PSD15

Sunderland City Council and South Tyneside Council

International Advanced Manufacturing Park Area Action Plan

Flood Risk and Water Management Technical Background Report

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South Tyneside Council

Sunderland City Council

JMP

Contents

Glossary

AAP	Area Action Plan
BIS	Department of Business, Innovation and Skills
CIRIA	Construction Industry Research and Information Association
DBAP	Durham Biodiversity Action Plan
DCO	Development Consent Order
DEFRA	Department of Environment, Food and Rural Affairs
DPD	Development Plan Document
EZ	Enterprise Zone
EU	European Union
FRA	Flood Risk Assessment
IAMP	International Advanced Manufacturing Park
GBSSO	Green Belt and Site Selection Options Report
LDF	Local Development Framework
LHA	Local Highways Authority
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
MoU	Memorandum of Understanding
NELEP	North East Local Enterprise Partnership
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NWL	Northumbrian Water Ltd
PwC	Price Waterhouse Coopers
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SEP	Strategic Economic Plan
SCC	Sunderland City Council
SCI	Statement of Community Involvement
STC	South Tyneside Council
SuDS	Sustainable Drainage System
UDP	Unitary Development Plan

1 Introduction

1.1. Overview

1.1.1. This is the **Flood Risk and Water Management Technical Background Report** for the International Advanced Manufacturing Park (IAMP) Area Action Plan (AAP). The aim of this report is to provide the technical evidence to inform the corresponding approach and policies in the IAMP AAP.

1.1.2. The Report is one of a suite of Technical Background Reports which form part of the evidence base for the IAMP AAP. The evidence can be accessed using the following links:

- www.sunderland.gov.uk/development-plan
- www.southtyneside.gov.uk/localplan

1.2. Introduction to the IAMP

1.2.1. The International Advanced Manufacturing Park represents a unique opportunity for the automotive sector in the UK. Located next to Nissan UK's Sunderland plant, the UK's largest and most productive car manufacturing plant, the IAMP will provide a bespoke, world class environment for the automotive supply chain and related advanced manufacturers to innovate and thrive, contributing significantly to the long-term economic success of the north-east of England and the national automotive sector.

1.2.2. The proposal is for a 260,000 sq m Gross Internal Area development aimed primarily at the automotive, advanced manufacturing and related distribution sectors. The IAMP will be located on land to the north of the existing Nissan car manufacturing plant, to the west of the A19 and to the south of the A184. This location benefits from its close proximity to Nissan and excellent transport links with opportunities for integrated connectivity provided by the surrounding Strategic Road Network, rail and port infrastructure.

1.2.3. Present since 1985, Nissan is a major employer in the North East and the Sunderland plant is a good example of a national and regional success in manufacturing. Nissan has been the largest car plant in the UK for 14 years and the largest exporter for 12 years. Overall production surpassed 500,000 vehicles in 2013 and is set to expand further with the plant producing one third of UK car output and over one third of exports. Nissan currently employs over 7,000 people in the Sunderland plant underpinning over 20,000 supplier jobs in the wider North East region.

1.2.4. Development of the IAMP will therefore underpin the continued success of the automotive and advanced manufacturing sectors in the United Kingdom and North East of England.

1.3. Structure of this Report

1.3.1. The Report is structured as follows:

- Section 2 sets out the evidence relevant to this background Report.
- Section 3 draws on the evidence to set out issues that should be taken into account in developing the approach and policy of the AAP.
- Section 4 advises on the potential actions that should be considered in further progressing the IAMP proposal to delivery.

2 Evidence Review

2.1. This section **presents** a summary of the key findings from the evidence review. A full list of evidence reviewed can be found below.

2.2. Overview

2.2.1. The key issues relating to drainage and flood risk are established from a number of studies, principally the Strategic Flood Risk Assessments1,2 undertaken for Sunderland City and South Tyneside Councils from 2010/2011. These have been supplemented more recently by updated inquiries and desk-study assessments of the scheme site based upon the National Planning Policy Framework3 and its corresponding guidance on drainage and flood management matters in order to identify the scale of any existing drainage or flood problems which may affect the proposed scheme and to what extent. At a higher level, the Water Framework Directive (WFD) as implemented within national legislation and supporting guidance through bodies such as the Environment Agency imposes restrictions upon the impacts of such new development and sets objectives to be met for improving or maintaining the quality of surface and ground-water bodies.

2.2.2. The flood-risk and drainage issues are described as follows with an emphasis initially on riverine flood risk as this is considered to be the most significant source locally:

- River flood risk
- Other flood risks
- Development location
- Other drainage
- Water quality

2.3. *River Flood risk*

2.3.1. The IAMP site is bisected by the River Don which originates west of the Leamside railway west of the site. A tributary channel joins the river between North Moor Farm and Hylton Bridge and a minor tributary stream rises east of Strother House Farm and passes round Hylton Grove Farm before joining the river. The Don flows eastwards and leaves the site via a culvert beneath the former Consett – Jarrow railway and the A19.

2.3.2. A number of embankments have historically been constructed alongside sections of the River Don and the main tributary upstream of Hylton Bridge. These provide only a limited level of protection to the farmland.

2.3.3. The Environment Agency (EA) had previously undertaken a coarse flood-modelling exercise for the River Don in order to provide indicative flood-risk mapping for the main river channels and its findings were displayed on the EA's website. The process that had generated this information was too coarse to be reliable for a detailed site assessment. A more detailed 1- and 2-dimensional hydraulic model has therefore been compiled for the Don between the former Leamside railway and the A19 in order to refine the flood extent forecasts. This then provides a robust basis for the flood risk assessment process.

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[1] Sunderland City Council Level 1 Strategic Flood Risk Assessment, JBA Consulting, June 2010. (SD59)

[2] South Tyneside Council Preliminary Flood Risk Assessment, June 2011. (SD57)

[3] National Planning Policy Framework and Technical Guidance to the National Planning Policy Framework, Communities & Local Government, March 2012.

2.3.4. The river modelling findings are documented in a report4 by JBA Consulting. The 'design standard' for river flooding in relation to general development is a 1% annual exceedance probability (AEP) flood which is one with a 1% chance of occurring in any given year. This is also sometimes described as a 100-year return period. The effects of climate change are also considered since future flood patterns are expected to change as weather patterns change over time. The factors for such changes are contained within the NPPF guidance and were updated5 in early 2016. These differ depending upon the development's lifetime: for IAMP, a lifetime of over sixty years was taken which warrants factors of 20%, 25% and 50% on top of the base flood condition.

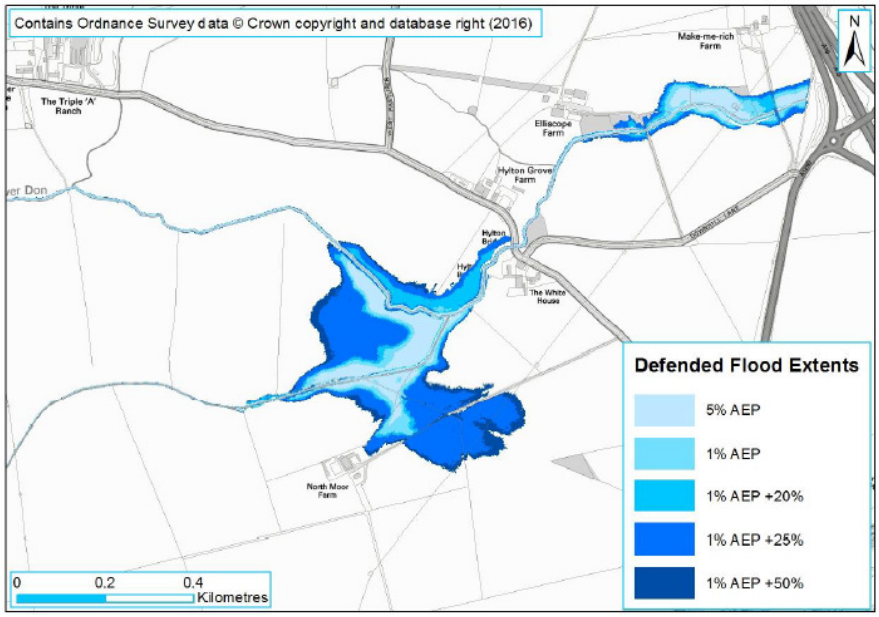
2.3.5. For the purposes of this report, all three factors were tested to give flood extents at the 1% AEP condition. The area affected is defined as Flood Zone 3. This in turn is split into Zones 3a and 3b. Zone 3b is defined as the 'functional floodplain' and represents areas that are commonly flooded (by events with an AEP of up to 5%). Zone 3a represents the remainder of Zone 3.

2.3.6. The flood extents are shown on the figure below, taken from the flood modelling report.

2.3.7. Flood Zone 2, defined as the area at risk between AEP 0.1% to 1%, was not explicitly modelled but the 1% AEP + 50% flood gives a reasonable indication of where the extents of this zone may lie as the 0.1% AEP flood is likely to be of that order.

2.3.8. There are two key areas prone to flooding. The major one is between North Moor Farm and Hylton Bridge and mainly affects the farmland between the Don and its tributary channel and land north-east of the farm. Flooding in this area increases markedly for climate-change in excess of 20%. The other area is between Elliscope Farm and the A19, though the river valley here is relatively confined and the range of changes in climate effects have relatively little difference.

Figure 5-1: Predicted peak flood extents for the defended design events and climate change runs



Source: JBA Consulting, 2016

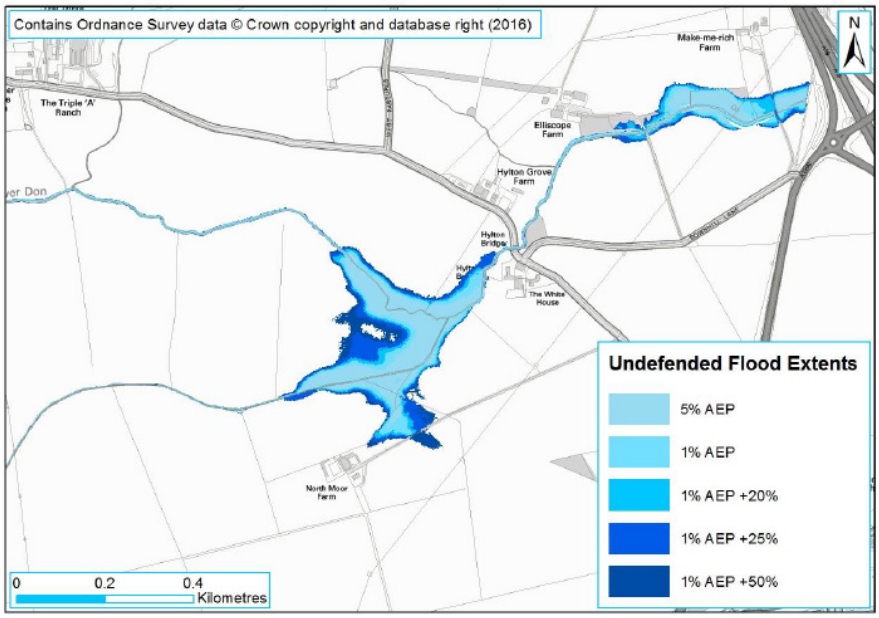
2.3.9. The patterns above also show that the river-side embankments between North Moor Farm and Hylton Bridge are generally overcome or outflanked by the 5% AEP flood condition.

[4] River Don at Washington Flood Modelling: Draft Hydraulic Modelling Report: JBA Consulting, May 2016

[5] Flood risk assessments: climate change allowances: published by Environment Agency via www.gov.uk February 2016.

2.3.10. The river model was also tested with all defences removed (on the assumption that these fall into disuse or fail in future floods) with the results as shown over the page. The patterns are similar up to the 1% AEP flood and climate-changes increasing flood flows by up to 20% but the higher climate effects now have far less impact.

Figure 5-2: Predicted peak flood extents for the undefended design events and climate change runs



Source: JBA Consulting, 2016

2.3.11. Flooding that was predicted further upstream along both the Don and its main tributary by the EA's indicative mapping is not replicated by the findings of the detailed river model and the predicted floodplain is instead confined close to the river channels.

2.3.12. In both cases, the 1% AEP + 50% flood outline does not encroach greatly, if at all, onto the planned scheme area and this indicates that the Flood Zone 2 extent is unlikely to significantly affect the proposed scheme.

2.3.13. A formal Flood Risk Assessment (FRA) is being undertaken for the IAMP scheme by the scheme promoter and the FRA report produced from that work will in due course form part of the evidence base for the DCO process.

2.4. *Other flood risks*

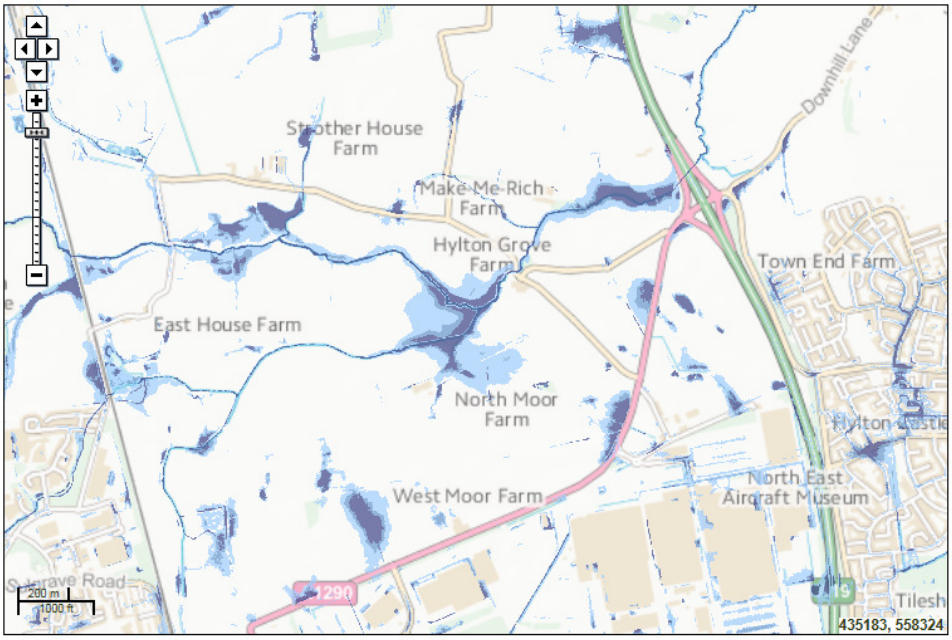
2.4.1. The site is dominated by farmland with isolated farmsteads or other buildings. There is no widespread existing sewer system and the site is essentially devoid of existing public sewers apart from a localised system on Washington Road serving the buildings around the North East Aircraft Museum. The risk of flooding from overflowing drains is therefore currently confined to localised areas around these building clusters.

2.4.2. There is a patchy system of field ditches providing land drainage. The land south of the Don falls mainly south-eastwards towards the intersection of the Washington Road and the A19. There is only a relatively narrow strip of land falling northwards towards the Don and its tributary. North of the Don, the topography is more conventional and falls chiefly towards the river. The very north-eastern corner of the IAMP site drains north-eastwards towards the Testos junction between the A19 and A184 via a land-drain which is culverted beneath the A19 and which ultimately drains into the Don east of the A19.

2.4.3. A culverted land-drain runs eastwards along / beside Washington Road as far as the A19, at which point it turns southwards to run alongside the A-road until it turns eastwards again to cross beneath the A19 and is believed to feed into the natural streams in Hylton Castle. There has been past flooding on Washington Road in the vicinity of the Air Museum and the vacant public house nearby: this is believed to have originated from

a local blockage in the land-drain culvert that has not yet been properly repaired. Further investigation will be necessary to prove this and to identify the responsible party.

2.4.4. The land is of moderate to poor natural-drainage quality. A desk-study[6] of the site's engineering qualities recorded the land as being underlain by "*Pelaw Clay, laminated clay and glacial till*" and alluvial material consistent with land close to a watercourse. This is borne out by the spread of field ditches within the site and past observations of low-lying areas of the farmland becoming waterlogged or subject to ponding during prolonged wet weather. These areas tally with the indicative areas at risk from surface flooding (from run-off unable to drain away into the ground flowing overland) shown below, taken from the EA's website.



2.4.5. Groundwater is not considered to pose any meaningful risk of flooding to the site. The physical nature of the soils locally does not permit ready movement of groundwater and there is no underlying water table that would be expected to rise to the surface.

2.5. *Development location*

2.5.1. The proposed IAMP site extent avoids the main river flood areas: the chief interaction between the development and the River Don in development footprint terms is from the new road linking the southern and northern sites which would cross the Don near Elliscope Farm. A small number of surface-drain outfalls will also be constructed but these will only affect localised small areas.

2.5.2. The northern site incorporates part of the route of a minor stream that joins the Don downstream of Hylton Bridge. This channel was too small to warrant inclusion in the detailed river modelling and its floodplain is considered to be confined close to the stream channel. This watercourse has only very localised impacts upon the proposed development area.

2.5.3. The IAMP site lies upstream of areas in Boldon that have experienced flooding problems associated both with the River Don and with local drainage systems. The site is currently undeveloped and contributes flows to the river at corresponding rates commensurate with this undeveloped condition. Any development on this land

[6] IAMP Desktop Engineering Assessment; Mott MacDonald, July 2014.

poses the risk of increasing discharge rates into the watercourses that in turn risks causing increased flood risk downstream.

2.6. *Other drainage*

2.6.1. The nearest foul sewers of any use to the scheme as a whole are located to the west. A small sewer originates on Cherry Blossom Way approximately 250m south of Washington Road and flows southwards. A large trunk foul sewer flows parallel with and east of the former Leamside railway bordering Washington, bound for the treatment works near Pattinson above the River Wear. A minor foul sewer runs eastwards along Washington Road from the cluster of buildings by the North East Aircraft Museum.

2.7. *Water quality*

2.7.1. Most of the site lies within the River Don (source to tidal limit) water body within the Tyne catchment. The southern part of the site that drains towards Hylton Castle falls within the Wear Lower & Estuary body but is outside any specific surface water operational district.

2.7.2. The 2015 Northumbria River Basin District management plan7 (RBMP) records the conditions for the River Don river body (defined as between its source and the tidal limit at Jarrow) as follows:

- Hydromorphological classification: heavily modified.
- Ecological quality: poor (was rated 'good' in 2009)
- Chemical quality: good (not assessed in 2009)
- Overall river quality: poor (was rated 'good' in 2009).

2.7.3. The RBMP has no classifications recorded for the Wear Lower & Estuary area for surface water.

2.7.4. General pressures from urban run-off and an unknown source are cited in relation to the chemical quality though not explicitly in relation to the river's ecological quality.

2.7.5. No underlying groundwater units are recorded locally.

[7] Part 1: Northumbria river basin district: River basin management plan; Environment Agency, December 2015

3 Key Issues

3.1. In response to the evidence base outlined above and summary of the existing situation, this section provides an overview of the key issues and constraints, the opportunities and requirements that the IAMP is seeking to address. This is structured around the following headings:

- Managing flood risk from large paved areas;
- Controlling run-off from new built development;
- Crossing the River Don clear of predicted flood levels;
- Managing water quality of development run-off.

3.2. The scheme offers opportunities to enhance the environment and development landscape as part of the flood-management or drainage works:

- River channel improvements
- Wetland/water habitat creation

3.3. Managing flood risk from large paved areas

3.3.1. There is clear guidance on the requirements for managing development run-off and for the design of new surface drainage from a number of sources: NPPF, LLFAs' requirements, sewerage company standards8 and local planning policies 9,10. These are designed to ensure that an effective and reliable drainage system is provided that manages the surface run-off to acceptable levels of operation. A residual risk remains whereby storms in excess of the design standards generate such quantities of water that the drainage system is overwhelmed. This is most likely to be due to a short-term high-intensity storm during which substantial quantities of water arrive on the paved surfaces very quickly and are unable to drain away into the sewers quickly enough. Water then moves on the surface as the topography directs and can follow flow routes that affect property within or beyond the development borders.

3.3.2. This scheme is particularly prone to the risk of surface flooding due to its nature, comprising large building footprints, service yards and parking areas, compared to a residential development where impermeable areas are more fragmented with unpaved areas interspersed across the layout. This in turn leads into the following issue.

3.4. Controlling run-off from new built development

3.4.1. The scale of the IAMP scheme and, as noted above, its characterisation with large buildings and yards/parking areas will require a drainage system of comparable capacity in order to restrict discharges from the development site to rates that match the land's present behaviour. This will then prevent increased flows in the receiving watercourses or drains downstream and avoid the risk of increased flooding away from the site. This should be integrated with the layout to avoid concentrating drainage works at the very downhill areas of the scheme: the south-eastern corner and the River Don corridor fringes. The standards for performance of such systems are well established and documented in industry-standard specifications (e.g. Sewers for Adoption, SuDS Manual11).

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[8] Sewers for Adoption, WRc (prevailing edition(s) in force)

[9] Sunderland Council Core Strategy, August 2013. (SD17)

[10] South Tyneside Council Core Strategy, June 2007. (SD22)

[11] SuDS Manual: CiRIA Report C753, December 2015

3.5. River Don crossing

3.5.1. The proposed link road between the southern and northern parts of IAMP needs to cross the River Don. The bridge structure should avoid obstructing the river's behaviour when in flood up to at least the design-standard flood as cited earlier. This is best done by ensuring that the bridge deck and abutments are clear of the predicted flood level with sufficient clearance to avoid interfering with any water-borne debris.

3.6. Run-off water quality

3.6.1. Diffuse pollution from urban development and particularly from highways or industrial areas is a major source of pollution to watercourses. A site of this scale has the potential to contribute significant quantities of pollutants to the receiving watercourses unless the quality of run-off can be managed as part of the drainage process. Silt control and light-liquid management are particularly important as these represent major components of the contamination load generated by such areas. The Drainage Strategy needs to determine how SuDS features or other aspects of the scheme design can work to manage the run-off quality whether by downstream control or reductions at source.

3.7. Opportunities

3.7.1. The scheme proposes to create a buffer zone between the river channels and the new development that in turn will allow space for new habitat works. As part of this there is the potential to carry out works to the river channels, creating new meanders or shelves that improve the river's habitat potential and which do not worsen its flood conveyance capacity. Removal of some river-side embankments may also improve flood behaviour though the consequences of such actions need to be tested farther afield to ensure that flooding is not caused or worsened elsewhere. These works would be opportunistic improvements in support of WFD requirements rather than direct mitigations for impacts of the new development.

3.7.2. The proposed surface drainage approach for the scheme offers the potential for significant areas of wetland or water-related habitats through the creation of a series of dykes and linear water features to convey flows around the site as well as through the creation of attenuation basins or ponds. This offers significant ecological and landscape benefits to the scheme and will mitigate for the loss of existing drains where development entails their removal.

3.7.3. The topography of the site, particularly across the land south of the River Don, means that surface flows need to be managed at shallow depths in order to achieve discharge into the culverted land-drain along Washington Road. This therefore encourages the use of surface features to convey and manage run-off rather than sewers and underground storage.

3.7.4. Any interface between the IAMP road network with the A19 presents an opportunity to improve the drainage of the A19 through provision of new SuDS features to serve and/or divert the existing road drainage where this passes through the new proposed junction. However this is also an opportunistic improvement to existing highway drainage in support of WFD objectives and local environmental improvements rather than direct mitigation of a new impact. The additional road surfaces created for any new or altered junction will be served by new drainage systems to the required standard[12] which would be owned and maintained by the corresponding highway authority.

[12] Design Manual for Roads and Bridges, Highways England (various documents)

4 Interventions & Actions

4.1. This section summarises the key proposed "interventions" and actions which will progressed through the AAP and presents these under the following headings:

- Flood risk
- Drainage

4.2. Mitigation Interventions

4.2.1. ***Flood risk***

4.2.1.1. The key means of mitigating flood risk is to avoid it to begin with if at all possible. The proposed development layout is outside the projected extents of Flood Zone 3 from the Don or its tributary even under the highest climate-change increase although the development extent east of North Moor Farm comes very close to the edge of the projected Zone 3 flooding.

4.2.1.2. Industrial development is classed as '*less vulnerable*' in the range of usages under the NPPF guidance and for such a category the Guidance requires that only the 'central' or 'upper central' climate change factors be considered. This represents the 20% and 25% factors respectively for the Don catchment and means that the extent of Zone 3a pertinent to IAMP is clear of the proposed limits by a clear margin.

4.2.1.3. If existing flood defences along the Don are allowed to degrade, however, the flooding pattern is altered and is actually less extensive in this area. In either case, however, there is no need for direct mitigation as there is no direct impact created at the design-standard event.

4.2.1.4. Any new structure crossing the Don should be designed to stand clear of the design-standard flood level and extent to avoid obstruction of the flood and thereby risk increased flooding upstream. Allowance should be made for clearance to avoid snagging water-borne debris that might otherwise become stuck and create a blockage to flow through the structure.

4.2.1.5. Surface flood risk can be managed by providing features that either intercept overland flows – such as dykes or swales – that return run-off into the drainage system. Where this is not possible, the scheme layout should define flow routes where overland flow in extreme circumstances can be tolerated and managed without posing undue risk to users or to property and which lead to safe points of discharge within or beyond the site limits.

4.2.1.6. The risk of worsening river flood risk off-site is to be addressed by providing a site drainage system of adequate proportions under the prevailing design standards[13,14,15], for which specific mitigation elements are described below.

[13] Sewers for Adoption, WRc (prevailing edition(s) in force)

[14] Design Manual for Roads and Bridges, Highways England (various documents)

[15] SuDS Manual: CiRIA Report C753, December 2015

4.2.2. ***Drainage***

4.2.2.1. The surface drainage system for IAMP must mitigate two aspects of the surface run-off: quantity and quality. There is clear guidance in planning policy at local and national level and in the industry design standards cited above as to the hierarchy of drainage methods to be used. Infiltration is preferred over attenuation and in turn, where attenuation is found to be necessary, discharge to natural watercourse is preferred to discharge to sewer or culvert.

4.2.2.2. The drainage design process must establish whether infiltration is practicable or not. The initial evidence suggests strongly that this is not the case and that discharge of run-off will need to be directed to the appropriate receiving watercourse. Rates of discharge are to be controlled to match the existing land-drainage behaviour or, where necessary, to avoid exacerbating any existing off-site flood problems. The scheme design must also provide sufficient storage to hold the excess water pending discharge.

4.2.2.3. The drainage network must also incorporate features which address the pollution risks that run-off from the IAMP scheme will generate. These should deal with silt loading and the capture of hydro-carbon contamination (oil, fuel) from vehicle wash-off or spillage. The CiRIA SuDS Manual, re-issued in December 2015, provides particular guidance on this aspect and may be considered the industry standard in such matters at present.

4.3. Actions

4.3.1.1. A formal Flood Risk Assessment is to be prepared for the scheme with the following key objectives:

- Identify all pertinent sources of material flood-risk to the IAMP scheme or which are generated in turn by the new development;
- Identify where and how the development needs to provide mitigation measures to manage impacts generated by the site or to manage the impacts of external flooding risks upon the development;
- Demonstrate compliance with the requirements of national and local planning policy on flood risk management;
- Demonstrate how the surface water drainage strategy will operate and the arrangements for ownership and future maintenance.

4.3.1.2. A formal Drainage Strategy is to be prepared for the scheme with the following key objectives:

- Record the process by which the overall surface drainage approach has been derived;
- Identify the means of discharge of surface run-off and specific points of discharge where appropriate;
- Identify how run-off water quality will be managed by the drainage system;
- Demonstrate compliance of an outline drainage network with the corresponding national and local planning policies and appropriate design standards;
- Identify the means of discharge of foul sewage from the site and the likely quantities or flow-rates involved;
- Identify specific provisions needed in the master planning process for the strategic foul drainage arrangements;
- Record relevant consultations with the adopting authority and other relevant parties.

4.3.1.3. A Water Framework Assessment is to be carried out to identify impacts generated by the development that may impede the WFD objectives for the relevant water bodies and to identify, where appropriate, opportunities for works associated with the scheme that contribute to those objectives.

4.3.1.4. As part of the wider environmental impact assessment process for the IAMP scheme, a section is to be included in the Environmental Statement to cover the water environment within and around the scheme that covers the following aspects:

- Flood risk
- Surface water – quantity and quality
- Groundwater – quantity and quality
- Existing drainage
- Water resources

4.3.1.5. The FRA, Drainage Strategy and WFA reports will form appendices to the ES in support of this chapter. An FRA is mandatory for a scheme of this scale. A Drainage Strategy, though not explicitly required as a separate document, is nevertheless good practice to demonstrate how the scheme will be served. The EA has stipulated that a WFA is required for this scheme.

5 References

5.1. National Planning Policy Framework: Department for Communities & Local Government, 2012.

5.2. River Don at Washington Flood Modelling: Draft Hydraulic Modelling Report: JBA Consulting, May 2016

5.3. National Planning Policy Framework Guidance: http://planningguidance.communities.gov.uk/

5.4. Part 1: Northumbria river basin district: River basin management plan; Environment Agency, December 2015

5.5. IAMP Desktop Engineering Assessment; Mott MacDonald, July 2014.

5.6. Sunderland City Council Level 1 Strategic Flood Risk Assessment, JBA Consulting, June 2010. (SD59)

5.7. South Tyneside Council Strategic Flood Risk Assessment, JBA Consulting, February 2011. (SD58)

5.8. South Tyneside Council Preliminary Flood Risk Assessment, June 2011. (SD57)

5.9. Sunderland Council Core Strategy, August 2013. (SD17)

5.10. South Tyneside Council Core Strategy, June 2007. (SD22)

5.11. Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems: Department for environment, food and rural affairs: March 2015.

5.12. SuDS Manual: CiRIA Report C753, December 2015

5.13. Sewers for Adoption; WRc (prevailing edition in force).