Overview and Scrutiny Committee Meeting Briefing Notes – 9 December 2020

Environment Agency Investments and Improvements since 2016

Executive Summary

INVESTMENT AND IMPROVEMENTS

- Since 2015, 223 homes are now better protected at a cost of £3.627m.
- The Environment Agency undertakes routine maintenance (grass cutting, tree and bush clearing, blockage removal, etc…) annually on a wide range of flood risk assets across Nottingham City.
- From 2016 to 2021, the Environment Agency will have also invested over £850k in intermittent maintenance improvements across Nottingham City.
- As part of the Environment Agency led Strategic Review 2020 accelerated pipeline, £570k was secured in 2020/21 to fund River Leen and Trent Outfall improvement works.
- The Environment Agency and Nottingham City Council together secured £224k in Grant in Aid Funding in 2020/21, designed to accelerate projects in the next 6-year programme.
- Pipeline projects for the next 6-year programme (2021-2027) in Nottingham City have yet to be formally confirmed, but the headlines to date, are as follows:
    - £1.44m Total Project Expenditure; £1.286m of Grant in Aid & Growth Funding
    - £1.5m of further contributions will be required over next 6-years
    - Rough order of magnitude (ROM) estimates suggest 538 homes will be better protected in next 6-year programme (further confidence assurance required, particularly around Mapperley Park Outcome Measures).

FLOOD EVENTS

- The Nottingham City area has experienced two significant flood events since 2016:
    - Day Brook, Main River fluvial flooding, June 2019
    - Tottle Brook, ordinary watercourse, June 2020
- Following the Tottle Brook incident, the Environment Agency has invested £30k on Tottle Brook modelling which is due to be signed-off in 2020/21.

FLOOD WARNING IMPROVEMENTS

- Flood forecasts have been added to the River and Sea Levels Online.Gov.UK webpages.
- The Environment Agency has developed and implemented the Flood Warning Scripting Tool to provide higher quality, consistent flood warning messages across the country.
- Environment Agency East Midlands Area was integral in developing the Property Impact Estimator (PIE) tool which enables forecasters to estimate property level flooding, reflecting the developing flood events and calculates ROM damage costs following a flood event.
- The Environment Agency Flood Warning Expansion Project will introduce new flood warnings to Upper Day Brook at Daybrook and Tottle Brook at Wollaton and Beeston, providing a flood warning service to over 600 additional properties by April 2022.
- New/improved flood models have been developed for the River Leen, Day Brook and River Trent.
- A new network of CCTV cameras has been installed including on the Day Brook and Leen Syphon.
- The Environment Agency worked with partners to deliver a Flood Warden Workshop in Nov 2019 and provides regular (6 monthly) updates to Wardens.
- Since 2016, the Environment Agency has continued to Chair the Nottinghamshire LRF Flooding Sub-Group, delivering Multi-Agency Flood Plans and a new Reasonable Worst Case Scenario.

Detailed Overview

Projects Delivering Homes Better Protected 2015-2021

Since 2015, together we have ensure that 223 homes are better protected, due to the delivery of the current 6-year programme (2015/2021) at a cost of £3.627M.

Completed Project Title	Outcomes Claimed / Gateway 4	Total Project Expenditure	Homes Better Protected 2015-2021	Brief Description
Woolsington Close, Strelley: Surface Water Management Scheme	29-Apr-16	£195,000	17	Surface Water Management Scheme
Nottingham City Council Individual Property Protection Programme	30-Sep-16	£380,000	30	Deliver a Property Flood Resilience scheme.
Daron Gardens / Edern Gardens (Top Valley) Flood Risk Management Scheme	30-Nov-18	£158,000	16	Surface Water Management Scheme
Nottingham and Derby Blue Green Infrastructure Project	31-Dec-19	£2,894,000	160	The Nottingham BGI Project delivered 160 Outcome Measure 2 households (OM2s) in the Day Brook catchment. These OM2's are predominantly Property Level Resilience measures and have been accounted for the next 20 years. The Nottingham BGI project was completed in March 2020. Unfortunately part of the river restoration works were damaged in the February storms and the remediation works are programmed to be finished once the opportunity arises. The emerging Leen strategic approach (see below) will review the Day Brook and a longer term approach.
	Total	**£3,627000**	**223**	

Revenue Maintenance works 2016-2021

The Environment Agency maintains a wide range of flood and coastal risk management (FCRM) assets, which reduce the risk of flooding to people and property across Nottingham City including embankments, pumping stations and flood gates. Routine maintenance includes regular grass cutting, annual tree and bush clearing, blockage removal, and asset repairs. In addition to routine maintenance, the Environment Agency has invested c. 850k in larger maintenance works on an intermittent basis (see table below, projects costing >£10k). The Environment Agency's maintenance programme is now accessible online via an interactive map and updated every 3 months.

Title Of Works	Delivery Date	Cost	Description of Intermittent maintenance
Leen Syphon Desilt	03/03/2017	53	Removal of waste from the River Leen syphon.
Leen Pile Survey/Painting	03/03/2017	18.6	Surveyed sheet pile walls on a stretch the River Leen to assess the need for future works and painted piling to extend asset life.
Wilkinson Street Channel Side Erosion	08/03/2019	24	Reinforced channel side banks with rip-rap stone with associated water vole assessment/removal prior to works commencing.
Leen Sheet Pile Investigations	14/08/2019	54.4	Structural investigation to determine the integrity of current sheet piling
Leen Syphon Access Improvement Works	08/01/2020	213	Improvement of the roadside access to Leen Syphon for operator safety during flood conditions.
Lower Leen Concrete Channel Repairs	02/03/2020	76	Package of works to repair concrete walls in lower Leen area
Leen Syphon Desilt	10/03/2020	150	Waste removal from the downstream end of the Leen Syphon culvert
Birdcage Walk Embankment Repairs	21/10/2020	11.7	Topping up of low spots in bank to improve condition.
Planned work: Hillside Erosion repair on Below Required Condition asset	End Jan 21	120	Erosion repair on revetment of flood wall
Planned work: Leen long stretch channel side repair	End Mar-21	72	Repair of channel side erosion

Environment Agency Led Strategic Review 2020 Accelerated Pipeline Funding Projects

As part of the Strategic Review 2020 accelerated pipeline (SR20) the following projects were identified and £570k of funding secured in 2020/21:

- River Leen – £410k
    - Head of Main River (HOMR) to Day Brook Confluence - £150k
    - Lower Leen and Syphon - £260k
- Nottingham Trent Outfalls - £160k

River Leen Projects

The Environment Agency and Nottingham City Council (NCC) are working in partnership to develop a joint vision for the River Leen. The River Leen is characterised by extensive engineered flood and coastal risk management (FCRM) assets and consideration of their renewal or replacement is required. It has been agreed that the Environment Agency will lead on the modelling and asset condition along the River Leen, while NCC will lead on reviewing other sources of flood risk and green access drivers.

As part of this work, low spots in the embankments of the River Leen have been identified, which indicate the capacity of the channel may be only 1 in 20 years (5% Annual Exceedance Probability Flood). Raising these low spots would create increased flood risk in the Nottingham Canal and other parts of Nottingham, and is not deemed an appropriate future option. This concern is shared by both organisations and NCC also have concerns around the limitations of future development, need for greater access along the river, access to green space in the City and there are joint aspirations for improvements to biodiversity.

Arup has been commissioned by the Environment Agency to begin a phase of work to improve the modelling, update the catchment hydrology, review asset condition, and identify opportunities through the creation of mapping that considers development, flood risk, biodiversity, etc. A joint vision will be developed to attract stakeholders in the future, such as Severn Trent Water and Nottinghamshire County Council. The aim is to develop a Strategic Outline Case (SOC) in 2021/22 that will provide a framework for future Outline Business Cases (OBCs). This strategic approach will consider the long-term ambitions of both our organisations for flood risk and environmental management and economic regeneration and growth.

The Environment Agency is also working with Nottingham University, who are running parallel projects looking at economics and community engagement, along the River Leen. High-level work has identified 670 potential Outcome Measure 2 households (OM2s) in the catchment, which will need to be apportioned appropriately to each project. Future projects on this watercourse, both short and long-term, will be identified, working in partnership with the long-term aim of delivering all of these projects in synergy.

Nottingham Trent Outfalls

The Nottingham Trent Outfalls is an Environment Agency led project which will have a positive impact upon the drainage in Nottingham City. As part of this project a number of structures are being reviewed including Meadow Lock, Tinkers Leen Outfall, Tottle Brook Outfall, Leen Outfall and Holme Sluices. When these structures are closed drainage within the City is adversely impacted.

Preliminary work has identified that approximately 3000 OM2's which were not claimed by the Nottingham Left Bank Scheme, and part of this project will be to look at benefit apportionment for each of the structures to provide funding for their continued maintenance and improvement. These assets are classified as Strategically Important Assets (SIA's) and were not renewed as part of the Nottingham Left Bank Scheme. These assets require investment and Arup has been commissioned to review the asset condition and complete some modelling work to provide a better understanding of the inter-relationship of these structures during periods of high river levels in the River Trent. The project will identify the relationship between these assets and the drainage network in greater detail to better manage the future flood risk.

20/21 Nottingham City Projects (inc. Strategic Review 2020)

The Environment Agency and Nottingham City Council secured £224k in Grant in Aid (GiA) funding in 2020/21 (inc. Strategic Review 2020 - £100m Additional Pipeline Development) designed to accelerate projects in the next 6 year programme.

Project Name	Delivery Team	Project Type	2020/21 Total Budget	GIA	Local Levy	Public & Private Contribution
Nottingham Trent Left Bank	Environment Agency	DEF	£104,000	£104,000	£0	£0
City Wide Retrofit SuDS Programme (Pilot)	Nottingham City	PLP	£20,000	£20,000	£0	£0
Nethergate Stream Flood Alleviation Scheme (SR20)	Nottingham City	DEF	£20,000	£20,000	£0	£0
Stockhill Surface Water Management Scheme (SR20)	Nottingham City	PLP	£20,000	£20,000	£0	£0
Tinkers Leen Flood Alleviation Scheme (SR20)	Nottingham City	DEF	£20,000	£20,000	£0	£0
Tottle Brook Flood Alleviation Scheme (SR20)	Nottingham City	DEF	£20,000	£20,000	£0	£0
Fernwood and Rivergreen Crescent Conveyance Scheme (SR20)	Nottingham City	DEF	£10,000	£10,000	£0	£0
Heathfield Playing School Flood Alleviation Scheme (BGI) (SR20)	Nottingham City	DEF	£5,000	£5,000	£0	£0
Ventnor Rise Flood Alleviation Scheme (BGI) (SR20)	Nottingham City	DEF	£5,000	£5,000	£0	£0
		Total	**£224,000**	**£224,000**	**£0**	**£0**

Flood Events in Nottingham City (2016 to present)

After any flood event the Environment Agency conducts a validation of all flood warnings that have been issued, to assess and improve lead time and accuracy. Additionally, Environment Agency Community Liaison Officers speak to members of the public directly after a flood event. Liaising with partners and the public that have received the messages is key to improving flood warning messages in the future. The Environment Agency also works with partners from the Nottinghamshire Local Resilience Forum (LRF) to gather information through the Nottinghamshire LRF Flooding Sub-group, which is chaired by the Environment Agency.

Since 2016, the Environment Agency has recorded one event of Main-River fluvial flooding affecting Nottingham City. This event occurred in June 2019 when the Day Brook came ‘out of bank ‘ and flooded 9 properties on Athorpe Grove, Old Basford. As a result, the Environment Agency made subsequent improvements to the procedures used to issue Flood Warnings for the Day Brook.

Nottingham City was also impacted by a heavy summer storm in June 2020, to the west of the City. Flooding from the ordinary watercourse section of Tottle Brook impacted several properties. Following this event the Environment Agency led an investigation into maintenance on The Brook and its impact on properties in Wollaton Vale. The Environment Agency are close to signing off a new model on the Tottle Brook which will be shared with Nottingham City, once complete. This catchment does form a part of the wider Leen catchment and the Environment Agency and Nottingham City Council will look to incorporate the management of flood risk on Tottle Brook into the developing River Leen Strategic Framework (as highlighted above).

Modelling & Forecasting Capital Projects 20/21

Project Name	2020/21 Total Budget
Tottle Brook	£30k

Pipeline projects in Nottingham City (2021-2027)

There are 21 pipeline projects which have been identified within the Nottingham City area, 6 of which have requested allocation for funding in the next financial year, including the River Leen Project. The Upper Day Brook Study led by Nottinghamshire County Council and Severn Trent Water will impact Nottingham City. This study has been completed and initial indications suggest that there are potentially 400 Outcome Measure 2 households that could benefit from flood risk improvements. The Environment Agency has asked that the study/report be shared with Nottingham City to widen understanding of any impacts or potential benefits to the downstream Main River section which lies within the City boundary.

21/22 Indicative Allocation and Local Choices Headlines (note that this is still in the process of being formally confirmed)

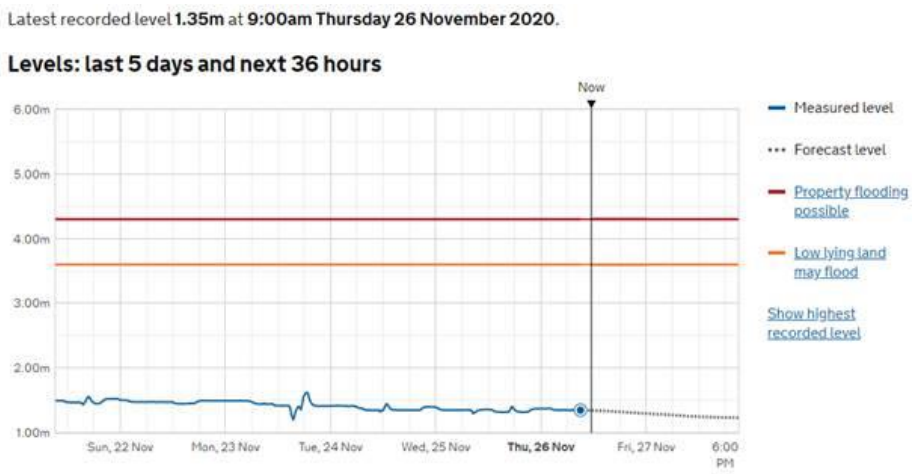
- £1.44m Total Project Expenditure; £1.286m of Grant in Aid & Growth
- £1.5m of Further contributions Required over next 6 years
- Rough order of magnitude (ROM) estimates suggest 538 homes could be better protected in the next 6-year programme (further confidence assurance required, particularly around Mapperley Park).

Project Name	Lead Risk Management Authority - Name	Risk Source	Adjusted Partnership Funding Score (%)	Benefit Cost Ratio	GiA + GROWTH 21/22	Contributions 6 year total	OM2+3 6 year total	Brief Description of Problem and Proposed Solution
Mapperley Park Surface Water Management Scheme	Nottingham City Council	Surface Water Flooding	82%	3.0	740,000	150,000	177*	The scheme is anticipated to include construction of underground storage tanks and increased highway infrastructure to capture surface water flows. *OM2 figure needs reviewing
Blue Green Infrastructure Phase 2	Nottingham City Council	River Flooding	40%	1.0	200,000	0	0	The project will provide protection of up to 100 properties and provide 5ha of environmental enhancement through continuing on from the Blue Green Infrastructure Phase 1.
Beechdale Surface Water Management Scheme	Nottingham City Council	Surface Water Flooding	93%	2.9	141,997	13,003	40	This project will improve the standard of protection of up to 40 properties through a combination of PLR measures and local interventions to manage surface water flows.
Lower Leen and syphon	Environment Agency	River Flooding	26%	1.3	100,000	0	0	Replacement of the debris screen as part of the continued asset maintenance as well as a wider scheme to incorporate the upgrade of failing assets.
Nottingham Trent Left Bank	Environment Agency	River Flooding	194%	0.0	94,637	0	0	New and Replacement flood defences on the left bank of the River Trent in Nottingham
Highway Retrofit SuDS Programme (Pilot Study)	Nottingham City Council	Surface Water Flooding	111%	2.5	10,000	0	10	SK5753943052
Broxtowe Park Brook : Capital Maintenance and Flood Risk Management Scheme	Nottingham City Council	River Flooding	47%	1.5	0	100,000	108	Appropriate FRM Scheme after optioneering.
City Wide Retrofit SuDS Programme Phase 1	Nottingham City Council	Surface Water Flooding	84%	1.9	0	20,000	25	This project will identify suitable sites for reducing surface water flood risk through the implementation of Sustainable Drainage Systems.

Colwick Sluices Refurbishment	Environment Agency	River Flooding	100%	1.3	0	0	0	Refurbishments to the existing Colwick Sluices structure
Fernwood and Rivergreen Crescent Conveyance Scheme	Nottingham City Council	River Flooding	92%	3.1	0	0	20	Undertake a blockage analysis to quantify the flood risk in the event of an asset failure and undertake relevant capital maintenance.
Heathfield School Playing Fields Flood Alleviation	Nottingham City Council	River Flooding	141%	1.2	0	200,000	10	A study is to be undertaken utilising an existing flood model for the catchment
Nethergate Stream Flood Alleviation Scheme	Nottingham City Council	River Flooding	119%	4.2	0	10,000	35	Developing the project from an Initial Assessment to implementing a Flood Alleviation Scheme.
Nottingham City Council Property Flood Resilience Programme (Phase 3)	Nottingham City Council	Surface Water Flooding	48%	1.2	0	150,000	40	Deliver a PFR scheme.
Nottingham River Trent Outfalls	Environment Agency	River Flooding	75%	3.7	0	0	0	A recent initial assessment has recommended that significant capital investment would be required in approximately 10 years (2030). Given these assets form part of the River Trent flood defences, remaining outcome measures have been apportioned to these works to enable this improvement.
River Leen (HOMR to Day Brook), Asset Renewal	Environment Agency	River Flooding	40%	1.2	0	0	0	Butlers Hill, Bulwell, Highbury Vale and Old Basford at risk from unnamed watercourses and Leen.
Silverdale Embankment Improvements, River Trent & Fairham Brook, Asset Renewal	Environment Agency	River Flooding	336%	16.8	0	0	0	Works weren't included in this location during the Right bank scheme in 2005. Asset approaching end of design life.
Stockhill Surface Water Management Scheme	Nottingham City Council	Surface Water Flooding	69%	2.9	0	200,000	50	Construction of flood risk management scheme and/or implementation of PLR following flood modelling study and Options Appraisal.
Tinkers Leen Flood Alleviation Scheme	Nottingham City Council	River Flooding	0%	0.0	0	0	0	The Tinkers Leen has historically flooded and affected major vehicular routes and infrastructure in Nottingham City. We anticipate large amounts of economic benefits (OM1) as a result of a scheme.
Tottle Brook (Main River), Nottingham, PLP	Environment Agency	River Flooding	62%	2.7	0	0	0	PLP scheme for the catchment - 24 properties at very significant risk - 11 of which are in the 21% - 40% most deprived area.
Tottle Brook Flood Alleviation Scheme	Nottingham City Council	River Flooding	36%	1.3	0	475,000	48	Construction of flood risk management scheme on Ordinary and Main Watercourse following flood modelling and options appraisal study.
Upper Daybrook Flood Alleviation	Nottinghamshire County Council	Surface Water Flooding	89%	1.0	0	1,000,000	400	various approaches including storage, SUDS and asset improvement
Ventnor Rise Flood Alleviation Scheme	Nottingham City Council	River Flooding	74%	2.0	0	200,000	10	Undertake site surveys and feasibility study to determine potential use of vacant land to enhance flood storage potential via environmental improvements.

Flood Forecasting and Warning Improvements

Flood Forecasts Online: Recently there has been the addition of flood forecasts to the River Levels Online .Gov.UK webpages. This webpage provides partners and the public with more information to help them take positive, preparatory action to prepare for flooding. The Environment Agency river level gauges at Colwick and Clifton Bridge now features a forecast level.



Flood Warning Scripting Tool: The Environment Agency has developed and implemented the Flood Warning Scripting Tool as part of the process for issuing our flood warning messages to improve the quality of the flood warning messages that partners and public receive during a flood event. This national tool enables the public to get high quality, consistent flood warning messages wherever they are in the country, and provides a consistent system for Environment Agency Flood Warning Duty Officers to use, thus providing great benefits for mutual aid working. East Midlands Area played a fundamental role in the development of this tool nationally.

Property Impact Estimator: The Environment Agency has developed a new Property Impact Estimator (PIE) tool in the East Midlands which enables staff to determine property level flooding reflecting the developing flood event. This information can be used consider where to deploy resources, where to evacuate, where to gather data during an event etc. It can also estimate damage costs associated with a flood event. This level of information is currently available only in the East Midlands and has been used to great success during TrentEx and the recent flooding in November 2019 and February 2020 in other areas of Nottinghamshire.

TrentEx: The Environment Agency developed and ran TrentEx in partnership with Nottinghamshire Local Resilience Forum and the Trent Catchment Flood Group. This exercise tested the response to a Trent wide flood event with specific aspects of strategic and tactical response in Nottinghamshire including Nottingham City.

Flood Warning Expansion Project: The Environment Agency is introducing a flood warning service to all un-serviced high risk properties in England. In Nottingham City, new flood warnings will be introduced to the Upper Day Brook at Daybrook and the Tottle Brook at Wollaton and Beeston (Nottingham City overlap). Combined, this will offer a flood warning service to over 600 properties by April 2022, delivering benefits for partners and the 'at risk' public.

Flood Models: Since 2016 improvements have been made to the River Leen and Day Brook model and River Trent model, improving the accuracy and timeliness of flood warnings. The Nottingham tributaries model has recently been completed and the Environment Agency will use this model to inform the new flood warning service on the Tottle Brook.

Flood Warning System: New Flood Warning System was introduced in 2017, and the Next Flood Warning system is now in development by the Environment Agency, which should bring additional benefits to partners in the content and frequency of messages received.

Flood Warden, training and communications: Flood Warden Workshop was held in Nov 2019. Flood Warden Update letter sent to all Flood Wardens in Nottingham and Nottinghamshire (sent twice a year) to update them on flooding matters.

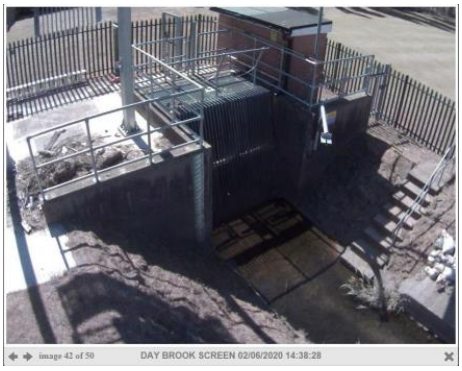
Local Resilience Forum (LRF) Flooding Sub-Group: Since 2016 the Environment Agency has continued to Chair the Nottinghamshire LRF Flooding Sub-Group and had the following successes:

- Multi-Agency Flood Plans (MAFP): Feedback and lessons learned from flooding events across the city and county (2016-20) were used to improve and update the LRF's MAFP.
- City specific local flood response plan review is due for March 2020.
- Flood Group and LRF agreed to a new Reasonable Worst Case Scenario to use as the LRF's risk assessment for a fluvial flooding event. The Scenario used within the fluvial flooding risk assessment aids the LRF and associated districts with planning for fluvial flooding events.
- Nottingham City have also been included in the Environment Agency national Flood Action Campaign with the relevant resources disseminated to Nottingham City for use as suitable.

CCTV: The Environment Agency has installed a new network of CCTV cameras to provide up to date blockage/capacity issues and allow for more accurate issuing of flood warnings and informed message content.

Day Brook playing fields

Day Brook debris screen



CCTV at Leen Syphon