



Retford Circular Economy Project Environmental Statement Addendum – Volume 3 Technical Appendices



Technical Appendix 10.1: Updated
Preliminary Land Quality Risk Assessment

January 2024

Project No.: 0695864



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Lound Hive Ltd

Retford Circular Economy Project (RCEP)

SLR Project No.: 416.11943.00001

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Technical Note: Update to Preliminary Land Quality Risk Assessment (PLQRA)

1.0 Introduction

SLR Consulting Ltd (SLR) produced a Preliminary Land Quality Risk Assessment (PLQRA) in support of the planning application for the extraction and processing of pulverised fuel ash (PFA) at the former ash lagoons as part of the Retford Circular Economy Project (RCEP).

The planning application was submitted with an Environmental Statement (ES) to Nottinghamshire County Council (NCC) for the Proposed Development in March 2023 (Ref: 1/23/00410/CDM). A response has since been provided by NCC requesting further information to support the application, and therefore an ES addendum (ESA) will be submitted to address these requirements.

Since the initial ES was submitted, further information has been obtained to update and provide further detail to the PLQRA. It is therefore the purpose of this Technical Note to summarise updates to the PLQRA in support of the ESA.

This document will therefore supplement the existing PLQRA report which should be referred to for more detailed information:

- Preliminary Land Quality Risk Assessment (PLQRA). Retford Circular Economy Project (RCEP). SLR Consulting Ltd, version no.1 February 2023 (ref; 416.11943.00001)

2.0 Phased Extraction

The sequence phasing and numbering of the extraction has been updated as shown on the drawings in Appendix A. The extraction will commence in the west of Area A, sequentially moving through each adjacent phase area in an eastern direction.

3.0 Restoration Plan

The final outline restoration design has been revised in accordance with the extraction sequencing as shown on the drawing in Appendix B. It now provides for significantly improved habitats.

It is envisaged that a detailed restoration plan for each extraction phase will be prepared for approval by NCC following completion of each phase.

It is proposed that this will be secured by a suitable planning condition.

4.0 Water Monitoring Plan

The previous PLQRA did not include reference to a water monitoring plan.

A groundwater and surface water monitoring programme will be developed and agreed with the Environment Agency (EA). This will include monitoring prior to construction to establish baseline conditions for surface waters and groundwater. Ongoing monitoring of surface water and groundwater throughout the life cycle of the Proposed Development will enable any deviations from the baseline to be identified and rectified through water management measures. Monitoring will continue for a period of time to be agreed with the EA post-restoration.

As a minimum the surface water monitoring regime will include surface water monitoring at locations on the River Idle upstream, mid-point and downstream of the Proposed Development and would be supplemented with regular visual inspections.

It is proposed that this will be secured by a suitable planning condition and/or as part of the site environmental permit.

5.0 Water Management

The design of the Proposed Development has been revised such that it is proposed to excavate and remove the PFA without abstracting or discharging groundwater. Therefore, the requirements of a permit for dewatering/discharging groundwater are not required. The PFA will be extracted to approximately 0.2-0.5m above the top of the underlying sandstone. The thickness of PFA remaining at the base of the excavation is to be confirmed but will ensure that there will be no upwelling of groundwater from the sandstone into the excavation. Once excavated the PFA will be placed along the side of the excavation to allow any perched water within the PFA to drain naturally back into the excavation. There will therefore be no active abstraction or disposal of groundwater required. The PFA will be 'worked wet'.

Further details on the working scheme are provided in the ESA, Volume 1, Chapter 5.

6.0 Dust Controls

The PFA that is to be extracted from the Site is saturated because it has been in the ground for many years. The PFA has an in-situ moisture content of 18% to 47%, or an average of 31% across the Site. Natural moisture content and rainfall are the most effective measures that will prevent/minimise emissions in the first instance. As such, PFA will have a very limited potential for dust generation when it is excavated and screened.

Notwithstanding the above, numerous management measures are proposed to ensure that the PFA that is to be moved and processed in the open air is kept moist and sufficiently managed. During operations, damping down with water (including with bowsers and foggers/sprays) is one of the main techniques used for dust suppression and there are a number of material characteristics of PFA that make this a very an effective technique.



PFA particles have a high degree of porosity and a large surface area, meaning they contain small pores and voids within their structure. This porosity contributes to the lightweight nature and readiness to absorb water which acts as a highly effective binding agent, suppressing the dust particles, making them heavier and preventing them from becoming airborne. By wetting the dust particles, they lose their ability to float in the air. Water atomisation is therefore highly effective and a fogging/spray system will be employed to prevent wind-blown fugitive dust emissions as well as implementation of other control measures such as weather monitoring, limiting excavation to what is immediately required, stockpile management and compacting/sealing of material.

Fugitive emissions management will follow requirements as detailed within the Revised Dust Management and Monitoring Plan (DMMP) as provided in the ESA, Volume 3, Technical Appendix 13.7.

7.0 PFA Contaminant Analysis

Since the PLQRA was completed samples of PFA collected from each exploratory hole location in the 2021 ground investigation have undergone for a suite of chemical and asbestos laboratory analysis. The samples were selected from each location to provide both lateral and vertical delineation of the PFA. A non-targeted approach was undertaken given the absence of any visual or olfactory indications of contamination by hydrocarbons, other chemicals or asbestos recorded during the intrusive works.

The PFA was scheduled for a suite of analysis that comprised:

- asbestos identification and quantification – 96 samples
- metals¹ – 62 samples
- poly-aromatic hydrocarbons (PAH)² – 62 samples
- Semi-volatile organic compounds (SVOC) – 62 samples.

PFA samples were also selected for leachate analysis that comprised:

- metals – 25 samples
- poly-aromatic hydrocarbons (PAH) – 25 samples
- Semi-volatile organic compounds (SVOC) – 25 samples.

There were no concentrations of PAH or SVOC detected above the laboratory limit of detection (LOD) in any of the 62 samples. Metals were detected at anticipated concentrations for the PFA (iron, magnesium, titanium, manganese, barium, strontium, vanadium, zinc, arsenic). No asbestos was detected in 95 of the samples submitted for analysis. A small isolated fibre bundle <10mm in length of chrysotile (white) asbestos was encountered at one location at a depth between 3m-4.5m in BH8.

For the PFA leachate analysis, none of the 25 samples contained PAH or SVOC above the laboratory limit of detection (LOD). Metals were detected at anticipated concentrations for the PFA (magnesium, boron, strontium, titanium, arsenic, molybdenum). The results of the

¹ Metals suite - antimony, arsenic, barium, boron, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, strontium, titanium, vanadium, zinc

² PAH suite - acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene, benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene



leachate analysis are comparable to the concentrations detected within the underlying groundwater.

The laboratory analysis of the PFA has demonstrated its constituent components are in accordance with the concentrations of a typical PFA. The analysis has confirmed the detection of metals (iron, magnesium, titanium, manganese, barium, strontium, vanadium, zinc, arsenic) and the absence of any trace signature of organics (PAH, TPH, SVOC). There was an absence of asbestos detected within the PFA with the exception of a very small asbestos fibre bundle at one isolated location in the north-eastern corner of High-Rise Phase 2 (HR P2).

Leachate analysis of the PFA is comparable to the concentrations detected within the underlying groundwater which show a heavy metal signature. Metals were detected at anticipated concentrations for the PFA (magnesium, boron, strontium, titanium, arsenic, molybdenum) and there were no concentrations of PAHs or SVOCs detected above the laboratory limit of detection (LOD).

Summary tables and laboratory analysis certificates are provided in a separate Technical Note (PFA Laboratory Analysis Results; SLR Consulting Ltd. Ref; 425.064852.00001_rev2 dated August 2023).

8.0 Contamination Assessment

From the historical evidence and the PFA characterisation investigation undertaken to date, there is no indication that any significant hydrocarbon, other chemical or asbestos contamination is present in any areas of the Site, as demonstrated by the preliminary findings from the PFA characterisation analysis.

A trace³ occurrence of asbestos was encountered in one sample, which, owing to the very small quantity encountered, does not meet the definition of asbestos as regulated under regulation 2 of the Control of Asbestos Regulations 2012 (CAR 2012). However, notwithstanding the very small quantity encountered and following a precautionary approach, a 'watching brief' will be implemented. This would be carried out in accordance with the requirements of CAR 2012, the accompanying Approved Code of Practice and Guidance as well as CAR-SOIL industry guidance. The specific measures to be implemented, including the watching brief, are outlined in the Discovery Strategy as provided in the ESA, Volume 3, Technical Appendix 5.3.

The leachate data obtained for the PFA has demonstrated that there would be no increased detrimental impact or further deterioration in groundwater quality, as existing concentrations within the groundwater exhibit similar concentrations to the leachate recorded from the PFA. In addition, the removal of the overlying PFA would ultimately result in removal of a contaminant source and therefore provide betterment over a period of time.

Additional ground investigations and field visual asbestos screening and asbestos identification and quantification analysis will also be undertaken as part of a further characterisation exercise before PFA excavation is commenced in each phase. It is proposed that this will be secured by a suitable planning condition and/or as part of the site environmental permit.

³ HSG 248 (2nd Edition) Asbestos: The Analysts Guide (May, 2021). It is the authoritative source of asbestos analytical procedures within Great Britain. The document provides a definition of 'trace' asbestos. A section on sampling and analysis of soils and made ground is also included.



9.0 Land Quality Risk Assessment

On the basis of the change in design and additional information obtained in relation to the contaminant characterisation of the PFA, the risk assessment has been updated accordingly. The table from the PLQRA has been reproduced in the following section and updated with the relevant information to inform a more robust assessment of the Conceptual Site Model (CSM).



Table 9-1 Preliminary Qualitative Risk Assessment

| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|--|--|---|------------------------|------------|---|
| S1 – PFA material S2 – Other buried wastes within the PFA S3 – Airborne particulates S4 – Made Ground (within the existing commercial/ industrial area) S6 – adjacent commercial/ industrial areas | P1 – Direct contact, ingestion or inhalation of contaminated soils and PFA dusts P2 – Airborne migration and transport of soils and PFA dusts P3 – Volatilisation and inhalation of vapours P8 – Migration and accumulation of ground gases | R1 – Human Health (construction/ operational workers) R2 – Human Health (on-site commercial/ industrial) | Health Impact – Medium | Low | <p>Moderate/Low Risk</p> <p>The scheme is proposed over a 22 year timeframe, and whilst risks to workers are typically relatively short-term, exposure could take place over a longer term than for a typical construction project. As such, construction and operational phase exposure risks should be considered for the project. There is no indication of the presence of ‘other’ buried waste in the PFA that could result in the presence of vapours or ground gases, and therefore exposure risk via this route is considered to be a relatively low risk. An isolated occurrence of asbestos has been encountered, however no other asbestos has been detected within the PFA. Therefore, the greatest risks are considered to be associated with dermal exposure to high pH which could result in skin irritation, or inhalation of dusts during the excavation and processing of the PFA material.</p> <p>Any works on the Site will be subject to work controlled under Environment Agency (EA) regulatory permit requirements, which will include the protection of Site workers. Exposure risks to workers will be addressed via Contractor Health and Safety Plans and Risk Assessments as part of Health and Safety requirements. In relation to potential asbestos, control measures will be followed in accordance with the Control of Asbestos Regulations (CAR) 2012. There will also be supporting documents such as the Construction Environmental Management Plan (CEMP) which will also detail required mitigation measures such as monitoring of dust at the Site and clean/dirty areas for contractor welfare. It is not anticipated that there will be any ‘other’ buried wastes within the PFA (including asbestos), however a Discovery Strategy will be followed and a watching brief will be put in place to identify such material so that it can be dealt with should it be uncovered. It is therefore considered that with such controls in place that exposure risks will be suitably mitigated.</p> <p>It is recommended that this report is shared with groundworks and enabling contractors to ensure they have an understanding of the site history and</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|---|---|--|------------------------|------------|--|
| | | | | | <p>setting and potential ground contamination risk issues that they could need to deal with.</p> <p>A temporary construction compound (TCC) will be constructed on the Site where existing commercial/industrial activities are taking place currently occupied by Breedon Retford (ready-mixed concrete), Frank England & Co and Tarmac Ltd. Site workers will therefore also occupy this area which will include temporary cabins for office and welfare compound use. This will be located on existing hardstanding. Such users will be subject to the same controls as the operational workers on the Site and therefore exposure risks will be mitigated. In addition, there will be less exposure risk in this area due to being located away from extractive areas and designated clean welfare areas being present. There is no indication of there being any greater contaminated Made Ground risks in this area, and the presence of vapour and ground gas risk considered to be low. However, this will need to be confirmed through further detailed assessment for this specific area and potential confirmation through ground investigation.</p> <p>Exposure will be mitigated through health & safety working practices, planning requirements and EA permit obligations. Further detailed ground investigation of PFA in extraction lagoon areas and commercial/industrial area prior to development. A Discovery Strategy and watching brief to be implemented to deal with any unexpected contamination. Implementation of a Dust Management & Monitoring Plan (DMMP).</p> |
| <p>S1 – PFA material</p> <p>S2 – Other buried wastes within the PFA</p> <p>S3 – Airborne particulates</p> | <p>P1 – Direct contact, ingestion or inhalation of contaminated soils and PFA dusts</p> <p>P2 – Airborne migration and transport of soils and PFA dusts</p> | R5 – Human Health (off-site residential) | Health Impact – Medium | Unlikely | <p>Low Risk</p> <p>The closest residential properties to the Site comprise Low Farm and Sutton Grange Farm, located immediately to the north of the Site; residential properties associated with a small development at Bellmoor Farm located approximately 100 m to the west; and two dwellings associated with the Wetlands Fishery beyond Lound Low Road to the north. There are further residential and farmhouse properties within 500m. The greatest potential exposure pathways are considered to be the release of airborne particulates that could be transported and deposited in those residential properties immediately closest to the Site, as well as release of dusts from articulated</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|---|--|---|-----------------------------|-----------------|--|
| | | | | | <p>HGVs as they transport PFA material away. The settlements at Lound, Sutton-cum-Lound and Retford are all considered at very low risk. The works on Site will be undertaken in a controlled way under regulatory permit requirements and in accordance with other supporting documents such as the CEMP/ Dust Management & Monitoring Plan (DMMP). It is not anticipated that there will be any 'other' buried wastes within the PFA (including asbestos), however a Discovery Strategy will be followed and a watching brief will be put in place to identify such material so that it can be dealt with should it be uncovered. In relation to potential asbestos, control measures will be followed in accordance with the Control of Asbestos Regulations (CAR) 2012. As such, mitigation measures will be put in place to monitor and control airborne exposure risks, and will include the wetting of the material to ensure the control of dry PFA as it is worked and extracted. The main processing area will be enclosed which will also further mitigate airborne exposure risks. Vehicle transport of the PFA will be managed through the CEMP and will include measures such as wheel washes and sheeting of vehicles. It is therefore considered that with such controls in place that exposure risks will be suitably mitigated.</p> <p>Exposure will be mitigated through health & safety working practices, planning requirements and EA permit obligations. Further detailed ground investigation of PFA in extraction lagoon areas. A Discovery Strategy and watching brief to be implemented to deal with any unexpected contamination. Implementation of a Dust Management & Monitoring Plan (DMMP).</p> |
| <p>S1 – PFA material</p> <p>S2 – Other buried wastes within the PFA</p> <p>S3 – Airborne particulates</p> <p>S4 – Made Ground (within the</p> | <p>P1 – Direct contact, ingestion or inhalation of contaminated soils and PFA dusts</p> <p>P2 – Airborne migration and</p> | <p>R6 – Human Health (off-site commercial/industrial)</p> | <p>Health Impact – Mild</p> | <p>Unlikely</p> | <p>Negligible Risk</p> <p>Commercial/industrial activity is located 100m north of the Site beyond Lound Low Road where an anaerobic digestion plant (Sutton Grange AD) is located. Further 200m to the north, is a significantly large concrete batching plant (Oranmore Precast Ltd). A small metal fabricator (Limitless Fabworks Ltd) is also located further to the west on Low Lound Road.</p> <p>Adjacent to the east of the proposed processing area, are located existing operational warehouse units associated with P&S Outdoor Timber Products</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|---|--|---|----------------------|------------|---|
| existing commercial/ industrial area) | transport of soils and PFA dusts | | | | <p>and a large unit and outdoor storage occupied by a waste management operator. A hand car wash is located approximately 250m southwest on North Road.</p> <p>The greatest potential exposure pathways are considered to be the release of airborne particulates that could be transported and deposited in those commercial use areas, as well as release of dusts from articulated HGVs as they transport PFA material away from the Site.</p> <p>The works on Site will be undertaken in a controlled way under EA regulatory permit requirements and in accordance with other supporting documents such as the CEMP and DMMP. A Discovery Strategy would be followed and a watching brief implemented to address unexpected contamination. As such, mitigation measures will be put in place to monitor and control airborne exposure risks, and will include the wetting of the material to ensure the control of dry PFA as it is worked and extracted. The main processing area will be enclosed which will also mitigate airborne exposure risks. Vehicle transport of the PFA will be managed through the CEMP and planning requirements. It is therefore considered that with such controls in place that exposure risks to adjacent commercial users will be suitably mitigated.</p> <p>Exposure will be mitigated through health & safety working practices, planning requirements and EA permit obligations. Further detailed ground investigation of PFA in extraction lagoon areas. A Discovery Strategy and watching brief to be implemented to deal with any unexpected contamination. Implementation of a Dust Management & Monitoring Plan (DMMP).</p> |
| <p>S1 – PFA material</p> <p>S2 – Other buried wastes within the PFA</p> <p>S3 – Airborne particulates</p> | <p>P1 – Direct contact, ingestion or inhalation of contaminated soils and PFA dusts</p> <p>P2 – Airborne migration and</p> | R7 – Human Health (off-site recreational users) | Health Impact – Mild | Unlikely | <p>Negligible Risk</p> <p>There are a wide range of leisure/amenity users in the immediate area that include walkers, cyclists, equestrians, anglers and visitors to the Idle Valley nature reserve located 500 m to the south of the main processing area. The A.P.E. and Prime8 educational and outdoor facilities are located on the other side of the Site to the north of Lound Low Road, close to the Wetlands Animal Park. The greatest potential exposure pathways are considered to be the release of airborne particulates that could be transported and deposited in</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|--------|--|----------|-------------|------------|--|
| | <p>transport of soils and PFA dusts</p> <p>P7 – Vertical and lateral migration of PFA and other contaminants in lagoons or other drainage to groundwater and surface water</p> | | | | <p>these recreational use areas, the release of dusts from articulated HGVs as they transport PFA material away from the Site and also any impacts to surface water quality that could affect amenity value.</p> <p>It is recognised that users of Idle Valley nature reserve could include individual users with higher levels of health sensitivity from potential exposure to airborne PFA which could impact on the respiratory system, those users with higher levels of activity (walkers, runners etc) and some who may be at constant exposure while occupying a static position (wetland users, anglers etc). There may be others who could be exposed through the direct ingestion or inhalation of dusts or exposure to the skin during other general leisure activity. In addition to this, the loss of amenity could impact on mental health and wellbeing. It is therefore important that the protection of such users is considered, as well as the amenity value of the nature reserve and the water sensitive habitats that rely on the freshwater quality.</p> <p>The works on Site will be controlled by legislative Health and Safety requirements, planning controls, EA regulatory permit requirements and in accordance with other supporting documents such as the CEMP and DMMP. A Discovery Strategy would be followed and a watching brief implemented to address unexpected contamination. As such, mitigation measures will be put in place to monitor and control airborne exposure risks, and will include the wetting of the material to ensure the control of dry PFAS as it is worked and extracted.</p> <p>The main processing area will be enclosed which will also further mitigate airborne exposure risks. Vehicle transport of the PFA will be managed through the CEMP and will include measures such as wheel washes and sheeting of vehicles. The airborne transport of dust loadings to impact on the adjacent wetland and nature reserve areas are therefore considered unlikely, however the air quality plan, which is separate to this assessment, will confirm this.</p> <p>The drainage design will ensure that operational waters are contained within the Site and that PFA impacted water will not be released to surface water and impact on or impair the sensitive water quality within the wetland areas.</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|---|---|--|--|------------|--|
| | | | | | <p>This will be undertaken separately through Water Environmental Management Plan (WEMP) and Drainage Management Plan (DMP) designs, and also addressed through the EA regulatory permit and compliance requirements.</p> <p>Given the levels of robust regulatory requirements, in particular the impacts to the water environment, it is considered that with such controls in place exposure risks to recreational users and amenity value of the wetlands will be suitably mitigated.</p> <p>Exposure will be mitigated through health & safety working practices, planning requirements and EA permit obligations. Further detailed ground investigation of PFA in extraction lagoon areas. A Discovery Strategy and watching brief to be implemented to deal with any unexpected contamination. Implementation of a Dust Management & Monitoring Plan (DMMP).</p> |
| <p>S1 – PFA material</p> <p>S2 – Other buried wastes within the PFA</p> | <p>P4 – Infiltration and leaching of PFA and other contaminants to groundwater</p> <p>P5 – Vertical and lateral migration of PFA and other contaminants in groundwater</p> <p>P6 – Vertical and lateral migration of PFA and other contaminants in groundwater to surface water</p> | <p>R8 – Controlled Waters (superficial River Terrace Deposits secondary A aquifer)</p> | <p>Pollution of controlled waters - Medium</p> | <p>Low</p> | <p>Moderate/Low Risk</p> <p>Whilst geological mapping indicates the presence of River Terrace Deposits (RTD) at the Site, it is assumed that the superficial deposits will have been fully worked and the base of the PFA is located on the underlying sandstone of the Chester Formation. Nevertheless, there will be some residual unworked RTD that will remain present, and at the quarry extents RTD will be present and provide connectivity with the deposit that extends off-Site. The RTD is designated a Secondary A Aquifer by the EA and therefore requires protection as a resource, as well as being a conduit to both surface water and deeper groundwater.</p> <p>Ground investigation has been undertaken which has included installation of boreholes within the PFA, which has allowed water quality sampling to be undertaken. The groundwater quality within the PFA has therefore been well characterised. There is no indication for the presence of ‘other’ buried material in the PFA contained within the chemical signature of the PFA, leachate or waters analysis. As such, the risks from such unknown buried material is considered to be low.</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|---|--|---|--|------------|--|
| | | | | | <p>The extraction and processing of the PFA has the potential to impact on the water quality within the RTD as the extraction will take place down to the water table. There is the possibility for the impact on water at the face of the extraction, as well as effects from damping down of the material and recirculation of operational water. Given the sensitivity of the water environment at and surrounding the Site, the operational activities will be subject to EA permit requirements and controls. This will include ongoing surface water and groundwater quality monitoring, specific drainage designs, surface water and groundwater risk assessments, settlement and treatment lagoon design, all of which will be addressed through the EA regulatory permit and compliance requirements detailed within a comprehensive Drainage Management Plan (DMP). A Water Environmental Management Plan (WEMP) will be prepared for construction/operational phase activities for the protection of controlled water receptors.</p> <p>Given the levels of robust regulatory requirements, in particular the impacts to the water environment, it is considered that with such controls in place pollution risks to the RTD will be suitably mitigated.</p> <p>Pollution risk will be mitigated through planning requirements and EA permit obligations. Implementation of Drainage Management Plan (DMP) and Water Environmental Management Plan (WEMP).</p> |
| <p>S1 – PFA material S2 – Other buried wastes within the PFA</p> | <p>P4 – Infiltration and leaching of PFA and other contaminants to groundwater P5 – Vertical and lateral migration of PFA and other contaminants in groundwater P6 – Vertical and lateral migration of</p> | <p>R9 – Controlled Waters (bedrock Sandstone Principal aquifer)</p> | <p>Pollution of controlled waters - Medium</p> | <p>Low</p> | <p>Moderate/Low Risk</p> <p>The sandstone of the Chester Formation underlying the Site is designated a Principal aquifer by the EA. It is strategically important aquifer on a regional scale and provides process water for industrial use in the vicinity of the Site. It is assumed that the RTD that overlie the bedrock will have been fully worked and the base of the PFA is located directly on the underlying sandstone. As such, there is an existing direct contact pathway and mixing of the PFA within the upper unit of this aquifer that is already taking place. Nevertheless, given the proposed activities, the sandstone must be afforded protection given its Principal aquifer status. Whilst it is likely that mixing of PFA will have impacted the upper stratum of the sandstone, the deposit will also be hydraulically connected and act as a conduit for groundwater in the</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|--|--|---|---|------------|--|
| | PFA and other contaminants in groundwater to surface water | | | | <p>surrounding RTD and sandstone bedrock but will also provide baseflow to the sensitive surface waters. In this regard, it is important that surface water quality is not impacted from increased flows and pulses of PFA impacted groundwater that could occur during opening of the ground during extraction operations at the Site.</p> <p>Given the known sensitivity of the water environment at and surrounding the Site, the operational activities will be subject to EA permit requirements and controls. This will include ongoing surface water and groundwater quality monitoring, specific drainage designs, surface water and groundwater risk assessment, all of which will be addressed through the EA regulatory permit and compliance requirements detailed within a comprehensive Drainage Management Plan (DMP). A Water Environmental Management Plan (WEMP) will be prepared for construction/operational phase activities for the protection of controlled water receptors.</p> <p>Given the levels of robust regulatory requirements, in particular the impacts to the water environment, it is considered that with such controls in place pollution risks to the Sandstone will be suitably mitigated.</p> <p>Pollution risk will be mitigated through planning requirements and EA permit obligations. Implementation of Drainage Management Plan (DMP) and Water Environmental Management Plan (WEMP).</p> |
| S1 – PFA material S2 – Other buried wastes within the PFA S3 – Airborne particulates | | R10 – Controlled Waters (off-site surface water including sensitive ecological receptors) | Pollution of controlled waters - Medium | Low | <p>Moderate/Low Risk</p> <p>There are no mapped watercourses within the Site boundary, with the nearest Water Framework Directive (WFD) classified watercourse being the River Idle located immediately to the east of the Site boundary, flowing from south to north. The wider area is extensively drained with several lagoons, waterbodies and canals, with two drains present onsite, one to the south-west, the other to the north. The EA has classified the River Idle a waterbody of Moderate water quality in the vicinity of the Site.</p> <p>The Site is located adjacent to the Sutton and Lound Gravel Pits Site of Special Scientific Interest (SSSI), due to the aggregations of non-breeding birds and assemblages of breeding birds. Statutory designated sites relating to water</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|--------|-------------------|----------|-------------|------------|--|
| | | | | | <p>that are considered hydrologically connected to the Site are the River Idle Washlands SSSI (approx. 7.9km north) and Misson Line Bank SSSI (approx. 9.8km north) both of which are located downstream of the Site, on banks of River Idle, albeit some distance downstream.</p> <p>It is also recognised that the River Idle and associated wetlands have amenity value, given the presence of leisure activities, the nature reserve and the water sensitive habitats that rely on the freshwater quality. As such, this amenity value also needs to be protected.</p> <p>As such, surface water sensitivity is considered to be high by virtue of the ecological designation on the Site and the hydrologically connected statutory designated sites. In addition to this, there are also eight active surface water abstractions within 2km of the Site, and whilst are not for sensitive potable uses, demonstrate the importance of the surface water as resource in a regional context.</p> <p>Given the known sensitivity of the water environment at and surrounding the Site, the operational activities will be subject to EA permit requirements and controls. This will include ongoing surface water and groundwater quality monitoring, specific drainage designs, surface water and groundwater risk assessment, all of which will be addressed through the EA regulatory permit and compliance requirements detailed within a comprehensive Drainage Management Plan (DMP). A Water Environmental Management Plan (WEMP) will be prepared for construction/operational phase activities for the protection of controlled water receptors.</p> <p>A groundwater and surface water monitoring programme to be developed and agreed with the EA. Ongoing monitoring of surface water and groundwater throughout the life cycle of the Scheme and will continue for a period of time to be agreed with the EA post-restoration. As a minimum the surface water monitoring regime will include surface water monitoring at locations on the River Idle upstream, mid-point and downstream of the Proposed Development and would be supplemented with regular visual inspections.</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|---|-------------------|---|----------------------------------|------------|--|
| | | | | | <p>Given the levels of robust regulatory requirements, in particular the impacts to the water environment, it is considered that with such controls in place pollution risks to surface waters will be suitably mitigated.</p> <p>Pollution risk will be mitigated through planning requirements and EA permit obligations. Implementation of Drainage Management Plan (DMP) and Water Environmental Management Plan (WEMP). Groundwater and surface water sampling programme to be agreed with EA.</p> |
| <p>S1 – PFA material</p> <p>S2 – Other buried wastes within the PFA</p> <p>S4 – Made Ground (within the existing commercial/industrial area)</p> <p>S6 – adjacent commercial/industrial areas</p> | | R11 – Property (on-site buildings and services) | Built Environment Impact - Minor | Unlikely | <p>Negligible Risk</p> <p>There will be a PFA processing area on the Site constructed in the area where existing commercial/industrial activities are taking place currently occupied by Breedon Retford (ready-mixed concrete), Frank England & Co and Tarmac Ltd. Site workers will occupy this area in an enclosed controlled processing, office and welfare compound use.</p> <p>To serve the operational uses, site buildings, infrastructure and services will need to be constructed and installed.</p> <p>Whilst this area is currently in commercial/industrial use, there is no indication of there being contaminated Made Ground risks in this area, or other associated activities that could have resulted in contaminant impacts to ground or groundwater. There may be the potential for localised areas of impact, but this is considered to be a low risk to the proposed built environment and infrastructure. Associated with this, there is no reason to assume there is a significant risk from contaminant vapours or ground gases to impact on the buildings and infrastructure, or those workers who may occupy it. As such, the risk is considered to be low and therefore no special mitigation requirements are considered necessary. However, this will need to be confirmed through further detailed assessment and build designs for this specific area which may require potential confirmation through ground investigation.</p> <p>Exposure will be mitigated through health & safety working practices and planning/building control requirements. Further assessment of ground</p> |



| Source | Pathway to Hazard | Receptor | Consequence | Likelihood | Risk |
|---------------------------|--|--|--------------------------------------|------------|--|
| | | | | | conditions in commercial/industrial area prior to development to include baseline ground investigation. |
| S5 – Topsoil cover system | P1 – Direct contact, ingestion or inhalation of contaminated soils and PFA dusts; P2 – Airborne migration and transport of soils and PFA dusts. | R3 – Human Health (on-site agricultural) R4 – Human Health (on-site recreational) R12 – Property (on-site grazing livestock receptors) | Health Impact – Minor/ Negligible | Unlikely | <p>Low Risk</p> <p>It is proposed to progressively extract the PFA in a phased approach and sequentially restore the Site as extraction proceeds into the next phase. Each phase is to be backfilled with unused overburden and restored with previously stripped and stored site-won topsoil. Following restoration, the Site will be returned to a mixture of biodiversity led land-use and agriculture, including wet meadow, reed beds and pasture. Potential farming uses and grazing livestock receptors will be re-introduced and there will be a public right of way (footpath) present across some of the restored areas.</p> <p>It will therefore need to be ensured that topsoil is suitable for its proposed use, there is a required thickness and there is no contamination risk to human health or the wider environment. It will need to be ensured that the topsoil is also suitable from a landscape and habitat perspective. An agricultural land classification (ALC) is being undertaken to assess the quality of existing use, which will inform requirements for restored areas. The restoration will be regulated under EA permit requirements and a Soil Management Plan (SMP) will be incorporated into the CEMP. The topsoil will be tested for a suite of contaminants and then subject to contamination risk assessments to confirm its suitability prior to use. It is therefore considered that controls will be in place to ensure that the topsoil used as a cover system across the Site will be of suitable thickness, quantity and quality for its proposed use.</p> <p>Topsoil used in the restoration cover system will be suitable for its proposed use in accordance with planning requirements and EA permit obligations. Preparation of Soil Management Plan (SMP) and Restoration Plan with post-restoration validation sampling exercise with contamination risk assessment detailed in a validation report.</p> |



10.0 Conclusions

It is proposed to extract the PFA in a phased approach over an approximate 22 year timescale. The works will include up to eleven phases (phases 1 - 11) to be extracted from and then restored progressively. The updated sequencing and phasing is provided in Appendix A.

The works would be undertaken in accordance with The Environmental Permitting (England & Wales) Regulations 2016 (EPR) (as amended) as the PFA is classified as a waste material. As such, the works will be required to operate under an Environmental Permit issued by the Environment Agency (EA).

It is proposed to excavate and remove the PFA without abstracting or discharging groundwater. Therefore, the requirements of a permit for dewatering/discharging groundwater are not required. The thickness of PFA remaining at the base of the excavation will ensure that there will be no upwelling of groundwater from the sandstone into the excavation. Once excavated the PFA will be placed along the side of the excavation to allow any perched water within the PFA to drain naturally back into the excavation. The PFA will be 'worked wet'.

Given that the Site will be licensed under a waste recovery operation, restoration will be undertaken in accordance with an Environment Agency construction quality assurance (CQA) plan; and will also meet planning requirements through the preparation of a Soil Management Plan (SMP) contained within an outline Construction Environmental Management Plan (CEMP) (ESA Volume 3, Technical Appendix 5.3). A comprehensive Drainage Management Plan (DMP) (ESA Volume 3, Technical Appendix 9.3) and Revised Water Environmental Management Plan (WEMP) will also be produced (ESA Volume 3, Technical Appendix 9.1). An updated Dust Impact Assessment (DA) has also been completed (ESA Volume 3, Technical Appendix 13.6) which has informed a Revised Dust Management and Monitoring Plan (DMMP) for the Scheme (ESA Volume 3, Technical Appendix 13.7).

Further technical assessments will be undertaken to support permit requirements which will include an on-going programme of surface water quality sampling and assessment, potential water treatment options prior to discharge, hydrogeological risk assessment and dust assessments. In addition to the permit, there will be a requirement from a planning perspective to ensure that environmental mitigation measures are in place as detailed within an outline Construction Environmental Management Plan (CEMP).

A ground investigation has been undertaken which has confirmed the volume and extent of PFA material present and the nature and location of underlying natural strata. The laboratory analysis of the PFA has demonstrated its constituent components are in accordance with the concentrations of a typical PFA. The analysis has confirmed the detection of metals (iron, magnesium, titanium, manganese, barium, strontium, vanadium, zinc, arsenic) and the absence of any trace signature of organics (PAH, TPH, SVOC). There has been an absence of asbestos detected within the PFA with the exception of a very small fibre bundle of chrysotile asbestos identified at one isolated location.

Leachate analysis of the PFA is comparable to the concentrations detected within the underlying groundwater which show a heavy metal signature. Groundwater and surface water quality monitoring have been undertaken which provide a good characterisation of the chemical signature of the PFA and the quality of the surrounding waters. Overall, it is considered that waters within the PFA (containing elevated heavy metals, sulphate and a



high alkaline pH) show limited similarities to the chemistry within surrounding perimeter boreholes and surface waters.

Given the ground investigation data and water quality monitoring that has been undertaken it is considered that the PFA and site setting has been well characterised in terms of the contaminant loadings and chemical signature which exists within the PFA at the Site and waters in the surrounding area. There is no indication for the presence of any 'other' buried waste material in the PFA.

From the historical evidence and the PFA characterisation investigation undertaken to date, there is no indication that any significant asbestos is present in any areas of the Site, as demonstrated by the preliminary PFA characterisation analysis. A trace occurrence of asbestos was encountered in one sample, this not meeting the definition of asbestos as regulated under regulation 2 of the Control of Asbestos Regulations 2012 (CAR 2012). The high existing natural moisture content of the PFA, combined with operational controls designed to mitigate fugitive dust emissions from PFA excavation and stockpiling activities will suppress any potential fugitive respirable asbestos emissions at source. Consequently, it is reasonably concluded based on current knowledge that:

- the asbestos risk level to on-Site workers is currently assessed as being very low, if not entirely negligible; and
- to off-Site receptors from such levels of asbestos contaminated PFA will also be negligible.

Accordingly, an asbestos 'watching brief' will be implemented as part of a Discovery Strategy, which will be in accordance with the requirements of the Control of Asbestos Regulations 2012 (CAR 2012), the accompanying Approved Code of Practice and Guidance as well as CAR-SOIL industry guidance. Fugitive emissions management will follow requirements as detailed within the Dust Management and Monitoring Plan (DMMP).

There will be potential contaminant migration pathways via surface water drainage, groundwater flows and via dust and particulates that may become airborne. However, given the regulated and controlled nature of the proposed activities on Site via health and safety working practices, permitting and planning requirements, it is concluded that human health and controlled water exposure pathways will be well controlled and mitigated as part of the operational design and subsequent scheme implementation. The Site will be restored with a cover system that comprises site-won soils which will be demonstrated to be suitable for its proposed use. A restoration plan and subsequent validation reporting for each phase will be prepared for approval with NCC.

As such, when assessing the significance of potential contaminant linkages through a qualitative preliminary risk assessment, the following conclusions that were made within the PLQRA are considered to remain applicable:

Human Health

- On-site risks to construction and commercial/industrial workers: Moderate/Low Risk
- On-site risks to agricultural / pasture users: Low Risk
- On-site risks to recreational users: Low Risk
- Off-site risks to residential receptors: Low Risk
- Off-site risks to commercial/industrial workers: Negligible Risk
- Off-site risks to recreational users: Negligible Risk



Controlled Waters

- Groundwater within the River Terrace Deposits secondary A aquifer: Moderate/Low Risk
- Groundwater within the Sandstone Principal aquifer: Moderate/Low Risk
- Surface Water within adjacent surface waters and the River Idle: Moderate/Low Risk

Property

- On-site buildings, infrastructure and services/utilities: Negligible Risk
- On site agricultural pasture / grazing livestock: Low Risk

10.1 Recommendations

Whilst it is considered that land quality risks will be controlled and mitigated through health and safety working practices, planning requirements and EA permit obligations, the following measures are also recommended to ensure that potential risk data gaps are addressed:

- Further ground investigation of the PFA within each phase/cell, prior to commencing extraction works in each phase of Area A within the Site. The scope and density of sampling will provide further levels of confidence and certainty to the initial data that has been obtained. It is proposed that this is secured by a suitable planning condition.
- Further assessment of ground conditions in the Main Processing Site (Area C) prior to development, which is to include baseline ground investigation. It is proposed that this is secured by a suitable planning condition.
- The preparation of Discovery Strategy prior to works commencing and a watching brief subsequently implemented to deal with any unexpected contamination. This would also include contingency measures to deal with such contamination should it be encountered (including asbestos). The Discovery Strategy has already been prepared, please refer to ESA Volume 3, Technical Appendix 5.3.
- On the successive completion of each extraction phase a Completion Report to be produced which details the materials encountered, monitoring data and the presence/absence of contamination (and if present, how it was discovered and subsequently dealt with). It is proposed that this is secured by a suitable planning condition.
- Implementation of the Revised Dust Management and Monitoring Plan (DMMP) for the protection of human health and controlled waters receptors. The DMMP has already been prepared, please refer to ESA Volume 3, Technical Appendix 13.7.
- A groundwater and surface water monitoring programme to be developed and agreed with the EA, to include during construction/operation and post-restoration. Surface water monitoring to include upstream, mid-point and downstream of the Scheme on the River Idle. It is proposed that this is secured by a suitable planning condition.



- Preparation of a restoration plan for approval with NCC, including a detailed plan for each phase of the Proposed Development. A Validation Report will be prepared for topsoil restoration. It is proposed that this is secured by a suitable planning condition.
- Implementation of a Soil Management Plan (SMP) and other environmental protection measures as detailed within a (Water) Construction Environmental Management Plan (CEMP/WEMP) and Drainage Management Plan (DMP). Outline versions of these documents have already been prepared, please refer to ESA Volume 3, Technical Appendix 9.1 and Appendix 9.3.





Appendix A Phased Extraction Drawings

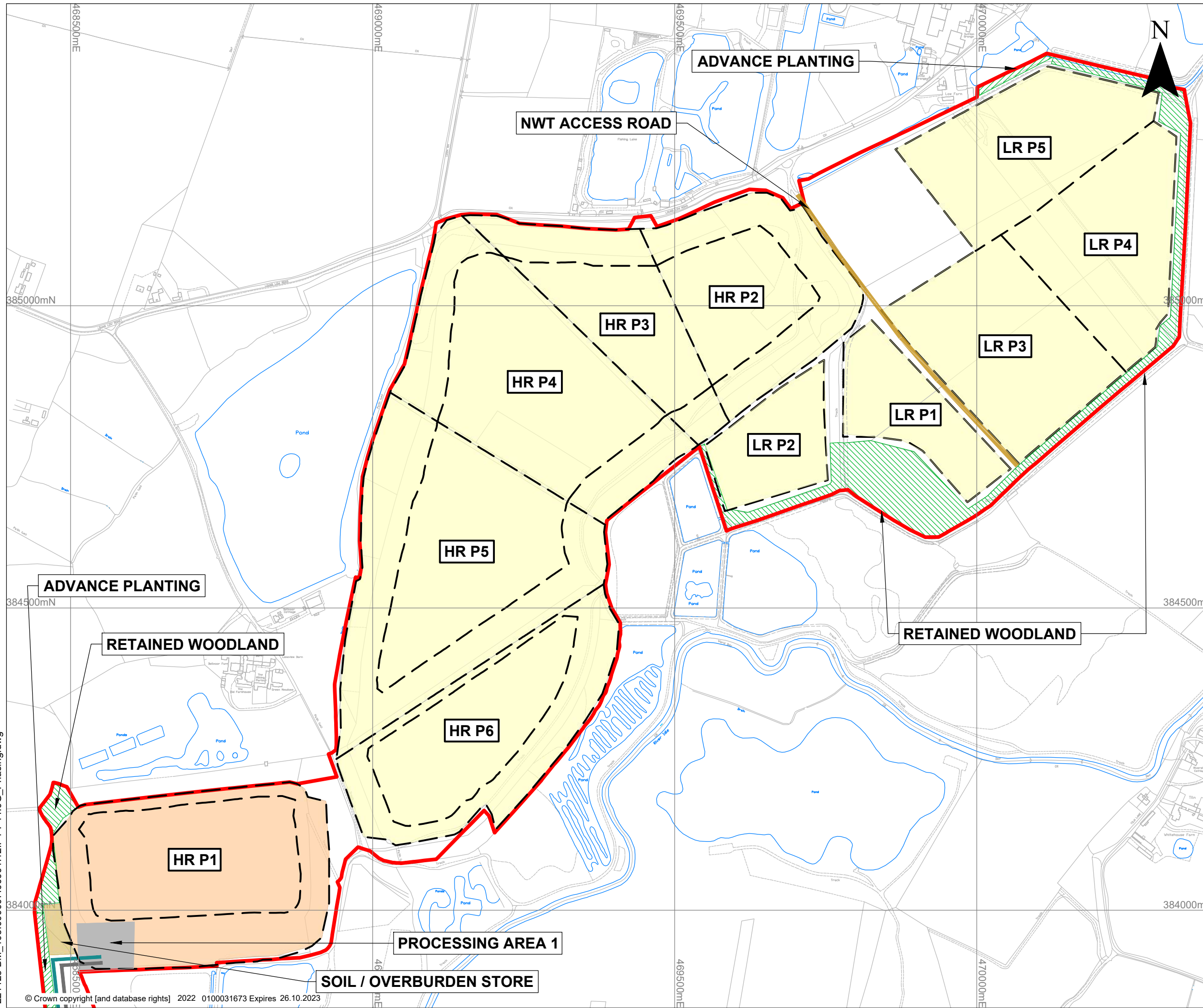
PLQRA Update

Retford Circular Economy Project (RCEP)

Lound Hive Ltd

SLR Project No.: 416.11943.00001

20 December 2023



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| | ADVANCE PLANTING |
| | RETAINED WOODLAND |
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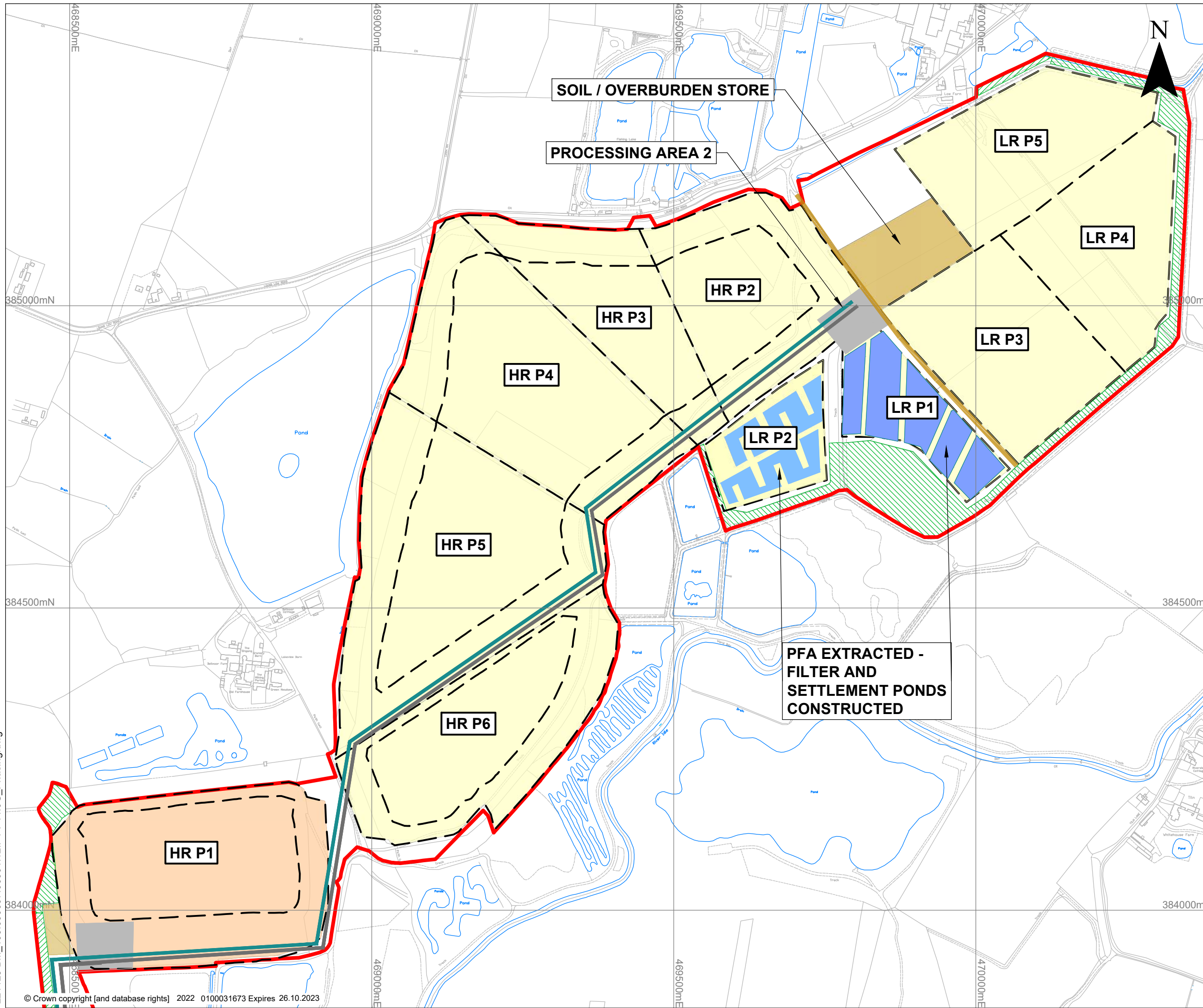
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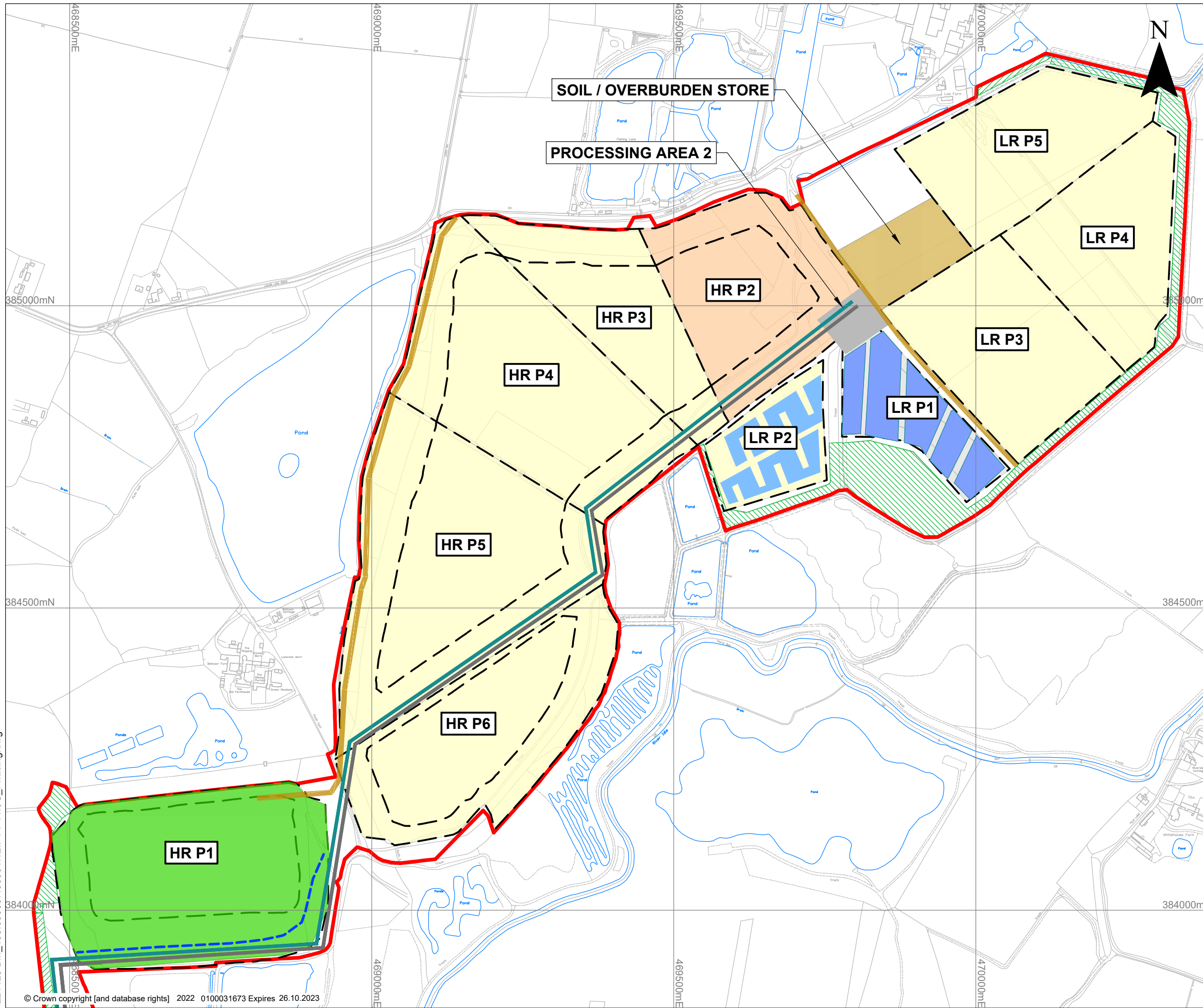
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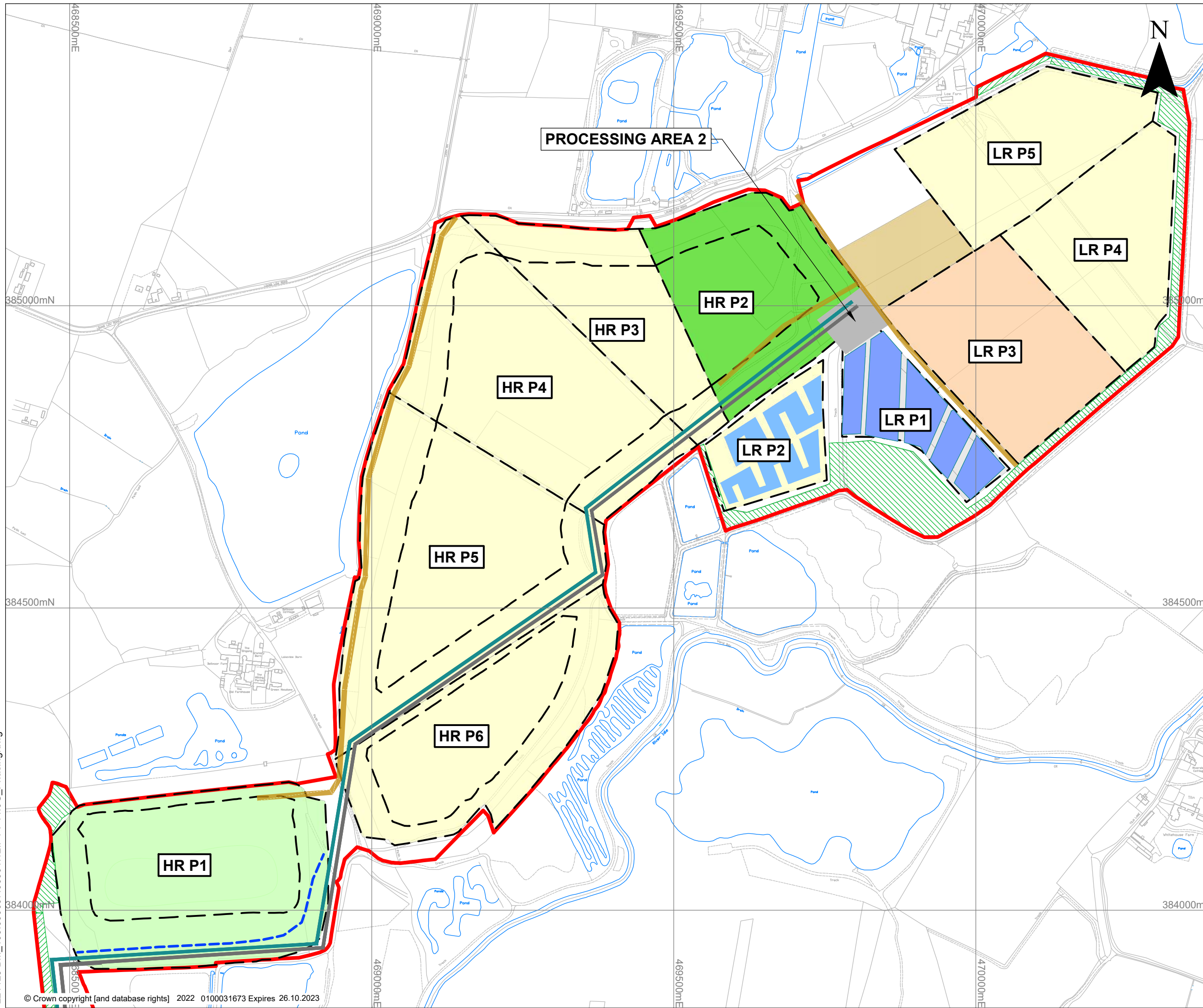
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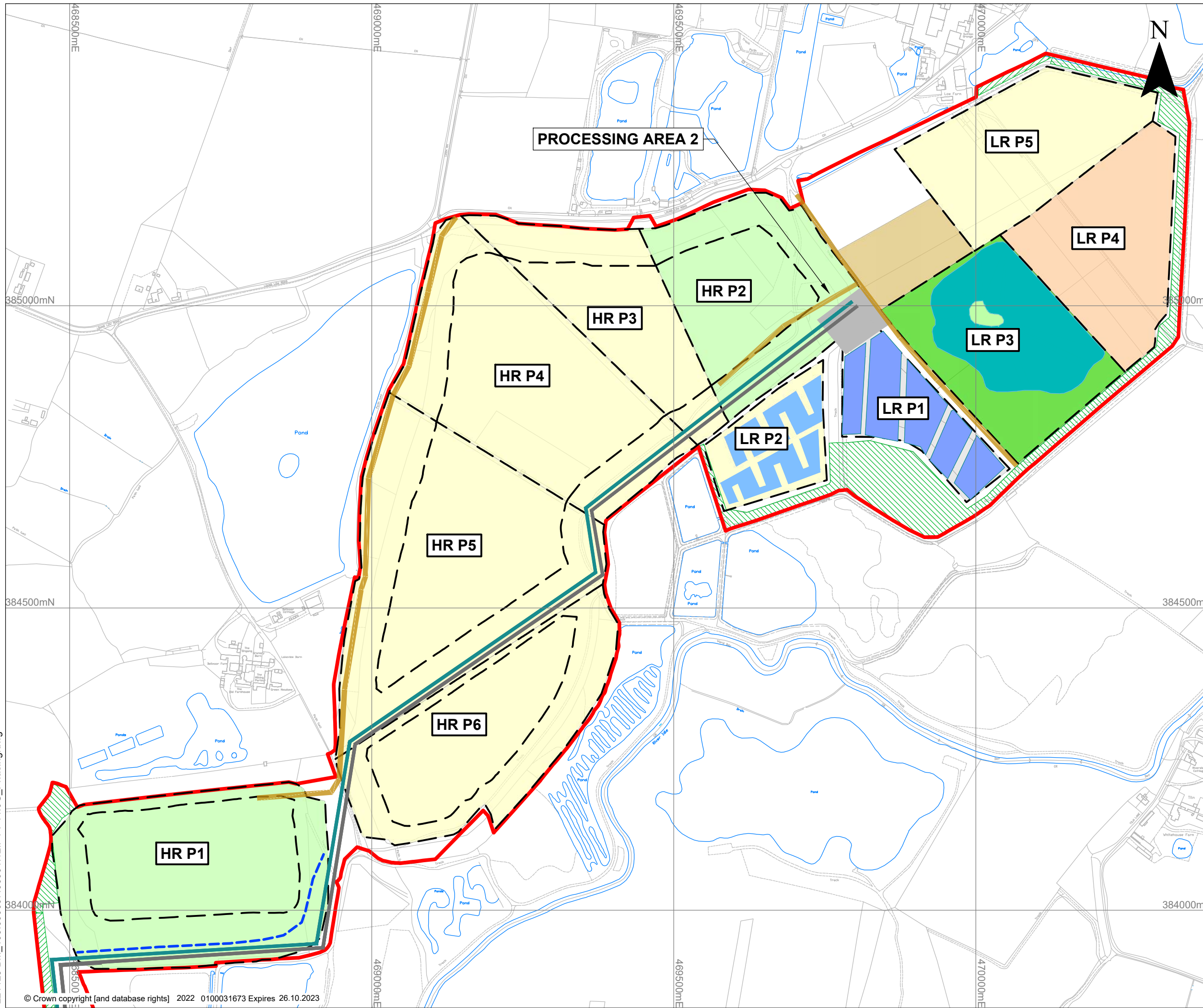
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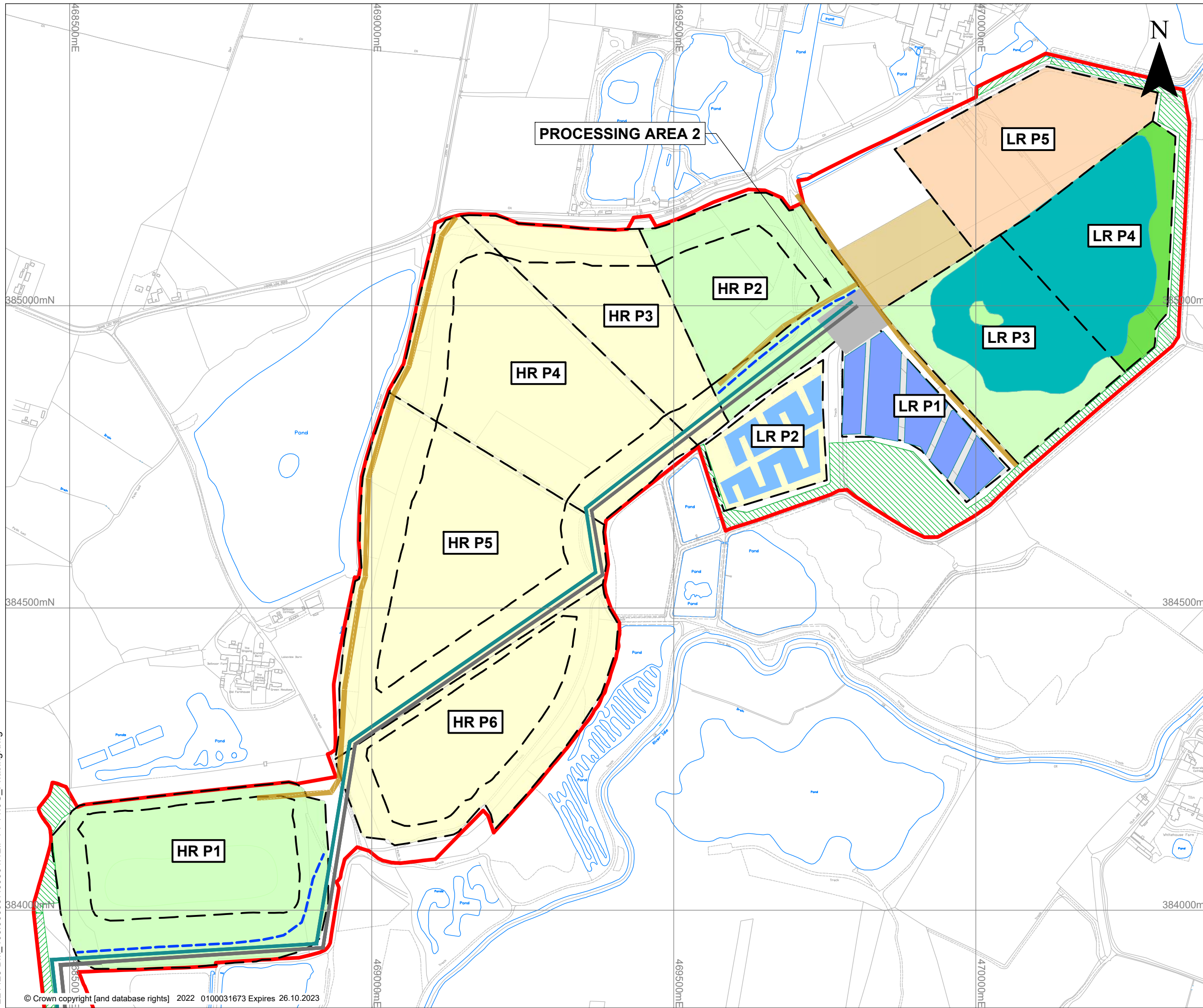
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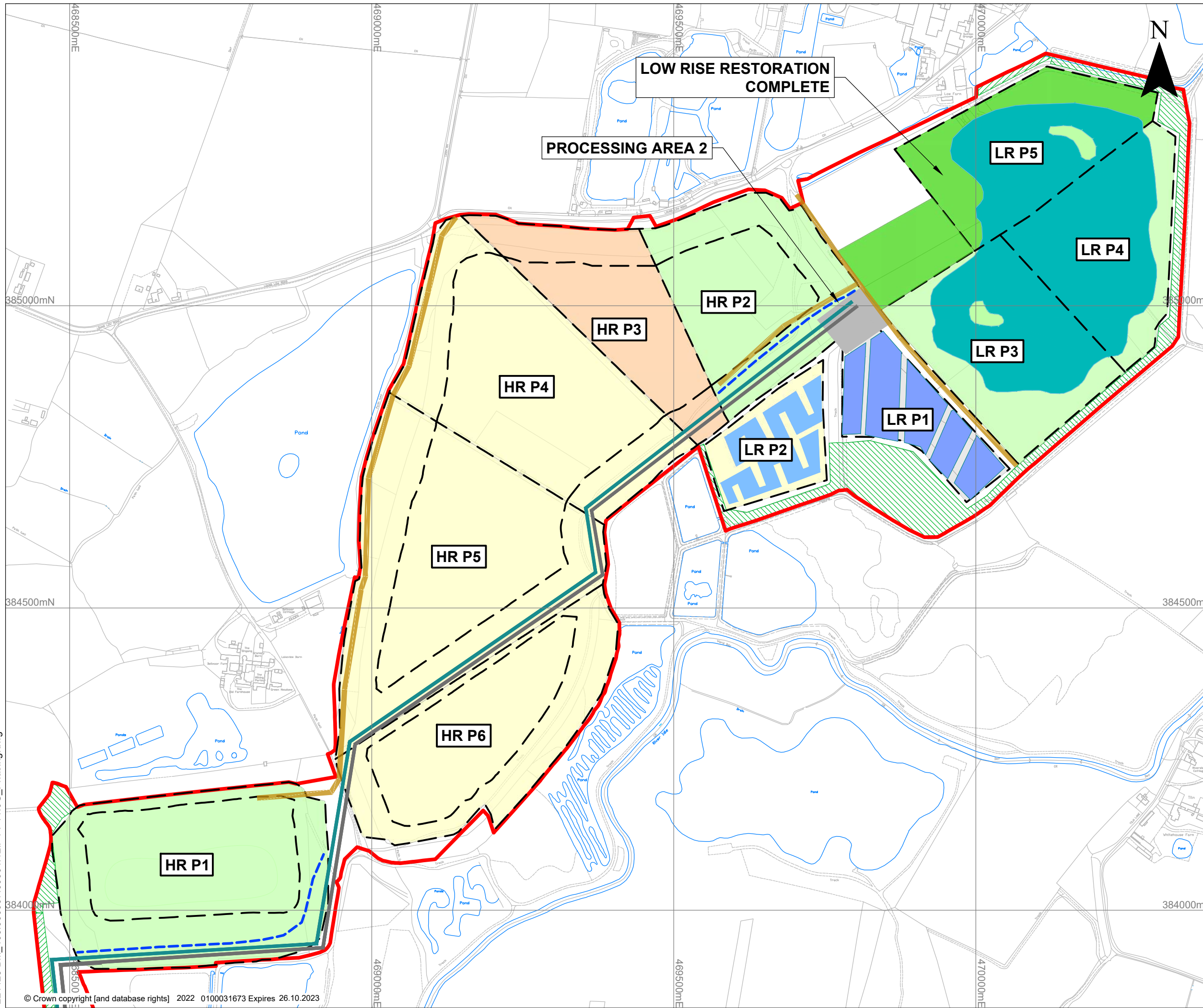
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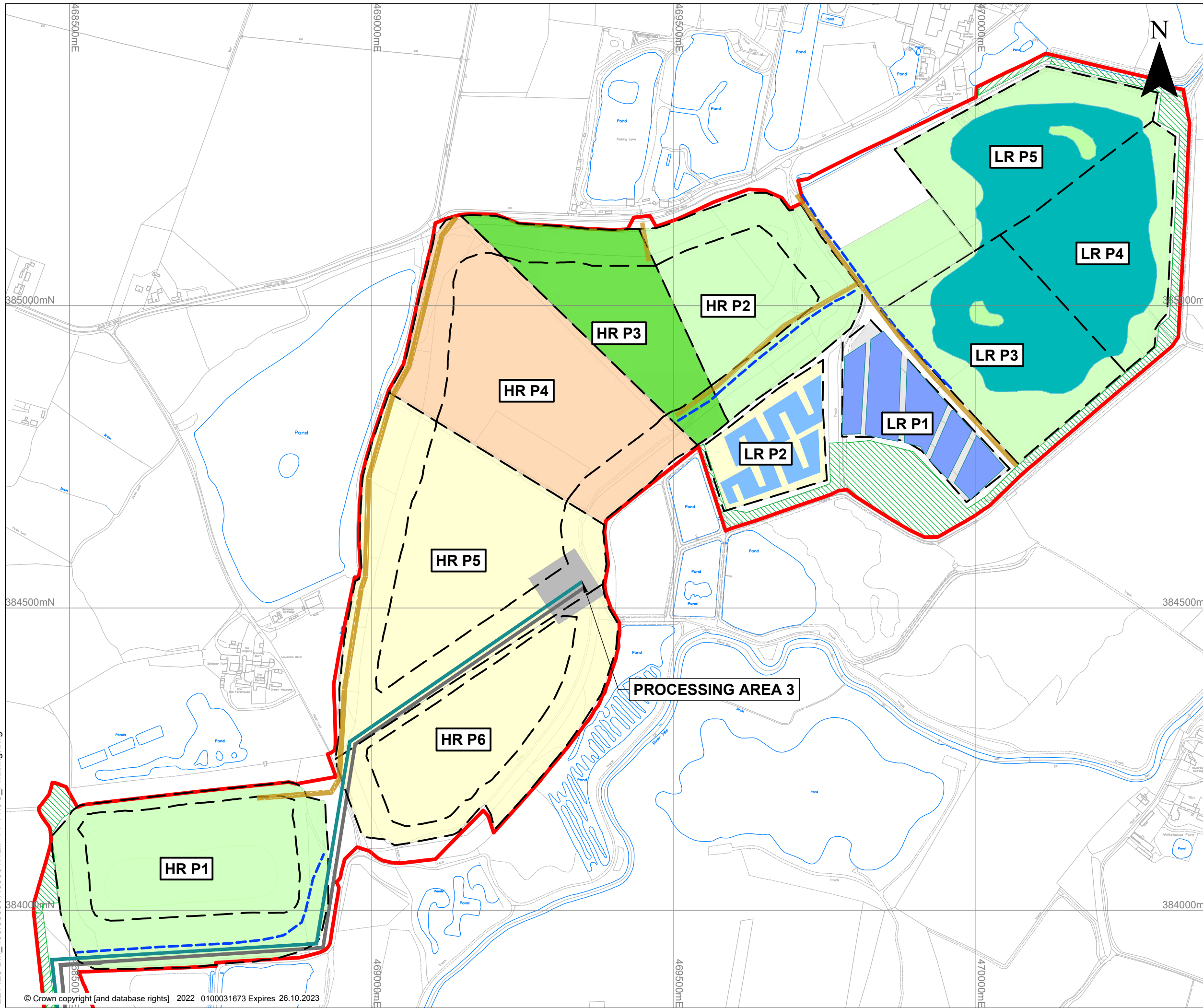
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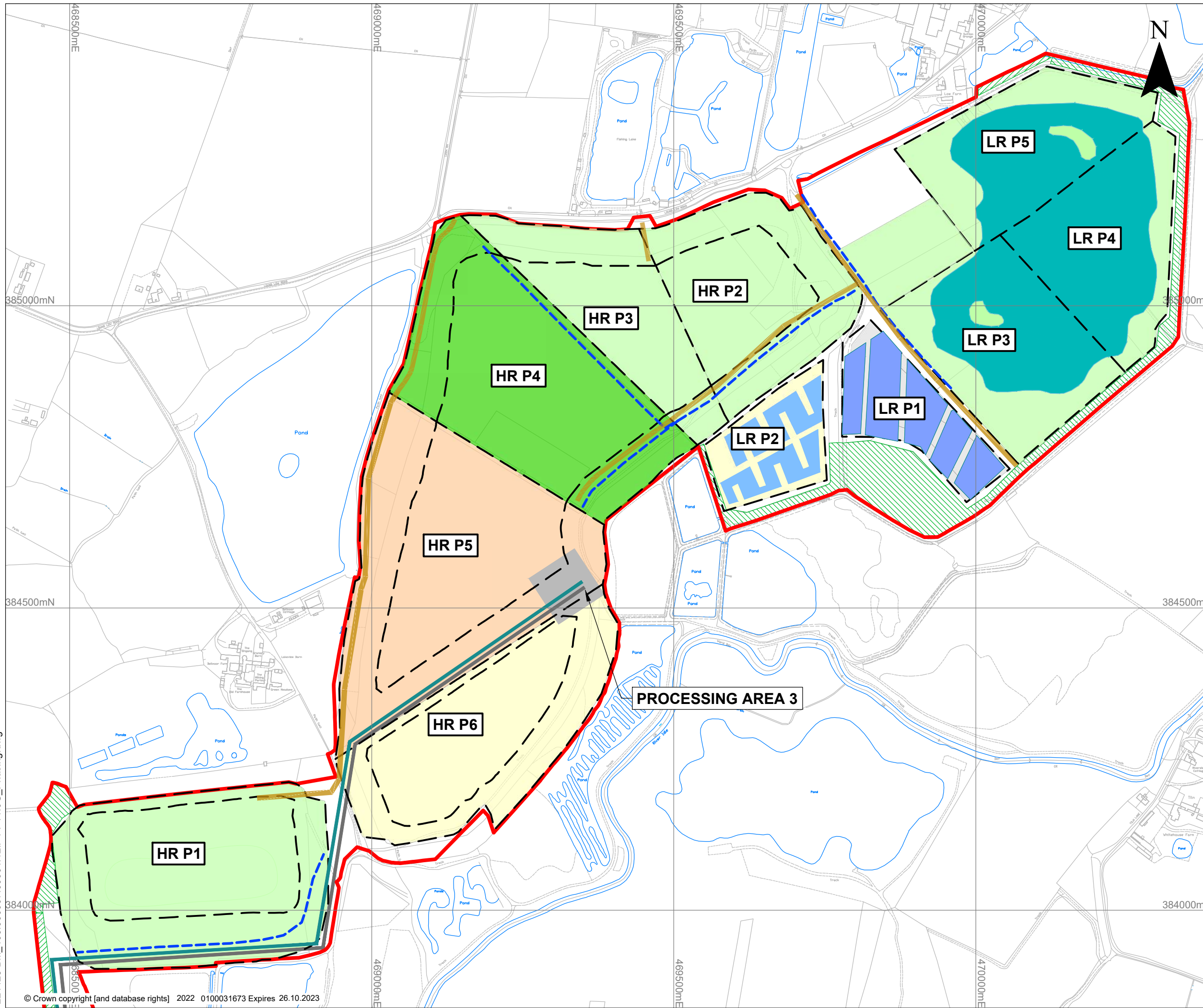
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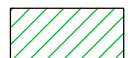



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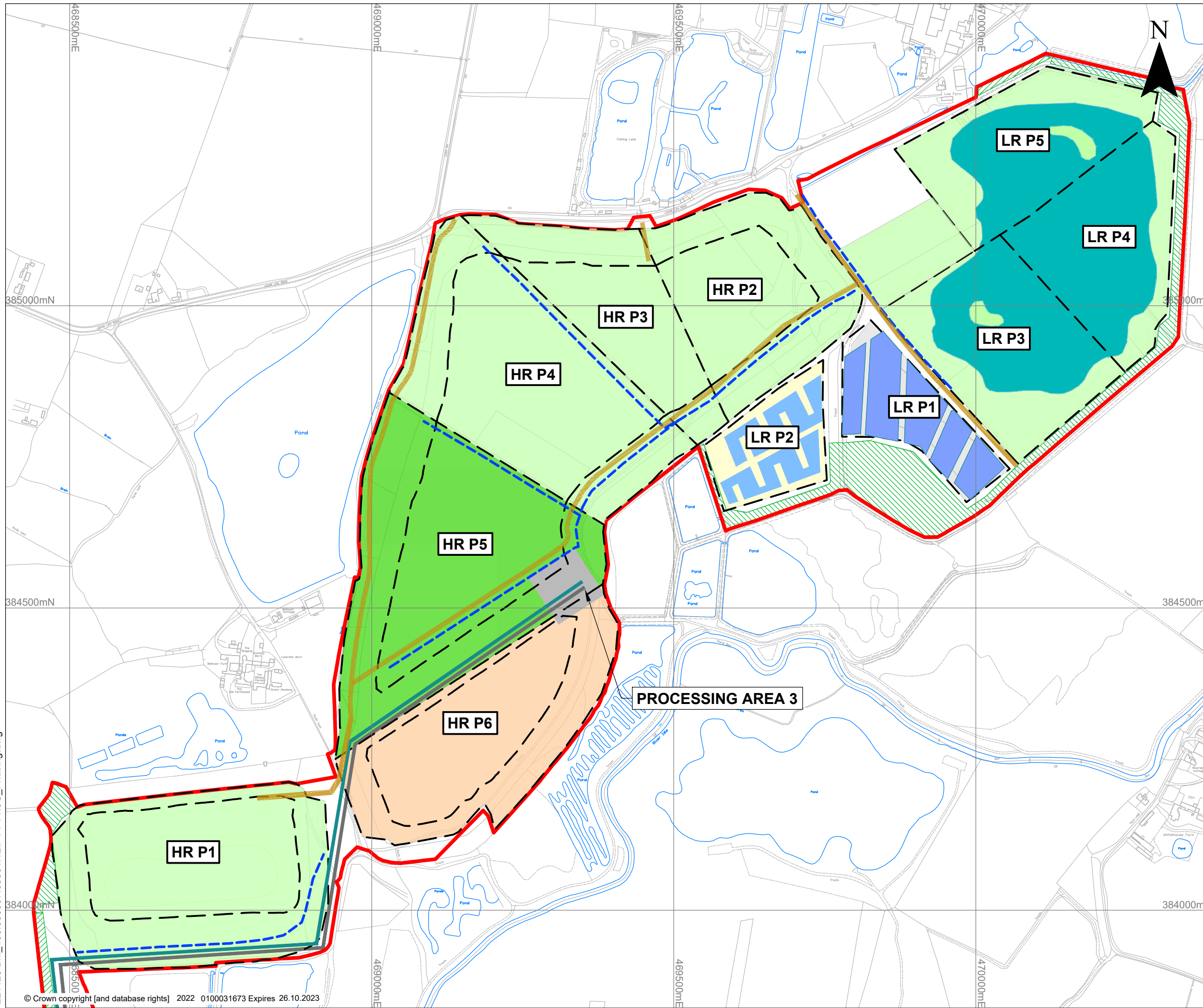
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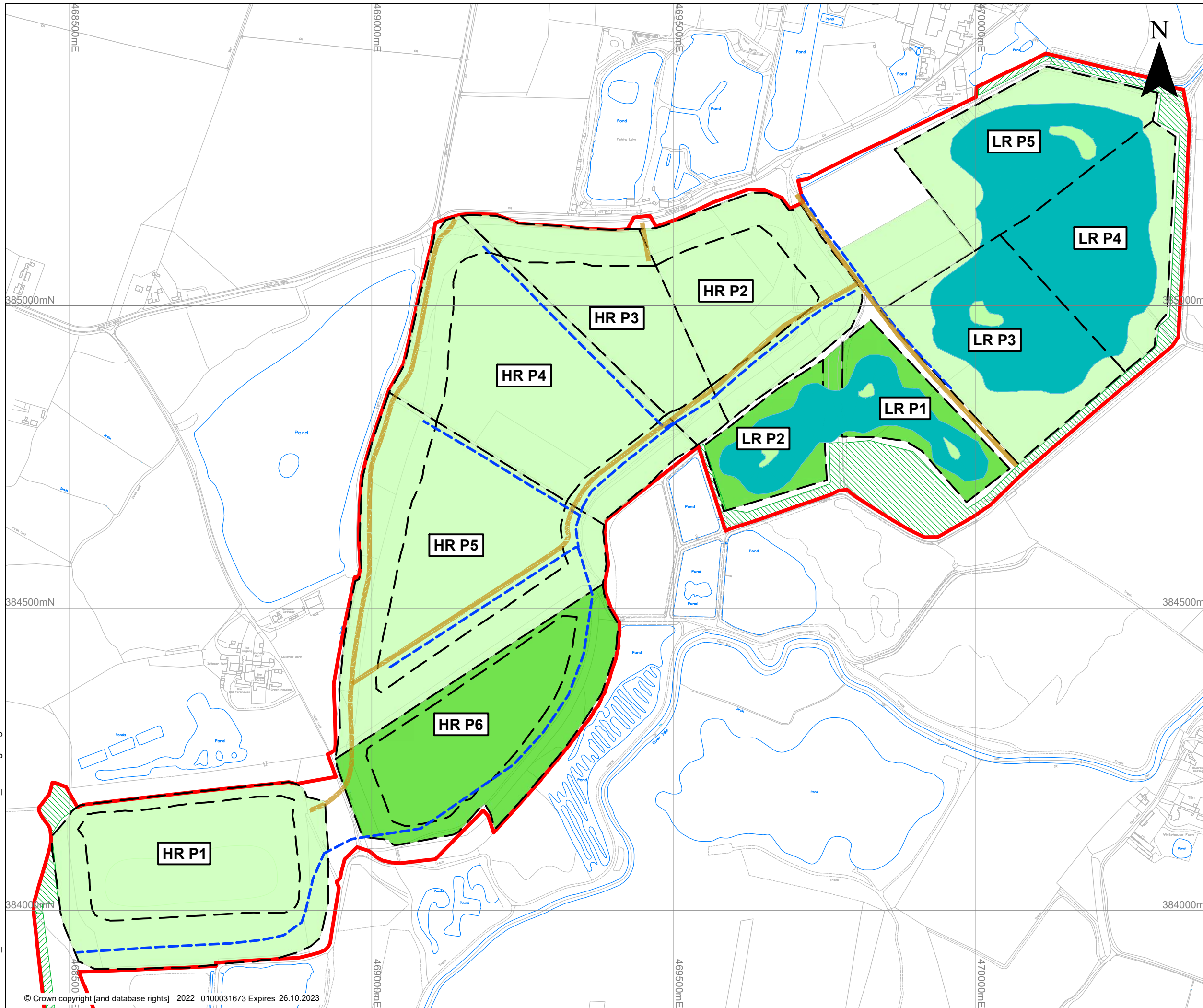
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P11

Scale 1:6000 @ A3 Date NOVEMBER 2022

221128 BM_403.000007.00001.12.P1-P11.0G_Phasing.dwg

Appendix B Restoration Drawing

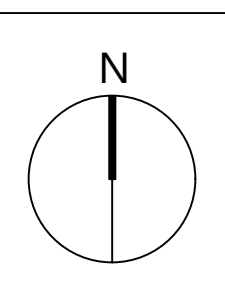
PLQRA Update

Retford Circular Economy Project (RCEP)

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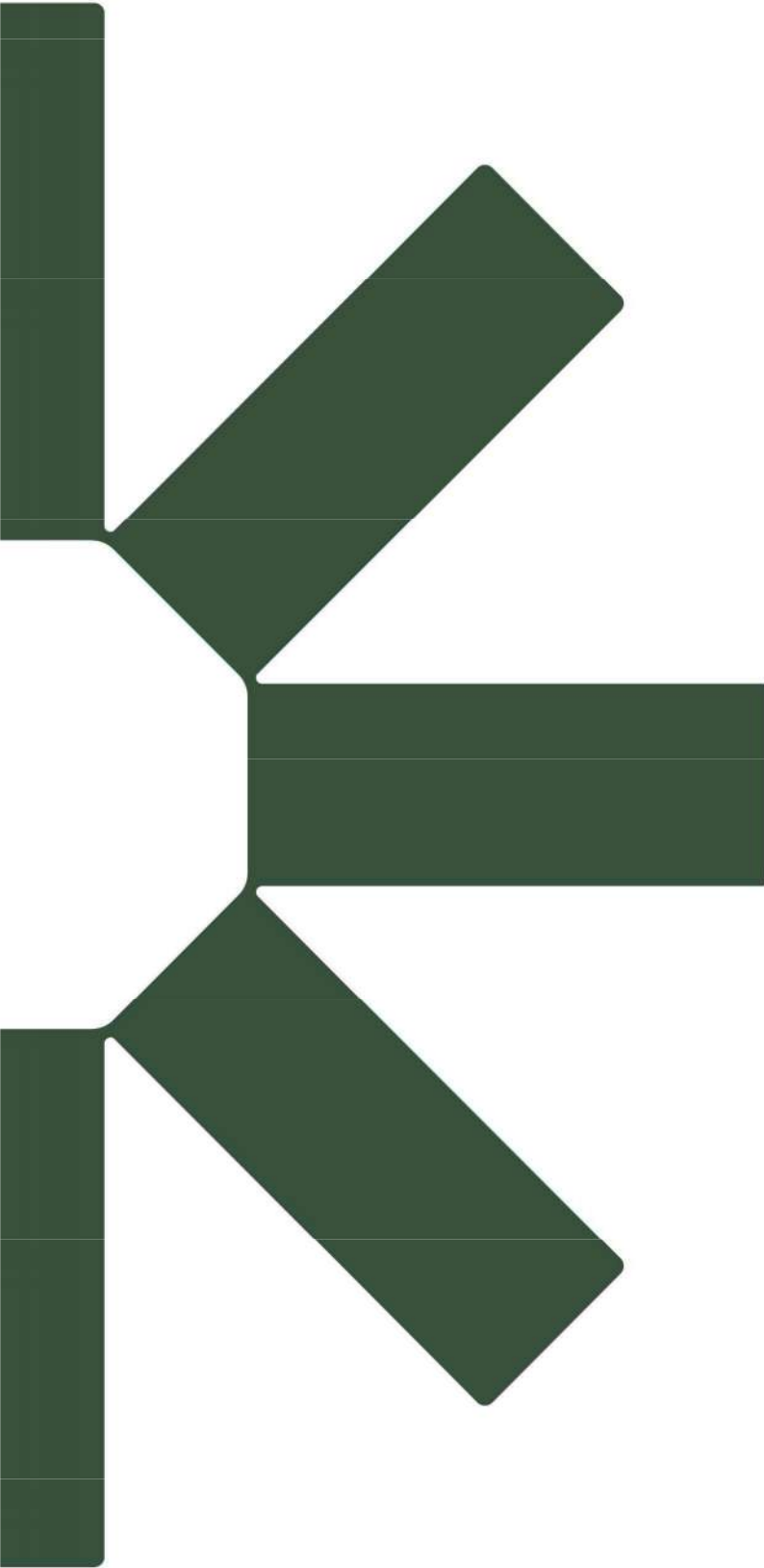
20 December 2023



| KEY | Note |
|-----|--|
| | Planning Application Boundary |
| | Existing Vegetation to be Retained * |
| | Retained Woodland within Site Boundary* |
| | Retained Neutral Grassland within Site Boundary |
| | Proposed Native Species Tree* |
| | 7 Enhanced Hedgerow with Tree* |
| | 9 Proposed Woodland/Scrub* |
| | 10 Proposed Wet Scrub* |
| | 14 Proposed Advance Planting |
| | 8 Proposed Pasture* |
| | 6 Proposed Species Rich Grassland* |
| | 4 Proposed wet grassland |
| | 2 Proposed Reed Beds* |
| | Existing Waterbody |
| | 1 Proposed Shallow Pool |
| | Proposed Standing Water |
| | Proposed Scrape (indicative location) |
| | 3 Proposed Ditch |
| | Proposed Indicative Culvert Location (Where paths cross) |
| | Existing Track to be Retained |
| | Existing Public Rights of Way (Footpath) |
| | Existing Public Rights of Way (Bridleway) |
| | Existing Retained Permissive* Bridleway |
| | 12 New Permissive* Bridleway (chipped surface) |
| | 13 New Permissive* Footpath |
| | Existing Realigned Public Right of Way (Sutton/FP1) |
| | Sutton and Lound Gravel Pits SSSI |
| | 11 Proposed Indicative Interpretation Board Location |
| | Proposed Indicative Gate Location |
| | 5 Indicative Log Piles/Hibernacula Location |

* Notes and numbered annotations refer to Drawing 4092_DR_LAN_101a





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