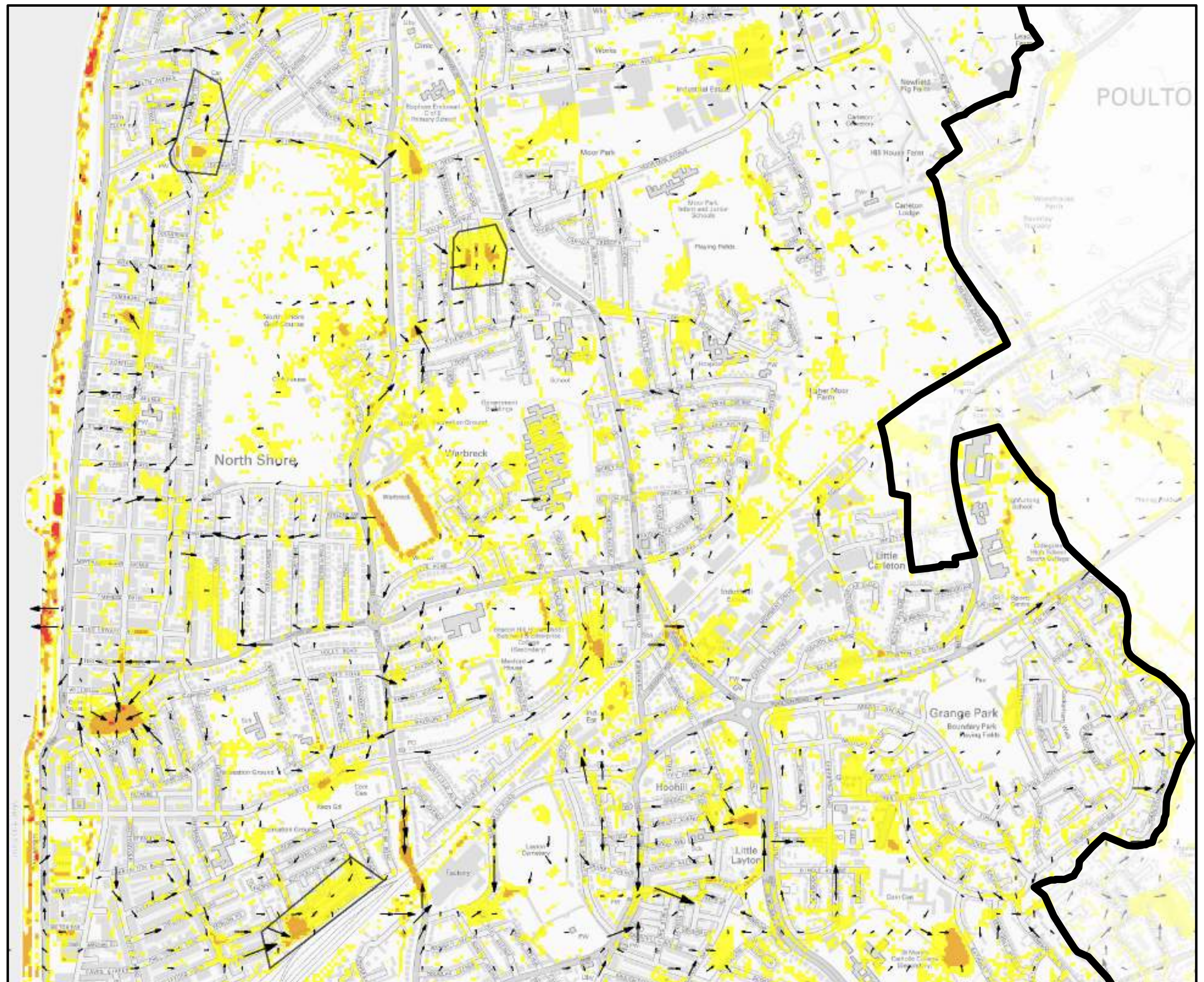
Job No	Drawing Status
227357	**Draft**

Drawing No	Issue
D2.3	**P0**

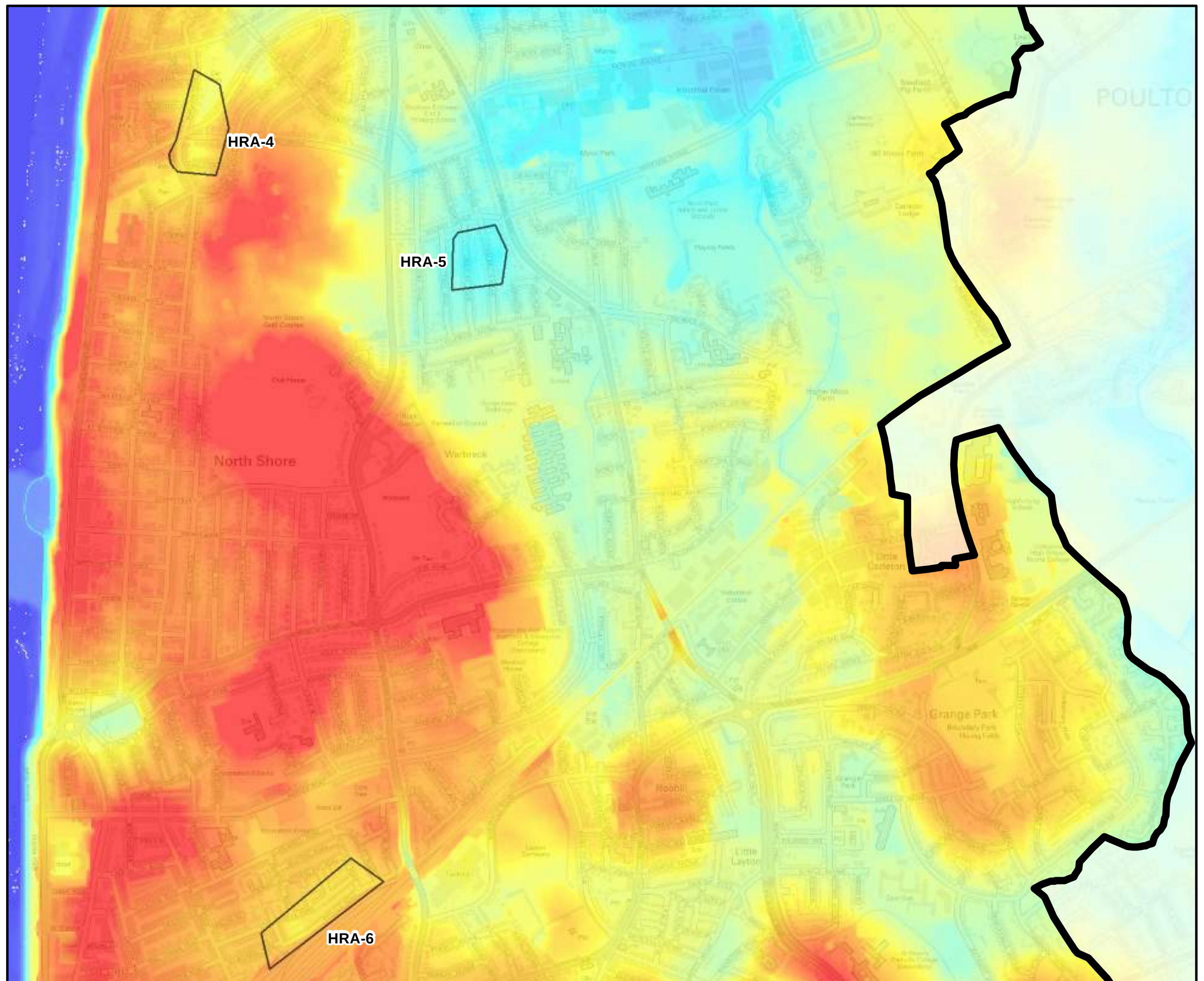
MXD Location

A3

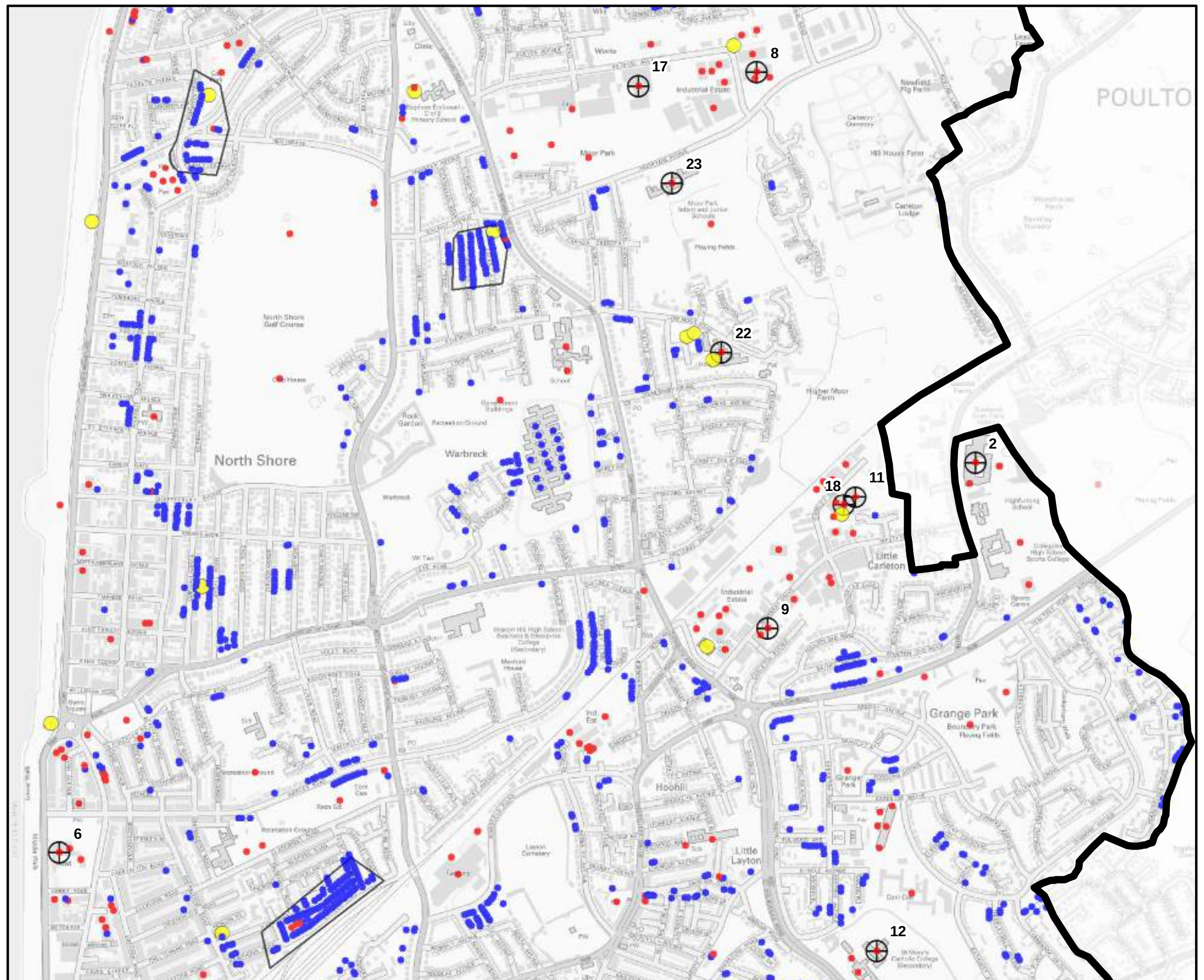
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

0.1% (1 in 1000yr)

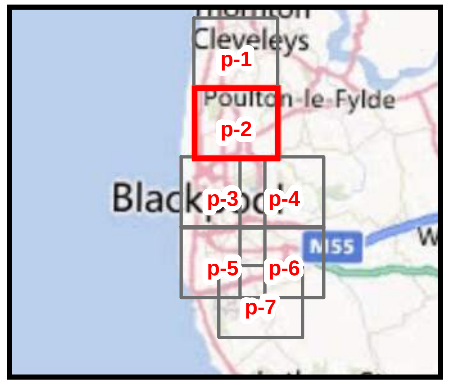
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 1000yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 0.1% (1 in 1000yr)

Scale at A3

1:20,000

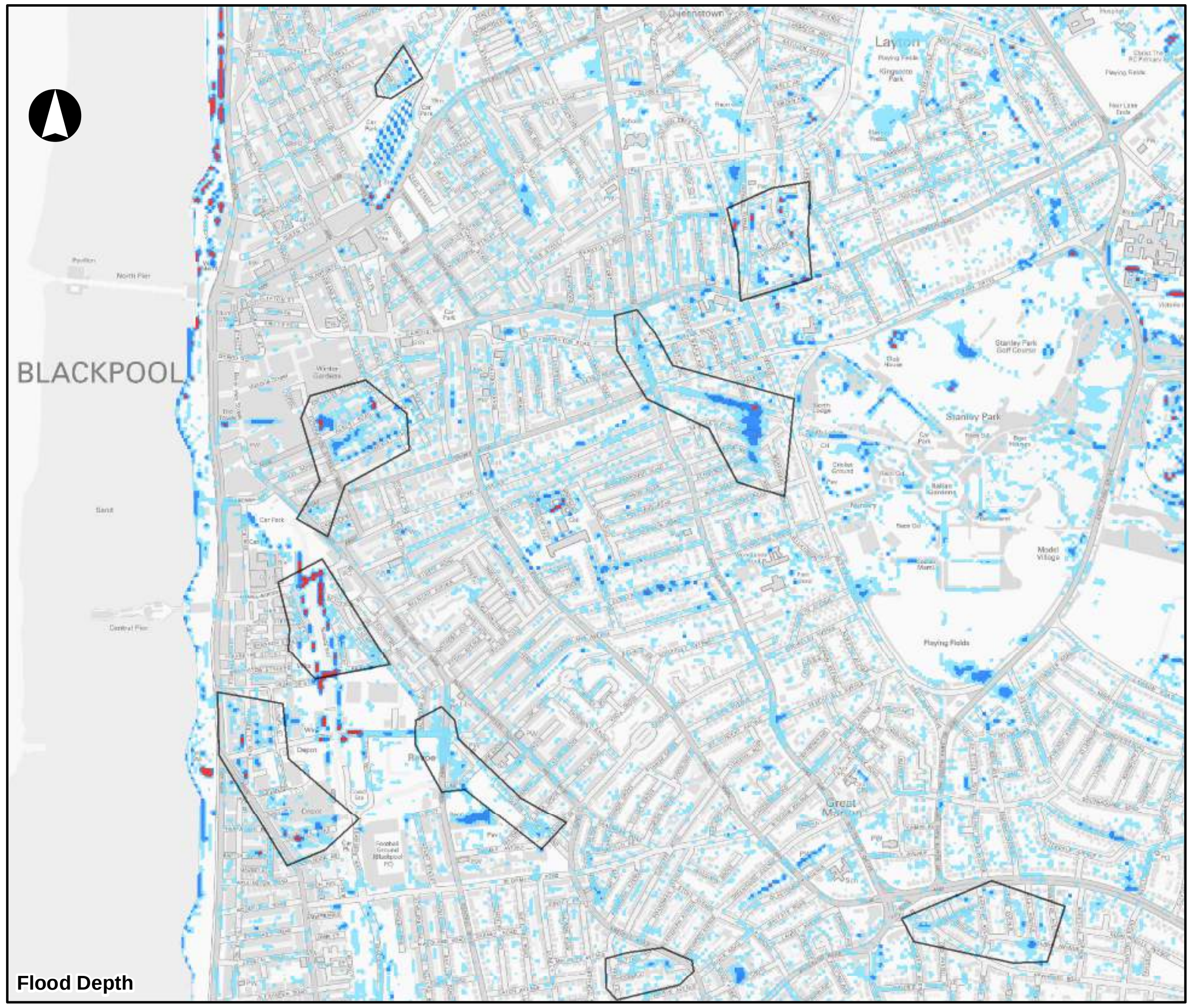
Job No	Drawing Status
227357	Draft

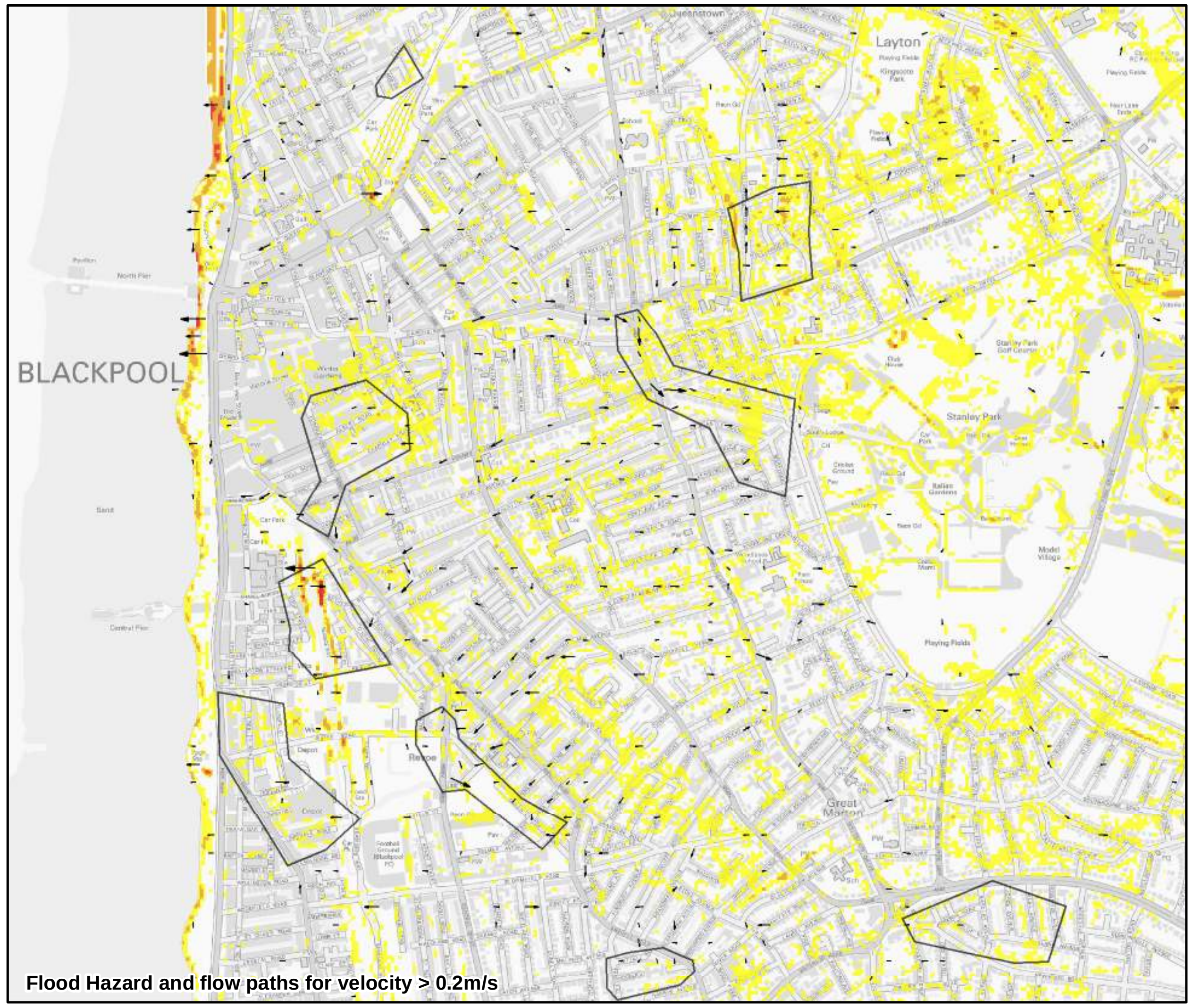
Drawing No	Issue
D2.4	P0

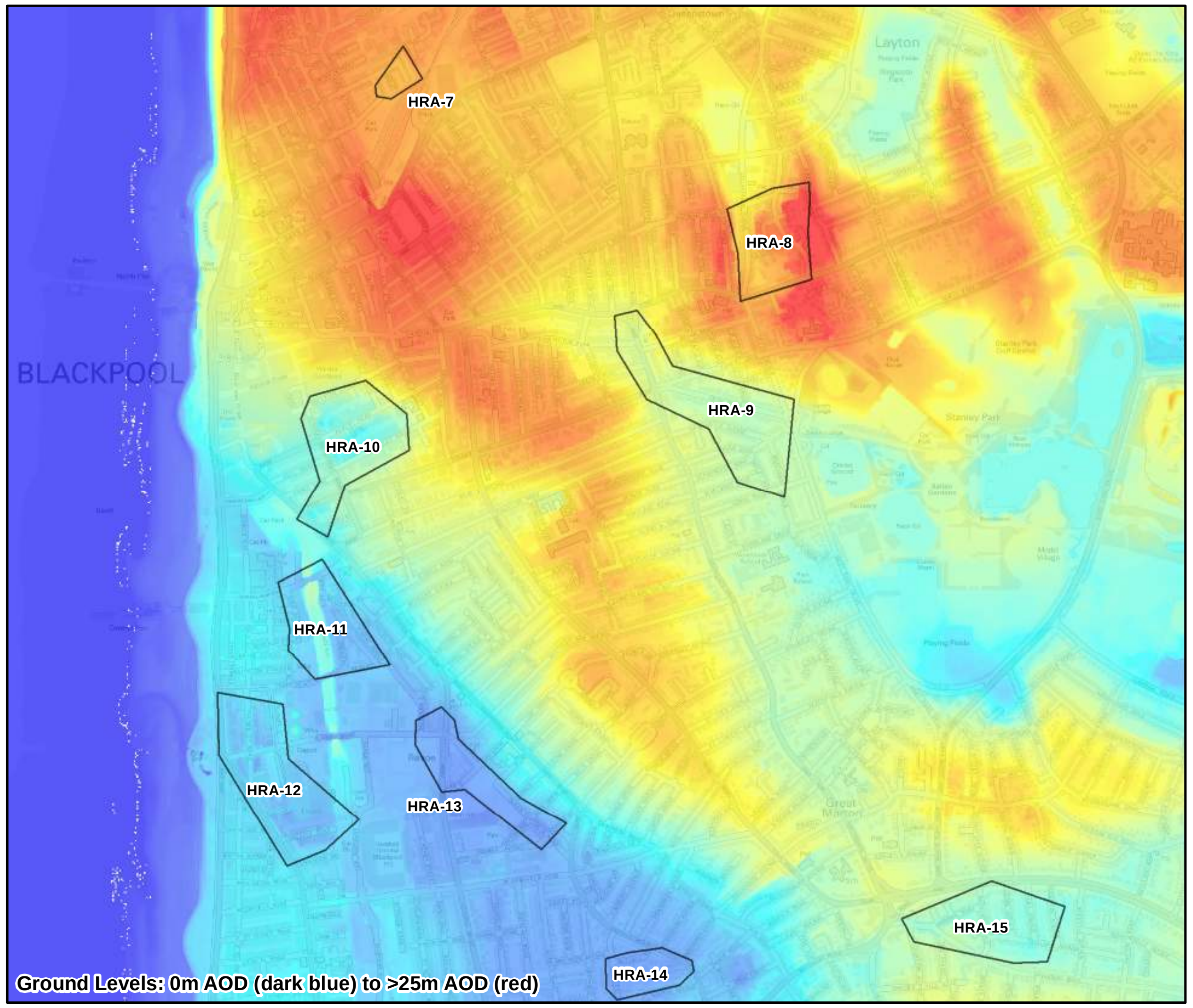
12/03/2013 13:33:56

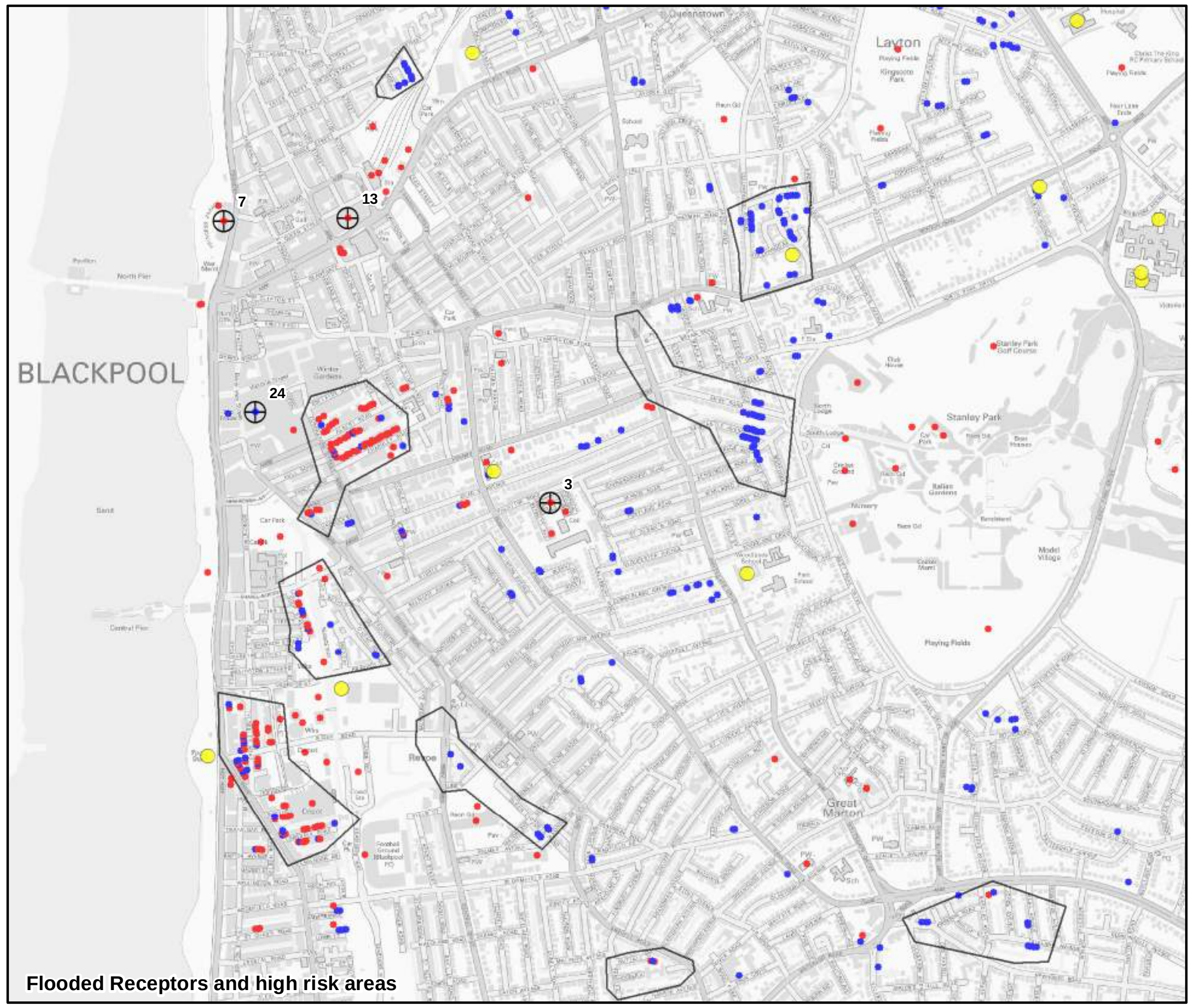
MXD Location

A3









Legend

Blackpool Council boundary

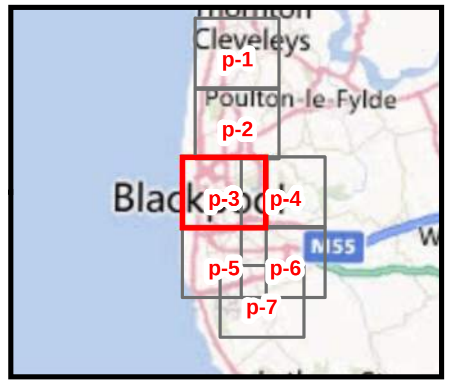
5% (1 in 20yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 20yr)
- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



D1	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 5% (1 in 20yr)

Scale at A3
1:20,000

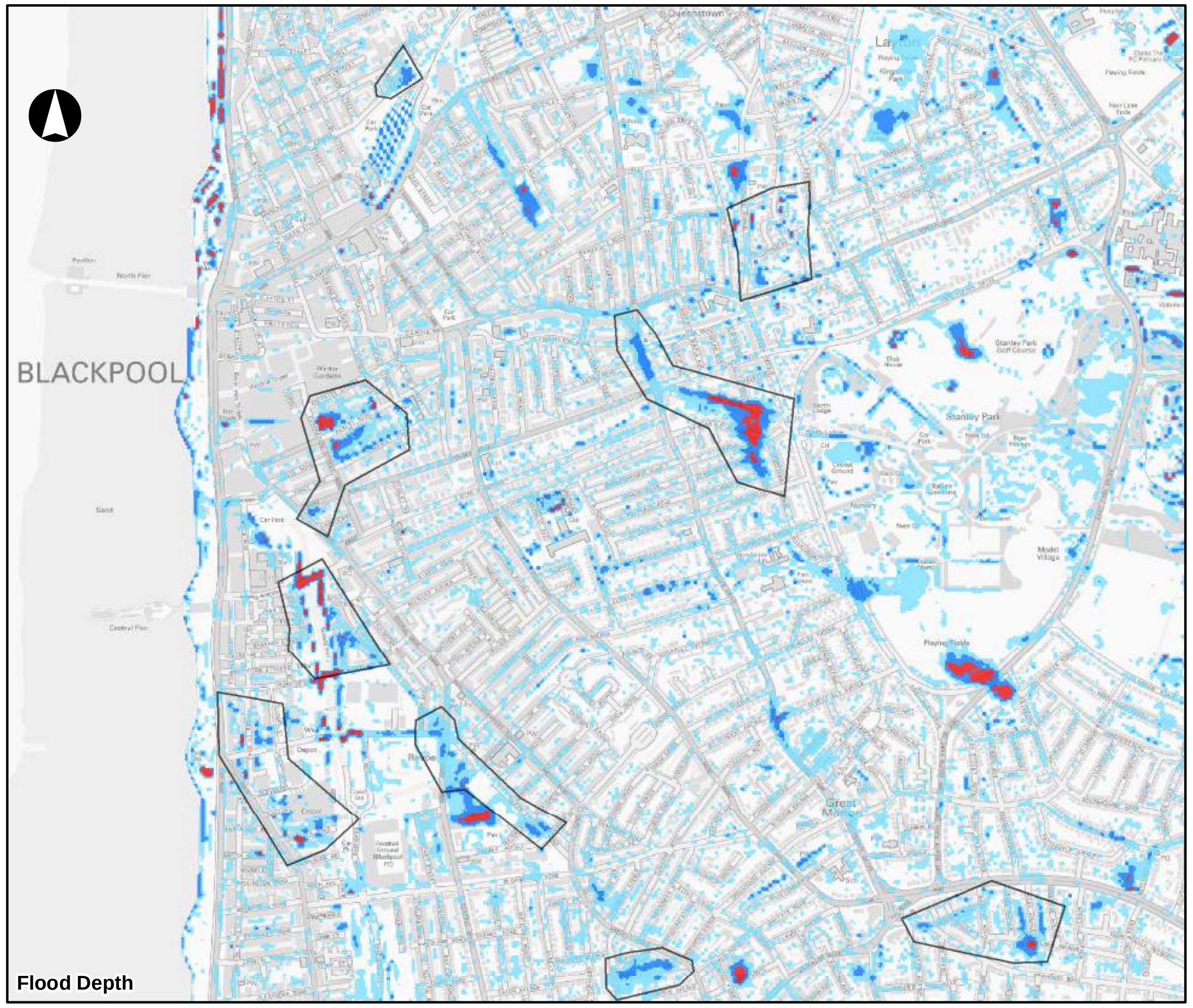
Job No	Drawing Status
227357	Draft

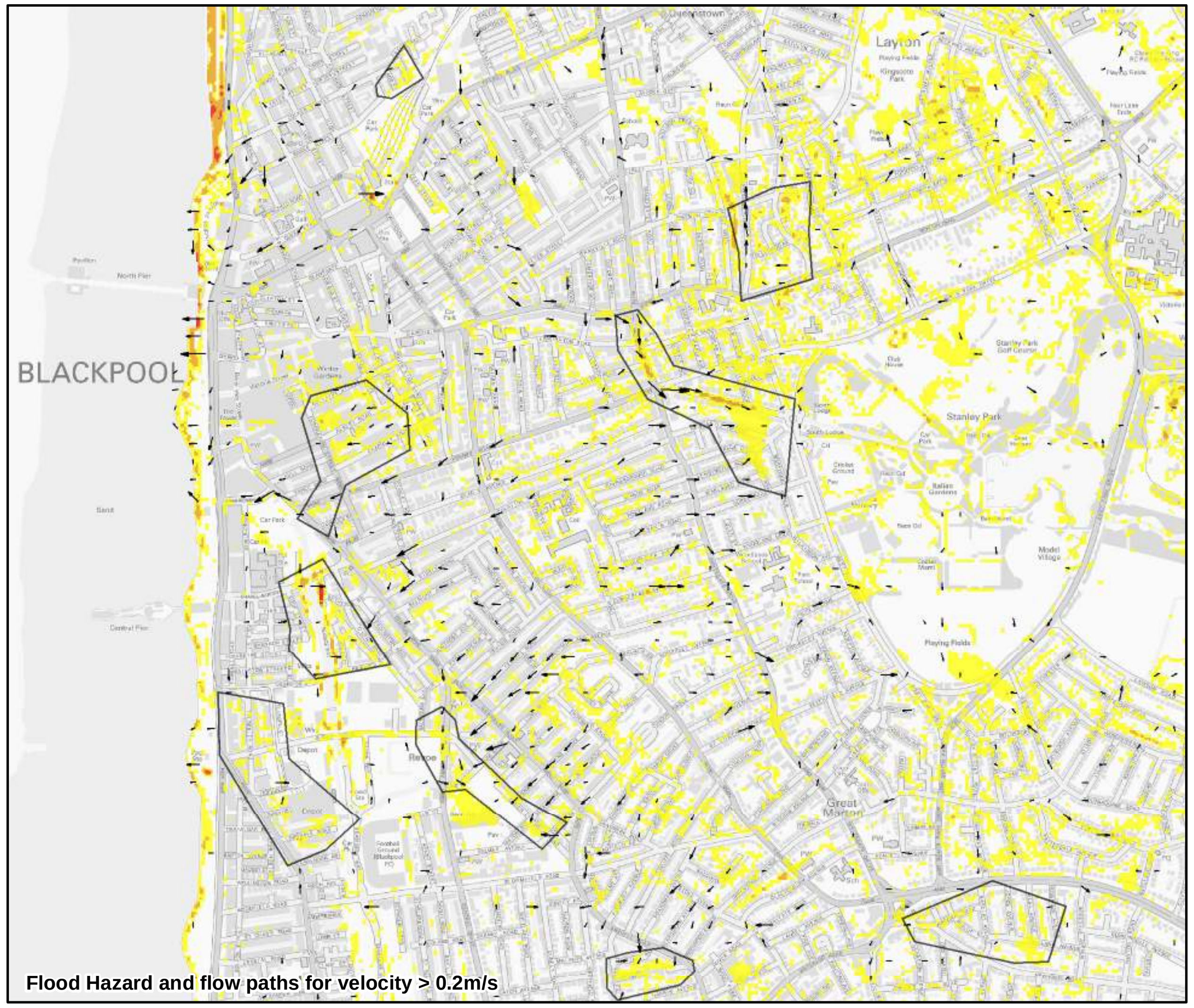
Drawing No	Issue
D3.1	D1

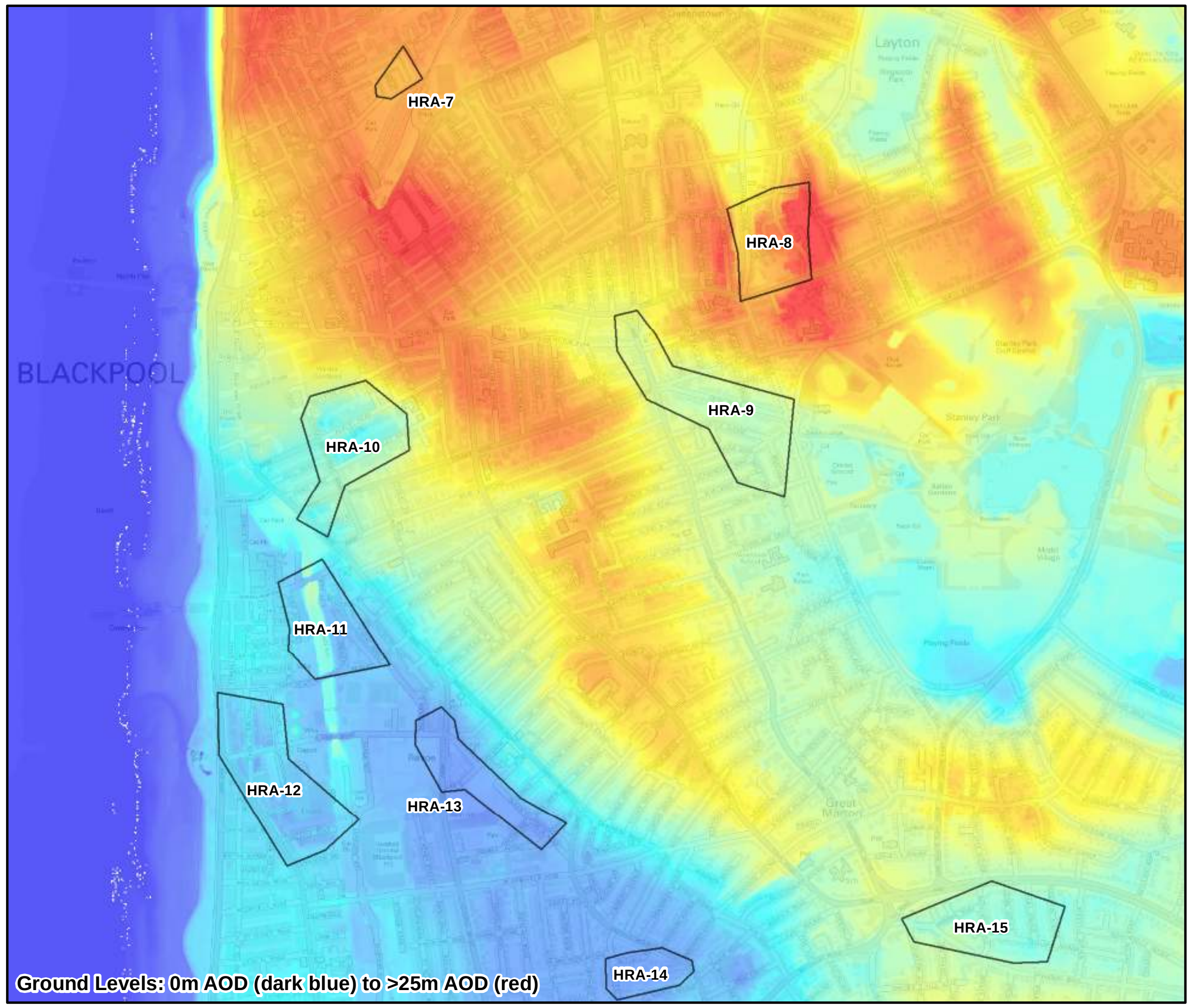
12/03/2013 13:34:07

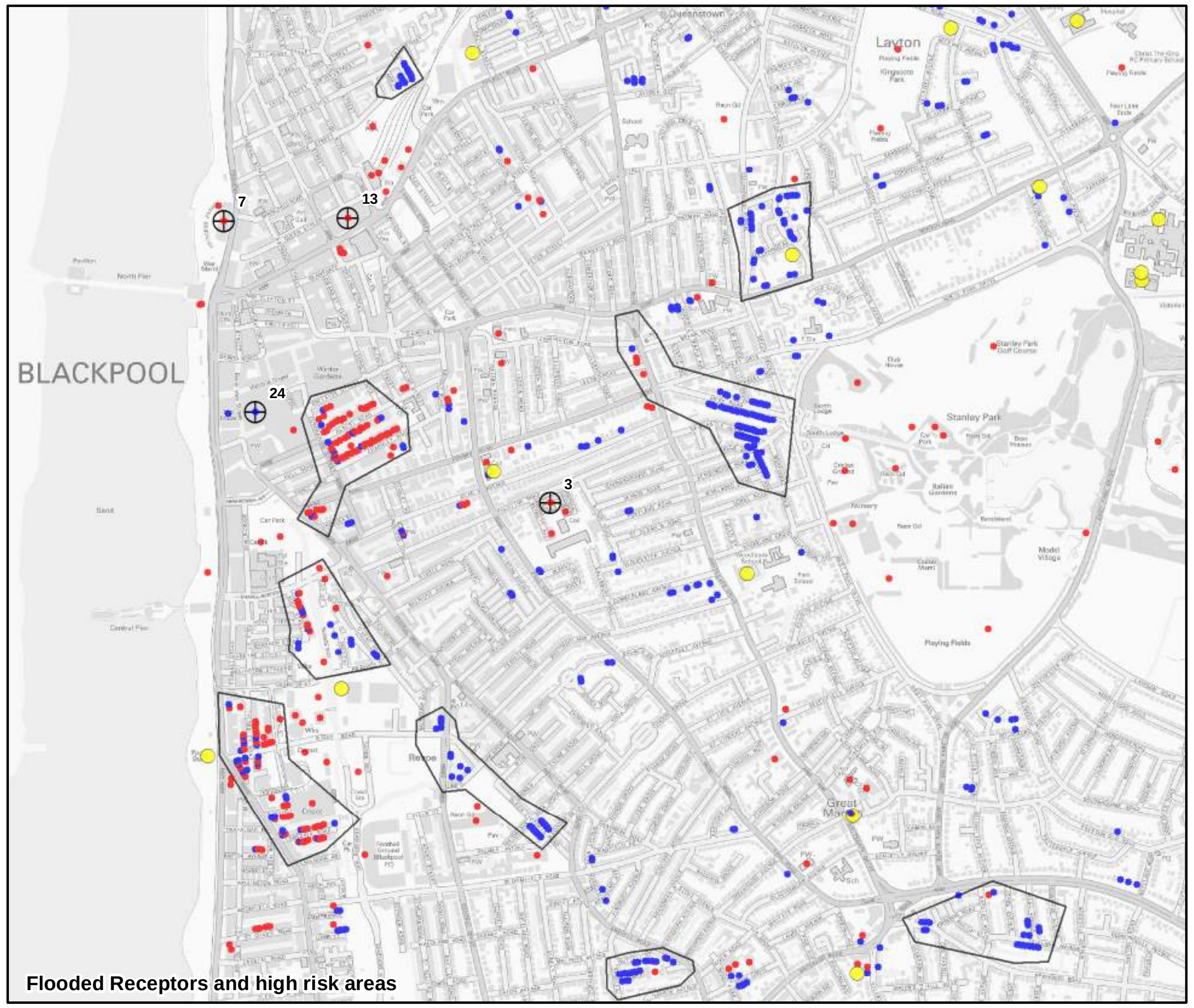
MXD Location

A3









MXD Location

Legend

Blackpool Council boundary

1% (1 in 100yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

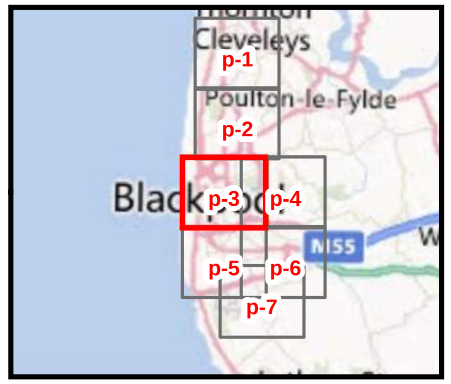
Flooded Receptors (1 in 100yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)

12/03/2013 13:34:20



Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

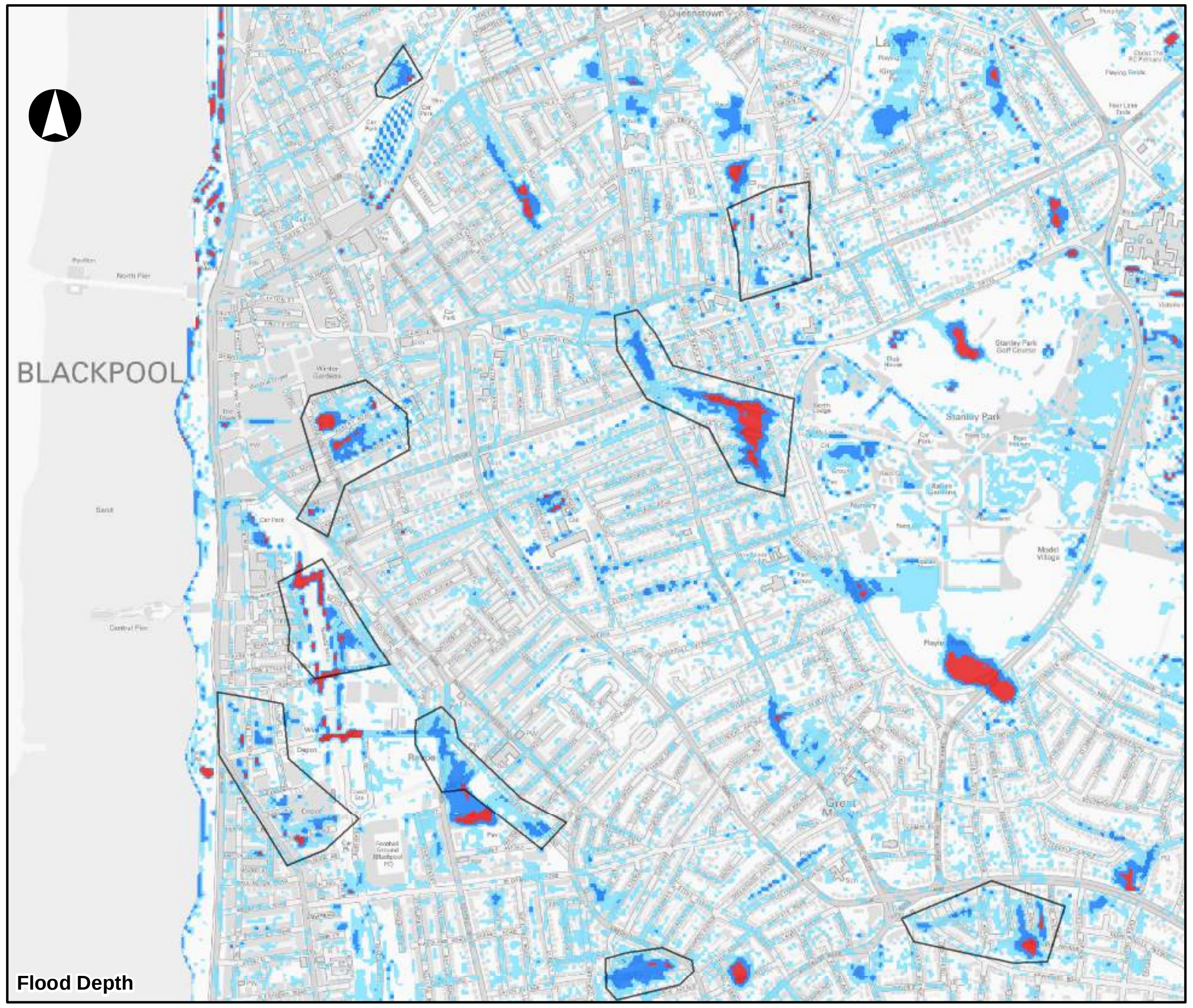
Surface water flood depth, hazard, flow paths and flooded receptors 1% (1 in 100yr)

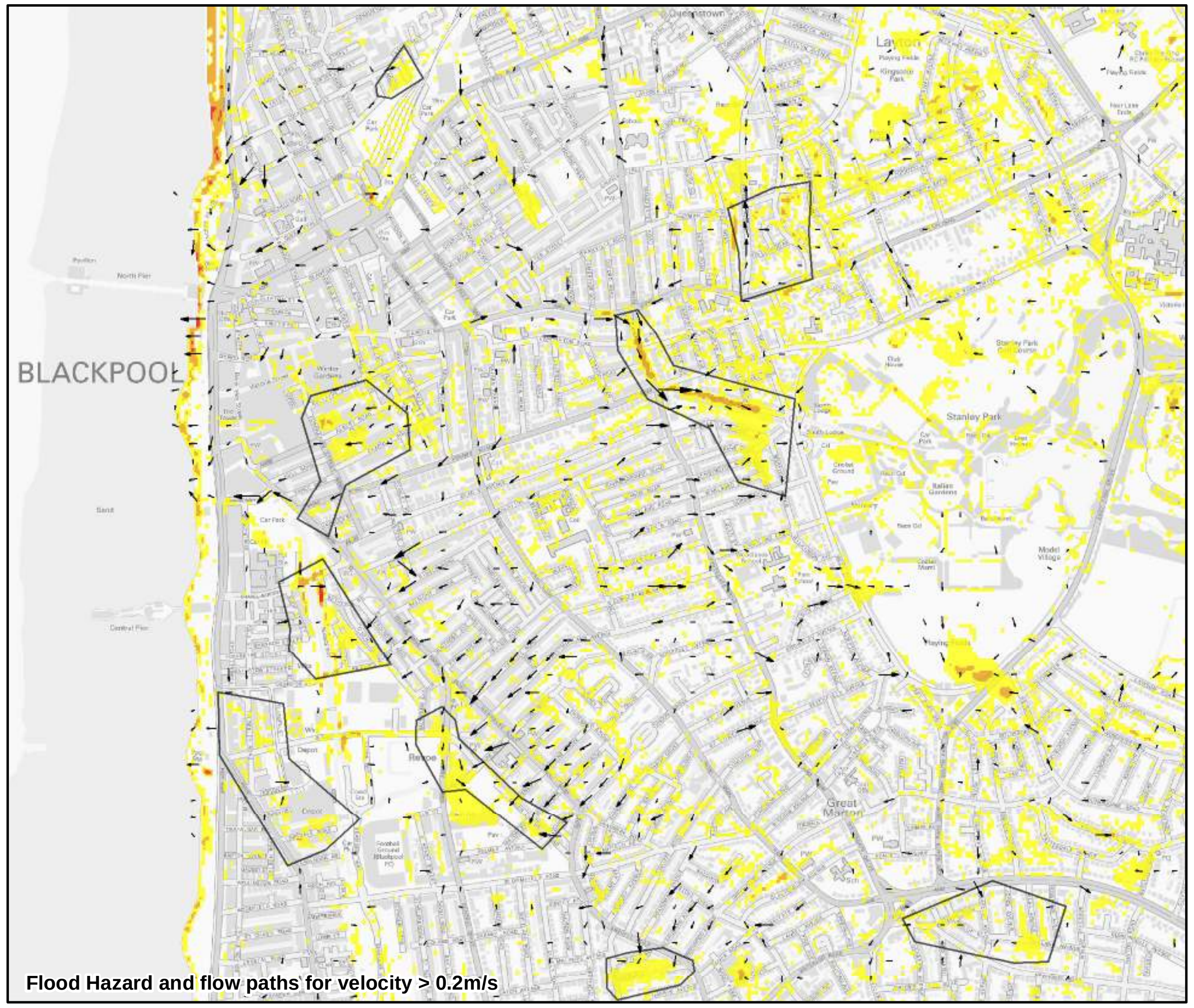
Scale at A3
1:20,000

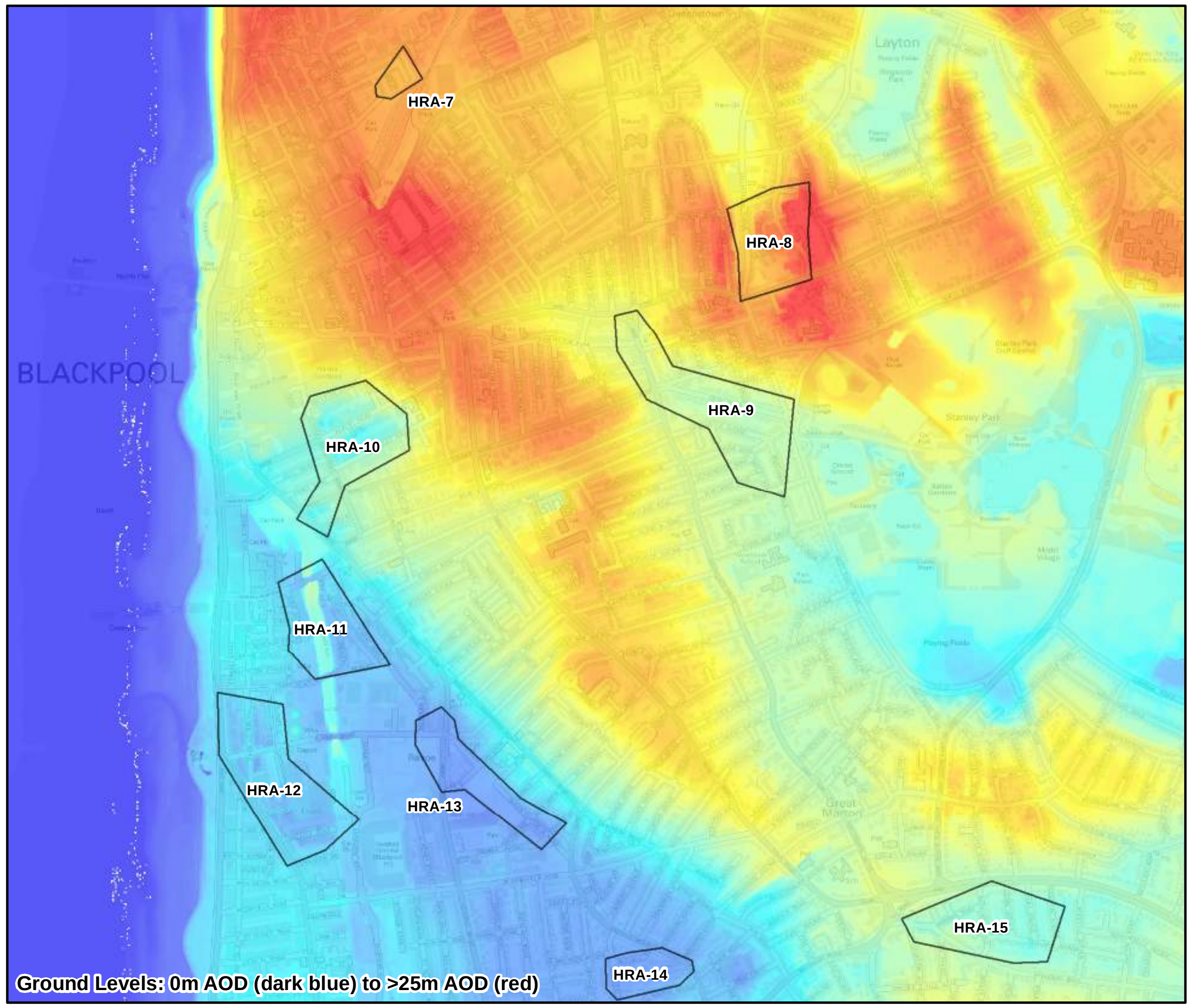
Job No	Drawing Status
227357	Draft

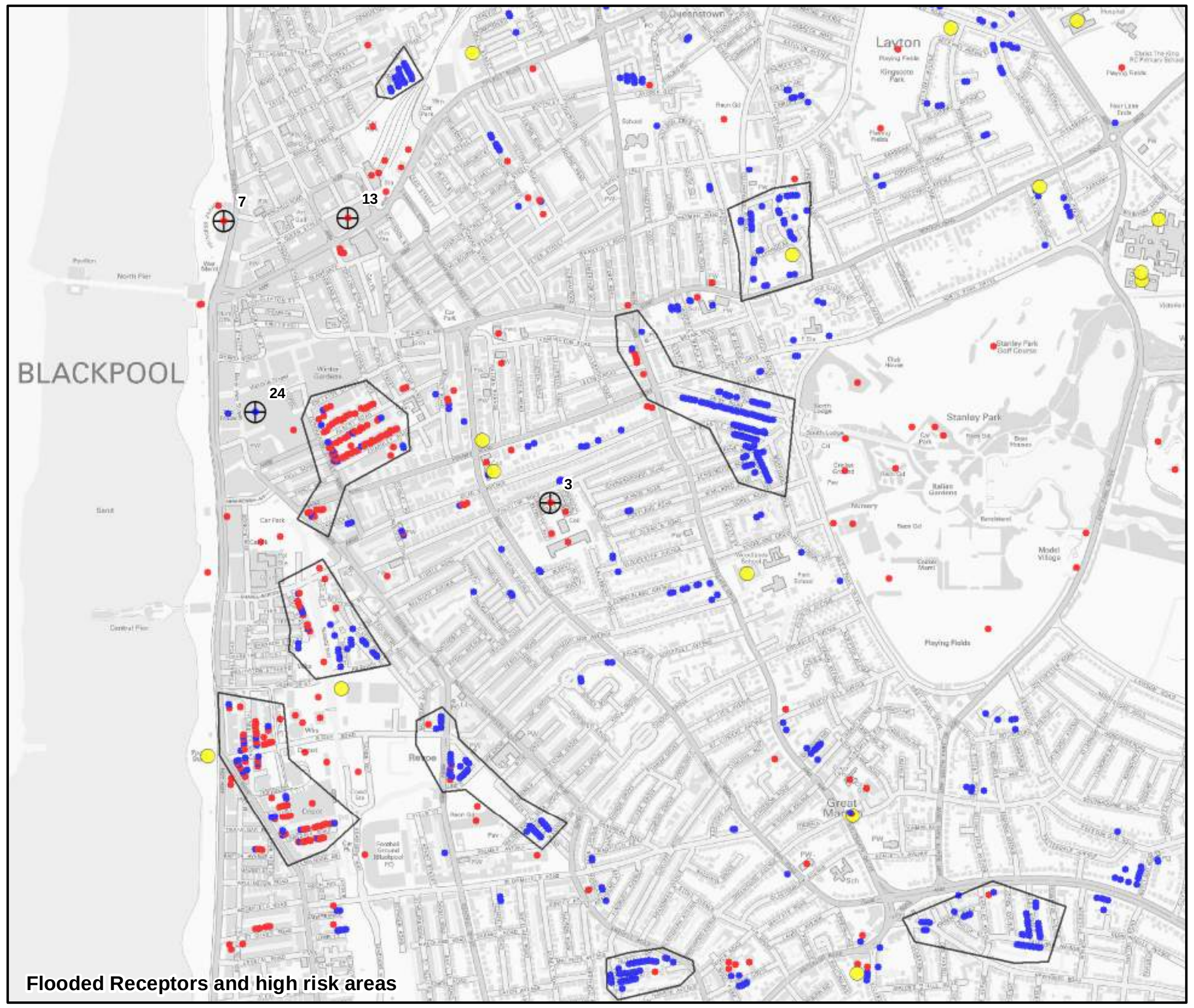
Drawing No	Issue
D3.2	P0

A3









Legend

Blackpool Council boundary

1% (1 in 100yr) future scenario

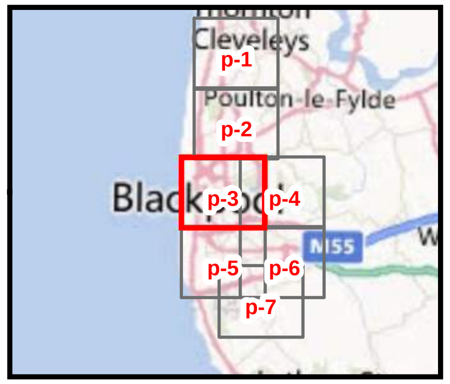
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr) future scenario

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres

0 270 540 1,080

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Rose Wharf 78 East Street
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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors Future scenario 1% (1 in 100yr)

Scale at A3

1:20,000

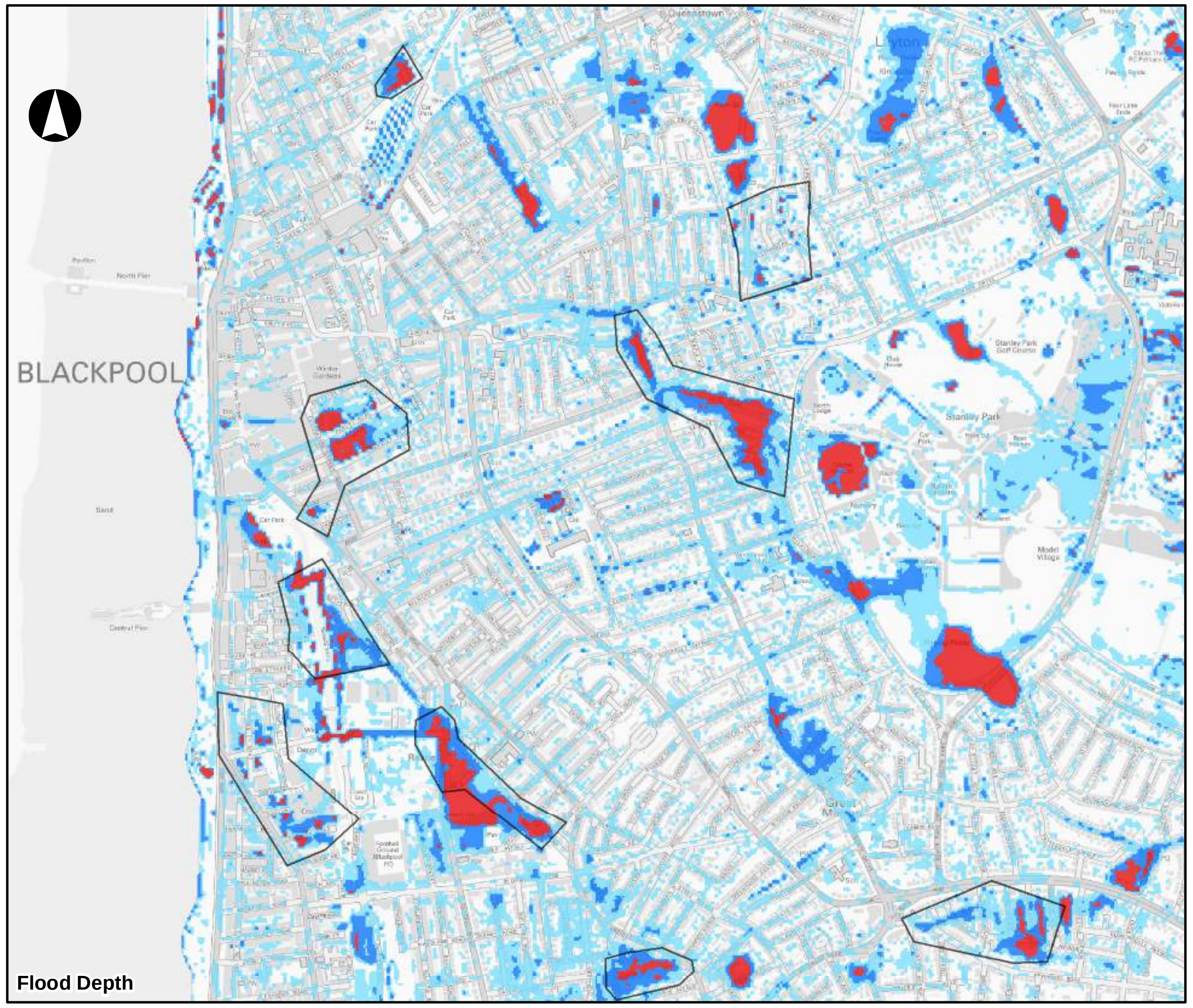
Job No	Drawing Status
227357	Draft

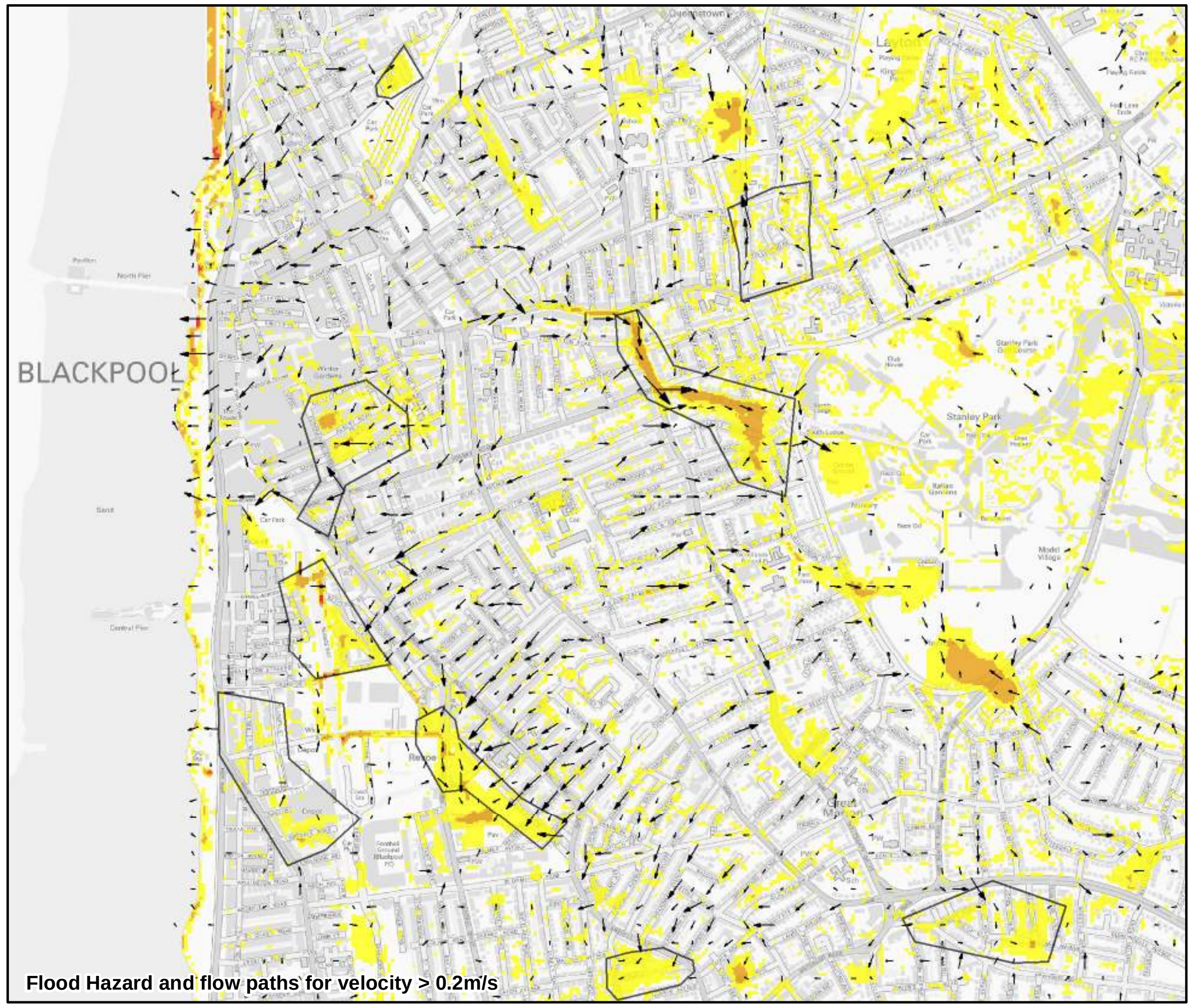
Drawing No	Issue
D3.3	P0

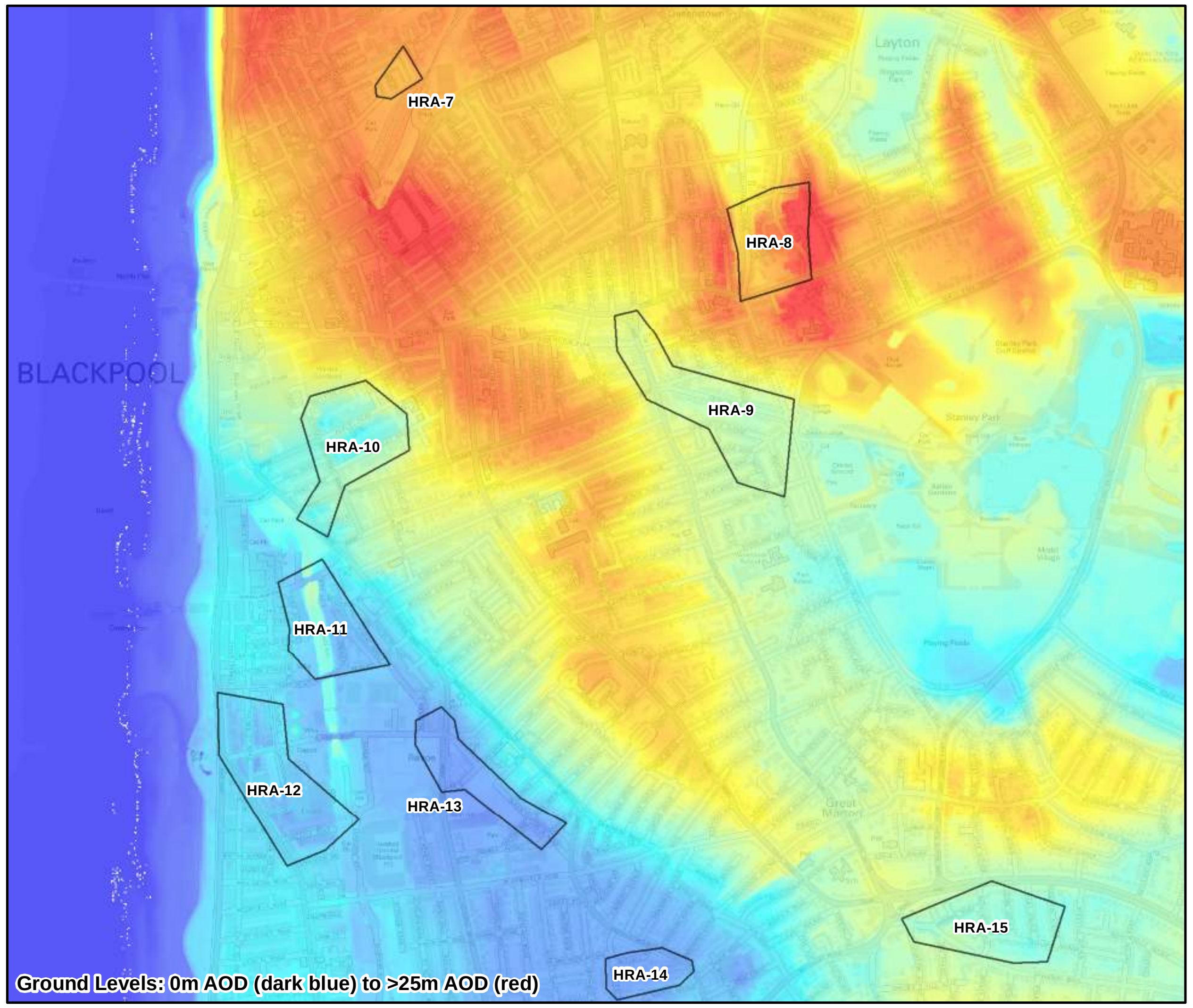
12/03/2013 13:34:31

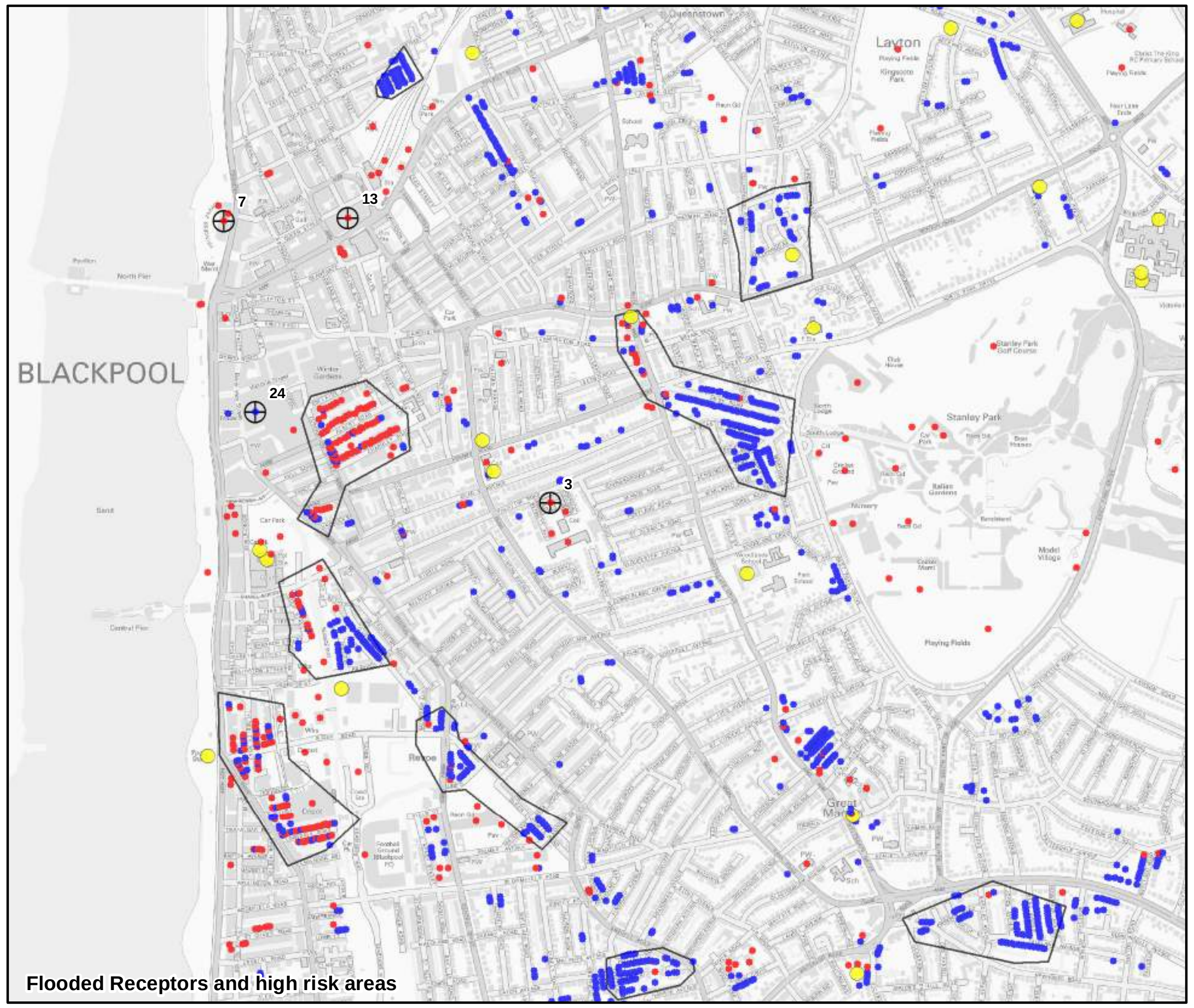
MXD Location

A3









Legend

Blackpool Council boundary

0.1% (1 in 1000yr)

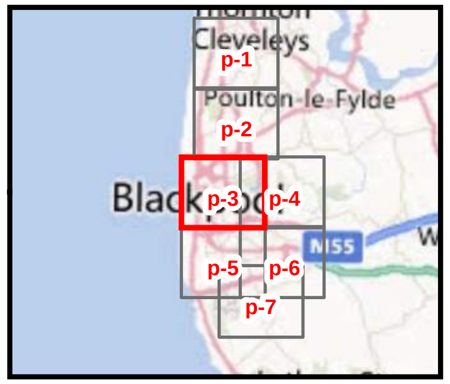
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 1000yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres

0 270 540 1,080

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Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 0.1% (1 in 1000yr)

Scale at A3

1:20,000

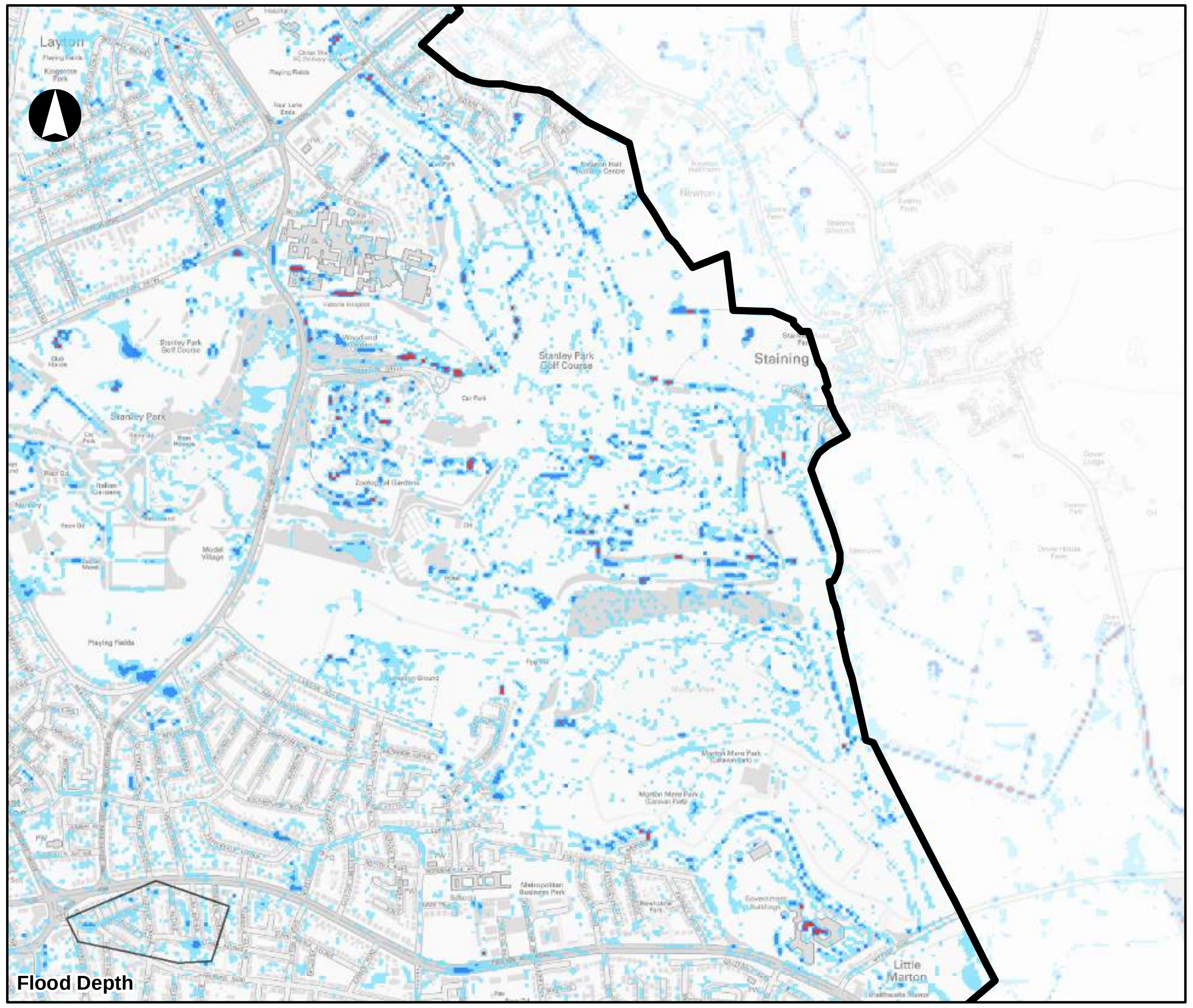
Job No	Drawing Status
227357	**Draft**

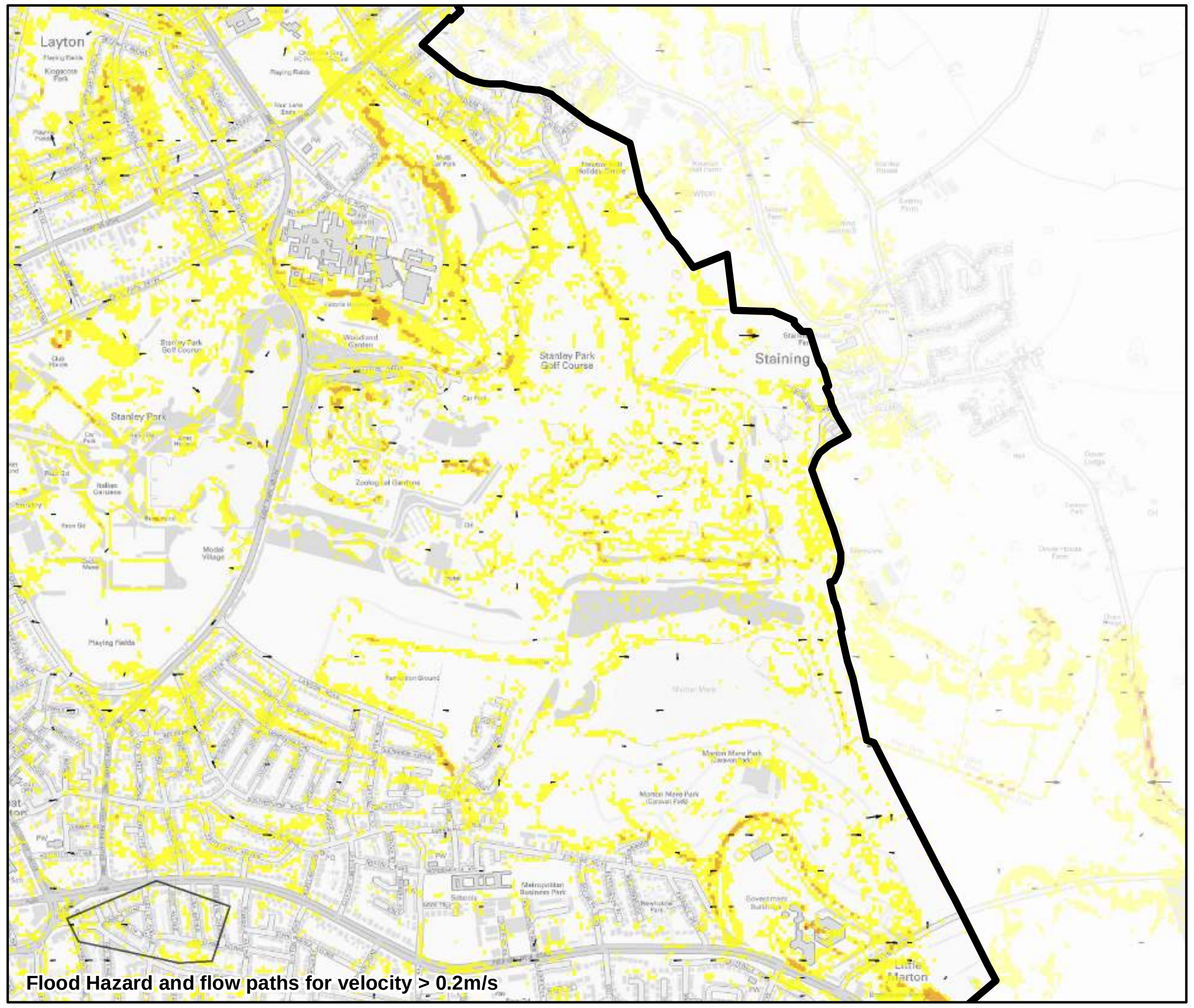
Drawing No	Issue
D3.4	**P0**

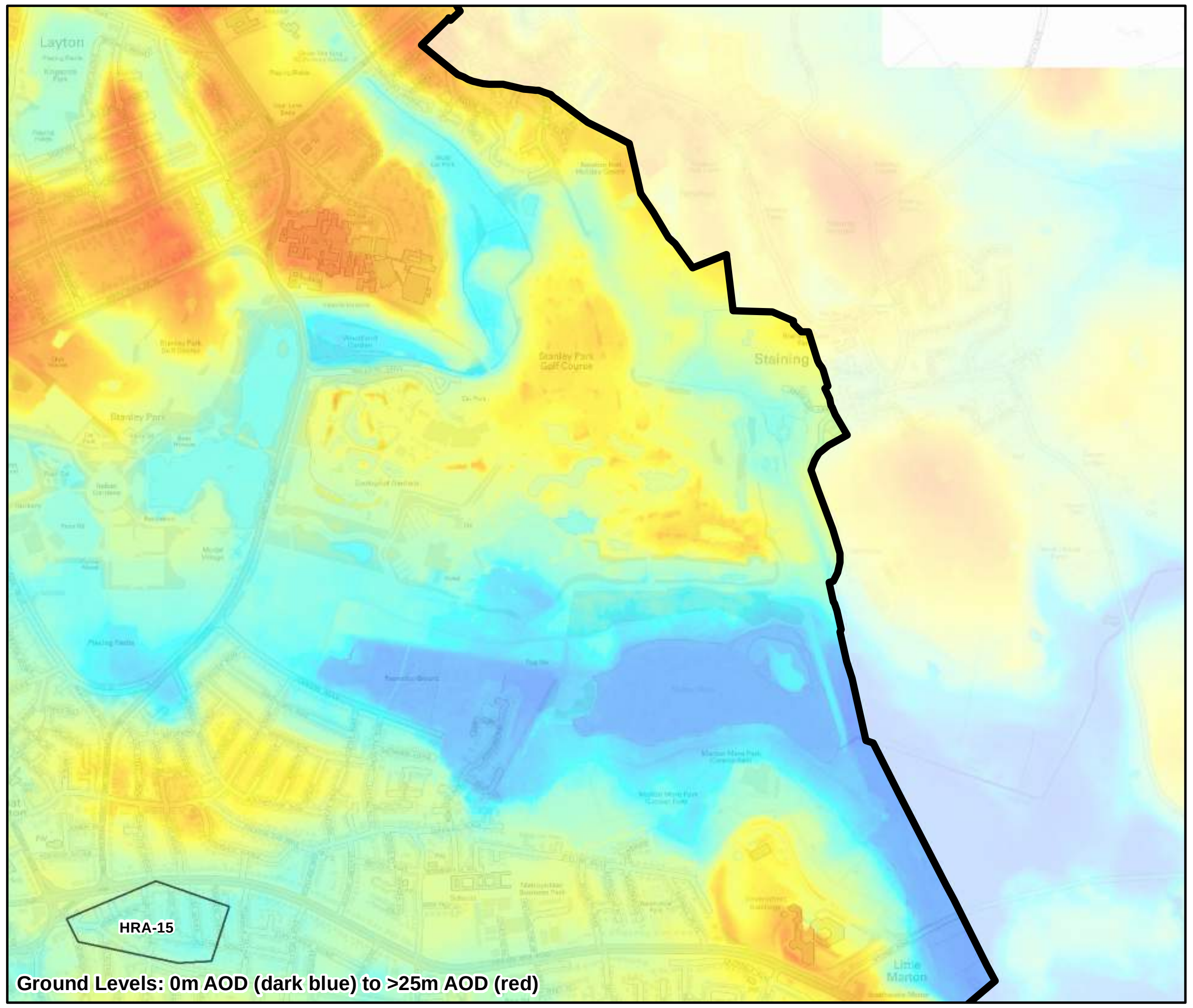
12/03/2013 13:34:41

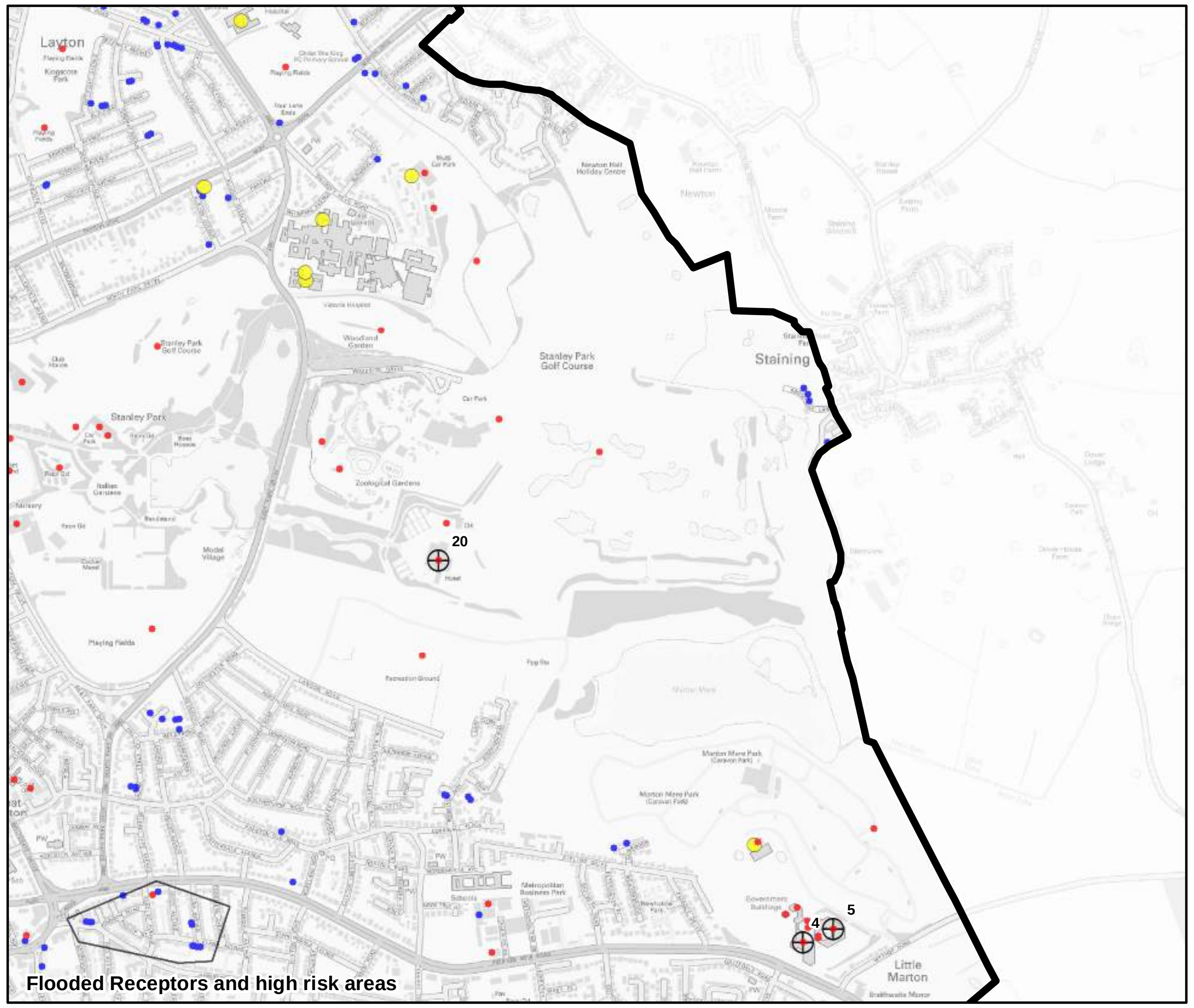
MXD Location

A3









Legend

Blackpool Council boundary

5% (1 in 20yr)

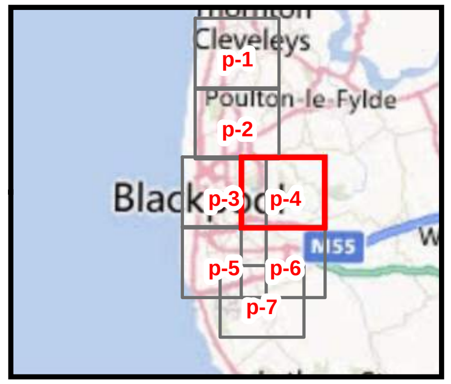
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 20yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



12/03/2013 13:34:53

D1	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 5% (1 in 20yr)

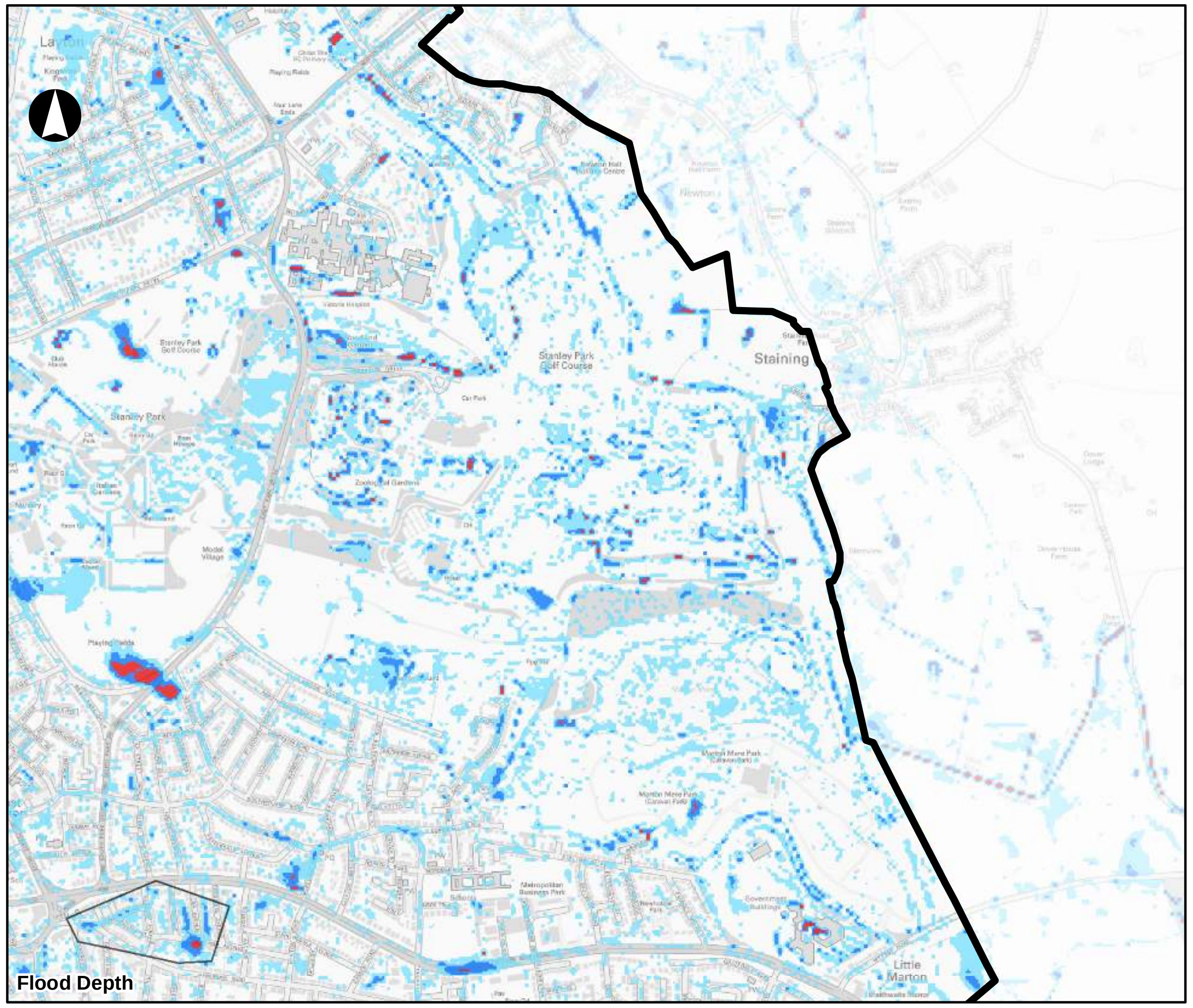
Scale at A3
1:20,000

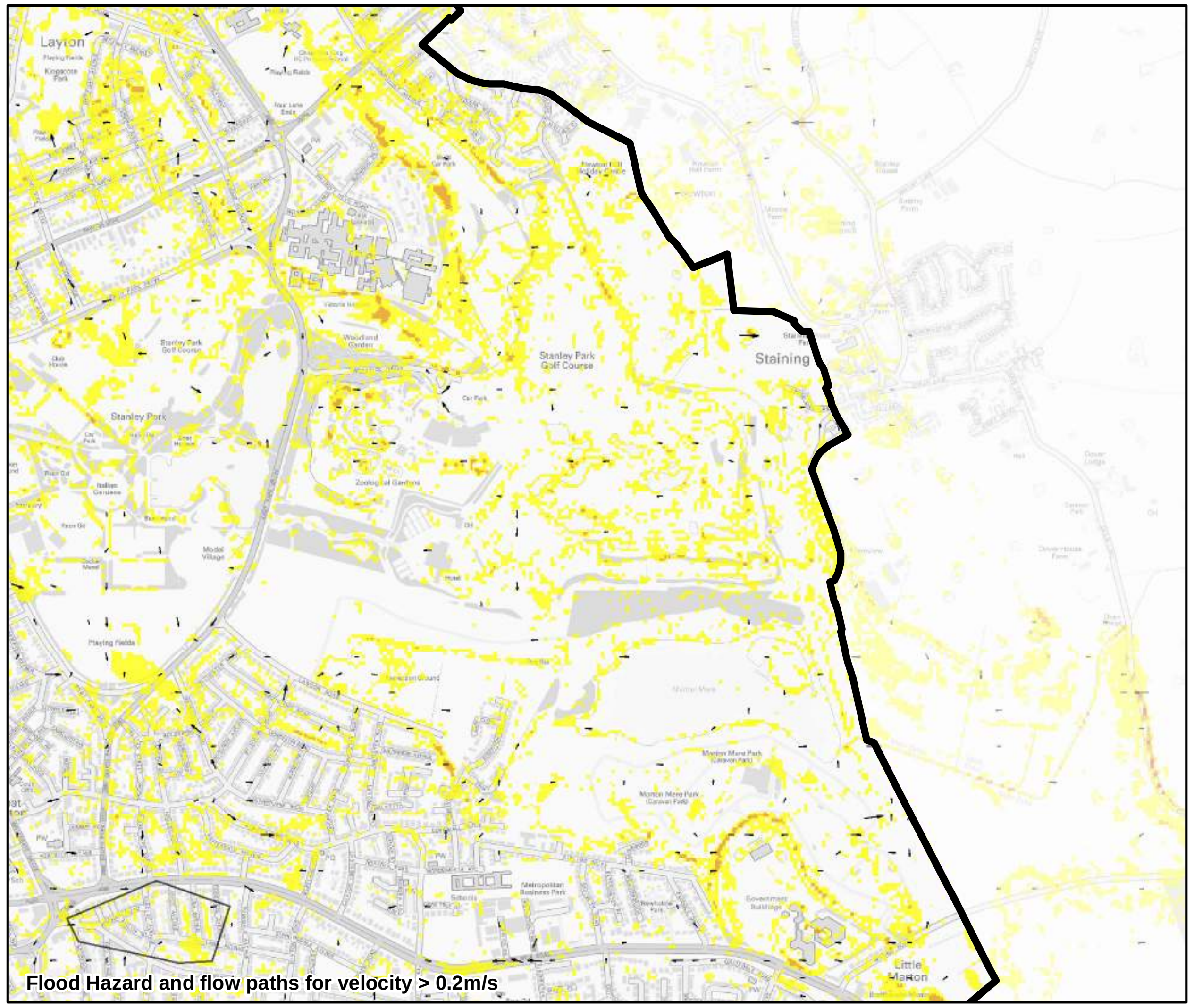
Job No	Drawing Status
227357	Draft

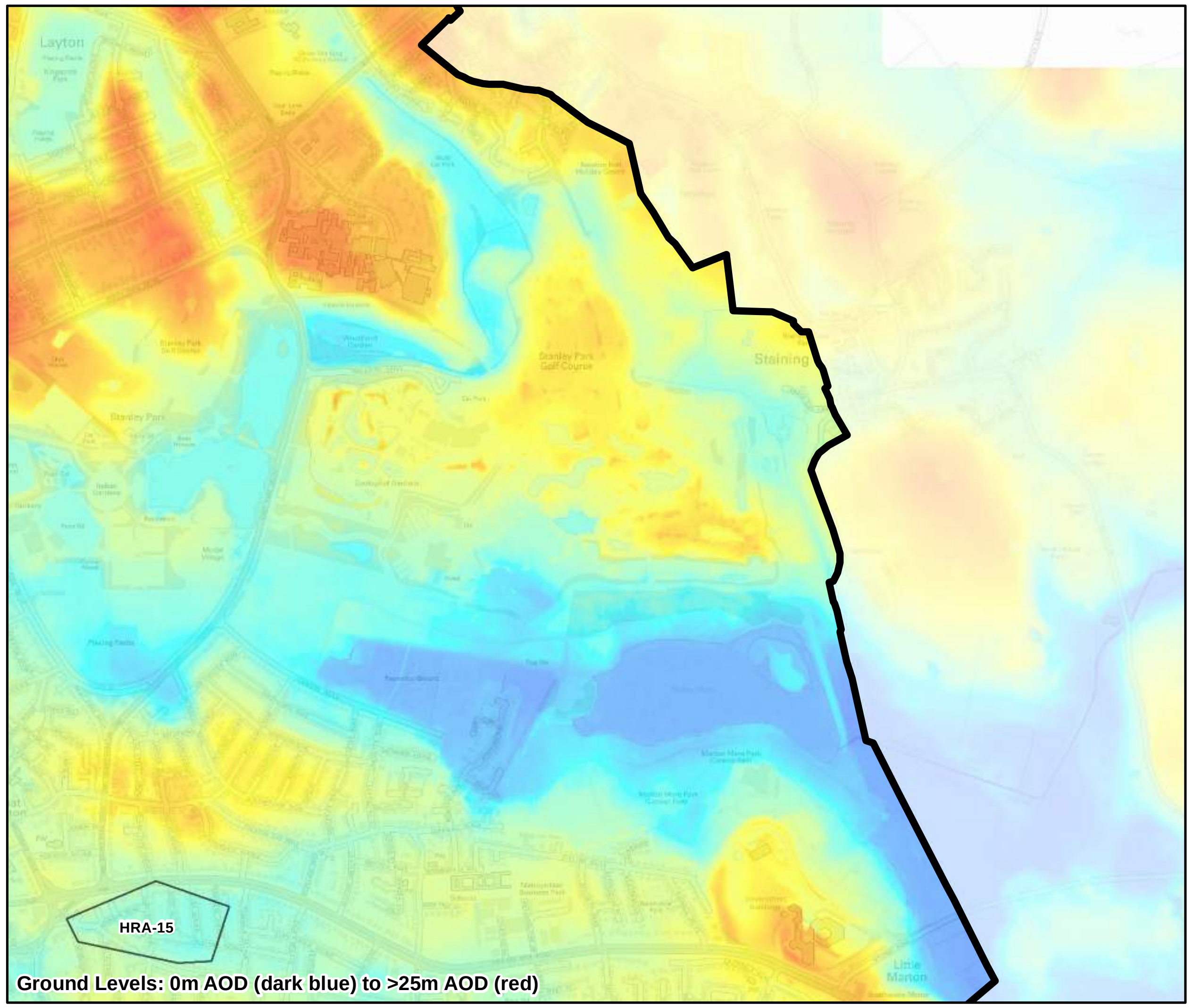
Drawing No	Issue
D4.1	D1

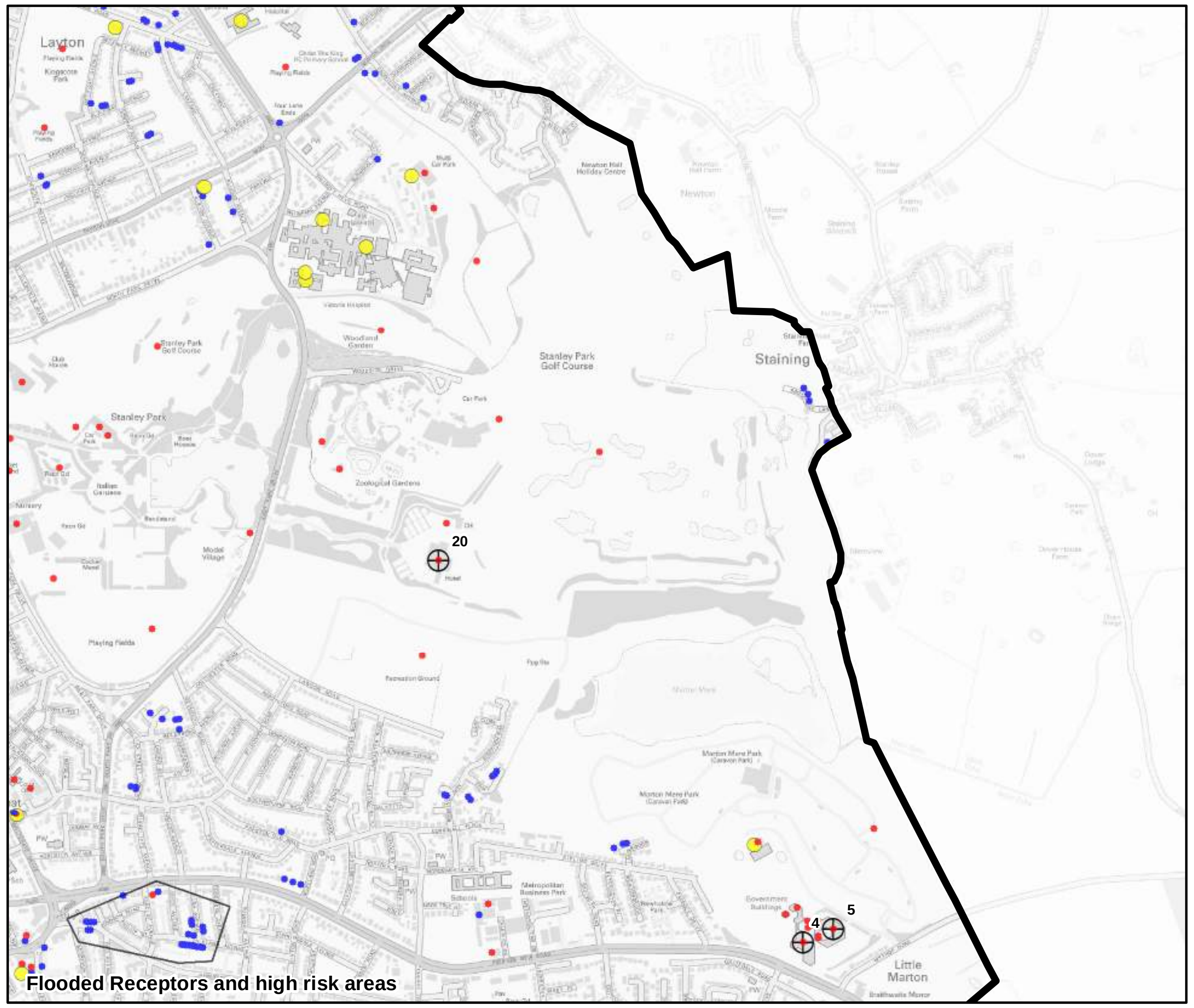
MXD Location

A3









Legend

Blackpool Council boundary

1% (1 in 100yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

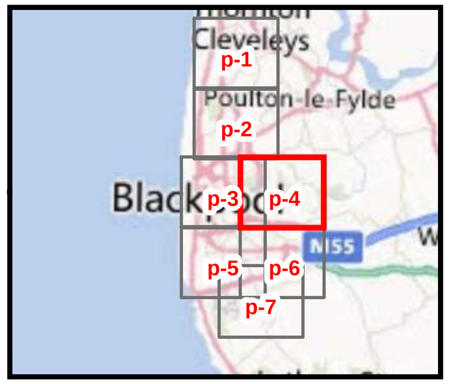
Flooded Receptors (1 in 100yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)

12/03/2013 13:35:09



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 1% (1 in 100yr)

Scale at A3

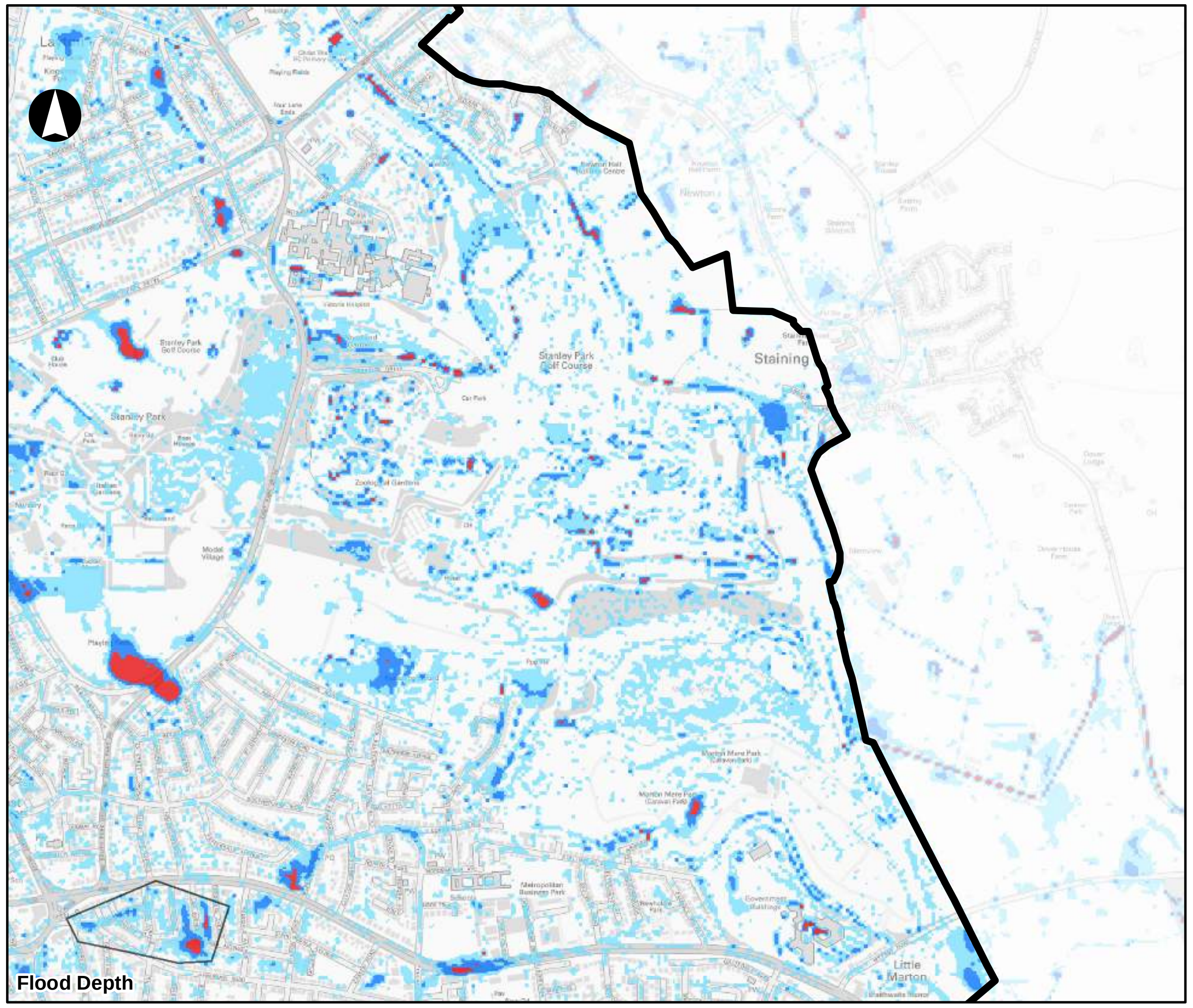
1:20,000

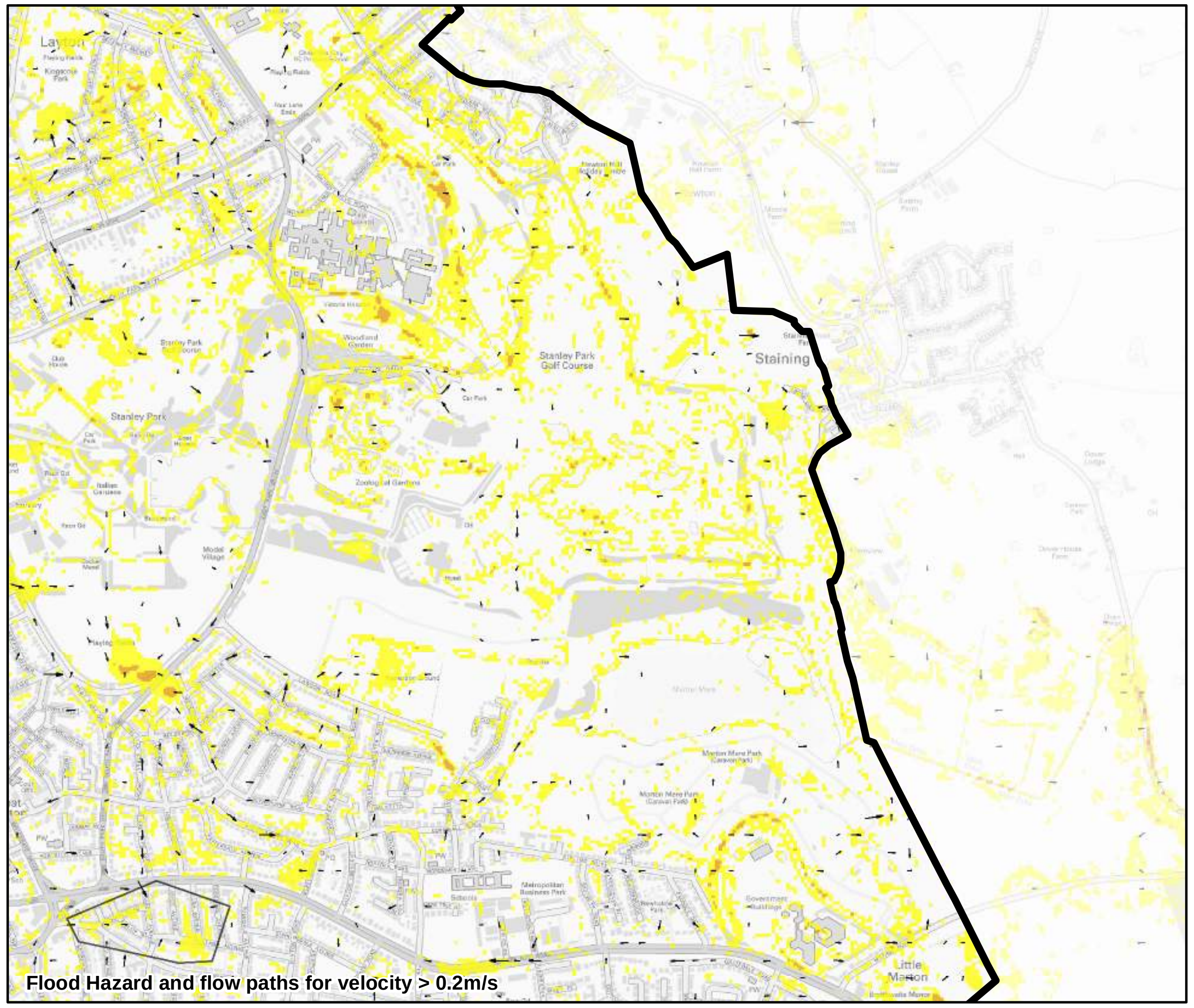
Job No	Drawing Status
227357	**Draft**

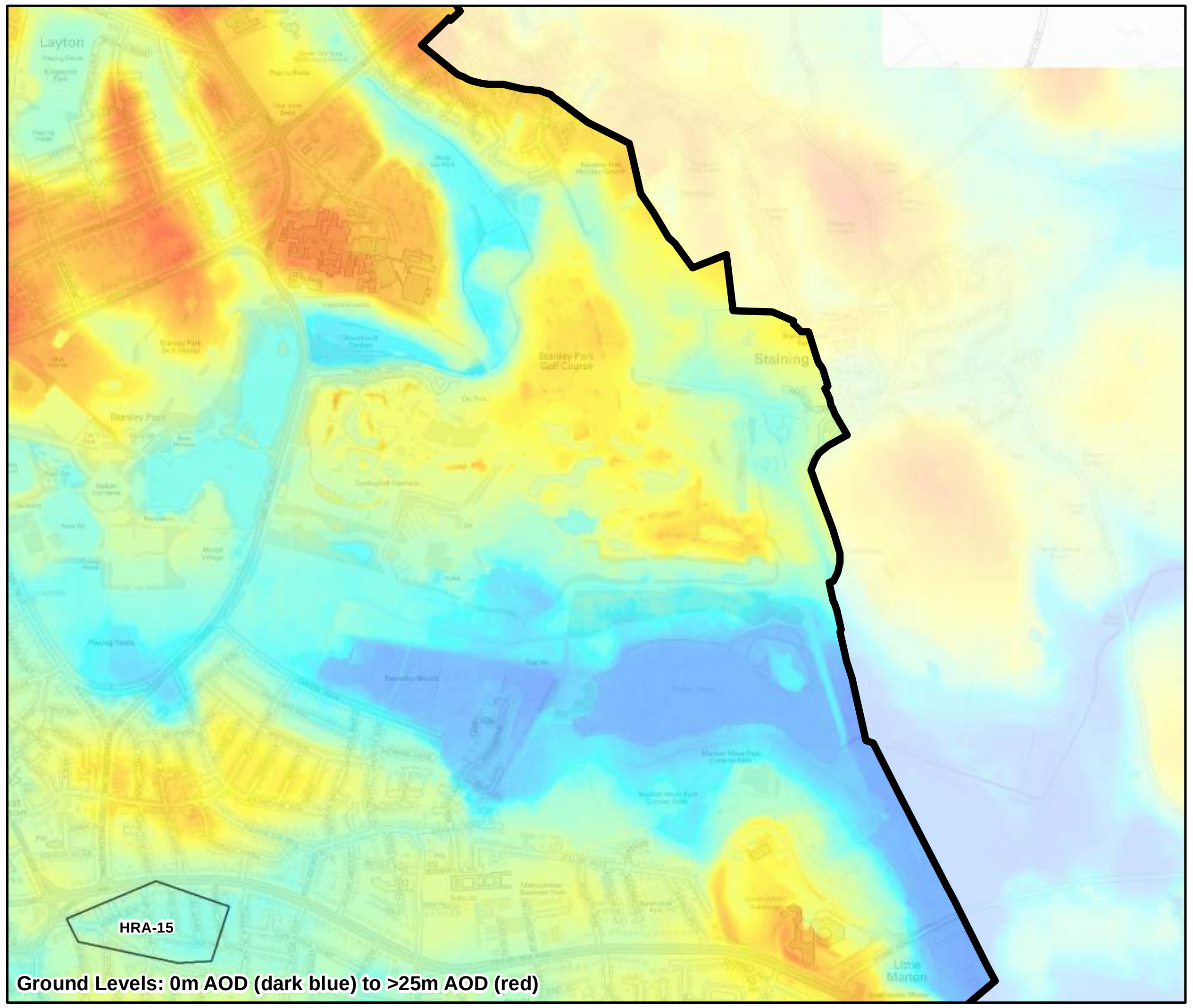
Drawing No	Issue
D4.2	**P0**

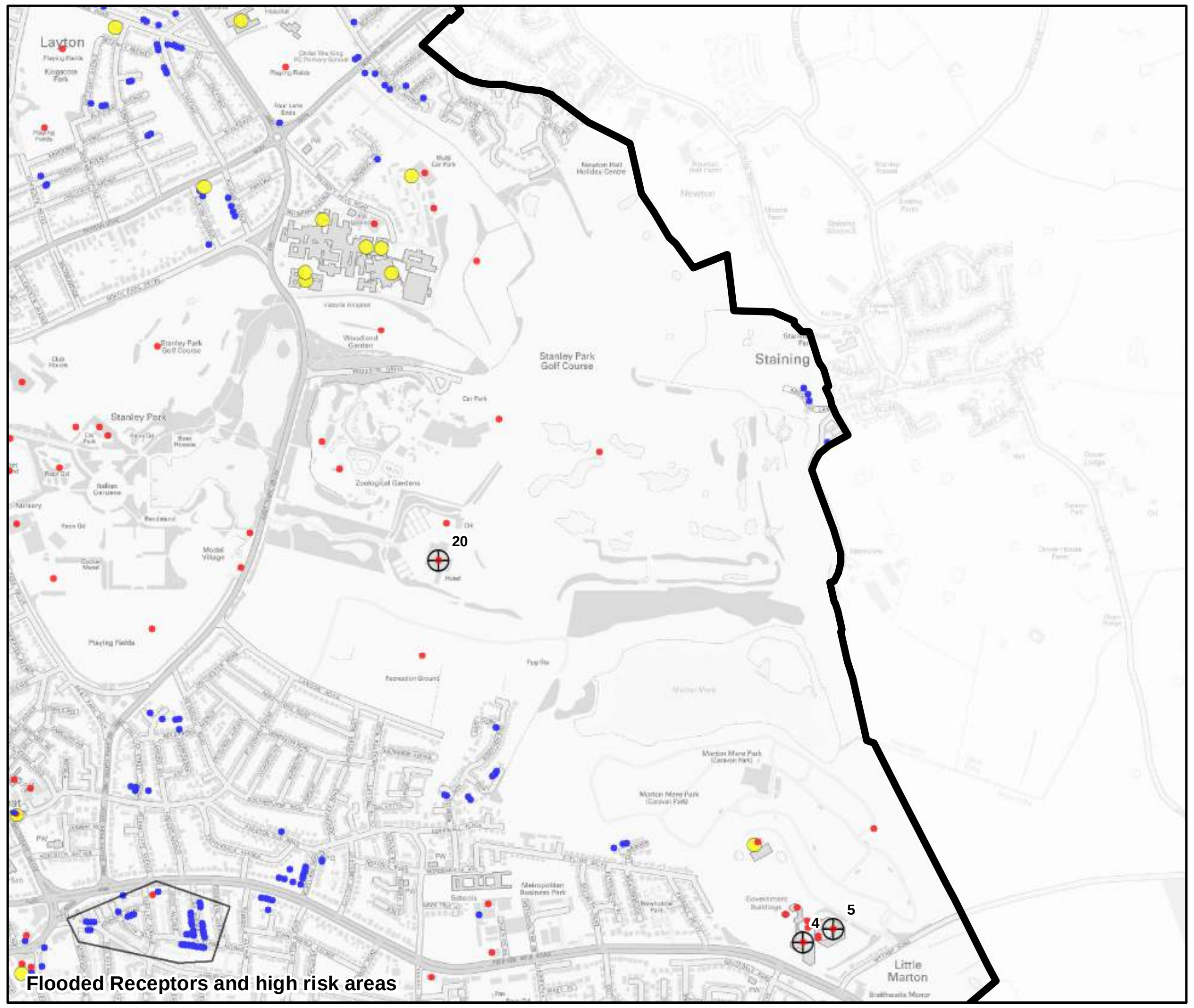
MXD Location

A3









Legend

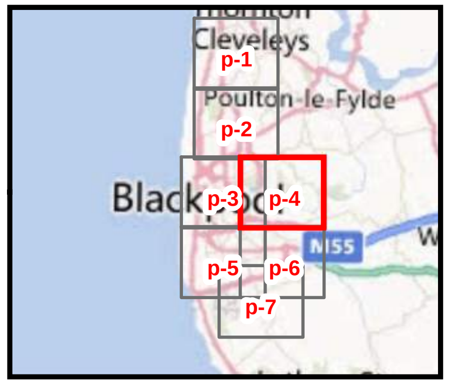
- Blackpool Council boundary

1% (1 in 100yr) future scenario

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr) future scenario

- Critical Infrastructure
- Non Residential
- Residential
- Top25 damages labelled by rank
- High Risk Areas (based on 1 in 20 and 1 in 100yr)



Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres
0 270 540 1,080

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Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors Future scenario 1% (1 in 100yr)

Scale at A3

1:20,000

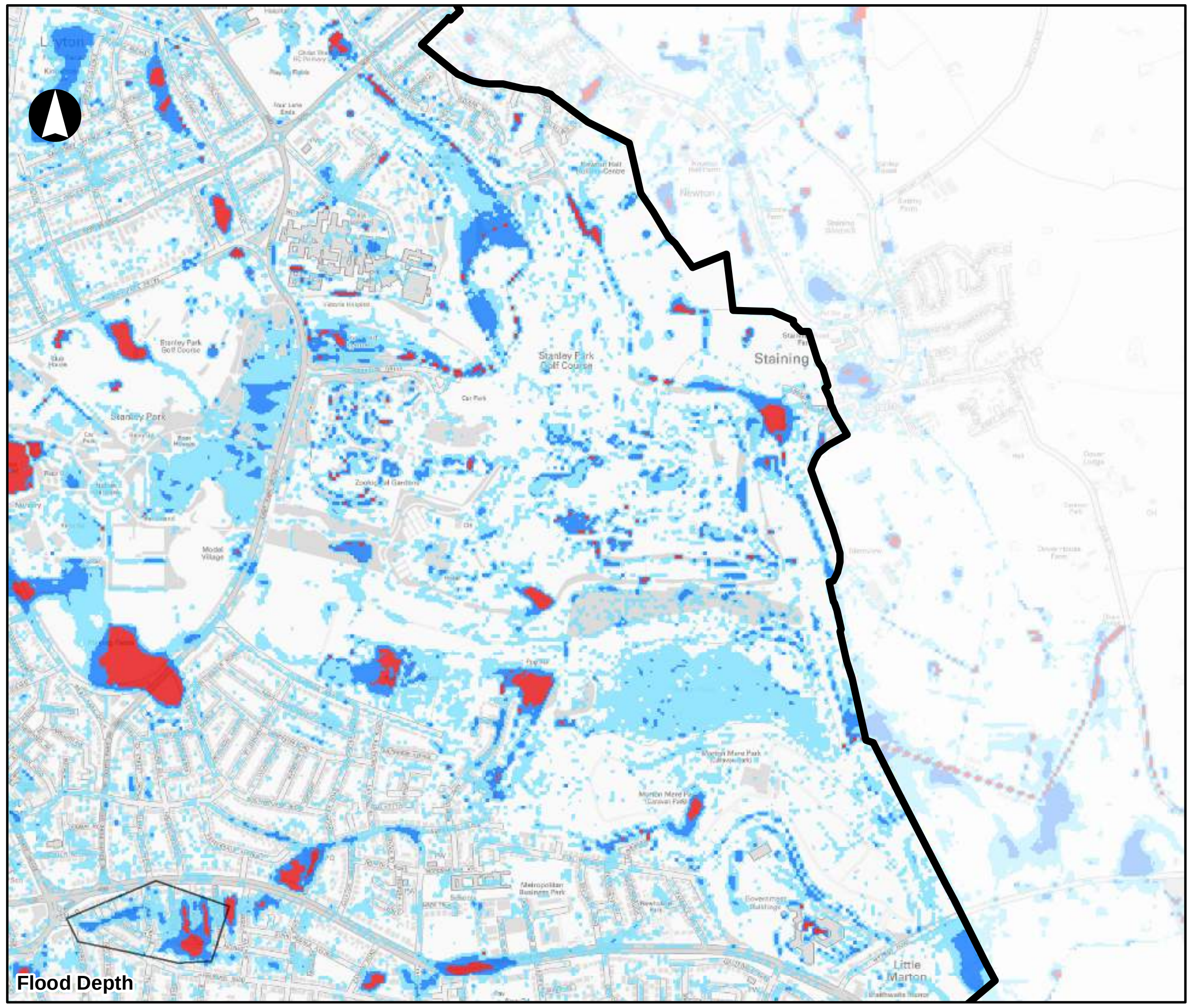
Job No	Drawing Status
227357	Draft

Drawing No	Issue
D4.3	P0

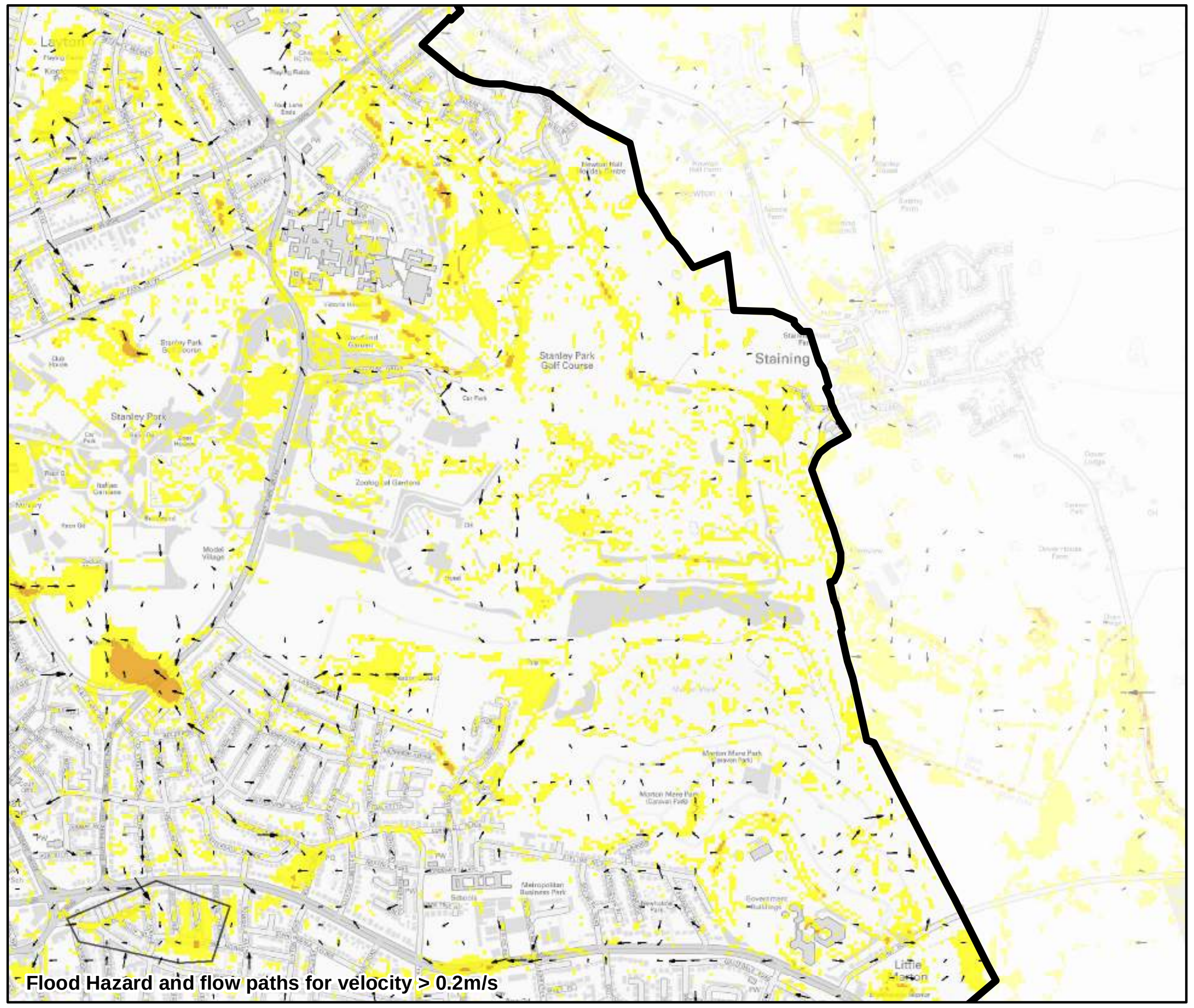
12/03/2013 13:35:25

MXD Location

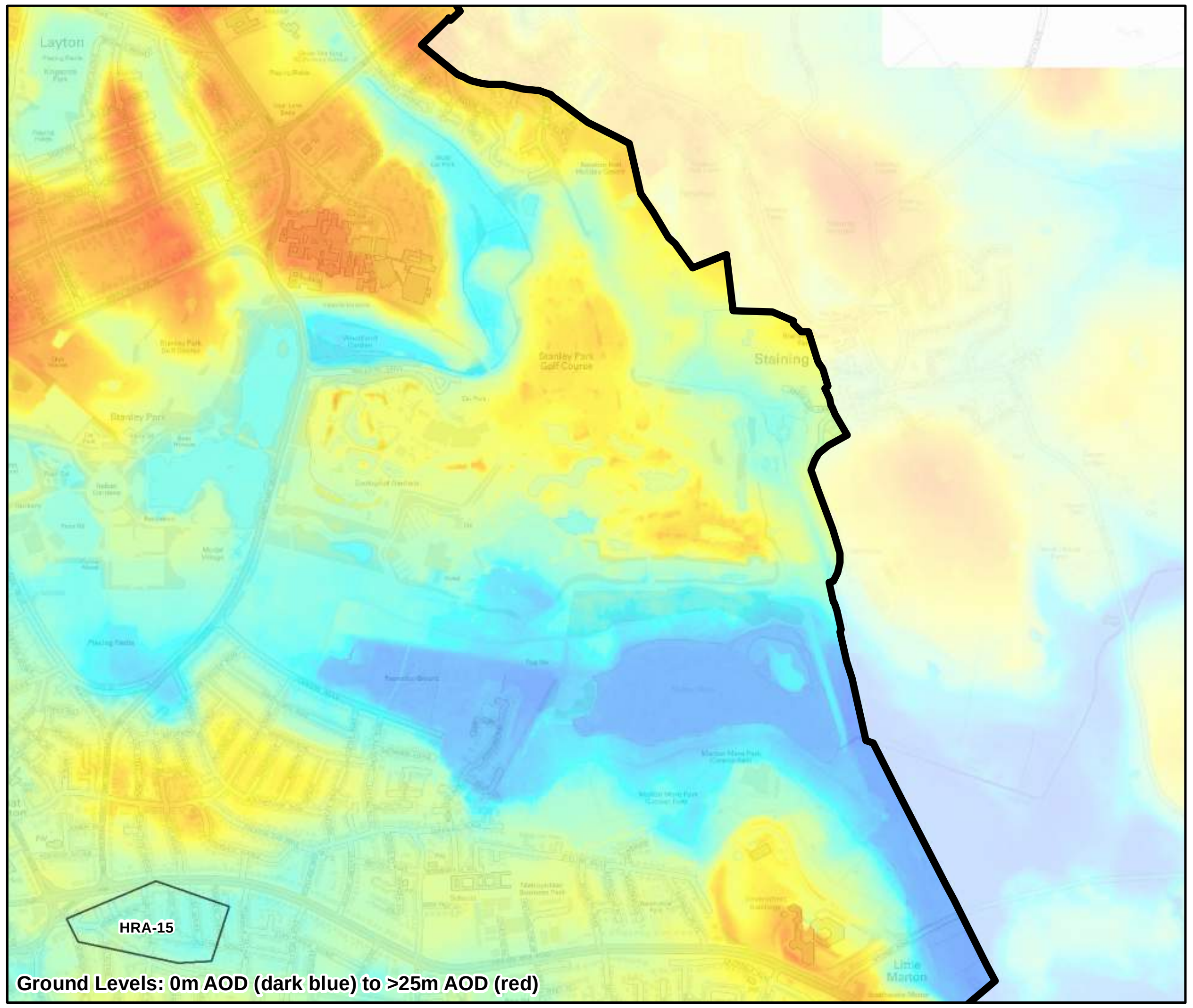
A3



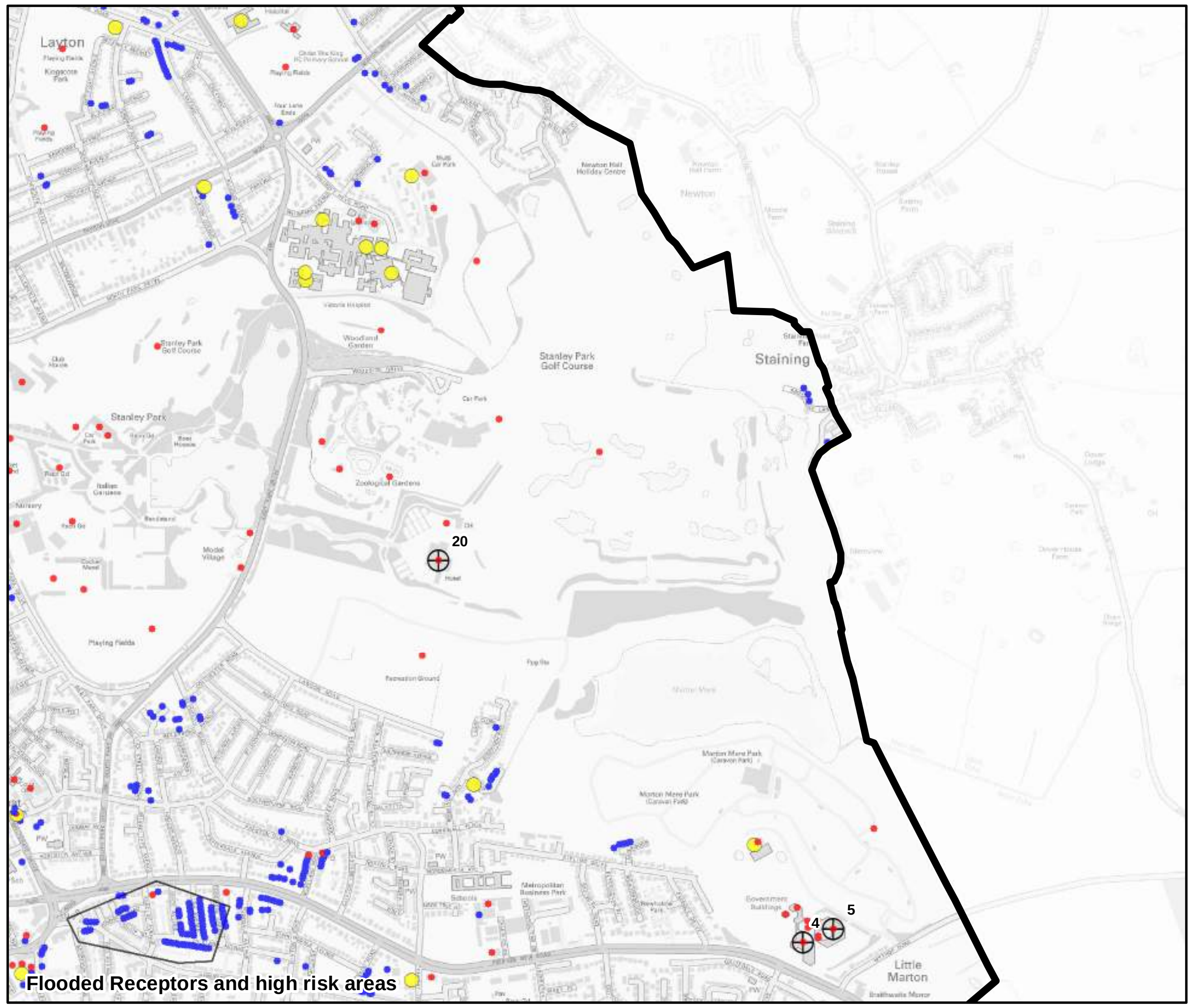
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

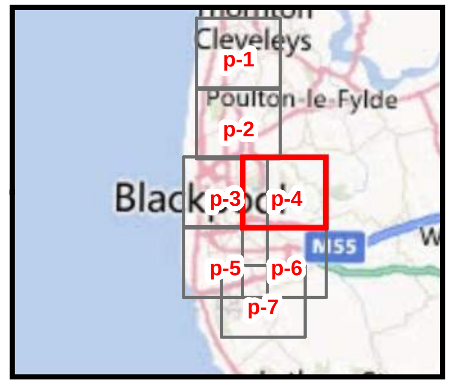
0.1% (1 in 1000yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 1000yr)
- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas
(based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 0.1% (1 in 1000yr)

Scale at A3
1:20,000

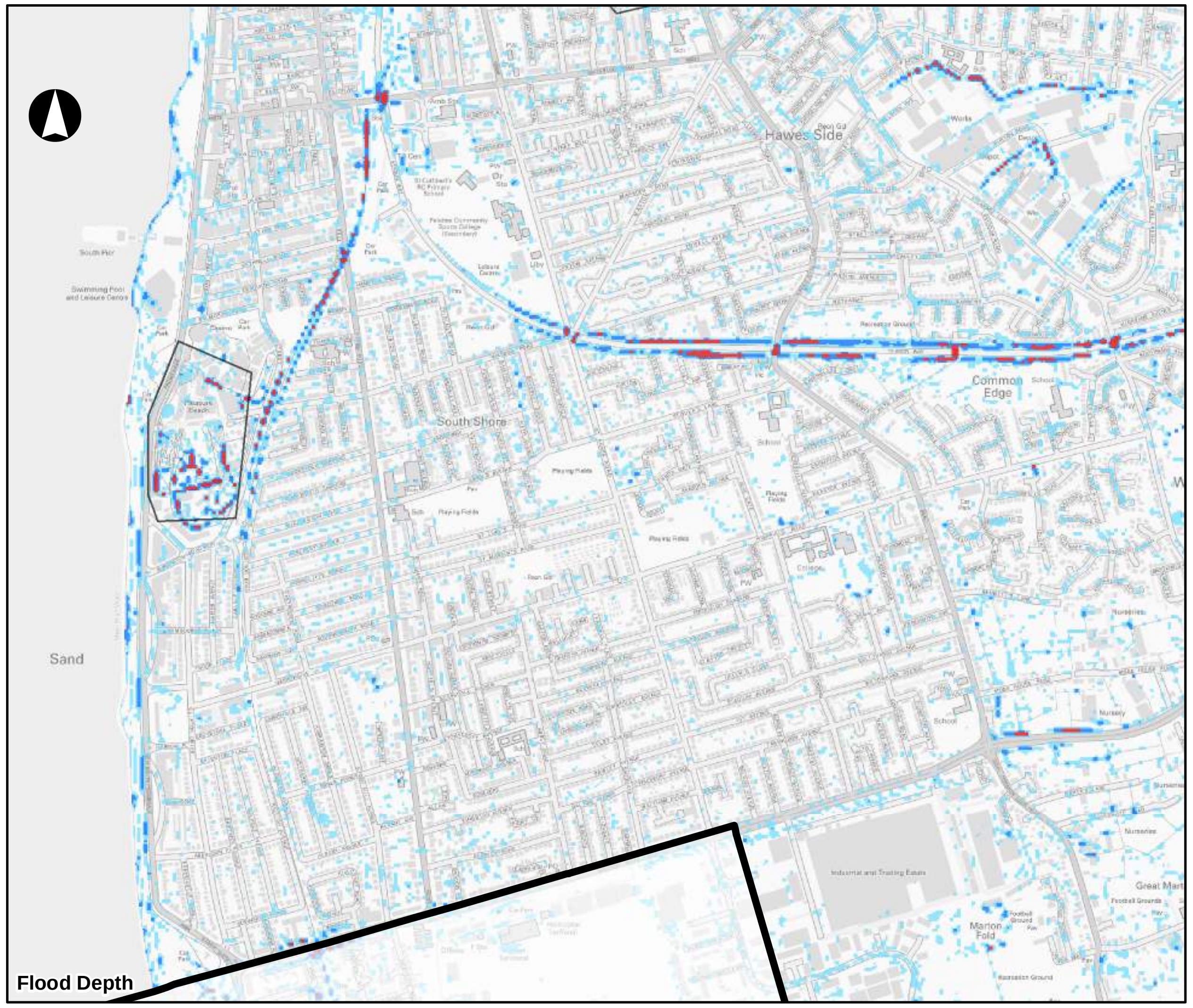
Job No	Drawing Status
227357	Draft

Drawing No	Issue
D4.4	P0

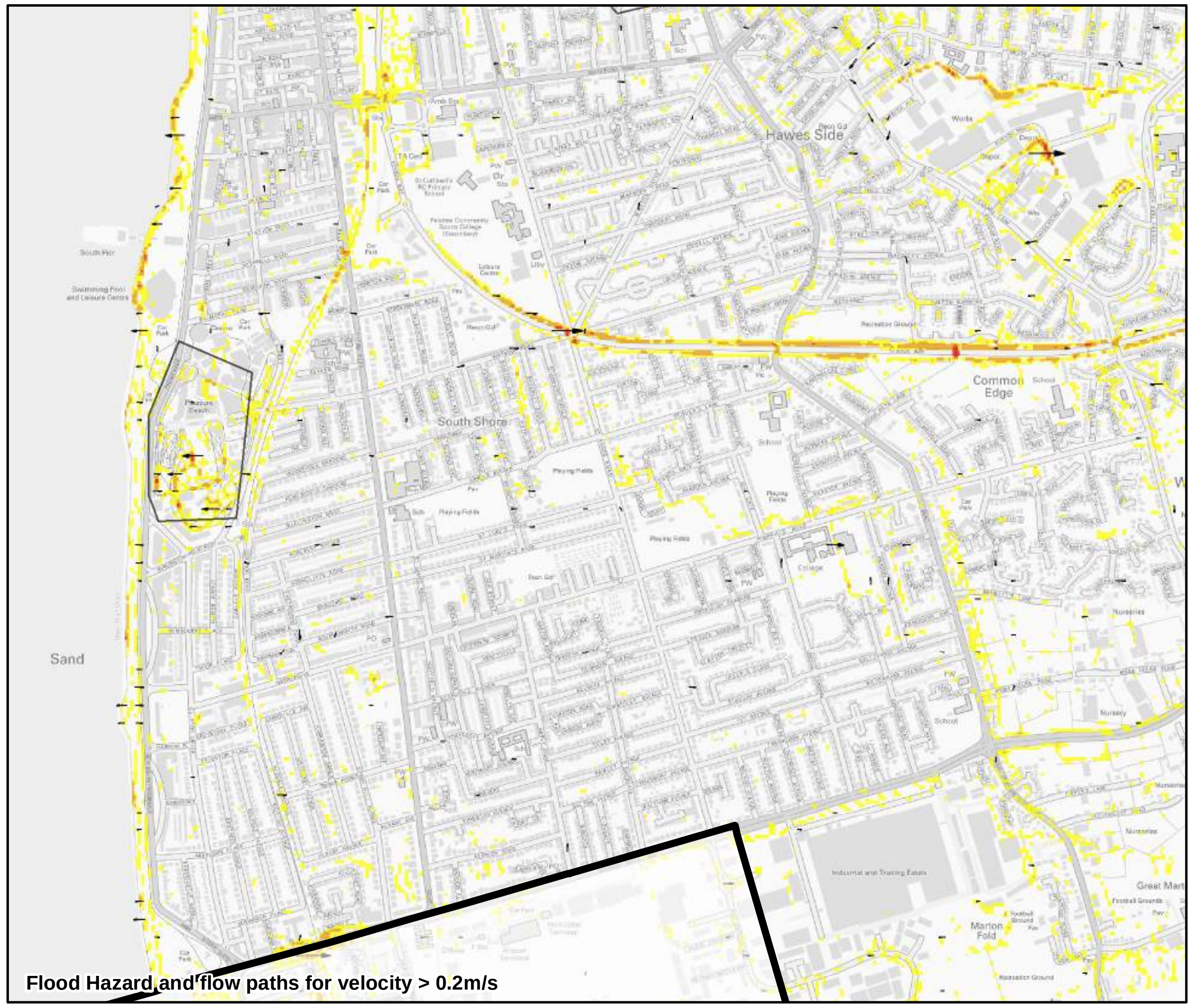
12/03/2013 13:35:41

MXD Location

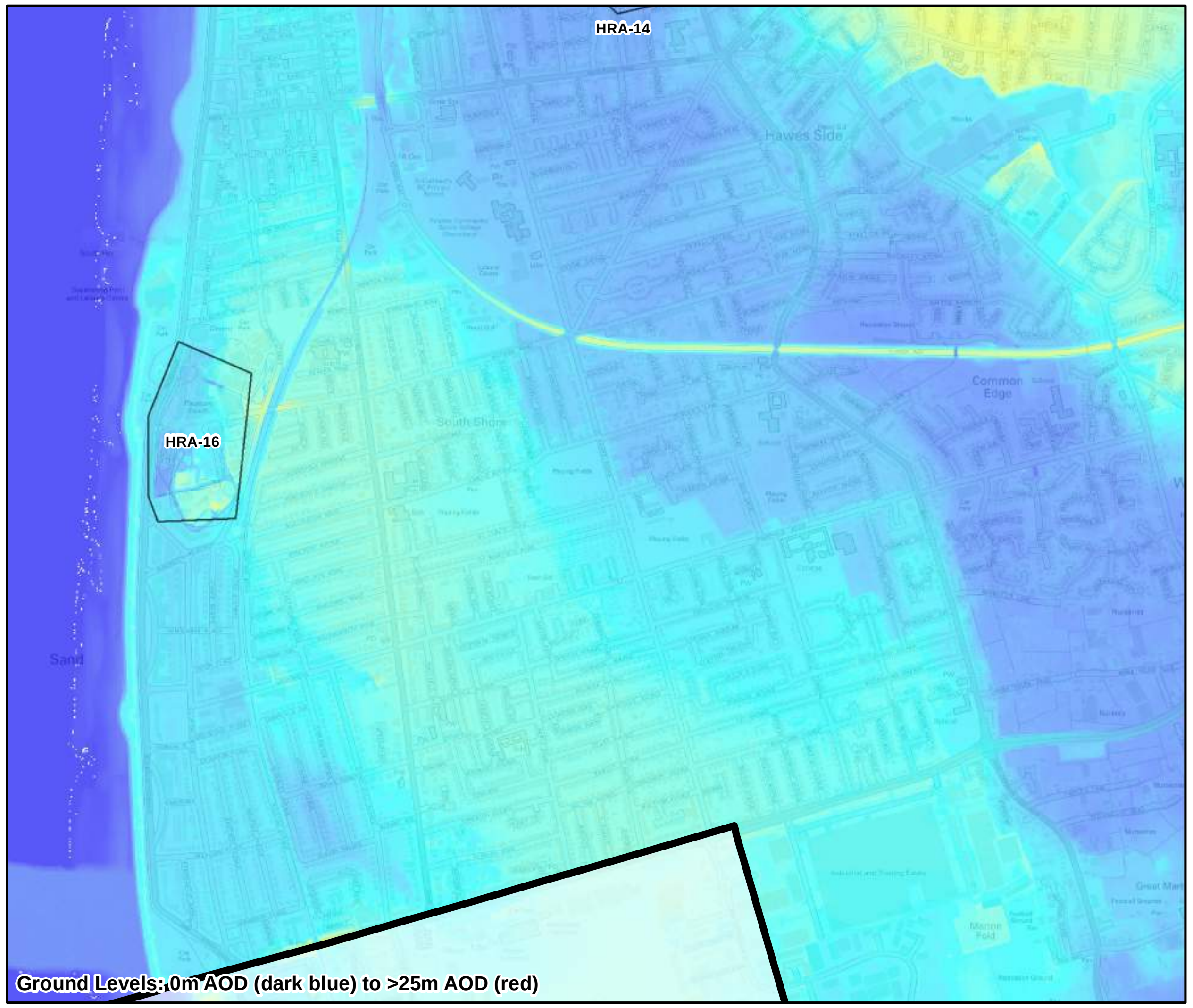
A3



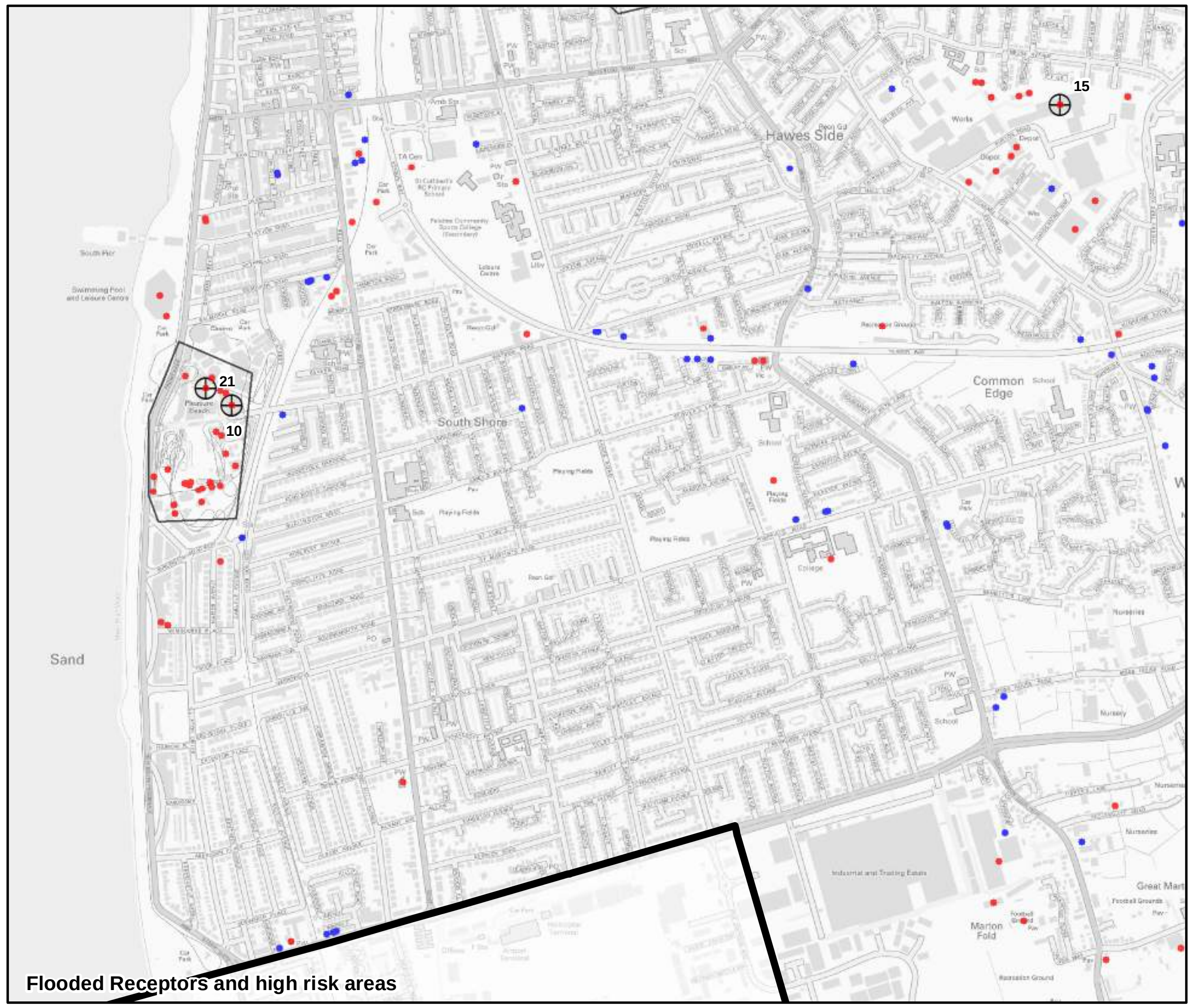
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

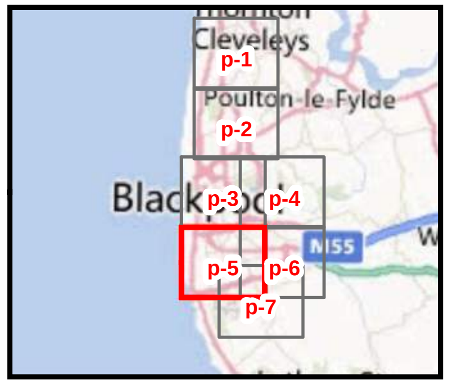
Blackpool Council boundary

5% (1 in 20yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 20yr)

- Critical Infrastructure
- Non Residential
- Residential
- Top25 damages labelled by rank
- High Risk Areas (based on 1 in 20 and 1 in 100yr)



D1	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 5% (1 in 20yr)

Scale at A3
1:20,000

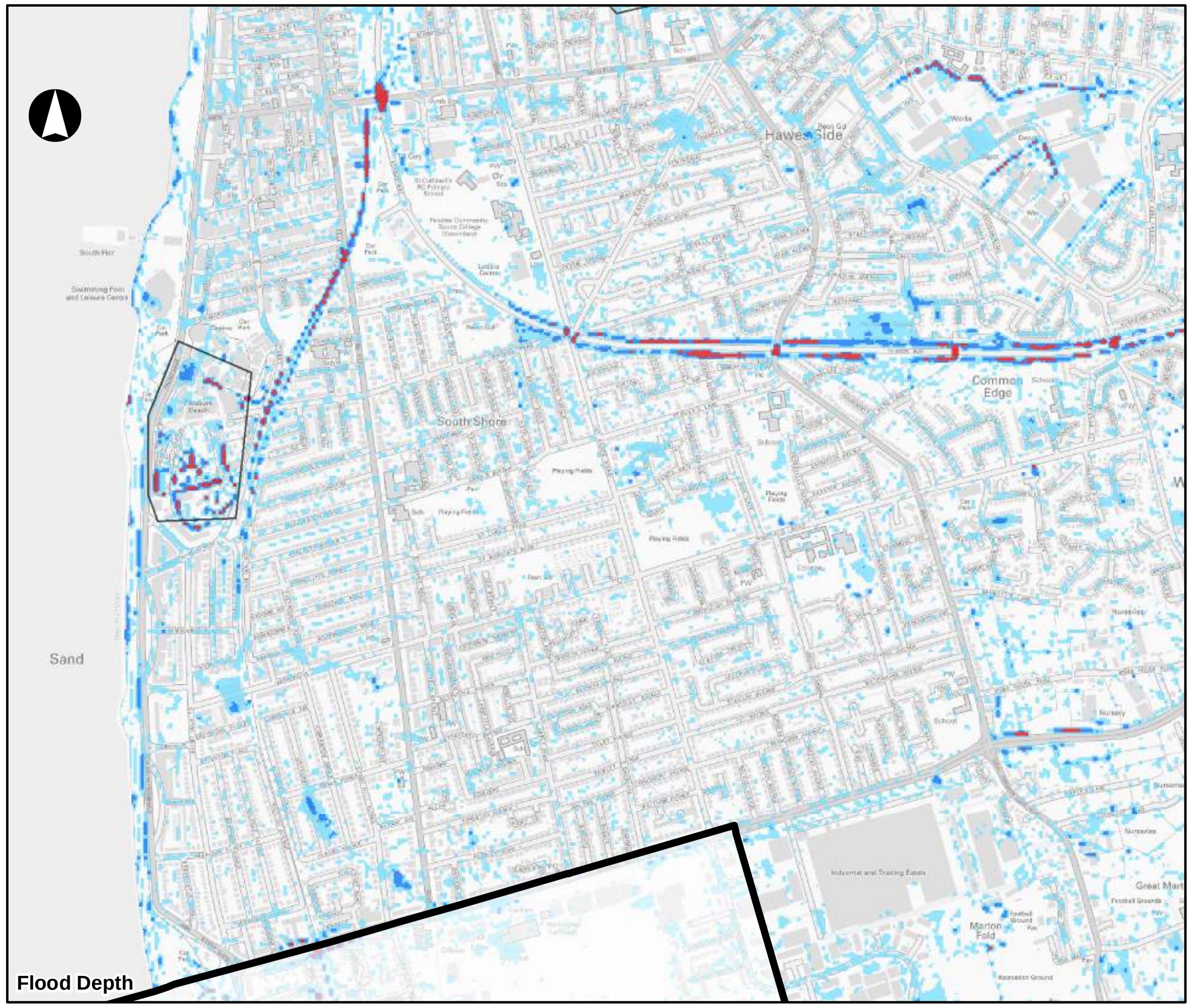
Job No	Drawing Status
227357	Draft

Drawing No	Issue
D5.1	D1

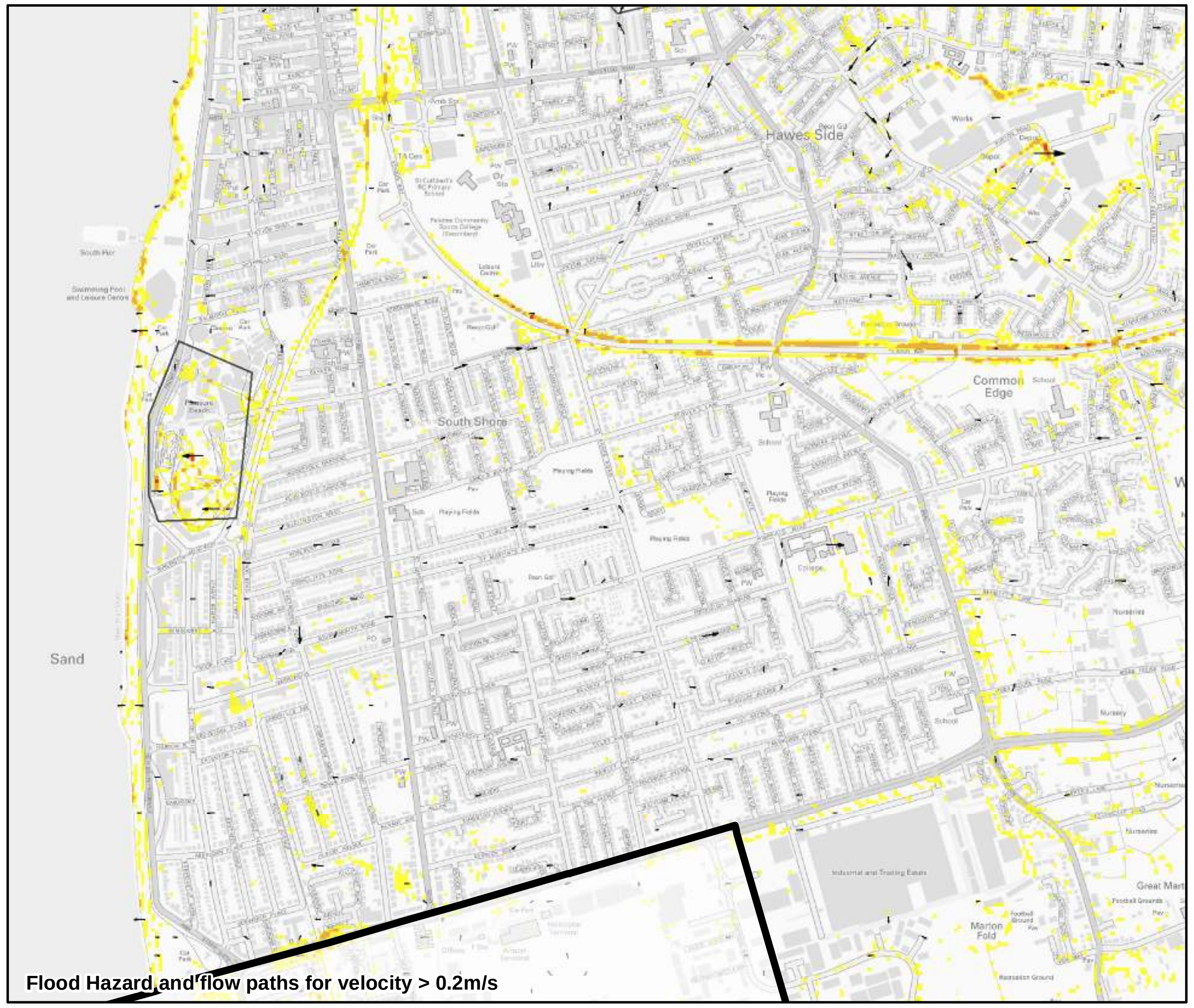
12/03/2013 13:35:58

MXD Location

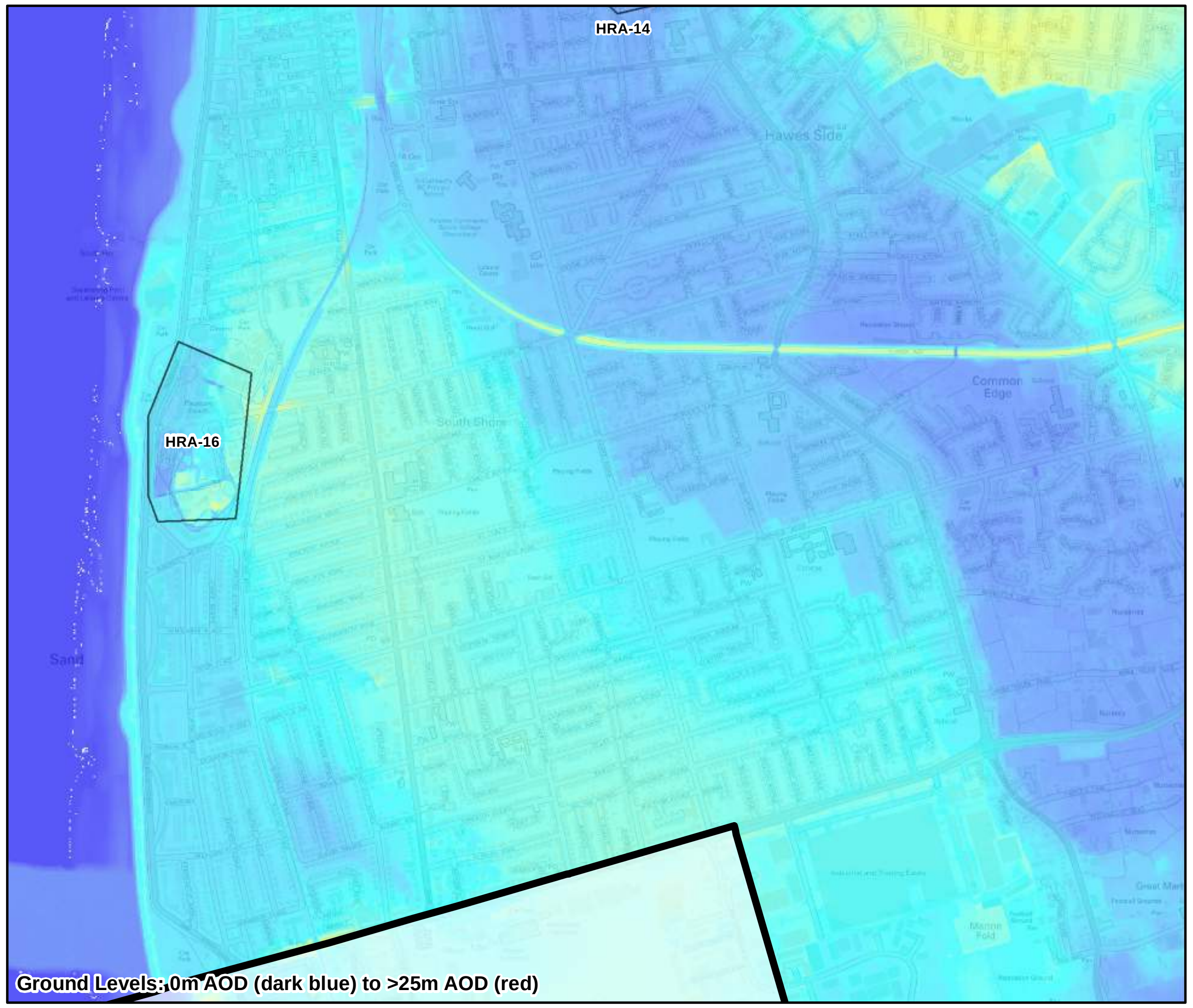
A3



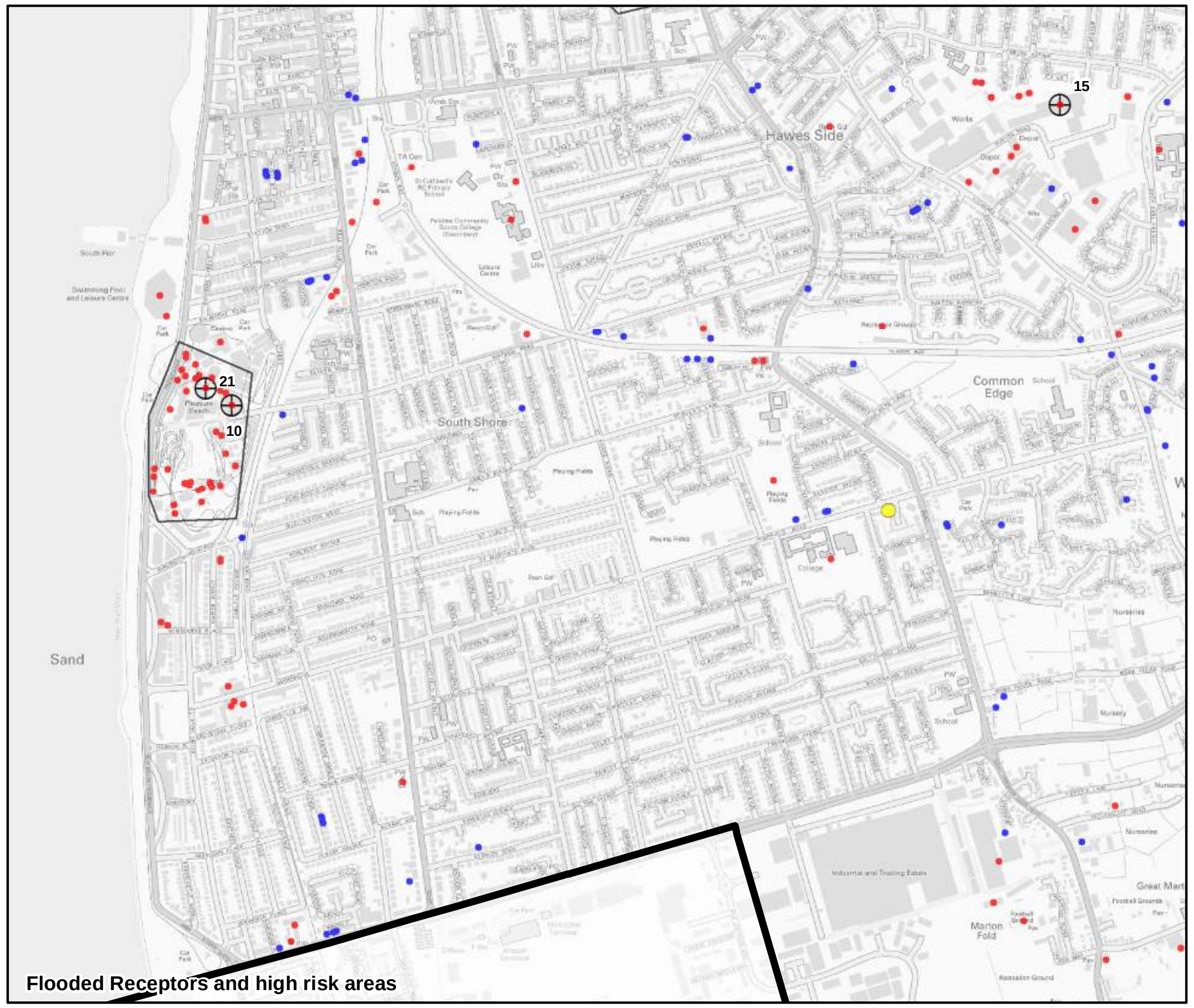
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

1% (1 in 100yr)

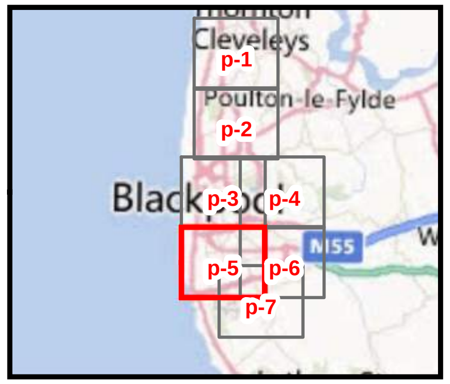
Flood depth (m)
- < 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- > 0.6

Flood Hazard Rating
- Danger to some
- Danger for most
- Danger to all

Flooded Receptors (1 in 100yr)
- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres: 0, 270, 540, 1,080

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Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 1% (1 in 100yr)

Scale at A3: 1:20,000

Job No: 227357

Drawing Status: Draft

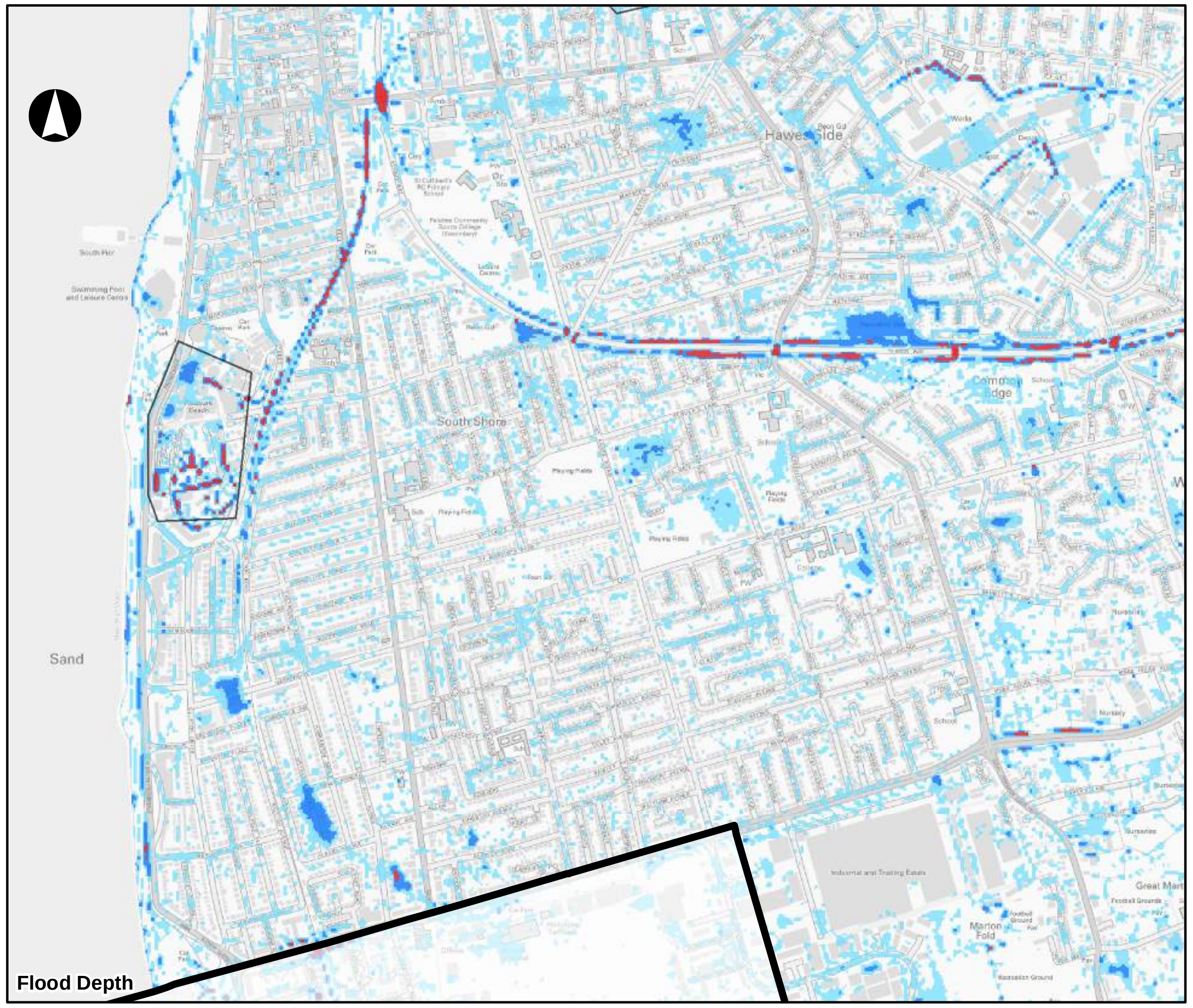
Drawing No: D5.2

Issue: P0

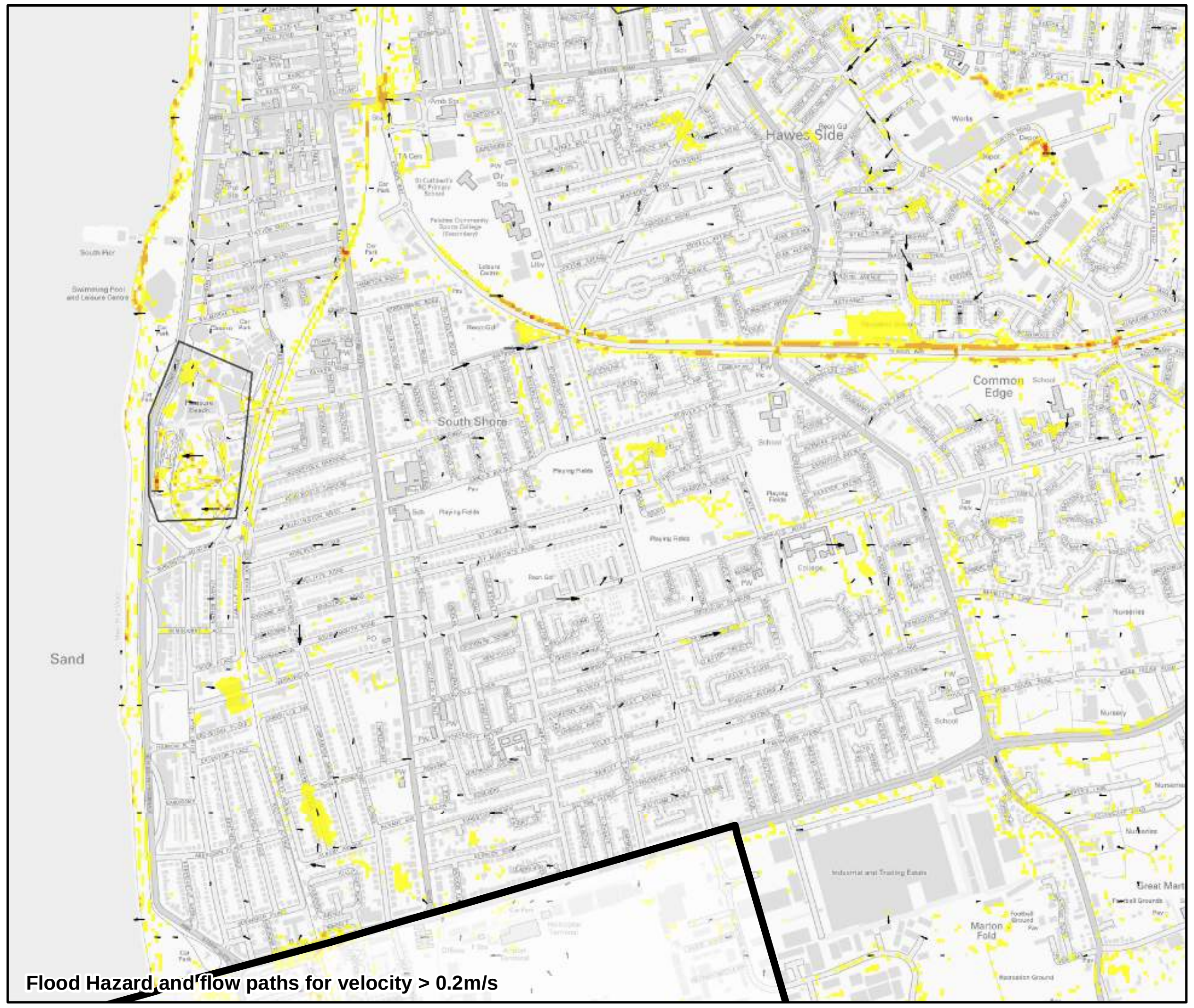
12/03/2013 13:36:10

MXD Location

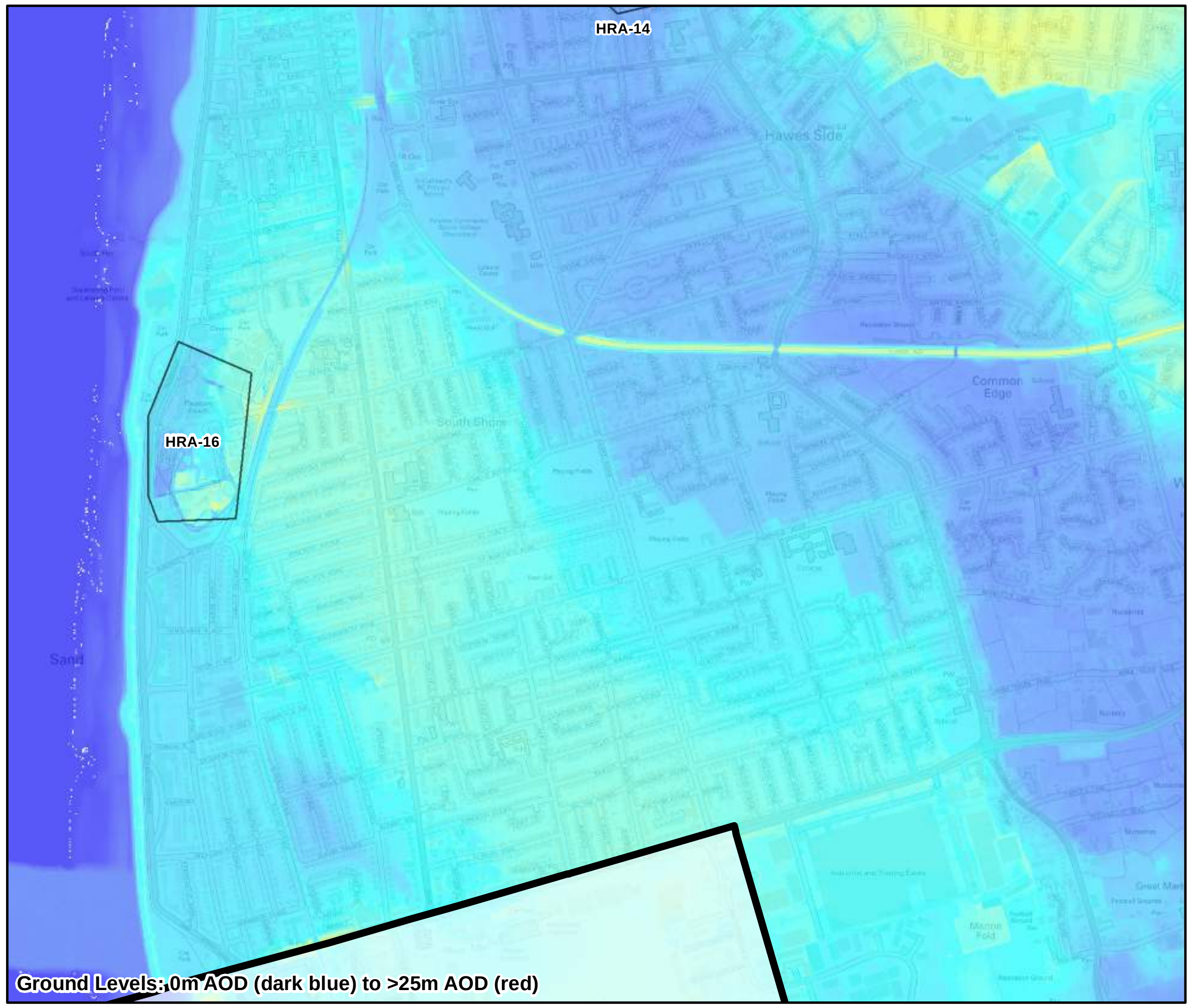
A3



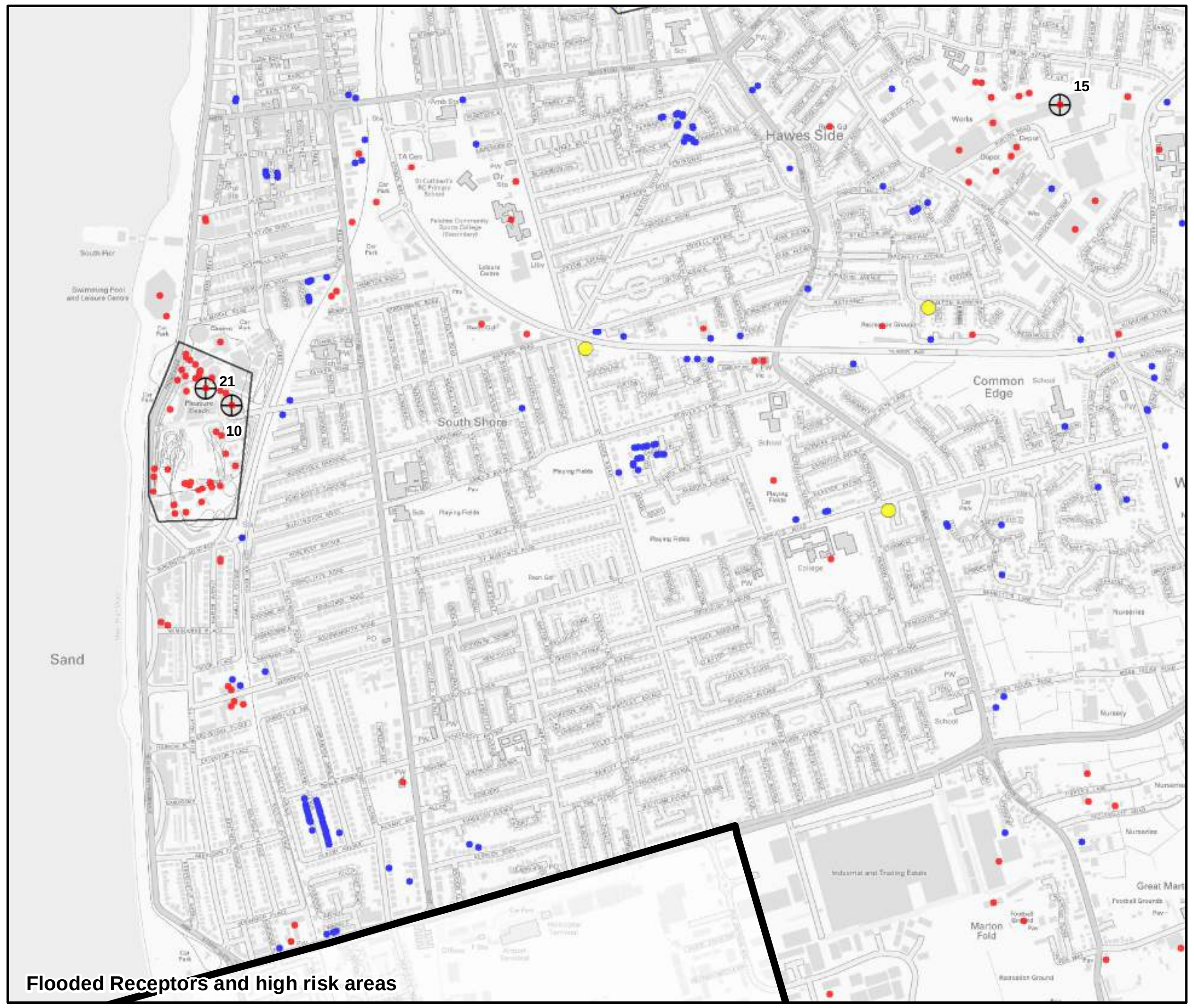
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

1% (1 in 100yr) future scenario

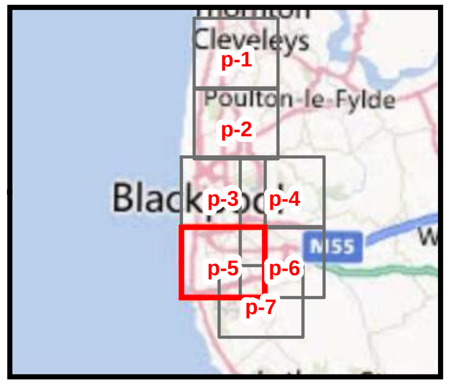
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr) future scenario

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors Future scenario 1% (1 in 100yr)

Scale at A3
1:20,000

Job No
227357

Drawing Status
Draft

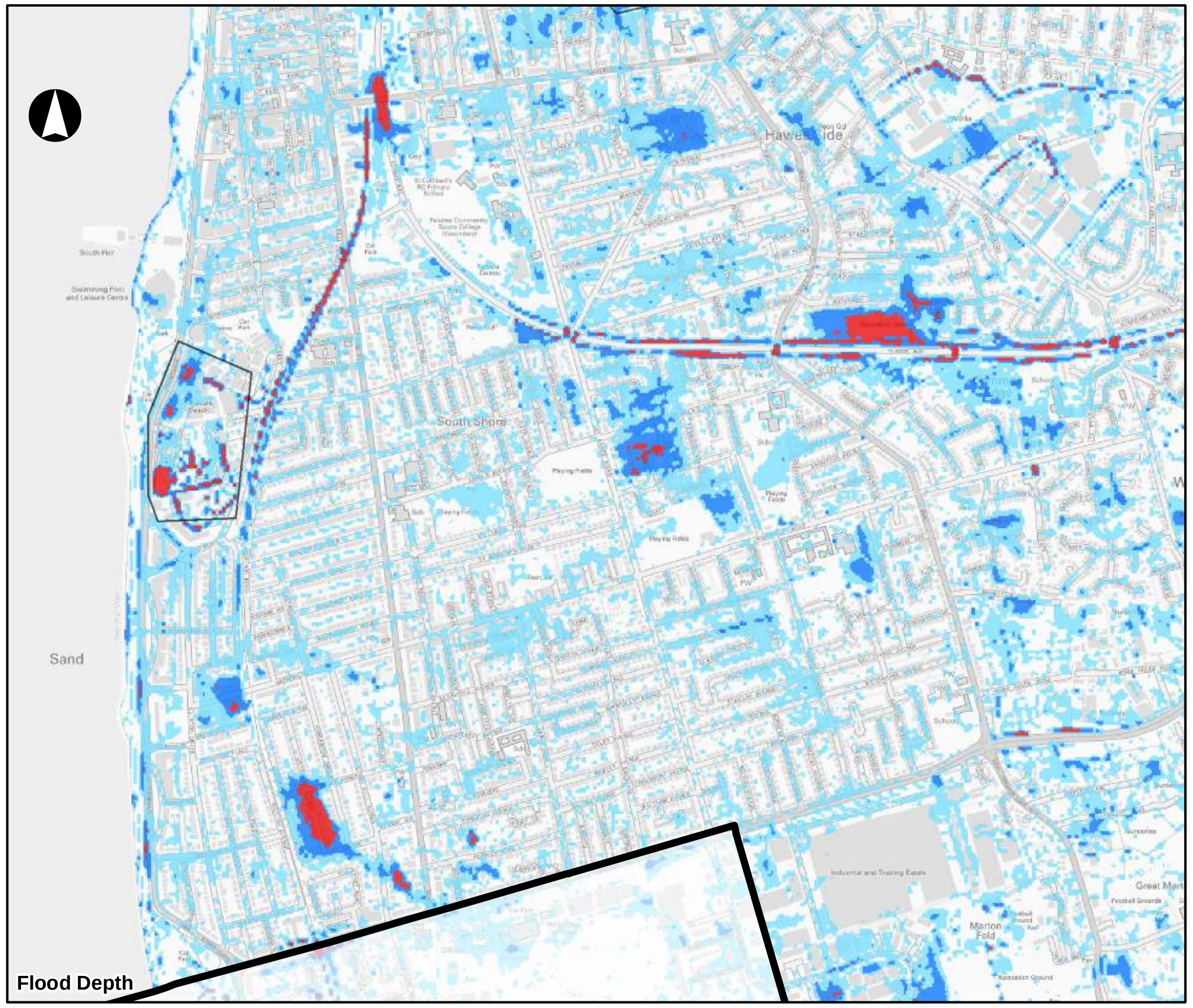
Drawing No
D5.3

Issue
P0

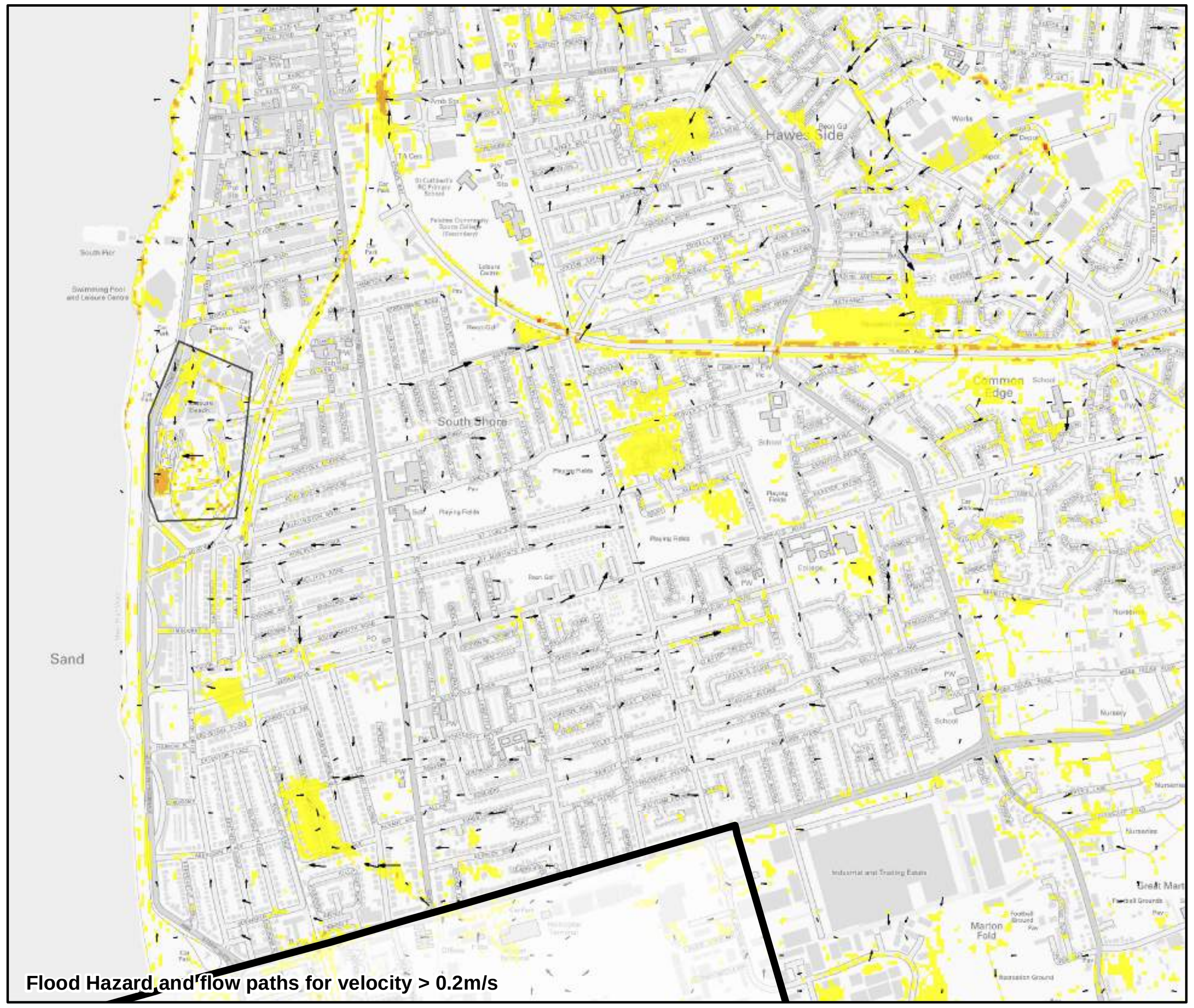
12/03/2013 13:36:20

MXD Location

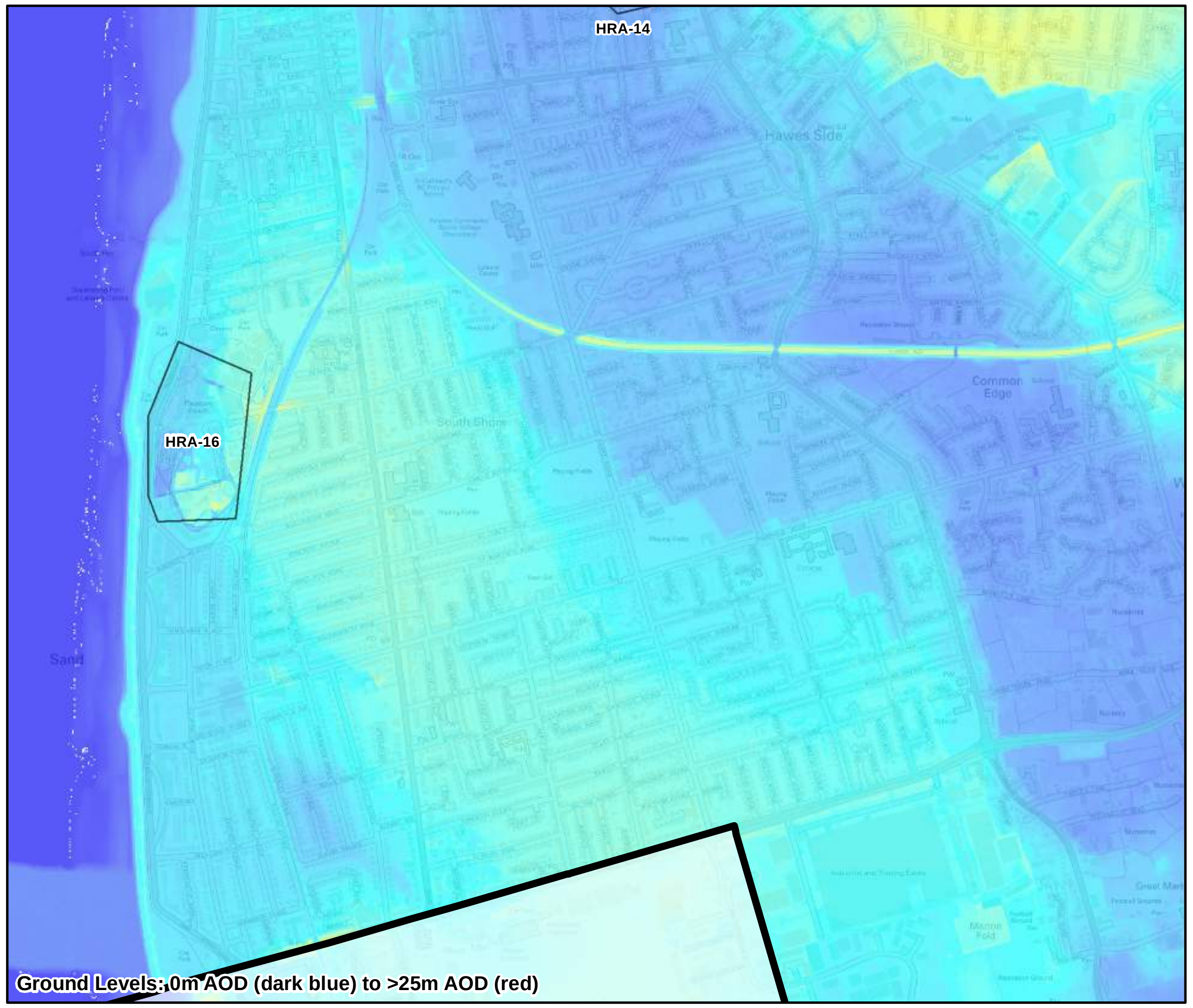
A3



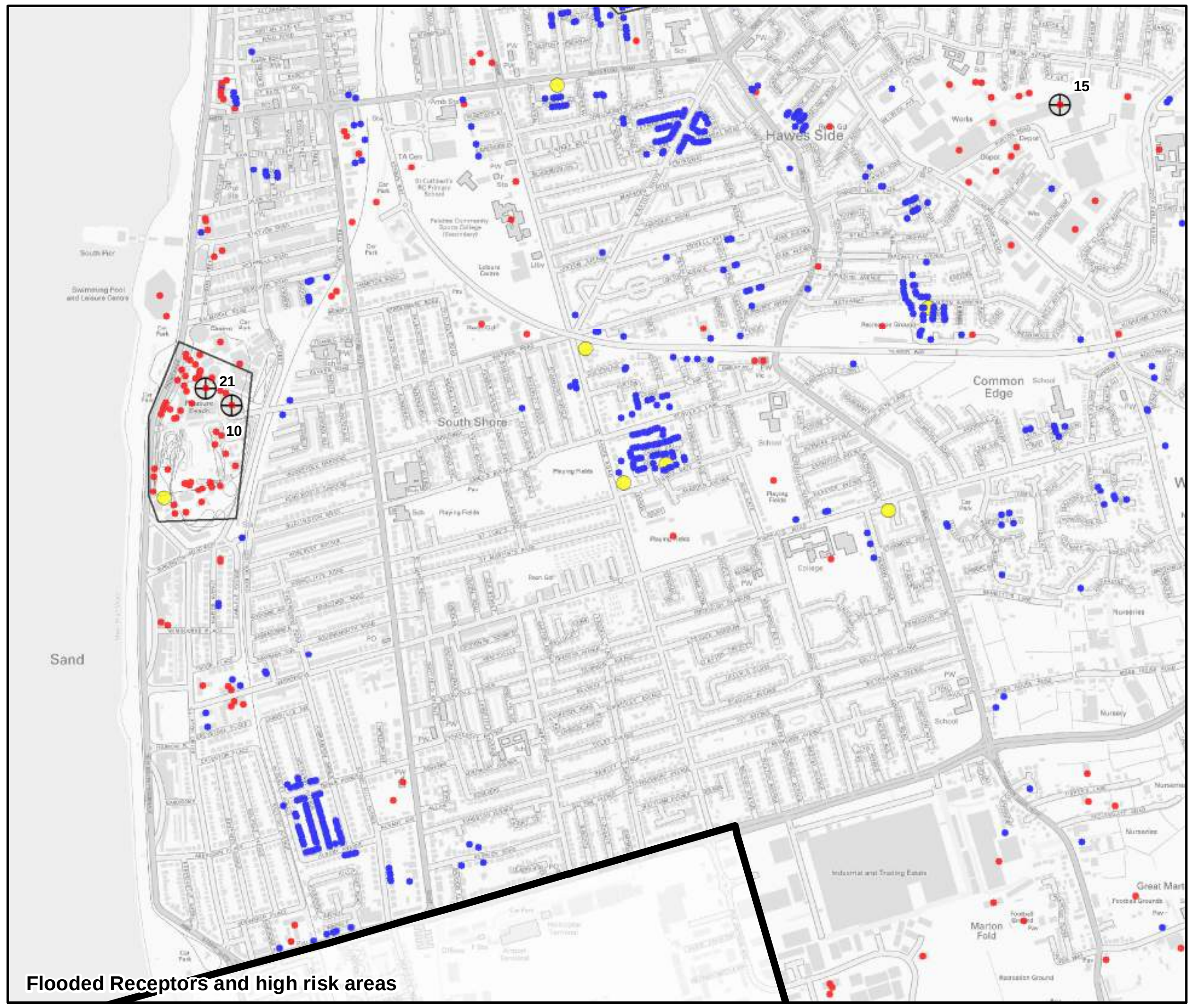
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

0.1% (1 in 1000yr)

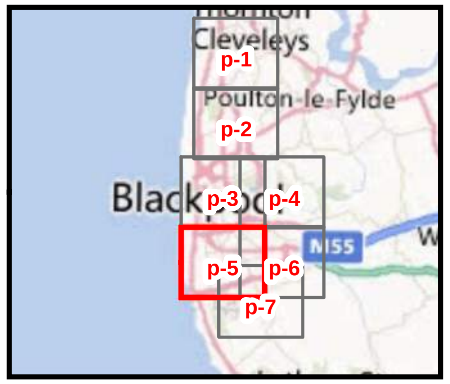
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 1000yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

ARUP

Rose Wharf 78 East Street
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www.arup.com

Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 0.1% (1 in 1000yr)

Scale at A3
1:20,000

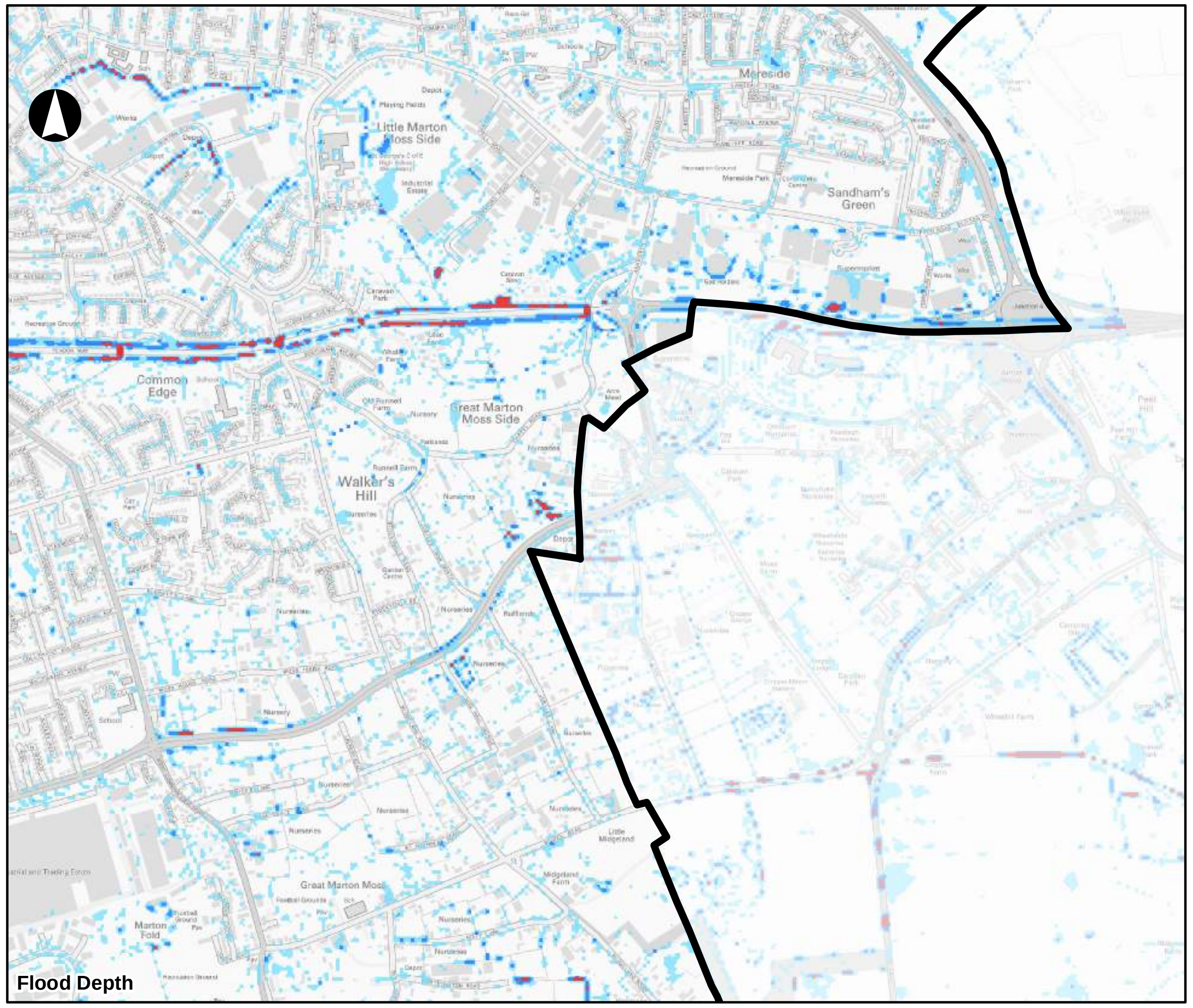
Job No	Drawing Status
227357	Draft

Drawing No	Issue
D5.4	P0

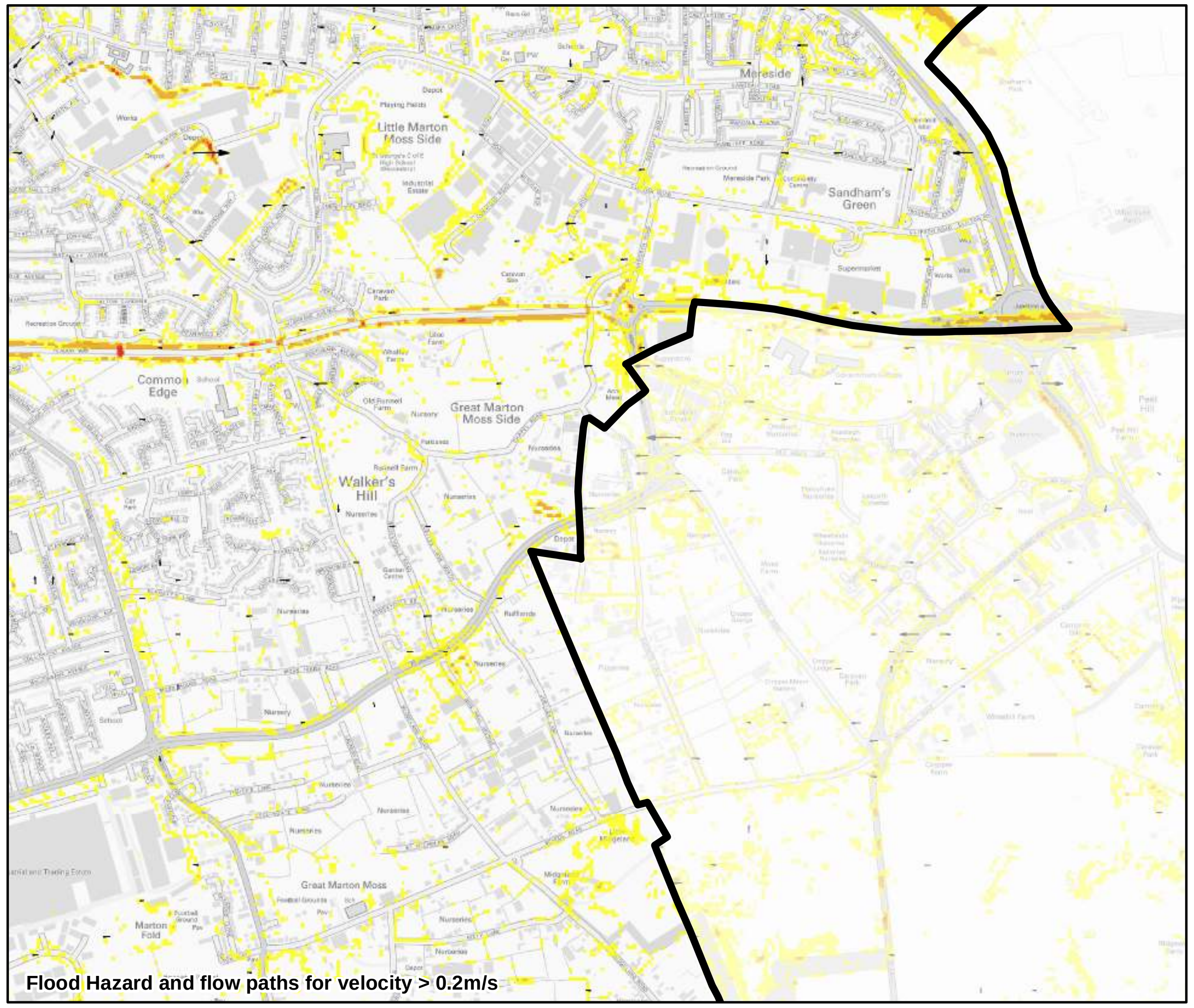
12/03/2013 13:36:31

MXD Location

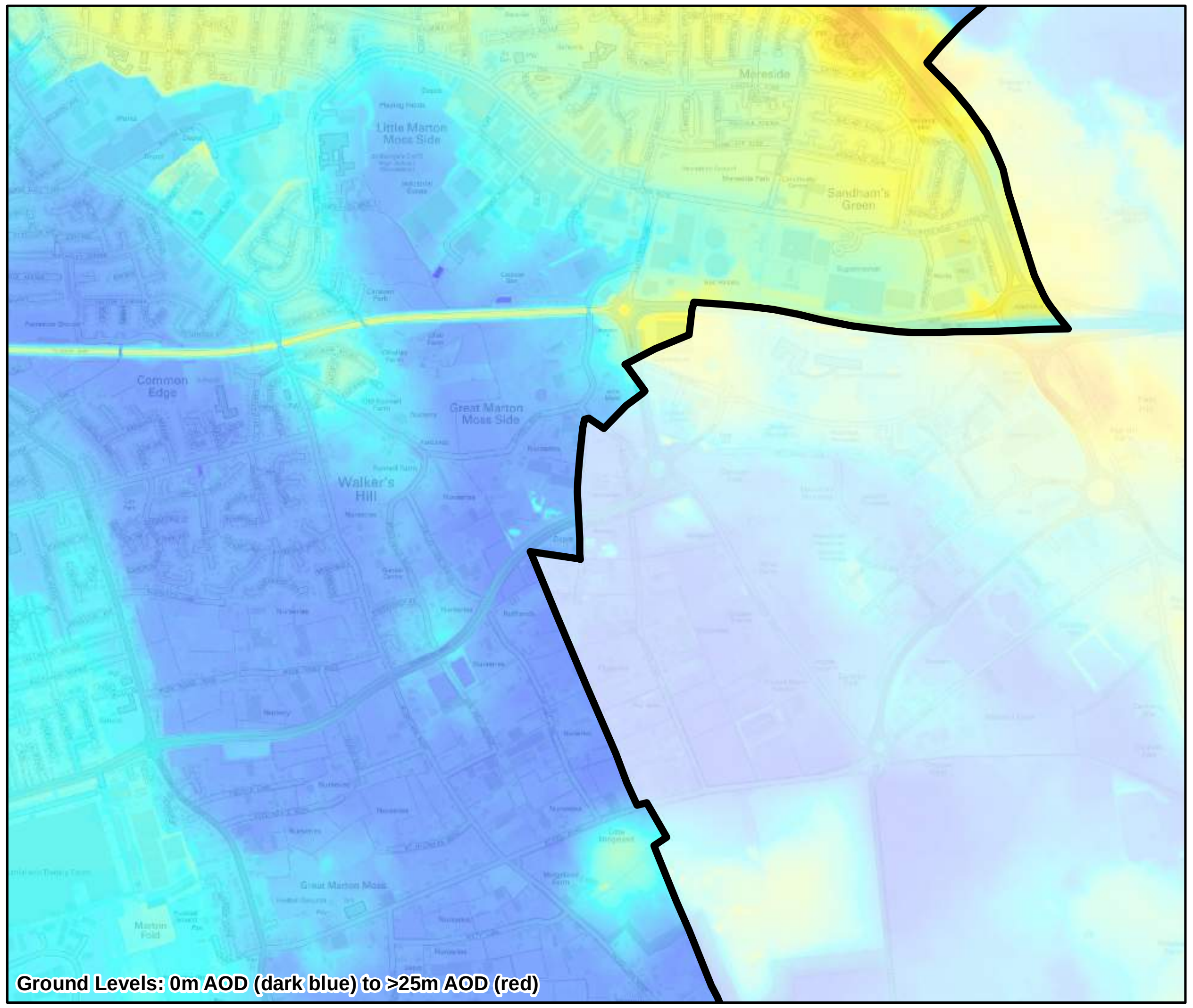
A3



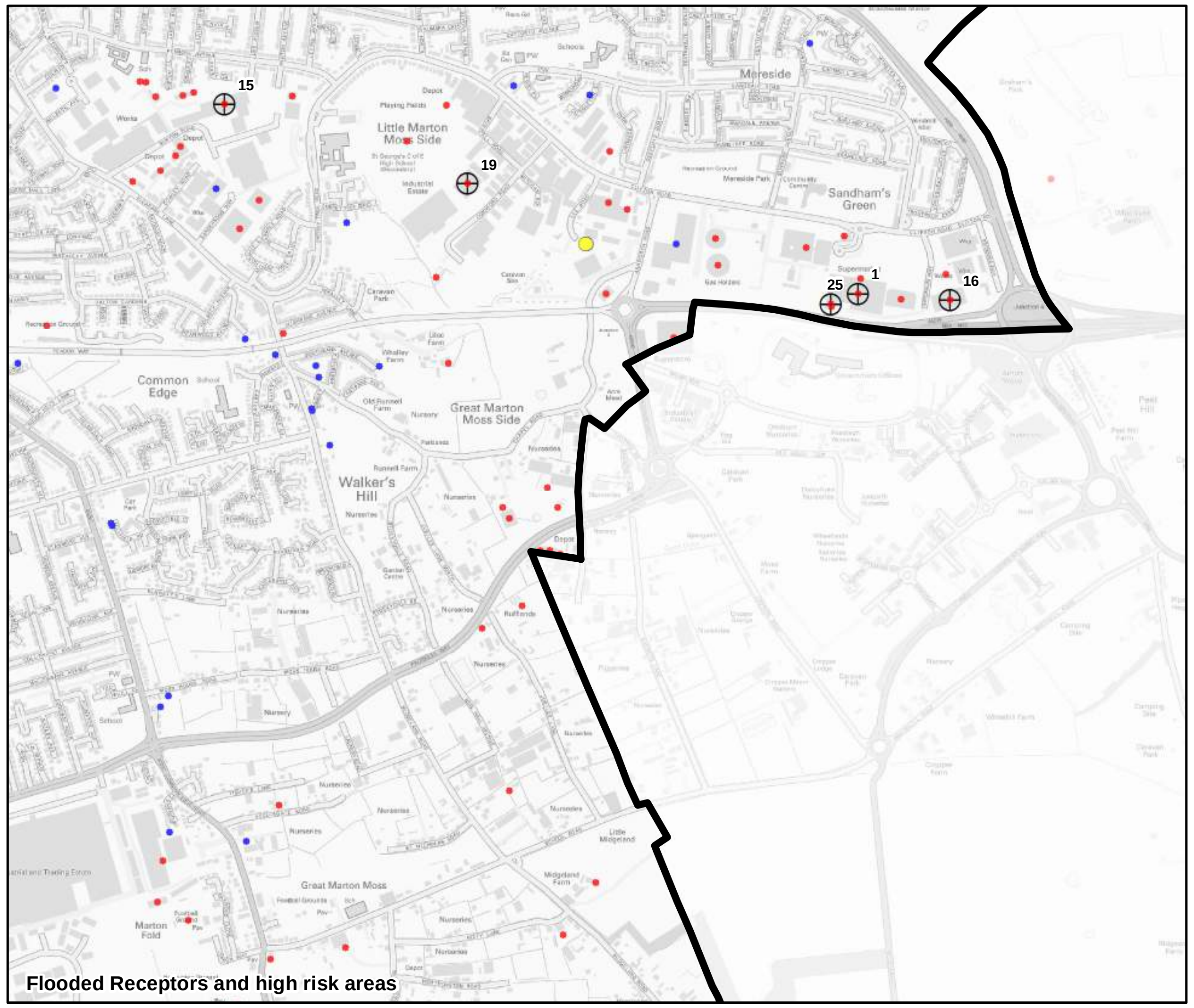
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

5% (1 in 20yr)

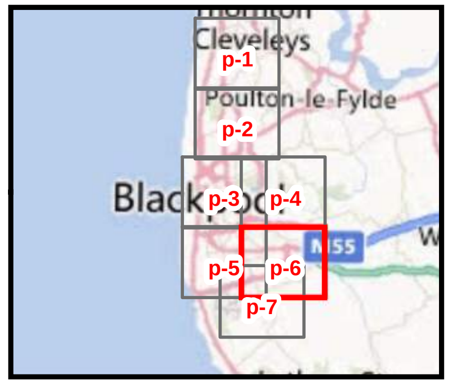
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 20yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



D1	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 5% (1 in 20yr)

Scale at A3
1:20,000

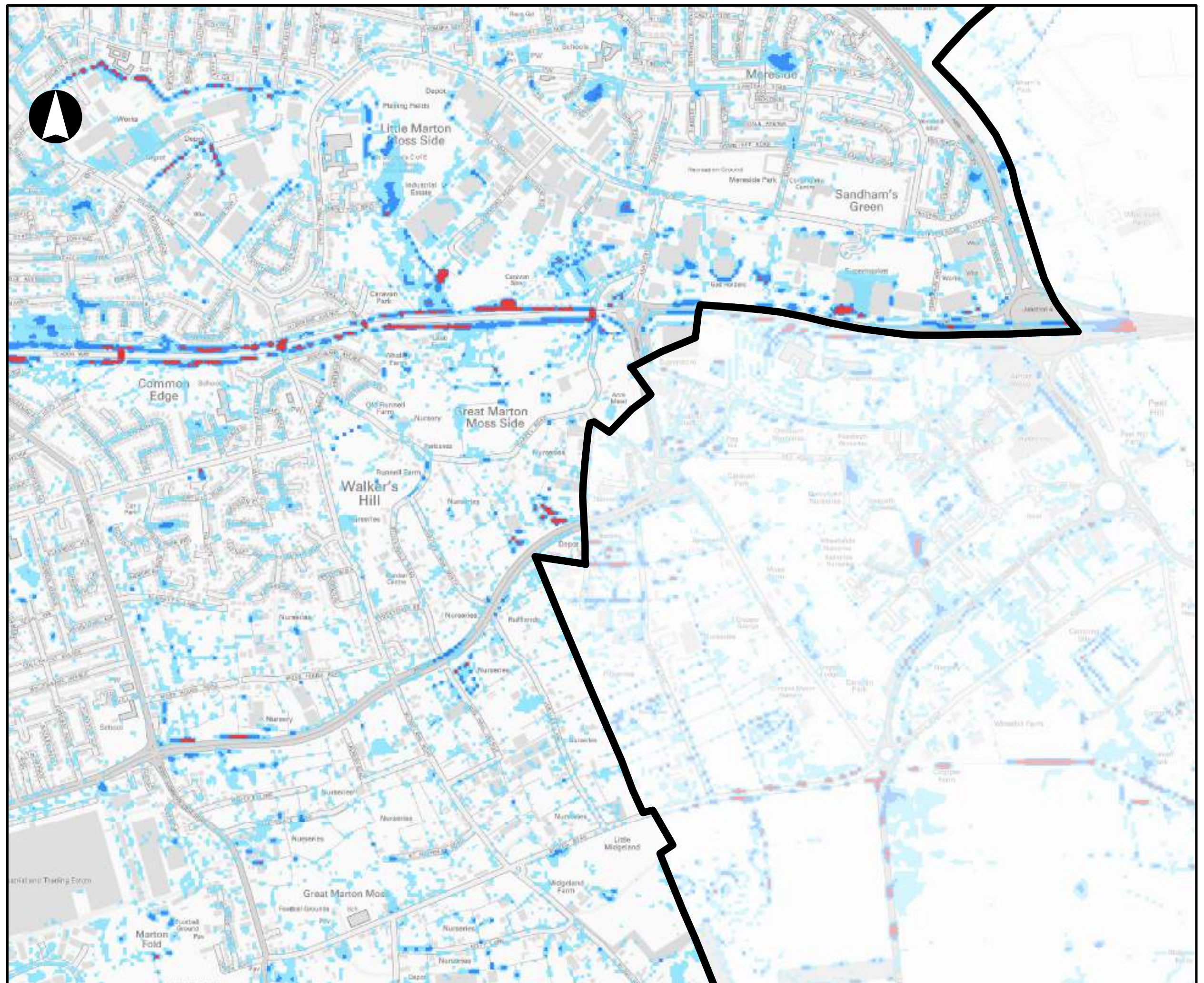
Job No 227357
Drawing Status Draft

Drawing No D6.1
Issue D1

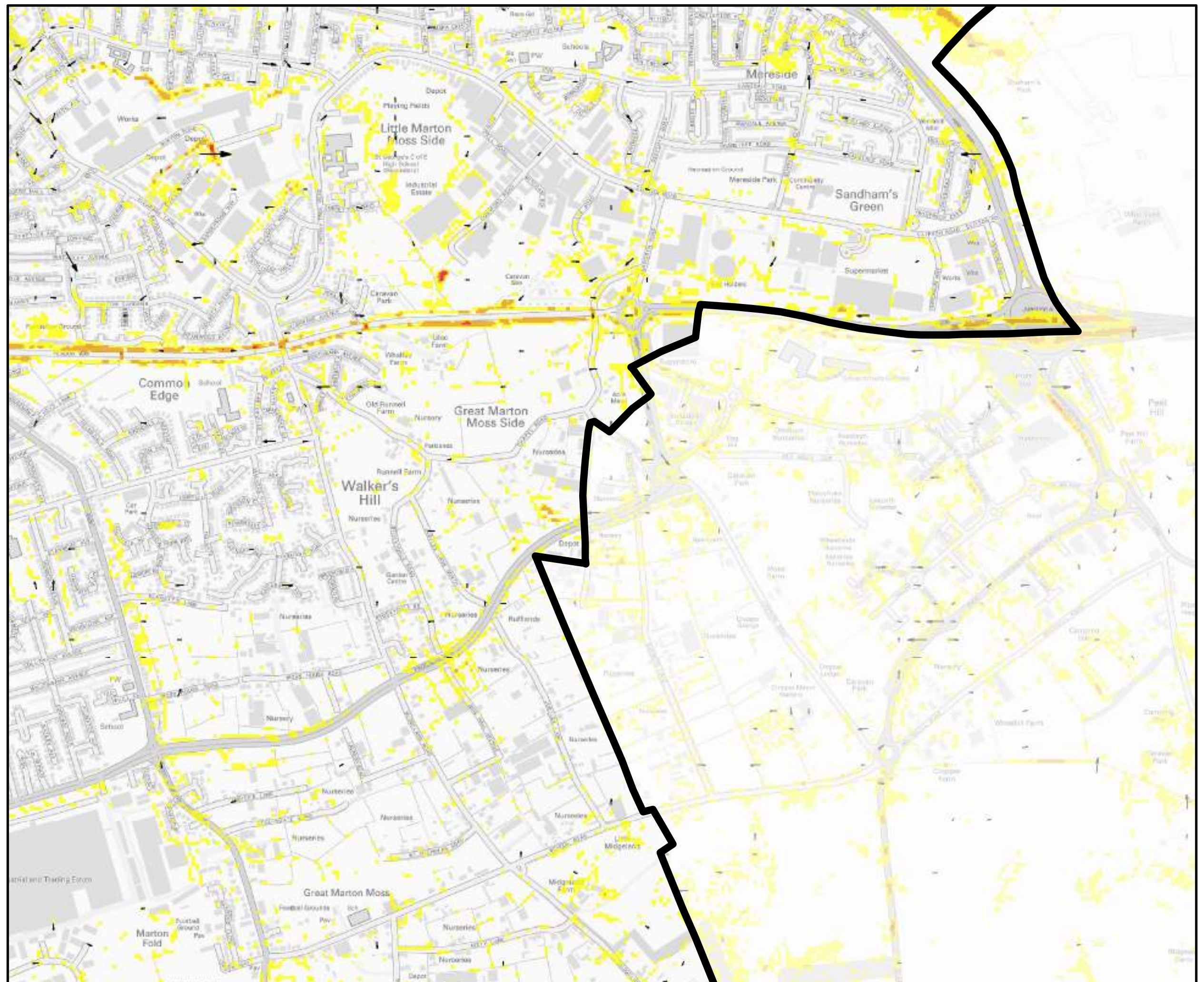
12/03/2013 13:36:43

MXD Location

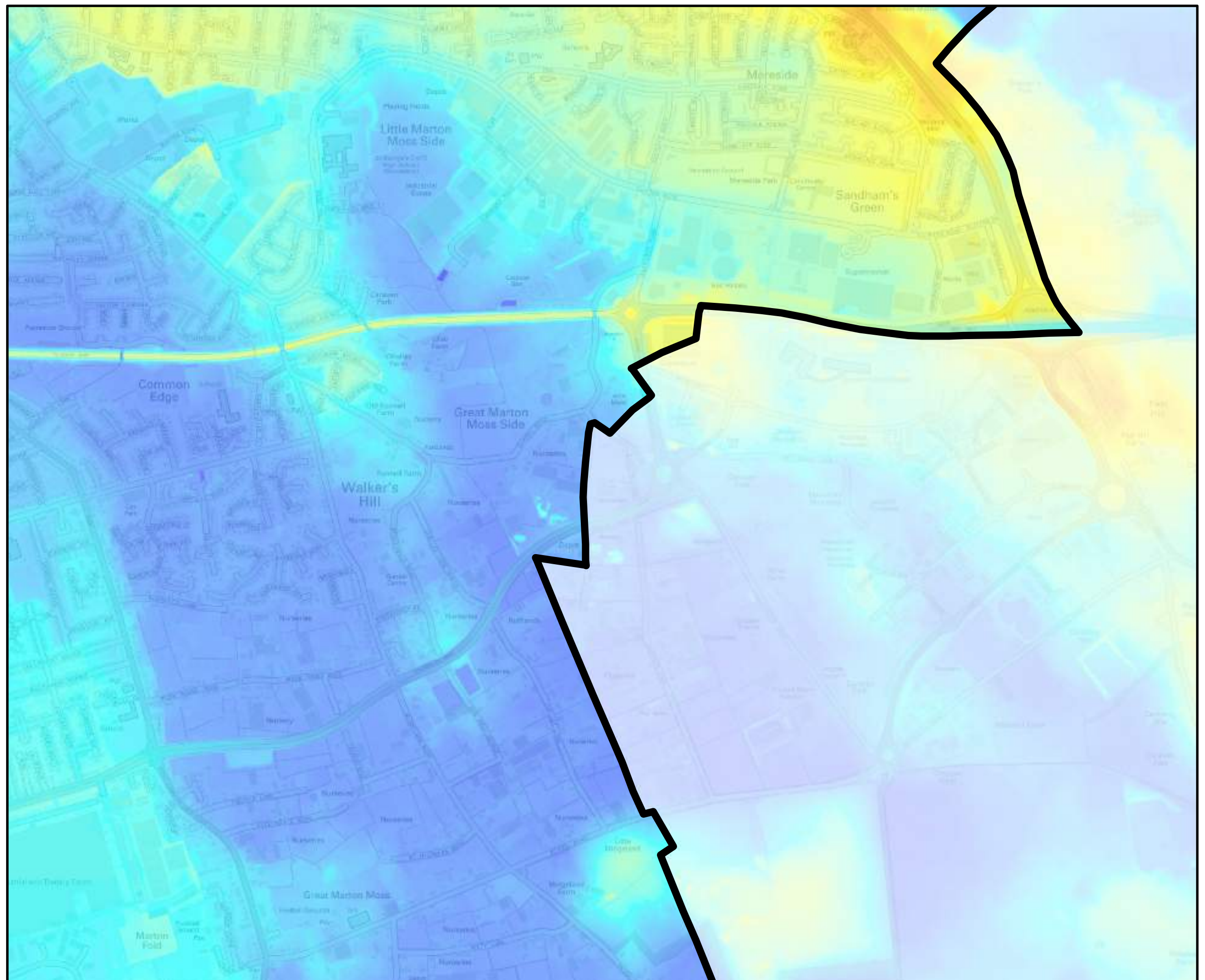
A3



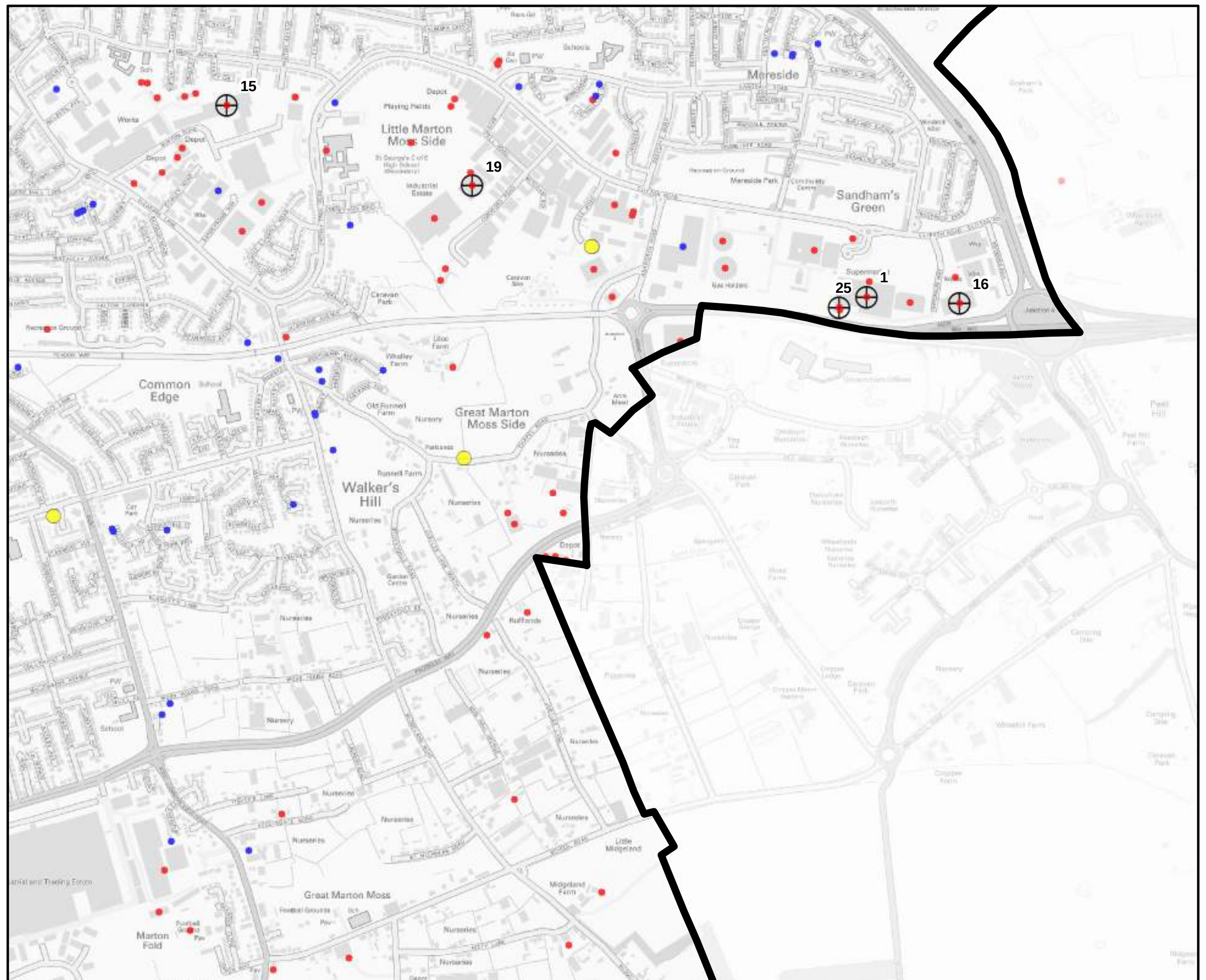
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

1% (1 in 100yr)

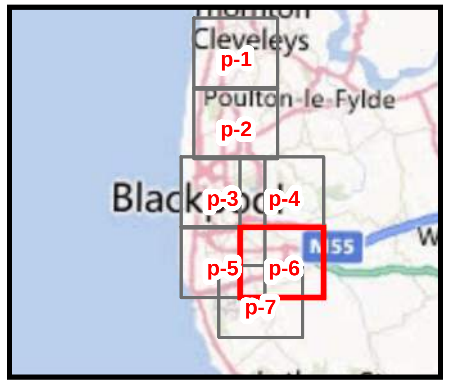
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



12/03/2013 13:36:57

P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 1% (1 in 100yr)

Scale at A3

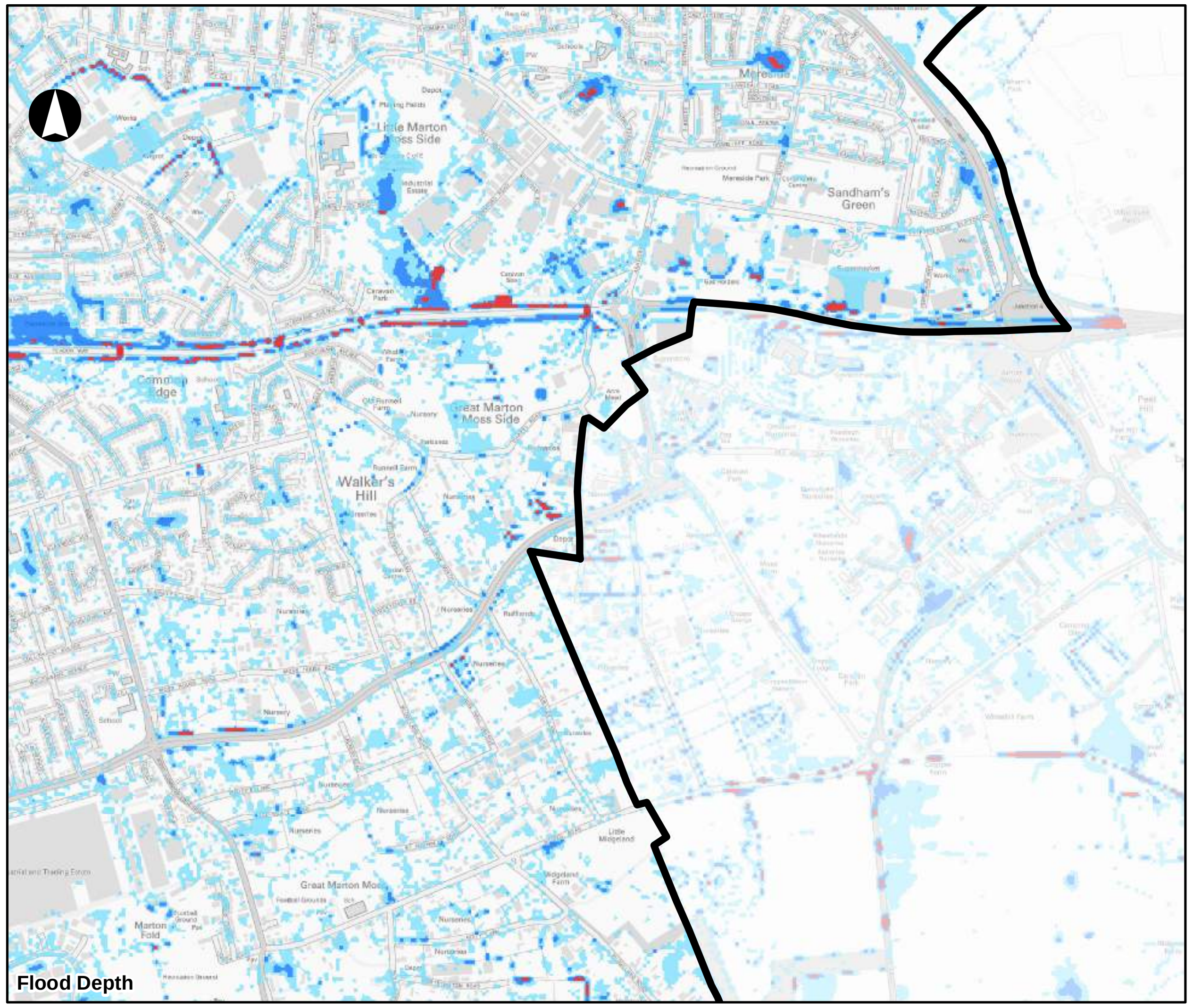
1:20,000

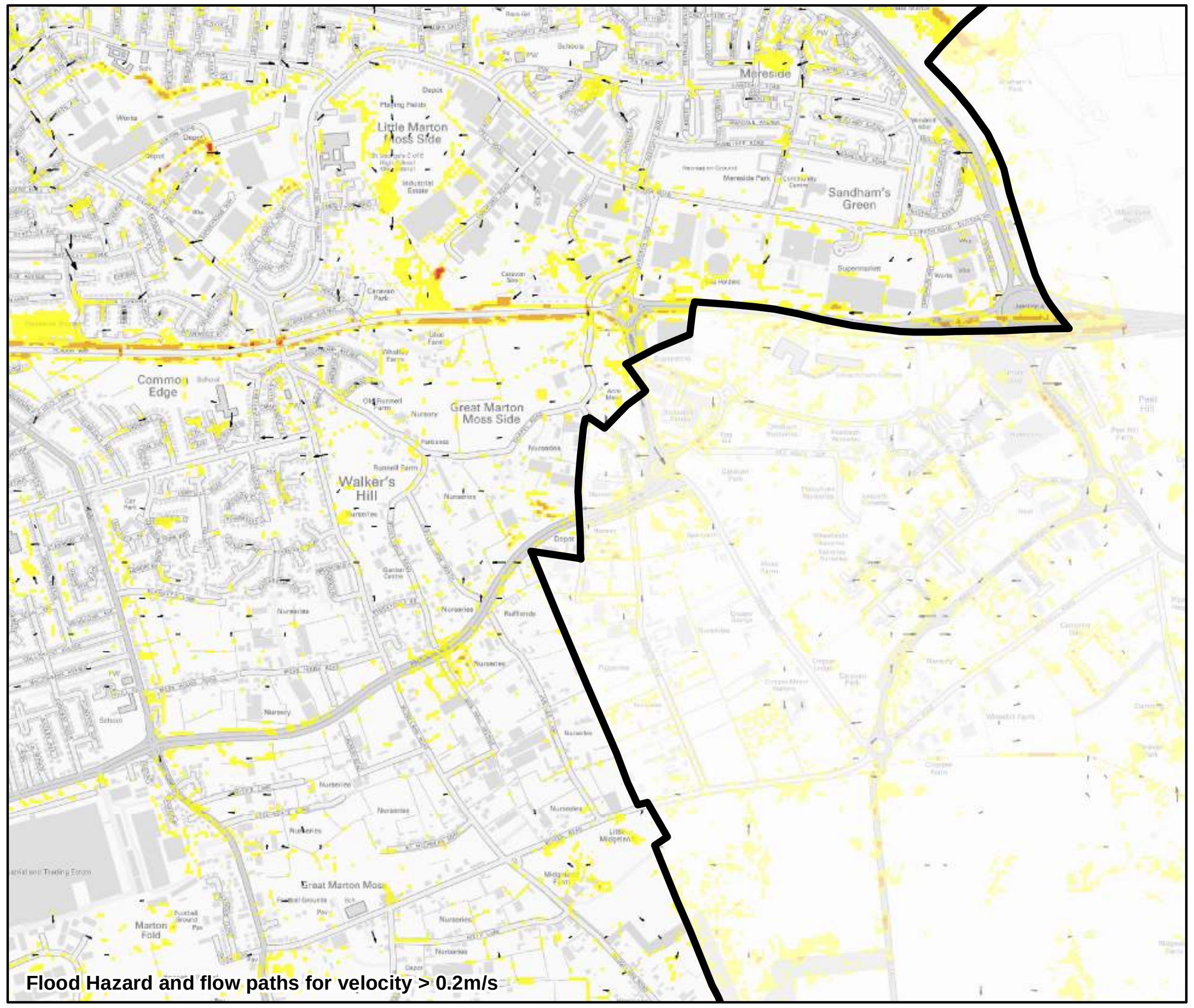
Job No	Drawing Status
227357	Draft

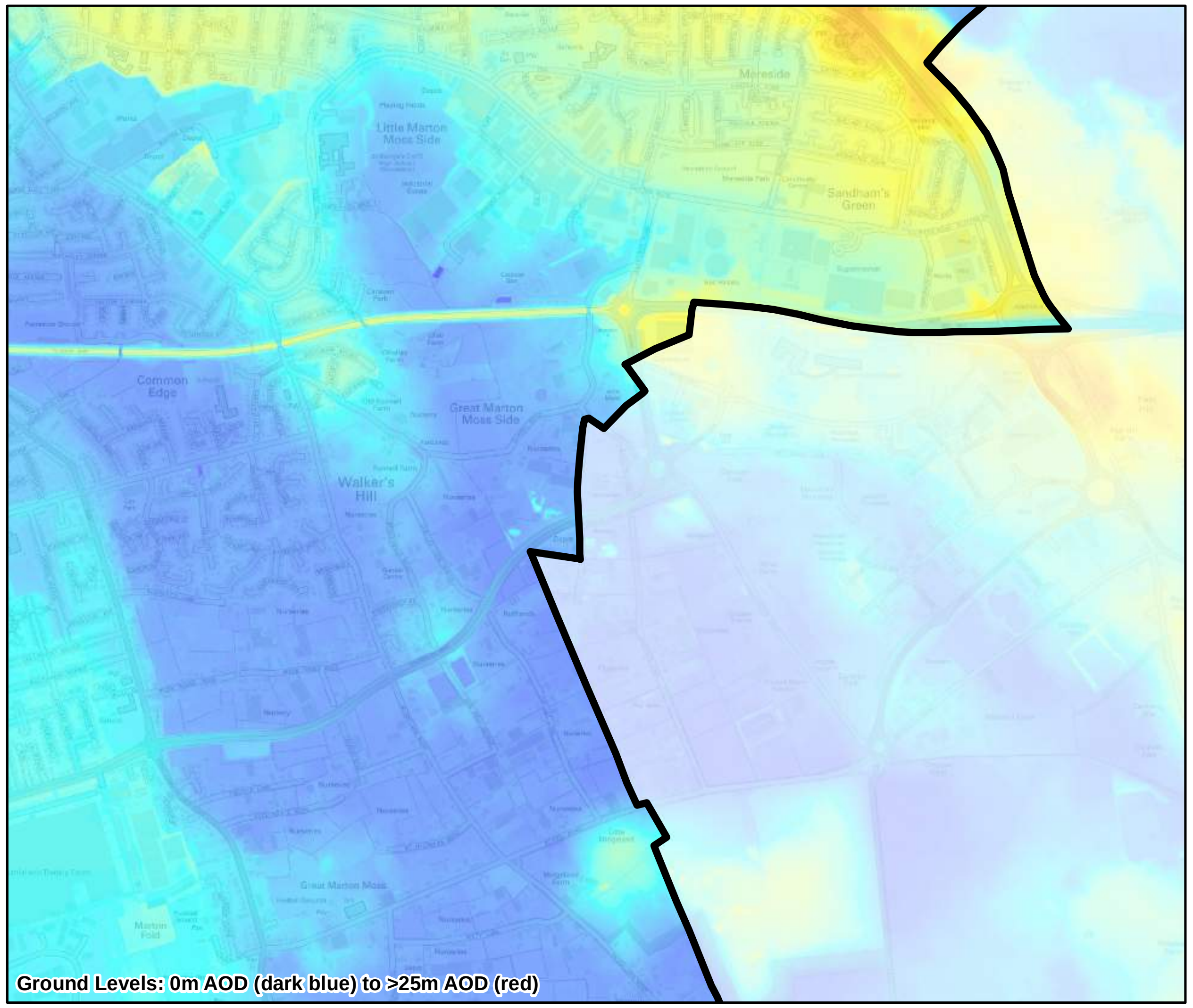
Drawing No	Issue
D6.2	P0

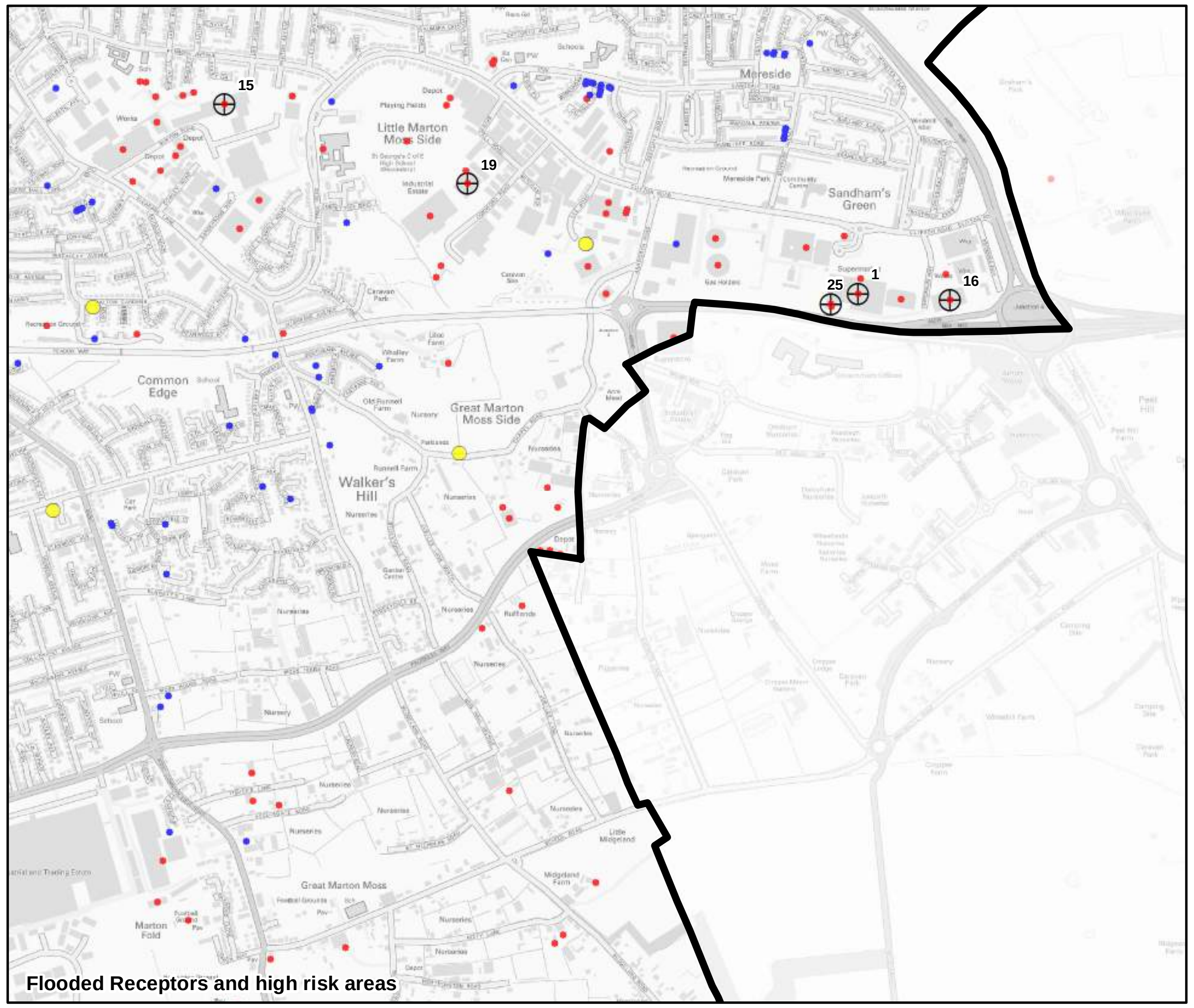
MXD Location

A3









Legend

Blackpool Council boundary

1% (1 in 100yr) future scenario

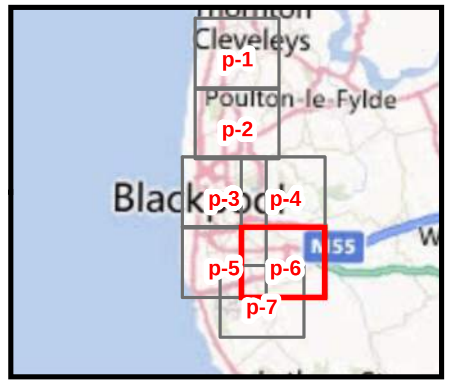
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr) future scenario

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors Future scenario 1% (1 in 100yr)

Scale at A3
1:20,000

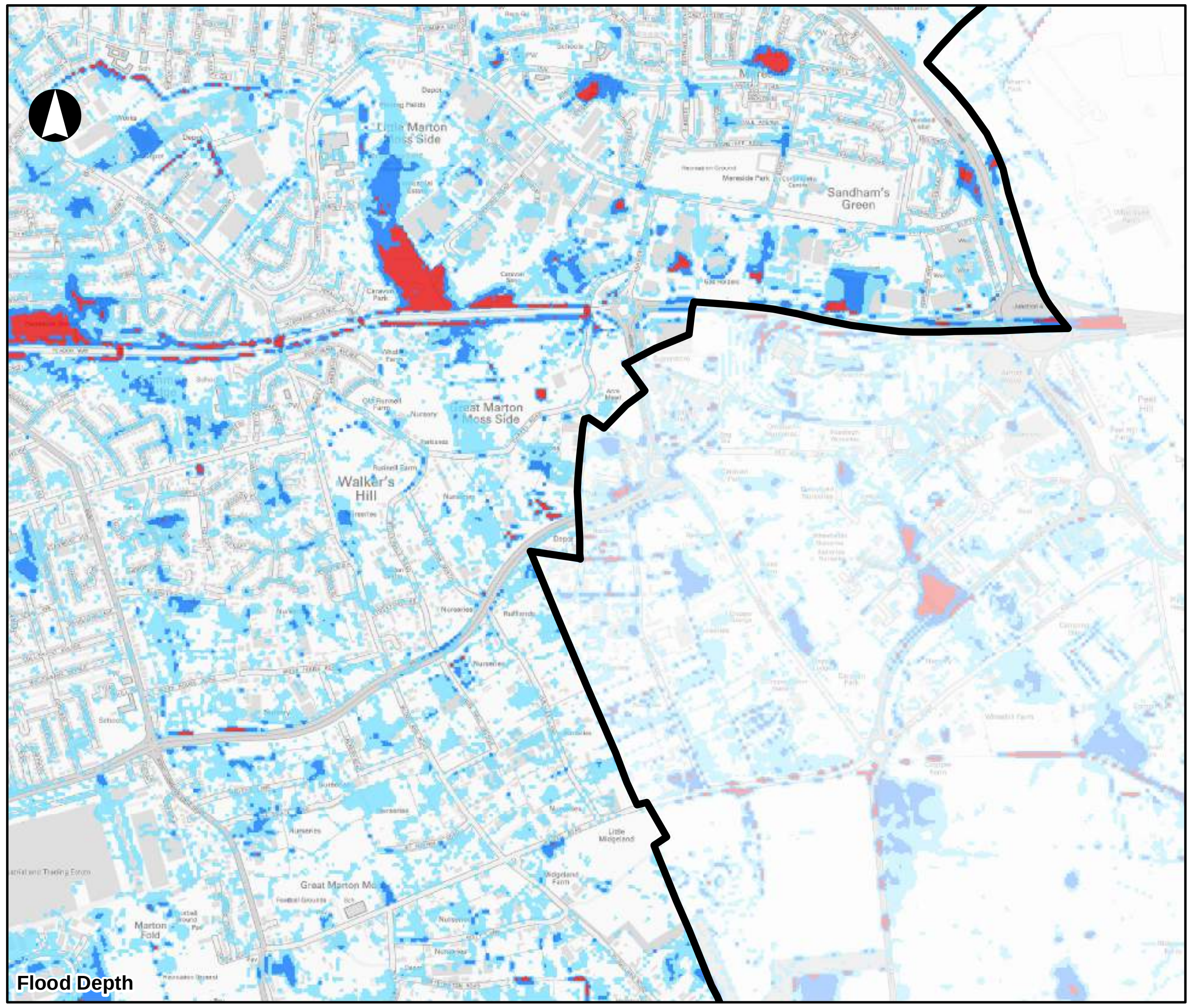
Job No	Drawing Status
227357	Draft

Drawing No	Issue
D6.3	P0

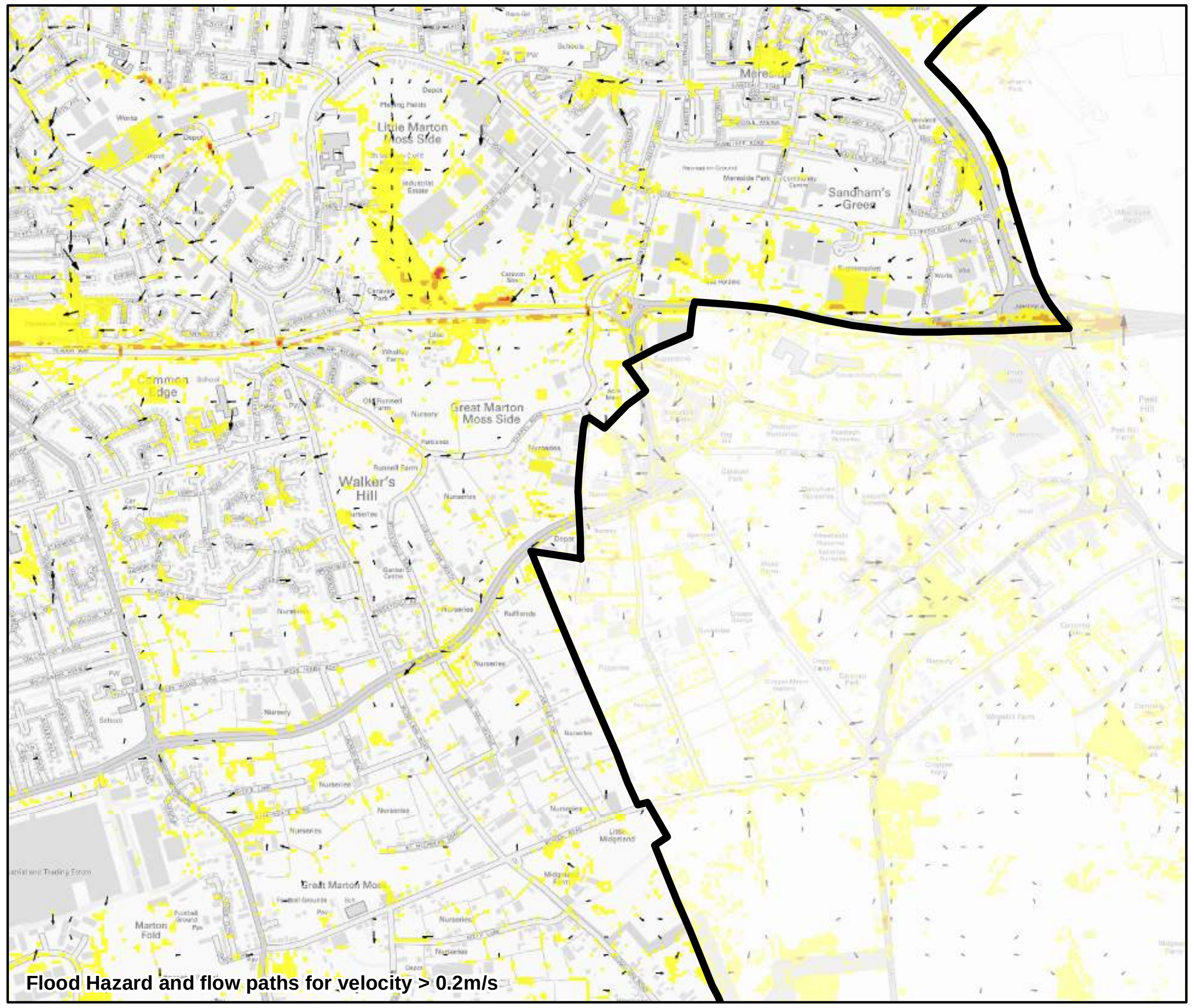
12/03/2013 13:37:11

MXD Location

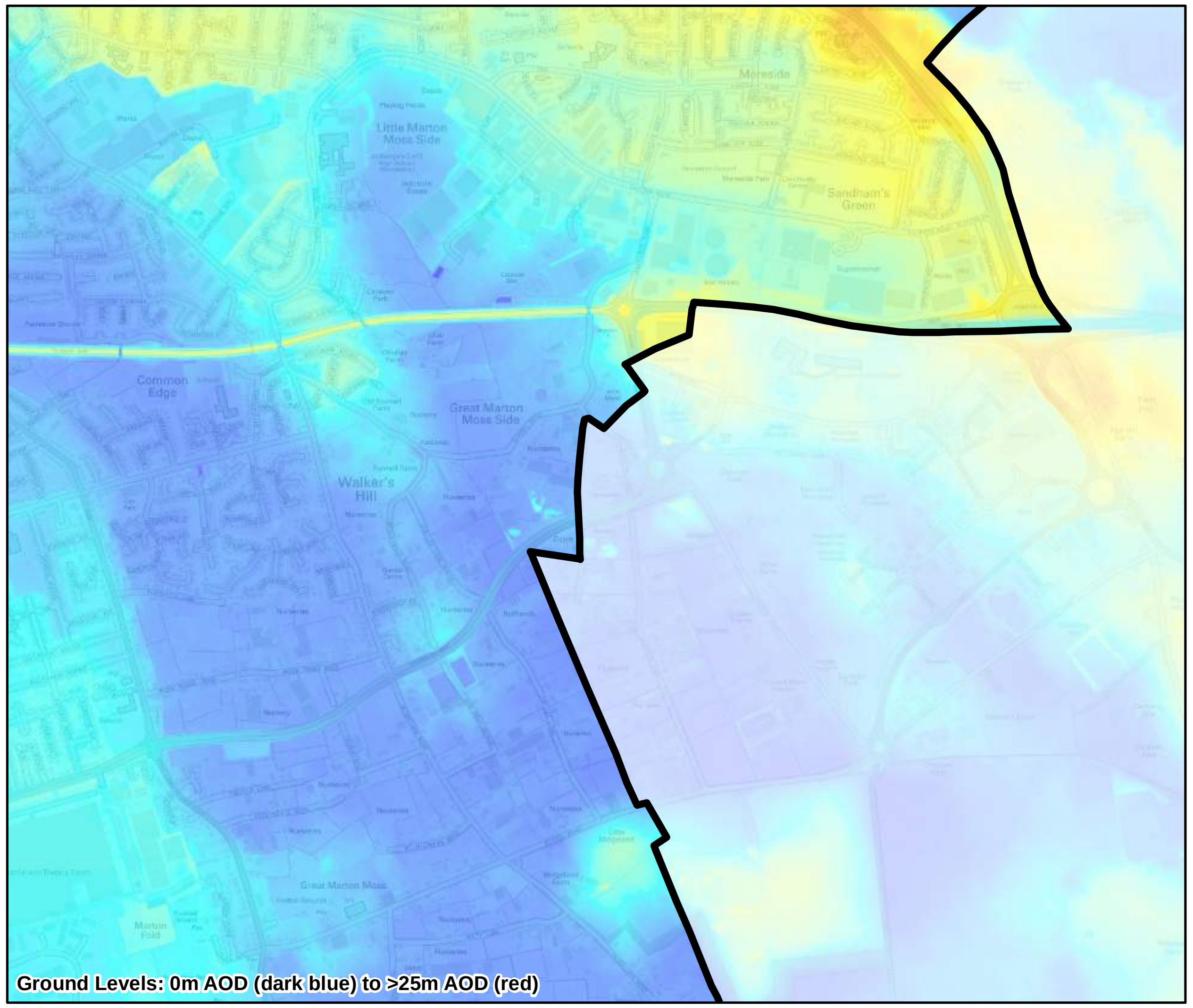
A3



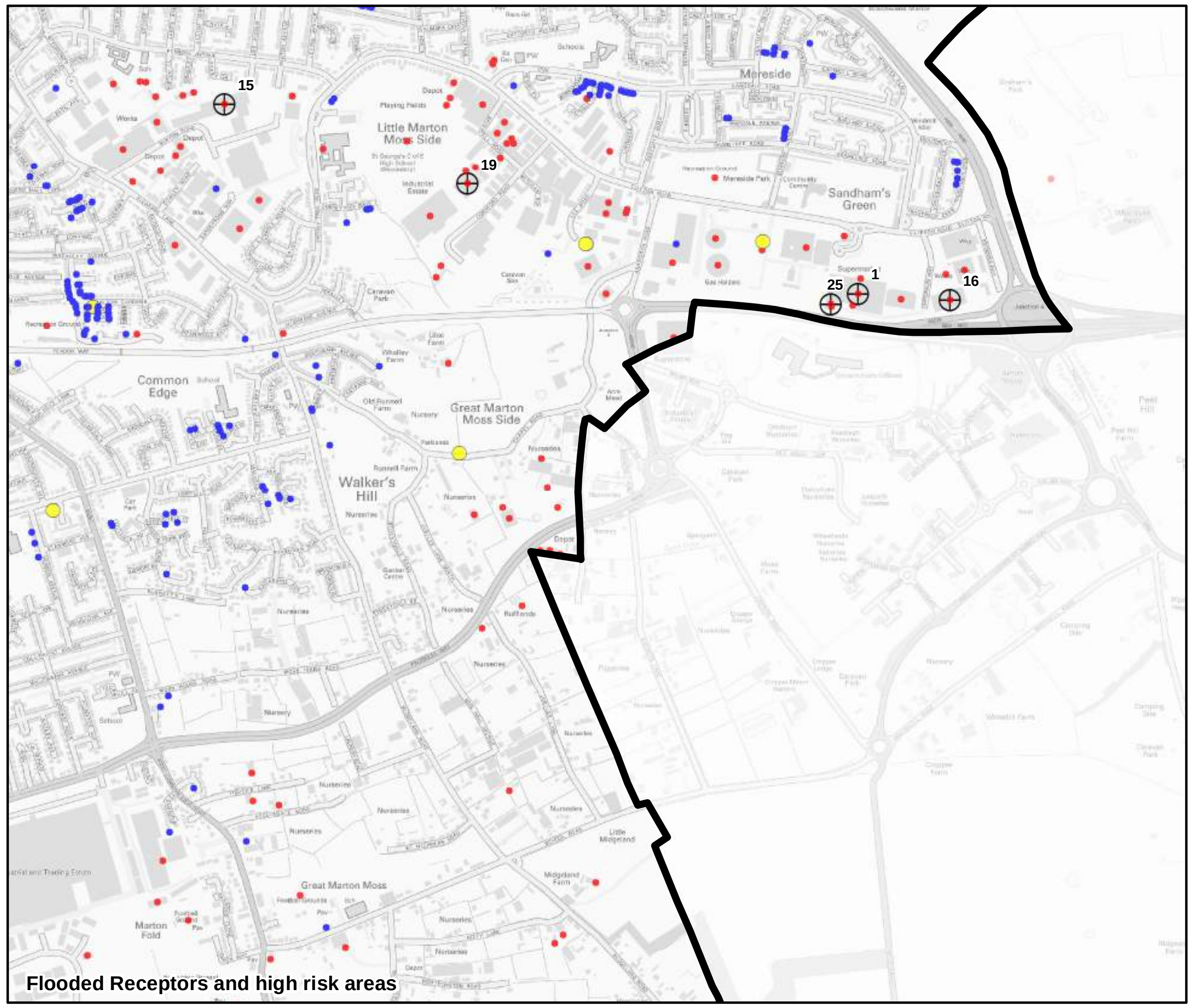
Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s



Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

MXD Location

Legend

Blackpool Council boundary

0.1% (1 in 1000yr)

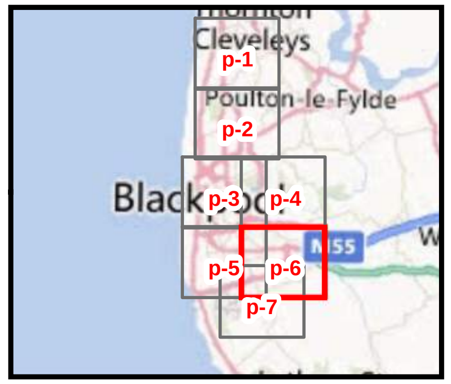
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 1000yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



12/03/2013 13:37:26

Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 0.1% (1 in 1000yr)

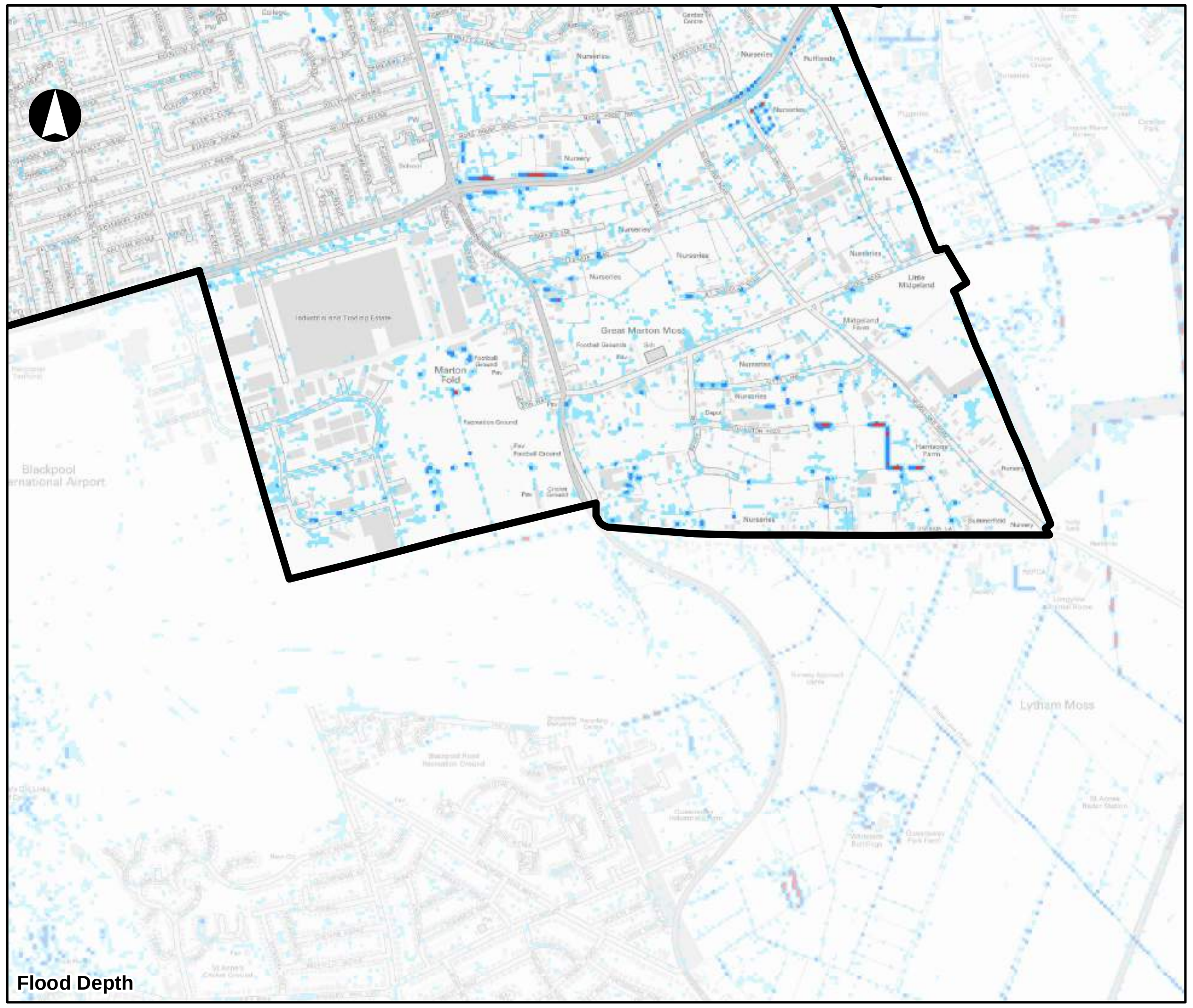
Scale at A3

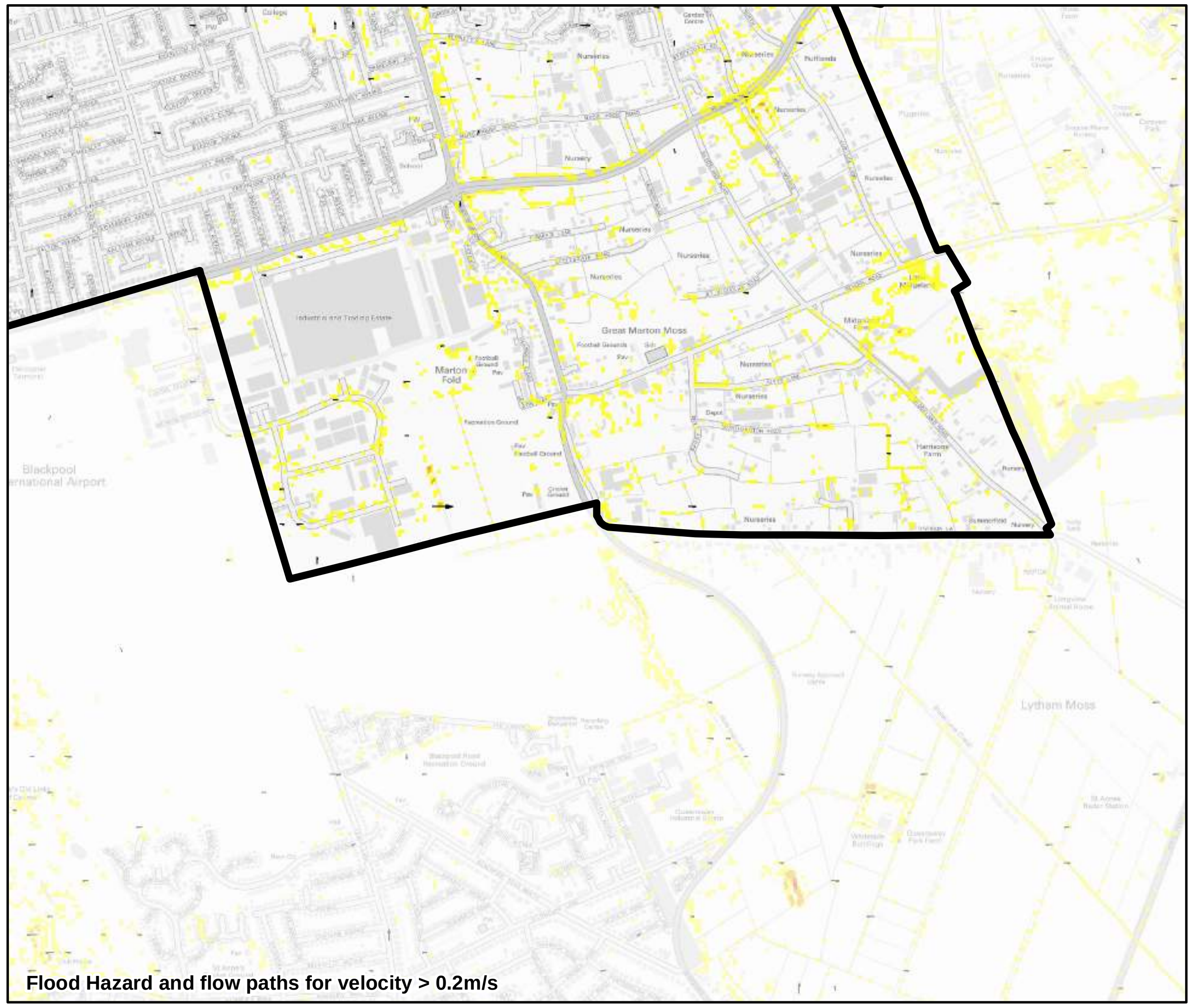
1:20,000

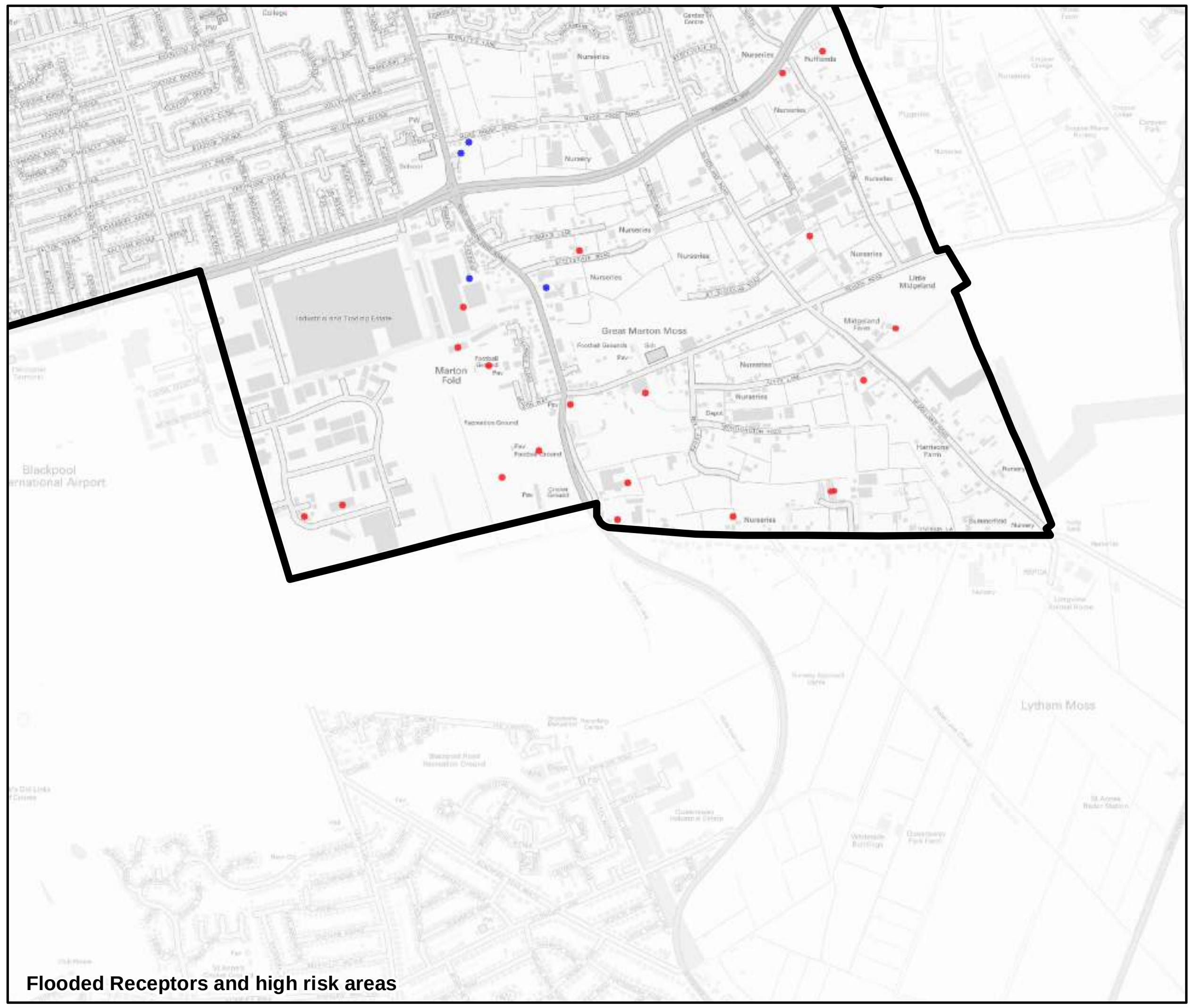
Job No	Drawing Status
227357	Draft

Drawing No	Issue
D6.4	P0

A3







MXD Location

Legend

Blackpool Council boundary

5% (1 in 20yr)

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

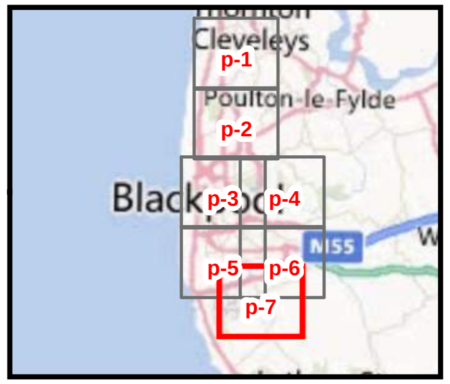
Flooded Receptors (1 in 20yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)

12/03/2013 13:37:41



D1	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 5% (1 in 20yr)

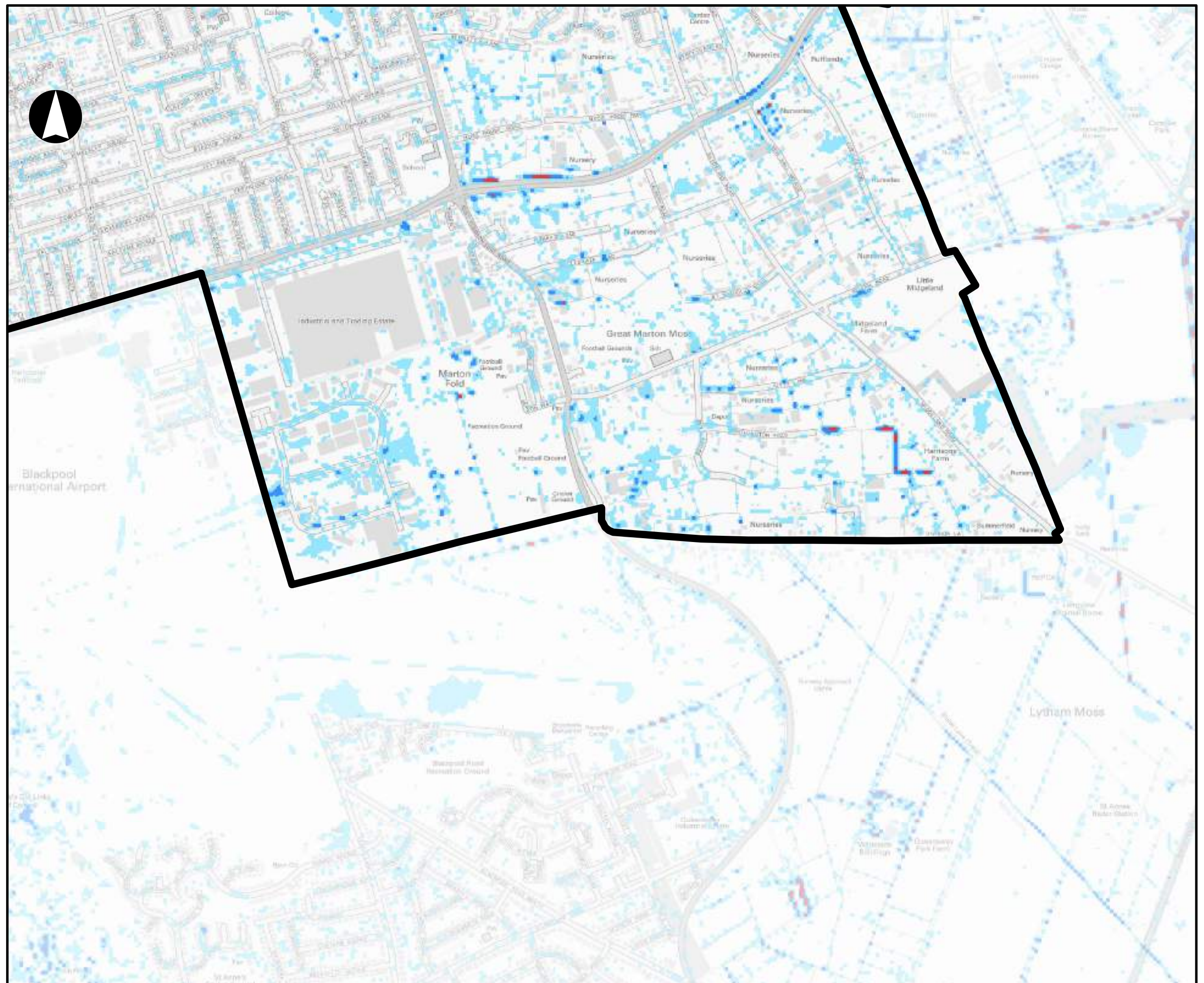
Scale at A3

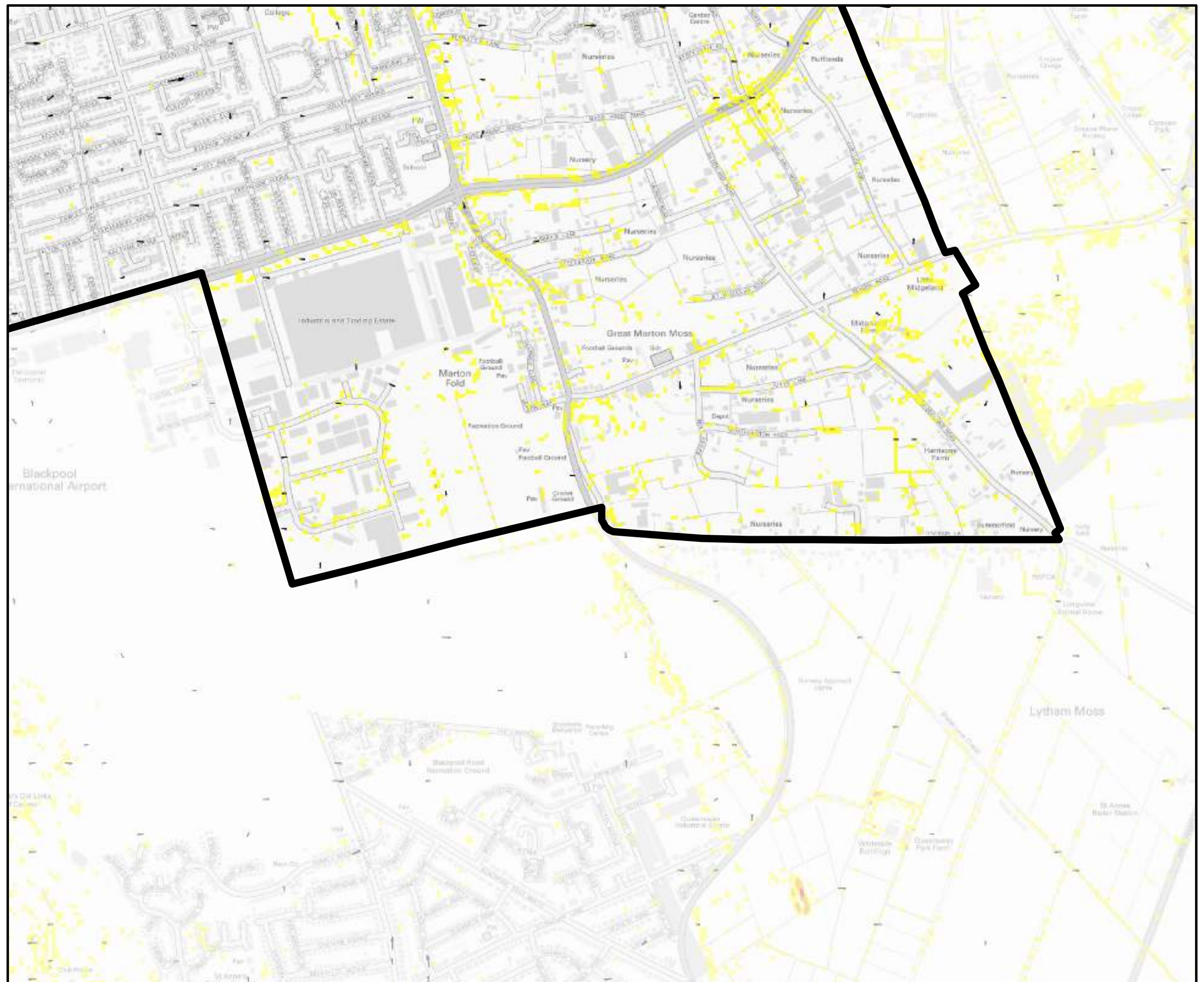
1:20,000

Job No	Drawing Status
227357	**Draft**

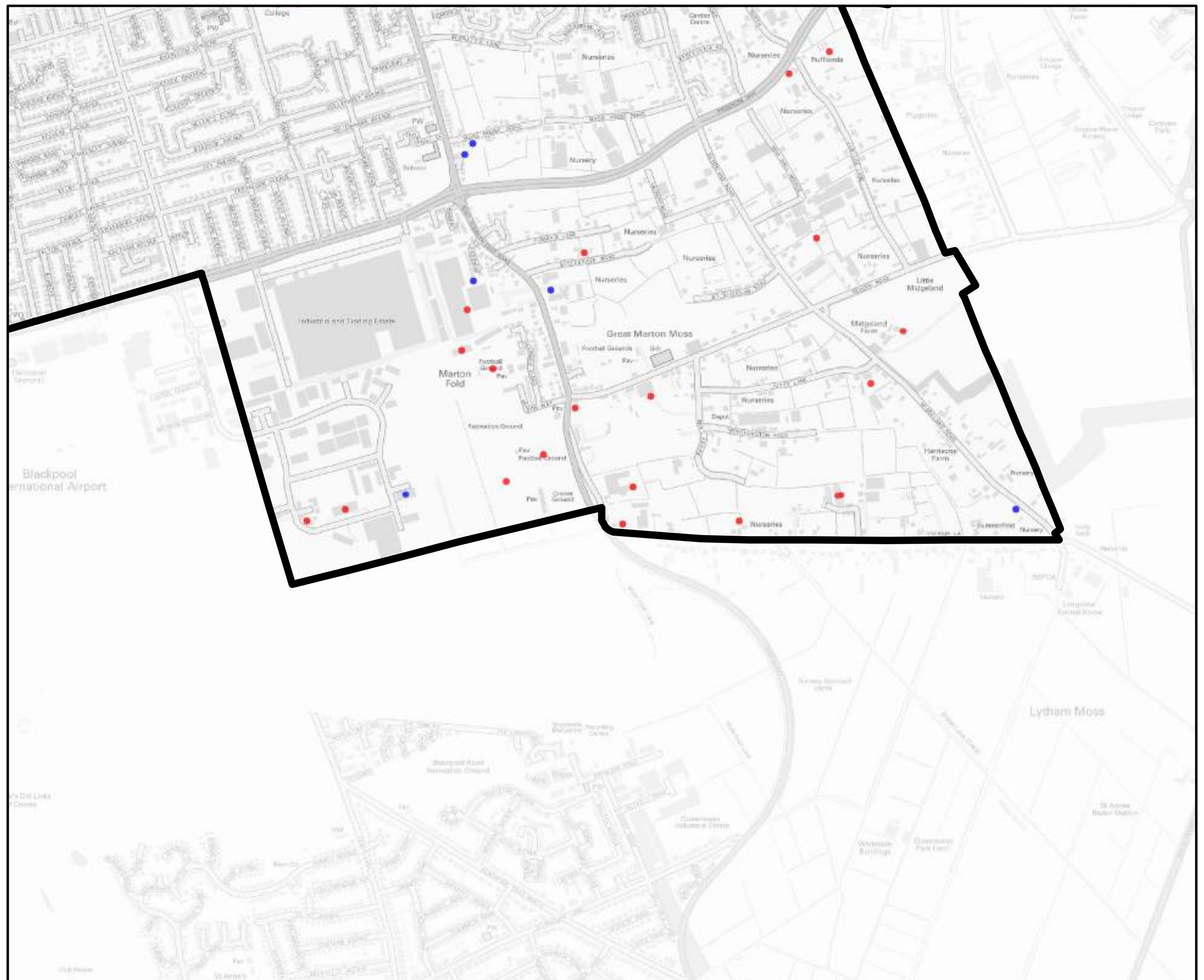
Drawing No	Issue
D7.1	**D1**

A3


Flood Depth


Flood Hazard and flow paths for velocity > 0.2m/s


Ground Levels: 0m AOD (dark blue) to >25m AOD (red)


Flooded Receptors and high risk areas

MXD Location

Legend

Blackpool Council boundary

1% (1 in 100yr)

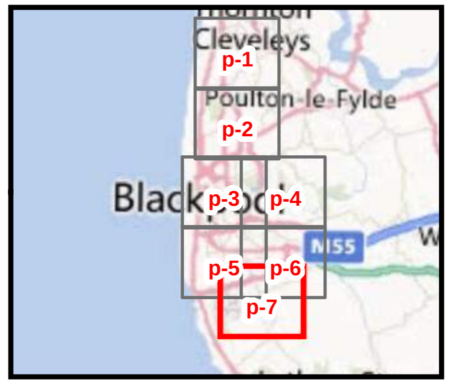
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 100yr)
- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)

12/03/2013 13:37:52



Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres
0 270 540 1,080

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Client
Blackpool Council

Job Title
Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 1% (1 in 100yr)

Scale at A3
1:20,000

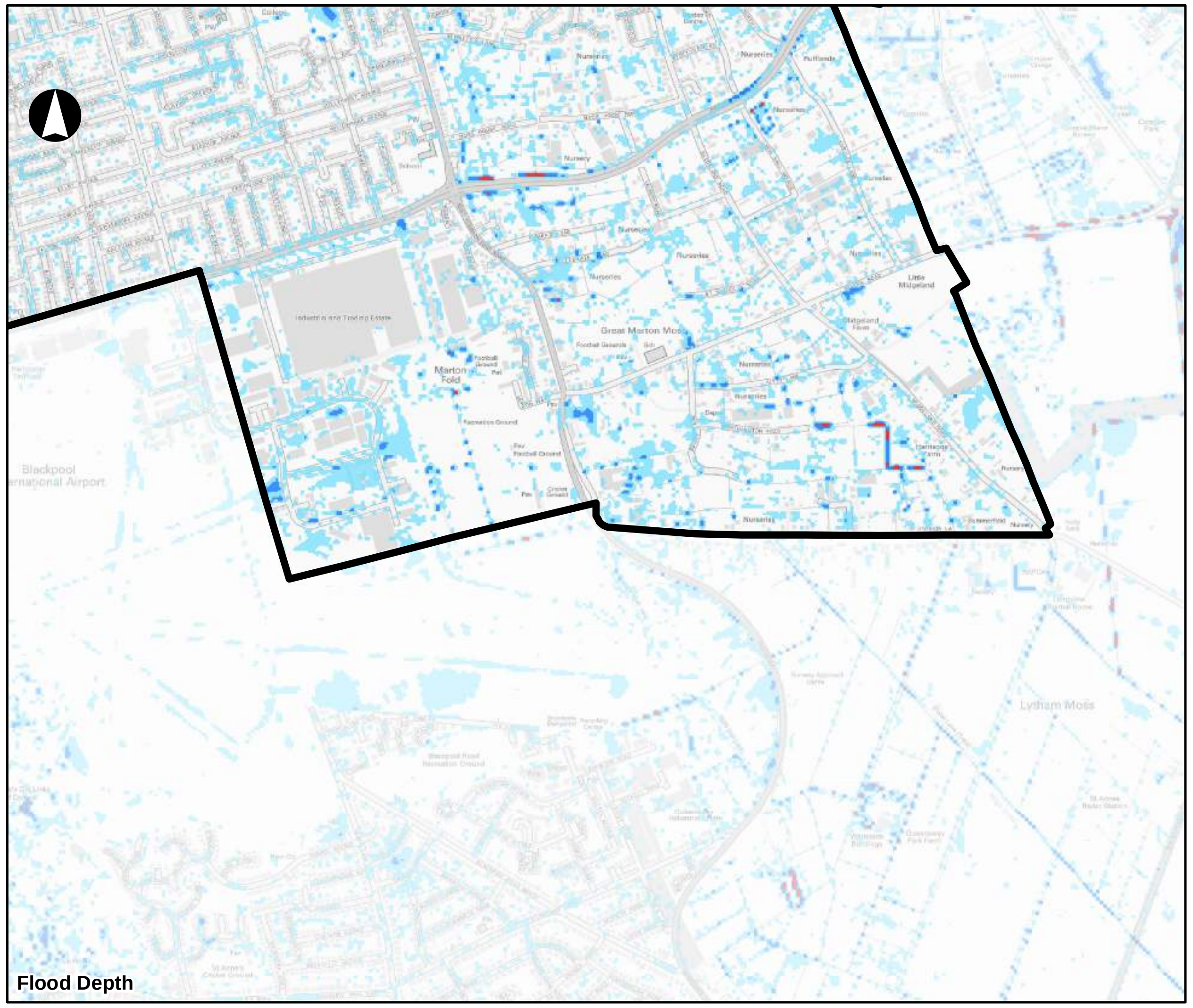
Job No
227357

Drawing Status
Draft

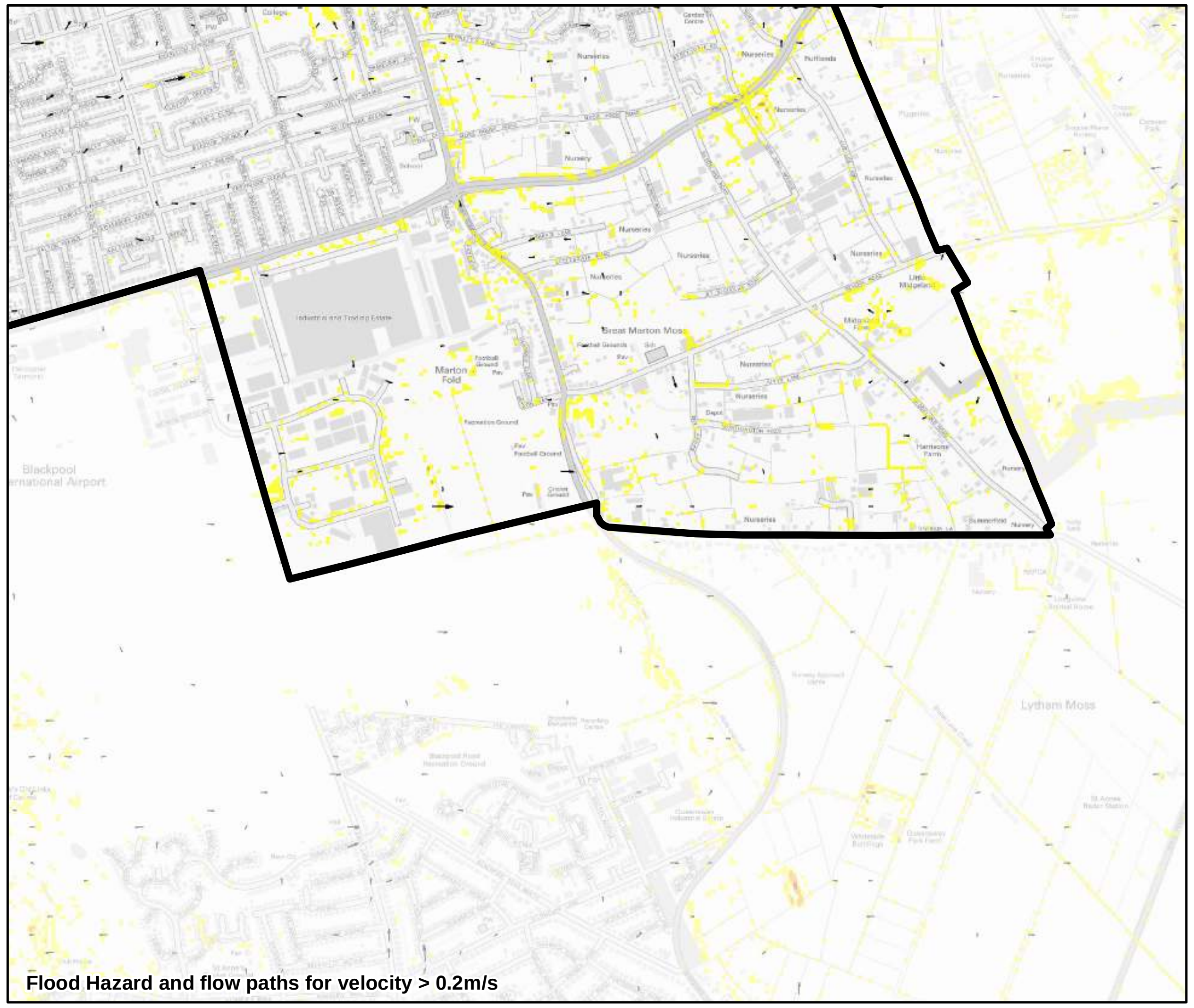
Drawing No
D7.2

Issue
P0

A3

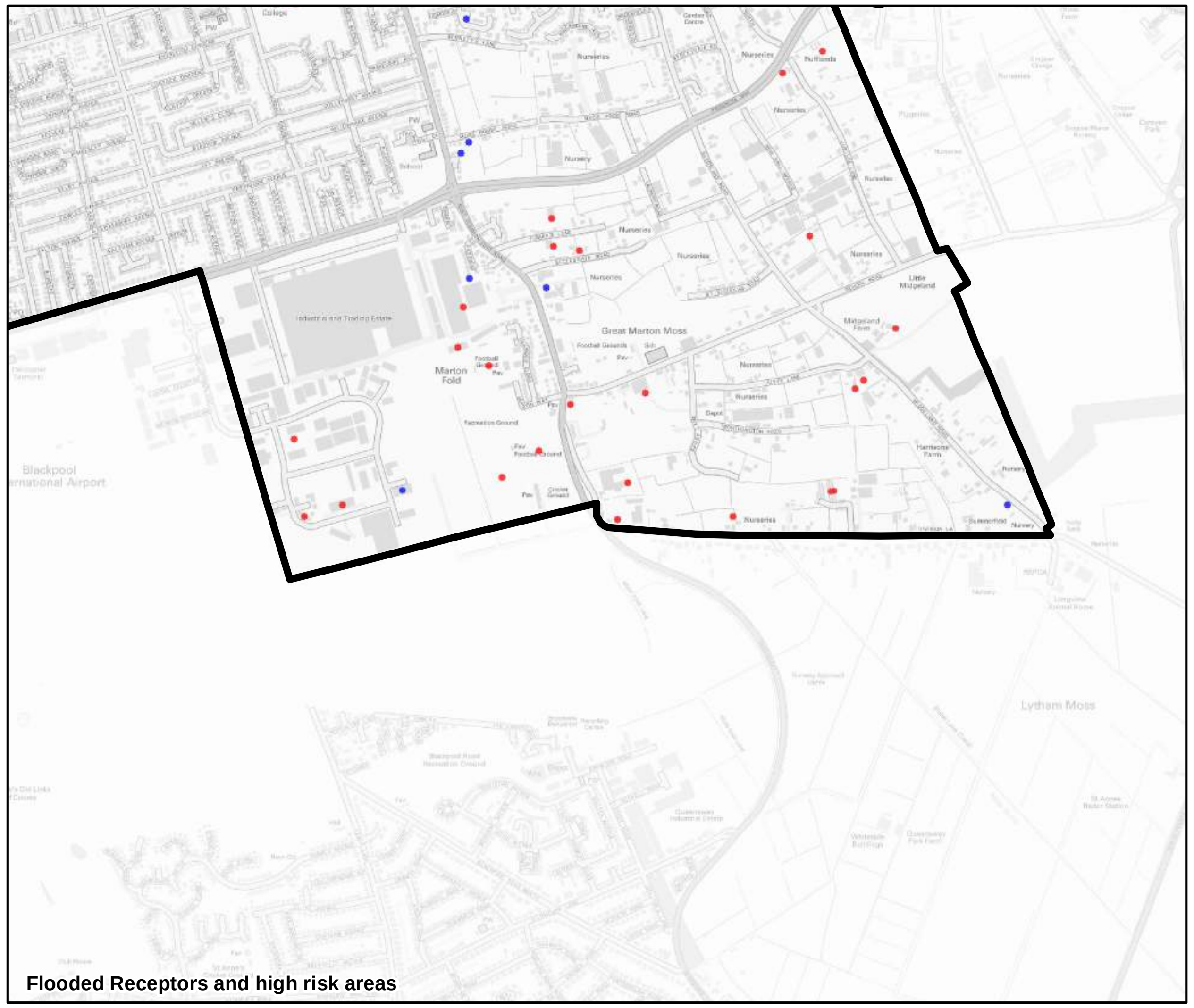


Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s

Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

1% (1 in 100yr) future scenario

Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

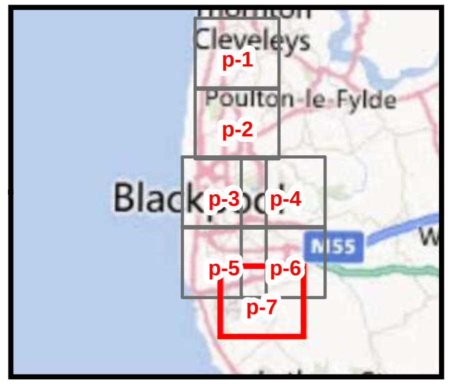
Flooded Receptors (1 in 100yr) future scenario

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)

12/03/2013 13:38:02



P0	2013-03-08	DVDL		KP
Issue	Date	By	Chkd	Appd

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors Future scenario 1% (1 in 100yr)

Scale at A3

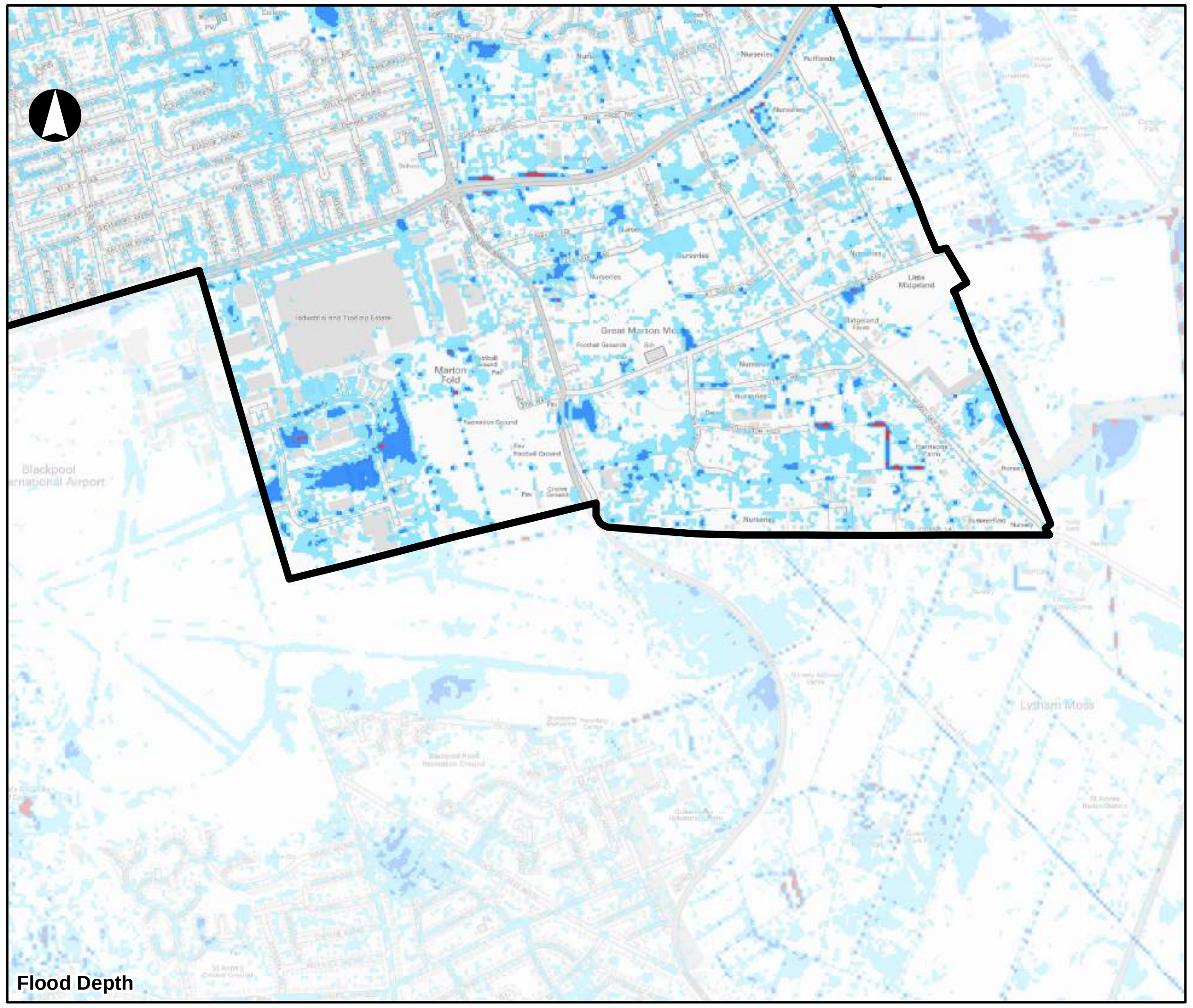
1:20,000

Job No	Drawing Status
227357	**Draft**

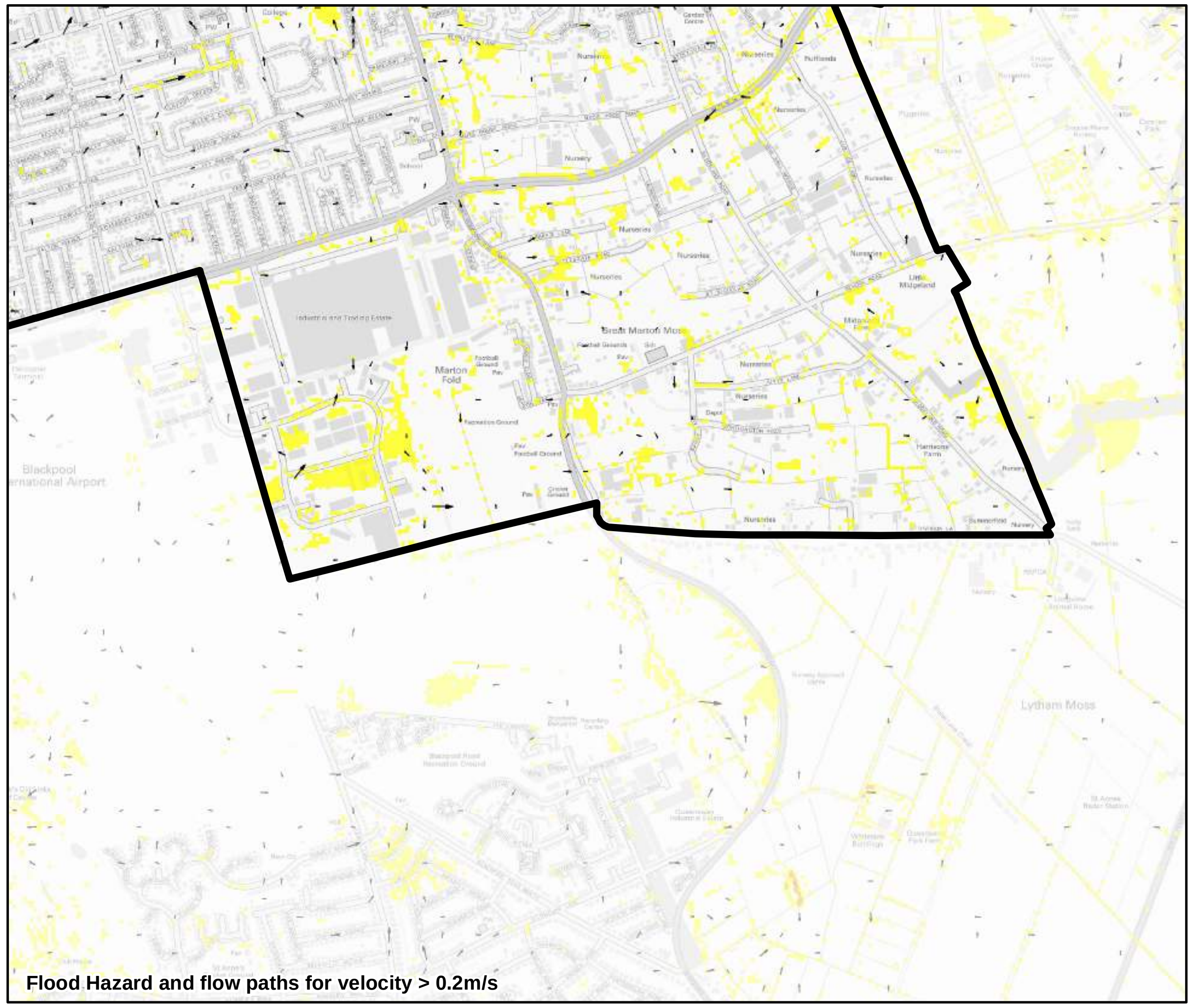
Drawing No	Issue
D7.3	**P0**

MXD Location

A3

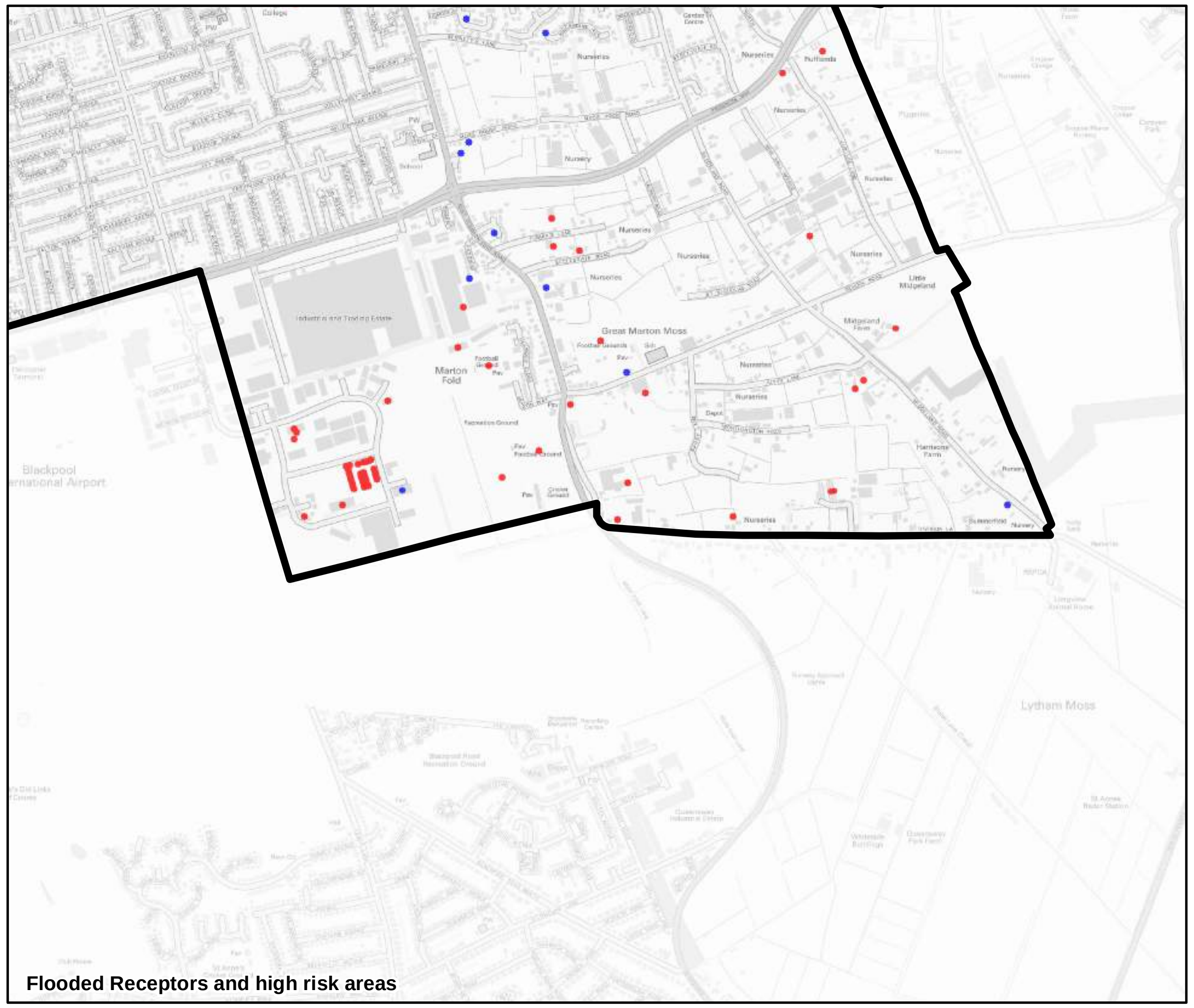


Flood Depth



Flood Hazard and flow paths for velocity > 0.2m/s

Ground Levels: 0m AOD (dark blue) to >25m AOD (red)



Flooded Receptors and high risk areas

Legend

Blackpool Council boundary

0.1% (1 in 1000yr)

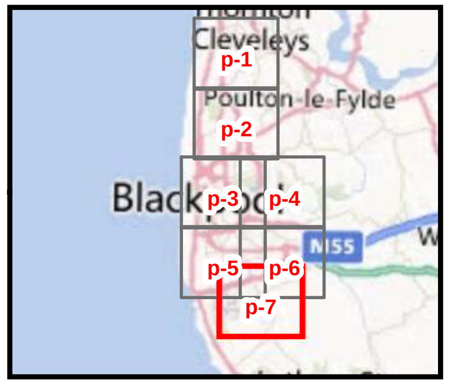
Flood depth (m)	Flood Hazard Rating
< 0.1	
0.1 - 0.3	Danger to some
0.3 - 0.6	Danger for most
> 0.6	Danger to all

Flooded Receptors (1 in 1000yr)

- Critical Infrastructure
- Non Residential
- Residential

Top25 damages labelled by rank

High Risk Areas (based on 1 in 20 and 1 in 100yr)



Issue	Date	By	Chkd	Appd
P0	2013-03-08	DVDL		KP

Metres

0 270 540 1,080

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Client

Blackpool Council

Job Title

Blackpool Surface Water Management Plan

Surface water flood depth, hazard, flow paths and flooded receptors 0.1% (1 in 1000yr)

Scale at A3

1:20,000

Job No	Drawing Status
227357	Draft

Drawing No	Issue
D7.4	P0

12/03/2013 13:38:12

MXD Location