

Yorkshire Water Strategic Planning Partner
**Barnsley Lundwood Wastewater Treatment Works
New Chemical Dosing Kiosk Area**

Flood Risk Assessment
September 2023

LUNDW STA WWT WWT RA C 0002

Version	Date	Description	Author	Check	Reviewer
1	12 September, 2023	1 st Draft	W. Beaver	R. Pickersgill	K. Limbrick

© This document and the material contained in it are the property of Stantec UK Limited. The document is provided to you in confidence and on the understanding, it is not disclosed to anyone other than those of your employees who need to evaluate it.

Table of Contents

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION.....	3
1.1 PURPOSE	3
1.2 REPORT OBJECTIVES AND STRUCTURE	3
1.3 AVAILABLE INFORMATION	3
2.0 DESCRIPTION OF THE EXISTING SITE AND PROPOSED DEVELOPMENT.....	4
2.1 EXISTING SITE DESCRIPTION.....	4
2.2 DETAILS OF THE PROPOSED DEVELOPMENT.....	4
3.0 FLOOD RISKS TO THE PROPOSED DEVELOPMENT.....	5
3.1 POTENTIAL SOURCES OF FLOODING	5
3.2 FLOOD MAP FOR PLANNING	5
3.3 PRIMARY SOURCE OF FLOODING	7
3.4 FLOODING FROM SURFACE WATER	8
3.5 FLOODING FROM RESERVOIRS.....	8
3.6 FLOODING FROM GROUNDWATER.....	8
3.7 FLOODING FROM SEWERS	8
4.0 PPG REQUIRMENTS.....	9
4.1 SEQUENTIAL TEST.....	9
4.2 FLOOD RISK VULNERABILITY CLASSIFICATION	9
4.3 REMAINING PPG REQUIRMENTS.....	9
5.0 FLOOD RISK CONSIDERATIONS	11
5.1 BE SAFE AND REMAIN OPERATIONAL FOR ITS LIFETIME	11
5.2 NOT INCREASE FLOOD RISK ELSEWHERE	11
6.0 CONCLUSIONS AND RECOMMENDATIONS	12
APPENDICES	14
Appendix A. SITE LOCATION, TOPOGRAPHY AND FLOOD RISK MAPS.....	15
Appendix B. PROPOSED DEVELOPMENT DRAWINGS.....	16
Appendix C. EA FLOOD MODEL RESULTS (Lower and Middle Don Model)	17

Executive Summary

This document presents the findings of a Flood Risk Assessment (FRA) undertaken to accompany a planning application for the construction of a new Chemical Dosing Kiosk Area at Yorkshire Water's Lundwood Wastewater Treatment Works (WwTW). The Site is located on the south-eastern edge of the village of Lundwood, approximately 3.2 km east of the centre of Barnsley, Yorkshire, and is owned and operated by Yorkshire Water.

Lundwood is situated within the administrative boundary of Barnsley Metropolitan Borough Council. The Site is an existing operational Yorkshire Water wastewater treatment plant. The River Dearne runs adjacent to the site to the South. Most of the components of the proposed development are classified as Permitted Development and therefore do not require planning permission, however, it is considered that the *"The installation of a Chemical Dosing Kiosk"* will require the submission of a full planning application due to its structure exceeding 29m³ in volume; the threshold set under Permitted Development rights as outlined under Class B (d) (development by or on behalf of sewerage undertakers) Part 13 of Schedule 2 of the Town and Country Planning (General Permitted Development) (England) Order 2015.

Parts of the WwTW are shown to be located within the floodplain of the River Dearne, which is designated as a Main River by the Environment Agency (EA). As such, current planning regulations require that the planning application for the proposed development is accompanied by an appropriate FRA.

This FRA has been prepared in accordance with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance (PPG) and covers both aspects of the proposed development (i.e. those components that are considered Permitted Development, and the new Chemical Dosing Kiosk that will require planning permission). The Proposed Development represents essential infrastructure required to ensure that final effluent discharges at Lundwood WwTW comply with the Water Industry National Environment Programme (WINEP) new phosphorus discharge levels jointly set by the Environment Agency, Department for Environment, Food and Rural Affairs (Defra), and Water Services Regulation Authority (Ofwat) in May 2022.

According to the Environment Agency's Flood Map for Planning, parts of the WwTW lie within Flood Zone 2 (Medium Probability) and Flood Zone 3 (High Probability) of the River Dearne. The proposed development would be classified as 'Less Vulnerable' under the PPG (i.e. *"Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place"*). As part of this FRA, the Environment Agency's 2018 Lower and Middle Don Model of the River Dearne has been obtained with which to quantify both the flood risk from the River Dearne and the impacts of the proposed development on flood risk elsewhere, and to ensure that the new infrastructure will remain safe and operational over its intended lifetime, whilst taking climate change into account. The model results show that the proposed development will be located within Flood Zone 1 (Low Probability).

This FRA confirms that the proposed development will meet the requirements of the NPPF/PPG. Specifically, this FRA has demonstrated that:

- The proposed land use is appropriate for its Flood Zone, and the development proposals will not involve an increase in the number of staff working within a flood risk area;

Barnsley Lundwood Wastewater Treatment Works: Flood Risk Assessment

- The proposed development will remain operational in times of flooding over the duration of its intended lifetime, will not result in a loss of floodplain storage capacity or reduce floodplain conveyance; and
- The new infrastructure will not result in an increase in the volume and rate of surface runoff leaving the site.

In summary, this FRA has demonstrated that the proposed development is appropriate for its location, will remain operational in times of flooding, and will not result in an increase in off-site flood risk.

1.0 INTRODUCTION

1.1 PURPOSE

This document presents the findings of a Flood Risk Assessment (FRA) undertaken for the proposed construction of a new Chemical Dosing Kiosk Area at Yorkshire Water's Lundwood Wastewater Treatment Works (WwTW). Parts of the Lundwood WwTW are located in Flood Zone 2 (Medium Probability) and Flood Zone 3 (High Probability) of the River Dearne, which is designated as a Main River by the Environment Agency. Under the Planning Practice Guidance (PPG), all planning applications on land within Flood Zones 2 and 3 need to be accompanied by an appropriate FRA.

An FRA also needs to be undertaken for: 1) developments of more than 1 ha in Flood Zone 1; 2) developments of less than 1 Ha in Flood Zone 1 where they could be affected by sources of flooding other than from rivers and the sea (for example surface water drains, reservoirs); and 3) developments in an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency.

This FRA seeks to demonstrate that flood risk from all sources has been considered as part of the proposed development and that the requirements of the PPG are met. As set out in the PPG, the objectives of an FRA are to ensure that:

- Flood risk is taken into account at all stages of the planning process to ensure that new development is appropriate for its location;
- The proposed development will remain safe and operational throughout the duration of its intended design lifetime; and
- The proposed development will not increase flood risk elsewhere.

1.2 REPORT OBJECTIVES AND STRUCTURE

This FRA concentrates on the flood risk issues over the operational lifetime of the proposed development. This report has been prepared in accordance with the requirements of the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG). The objectives of this report are to a) quantify the flood risk to the site; b) demonstrate that the proposed development will remain safe and operational over its intended design lifetime taking climate change into consideration; and c) demonstrate that the proposed development will not increase flood risk elsewhere.

1.3 AVAILABLE INFORMATION

This FRA is based on the following available information:

- Open-source LiDAR Digital Terrain Model (DTM) data (LiDAR Composite, DTM at 1m resolution);
- The Environment Agency's 2018 Lower and Middle Don Model of the River Dearne; and
- A site layout plan, topographical survey and outline design drawings of the proposed development, all provided by Yorkshire Water.

2.0 DESCRIPTION OF THE EXISTING SITE AND PROPOSED DEVELOPMENT

2.1 EXISTING SITE DESCRIPTION

Lundwood WwTW is located on the south-eastern edge of the village of Lundwood, approximately 3.2 km east of the centre of Barnsley, Yorkshire. Lundwood is situated within the administrative boundary of Barnsley Metropolitan Borough Council and is owned and operated by Yorkshire Water.

The national grid reference for the site is:

SE379069

The postal address for the site is:

Lund Lane, Barnsley, South Yorkshire, S71 5PB.

The existing site layout is shown in Appendix A.

2.2 DETAILS OF THE PROPOSED DEVELOPMENT

Yorkshire Water is required to upgrade its Lundwood WwTW to ensure its final effluent discharges comply with tightening Phosphorus consent requirements; under WINEP, the new standards to reduce Phosphorus (P) concentrations in the final effluent is to 0.25mg/l Total P annual average. This driver originates from new Water Framework Directive and Urban Wastewater Treatment Directive consents being applied to the site from the Environment Agency. The Proposed Development comprises a new Chemical Dosing Kiosk Area.

The proposed new Chemical Dosing Kiosk Area will exceed 29 cubic metres in capacity and therefore exceed the threshold set under Permitted Development rights as outlined under Class B (d) (*development by or on behalf of sewerage undertakers*) Part 13 of Schedule 2 of the Town and Country Planning (General Permitted Development) (England) Order 2015, and therefore would require full planning permission.

The proposed development drawings are detailed in Appendix B.

3.0 FLOOD RISKS TO THE PROPOSED DEVELOPMENT

3.1 POTENTIAL SOURCES OF FLOODING

Flooding can occur from a number of sources as presented in Table 1. Maps showing the potential sources of flooding that could impact the proposed development are shown in Appendix A.

Table 1 - Possible sources of flooding identified in the Planning Practice Guidance (PPG)

Source	Description
Flooding from rivers (or fluvial flooding)	River flows which exceed the flow capacity of the river channel (or culverts) can cause flooding from rivers. It can happen for example, when heavy rain falls on an already waterlogged catchment. A blockage caused by natural material or manmade objects/litter can also cause rivers to overtop their banks.
Flooding from the sea (or coastal/tidal flooding)	High tides and/or storm surges which lead to overtopping of existing defences (if any) can cause flooding from the sea.
Flooding from surface water (or pluvial flooding)	Intense rainfall that cannot soak into the ground or enter drainage systems can quickly run off the land and result in local flooding. This type of flooding is typically localised and happens very quickly after the rain has fallen.
Flooding from groundwater	Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in areas underlain by permeable rocks or granular layers called aquifers.
Flooding from sewers	Sewer flooding can occur when piped systems are overwhelmed by heavy rainfall, when sewers become blocked or when sewers are of inadequate capacity.
Flooding from reservoirs, canals and other artificial sources	Non-natural or artificial sources of flooding can include reservoirs, canals and lakes where water is retained above natural ground level.

3.2 FLOOD MAP FOR PLANNING

The Planning Practice Guidance (PPG) defines three Flood Zones as shown in Table 2. The following section presents the PPG Flood Zone classification for the proposed development based on the Environment Agency's Flood Map for Planning.

Barnsley Lundwood Wastewater Treatment Works: Flood Risk Assessment

Table 2 - PPG Flood Zones

Flood Zone	Description
1	Low probability – less than 1 in 1,000 year (<0.1%) for river or sea flooding.
2	Medium probability – between 1 in 1,000 year (0.1%) and 1 in 100 year (1%) for river flooding or between 1 in 1,000 (0.1%) and 1 in 200 year for sea flooding.
3a	High probability – 1 in 100 year (1%) or greater for river flooding or 1 in 200 year (0.5%) or greater for sea flooding.
3b	The Functional Floodplain – land where water has to flow or be stored in times of flood. There is not a strict definition of the annual probability of flooding in this zone, but the 1 in 20 year (5%) or greater return period should provide a starting point for consideration.

According to the Flood Map for Planning provided by the Environment Agency (EA), parts of the existing WwTW are located within Flood Zones 2 and 3. Flood Zone 2 has a Medium Probability of flooding and Flood Zone 3 has a High Probability, as described in Table 2. The source of this flooding is the River Dearne. The Flood Map for Planning for the site is detailed in Appendix A. The proposed dosing kiosk is, however, shown to be located within Flood Zone 1 (Low Probability).

3.3 PRIMARY SOURCE OF FLOODING

To quantify the flood risk to the site in detail, the Environment Agency's flood model of the River Dearne has been obtained. This model has been used to quantify both the flood risk from the River Dearne and the impacts of the construction of the proposed development on flood risk elsewhere, and to ensure that the new infrastructure will remain safe and operational over its intended lifetime, whilst taking climate change into account.

The EA's flood model of the River Dearne is the '2018 Lower and Middle Don Flood Risk Mapping Study' model. Flood levels for a range of return periods are available from this model. The flood levels are required for the safe and sustainable design of the proposed development.

Peak design flows in the received model were determined at a number of hydrological assessment points along the River Dearne using the FEH statistical method. Tributary inflows were also scaled to match FEH statistical peak flows. Updating the input hydrology has been considered to be beyond the scope of this project; the provided model includes a simulation for a variety of scenarios with which to assess flood risk. The proposed development is within the Don and Rother Management Catchment and is classified as 'Less Vulnerable' under the PPG (i.e. *"Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place"*). The site is also located in Flood Zones 2 and 3; therefore, the central climate change allowance for 2080s of 28% should be applied. The design scenarios included in the EA's flood model of the River Dearne include a variety of return periods and climate change allowances. The 28% climate change allowance is not included within this, however, a 20%, 30% and 50% climate change uplift is included. It was therefore concluded that the model did not need to be edited to include a 28% climate change uplift as the existing +30% climate change allowance demonstrates a close, conservative approximation. Existing result files from the EA's model were inspected to obtain the flood levels at the site for the 30 year, 100 year, 100 year plus 30% CC, 200 year and 1000 year events. Maximum flood levels were extracted from the 2D component for the design events. The flood extents and levels for each design scenario mentioned above are presented in Appendix C of this document. As detailed in Appendix C, while large areas of the site that is owned by Yorkshire Water are located within the modelled flood extent, the proposed development under the planning boundary is not within the modelled floodplain in any of the five design scenarios. Therefore, there is no need for any further flood protection measures. The proposed dosing kiosk is, therefore, confirmed as being located within Flood Zone 1 (Low Probability).

3.4 FLOODING FROM SURFACE WATER

The Environment Agency's Surface Water Flood Map is presented in Appendix A and shows some areas of the Lundwood WwTW at risk of surface water flooding. The location of the proposed Chemical Dosing Kiosk Area, however, is not in a location at risk of surface water flooding; as such, flood risk from this source is not considered further.

3.5 FLOODING FROM RESERVOIRS

The Environment Agency's Risk of Flooding from Reservoirs map is shown within Appendix A. While some areas of the site are exposed to a risk of flooding from reservoirs when there is also flooding from rivers, the location for the proposed development is not shown to be at risk of flooding due to reservoir failure and so this source of flood risk is not considered further.

3.6 FLOODING FROM GROUNDWATER

The Lundwood WwTW site is located adjacent to the River Dearne. Any groundwater present beneath the site is likely to be in hydraulic continuity with water levels in the river due to this close proximity. The flood levels presented in Appendix C can, therefore, also be considered representative of any potential groundwater flood risk to the site.

3.7 FLOODING FROM SEWERS

The proposed development will be located on a site adjacent to existing watercourses and will not, therefore, be served by – or exposed to flood risk from – a significant sewer catchment area (either surface or foul). The risk of flooding from sewers is, therefore, not considered further.

4.0 PPG REQUIREMENTS

4.1 SEQUENTIAL TEST

The Sequential Test aims to steer new development to areas that have the lowest probability of flooding. Given that the proposed development would be located within existing business premises, the PPG (2021) suggests a pragmatic approach to the Sequential Test in such circumstances: *“in considering planning applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere.”* As such, the requirement to pass the Sequential Test is not considered further.

4.2 FLOOD RISK VULNERABILITY CLASSIFICATION

The proposed development would be classified as ‘Less Vulnerable’ under the PPG (i.e. *“Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place”*). According to the PPG ‘compatibility’ guidance presented in Table 3 below, this means that the proposed development would, therefore, be considered appropriate for location within Flood Zones 2 and 3 (and indeed in Flood Zone 1), without first having to pass the PPG Exception Test.

Table 3 - Flood risk vulnerability and flood zone ‘compatibility’.

Flood Zone	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
1	✓	✓	✓	✓	✓
2	✓	Exception Test required	✓	✓	✓
3a	Exception Test required	X	Exception Test required	✓	✓
3b	Exception Test required	X	X	X	✓

✓ Development is appropriate for flood zone

X Development should not be permitted

4.3 REMAINING PPG REQUIREMENTS

To address the remainder of the PPG requirements, the proposed development will be designed and constructed to:

- Remain operational and safe for its users in times of flood over the duration of its intended lifetime taking climate change into account;

Barnsley Lundwood Wastewater Treatment Works: Flood Risk Assessment

- Result in no net loss of floodplain storage;
- Not impede flood water flows; and
- Not increase flood risk elsewhere.

Given the scale and nature of the proposed development, the key considerations listed above form the focus of the remainder of this FRA and are presented in Section 5 below.

5.0 FLOOD RISK CONSIDERATIONS

5.1 BE SAFE AND REMAIN OPERATIONAL FOR ITS LIFETIME

5.1.1 Remain Safe and Operational

The proposed development has been shown to be located on land above the maximum flood levels produced from the Environment Agency's 2018 Lower and Middle Don Model for the River Dearne (it is, therefore, located within Flood Zone 1 – Low Probability). As such, it would be expected to remain safe and operational for its lifetime without further mitigation measures.

5.1.2 Climate Change

A climate change allowance of 30% has been included in this FRA. The PPG recommends that 'Less Vulnerable' land uses apply the 'Central' allowance for climate change impacts on peak river flows in Flood Zones 2 and 3a. The proposed development is located within the PPG Don and Rother Management Catchment. The appropriate design horizon for the proposed development is the 2080 period. The PPG 'Central' allowance for this design horizon is 28%. The climate change allowance considered within this FRA therefore exceeds that recommended by the PPG while still showing the proposed development to be located on land above the maximum flood levels.

5.2 NOT INCREASE FLOOD RISK ELSEWHERE

5.2.1 No net loss of floodplain storage

The Proposed Development area is within Flood Zone 1 and therefore at a low risk of flooding. As such, it would not result in any net loss of floodplain storage.

5.2.2 No impediment to flood water flows

The Proposed Development area is within Flood Zone 1 and therefore at a low risk of flooding. As such, it would not result in an impediment to flood water flows.

5.2.3 Surface water runoff

The Proposed Development comprises a small Chemical Dosing Kiosk Area, which will sit on small concrete plinths surrounded by areas of crushed stone; runoff from which will discharge to the existing storm water system already present on the site (Appendix B). The proposed development will not, therefore, result in a significant increase in the volume or rate of surface water runoff generated throughout the existing WwTW site.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This document presents the findings of a Flood Risk Assessment (FRA) undertaken to accompany a planning application for the construction of a new Chemical Dosing Kiosk Area at Yorkshire Water's Lundwood Wastewater Treatment Works (WwTW). The Site is located on the south-eastern edge of the village of Lundwood, approximately 3.2 km east of the centre of Barnsley, Yorkshire, and is owned and operated by Yorkshire Water.

Lundwood is situated within the administrative boundary of Barnsley Metropolitan Borough Council. The Site is an existing operational Yorkshire Water wastewater treatment plant. The River Dearne runs adjacent to the site to the South. Most of the components of the proposed development are classified as Permitted Development and therefore do not require planning permission, however, it is considered that the *“The installation of a Chemical Dosing Kiosk”* will require the submission of a full planning application due to its structure exceeding 29m³ in volume; the threshold set under Permitted Development rights as outlined under Class B (d) (development by or on behalf of sewerage undertakers) Part 13 of Schedule 2 of the Town and Country Planning (General Permitted Development) (England) Order 2015.

Parts of the WwTW are shown to be located within the floodplain of the River Dearne, which is designated as a Main River by the Environment Agency (EA). As such, current planning regulations require that the planning application for the proposed development is accompanied by an appropriate FRA.

This FRA has been prepared in accordance with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance (PPG) and covers both aspects of the proposed development (i.e. those components that are considered Permitted Development, and the new Chemical Dosing Kiosk that will require planning permission). The Proposed Development represents essential infrastructure required to ensure that final effluent discharges at Lundwood WwTW comply with the Water Industry National Environment Programme (WINEP) new phosphorus discharge levels jointly set by the Environment Agency, Department for Environment, Food and Rural Affairs (Defra), and Water Services Regulation Authority (Ofwat) in May 2022.

According to the Environment Agency's Flood Map for Planning, parts of the WwTW lie within Flood Zone 2 (Medium Probability) and Flood Zone 3 (High Probability) of the River Dearne. The proposed development would be classified as 'Less Vulnerable' under the PPG (i.e. *“Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place”*). As part of this FRA, the Environment Agency's 2018 Lower and Middle Don Model of the River Dearne has been obtained with which to quantify both the flood risk from the River Dearne and the impacts of the proposed development on flood risk elsewhere, and to ensure that the new infrastructure will remain safe and operational over its intended lifetime, whilst taking climate change into account. The model results show that the proposed development will be located within Flood Zone 1 (Low Probability).

This FRA confirms that the proposed development will meet the requirements of the NPPF/PPG. Specifically, this FRA has demonstrated that:

- The proposed land use is appropriate for its Flood Zone, and the development proposals will not involve an increase in the number of staff working within a flood risk area;

Barnsley Lundwood Wastewater Treatment Works: Flood Risk Assessment

- The proposed development will remain operational in times of flooding over the duration of its intended lifetime, will not result in a loss of floodplain storage capacity or reduce floodplain conveyance; and
- The new infrastructure will not result in an increase in the volume and rate of surface runoff leaving the site.

In summary, this FRA has demonstrated that the proposed development is appropriate for its location, will remain operational in times of flooding, and will not result in an increase in off-site flood risk.