Appendix 10.A: Policy and Legislative Context

Ambient Air Quality Legislation and National Policy

The Ambient Air Quality Directive and Air Quality Standards Regulations

The 2008 Ambient Air Quality Directive (2008/50/EC) [10] aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; it sets legally binding concentration-based limit values, as well as target values. There are also information and alert thresholds for reporting purposes. These are to be achieved for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene. This Directive replaced most of the previous EU air quality legislation and in England was transposed into domestic law by the Air Quality Standards (England) Regulations 2010 [11], which in addition incorporates the 4th Air Quality Daughter Directive (2004/107/EC) that sets targets for ambient air concentrations of certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). Equivalent regulations exist in Scotland, Wales and Northern Ireland. Member states must comply with the limit values (which are legally binding on the Secretary of State) and the Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

European Legislation

Certain industrial installations and waste management facilities are regulated under the Environmental Permitting Regulations (EPR) 2010 [12], which implement in England and Wales the EU Directive 2008/1/EC concerning Integrated Pollution Prevention and Control (“the IPPC Directive”) [13] and the Waste Framework Directive. The EPR define activities that require the operator to obtain an Environmental Permit from the Environment Agency (EA).

On 24 November 2010, Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) (Recast) (”the IED”) was published. The IED repeals the IPPC Directive (2008/1/EC) from 7 January 2014.

UK Air Quality Strategy

The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007

[14]. The Strategy sets UK air quality standards[♦] and objectives[#] for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.

The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of EU limit values. Defra is currently reviewing the LAQM process.

For the purposes of this assessment, the limit values set out in the Air Quality Standards Regulations 2010 and the objective levels specified under the current UK AQS have been used. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.

The limit values and objectives relevant to this assessment are summarised in Table A.1.

Table A.1 Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than	Target Date
Nitrogen Dioxide (NO_2)	1 hour	200 µg.m^{-3}	18 times per calendar year (99.79th percentile)	-
	Annual	40 µg.m^{-3}	-	-
Particulate Matter (PM_{10})	24 Hour	50 µg.m^{-3}	35 times per calendar year (99.9th percentile)	-
	Annual	40 µg.m^{-3}	-	-
Particulate Matter ($PM_{2.5}$)	Annual	Target of 15% reduction in concentrations at urban background locations	-	Between 2010 and 2020 (a)
		Variable target of up to 20% reduction in concentrations at urban background		Between 2010 and 2020 (b)

♦ Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than	Target Date
		locations (c)		
	Annual	25 µg.m^{-3}	-	01.01.2020 (a)
		25 µg.m^{-3}		01.01.2015 (b)
Carbon monoxide (CO)	Maximum daily running 8 hour mean	10,000 µg.m^{-3}	-	-
Benzene	Annual	5 µg.m^{-3}	-	-

(a) Target date set in UK Air Quality Strategy 2007
(b) Target date set in Air Quality Standards Regulations 2010
(c) Aim to not exceed 18 µg.m^{-3} by 2020
* Applies to vegetation and ecosystems

Environmental Permitting Regulations

EPR is a regulatory system to control the environmental and health impacts across all environmental media (using an integrated approach) of certain listed industrial and waste activities, via a single permitting process. To gain a permit, operators have to demonstrate in their applications, in a systematic way, that the techniques they are using or are proposing to use for their installation are the Best Available Techniques (BAT) to prevent or minimise the effects of the activity on air, land and water taking account of relevant local factors. The permitting process also places a duty on the regulating body to ensure that the requirements of the IPPC Directive are included for permitted sites to which these apply.

The EA also regulates under EPR those facilities where waste is handled, stored, treated or disposed of, such as landfills, waste transfer and treatment facilities. Some of these facilities are issued with a permit and some are exempt from the need for a permit but do have to be registered with the Agency. Prior to EPR, these had been regulated under the Waste Management Licensing (WML) regime, with the Waste Management Licensing Regulations 1994 implementing the Waste Framework Directive (WFD) in the UK. These regulations covered activities where waste is recovered or disposed of and placed a duty on operators to apply best practice *"to ensure that waste is managed properly, recovered or disposed of safely and does not cause harm to human health or pollution of the environment"*. This duty to apply appropriate measures has been transferred into EPR for waste operations.

It is a mandatory requirement of EPR that the EA ensures that no single industrial installation or waste operation regulated is the sole cause of a breach of a UK air quality objective. Additionally, the Agency has committed to guarantee that no installation or waste operation will contribute significantly to a breach of a UK air quality objective.

To do this the Agency will ensure that BAT and other appropriate measures (in the case of waste management sites) are used to deliver the maximum improvements to air quality where UK air quality objectives are in danger of being breached.

The essence of BAT is that the techniques selected to protect the environment should achieve a high degree of protection of people and the environment taken as a whole. Indicative BAT standards are laid out in national guidance and where relevant, should be applied unless a different standard can be justified

for a particular installation. The EA may seek to impose lower emissions limits where EU Air Quality Limit Values may be exceeded as a result of the proposals.

The Environment Agency has published guidance on assessment of environmental impacts of regulated processes. Of particular relevance to this application are: Horizontal Guidance Note EPR H1 on Environmental Risk Assessment [15], which provides guidelines for atmospheric dispersion modelling; and Horizontal Guidance H4 [16] on Odour Management, which gives more detailed technical guidance on odour.

National Planning Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF) [17] is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF is a presumption in favour of sustainable development. For determining planning applications, this means approving development proposals if they accord with the local development plan, unless material considerations indicate otherwise. If the development plan is absent, silent or the policies are out of date, then planning permission should be granted unless any adverse impacts would significantly outweigh the benefits, or specific policies in the NPPF indicate development should be restricted.

The NPPF sets out 12 core land-use planning principles. The relevant core-principle in the context of this air quality assessment is that planning should "*contribute to conserving and enhancing the natural environment and reducing pollution*". (Paragraph 17)

As stated in the NPPF, pollution is "*anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light*." The term 'pollution' can therefore be seen to include odour explicitly and also bioaerosols implicitly.

Under the heading 'Conserving and Enhancing the Natural Environment', the NPPF states:

"The planning system should contribute to and enhance the natural and local environment by:

- …
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability… "* (Paragraph 109)

National Planning Practice Guidance

The national Planning Practice Guidance (nPPG) was issued on-line on 6th March 2014 and will be updated by government as a live document. The Air Quality section of the nPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.

The nPPG advises that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

The nPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

The nPPG provides advice on how air quality impacts can be mitigated and notes *"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.*

Local Planning Policy

The Cheshire West and Chester Local Plan was adopted on 29 January 2015 and forms part of the statutory development plan for the borough, setting out policies to 2030.

The following policies in the Local Plan relate to air quality:

*"**SOC 5***

Health and well-being

…

Development that gives rise to significant adverse impacts on health and quality of life (e.g. soil, noise, water, air or light pollution, and land instability, etc) including residential amenity, will not be allowed."

Following the adoption of the Local Plan, some policies in the former district and county local plans were retained, including the following policy in the Vale Royal Borough Local Plan:

"***Policy BE1 - Safeguarding and Improving the Quality of the Environment***

Proposals for all new development will be expected to achieve a high standard of design. To safeguard the quality of the existing built environment and, wherever possible improve and enhance the environment all development will be assessed against the following considerations; where they are relevant to the development:

(i) *It should not have a significantly detrimental effect on the amenities of the people living nearby by reason of overshadowing, overlooking, visual impact, noise and disturbance, odour or in any other material way;*

…

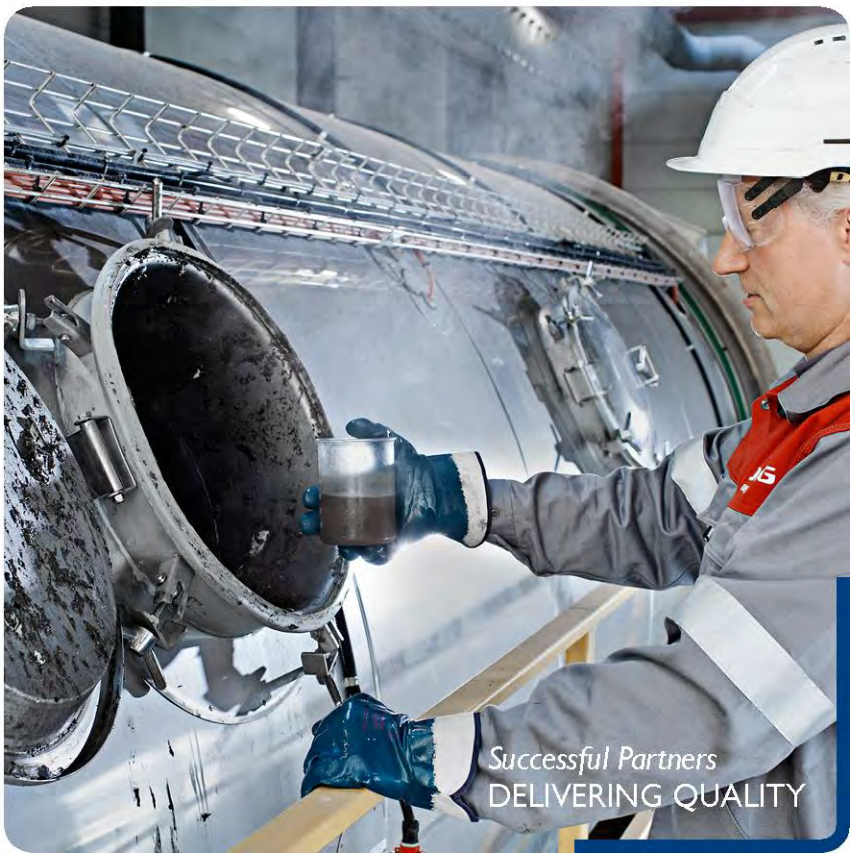
(vii) *It should not increase land, air, noise, light or water pollution to unacceptable levels and where possible should reduce levels. …*"

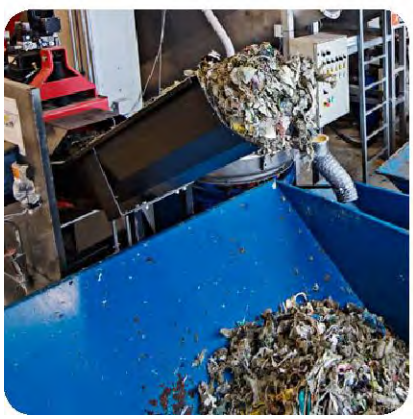
Appendix 10.B: Detailed Air Quality Assessment Methodology

REnescience Northwich









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Quality Management

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0	06/08/15	Draft	-	-
1	02/10/15	Final	Comments	-

Contents

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1 Construction Phase – Methodology

Construction Traffic

1.1 Exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles) are unlikely to have a significant impact on local air quality except for large, long-term construction sites: the EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document indicates that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. The results of the Highways and Access assessment indicates that the aforementioned EPUK/IAQM thresholds are not expected to be exceeded for any individual road during the construction phase of this project; therefore, construction-vehicle exhaust emissions have not been assessed specifically.

Construction Dust

1.2 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter [1]. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

1.3 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

1.4 The Institute of Air Quality Management (IAQM) *Guidance on the assessment of dust from demolition and construction* sets out 350 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. (In this particular application, there are no ecological receptors within the distances and ecological effects have been scoped out). These distances are set to be deliberately conservative.

1.5 Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set

at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

1.6 The IAQM dust guidance aims to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM dust guidance document states: *"The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified."*

1.7 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: "*This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified*."

1.8 Air quality impacts of dust from any contaminated land or buildings have not been considered in the air quality assessment. If contaminated land is identified on the Application Site, the impacts will be assessed in other technical discipline reports.

2 Operational Phase – Point Sources and Traffic Impacts Assessment Methodology

Atmospheric Dispersion Modelling of Pollutant Concentrations

2.1 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

2.2 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in Section 4 of the Air Quality Assessment Chapter.

Methodology – Operational Effects (Emissions from Industrial Point Sources)

Model Selection

2.3 A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources. Modelling for this study has been undertaken using ADMS 5, a version of the ADMS (Atmospheric Dispersion Modelling System) developed by Cambridge Environmental Research Consultants (CERC) that models a wide range of buoyant and passive releases to atmosphere either individually or in combination. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings and deposition. Dispersion models predict atmospheric concentrations within a set level of confidence and there can be variations in results between models under certain conditions; the ADMS 5 model has been formally validated and is widely used in the UK and internationally for regulatory purposes.

2.4 ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Amongst the features of ADMS are:

- An up-to-date dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent

on the friction velocity and the heat flux at the surface. This approach allows the vertical structure of the boundary layer, and hence concentrations, to be calculated more accurately than does the use of Pasquill-Gifford stability categories, which were used in many previous models (e.g. ISCST3). The restriction implied by the Pasquill-Gifford approach that the dispersion parameters are independent of height is avoided. In ADMS the concentration distribution is Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions, to take account of the skewed structure of the vertical component of turbulence;

- A number of complex modules including the effects of plume rise, complex terrain, coastlines, concentration fluctuations and buildings; and
- A facility to calculate long-term averages of hourly mean concentration, dry and wet deposition fluxes and radioactivity, and percentiles of hourly mean concentrations, from either statistical meteorological data or hourly average data.

Approach

2.5 The approach to the assessment of emissions from the exhaust stacks has involved the following key elements:

- Establishing the background Ambient Concentration (AC) from consideration of Air Quality Review & Assessment findings and assessment of existing local air quality through a review of available air quality monitoring and Local Air Quality Management (LAQM) projections in the vicinity of the proposed site.
- Quantitative assessment of the operational effects on local air quality from stack emissions utilising a “new generation” Gaussian dispersion model, ADMS.
- Assessment of Process Contributions (PC) from the facility in isolation, and assessment of resultant Predicted Environmental Concentrations (PEC) taking into account cumulative impacts through incorporation of the AC.
- Comparison of the PEC with the relevant air quality objective.

Stack Height Determination

2.6 Even with all appropriate emission controls in place, there is still the need to discharge the exhaust gases through an elevated stack to allow dispersion and dilution of the residual combustion emissions. The stack needs to be of sufficient height to ensure that combustion emission concentrations are acceptable by the time they reach ground level. The stack also needs to be high enough to ensure that this is not within the aerodynamic influence of nearby buildings, or else wake effects can quickly bring the undiluted plume down to the ground.

2.7 Local pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of

input data, which can include emission rates, meteorological data and local topographical information. A stack height determination ensures that ground level concentrations of the released pollutants remain within acceptable limits.

2.8 A stack height determination has been undertaken for the biogas engines stack to establish the height at which there is minimal additional environmental benefit associated with the cost of further increasing the stack. This is consistent with the approach set out in the EA's Horizontal Guidance Note EPR H1 [2], which requires the identification of "*an option that gives acceptable environmental performance but balances costs and benefits of implementing it*."

2.9 The stack height determination has focussed on identifying the stack height required to overcome the wake effects of nearby buildings. This involved running a series of atmospheric dispersion modelling simulations to predict the ground-level concentrations with the stack at different heights: starting at 15 metres and extending up in 3 metre increments, until a height of 45 metres was reached. The simulations took into account the full range of all likely meteorological conditions by considering five years of hourly sequential meteorological data from a representative measuring station (Manchester Ringway). The model therefore considered dispersion under 43,800 (i.e. 24 x 365 x 5) combinations of hourly-average metrological conditions. Modelling was carried out over a domain of 10 km by 10 km centred on the stack, with a grid spacing of 50 m. Results have been reported for the location where the highest concentration was predicted.

2.10 The detailed methodology for the modelling described in the following sections applies to both the stack height determination and the full assessment.

Meteorological Data

2.11 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described below:

- Wind direction determines the sector of the compass into which the plume is dispersed;
- Wind speed affects the distance that the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models, including ADMS, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

2.12 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

2.13 The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Dispersion model simulations were performed using five years of data from Manchester Ringway (approximately 16 km north-east of the proposed development) between 2010 and 2014.

2.14 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Figure 10.A.

Emissions Parameters and Rates used in the Model

2.15 The biogas engines are expected to run for up to 8,000 hours per year, allowing for planned maintenance downtime. The flare is expected to run intermittently throughout the year. The start-up boiler is expected to run for no more than four weeks in a year, only to provide start-up heat to the process following shutdown for planned maintenance. As such, the biogas engines and start-up boiler are not expected to run at the same time. Overall, the mass emissions associated with the start-up boiler are significantly less than those associated with the biogas engines (NO_X mass emission rates for the start-up boiler are approximately 2% of those for the biogas engines). Modelling has been undertaken for the biogas engines and the biogas flare on the conservative assumption that they will run all year round for 8,760 hours. No modelling has been undertaken for the start-up boiler specifically; however, it is considered that its effects are included within the modelling of the biogas engines and flare, as the additional 760 hours more than compensates for the likely emissions associated with the start-up boiler.

2.16 Stack emissions characteristics are provided in Table 2.1 and the mass emission rates for the relevant pollutants emitted are summarised in Table 2.2.

Table 2.1: Stack Emission Characteristics

Parameter	Unit	Biogas Engines Stack	Biogas Flare
Stack Height	m	33 [(a)]	10
Location (x, y)	m	(367984.9, 374124.7)	(367981.3, 374122.4)
Effective diameter	m	0.87	1.80
Efflux velocity	$m.s^{-1}$	19.3	10.7
Efflux temperature	^{o}C	120	1050
Actual volumetric flow	$Am^3.hr^{-1}$	11.40	27.23

Notes: (a) Stack height based on results of stack height determination in Appendix 10.D

Table 2.2: Mass Emissions of Released Pollutants

Pollutants	Mass Emission Rate ($g.s^{-1}$)	
	Biogas Engines Stack	Biogas Flare
CO	10.31	0.06
NO_x	4.30	0.52
VOCs (not including methane)	0.64	-
Unburned hydrocarbons	-	0.01

NO_x to NO_2 Relationship

2.17 The NOx emissions will typically comprise approximately 90-95% nitrogen monoxide (NO) and 5-10% nitrogen dioxide (NO_2) at source. The NO oxidises in the atmosphere in the presence of sunlight, ozone and volatile organic compounds to form NO_2, which is the principal concern in terms of environmental health effects.

2.18 There are various techniques available for estimating the proportion of NOx converted to NO_2. The methods used in this assessment are discussed below.

Assumptions for Annual-Mean Calculations

2.19 Total conversion (i.e. 100%) of NO to NO_2 is sometimes used for the estimation of the absolute upper limit of the annual mean NO_2. This technique is based on the assumption that all NO emitted is converted to NO_2 before it disperses to ground level. However, it should be noted that even at ambient concentrations a proportion of NO_X remains in the form of NO. Total conversion is, therefore, an unrealistic assumption, particularly in the near field.

2.20 The Environment Agency [3] has recommended that for a 'worst case scenario', a 70% conversion of NO to NO_2 should be considered for calculation of annual average concentrations. If a breach of the annual average NO_2 objective/limit value occurs, the Environment Agency requires a more detailed assessment where operators are asked to justify the use of percentages lower than 70%.

2.21 For the purposes of this assessment, a 70% conversion of NO to NO_2 is assumed for annual average NO_2 concentrations in line with the Environment Agency's recommendations.

Assumptions for Hourly-Mean Calculations

2.22 For the calculation of short-term contributions from the stack emissions to ground level concentrations of NO_2, 35% of the modelled NO_x was added to the background concentration of NO_2.

2.23 An assumed conversion of 35% follows the Environment Agency's recommendations for the calculation of 'worst case scenario' short-term NO_2 concentrations [19]. If a breach of the hourly NO_2 objective/limit value is predicted on this basis, the Environment Agency requires a more detailed assessment where operators are asked to justify their use of percentages lower than 35%.

Modelling of Long-term and Short-term Emissions

2.24 Long-term (annual-mean) NO_2 and benzene, and short-term (8-hour) CO have been modelled for comparison with the relevant annual mean objectives.

2.25 For short-term NO_2, the objective is for the hourly-mean concentration not to exceed 200 $\mu g.m^{-3}$ more than 18 times per calendar year. As there are 8,760 hours in a year, the hourly-mean concentration would need to be below 200 $\mu g.m^{-3}$ in 8,742 hours, i.e. 99.79% of the time. Therefore, the 99.79th percentile of hourly NO_2 has been modelled.

Terrain

2.26 The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and by increasing turbulence and, hence, plume mixing.

2.27 The terrain in the area of the site for the proposed facility is generally flat but with hills to the north and west of the site. These slopes are considered potentially significant in terms of their effect on the dispersion of pollutants. On this basis, terrain data have been included in the dispersion model.

Surface Roughness

2.28 The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length.

2.29 A surface roughness length of 0.5 m has been assigned during the meteorological processing in ADMS 5, to represent the average urban surface characteristics across the study area.

Building Wake Effects

2.30 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are

greater than about 30 - 40% of the stack height, downwash effects can be significant. The dominant structure (i.e. with the greatest dimensions likely to promote turbulence) included within the model are listed in Table 2.3.

Table 2.3: Dimensions of Buildings Included Within the Dispersion Model

Building	National Grid Reference of Building Centre	Height (m)	Length/Width or Diameter (m)	Angle (°) from North
Bunker Hall	367941, 374191	24	32/29	342
Reception Hall	367967, 374194	11.2	21/21	342
Sorting Hall	367931, 374233	14.5	57/20	342
Digester Tank 1	367859, 374205	20	32	-
Digester Tank 2	367855, 374171	20	32	-
Digester Tank 3	367889, 374161	20	32	-
Digester Tank 4	367863, 374136	20	32	-

Methodology – Operational Traffic Effects

Overview

2.31 The air quality impacts associated with the changes in traffic flow characteristics on the local road network have been assessed using ADMS-Roads, a version of the Atmospheric Dispersion Modelling System (ADMS).

2.32 The following scenarios were modelled:

- Without Development – without the Proposed Development in the first year that the development is expected to be fully operational year, 2017; and
- With Development – with the Proposed Development in the first year that the development is expected to be fully operational year, 2017.

Traffic Data

2.33 Traffic data used in the assessment have been provided by the project's transport consultants. The traffic flow data provided for this assessment are summarised in Table 2.4. The modelled road links are illustrated in Figure 10.B.

Table 2.4 Traffic Data Used Within the Assessment

Road Link ID	Road Link Name	Speed ($km.hr^{-1}$)	Daily Two Way Vehicle Flow					
			Base Flows (2015)		Without Development (2017)		With Development (2017)	
			LDV	HDV	LDV	HDV	LDV	HDV
1	A350 - Griffiths Road (North of Site Access)	63	7236	219	8240	225	8246	225
2	Site access	37	538	108	1368	110	1406	202
3	A350 - Griffiths Road (South of Site)	72	7401	292	5057	622	5088	713
4	A530 - North of A556	51	13802	411	16358	726	16385	817
5	A556 - East	69	27610	1861	29546	2064	29546	2112
6	A530 - South of A556	66	14445	1177	15602	1298	15606	1319
7	A556 - West	68	23990	1609	25393	1715	25423	1739

Notes: ($km.hr^{-1}$) = kilometres per hour
HDV = Heavy Duty Vehicle - vehicles greater than 3.5 t gross vehicle weight including buses
LDV = Light Duty Vehicle

2.34 The average speed on each road has been reduced by 10 $km.hr^{-1}$ near junctions and at roundabouts to take into account the possibility of slow moving traffic, in accordance with LAQM.TG(09).

Emission Factors

2.35 The modelling has been undertaken using Defra's 2014 emission factor toolkit (version 6.0) which draws on emissions generated by the European Environment Agency (EEA) COPERT 4 (v10) emission calculation tool.

Meteorological Data

2.36 One year of meteorological data for Manchester Ringway (2014) has been used within the ADMS-Roads model.

Long-term Pollutant Predictions

2.37 Annual-mean NO_x and PM_{10} concentrations have been predicted at selected sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_X emissions is converted to NO_2 to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO_2 concentrations have been derived from the modelled road-related annual-mean NO_x concentration using the Defra LAQM.TG(09) calculator [4].

Short-term Pollutant Predictions

2.38 In order to predict the likelihood of exceedences of the hourly-mean AQS objectives for NO_2 and the daily-mean AQS objective for PM_{10}, the following relationships between the short-term and the annual-mean values at each receptor have been considered.

2.39 Research undertaken in support of LAQM.TG(09) has indicated that the hourly-mean limit value and objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean NO_2 concentration is less than 60 $\mu g.m^{-3}$. In May 2008, a re-analysis of the relationship between annual and hourly-mean NO_2 concentrations was undertaken using data collated between 2003 and 2007 [5]. The conclusions and recommendations of that report are:

"Analysis shows that statistically, on the basis of the dataset available here, the chance of measuring an hourly nitrogen dioxide objective exceedence whilst reporting an annual-mean NO_2 of less than 60 $\mu g.m^{-3}$ is very low….

It is therefore recommended that local authorities continue to use the threshold of 60 $\mu g.m^{-3}$ NO_2 as the guideline for considering a likely exceedence of the hourly-mean nitrogen dioxide objective."

2.40 The number of exceedences of the daily-mean AQS objective for PM_{10} of 50 $\mu g.m^{-3}$ may be estimated using the relationship set out in LAQM.TG(09):

*Number of Exceedences of Daily Mean of 50 $\mu g.m^{-3}$ = -18.5 + 0.00145 * (Predicted Annual-mean $PM_{10})^3$ + 206 / (Predicted Annual-mean PM_{10} Concentration)*

2.41 This relationship suggests that the daily-mean AQS objective for PM_{10} is likely to be met if the predicted annual-mean PM_{10} concentration is 31.8 $\mu g.m^{-3}$ or less..

2.42 The daily mean objective is not considered further within this assessment if the annual-mean PM_{10} concentration is predicted to be less than 31.5 $\mu g.m^{-3}$.

Fugitive PM_{10} Emissions

2.43 Transport PM_{10} emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM_{10} exhaust emissions; therefore, the relative importance of fugitive PM_{10} emissions is increasing. Current emission factors for particulate matter include brake dust and tyre wear (which studies suggest may account for approximately one-third of the total particulate emissions from road transport); however, no allowance is made for re-suspended road dust as this remains unquantified.

Receptors

3.1 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. Such sensitive receptors should be selected where the public is regularly present and

likely to be exposed over the averaging period of the objective. LAQM.TG(09) [6] provides examples of exposure locations and these are summarised in Table 2.5.

Table 2.5: Example of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the buildings façades), or any other location where public exposure is expected to be short-term.
Daily-mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expect to be short-term.
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc which ware not fully enclosed, where member so the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access

3.2 Modelling of point source impacts has been undertaken using a grid of 10 km by 10 km with a grid spacing of 50 m.

3.3 In addition, the effects of the proposed development have been assessed at the façades of local existing receptors. Receptors have been selected at representative locations where changes in pollutant concentrations are anticipated to be greatest as a result of the proposed development. All human receptors have been modelled at a height of 1.5 m, representative of typical head height. The receptor locations are listed in Table 2.6 and illustrated in Figure 10.B.

3.4 The proposed development site is located within a predominantly industrial area at the existing 'Lostock Works' site allocated for waste management in the CWCC Local Plan. The closest known sensitive residential receptors are located along Manchester Road, approximately 180 m north of the proposed development site.

Table 2.6: Modelled Sensitive Receptors

ID	Description	National Grid Reference	
		X(m)	Y(m)
Roads and Point Source Impacts			
1	1 Griffiths Road	368621	374688
2	1 Cottage Close	368303	373519
3	Cottage Close/Griffiths Road	368292	373468
4	Brittania Drive/King Street	368420	373049
5	School Road North/King Street	368432	372891
6	2 Tudor Close	368468	372739
7	Rudheath Community Primary School	368014	372719
8	Cooke's Lane	369046	373217
9	Village Close	369323	373594
10	High House Farm	368739	372479
Point Source Impacts Only			
11	Proposed Farm Road Residential Development	368138	373690
12	Proposed Griffiths Road Residential Development	368269	373591
13	Proposed Making Space Sheltered Residential Development	367443	373845
14	Proposed Gladedale Residential Development	367553	374712
15	Manchester Road	368149	374574
16	Station Road	369033	374904
17	Lostock Green	369084	374205

Note: Receptors have been modelled at 1.5m above ground level, representative of typical head height
m = metres.

3.5 All of the AQS objectives apply at the façades of all residential properties and schools.

3.6 Natural England (NE) and Cheshire West and Chester Council (CWCC) were consulted to agree the scope to assessing air quality impacts at designated habitat sites. NE confirmed that since any European sites and Sites of Special Scientific Interest (SSSIs) lie beyond 500 m of the proposed development, no impacts are expected at the sites and they do not need to be assessed [7]. Laura Hughes, Natural Environment Officer at CWCC, confirmed that a qualitative description of expected air quality impacts on the 'Ashton's and Neumann's Flashes' Local Wildlife Site would be sufficient for assessing air quality impacts at ecological sites [8].

Significance Criteria

Stack Impacts

3.7 In order to ensure that the descriptions of effects used within this report are clear, consistent and in accordance with recent guidance, definitions have been adopted from the EA's H1 Guidance [9].

3.8 Table 3.12 provides a summary of criteria that should be used to:

a) Screen out insignificant emissions,

b) Identify when detailed dispersion modelling is required, and

c) Assess the significance of effects against air quality criteria.

Table 2.7: Summary for the Assessment of Stack Emissions to Air – H1 Methodology

Parameter	Long-term	Short-term
Criteria for screening out Insignificant Emissions	Emissions can be seen as insignificant where: PC long-term < 1% of long-term EAL / EQS	Emissions can be seen as insignificant where: PC short-term < 10% of short-term EAL / EQS
Criteria for detailed air modelling	Detailed air modelling is required if: PC long-term >70% of long-term EAL / EQS or where there is an AQMA / AQAP for a substance	Detailed air modelling is required if: PC short-term >20% of (short-term EAL / EQS minus the long-term background concentration) or where there is: - local human population - presence of SSSI, SAC etc. within specified distance - groundwater vulnerable zone - other exceptional concerns
Acceptability against local Environmental Quality Requirements	If Long-term background > EU EQS or PEC long-term > long-term EU EQS then consideration of further control measures is required. If long-term background > long-term National EQS or PEC long-term > long-term National EQS then the operator needs to justify that further control measures are not required. Comparison with EALs can be treated as for National EQS	If PEC short-term (PC short-term plus twice the long-term background) > short-term National EQS, then the operator needs to justify that further control measures are not required

Notes: PC = process contribution; PEC = predicted environmental concentration (PC plus background concentration); EAL = Environmental Assessment Level; EQS = Environmental Quality Standard
AQMA = Air Quality Management Area; AQAP = Air Quality Action Plan

Development Traffic Impacts

2.44 The EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document [10] advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

2.45 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 2.8 provides the EPUK/IAQM approach for describing the air quality impacts at sensitive receptors.

Table 2.8 Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level			
	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.
3. The table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

2.46 The impact descriptors above apply at individual receptors. The EPUK/IAQM guidance states that the impact descriptors *"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."*

2.47 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

3 Operational Phase – Fugitive Odour, Dust and Bioaerosols Assessment Methodology

Fugitive Odour

3.1 The qualitative risk-ranking assessment of the odour impact of emissions from the proposed development on local sensitive receptors was carried out using the method in the IAQM odour guidance for planning Appendix 1, which provides examples of risk factors for odour source potential, pathway effectiveness and receptor sensitivity (set out in Table 3.1).

Table 3.1 IAQM Examples of Risk Factors for Odour Source, Pathway and Receptor

Source Odour Potential	**Pathway Effectiveness**	**Receptor**
Factors affecting the source odour potential include: • the magnitude of the odour release (taking into account odour-control measures) • how inherently odorous the compounds are • the unpleasantness of the odour	Factors affecting the odour flux to the receptor are: • distance from source to receptor the frequency (%) of winds from the source to receptor (or, qualitatively, the direction of receptors from source with respect to prevailing wind) • the effectiveness of any mitigation/control in reducing flux to the receptor • the effectiveness of dispersion/ dilution in reducing the odour flux to the receptor • topography and terrain	For the sensitivity of people to odour, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the following general principles:
Large Source Odour Potential Magnitude - Larger Permitted processes of odorous nature or large STWs; materials usage hundreds of thousands of tonnes/m^3 per year; area sources of thousands of m^2. The compounds involved are very odorous (e.g. mercaptans), having very low Odour Detection Thresholds (ODTs) where known. Unpleasantness - processes classed as "Most offensive" in H4; or (where known) compounds/odours having unpleasant (-2) to very unpleasant (-4) hedonic score. Mitigation/control - open air operation with no containment, reliance solely on good management techniques and best practice.	**Highly Effective Pathway for Odour Flux to Receptor** Distance - receptor is adjacent to the source/site; distance well below any official set-back distances [a]. Direction - high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind). Effectiveness of dispersion/dilution - open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.	**High Sensitivity Receptor** - surrounding land where: • users` can reasonably expect enjoyment of a high level of amenity; and • the people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium Source Odour Potential Magnitude - smaller Permitted processes	**Moderately Effective Pathway for Odour Flux to Receptor**	**Medium Sensitivity Receptor** - surrounding land where:

Source Odour Potential	Pathway Effectiveness	Receptor
or small Sewage Treatment Works (STWs); materials usage thousands of tonnes/m^3 per year; area sources of hundreds of m^2. The compounds involved are moderately odorous. Unpleasantness – processes classed in H4 as "Moderately offensive"; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score. Mitigation/control – some mitigation measures in place, but significant residual odour remains.	Distance – receptor is local to the source. Where mitigation relies on dispersion/dilution – releases are elevated, but compromised by building effects.	• users' would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or • people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Small Source Odour Potential Magnitude – falls below Part B threshold; materials usage hundreds of tonnes/m^3 per year; area sources of tens m^2. The compounds involved are only mildly odorous, having relatively high ODTs where known. Unpleasantness – processes classed as "Less offensive" in H4; or (where known) compounds/odours having neutral (0) to very pleasant (+4) hedonic score. Mitigation/control – effective, tangible mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.	**Ineffective Pathway for Odour Flux to Receptor** Distance – receptor is remote from the source; distance exceeds any official set-back distances. Direction – low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind). Where mitigation relies on dispersion/ dilution – releases are from high level (e.g. stacks, or roof vents > 3 m above ridge height) and are not compromised by surrounding buildings	**Low Sensitivity Receptor** – surrounding land where: • the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial, farms, footpaths and roads.

Notes: [a] Minimum setback distances may be defined for some odorous activities

3.2 The first step of this qualitative assessment is to estimate the odour-generating potential of the site activities, termed the "Source Odour Potential". This takes into account three factors:

i. The scale (magnitude) of the release from the odour source, taking into account the effectiveness of any odour control or mitigation measures that are already in place. This involves judging the relative size of the release rate after mitigation and taking account of any pattern of release (e.g. intermittency). The assumption has been made, as required by the NPPF, that the pollution-control regimes applying to these sites will operate effectively and that the appropriate BAT standards of odour control will be enforced.

ii. How inherently odorous the emission is. In some cases it may be known whether the release has a low, medium or high odour detection threshold (ODT); this is the concentration at which an odour becomes detectable to the human nose. In most instances the odours released by a source will be a complex mixture of compounds and the detectability will not be known. However, for some industrial processes the odour will

be due to one or a small number of known compounds and the detection thresholds will be a good indication of whether the release is highly odorous or mildly odorous.

iii. The relative pleasantness/unpleasantness* of the odour. Lists of relative pleasantness of different substances are given in the Environment Agency guidance H4 Odour Management [11].

3.3 Using the example risk ranking in Table 3.1, the Source Odour Potential can be categorised as small, medium or large.

Table 3.2 H4 Offensiveness of Odour Emission Sources

Offensiveness	**Odour Emission Sources**
Most Offensive	Processes involving decaying animal or fish remains Processes involving septic effluent or sludge Biological landfill odours
Moderately Offensive	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
Less Offensive	Brewery Confectionary Coffee

3.4 Next, the effectiveness of the pollutant pathway as the transport mechanism for odour through the air to the receptor, versus the dilution/dispersion in the atmosphere, needs to be estimated. Anything that increases dilution and dispersion of the odorous pollutant plume as it travels from source (e.g. processes and plant) to receptor will reduce the concentration at the receptor, and hence reduce exposure. Important factors to consider here are:

i. The distance of sensitive receptors from the odour source.

ii. Whether these receptors are downwind (with respect to the predominant prevailing wind direction). Odour episodes often tend to occur during stable atmospheric conditions with low wind speed, which gives poor dispersion and dilution; receptors close to the source in all directions around it can be affected under these conditions. When conditions are not calm, it will be the downwind receptors that are affected. Overall therefore, receptors that are downwind with respect to the prevailing wind direction tend to be at higher risk of odour impact.

* This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score.

iii. The effectiveness of the point of release in promoting good dispersion, e.g. releasing the emissions from a high stack will - all other things being equal - increase the pathway, dilution and dispersion.

iv. The topography and terrain between the source and the receptor. The presence of topographical features such as hills and valleys, or urban terrain features such as buildings can affect air flow and therefore increase, or inhibit dispersion and dilution.

3.5 Using the example risk ranking in Table 3.1, the pollutant pathway from source to receptor can be categorised as ineffective, moderately effective, or highly effective.

3.6 In the third step, the estimates of Source Odour Potential and the Pathway Effectiveness are considered together to predict the risk of odour exposure (impact) at the receptor location, as shown by the example matrix in Table 3.3.

Table 3.3 Risk of Odour Exposure (Impact) at the Specific Receptor Location

		Source Odour Potential		
		Small	**Medium**	**Large**
Pathway Effectiveness	**Highly effective**	Low Risk	Medium Risk	High Risk
	Moderately effective	Negligible Risk	Low Risk	Medium Risk
	Ineffective	Negligible Risk	Negligible Risk	Low Risk

3.7 The next step is to estimate the effect of that odour impact on the exposed receptor, taking into account its sensitivity, as shown by the example matrix in Table 3.4. The odour effects may range from negligible, through slight adverse and moderate adverse, up to substantial adverse.

Table 3.4 Likely Magnitude of Odour Effect at the Specific Receptor Location

Risk of Odour Exposure	**Receptor Sensitivity**		
	Low	**Medium**	**High**
High	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible	Negligible Effect	Negligible Effect	Negligible Effect

3.8 This procedure results in a prediction of the likely odour effect at each sensitive receptor. The next step is to estimate the overall odour effect on the surrounding area, taking into account the different magnitude of effects at different receptors, and the number of receptors that experience

these different effects[*]. This requires the competent and suitably experienced Air Quality Practitioner to apply professional judgement.

Fugitive Dust

3.9 For fugitive dust there is currently no specific technical guidance. A similar approach to the assessment of dust effects during the construction phase has been used to assess the likely risk of effects from dust taking into account the significance of the sources and their likely duration and frequency, the proximity to sensitive receptors and the project design solutions and mitigation incorporated into the scheme.

Bioaerosols

3.10 Bioaerosols are microscopic airborne particles or droplets of biological origin. The individual particles vary in size from fractions of a micron to up to 30 µm or more, but many have a tendency to form larger clumps or agglomerations, or to attach to inert dust particles. Bioaerosols can be subdivided into:

I. Viable components: living organisms/cells; and
II. Non-viable components: non-viable organisms plus chemicals that are parts of the organism (e.g. the cell walls, such as endotoxins).

3.11 In the absence of any specific guidance on assessing bioaerosol emissions from MBT facilities, an approach similar to that commonly used for assessing bioaerosol releases from composting facilities has been employed. This approach is consistent with the Defra document '*Mechanical Biological Treatment of Municipal Solid Waste*' [12].

3.12 Guidance in document *'Guidance on the evaluation of bioaerosol risk assessment for composting facilities*' published by the Environment Agency [13], sets out the following method for assessing the risk of exposure to bioaerosols.

3.13 The probability of harm from bioaerosols can be described as:

- High – exposure is probable, direct exposure likely with no/few barriers between source and receptor;
- Medium – exposure is fairly probable, barriers less controllable;
- Low – exposure unlikely, barriers exist to mitigate; or
- Very low – exposure very unlikely, effective and multiple barriers.

3.14 The consequences of exposure to bioaerosols can be described as:

[*] Unless there is only a small number of local receptors, then a representative selection of receptors will have been used in the assessment. This final stage of considering the overall effect needs to take into account how many receptors these selected ones represent.

- High – severe consequences, evidence that exposure may result in serious damage
- Medium – significant consequences, evidence that exposure may result in damage that is not severe and is reversible
- Low – minor consequences, damage not apparent, reversible adverse changes possible
- Very low – negligible consequences, no evidence for adverse changes

3.15 By examining the probability and consequences together, the magnitude of the risk can be determined.

4 Uncertainty

4.1 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

4.2 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

4.3 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data.

4.4 The atmospheric dispersion model used for this assessment, ADMS Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas. A site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.

4.5 LAQM.TG(09) requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their R&A duties. Model verification refers to *"checks that are carried out on model performance at a local level"*. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.

4.6 For the verification and adjustment of NO_X/NO_2 concentrations for R&A purposes, LAQM.TG(09) recommends that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.

4.7 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able

to verify the models they use for R&A purposes; however for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. Within the study area, NO_2 monitoring is undertaken at two passive roadside locations. This would not be considered a broad spread of monitoring locations. While caution should be applied when performing model verification without a broad spread of monitoring locations, the measured concentrations at the two monitoring locations have been compared with the modelled results to assist in determining the performance of the model. Appendix 10.C provides detail on the method and findings of this model performance study.

4.8 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 4.1.

Table 4.1 Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	The background concentration is the major proportion of the total predicted concentration. The conservative assumptions adopted ensure that the background concentration used within the model is towards the top of the uncertainty range, rather than a central estimate.
Fraction from Modelled Sources	Traffic flow estimates	Traffic flows provided have all been based on traffic counts, rather than flows derived from a traffic model. High growth assumptions have been used to develop the traffic dataset used within the model.	The modelled fraction is a minor proportion of the total predicted concentration. The modelled fraction is likely to be between a central estimate and the top of the uncertainty range.
	Traffic speed estimates	Measured average traffic speeds have been used within the model. The average speed has been reduced in congested areas to take account of slow-moving and queuing traffic.	
	Road-related emission factors – projection to future years	The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.	
	Boiler emissions and stack characteristics	References to the source documents have been provided for each parameter not provided by the project team. Where a range of values are available, the	

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
		parameter likely to give the worst-case prediction has been used. The flare and gas engines have been modelled as continuous sources, which is an extremely conservative assumption.	
	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment.	
	Receptors	Receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	
	Dispersion Modelling	The model predictions have been compared with monitored concentrations. The model outputs have been adjusted accordingly.	

4.9 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

References

1 British Standard Institute (1983) BS 6069:Part 2:1983, ISO 4225-1980 Characterization of air quality. Glossary

2 Environment Agency (2010) Environmental Permitting Regulations (EPR) – H1 Environmental Risk Assessment, Annex K

3 http://www.environment-agency.gov.uk/static/documents/Business/noxno2conv2005_1233043.pdf

4 LAQM.TG(09) Tools http://www.airquality.co.uk/laqm/tools.php

5 AEAT, 2008, Analysis of the relationship between annual-mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective.

6 Local Air Quality Management Technical Guidance, 2009 (LAQM.TG(09))

7 Cheshire West and Chester Council, letter to Tom Dearing dated 13/08/2015 (ref. 15/02915/EIA)

8 Email from Laura Hughes to Rosemary Challen dated 19/08/2015

9 Environment Agency, 2010, Environmental Permitting Regulations (EPR) – H1 Environmental Risk Assessment, Annex F

10 EPUK/IAQM (May 2015) Land-Use Planning & Development Control: Planning For Air Quality

11 Environment Agency: H4 Odour Management. March 2011

12 Defra, 2014, Mechanical Biological Treatment of Municipal Solid Waste

13 Environment Agency: Guidance on the evaluation of bioaerosol risk assessment for composting facilities'.

Appendix 10.C: Road Traffic Pollution Model Performance Study

The approach to road traffic pollution model verification set out in LAQM.TG(09) requires a comparison of road-related annual-mean NO_X concentrations. For the verification and adjustment of NOx/NO_2 concentrations, the guidance recommends that the comparison involves a combination of automatic and diffusion monitoring. Within the study area, NO_2 concentrations are monitored at only two passive roadside locations using diffusion tubes; therefore, a formal verification

A summary of the monitored data for the two monitoring locations is provided in Table 10.C.1. The monitoring locations are illustrated in Figure 10.F. All data have been obtained from CWCC's 2014 Air Quality Progress Report.

Table 10.C.1 Monitored Annual-Mean NO_2 Concentrations

Site Name	x	y	Concentration ($\mu g.m^{-3}$)		
			2011	2012	2013
Cottage Close	368307	373523	25.8	24.2	22.9
King St. Rudheath	368432	372988	34.9	34.5	31.8

The existing traffic flow data provided by the transport consultants relates to 2015. The background concentrations have been taken from the Defra maps and the Manchester Ringway meteorological data for 2014 has been used. The predicted concentrations for this scenario are compared with the most recent measured concentrations within the study area, as summarised in Table 10.C.2.

Table 10.C.2 Comparison of Monitored and Modelled Annual-Mean NO_2 Concentrations

Site Name	Modelled NO_2 Concentration ($\mu g.m^{-3}$)	Monitored NO_2 Concentration ($\mu g.m^{-3}$)	% Difference [(modelled-monitored)/monitored)* 100]
Cottage Close	17.4	22.9	-23.9
King St. Rudheath	21.4	31.8	-32.8

It is clear from the above that the model is under-predicting at both locations. Therefore, the steps to model verification have been undertaken as detailed below, with the aim of improving the model's accuracy and preventing the under-prediction of concentrations.

The approach to model verification set out in LAQM.TG(09) requires a comparison of the modelled road-related annual-mean NO_X concentrations with the monitored road-related annual-mean NO_X concentrations. This comparison is set out in Table 10.C.3.

Table 10.C.3 Comparison of Road-Related Monitored and Modelled NOx Concentrations

Site Name	Modelled NO_x Road Contribution ($\mu g.m^{-3}$)	Monitored NO_x Road Contribution ($\mu g.m^{-3}$	Ratio: Monitored/Modelled
Cottage Close	5.2	16.1	3.1
King St. Rudheath	13.0	35.3	2.7
Average Ratio			2.9

The average ratio has been applied to the modelled road contribution as a correction factor to determine whether the results of monitoring can be improved. A comparison of the corrected modelled concentrations with the measured concentrations is provided in Table 10.C.4.

Table 10.C.4 Comparison of Road-Related Monitored and Corrected-Modelled NOx Concentrations

Site Name	Corrected Modelled NO_x Road Contribution ($\mu g.m^{-3}$)	Monitored NO_x Road Contribution ($\mu g.m^{-3}$	% Difference [(modelled-monitored)/monitored)* 100]
Cottage Close	15.1	16.1	-2.1
King St. Rudheath	37.7	35.3	3.4
Average % Difference			0.6

The results in Table 10.C.4 show that, with the correction factor applied, the difference in modelled and monitored concentrations is much smaller. While it is not appropriate to undertake a formal verification study for the reasons set out above, these results indicate that the accuracy of the model can be improved through the use of the correction factor. On that basis, and to ensure conservatism of the modelled concentrations, a correction factor of 2.9 has been applied to all predicted road-related concentration contributions in this assessment.

Appendix 10.D: Stack Height Determination

Overview

A stack height determination has been undertaken to establish the height at which ground level concentrations meet Environmental Quality Standards and also the point where there is minimal environmental benefit associated with the cost of further increasing the stack. This is consistent with the approach set out in the Environment Agency's (EA's) Horizontal Guidance Note EPR H1 [15] which requires the identification of "*an option that gives acceptable environmental performance but balances costs and benefits of implementing it*."

The emissions data used in the stack height determination are summarised in the main Air Quality Chapter. Simulations have been run using ADMS 5 to determine what stack height is required to overcome local building wake effects.

The stack height determination considers ground level concentrations over the averaging periods relevant to the air quality assessment for the main pollutant of concern, NO_2, together with the full range of all likely meteorological conditions through the use of five years of hourly sequential meteorological data from a representative measuring station (Manchester Ringway).

The model was run for assuming stack heights of 15 m to 45 m at 3 m incremental spacing. Results were obtained for both long and short-term averaging periods.

The dispersion modelling assumed a domain of 10 km by 10 km centred on the proposed stack location and a grid spacing of 50 m. Results are reported for the location where the highest concentration is predicted. This is considered a robust and conservative approach.

Results

The predicted maximum Process Contribution (PC) at ground level, for short and long-term (annual) averaging periods, were plotted against the varying stack heights as shown in Graph 10.D. 1. The graph suggests that there are no significant environmental benefits with incremental increases in stack heights above 24 m. The predicted maximum PCs are also given in Table 10.D. 1. The PCs have been added to the estimated background concentration to obtain the Predicted Environmental Concentration (PEC). To ensure a worst-case prediction, the background concentration is assumed to be equal to the most recent concentration measured along Manchester Road, 33.4 $\mu g.m^{-1}$.

Graph 10.D. 1 Predicted Process Contribution Against Stack Height

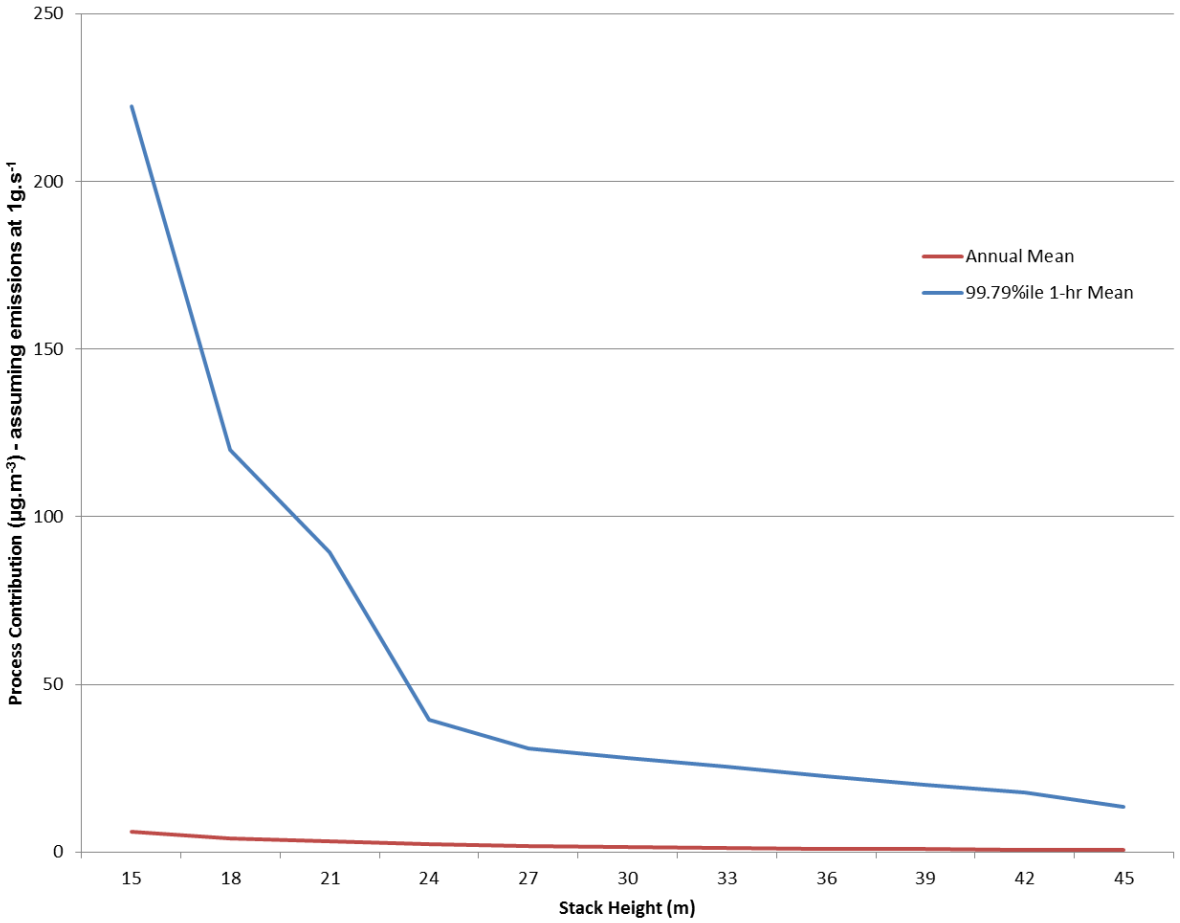


Table 10.D. 1 Predicted NO_2 Concentrations

Stack Height (m)	Process Contribution ($\mu g.m^{-3}$)		Process Contribution as % of the AQS Objective		PEC ($\mu g.m^{-3}$)	
	Annual Mean	99.79th %ile 1-Hour Mean	Annual Mean	99.79th %ile 1-Hour Mean	Annual Mean	99.79th %ile 1-Hour Mean
15	18.3	334.3	45.8	167.1	51.7	401.1
18	12.1	180.3	30.4	90.2	45.5	247.1
21	9.6	134.6	23.9	67.3	43.0	201.4
24	7.5	59.4	18.6	29.7	40.9	126.2
27	5.6	46.5	14.1	23.2	39.0	113.3
30	4.6	42.2	11.4	21.1	38.0	109.0
33	3.7	38.3	9.2	19.1	37.1	105.1
36	3.1	34.2	7.7	17.1	36.5	101.0
39	2.5	30.2	6.3	15.1	35.9	97.0

Stack Height (m)	Process Contribution ($\mu g.m^{-3}$)		Process Contribution as % of the AQS Objective		PEC ($\mu g.m^{-3}$)	
	Annual Mean	99.79th %ile 1-Hour Mean	Annual Mean	99.79th %ile 1-Hour Mean	Annual Mean	99.79th %ile 1-Hour Mean
42	2.1	26.6	5.2	13.3	35.5	93.4
45	1.7	20.2	4.2	10.1	35.1	87.0

As shown in Table 10.D. 1, for a stack height of 33 m, the maximum short and long-term PCs are greater than 1% and 10% of the environmental standards for each averaging period respectively and cannot simply be screened out as being insignificant. The background concentration must therefore also be considered. For a stack height of 33 m, the resulting worst-case long-term and short-term PECs are below the EALs of 40 $\mu g.m^{-3}$ and 200 $\mu g.m^{-3}$ respectively.

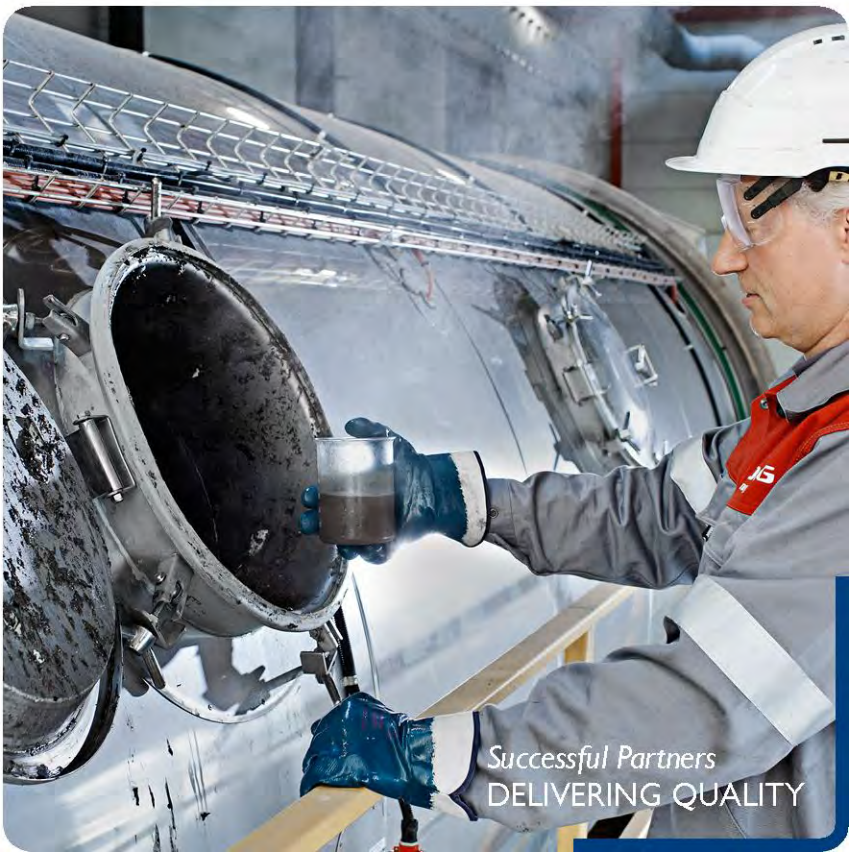
Appendix 10.E: Odour Management Plan (OMP)

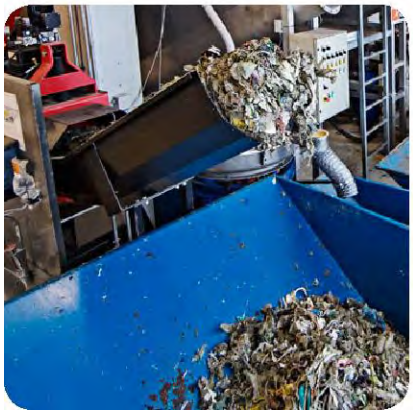
Appendix 10.E: Draft Odour Management Plan

REnescience Northwich









Quality Management

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Revision History				
Rev	**Date**	**Status**	**Reason for revision**	**Additional comments**
0	08/15	Draft	-	-
1	02/10/15	Final	Finalise	

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Contents

Tables and Figures

Figures

1 Introduction

Background

1.1 RPS has prepared an Odour Management Plan (OMP) for the proposed REnescience Northwich development located off the A530 Griffiths Road, near Northwich and Lostock Gralam, Cheshire.

1.2 This draft OMP supports both the environmental assessment and environmental permitting process for the proposed development. The proposed development is located within the administrative area of Cheshire West and Chester Council (CWCC).

1.3 The operation of the facility will be regulated by the Environment Agency (EA) under an Environmental Permit and the OMP will be kept under review by the EA.

1.4 The proposed development is a bioresource project, comprising stages of mechanical and biological treatment (MBT) of waste and renewable energy generation. It will have a nominal waste input capacity of up to 18 tonnes per hour, equivalent to 144,000 tonnes per annum (tpa) over the course of 8,000 typical annual operating hours. It will treat municipal solid waste, fines and commercial and industrial waste of a similar composition, that are supplied from existing intermediary waste transfer and treatment sites.

1.5 The air quality effects from the proposed development have been assessed in the Environmental Statement Chapter 10: Air Quality.

Purpose and Scope

1.6 This OMP provides information on the measures to be implemented to control odour emissions from the proposed facility. The OMP addresses the Institute of Air Quality Management (IAQM) good practice requirements, described within *Guidance on the assessment of odour for planning* [1], which is informed by the following guidance:

- The Environment Agency (EA) general requirements for OMPs as part of the permitting process, as described in technical guidance note H4 *Odour Management* (2011) [2];
- The Defra Odour Guidance for Local Authorities (2010) and the Defra Good Practice and Regulatory Guidance on Composting and Odour Control for Local Authorities (2009);
- The Scottish Environment Protection Agency (SEPA) *Odour Guidance* (2010); and
- Odour Monitoring and Control on Landfill Sites (2013)[1].

1.7 In summary, the guidance recommends a simple document along the following lines:

[1] *Odour Monitoring and Control on Landfill Sites,* Scotland & Northern Ireland Forum for Environmental Research (Sniffer), March 2013.

- A process description, particularly describing odorous, or potentially odorous, activities or materials used;
- Identification of all the release points for each of the activities and their locations;
- Identification of the sensitive receptors within the area of influence that could be impacted;
- A description of the baseline mitigation/control measures that would be used day-to-day under normal operating conditions in the absence of any unusual risk factors;
- Identification of possible risk factors (e.g. equipment/control failures, abnormal/unintentional situations, adverse weather conditions, spillages, etc.); and a listing of the consequences for odours of these risk factors;
- A description of the additional measures that will be applied during these periods to deal with these risks;
- A list of the actions in detail and who is responsible for carrying them out;
- A description of what would trigger this further action/additional measures;
- A description of the roles and responsibilities of personnel on site (e.g. organisational chart), and the training and competence of staff in odour-critical roles;
- Details of how the actions contained within the OMP will be carried out, and who has been assigned managerial and operational responsibilities for them.

1.8 To meet these requirements, this OMP is structured as follows:

- Section 2 – a description of the site and process;
- Section 3 – measures that are used to control odour during normal operations;
- Section 4 – routine maintenance and inspection;
- Section 5 – routine monitoring, recording and reporting;
- Section 6 – measures that will be used to control odour during maintenance and any abnormal events; and
- Section 7 – management measures taken to control odours.

2 Description of Site and Process

Section Overview

2.1 This section of the OMP contains:

- Site overview – a description of the site function and layout, neighbouring communities and sensitive receptors;
- Process description – a description of the plant, operations and controls; and
- Odour source inventory – a summary of the main sources of odour, their locations and the materials/activities involved, and the characteristics of the odour sources (e.g. fugitive or controlled, point, area or volume, release height, likely odorous compounds, quantities likely to be released, pattern of release, method of control).

Site Overview

2.2 The proposed REnescience Northwich development is located off the A530 Griffiths Road, near Northwich and Lostock Gralam, Cheshire. The site is within the administrative area of Cheshire West and Chester Council (CWCC).

2.3 The facility will operate 24 hours a day, around 8,000 hours per year.

Process Description

2.4 The facility will use a 'REnescience' enzymatic waste treatment process developed by DONG Energy, which has been proven at a demonstration plant operating in Copenhagen, Denmark for six years that has treated waste from around Europe, including household waste from the UK. The REnescience process uses enzymes to break down and remove organic matter from mixed wastes, in order that recyclable materials can be efficiently recovered and renewable energy can be generated. The REnescience process separates waste into four constituent fractions, all of which are expected to be capable of further use or recovery.

2.5 By using enzymes to target organic materials entrained in the waste and concentrate these organics into a single output, the process removes contamination from the remaining fractions, thus generating cleaner recyclable materials and enabling a higher degree of recycling to be achieved (the principal benefit of the DONG REnescience process). The process is designed to treat unsorted, non-hazardous residual ('black bag') waste, and commercial and industrial waste of a similar nature: REnescience Northwich will not accept source-segregated recyclables and will complement existing municipal and commercial recycling, helping to raise the overall recycling rate.

2.6 In the proposed development, the separated organic fraction (in the form of bioliquid) will be further treated using an anaerobic digestion (AD) process to generate biogas, which will then be

used to generate renewable electricity in on-site reciprocating gas engines. Waste renewable heat from the gas engines will also be utilised in the REnescience process on site. Separating and concentrating organic material into bioliquid before AD treatment maximises the biogas production for renewable electricity and heat generation, and minimises the residual digestate after de-watering.

2.7 The four separated waste fractions and their recycling/recovery/disposal routes are as follows.

- Bioliquid, containing concentrated organic material in a liquid suspension. This is further treated on-site using AD to yield:
  - biogas, used to generate renewable heat and electricity in reciprocating gas engines; and
  - digestate, de-watered to leave compost-like output (CLO) that will be suitable for use in land restoration.
- Recovered recyclable materials: ferrous and non-ferrous metal and solid plastics (e.g. plastic bottles).
- Other recovered materials such as film plastics, textiles and remaining cardboard, which together form a refuse-derived fuel (RDF) or solid recovered fuel (SRF) that can be used for energy generation in facilities elsewhere.
- Recovered inert materials such as gravel and glass cullet/sand that can be re-used as aggregates.

2.8 In separating out these waste fractions, the process tends to reduce the odour potential, such that the recovered materials are all of low odour potential.

Neighbouring Communities, other Odour Sources and Sensitive Receptors

2.9 The proposed development site is set in a predominantly industrial area of existing and former chemical industry works. The site is located approximately 0.6 km from the residential outskirts of Northwich and Rudheath to the west and south (or around 2 km from Northwich town centre), and 1.2 km from the village of Lostock Gralam to the east. The closest residential dwellings are located along Manchester Road, approximately 180 m north of the proposed development site.

2.10 There are no universal guidelines setting out distances within which potential odours give cause for concern; however, the Environment Agency has recently issued guidance for industrial installations that need both a permit and planning permission. For AD plant, the guidelines state developments within 400 m of sensitive receptors are likely to require additional risk assessment and odour control measures. There are several sensitive receptors within 400 m of the site, as shown in Figure 10.G.

Odour Sources

Generation of Odours at the Facility

2.11 There is the potential for odours to arise from some aspects of the waste treatment process. Table 2.1 on the following pages contains the Odour Source Inventory for the facility. It provides a summary of the main sources of odour, their locations and the materials/activities involved, and the characteristics of the odour sources (e.g. fugitive or controlled, point, area or volume, release height, likely odorous compounds, quantities likely to be released, pattern of release and method of control).

Table 2.1: REnescience Facility Odour Source Emissions Inventory

Source	Location	Activity and materials involved	Type of emissions	Likely odorous compounds	Means of control	Description of Release	Characteristics of Release
Waste delivery and reception	Site access road	Incoming loads of waste	Fugitive to outside air	Fresh odours	Measures to control at source listed in Section 3	Vehicle paths along the access road (fugitive line source)	Close to ground level, intermittent release, at ambient temperature
	Waste Reception Building	Opening and closing of vehicle access doors	Fugitive to outside air	Fresh odours	Measures to control at source listed in Section 3	Escapes periodically from open doors (fugitive area sources)	Close to ground level, intermittent release, at ambient temperature
Enzymatic waste treatment process	"Bioreactors" (enclosed vessels)	Enzymatic waste treatment to target organic materials and concentrate into bioliquid	Fugitive to outside air, e.g. during inspection or maintenance	Biogas smell, e.g. terpenes	Measures to control at source listed in Section 3	Escapes periodically	Close to ground level, intermittent release, at ambient temperature
	2D/3D material sorting areas	Sorting of 2D and 3D material	Point source	Fresh odours	Measures to control at source listed in Section 3	From carbon filters	Continuous release, at an elevation of approximately 3-4 m
Anaerobic digestion process	Bioliquid reception/retention/ digester tanks	Anaerobic digestion of bioliquid	Point source	Biogas smell with the potential for hydrogen sulphide	Measures to control at source listed in Section 3	Loss of containment due to failure	Intermittent, elevated release
Biogas Engines	Biogas engines stack	Combustion of biogas	No significant odour potential	Combusted biogas has no residual odour	Measures to control at source listed in Section 3	From stack	Continuous release at an elevation
Flare	Flare	Emergency flaring of biogas	No significant odour potential	Combusted biogas has no residual odour	Measures to control at source listed in Section 3	From flare	Continuous release at an elevation
Digestate storage and removal	Digestate store	Digestate storage	Material has low odour potential as most volatiles and odorous compounds are in biogas	Minor residual odour	Measures to control at source listed in Section 3	Escapes periodically	Ground level, intermittent release, at ambient temperature

3 Odour Control During Normal Operation

Section Overview

3.1 This section of the OMP describes the means by which REnescience Northwich will control odour impacts from normal operations. A great deal can be done to minimise the quantities of odours at site or to minimise their release by good working practices and process control. Therefore, the proposed facility works in accordance with the accepted hierarchy of preferred controls, that is:

- prevent formation/release of odour in the first place;
- where this is not practicable, minimise the release of odour;
- abate excessive emissions; finally
- dilute any residual odour by effective dispersion in the atmosphere.

Containment of Residual Odour Releases

3.2 The waste reception building is fully enclosed. The enzymatic process takes place in fully enclosed vessels ('bioreactors'). Sorting of 2D and 3D material takes place within the enclosed loading hall.

3.3 Secondary odour control will be provided in each of these areas using a combination of external carbon filters, or alternative, to provide for fluctuating control. AD tanks will be fully enclosed, continuously monitored and subject to routine regular inspection. Offgas will be combusted in a high temperature flare with pilot light or automatic ignition.

3.4 Recovered materials (e.g. clean 3D recyclables) may be baled and stored in an open area but are not expected to be odorous. A digestate store will contain compost-like output material.

3.5 All waste will be delivered in HGVs within enclosed containers.

3.6 All doors to the odorous buildings (reception hall and loading hall) will remain closed except when vehicles/people exit/ingress.

3.7 All doors to the odorous building will be automatic. These may be opened manually by the driver for safety reasons but will close automatically.

3.8 The air from the waste reception hall and waste bunker will be extracted by a ventilation hood and passed through a carbon filter or alternative equivalent means of control to control and minimise odour. Reject loads will remain enclosed and will be rejected normally within two hours. Particularly odorous incoming loads may be preferentially rapidly processed, or mixed and covered with waste in the bunker to aerate and dilute the material. Quarantine material will be stored in the quarantine area pending its treatment or rejection.

3.9 The bioliquid reception tanks will be enclosed. Bioliquid and AD tanks will have pressure monitoring and gas production rates will be monitored. Any loss of pressure or unexpected change in gas production will be investigated using safe monitoring techniques..

Good Working Practices/Housekeeping Measures to Minimise Odour Releases

3.10 The following 'good housekeeping' site practices will be used:

- Keeping the area clean and tidy;
- Removing and bagging any spilled materials;
- Designing floors for easy clean-up, including a concrete surface with a positive slope to drainage systems;
- Eliminating crevices, corners and flat surfaces, which are hard to keep clean and where waste residues can accumulate;
- Drainage systems will be treated periodically with odour neutralising and bacteria-inhibiting solutions as required and using reactive monitoring/inspection and feed forward to a preventative maintenance programme;
- Building catch basins, floor drains and drainage systems will be kept clean to ensure that odour-causing residues will not build up; and
- External washing area for HGVs and loaders.

4 Routine Maintenance and Inspection

Section Overview

4.1 This section of the OMP describes how DONG Energy will address plant performance and planned inspection and maintenance to help maintain the effectiveness of odour controls.

General

4.2 Planned maintenance and inspection is crucial to maintaining the effectiveness of odour control measures. DONG Energy will ensure the good performance of all plant, both the main processes and odour control equipment. An effective, planned inspection and preventative maintenance programme will be employed on all odour-critical plant and equipment, as specified below. This includes a written maintenance programme and a record of maintenance.

4.3 A list of spares required and the procedure for re-ordering will be developed as part of DONG Energy's Environmental Management System (EMS) and will be based on the manufacturers' recommendations of spares required, together with standby equipment for odour-critical items (e.g. fans, pumps) or covered by call-out contracts with contractors. Odour-critical plant and equipment will be covered by an out-of-hours breakdown contract by the supplier/contractor.

4.4 The sections below detail how often different pieces of plant are maintained.

Building Containment

4.5 In order to achieve overall odour containment and thus minimise unplanned releases of odour to atmosphere, the integrity of the building fabric will be maintained continuously, particularly in the waste reception hall and doorways. It is an essential requirement that all doors in buildings remain closed when vehicles are not entering or exiting the work areas. The effective operation of closing of doors will be checked routinely.

Enzymatic Waste Treatment Process

4.6 The bioreactors will be enclosed vessels. The sorting of 2D and 3D materials will take place within the enclosed loading hall. Although the odour potential here is fairly low, secondary odour control will be provided in the sorting hall using a carbon filter, or alternative, to provide fluctuating control of odours.

4.7 The process will be subject to a regular inspection and preventative maintenance programme as part of the Environmental Management System (EMS).

AD Process

4.8 Bioliquid tanks will be fully enclosed and regularly inspected.

4.9 The process will be subject to a regular inspection and preventative maintenance programme as part of the EMS.

Biogas Engines and Flare

4.10 The biogas engines and flare will be subject to a regular inspection and preventative maintenance programme as part of the EMS.

5 Routine Monitoring, Recording and Reporting

Section Overview

5.1 Monitoring has an important role to play in assessing the effectiveness of operational practices to prevent and contain odours; and in assessing the nature and extent of an odour problem should it arise.

5.2 This section of the OMP describes how the effectiveness of operational practices and controls will be checked by:

- monitoring of changes on site; and
- monitoring of effects off site (at the site boundary and beyond).

Monitoring of Odour Emissions at Source

5.3 The term 'monitoring' includes both emissions monitoring of odour (or a surrogate parameter) and inspections of the process, buildings and equipment to check that emissions are being contained and controlled to meet the accepted standards of good practice in relevant guidance.

5.4 DONG Energy will incorporate periodic (annual for the first five years of operation) odour emissions monitoring of the carbon filters to check the continuing effectiveness of odour abatement control.

Monitoring of Odour at the Site Boundary and Sensitive Receptors

General Approach to Off-site Monitoring

5.5 DONG Energy will monitor the emissions at the site boundary to ensure releases do not result in odour nuisance at sensitive receptors. The routine monitoring techniques at the REnescience Northwich facility – sniff tests and complaints monitoring – are recognised as appropriate tools in current best-practice for odour assessments in the IAQM's *Guidance on the assessment of odour for planning*. The techniques are well suited for checking how well the odour controls are performing and ensuring residual odour releases do not result in odour nuisance at sensitive receptors.

5.6 It is not appropriate to set "boundary limit" values for sniff tests and complaints monitoring. These routine monitoring techniques do not generate absolute, quantitative results that can be compared to a limit value, but are subjective and subject to validation by checking activities on site and complaints. The monitoring is designed to act as a trigger for management actions and investigations if they indicate a problem.

5.7 Details of how the results will be recorded and submitted, and action plans for investigation, remedial measures and procedural changes in the event of detected abnormal emissions are given in paragraphs 5.16 to 5.19.

Sensory Field Odour Assessment by the 'Sniff Test'

5.8 Monitoring of odour exposure by sensory field odour assessment ("sniff testing") uses trained odour assessors to record the attributes of the odour. The assessment is "sensory" in that the human nose is used as the detector – a sound approach considering that no analytical instrument can give a unified measure of a complex mixture of compounds that quantifies it as a unified whole in the same way that a human experiences odour. This technique is recommended in Defra's Draft Local Authority Guide on Odour, the Environment Agency's H4 Odour Management Guidance and the IAQM *Guidance on the assessment of odour for planning* as being suitable for daily monitoring of odours at the boundary of the site.

5.9 DONG Energy will carry out walkover surveys incorporating daily or twice-daily sniff testing at the site boundary. If necessary (e.g. in the event of any complaints being received), investigations will be also be carried out at the locations of sensitive receptors. DONG Energy will normally meet with respondents as soon as practicable after receiving a complaint, except where vexatious. The OMP will provide details of the method used and the information recorded during each sniff test.

Table 5.1: Summary of field odour (sniff test) monitoring at the site boundary

Parameter	Measure
Sampling Time	Approximately 5 minutes at each location
Sampling locations	At regular intervals along the site boundary
Sampling and analysis method	Based on the Environment Agency Sniff Test protocol in H4
Odour Categories	None, faint, moderate and strong
Person carrying out the assessment	Site Chargehand, Site Manager or Site Supervisor
Monitoring frequency	Daily or twice-daily
Weather Information to be noted	Temperature, wind speed, wind direction, wind speed gust and summary

5.10 The sensory field odour ("sniff test") assessment is based on the Environment Agency Sniff Test protocol in H4. The detailed description of that methodology has not been repeated in this OMP.

5.11 Details of how the results are recorded and submitted are given in Section 5. Sniff testing is designed to detect any abnormal plant odour emissions. In the event that abnormal odour is detected the source of the odour would be investigated and remedial action taken as necessary, as described in Section 5.

Complaints Monitoring

5.12 Separate from the procedural response to a received complaint is the monitoring of complaints levels. This technique – complaints monitoring – is an important tool for assessing the level of

odour impact. The Environment Agency recognises in its former Internal Guidance on Odour from Waste Management Facilities that reliable complaints, in themselves, should be considered a form of monitoring and complaints should be treated as if they were monitoring data.

5.13 DONG Energy will implement a system of complaints monitoring and analysis. Complaints are collected, registered and validated as described in Section 7 of this OMP. The record of complaints received at the end of each calendar quarter will be reviewed with a view to identifying:

- trends, in terms of the subject, cause or origin of complaints; and
- aspects experienced at one location that could apply to other locations.

5.14 Any action deemed necessary as a result of the analysis shall be identified and discussed in order to programme a course of corrective actions.

5.15 Complaints are a very important indicator of community dissatisfaction (although not the only one) and the technique of complaints monitoring is a powerful tool. However, it is important to bear in mind that complaints are only a symptom of annoyance or nuisance; there are various reasons why complaint level is not an exact indicator of odour annoyance or nuisance itself. Nevertheless, the collection, maintenance and analysis of complaints records is an important method of indicating the effectiveness or otherwise of measures implemented to reduce nuisance due to odour. Whilst complaints are not a perfect indicator of nuisance, a change in the number of complaints is a reasonable indicator of improving or worsening impact due to odour. It is certainly true that the level of annoyance due to odour is extremely difficult to distinguish from factors such as traffic, noise, dust or just a perception of general unpleasantness on a personal level. It is also quite common for a large proportion of complaints to be received from a very limited number of people in the community. Therefore, odour complaints are most useful when used as a prompt for further investigations.

Recording of Results, Reporting and Actions

Recording of Results

5.16 The results of the sniff-tests will be recorded on the daily inspection sheet. DONG Energy will maintain records of all monitoring carried out under this OMP, including records of the taking and analysis of samples when necessary, any instrumental measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data. The records will be retained, unless otherwise agreed by the Environment Agency, for at least 6 years from the date when the records were made.

Reporting

5.17 Any records required to be submitted by the Environmental Permit will be supplied to the Environment Agency within 14 days where the records have been requested in writing by the Agency.

5.18 The Agency will be notified without unnecessary delay (with written confirmation submitted within 24 hours) following the detection of any malfunction, breakdown or failure of equipment or techniques, accident or fugitive emission which has caused, is causing or may cause significant odour annoyance; or the breach of any odour limit specified in the Environmental Permit.

5.19 In addition, individual reports of complaints will be submitted immediately after receipt.

Actions in the Event of Abnormal Emissions

5.20 In the event of abnormal emissions (e.g. visual inspections, alarms triggered in the site control room, or monitoring beyond the site boundary), the Site Manager or Site Supervisor would take the following actions:

- check all relevant items of the odour control plant in order to identify possible cause of excursion (for example, neutraliser fan failure, chemical flow failure, etc);
- contact relevant maintenance contractor - to give telephone support/advice or attend site;
- record response to alarm and remedial action taken in the site diary; and
- contact DONG Energy to advise of a potential problem leading to possible customer complaints.

6 Odour Control during Maintenance and Abnormal Events

Section Overview

6.1 This section of the OMP deals with the management and control of odours during maintenance and emergency periods and is crucial to the Odour Management Plan. This section describes how DONG Energy will operate an action plan for abnormal event scenarios (including emergencies, maintenance, breakdowns, weather anomalies, etc). This is a summary of the foreseeable situations that may compromise the operator's ability to prevent and/or minimise odorous releases from the process and the actions to be taken to minimise the impact. Such actions may be as simple as temporarily preventing the input of feedstock to the more drastic shutting down of the plant. The action plan is intended to be used by operational staff on a day-to-day basis.

Risk Assessment

6.2 In the following pages, a tabular risk assessment has been compiled. This table:

- identifies the conditions under which abnormal operational conditions or failures might arise;
- describes what these are;
- summarises the potential impacts from the identified abnormal/failure situations and assesses the degree of those impacts; and
- describes how these conditions could be prevented and/or mitigated and controlled.

6.3 The highest risk of odour problems at the proposed development can be expected to be from the receipt of the waste. The majority of the odour can be controlled in some way by effective management, good housekeeping and the handling inside enclosed buildings and processes.

6.4 Where routine, planned and emergency maintenance of the facility has to be carried out and there is a likelihood of odour being released to atmosphere in quantities sufficient to result in detection off-site, a detailed risk assessment of the activity is conducted. As part of this, issues of odour generation, release and control are considered.

6.5 With regards to essential items of equipment a list of spares required will be developed as part of DONG Energy's EMS and will be based on the manufacturers` recommendations of spares required, together with standby equipment for some critical items (e.g. biogas engines).

6.6 In the event of a serious breakdown, such that material cannot be transferred, deliveries to the site will be stopped to ensure compliance with licence conditions. Alternatively, replacement equipment will be brought onto site.

Identify possible abnormal operation or failure that would lead to an odour event	Measures in place to prevent or reduce abnormal operation or failure	Actions/ Responsibilities
Spillages	DONG Energy will implement a cleaning procedure and schedule all site areas.	Competent Person to carry out regular inspections of all areas to detect spills. If spills detected required, spilt materials and debris will be hosed down.
Extreme weather conditions (e.g. prolonged heat wave)	Use odour neutralising sprays, where appropriate.	The site manager will be capable of performing these measures.
Doors/openings – failure of automatic closing mechanism	Doors will be able to be operated by remote control or manually. A routine maintenance plan and schedule will be incorporated into any existing maintenance programme.	Nearest person to immediately close the doors either remotely or manually and inform Competent Person. Competent Person to ensure doors are repaired as quickly as possible. Until repairs are completed, Competent Person to ensure doors remain open for the shortest time possible. Reason for failure will be investigated (in association with supplier/contractor if required) and maintenance plan revised if required.
Breakdown/malfunction of odour-critical plant (e.g. fans, scrubbers, filters)	On-site M&E staff to repair, using spares held, as required. Call-out made to equipment supplier/manufacturer, as required or repaired on site. Use odour neutralising sprays, where appropriate.	M&E staff to ensure plant repaired as quickly as possible. Reason for breakdown/malfunction will be investigated (in associated with supplier/contractor if required) and maintenance plan revised if required.
Replacement of the filter bed (needed every 12-24 months typically)	Run down operation and reduce waste storage/plan for seasonal changes e.g. low temperature.	M&E staff to ensure filter bed replaced quickly, normally within one working day.

7 Management Issues

Section Overview

7.1 This section of the OMP provides information on:

- staffing responsibilities;
- staff training;
- complaint management, investigation and resolution procedures;
- provision of a complaints telephone line; and
- communications with external stakeholders.

Roles and Responsibilities

7.2 DONG Energy is committed to managing effectively the impacts of odour from the proposed development. This section describes the responsibility for the management and operation of the proposed development.

7.3 In order to effectively implement the control measures discussed within this document the site has a management structure in place designed to deal with any potential odour emission.

7.4 Where a site operative becomes aware of a potential odour release from the site it must be reported to the Site Manager as soon as practical. It is the responsibility of the Site Manager to resolve any potential odour issues.

7.5 Any complaints or issues relating to the surrounding land use will be directed to the Site Manager for dialogue and a suitable conclusion.

7.6 All site staff are subject to EMS awareness training that includes their individual requirements to conduct continual daily odour assessments and their responsibility to record any non-conformances.

7.7 The Site Manager will review all control measures in place in the event that an odorous emission is substantiated off site. Any control measures seen to be failing following a review, will have new controls agreed and implemented.

Training and Competence

General Procedures for Training and Competency of Staff

7.8 Training and competency of staff is controlled by the EMS that covers training, awareness and competence. The company identifies training requirements of its employees and provides suitable resources to ensure they have the required knowledge, skills and expertise to carry out their duties. This includes their roles and responsibilities in complying with the policy statements,

the EMS and all relevant legislation. This is achieved through induction training for new employees, awareness training for all and specific training as required. Contractors and all persons performing tasks on behalf of the Company will be made aware of the policy and relevant EMS requirements and will be competent in the roles undertaken.

7.9 All new starters to the REnescience Northwich Facility will be trained on this complaints policy and procedure as part of standard induction procedures. All REnescience Northwich facility personnel receive ongoing training based upon identified needs; any staff deficient in knowledge and understanding of this procedure will be nominated for additional training.

Training and Competency of Operational Staff at the REnescience Northwich facility

7.10 All staff at the REnescience Northwich facility are made fully aware of the need to be vigilant with regard to site odour control and management procedures.

7.11 Staff responsible for the operation, maintenance or repair of odour-critical plant are trained and competent. Records will be maintained (documented training records) demonstrating compliance with this. In order to minimise risk of emissions, particular emphasis will be given during training to:

- awareness of their responsibilities for avoiding odour nuisance;
- minimising emissions on start-up and shut-down; and
- actions to minimise emissions during abnormal conditions.

7.12 DONG Energy will maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment.

7.13 The Environment Agency will be notified of any changes in technically competent management and the name of the incoming person together with evidence that that person has the required technical competence.

7.14 Regulation 4 of The Waste Management Licensing Regulations 1994 [3] provides that a person is technically competent for the purposes of section 74(3)(b) of the 1990 Act if he is the holder of the relevant Certificate of Technical Competence (COTC) awarded by the Waste Management Industry Training and Advisory Board (WAMITAB). Relevant operational staff at the facility will have a Certificate of Technical Competence, having successfully completed the WAMITAB qualification Level 4 in Mechanical Biological Treatment (4MBTFAD6).

Complaints Handling and Communications

7.15 DONG Energy will have in place a comprehensive system of monitoring and inspection to check odour control measures are functioning effectively at the REnescience Northwich facility.

However, in the event that an odour complaint is received, it is important that complaints are properly and systematically dealt with, and acted upon.

7.16 This section of the OMP describes:

- How DONG Energy will respond to any odour complaint;
- How DONG Energy will investigate any odour complaints, take the appropriate steps and actions, and keep stakeholders informed; and
- How DONG Energy will communicate to appropriate bodies routinely and in response to any incidents or planned maintenance.

Complaints Management and Registration

7.17 The following procedure for dealing with odour complaints describes who is responsible for dealing with the different aspects of the complaint.

Publicising Contact Details for Odour Complaints

7.18 DONG Energy will provide contact details to allow odour complaints to be made by telephone, email or via a website. These details will be publicised and communicated to members of the general public and displayed on signs at the site gate and on the company website.

Complaint Registration

7.19 In the event that DONG Energy receives a complaint alleging potential odour nuisance from the REnescience Northwich facility:

- the complaint will be registered; and
- complaints data will be recorded in a systematic way, enabling comparison with standard odour descriptors, with wind direction and with site work activities.

Roles and responsibilities for complaints management

7.20 The following team members will deal with specific aspects of the complaint.

Table 7.1: Odour Complaints Contact List

Recipient	Position	Contact Details
The person within DONG Energy to whom complaints are to be directed to as a point of central contact and to record the complaint on the registration system	Environmental Manager	Site address
The person within DONG Energy to who has management responsibility for ensuring complaints are assessed and dealt with	Site Manager	Site address
The person within DONG Energy who has technical responsibility for dealing with the resolution of any complaints where assessed as significant	Environmental Manager	Site address
The person within DONG Energy responsible for liaison with the Environment Agency on progress (from acknowledgement of complaint to resolution where assessed as significant)	Environmental Manager	Site address
The person within DONG Energy responsible for liaison with the local stakeholders on progress (from acknowledgement of complaint to resolution where assessed as significant)	Environmental Manager	Site address

Collecting the relevant complaint details

7.21 The recommended minimum information that needs to be collected for each complaint is:

- the time and date when the offensive odour was observed;
- the location (within approx. 100 m) where the offensive odour was observed, e.g. postal address, grid reference) and its sensitivity;
- the Complainant`s description of odour. This should include a subjective description of all the factors necessary to make an assessment of the impact of the odour, including intensity, character (preferably on the basis of a choice from standardised descriptors given in Environment Agency Technical Guidance Note H4), relative unpleasantness (either pleasant, unpleasant or neutral), frequency and duration;
- the identity of the complainant, if possible, to assess the repeated nature of complaints;
- the residential address of the complainant; and
- any other information the complainant can offer on activities at the alleged odour source.

7.22 It is also necessary to collect (by observation or further investigation) the following additional information to allow subsequent analysis and collation of complaints:

- wind direction and speed, and atmospheric stability class at the time of complaint; and
- any process incidents at the time of complaint.

7.23 A standardised form (based on that used by the Environment Agency in its H4 Odour Management guidance) is used for recording this information and entering it on the registration system is used, shown in Table 7.2.

Table 7.2: Form for the recording of an odour-related complaint

Odour Complaint Report Form			Sheet No
Date:	Installation to which complaint relates	Grid Reference:	
Name and address of complainant:			
Tel no. of complainant:			
Time and date of complaint:			
Date, time and duration of offending odour:			
Location of odour, if not at above address:			
Weather conditions (ie, dry, rain, fog, snow):			
Cloud cover (0-8):			
Cloud height (low, high, very high):			
Wind strength - (light, steady, strong, gusting) or use Beaufort scale:			
Wind direction:			
Complainant's description of odour (i.e. comparison with other odours, strong/weak, continuous, fluctuating):			
Has complainant any other comments about the odour?			
Are there any other complaints relating to the installation, or to that location? (either previously or relating to the same exposure)			
Any other relevant information:			
On-site activities at time the odour occurred:			
Operating condition at time offensive odour occurred (e.g. flow rate, pressure at inlet and pressure at outlet)			
Actions taken:			
Form completed by		Signed	

Investigation of Odour Complaints

7.24 This escalating response procedure shows what investigative actions will be taken in response to a complaint. The aim of the investigative actions will be to establish:

- the source of the odour complaint; and
- the impact of the odour.

7.25 A series of investigative tools, of increasing sophistication, will be used until these two questions can be satisfactorily answered. This then enables the appropriate odour controls to be applied if the impact is significant and the source is confirmed as the REnescience Northwich facility.

Complaint screening

7.26 Investigation will start with an initial screening of the complaint. If the screening process “fails to confirm” the odour incident the odour investigation will stop at that point. If the screening process confirms the odour incident, then a more detailed investigation is carried out.

7.27 The object of the initial screening is to quickly identify those odour complaints that are unlikely to be due to the REnescience Northwich facility, perhaps because they result from some other activities in the area.

7.28 Initial screening should consider the following:

- knowledge of potential sources on the REnescience Northwich facility (tie-up with work activities in progress, any plant problems, etc);
- knowledge of potential sources in the locality other than the REnescience Northwich facility;
- wind direction at the time of the alleged odour episode of the locations of the REnescience Northwich facility and the complainant;
- distance of the complainant from site; and
- concurrent odour monitoring data (e.g. daily perimeter sniff tests).

7.29 If a trained odour assessor is able to attend rapidly after a complaint it may be possible to carry out effective appraisal of the complaints independently by a sniff test.

7.30 DONG Energy will liaise with local stakeholders (including the complainant) and inform them on the outcome of the screening assessment of the complaint and whether or not any action is to be taken.

Further investigation of the complaint

7.31 If the initial screening is unable to discount the REnescience Facility as the source of the odour complaint, then further investigation will be carried out, which will either 'confirm' and 'further characterise' the odour incident as due to the Renescience Facility, or it will 'fail to confirm' the incident.

7.32 Further investigation will be by means of a graded response, designed to answer the questions:

- Is the episode due to the facility? (i.e. source verification); and
- How bad is episode? (i.e. assessment of impact).

7.33 DONG Energy may use odour monitoring (including, but not necessarily restricted to sniff testing) to provide data to answer these questions, or provide additional confirmation. The monitoring effort is increased in a graduated way until the data generated is sufficient to answer the relevant questions being asked. If the level of monitoring being carried out at a particular stage in the graded response cannot answer the question (either at all, or with sufficient confidence to satisfy stakeholders) then monitoring should move to the next level.

7.34 As well as monitoring, DONG Energy may be able to obtain more detailed information from operator records about process conditions, observations or inspections at the time of complaint – this would allow odour trends to be identified and possibly reconciled with particular process operations or maintenance.

Communications with External Stakeholders

Communicating with the Environment Agency

7.35 In the event that any complaint is made by a member of the public about any matter associated with the REnescience Facility, DONG Energy will give notice in writing to the Environment Agency no later than the next working day after the complaint is received. This written notification will normally be in the form of an email. The notification will include a description of the complaint, the name and address of the person making the complaint and the action proposed as a result, unless agreed by the Environment Agency. Depending on the nature of the complaint, it will not always be possible to resolve the matter within this short timescale. In such cases an indication will be given that further investigations are necessary.

Communicating with Complainants

7.36 In the case of answer phone messages and complaints submitted by email or by letter, an acknowledgement and initial response will be given by telephone or by email within 48 hours, provided that telephone or email contact details have been given by the complainant. Where complaints cannot be resolved on initial contact and further investigations are required, a written response will be made within 10 working days of submission of the complaint.

7.37 The primary reasons for further investigation of complaints are to assess potential nuisance and identify the likely cause and source of the odour so that nuisance can be reduced or stopped. In the case of further investigations, DONG Energy will communicate to the complainant the course of actions likely to be taken.

7.38 The level of annoyance associated with odours can often be reduced if affected individuals are provided with credible information about what they are smelling, the process that generates the

odours, any factors affecting dispersion, what health impacts might be associated with the odour, what efforts are being undertaken to control odours and what is being done in response to their complaint. Liaison with the local community, offering credible reassurance and taking complaints seriously are often effective means of mitigating odour nuisance. To put this into practice, DONG Energy will aim to communicate the following message:

- The reason for the odour;
- The likely duration of the odour;
- What plan is in place to end the odour episode;
- What preventative plan will be implemented to prevent a re-occurrence;
- What grievance procedure the aggrieved party can take; and
- Who is the responsible person on site to contact.

OMP Updating and Review

7.39 DONG Energy is committed to an internal auditing process and to developing documented auditing procedures (forms) to record the process. The updating and review of controlled documents will be controlled by the EMS.

7.40 The Environment Agency will be provided reasonable access to audit the implementation of the OMP, the sniff test results, complaints records and records of DONG Energy's compliance with the OMP.

7.41 It is DONG Energy's intent that the change mechanism should provide for improvements in management practice and organisation, to allow the OMP to be a living document, whereby changes to plant, equipment and practices that improve the operation of the facility and do not detract from overall environmental performance, are not unduly delayed or hindered. It is envisaged that the OMP will be reviewed and updated on an annual or biannual basis.

References

1 Bull et al (2014). *IAQM Guidance on the assessment of odour for planning,* Institute of Air Quality Management, London.

2 Environment Agency (March 2011). H4 Odour Management.

3 ODPM (1994) Environmental Protection. The Waste Management Licensing Regulations 1994

Appendix 11.A: Noise Model Source Data

External Plant Data

Plant	Quantity	Type	on time	Period	Height (m)	Sound Power Level L_{WA} dB	Spectral Shape dB(A)							
							63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
CHP (Gas Engines)	5	Point	100%	24 hour	2.0	98	60	72	73	80	86	91	84	79
Gas Engine Stack	1	Point	100%	24 hour	33.0	89	88	78	70	66	64	70	71	69
Front-end Loader	2	Line	100%	Daytime (07:00 - 19:00)	1.0	104	80	75	83	83	103	99	85	77
HGV	4	Line	na	Daytime (07:00 - 19:00)	1.0	98	81	84	86	92	93	92	88	80
Flare	1	Point	3%	24 hour	10.0	93	88	78	70	66	64	70	71	69

Internal Reverberant Sound Level in Buildings

	Sound Power Level L_{WA} dB	Spectral Shape dB(A)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Internal Reverberant Sound Level $L_{Ap,in}$	80	53	63	69	73	76	73	69	61

Cladding Specification

Façade	Construction	Sound Reduction Index (SRI)								
		Rw	63	125	250	500	1000	2000	4000	8000
Walls	0.5 mm corrogated steel	19	7	9	13	17	18	21	24	27
Roof	Insulated panel (KS 1000 RW or similar)	25	20	18	20	24	20	29	39	47

Stack Silencer Reduction Calculations

	LWA	Spectral shape							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
JMC 41	121	111.0	116.0	105.0	102.0	96.0	108.0	107.0	104.0
JMC 42	123	117.0	115.0	113.0	108.0	105.0	108.0	109.0	107.0
	128.1	121.0	121.5	116.6	112.0	108.5	114.0	114.1	111.8
IMS Reactive Exhaust Gas Silencer MA51		33.0	44.0	47.0	46.0	45.0	44.0	43.0	43.0
	88.6	88.0	77.5	69.6	66.0	63.5	70.0	71.1	68.8

SoundPlan Stack Directivity Input

	Degrees	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Sound Plan Stack Directivity Input	**0**	0.6	2.4	4.2	6.1	7.9	9.7	11.6	13.4
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	30	0.8	1.5	2.1	2.8	3.9	3.6	3.1	2.3
	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	50	1.2	1.1	0.9	0.6	-0.1	-1.3	-3.2	-5.7
	60	-0.2	-0.5	-1.0	-2.0	-3.8	-6.7	-9.8	-12.5
	70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	90	1.3	-1.8	-4.9	-8.0	-11.1	-14.3	-17.4	-20.5
	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	120	0.7	-3.8	-8.4	-13.0	-17.6	-22.2	-26.7	-31.3
	130	0.7	-3.8	-8.4	-13.0	-17.6	-22.2	-26.7	-31.3
	140	0.7	-3.8	-8.4	-13.0	-17.6	-22.2	-26.7	-31.3
	150	0.7	-3.8	-8.4	-13.0	-17.6	-22.2	-26.7	-31.3
	160	0.7	-3.8	-8.4	-13.0	-17.6	-22.2	-26.7	-31.3
	170	0.7	-3.8	-8.4	-13.0	-17.6	-22.2	-26.7	-31.3
	180	0.7	-3.8	-8.4	-13.0	-17.6	-22.2	-26.7	-31.3

Appendix 11.B: Baseline Noise Monitoring Data

Sound Level Survey Record (Unattended Baseline Survey)

Location			L1 273 Manchester Road			
Purpose of Monitoring			Baseline			
Relevant Guidance / Standard			BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014			
Sound Measurement System						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
Hire	Rion NL-52		320636	-	0001	-
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	20 - 130 dB	F	A	Façade	✓

		START	END
Personnel		PGH	-
Date / time		09/07/2015 12:05	-
Calibrator	RPS ID	14	-
	Manufacturer / Model	RION NC-74	#N/A
	Serial Number	110118	#N/A
	Date last verification	10/02/2014	#N/A
	Reference level	94.0	-
	Meter reading	94.0	-
Weather	Wind speed (m/s) & dir'n 1	0.8 SW	- -
	Wind speed (m/s) & dir'n 2	1.8 SW	- -
	Wind speed (m/s) & dir'n 3	1 SW	- -
	Wind speed (m/s) & dir'n Av.	1.2 SW	- -
	Cloud cover (100%= 8 oktas)	3- oktas	-
	Temperature (degrees Celsius)	~21 ºC	-
	Relative Humidity (%)	~ 50 %	-

Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)	TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn
	x											

Subjective description / additional details	Clear. Dry ground.	Clear. Dry ground.

Photographs of Measurement Location

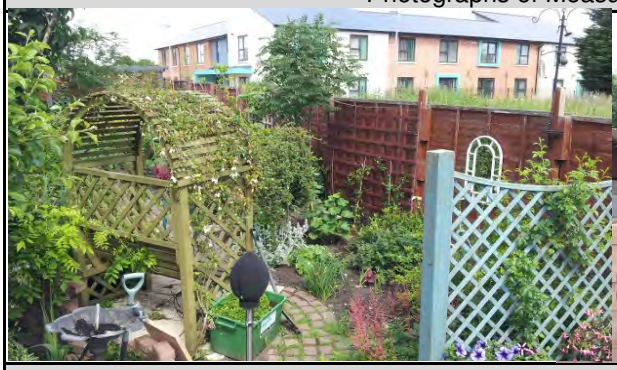
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))
~1m from façade in front of house.
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Road noise, Sound of steel roof erection across street, aeroplane flying over.
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Road noise

Sound Level Survey Record (Unattended Baseline Survey)

Location			L2 38 James Street			
Purpose of Monitoring			Baseline			
Relevant Guidance / Standard			BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014			
Sound Measurement System						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
Hire	Rion NL-52		932323	-	0002	-
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	20 - 130 dB	F	A	Freefield	✓

			START						**END**				
Personnel			PGH						PB				
Date / time			09/07/2015 11:00						-				
Calibrator	RPS ID		14						14				
	Manufacturer / Model		RION NC-74						RION NC-74				
	Serial Number		110118						110118				
	Date last verification		10/02/2014						10/02/2014				
	Reference level		94.0						94.0				
	Meter reading		94.0						94.0				
Weather	Wind speed (m/s) & dir'n 1		1.1		SW				-		-		
	Wind speed (m/s) & dir'n 2		0.5		SW				-		-		
	Wind speed (m/s) & dir'n 3		0.8		SW				-		-		
	Wind speed (m/s) & dir'n Av.		0.8		SW				-		-		
	Cloud cover (100%= 8 oktas)		3- oktas						5- oktas				
	Temperature (degrees Celsius)		~21 ºC						~20 ºC				
	Relative Humidity (%)		~ 45 %						~ 50 %				
	Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)		TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn
			x											
	Subjective description / additional details		Clear. Dry ground.						Clear. Dry ground.				

Photographs of Measurement Location



Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))

Near middle of back garden in close proximity to small tree. Soft ground to source. Fence 4 m away.

Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)

Distant road traffic, birds, impulsive sound from west, distant dog barking, train and train horn. Building working expected between 3pm-5pm Tuesday and Wednesday

Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)

Distant road traffic, wind rustle, aircraft noise, people talking next door

Sound Level Survey Record (Attended Baseline Survey)

Location					L4 On footpath north of Farm Road								
Purpose of Monitoring					Baseline								
Relevant Guidance / Standard					BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014								
Sound Measurement System													
RPS ID	Manufacturer / Model		Serial Number		Last Lab Verification		Filename		Memory Card ID				
32	B&K 2250		2579764		30/06/2014		003, 006		-				
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting		Frequency Weighting		Façade / Freefield		Photo?				
1.5 m	15 min	20 - 140 dB	F		A		Freefield		✓				
			003				**006**						
Personnel			PGH				PGH						
Date / time			09/07/2015 18:00				09/07/2015 19:54						
Calibrator	RPS ID		35				35						
	Manufacturer / Model		B&K 4231				B&K 4231						
	Serial Number		2665087				2665087						
	Date last verification		20/02/2015				20/02/2015						
	Reference level		94.0				94.0						
	Meter reading		94.0				94.0						
Weather	Wind speed (m/s) & dir'n 1		1.6	NE			1	NE					
	Wind speed (m/s) & dir'n 2		1.1	NE			1.8	NE					
	Wind speed (m/s) & dir'n 3		1.1	NE			0.7	NE					
	Wind speed (m/s) & dir'n Av.		1.3	NE			1.2	NE					
	Cloud cover (100%= 8 oktas)		2- oktas				1- oktas						
	Temperature (degrees Celsius)		~20 ºC				~17 ºC						
	Relative Humidity (%)		~ 50 %				~ 55 %						
	Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)		TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn
	Subjective description / additional details		Clear. Dry ground.				Clear. Dry ground.						

Photographs of Measurement Location

Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))
Industrial Sources to NW over a grassy hill. Position elevated above nearby houses.
Description of sound environment during 003 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Industrial sound from N/NW - continuous sound of aggregate fallling off conveyor/raspy turbine - (loading train). Aeroplanes, dog barking, leaf blower ~150 m in garden to E. Distant traffic.
Description of sound environment during 006 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Low level hum and impulses, aeroplanes, birds, process/movement alram, istant voices from playing field, dog barking, dog walker passing

Sound Level Survey Record (Attended Baseline Survey)

Location					L4 On footpath north of Farm Road								
Purpose of Monitoring					Baseline								
Relevant Guidance / Standard					BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014								
Sound Measurement System													
RPS ID	Manufacturer / Model		Serial Number		Last Lab Verification		Filename		Memory Card ID				
32	B&K 2250		2579764		30/06/2014		009, 0112		-				
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting		Frequency Weighting		Façade / Freefield		Photo?				
1.5 m	15 min	20 - 140 dB	F		A		Freefield		✓				
			009				**012**						
Personnel			PGH				PGH						
Date / time			10/07/2015 01:21				10/07/2015 02:44						
Calibrator	RPS ID		35				35						
	Manufacturer / Model		B&K 4231				B&K 4231						
	Serial Number		2665087				2665087						
	Date last verification		20/02/2015				20/02/2015						
	Reference level		94.0				94.0						
	Meter reading		94.0				94.0						
Weather	Wind speed (m/s) & dir'n 1		0.2		?		Still		?				
	Wind speed (m/s) & dir'n 2		0		?		Still		?				
	Wind speed (m/s) & dir'n 3		0		?		Still		?				
	Wind speed (m/s) & dir'n Av.		0.1		?		-		?				
	Cloud cover (100%= 8 oktas)		7- oktas				7- oktas						
	Temperature (degrees Celsius)		~15 ºC				~15 ºC						
	Relative Humidity (%)		~ 65 %				~ 65 %						
	Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)		TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn
	Subjective description / additional details		Clear. Dew on ground.				Clear. Dew on ground.						
Photographs of Measurement Location													

Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))
Industrial Sources to NW over a grassy hill. Position elevated above nearby houses.
Description of sound environment during 009 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Industrial sound/distant motorway (dominant). Industural site to north audible. Distant birds, distant cars.
Description of sound environment during 012 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Same as above with more traffic

Sound Level Survey Record (Attended Baseline Survey)

Location			L5 North of James Stree			
Purpose of Monitoring			Baseline			
Relevant Guidance / Standard			BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014			
Sound Measurement System						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
32	B&K 2250		2579764	30/06/2014	001, 004	-
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	15 min	20 - 140 dB	F	A	Freefield	✓

		001		004	
Personnel		PGH		PGH	
Date / time		09/07/2015 15:30		09/07/2015 18:34	
Calibrator	RPS ID	35		35	
	Manufacturer / Model	B&K 4231		B&K 4231	
	Serial Number	2665087		2665087	
	Date last verification	20/02/2015		20/02/2015	
	Reference level	94.0		94.0	
	Meter reading	94.0		94.0	
Weather	Wind speed (m/s) & dir'n 1	1.1	NE	0.6	NE
	Wind speed (m/s) & dir'n 2	1.7	NE	2.0	NE
	Wind speed (m/s) & dir'n 3	0.8	NE	1.0	NE
	Wind speed (m/s) & dir'n Av.	1.2	NE	1.2	NE
	Cloud cover (100%= 8 oktas)	1- oktas		1- oktas	
	Temperature (degrees Celsius)	~21 ºC		~21 ºC	
	Relative Humidity (%)	~ 45 %		~ 45 %	

Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)	TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn

Subjective description / additional details	Clear. Dry ground.	Clear. Dry ground.

Photographs of Measurement Location

Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))
On hard ground next o gate at end of track. Soft and uneven ground to nearby road.
Description of sound environment during 001 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Birds, folliage in wind, aeroplanes, distant traffic. Incects, train, distant car alarm, distant car horns.
Description of sound environment during 004 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)
Industrial sound, train, aeroplanes, distant traffic, jogger/dogwalkers passing, birds.

Sound Level Survey Record (Attended Baseline Survey)

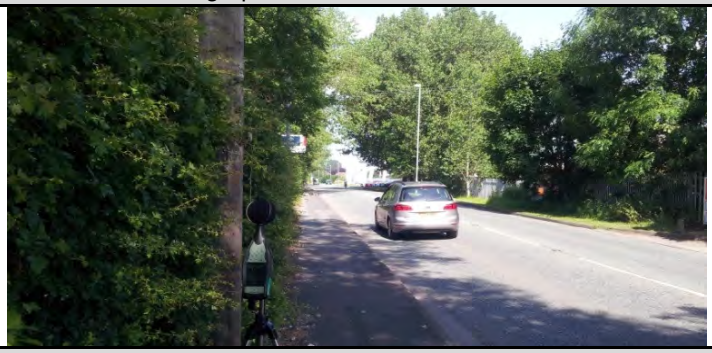
Location			L3 Manchester Road opposite Brickfield Business Centre			
Purpose of Monitoring			Baseline			
Relevant Guidance / Standard			BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014			
Sound Measurement System						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
32	B&K 2250		2579764	30/06/2014	002, 005	-
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	15 min	20 - 140 dB	F	A	Freefield	✓

		002		005	
Personnel		PGH		PGH	
Date / time		09/07/2015 16:15		09/07/2015 19:25	
Calibrator	RPS ID	35		35	
	Manufacturer / Model	B&K 4231		B&K 4231	
	Serial Number	2665087		2665087	
	Date last verification	20/02/2015		20/02/2015	
	Reference level	94.0		94.0	
	Meter reading	94.0		94.0	
Weather	Wind speed (m/s) & dir'n 1	0.4	NE	0.7	NE
	Wind speed (m/s) & dir'n 2	0.8	NE	0.6	NE
	Wind speed (m/s) & dir'n 3	0.8	NE	0.5	NE
	Wind speed (m/s) & dir'n Av.	0.7	NE	0.6	NE
	Cloud cover (100%= 8 oktas)	1- oktas		1- oktas	
	Temperature (degrees Celsius)	~20 ºC		~19 ºC	
	Relative Humidity (%)	~ 45 %		~ 50 %	

Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)	TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn

Subjective description / additional details	Clear. Dry ground.	Clear. Dry ground.

Photographs of Measurement Location



Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))

~2 m from carriage way edge

Description of sound environment during 002 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)

Road Traffic.

Description of sound environment during 005 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)

Road traffic, dog barking, aeroplane, dog walkers passing by.

Sound Level Survey Record (Attended Baseline Survey)

Location					L5 North of James Street								
Purpose of Monitoring					Baseline								
Relevant Guidance / Standard					BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014								
Sound Measurement System													
RPS ID	Manufacturer / Model			Serial Number		Last Lab Verification		Filename		Memory Card ID			
32	B&K 2250			2579764		30/06/2014		008, 011		-			
Microphone Height	Measurement Interval	Dynamic Range		Time Weighting		Frequency Weighting		Façade / Freefield		Photo?			
1.5 m	15 min	20 - 140 dB		F		A		Freefield		✓			
				008				**011**					
Personnel				PGH				PGH					
Date / time				10/07/2015 00:48				10/07/2015 02:17					
Calibrator	RPS ID			35				35					
	Manufacturer / Model			B&K 4231				B&K 4231					
	Serial Number			2665087				2665087					
	Date last verification			20/02/2015				20/02/2015					
	Reference level			94.0				94.0					
	Meter reading			94.0				94.0					
Weather	Wind speed (m/s) & dir'n 1			0.2		?		0.2		?			
	Wind speed (m/s) & dir'n 2			0		?		0.0		?			
	Wind speed (m/s) & dir'n 3			0		?		0.0		?			
	Wind speed (m/s) & dir'n Av.			0.1		?		0.1		?			
	Cloud cover (100%= 8 oktas)			5- oktas				7- oktas					
	Temperature (degrees Celsius)			~15 ºC				~15 ºC					
	Relative Humidity (%)			~ 70 %				~ 70 %					
	Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)	TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn
	Subjective description / additional details	Clear. Dew forming.						Clear. Dew forming.					

Photographs of Measurement Location

Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))

On hard ground next o gate at end of track. Soft and uneven ground to nearby road.

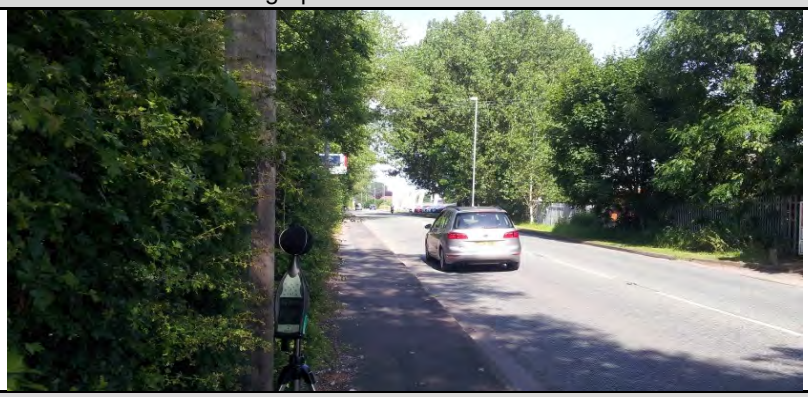
Description of sound environment during 008 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)

Water movement, industrial continuous sound, sounds like two industrial sources, one following line of road and one towards SW -could be distant motorway. Bird call.

Description of sound environment during 011 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)

Same as above plus distant traffic and train.

Sound Level Survey Record (Attended Baseline Survey)

Location			L3 Manchester Road opposite Brickfield Business Centre										
Purpose of Monitoring			Baseline										
Relevant Guidance / Standard			BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014 / BS 8233:2014										
Sound Measurement System													
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification		Filename		Memory Card ID					
32	B&K 2250		2579764	30/06/2014		007, 010		-					
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting		Façade / Freefield		Photo?					
1.5 m	15 min	20 - 140 dB	F	A		Freefield		✓					
			007			**010**							
Personnel			PGH			PGH							
Date / time			09/07/2015 16:15			09/07/2015 19:25							
Calibrator	RPS ID		35			35							
	Manufacturer / Model		B&K 4231			B&K 4231							
	Serial Number		2665087			2665087							
	Date last verification		20/02/2015			20/02/2015							
	Reference level		94.0			94.0							
	Meter reading		94.0			94.0							
Weather	Wind speed (m/s) & dir'n 1		0	?		Still	?						
	Wind speed (m/s) & dir'n 2		0.2	?		Still	?						
	Wind speed (m/s) & dir'n 3		0.5	?		Still	?						
	Wind speed (m/s) & dir'n Av.		0.2	?		-	?						
	Cloud cover (100%= 8 oktas)		1- oktas			1- oktas							
	Temperature (degrees Celsius)		~20 ºC			~19 ºC							
	Relative Humidity (%)		~ 45 %			~ 50 %							
	Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)		TI	P	F	W	Fr	Sn	TI	P	F	W	Fr	Sn
	Subjective description / additional details		Clear. Dry ground.			Clear. Dry ground.							
Photographs of Measurement Location													
													
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))													
~2 m from carriage way edge													
Description of sound environment during 007 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)													
Occasional car/truck, continuous low level industrial sound - sounds like large fans with occasional faint whine.													
Description of sound environment during 110 survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)													
Same as above													

Survey Data L1

Daytime (07:00 - 23:00)

	Start	Valid Time	LAeq	LAE	LAFmax	LAFmin	L5	L10	L50	L90	L95	Over	Under	Excluded Interval
Friday	10/07/2015 07:00	16:00:00	71.8	119.4	99.5	47.5	76.6	75.3	68.8	55.8	52.8	-	-	-
Saturday	11/07/2015 07:00	16:00:00	71.8	119.4	111.7	45.0	76.6	75.3	68.0	53.8	51.4	-	-	-
Sunday	12/07/2015 07:00	16:00:00	70.0	117.6	102.4	41.9	76.2	74.7	62.7	48.4	46.9	-	-	-
Monday	13/07/2015 07:00	16:00:00	72.5	120.1	108.3	41.8	77.5	76.3	69.7	54.9	50.2	-	-	-
Tuesday	14/07/2015 07:00	16:00:00	72.1	119.7	103.1	42.6	77.0	75.8	70.2	55.2	50.8	-	-	-
Wednesday	15/07/2015 07:00	16:00:00	72.0	119.6	108.1	45.1	76.7	75.5	69.8	55.4	51.7	-	-	-
		average (façade)	72	119	106	44	77	75	68	54	51			
		average (free field corrected	69	116	103	41	74	72	65	51	48			

Night-time (23:00 -07:00)

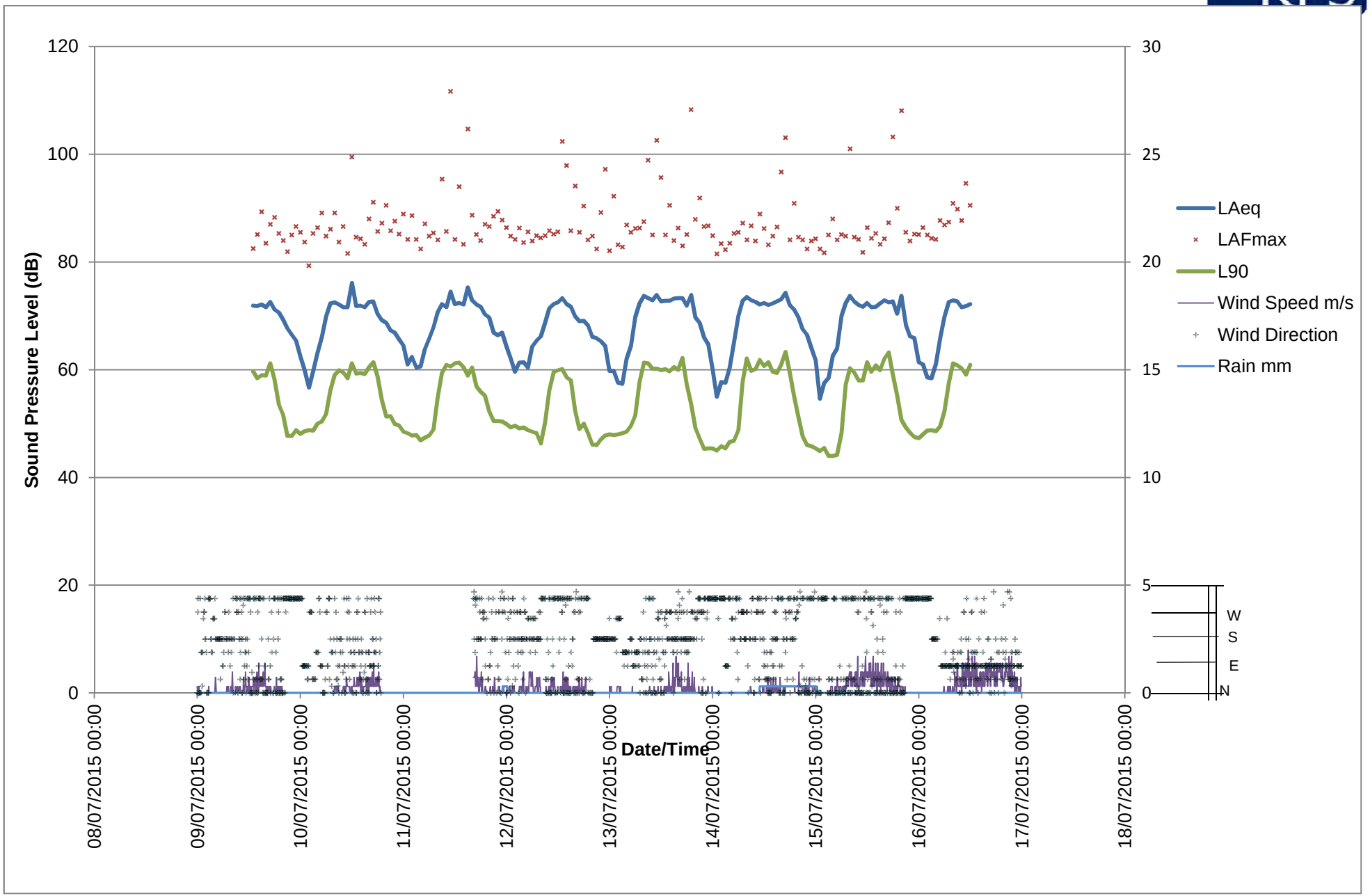
	Start	Valid Time	LAeq	LAE	LAFmax	LAFmin	L5	L10	L50	L90	L95	Over	Under	Excluded Interval
Thursday	09/07/2015 23:00	08:00:00	64.7	109.3	89.1	46.9	72.1	65.7	50.6	48.8	48.5	-	-	-
Friday	10/07/2015 23:00	08:00:00	63.5	108.1	88.9	44.7	70.4	64.0	49.5	47.8	47.4	-	-	-
Saturday	11/07/2015 23:00	08:00:00	63.2	107.8	87.8	46.7	69.8	62.5	50.8	49.2	48.8	-	-	-
Sunday	12/07/2015 23:00	08:00:00	63.9	108.5	97.2	46.0	70.7	64.1	49.4	48.1	47.9	-	-	-
Monday	13/07/2015 23:00	08:00:00	63.9	108.5	86.7	42.7	71.2	64.6	47.5	45.6	45.2	-	-	-
Tuesday	14/07/2015 23:00	08:00:00	64.0	108.6	88.0	41.2	71.2	64.5	46.7	44.8	44.2	-	-	-
Wednesday	15/07/2015 23:00	08:00:00	64.5	109.1	87.7	45.2	71.8	65.4	50.1	48.2	47.7	-	-	-
		average (façade)	64	109	89	45	71	64	49	48	47			
		average (free field corrected	61	106	86	42	68	61	46	45	44			

Short Term Survey Data

Location - Report	Period	Start Date/ Time	Duration	LAFmax	LAFmin	LAeq	LAF1	LAF5	LAF10	LAF50	LAF90	LAF95	LAF99
L3	Daytime	09/07/2015 16:15	00:15:00	86.52	49.83	74.84	82.99	80.41	78.9	72	61.49	57.59	52.37
L3	Daytime	09/07/2015 19:25	00:15:00	87.29	41.53	73.25	82.68	79.59	77.61	67.85	55.54	52.24	44.39
L3	Night-time	10/07/2015 00:19	00:15:00	85.34	38.02	64.87	78.74	70.28	65.44	49.02	39.54	39.26	38.79
L3	Night-time	10/07/2015 01:51	00:15:00	83.98	38.83	62.29	76.97	65.93	57.49	40.96	40.04	39.86	39.57
L4	Daytime	09/07/2015 18:00	00:15:00	60.43	41.49	47.5	53.43	50.7	49.81	46.51	44.33	43.75	42.73
L4	Daytime	09/07/2015 19:53	00:15:00	62.05	37.63	44.38	54.06	49.6	46.35	41.39	39.79	39.39	38.79
L4	Night-time	10/07/2015 01:20	00:15:00	63.32	37.13	42.31	47.76	45.42	44.41	41.53	39.11	38.71	38.09
L4	Night-time	10/07/2015 02:44	00:15:00	55.18	36.96	41.95	46.29	44.5	43.81	41.5	39.34	38.89	38.11
L5	Daytime	09/07/2015 15:30	00:15:00	67.68	38.22	46.59	57.56	51.83	48.52	42.78	40.45	39.98	39.27
L5	Daytime	09/07/2015 18:38	00:13:41	73.07	40.7	49.35	57.51	53.76	51.54	46.19	43.27	42.73	41.85
L5	Daytime	09/07/2015 18:53	00:14:17	64	41.64	48.37	57.76	52.96	50.68	45.87	43.85	43.39	42.63
L5	Night-time	10/07/2015 00:47	00:15:00	50.51	35.76	38.6	41.62	40.65	40.16	38.11	37.13	36.91	36.52
L5	Night-time	10/07/2015 02:17	00:15:00	54.15	35.84	40.97	51.41	43.34	41.54	39.46	37.81	37.46	37

Short Term Survey Data

Location - Report	Period	Start Date/ Time	Duration	LAFmax	LAFmin	LAeq	LAF1	LAF5	LAF10	LAF50	LAF90	LAF95	LAF99
L3	Daytime	09/07/2015 16:15	00:15:00	86.5	49.8	74.8	83.0	80.4	78.9	72.0	61.5	57.6	52.4
L3	Daytime	09/07/2015 19:25	00:15:00	87.3	41.5	73.3	82.7	79.6	77.6	67.9	55.5	52.2	44.4
L3	Night-time	10/07/2015 00:19	00:15:00	85.3	38.0	64.9	78.7	70.3	65.4	49.0	39.5	39.3	38.8
L3	Night-time	10/07/2015 01:51	00:15:00	84.0	38.8	62.3	77.0	65.9	57.5	41.0	40.0	39.9	39.6
L4	Daytime	09/07/2015 18:00	00:15:00	60.4	41.5	47.5	53.4	50.7	49.8	46.5	44.3	43.8	42.7
L4	Daytime	09/07/2015 19:53	00:15:00	62.1	37.6	44.4	54.1	49.6	46.4	41.4	39.8	39.4	38.8
L4	Night-time	10/07/2015 01:20	00:15:00	63.3	37.1	42.3	47.8	45.4	44.4	41.5	39.1	38.7	38.1
L4	Night-time	10/07/2015 02:44	00:15:00	55.2	37.0	42.0	46.3	44.5	43.8	41.5	39.3	38.9	38.1
L5	Daytime	09/07/2015 15:30	00:15:00	67.7	38.2	46.6	57.6	51.8	48.5	42.8	40.5	40.0	39.3
L5	Daytime	09/07/2015 18:38	00:13:41	73.1	40.7	49.4	57.5	53.8	51.5	46.2	43.3	42.7	41.9
L5	Daytime	09/07/2015 18:53	00:14:17	64.0	41.6	48.4	57.8	53.0	50.7	45.9	43.9	43.4	42.6
L5	Night-time	10/07/2015 00:47	00:15:00	50.5	35.8	38.6	41.6	40.7	40.2	38.1	37.1	36.9	36.5
L5	Night-time	10/07/2015 02:17	00:15:00	54.2	35.8	41.0	51.4	43.3	41.5	39.5	37.8	37.5	37.0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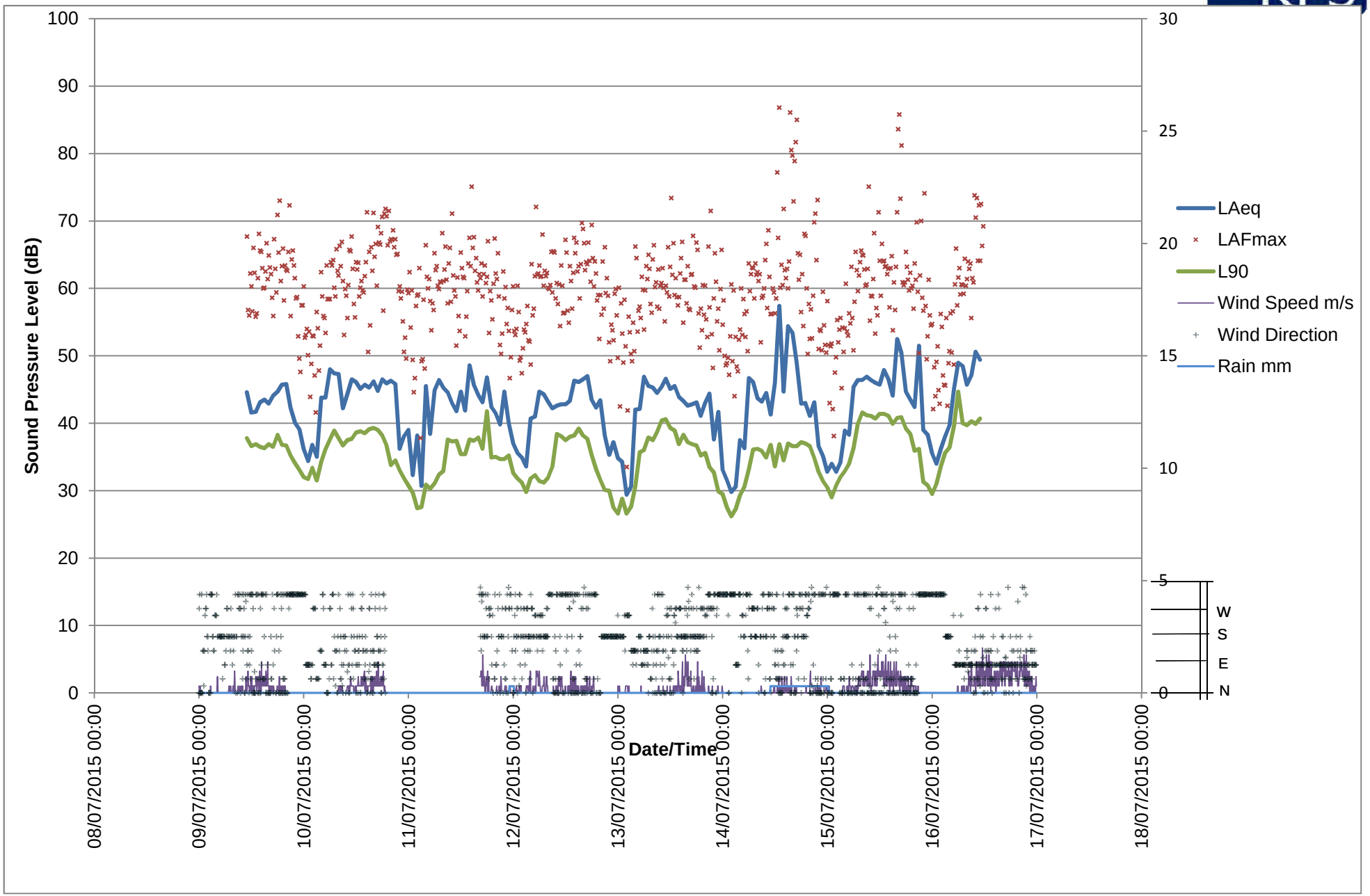
100
80
60
40
20
0
30
25
20
15
10
5
0
Sound Pressure Level (dB)
LAeq
LAFmax
L90
Wind Speed m/s
Wind Direction
Rain mm
W
S
E
N
08/07/2015 00:00
09/07/2015 00:00
10/07/2015 00:00
11/07/2015 00:00
12/07/2015 00:00
13/07/2015 00:00
14/07/2015 00:00
15/07/2015 00:00
16/07/2015 00:00
17/07/2015 00:00
18/07/2015 00:00
Date/Time


Sound Pressure Level (dB)
100
90
80
70
60
50
40
30
20
10
0
30
25
20
15
10
5
0
W
S
E
N
LAeq
LAFmax
L90
Wind Speed m/s
Wind Direction
Rain mm
08/07/2015 00:00
09/07/2015 00:00
10/07/2015 00:00
11/07/2015 00:00
12/07/2015 00:00
13/07/2015 00:00
14/07/2015 00:00
15/07/2015 00:00
16/07/2015 00:00
17/07/2015 00:00
18/07/2015 00:00
Date/Time

Appendix 11.C: Noise Model Results

Noise Model Results

Name	Floor	LrD dB(A)	LrN dB(A)
38 James Street	GF	30.5	30.3
217 Manchester Road	GF	45.7	40
Ann Street (Off Manchester Road)	GF	42	37.8
Consented Residential Cottage Close	GF	36.4	33.7
Consented Residential Farm Road	GF	36.3	32.8
Consented Residential James Street	GF	34.6	34.4
Cottage Close	GF	35.6	33
St John's Close	GF	33.6	31.4

Appendix 11.D: Road Traffic Noise Calculations

CRTN Calculations

Operational Traffic Assessment

		Plus Committed Development 2016 18-hr AAWT (06:00 - 00:00 hr)				Plus Committed Development Plus Development Traffic 2016 18-hr AAWT (06:00 - 00:00 hr)				Noise Change (dB)
ID	**Road Section**	**Flow**	**% HGV**	**Speed (km/h)**	**$L_{A10,18hr}$ (dBA)**	**Flow**	**% HGV**	**Speed (km/h)**	**$L_{A10,18hr}$ (dBA)**	
Link 1	Link 1: A530 Griffiths Road North (Site 1)	9144	2.6%	63	68.2	9151	2.6%	63	68.2	0.0
Link 3	Link 3: A530 Griffiths Road South (Site 3)	9905	7.0%	71	70.4	10027	7.8%	71	70.6	0.2
Link 4	Link 4: A530 North of A556 (Site 4)	18427	4.4%	49	70.5	18545	4.9%	49	70.6	0.1
Link 5	Link 5: A556 East (Sites 5 + 6)	33640	6.7%	69	75.4	33688	6.9%	69	75.5	0.1
Link 6	Link 6: A530 South of A556 (sites 7 + 8)	17711	7.1%	65	72.4	17736	7.2%	65	72.4	0.0
Link 7	Link 7: A556 West (Sites 9 + 10)	28899	6.7%	68	74.7	28953	6.8%	68	74.7	0

Cumulative Traffic Assessment

		Without Development 2016 18-hr AAWT (06:00 - 00:00 hr)				Plus Committed Development Plus Development Traffic 2016 18-hr AAWT (06:00 - 00:00 hr)				Noise Change (dB)
ID	**Road Section**	**Flow**	**% HGV**	**Speed (km/h)**	**$L_{A10,18hr}$ (dBA)**	**Flow**	**% HGV**	**Speed (km/h)**	**$L_{A10,18hr}$ (dBA)**	
Link 1	Link 1: A530 Griffiths Road North (Site 1)	8254	2.9%	63	67.8	9151	2.6%	63	68.2	0.4
Link 3	Link 3: A530 Griffiths Road South (Site 3)	8549	3.8%	71	69.1	10027	7.8%	71	70.6	1.5
Link 4	Link 4: A530 North of A556 (Site 4)	15534	3.1%	49	69.3	18545	4.9%	49	70.6	1.3
Link 5	Link 5: A556 East (Sites 5 + 6)	32234	6.5%	69	75.2	33688	6.9%	69	75.5	0.3
Link 6	Link 6: A530 South of A556 (sites 7 + 8)	16747	6.8%	65	72.1	17736	7.2%	65	72.4	0.3
Link 7	Link 7: A556 West (Sites 9 + 10)	27895	6.7%	68	74.5	28953	6.8%	68	74.7	0.2

Appendix 11.E: Cumulative Operational Noise Effects

Cumualtive Operational Noise Effects

Daytime

NSR	2015 Baseline		Specific Sound Levels from Consented Developments, L_S (dB)						Future Baseline		Specific Sound Level from Proposed Development, L_S (dB)	Specific / Residual Sound Level Difference (dB)	Rating Penalty (dB)	Rating Level from Proposed Development, $L_{Ar,Tr}$ (dB)	Rating / Background Sound Level Difference (dB)	Increase in Total Specific Sound Level (dB)	Increase in Total Ambient Sound Level (dB)
	Residual Sound Level, $L_{Aeq,16h}$ (dB)	Background Sound Level, $L_{A90,16h}$ (dB)	SEP	BEP	WRC/WTB	PPP	MRP	All	Residual Sound Level, $L_{Aeq,16h}$ (dB)	Background Sound Level, $L_{A90,16h}$ (dB)							
38 James Street	46	36	41	37	33	0	43	46	49	46	31	-18	0	31	-16	0	0
217 Manchester Road	69	48	47	37	39	0	43	49	69	51	46	-23	0	46	-6	2	0
Ann Street (Off Manchester Road)	69	48	41	42	39	0	43	47	69	51	42	-27	0	42	-9	1	0
Consented Residential Cottage Close	44	42	47	37	39	0	37	48	50	49	36	-13	0	36	-13	0	0
Consented Residential Farm Road	44	42	47	37	39	0	43	49	50	50	36	-14	0	36	-14	0	0
Consented Residential James Street	47	44	41	43	33	0	49	50	52	51	35	-17	0	35	-17	0	0
Cottage Close	44	42	47	37	39	0	37	48	50	49	36	-14	0	36	-14	0	0
St John's Close	44	42	47	37	39	0	37	48	50	49	34	-16	0	34	-16	0	0

Night-time

NSR	2015 Baseline		Specific Sound Levels from Consented Developments, L_S (dB)						Future Baseline		Specific Sound Level from Proposed Development, L_S (dB)	Specific / Residual Sound Level Difference (dB)	Rating Penalty (dB)	Rating Level from Proposed Development, $L_{Ar,Tr}$ (dB)	Rating / Background Sound Level Difference (dB)	Increase in Total Specific Sound Level (dB)	Increase in Total Ambient Sound Level (dB)
	Residual Sound Level, $L_{Aeq,16h}$ (dB)	Background Sound Level, $L_{A90,16h}$ (dB)	SEP	BEP	WRC/WTB	PPP	MRP	All	Residual Sound Level, $L_{Aeq,16h}$ (dB)	Background Sound Level, $L_{A90,16h}$ (dB)							
38 James Street	41	30	38	37	0	0	36	42	44	42	30	-14	0	30	-12	0	0
217 Manchester Road	61	44	44	37	0	0	36	45	61	48	40	-21	0	40	-8	1	0
Ann Street (Off Manchester Road)	62	40	38	42	0	0	36	44	62	45	38	-25	0	38	-8	1	0
Consented Residential Cottage Close	42	39	44	37	0	0	30	45	47	46	34	-13	0	34	-12	0	0
Consented Residential Farm Road	42	39	44	37	0	0	36	45	47	46	33	-14	0	33	-14	0	0
Consented Residential James Street	39	37	38	43	0	0	42	46	47	47	34	-13	0	34	-12	0	0
Cottage Close	42	37	44	37	0	0	30	45	47	46	33	-14	0	33	-13	0	0
St John's Close	42	37	44	37	0	0	30	45	47	46	31	-15	0	31	-14	0	0

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REnescience Northwich

Rev	Description	Date	Initial	Checked

RPS

6–7 Lovers Walk, Brighton, BN3 3BE
T: 01273 546 800 **E:** rpsbn@rpsgroup.com

Client DONG Energy Limited

Project REnescience Northwich

Title Development Location Plan

Date Created	Drawn By	PM/Checked By
September 2015	TAD	DS

Job Ref.
JAS8407

Figure Number	Rev
Figure 2.A	1

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0 1
kilometres
Scale: 1:20,000

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Planning Application Boundary

North

Denton Drive Industrial Estate
Manchester Road
Railway
Wade Brook
Solvay
Proposed Site
Works
Tata Chemicals
Site Access Road
Weaver Navigation
Trent and Mersey Canal
Griffiths Road
Mines Road

50m SCALE 1:2500

1 Location Plan
1 : 2500

Rev	Description	By	Ckd	Date
D	Boundary line illustration updated	HH	RJF	06.10.15
C	Land ownership boundary removed	HH	TFH	02.10.15
B	Land ownership boundary incorporated	HH	TFH	29.09.15
A	Photomontage removed	HH	TFH	22.09.15

RPS

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Sherwood Avenue, Newark, Nottinghamshire, NG24 1QQ

T:+44 (0)1636 605 700 E:rpsnewark@rpsgroup.com

Client REnescience value from waste

Project REnescience Northwich

Title Planning Application Boundary

Status	Scale	Date Created
Final	1 : 2500 @ A1	17/08/15
Project Leader	**Drawn By**	**Checked by**
AS	HH	TFH

Figure Number	Revision	Suitability
Figure 2.B	D	

Project Number	Originator	Building Name	Floor	Doc Type	Role	Drawing Number

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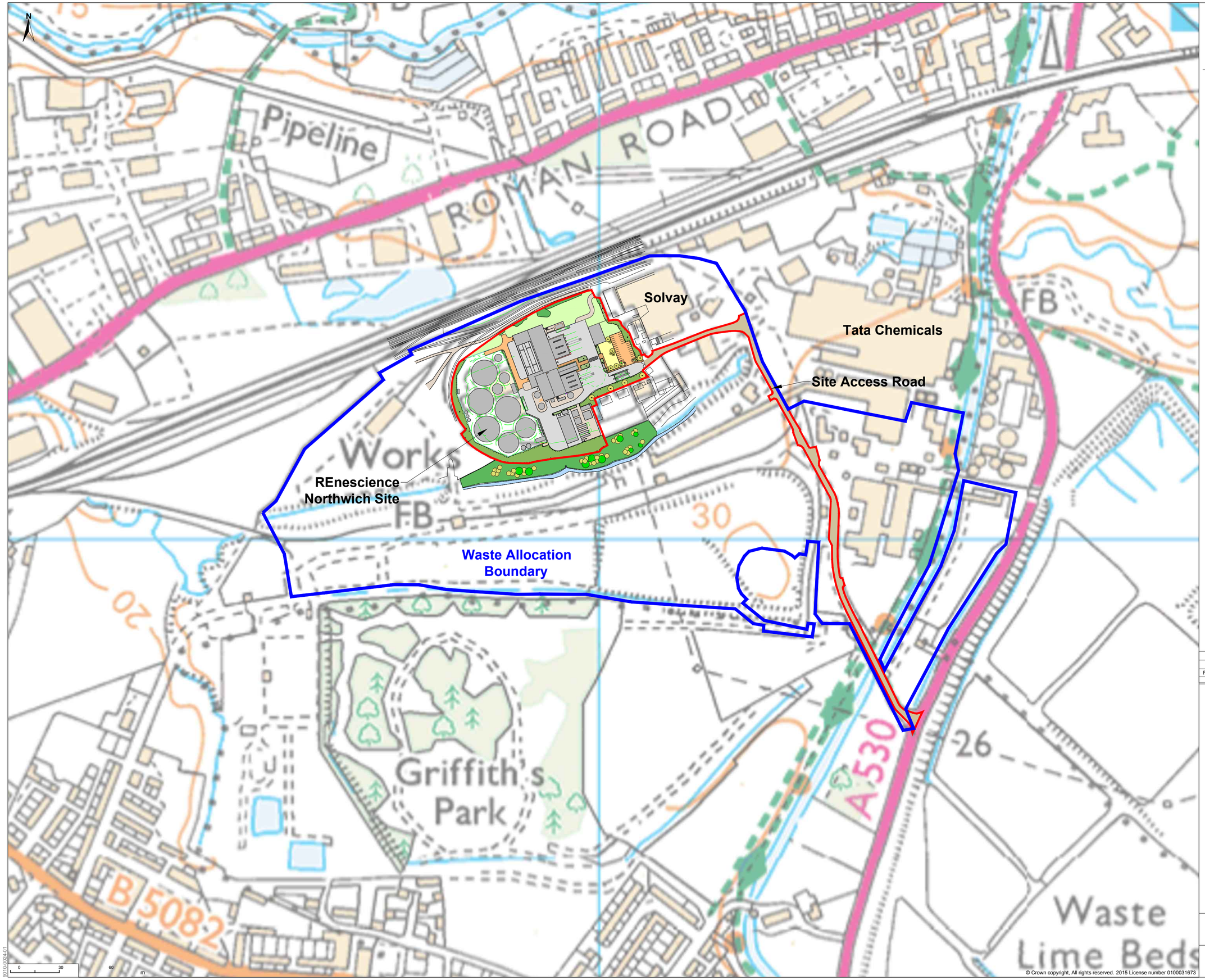

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Legend

Site boundary

Rev	Description	Date	Initial	Checked

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T: +44(0)1235 821 888 **E:** rpsox@rpsgroup.com **F:** +44(0)1235 834 698

Client: DONG Energy Ltd

Project: REnescience Northwich

Title: Site Context Plan

Status	Drawn By	PM/Checked by
FINAL	AVG	
Job Ref	**Scale @ A3**	**Date Created**
OXF9010	1:3,000	SEPT 2015

Figure Number	Rev
2.C	0

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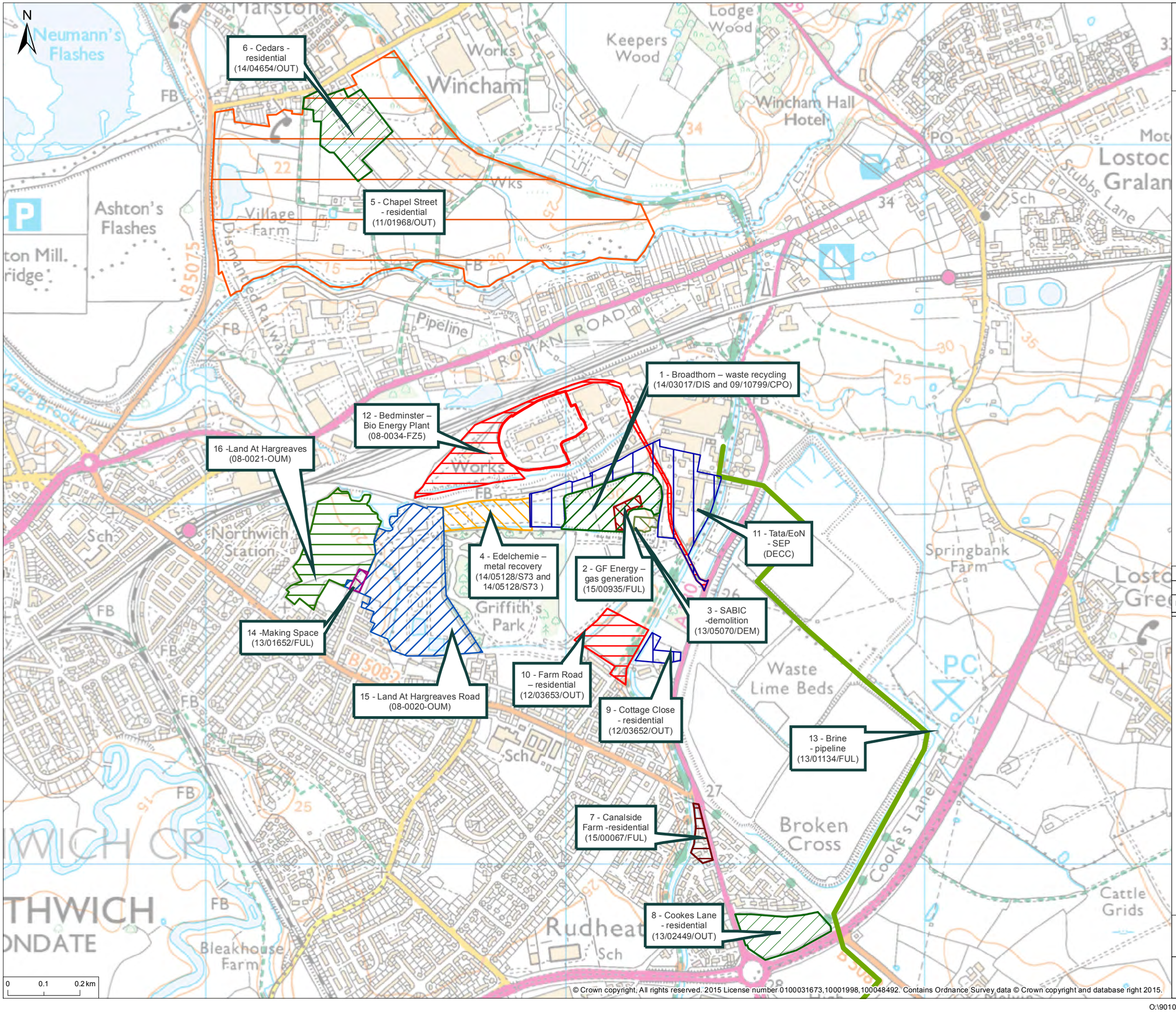
9010-0024-01

9010-0024-01



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Legend

Site boundary

Rev	Description	Date	Initial	Checked

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Milton Park
Abingdon
Oxfordshire
OX14 4SH
T: +44(0)1235 821 888 E: rpsox@rpsgroup.com F: +44(0)1235 834 698

Client: DONG Energy Ltd

Project: REnescience Northwich

Title: Cumulative sites

Status	Drawn By:	PM/Checked By
FINAL	MS	JB
Job Ref	**Scale @ A3**	**Date Created**
OXF9010	1:10,000	OCT 15

Figure Number: **2.D** Rev: **-**

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O:\9010 DONG Energy MBT-AD Project, Northwich\Tech\Drawings\9010-0020-04.mxd

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Equipment Key:

Equipment		Description
BRT	=	Bioliquid reception tank
BRetT	=	Bioliquid retention tank
BDT	=	Biogas digestor tank
HT	=	Hygeinisation tank (optional)
CD	=	Containerised de-gritter (cyclone)
PD	=	Post digester with gas storage
BDe	=	Biogas desulphuriser
BDr	=	Biogas dryer
BP	=	Biogas Polisher
CHP	=	CHP containers
GES	=	Gas engine stack
BH	=	Biogas holder (optional)
BFS	=	Biogas flare stack
DD	=	Digestate dewatering
RWT	=	Reject water tank
WCU	=	Water cleaning unit
PH	=	Pumping hub (containerised)
SB	=	Startup Boiler
	=	Application Boundary

North

Railway

Lines indicate existing railway lines

Access road to adjacent site

Existing Rail Siding

Existing tree line to be retained if viable

Existing tree line to be retained if viable

Wildflower Grassland

New emergency access gates

Gravel maintenance route

Top of bund wall to be +25.800 to full perimeter

Carbon filter and fan

Secondary access route

Fuel Storage Tank

Area to be allocated for Fragrant Orchids

Landscaped Zone

Residual Tank 15m O/A Height

Digester Tank 20m O/A Height to Ridge

External Bioreactors

Sorting Hall 14.5m O/A Height

Loading Hall 10m O/A Height

Store 8m O/A Height

CD 2.4m O/A Height

Feed Tank 15m O/A Height

Paved pedestrian routes to front of facility

Feed Tank 15m O/A Height

PH 2.4m O/A Height

Office 4.8m O/A Height

Gravel Car Park (30 spaces)

HT 10m O/A Height

Digester Tank 20m O/A Height to Ridge

Manifold with Jet Wash

Bunker Hall 24m O/A Height

Reception Hall 11.2m O/A Height

Cycle Store

Access Road

Digester Tank 20m O/A Height to Ridge

Input Water Tanks

25000

Dashed line indicates top of plateau +25m AOD

Digester Tank 20m O/A Height to Ridge

Weighbridge

Weighbridge

New entrance gates and kerb alterations

Tank

Existing Gatehouse

Transformer Carbon filter and fan

Hardcore finish to pedestrian areas

Post Digester Tank 16m O/A Height to Ridge

CD 2.4m O/A Height

SB

Existing site boundary fence to be retained

Sub Oil Tank

Substation

BDr 10m O/A Height

DD 4m O/A Height

High and low level intercom to both in lanes and also to out lane bound vehicles on the weighbridge

Post Digester Tank 16m O/A Height to Ridge

BP 10m O/A Height

DD 4m O/A Height

WCU 10m O/A Height

Electronic rising barrier to both lanes, linked to control room

CLO Store 8m O/A Height

PH 2.4m O/A Height

CHP

CHP

CHP (Future)

Existing 132 kV Substation

CHP

CHP

BDe 7m O/A Height

BFS

GES

All soft landscaping outside boundary to be left as existing

Wade Brook

Rev	Description	By	Ckd	Date
E	Land ownership boundary removed	HH	TFH	02.10.15
D	Soft lanscaping notes added, north sign added, image renamed, office roof level altered	HH	TFH	01.10.15
C	Emergency access route altered, land ownership boundary indicated	HH	TFH	29.09.15
B	Boundary fence note added	HH	TFH	22.09.15
A	Application boundary incorporated, renamed start up boiler and bund wall and annotated substation outside site boundary	HH	TFH	18.09.15

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Client REnescience value from waste

Project REnescience Northwich

Title Site Layout Plan

Status	Scale	Date Created
Final	1 : 500 @ A1	03/09/15
Project Leader	Drawn By	Checked by
AS	HH	TFH

Figure Number: Figure 2.E | Revision: E | Suitability:

Project Number | Originator | Building Name | Floor | Doc Type | Role | Drawing Number

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1 **Illustrative Master Plan**
1 : 500

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Client DONG Energy Limited

Project REnescience Northwich

Title Indicative 3D View from North East

Date Created	Drawn By	PM/Checked By
OCT 15	CP	DS

Job Ref.
JAS8407

Figure Number	Rev
Figure 2.F	0

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Figure 2.F Indicative 3D View from North East

Figure 2.F Indicative 3D View from North East

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Project REnescience Northwich

Title Indicative 3D View from North West

Date Created	Drawn By	PM/Checked By
OCT 15	CP	DS

Job Ref.
JAS8407

Figure Number
Figure 2.G

Rev
0

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Figure_ 2.G Indicative View of North West

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Client DONG Energy

Project REnescience Northwich

Title Indicative 3D view from South West

Date Created	Drawn By	PM/Checked By
OCT 15	CP	DS

Job Ref.
JAS8407

Figure Number
Figure 2.H

Rev
0

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Figure 2.H Indicative 3D View from South West

Figure 2.H Indicative 3D View from South West

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Rev	Description	Date	Initial	Checked

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Client DONG Energy Limited

Project REnescience Northwich

Title Indictative 3D View from South East

Date Created	Drawn By	PM/Checked By
OCT 15	CP	DS

Job Ref.
JAS8407

Figure Number
Figure 2.I

Rev
0

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Figure 2.I Indicative 3D View from the South East

Figure 2.I Indicative 3D View from the South East

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Client DONG Energy Limited

Project REnescience Northwich

Title Indicative Eye Level View

Date Created	Drawn By	PM/Checked By
Oct 15	CP	DS

Job Ref.
JAS8407

Figure Number	Rev
Figure 2.J	0

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Figure 2.J Indicative Eye Level View

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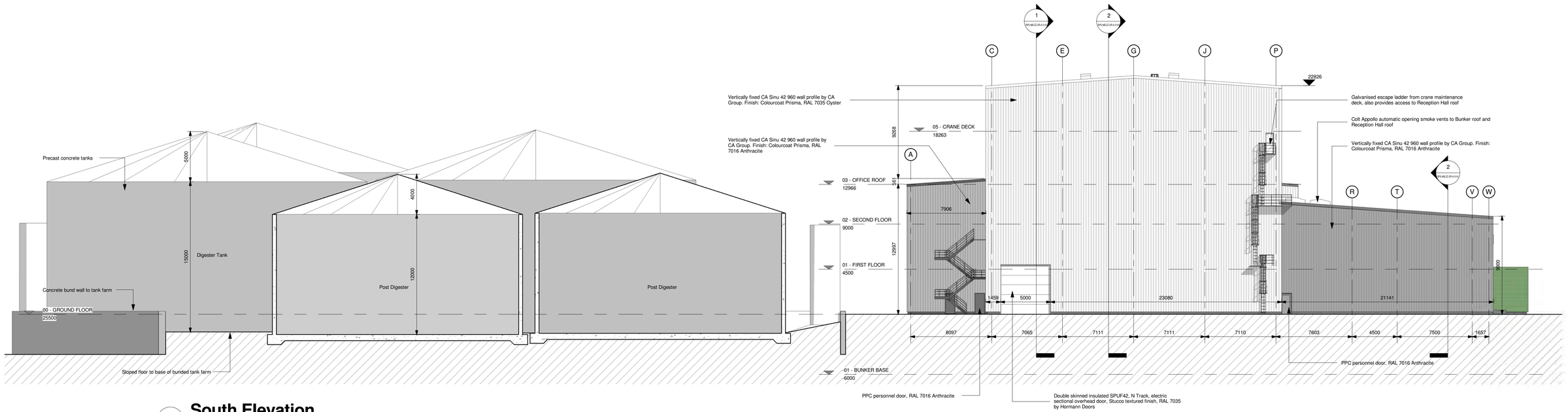
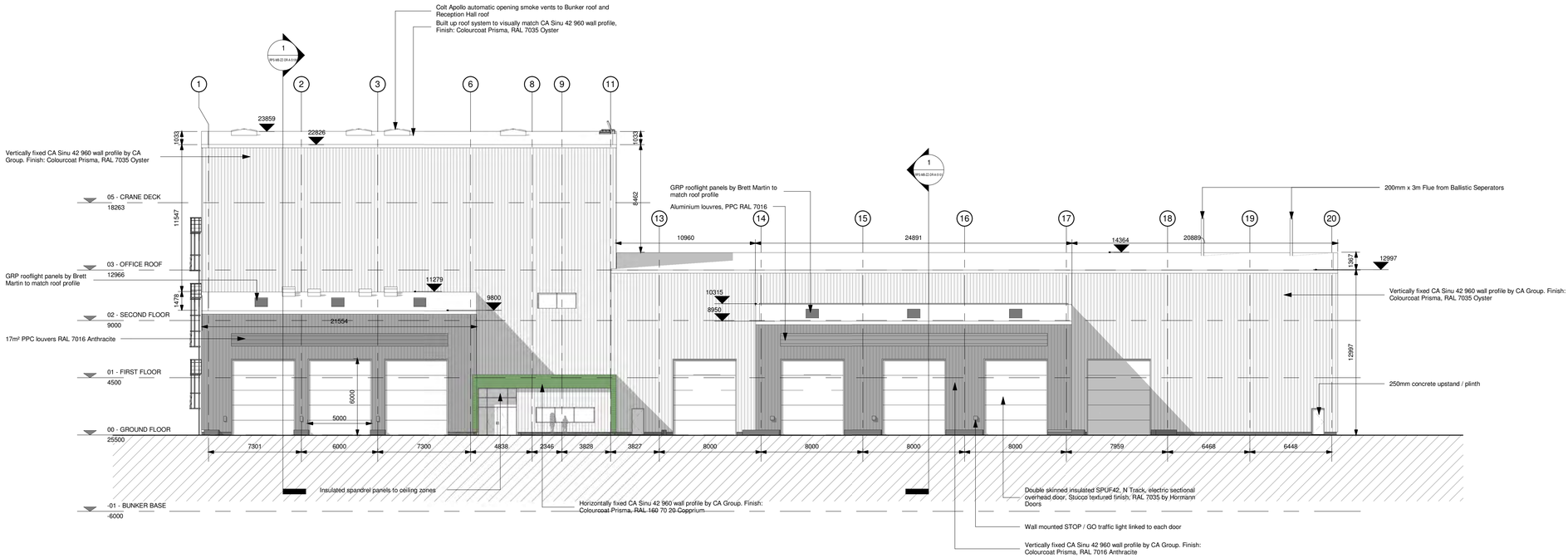


2 South Elevation
1 : 200



1 East Elevation
1 : 200

Rev	Description	By	Ckd	Date
B	Elevation extended to show tank farm	HH	TFH	01.10.15
A	Building footprint reduced, parapets removed, cladding spec altered	HH	TFH	15.09.15

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Client REnescience value from waste

Project REnescience Northwich

Title East and South Elevations

Status	Scale	Date Created
Final	1 : 200 @ A1	14/07/15
Project Leader	**Drawn By**	**Checked by**
AS	TFH	TFH

Figure Number	Revision	Suitability
Figure 2.K	B	

Project Number	Originator	Building Name	Floor	Doc Type	Role	Drawing Number

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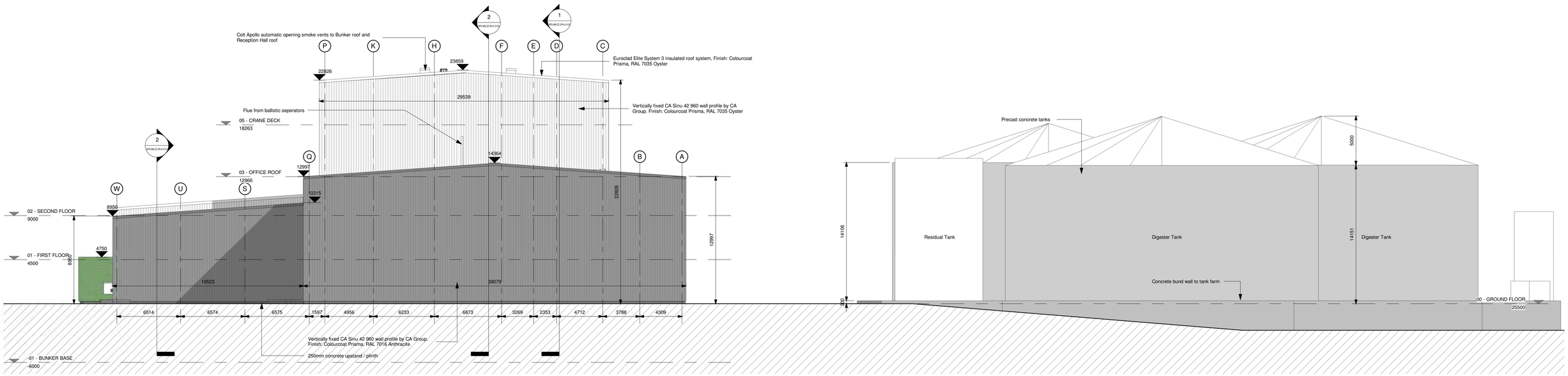
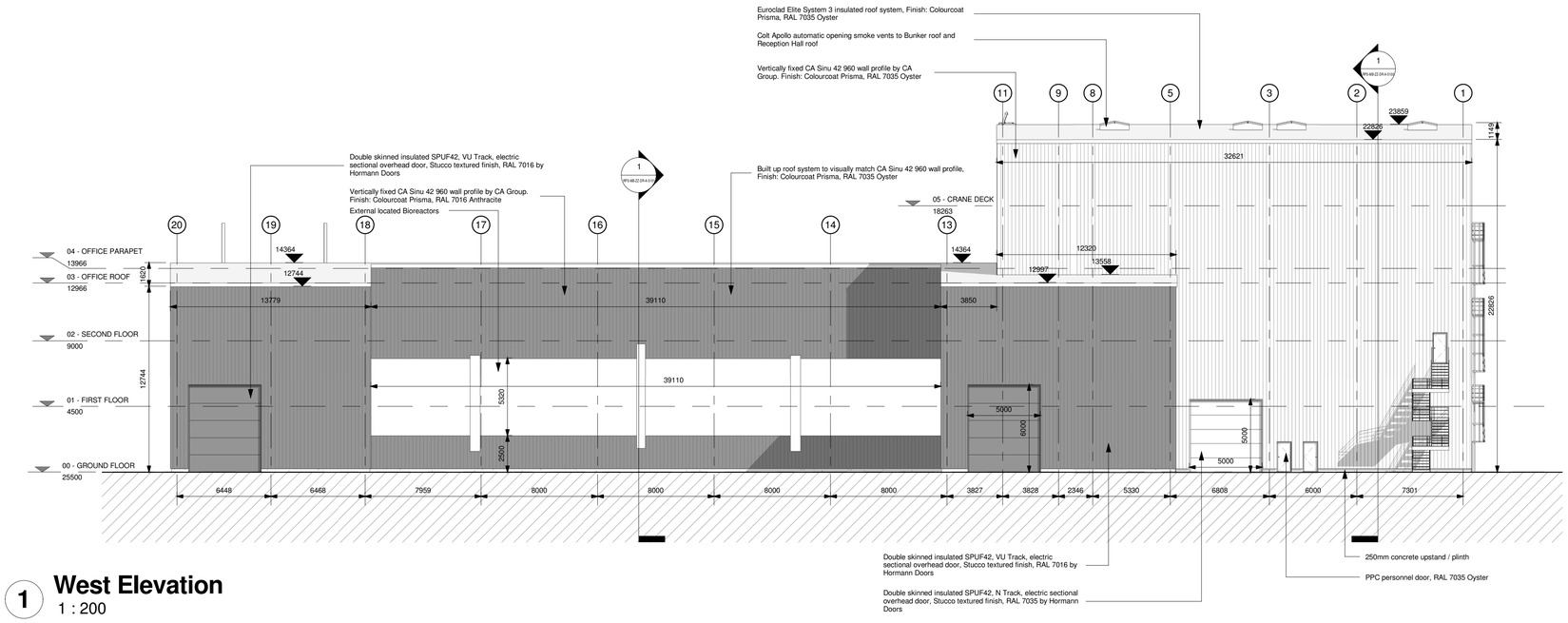


2 North Elevation
1 : 200



1 West Elevation
1 : 200

Rev	Description	By	Ckd	Date
C	Elevation extended to show tank farm	HH	TFH	01.10.15
B	Sectional overhead door to reactor area moved on West Elevation	HH	TFH	23.09.15
A	Building footprint reduced, parapets removed, cladding spec altered	HH	TFH	15.09.15

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Client REnescience value from waste

Project REnescience Northwich

Title West and North Elevations

Status	Scale	Date Created
Final	1 : 200 @ A1	15/07/15
Project Leader	**Drawn By**	**Checked by**
AS	TFH	TFH

Figure Number	Revision	Suitability
Figure 2.L	C	

Project Number	Originator	Building Name	Floor	Doc Type	Role	Drawing Number

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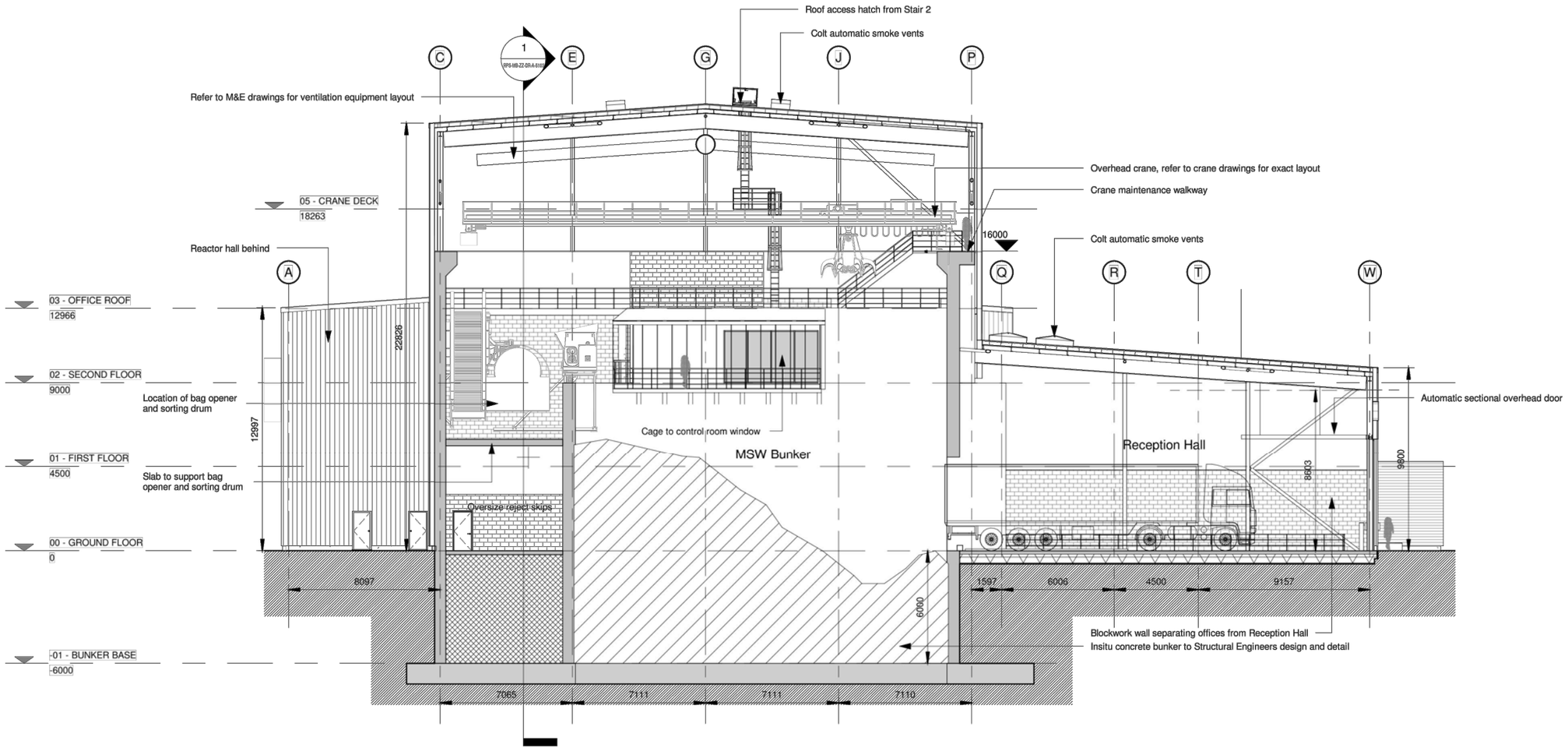

Rev	Description	Date	Initial	Checked

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6–7 Lovers Walk, Brighton, BN3 3BE
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Client DONG Energy Limited

Project REnescience Northwich

Title Waste Reception Hall Section

Date Created	Drawn By	PM/Checked By
October 2015	TAD	DS

Job Ref.
JAS8407

Figure Number
Figure 2.M

Rev
1

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Figure_2.M_Waste_Reception_Hall_Section_rev1

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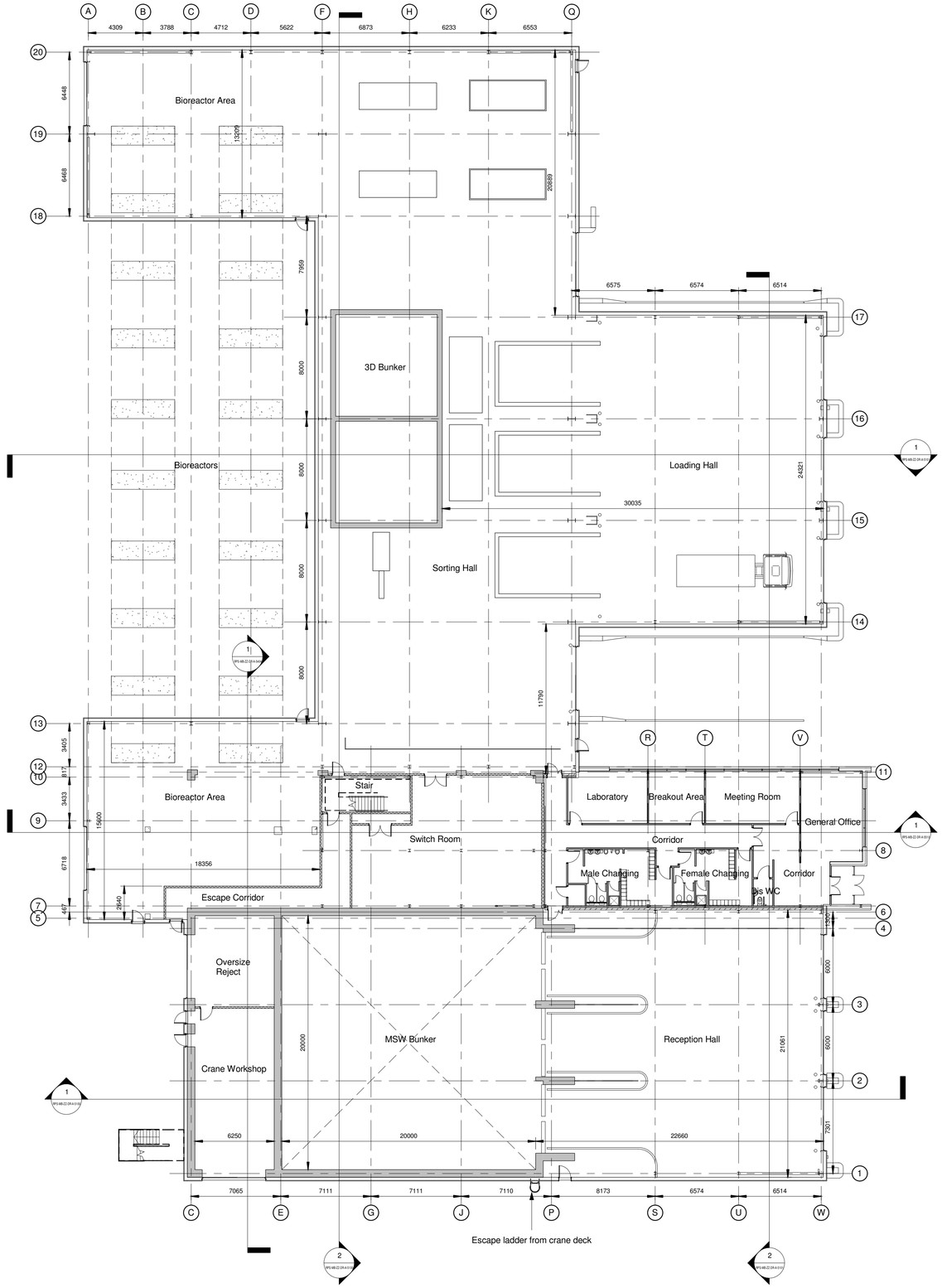

1 Ground Floor Plan

1 : 200

Rev	Description	By	Ckd	Date
B	Text notes altered	HH	TFH	22.09.15
A	Proccess model incorporated	HH	TFH	06.08.15

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Client REnescience — value from waste

Project REnescience Northwich

Title Ground Floor General Arrangement

Status	Scale	Date Created
Final	1 : 200 @ A1	07/07/15
Project Leader	**Drawn By**	**Checked by**
AS	TFH	TFH

Figure Number	Revision	Suitability
Figure 2.N	B	

Project Number	Originator	Building Name	Floor	Doc Type	Role	Drawing Number

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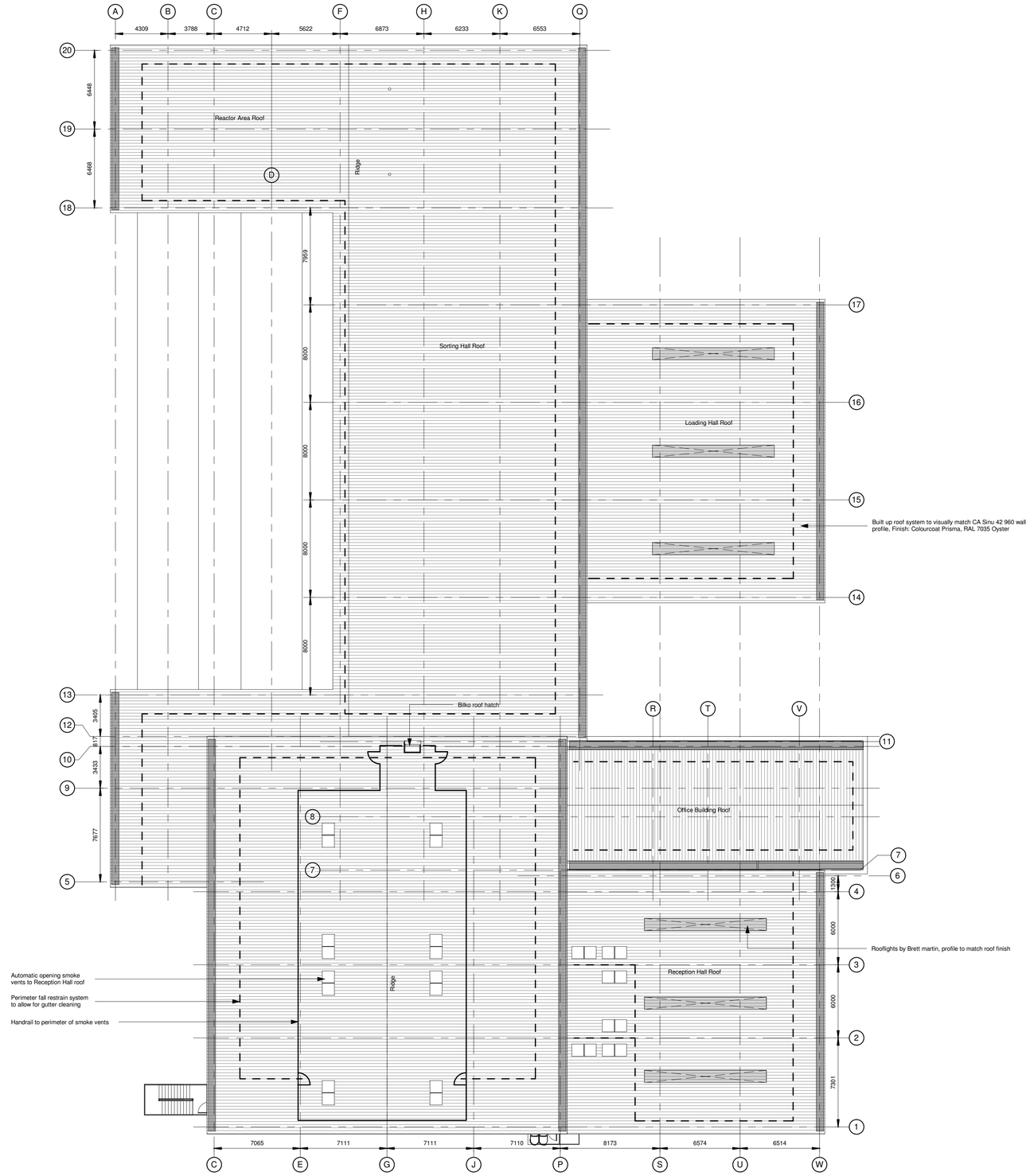
Key

- Perimeter fall resistant system
- Handrail
- Colt Apollo automatic smoke vent
- Gutter



1 Roof Plan
1 : 200

Rev	Description	By	Ckd	Date
B	Office renamed	HH	TFH	01.10.15
A	Text notes altered	HH	TFH	22.09.15

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Client REnescience value from waste

Project REnescience Northwich

Title Roof General Arrangement

Status	Scale	Date Created
Final	1 : 200 @ A1	08/07/15
Project Leader AS	**Drawn By** TFH	**Checked by** TFH

Figure Number	Revision	Suitability
Figure 2.O	B	

Project Number	Originator	Building Name	Floor	Doc Type	Role	Drawing Number

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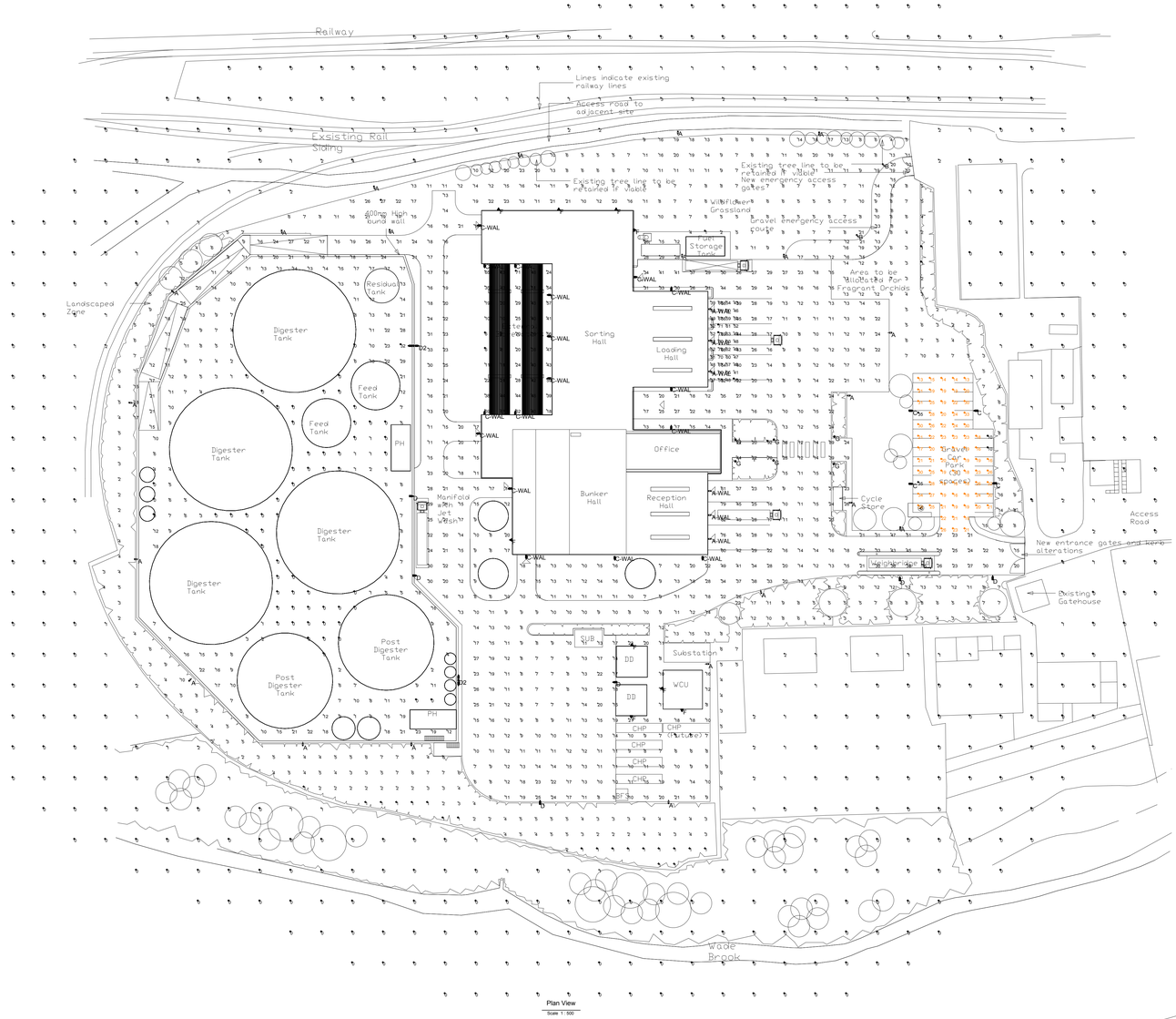
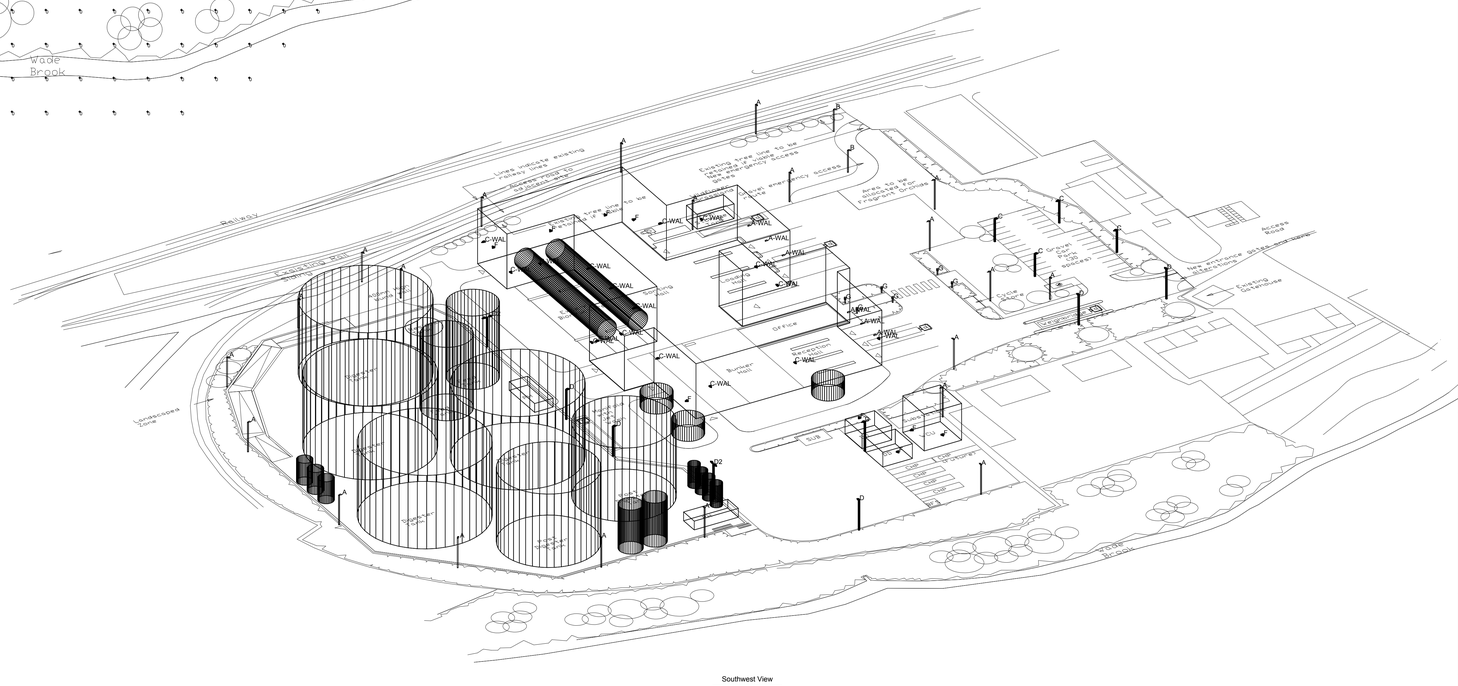


Plan View

Scale 1 : 500



Southwest View

Not to Scale

LUMINAIRE SCHEDULE

Symbol	Label	Qty	Catalog Number	Description	Lamp
	A	21	FTS.L094.AY	FACTOR SMALL STREETLIGHT @ 8 MTRS	LED C.9000LM - 4000K
	A-WAL	6	FTS.L094.AY	FACTOR SMALL STREETLIGHT @ APPROX 8 MTRS	LED C.9000LM - 4000K
	B	2	FTS.L044.NR	FACTOR SMALL STREETLIGHT @ 6 MTRS	LED C.4000LM - 4000K
	C	4	FTS.L064.AY	FACTOR SMALL STREETLIGHT @ 6 MTRS	LED C.6000LM - 4000K
	C-WAL	10	FTS.L064.AY	FACTOR SMALL STREETLIGHT @ APPROX 8 MTRS	LED C.6000LM - 4000K
	C-WAL	7	FTS.L064.AY	FACTOR SMALL STREETLIGHT @ APPROX 4.5 MTRS	LED C.6000LM - 4000K
	D	6	FTR.L114.AY	FACTOR STREETLIGHT @ 8 MTRS	LED C.11000LM - 4000K
	D2	2	FTR.L114.AY	FACTOR STREETLIGHT @ 8 MTRS	LED C.11000LM - 4000K
	F	9	DEW.L014	DENVER WALL ELITE @ APPROX 3 MTRS	LED C.1000LM - 4000K
	G	6	4082662	Paletto Menhir H.1050mm 37W Led 4000K @ 1 MTR	

STATISTICS

Description	Symbol	Avg	Max	Min	Min/Avg
Overspill	+	0 lux	4 lux	0 lux	N / A
Carpark	+	22 lux	35 lux	10 lux	0.45
External Bioreactor Area	+	36 lux	71 lux	6 lux	0.17
Loading / Unloading	+	54 lux	71 lux	36 lux	0.67
Site Area	+	19 lux	92 lux	5 lux	0.26
Site Perimeter	+	8 lux	27 lux	1 lux	0.13
Tank Area	+	7 lux	32 lux	0 lux	0.00

Safety, Health & Environment Information

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note below. It is assumed that all works on this drawing will be carried out by a competent contractor, working, where appropriate, to an appropriate method statement.

Construction Risks	Mainentance/Cleaning Risks	Demolition/Adaption Risks

Rev	Description	Date	Initial	Checked

For guidance only. Do not scale off this drawing.

1:20 - 0 | 200mm | 400mm | 600mm | 800mm | 1000 | 1200 | 1400 | 1600 | 1800 | 2000
1:100 - 0 | 1m | 2m | 3m | 4m | 5m | 6m | 7m | 8m | 9m | 10m
1:50 - 0 | 1m | 2m | 3m | 4m | 5m
1:5 - 0 | 100mm | 200mm | 300mm | 400mm | 500mm

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A firm Accredited to BS EN ISO 9001 & BS EN ISO 14001

In Association with:

Client: REnescience

Project: REnescience Northwich

Drawing Title: Lighting Plan

Designed by:	Checked by:	Approved by:
PB	PH	
Scale @ A0: 1:500	Created: Sept'15	Drawing Status: Final
Figure Number: Figure 2.P		Revision: P1

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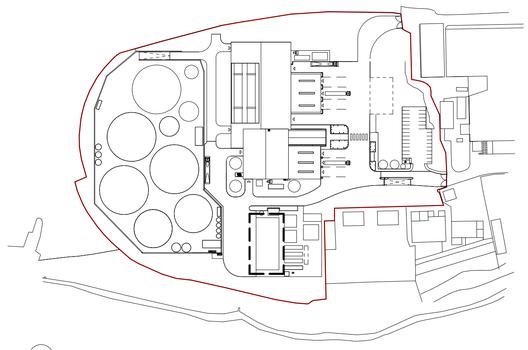
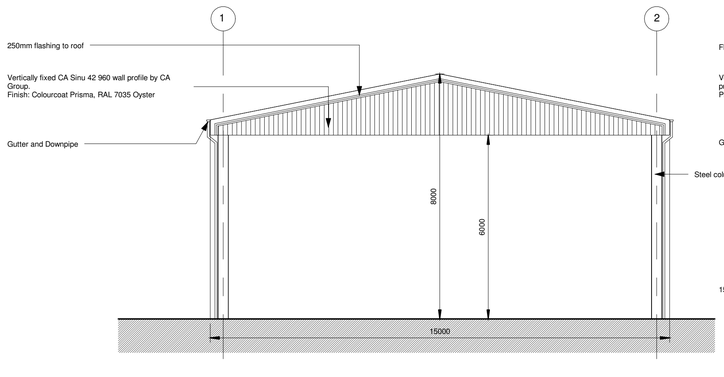
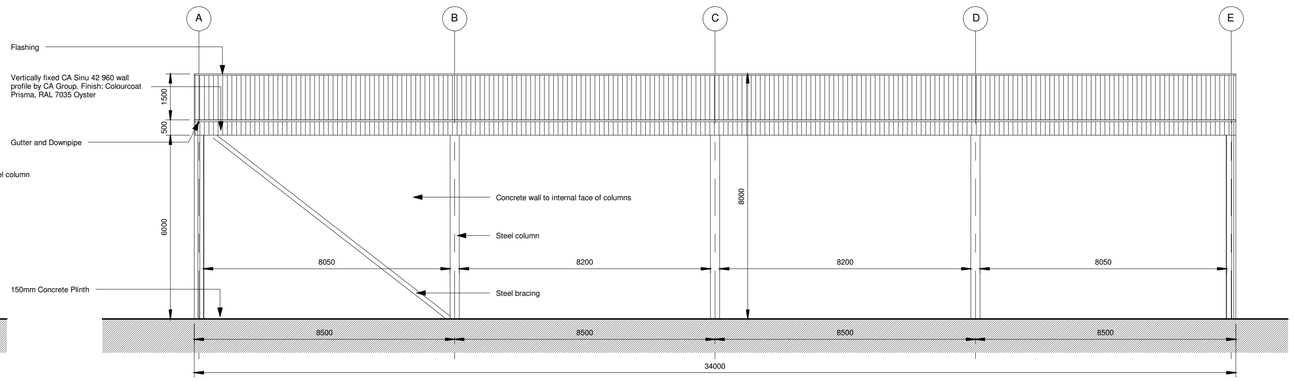
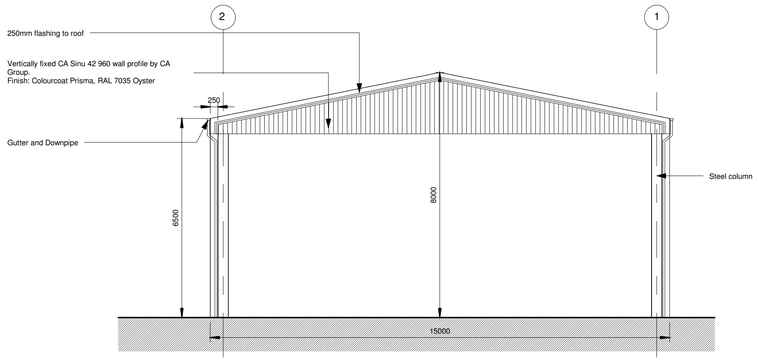




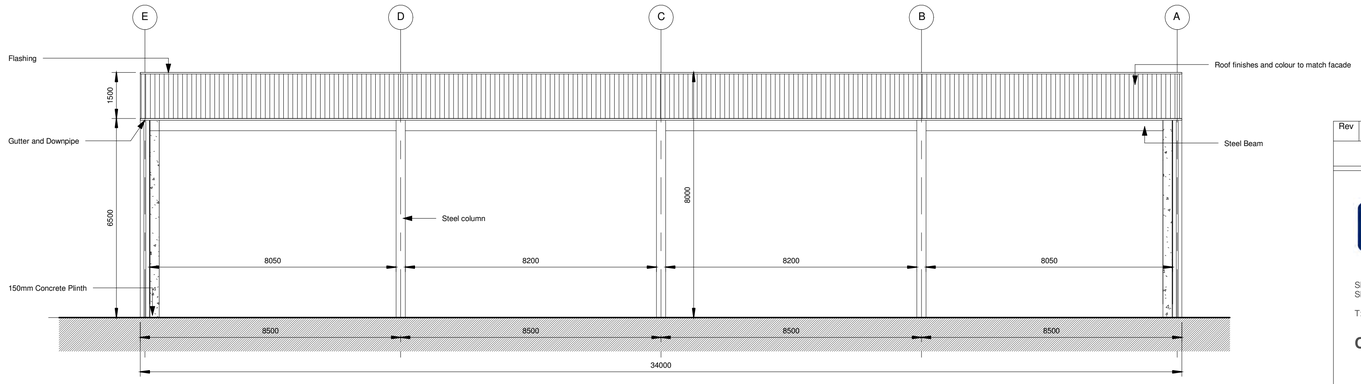
North Elevation
Scale 1:50



East Elevation
Scale 1:50



South Elevation
Scale 1:50



West Elevation
Scale 1:50

1 CLO Store Elevations

1 : 100

Rev	Description	By	Ckd	Date

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Client REnescience value from waste

Project REnescience Northwich

Title CLO Store Elevations

Status	Scale	Date Created
Final	1:100 at A1	01/10/15
Project Leader	**Drawn By**	**Checked by**
AS	HH	TFH

Figure Number	Revision	Suitability
Figure 2.Q	-	

Project Number	Originator	Building Name	Floor	Doc Type	Role	Drawing Number

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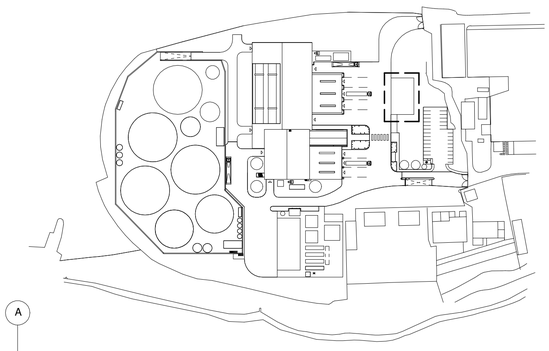
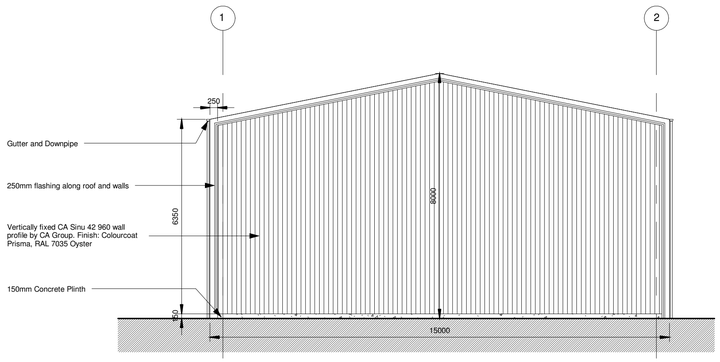
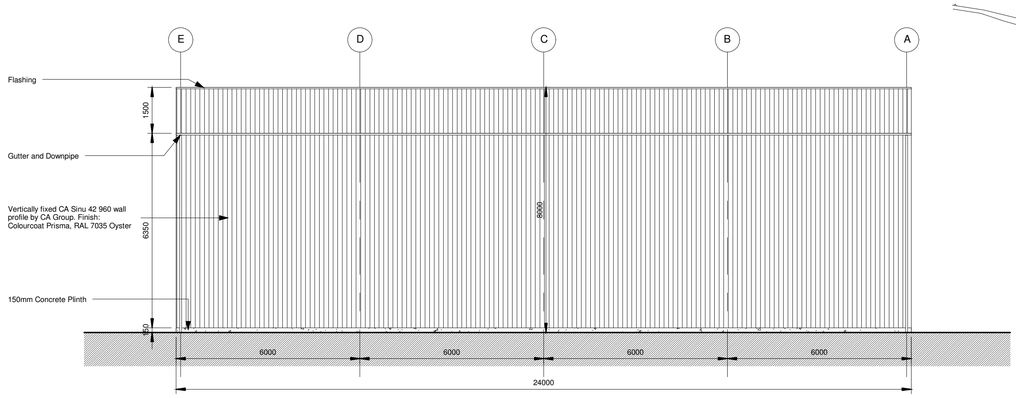
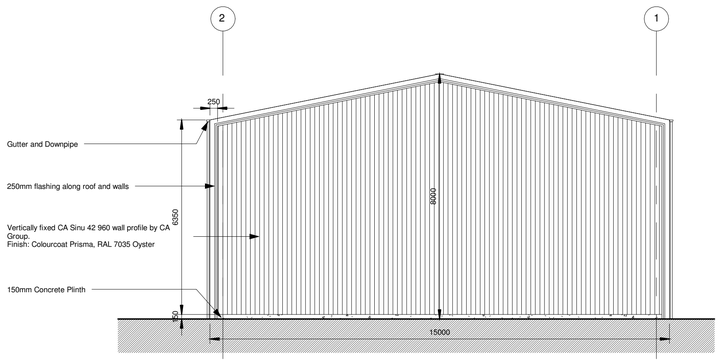




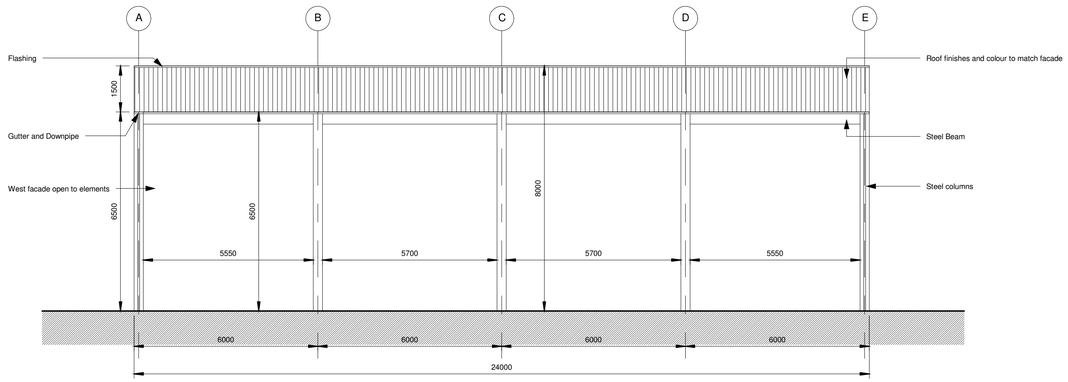
North Elevation
Scale 1:50



East Elevation
Scale 1:50



South Elevation
Scale 1:50



West Elevation
Scale 1:50

1 Store Elevations
1 : 100

Rev	Description	By	Ckd	Date

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Client REnescience value from waste

Project REnescience Northwich

Title Recovered Materials Store Elevation

Status	Scale	Date Created
Final	1:100 at A1	01/10/15
Project Leader	**Drawn By**	**Checked by**
AS	HH	TFH

Figure Number	Revision	Suitability
Figure 2.R	-	

Project Number	Originator	Building Name	Floor	Doc Type	Role	Drawing Number

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Boundary line

North

Footprint of proposed building

Footprint of proposed tank farm

Topographical Survey
1 : 250

5m SCALE 1:250

Rev	Description	By	Chkd	Date
A	Boundary line indicated	HH	TFH	01.10.15

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Client REEnescience value from waste

Project REnescience Northwich

Title Topographical Survey

Status	Scale	Date Created
Final	1 : 250 @ A0	14/07/15
Project Leader	Drawn By	Checked by
AS	HH	TFH

Figure Number: Figure 2.S | Revision: A | Suitability:

Project Number | Originator | Building Name | Floor | Dev Type | Role | Drawing Number

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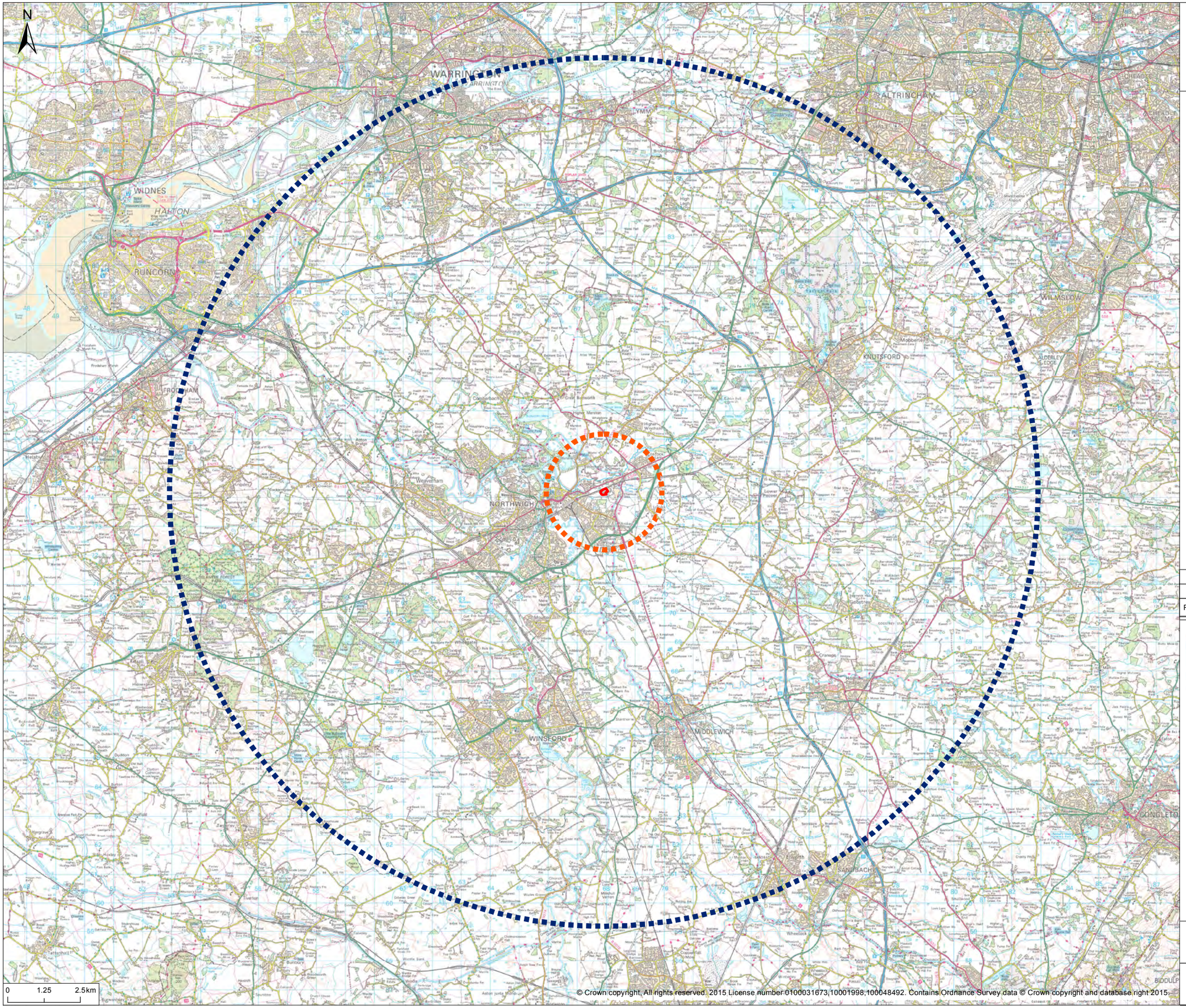

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Legend

- Site boundary
- 2km buffer
- 15km buffer

Rev	Description	Date	Initial	Checked

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Client DONG Energy Ltd

Project REnescience Northwich

Title Location & Study Area

Status	Drawn By:	PM/Checked By
FINAL	AVG	-
Job Ref	**Scale @ A3**	**Date Created**
OXF9010	1:125,000	SEP 15

Figure Number **4.A** Rev **-**

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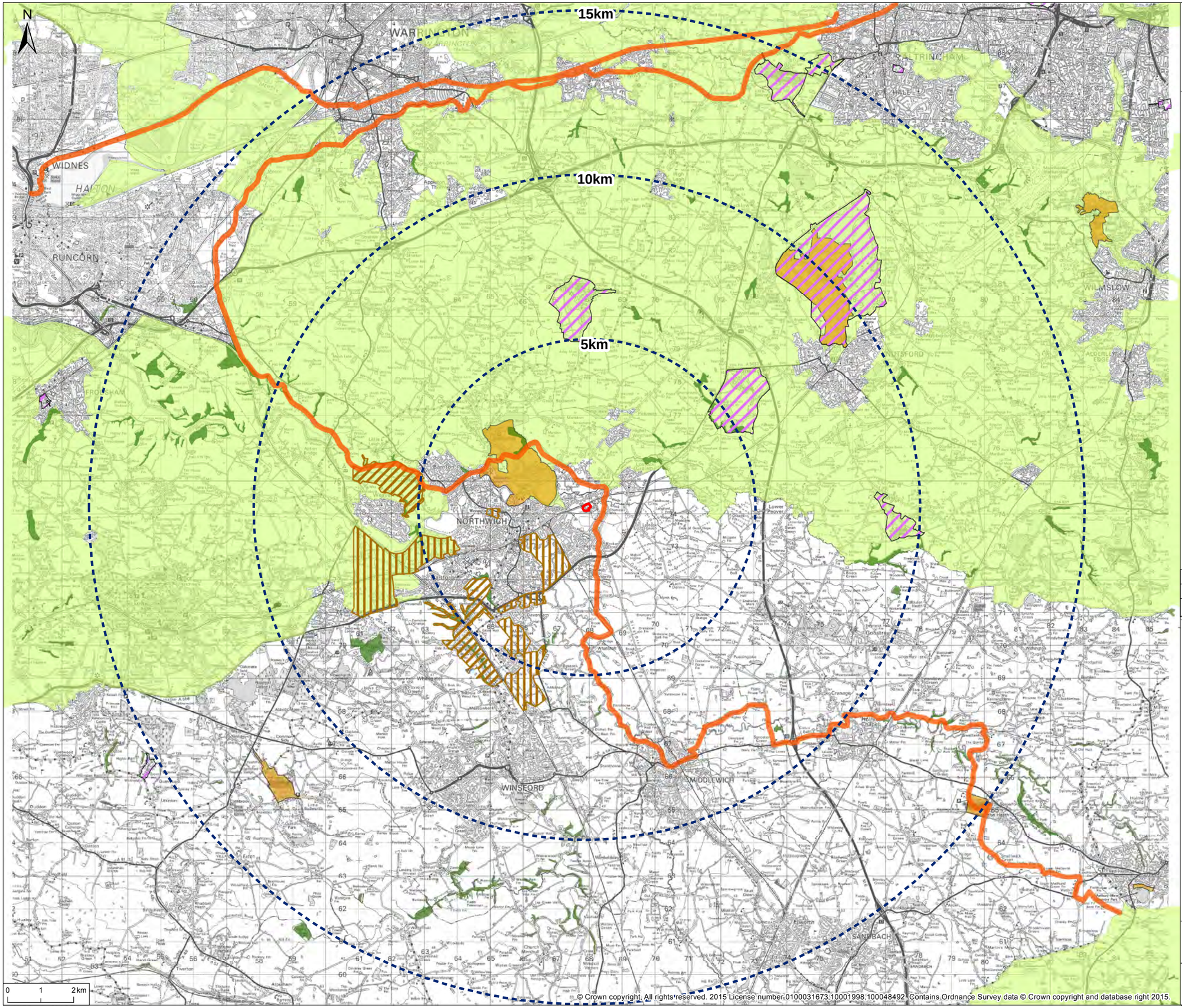

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Legend

- Site boundary
- Buffer at 5km intervals
- Important Recreational Routes
- Registered Park & Garden
- Areas of Special County Value
- Areas of Significant Local Environmental Value
- Ancient Woodland
- Country Park
- Green Belt

Rev	Description	Date	Initial	Checked

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Client DONG Energy Ltd

Project REnescience Northwich

Title Landscape Designations

Status	Drawn By:	PM/Checked By
Final	AVG	-
Job Ref	**Scale @ A3**	**Date Created**
OXF9010	1:110,000	SEP 15

Figure Number **4.B** Rev **-**

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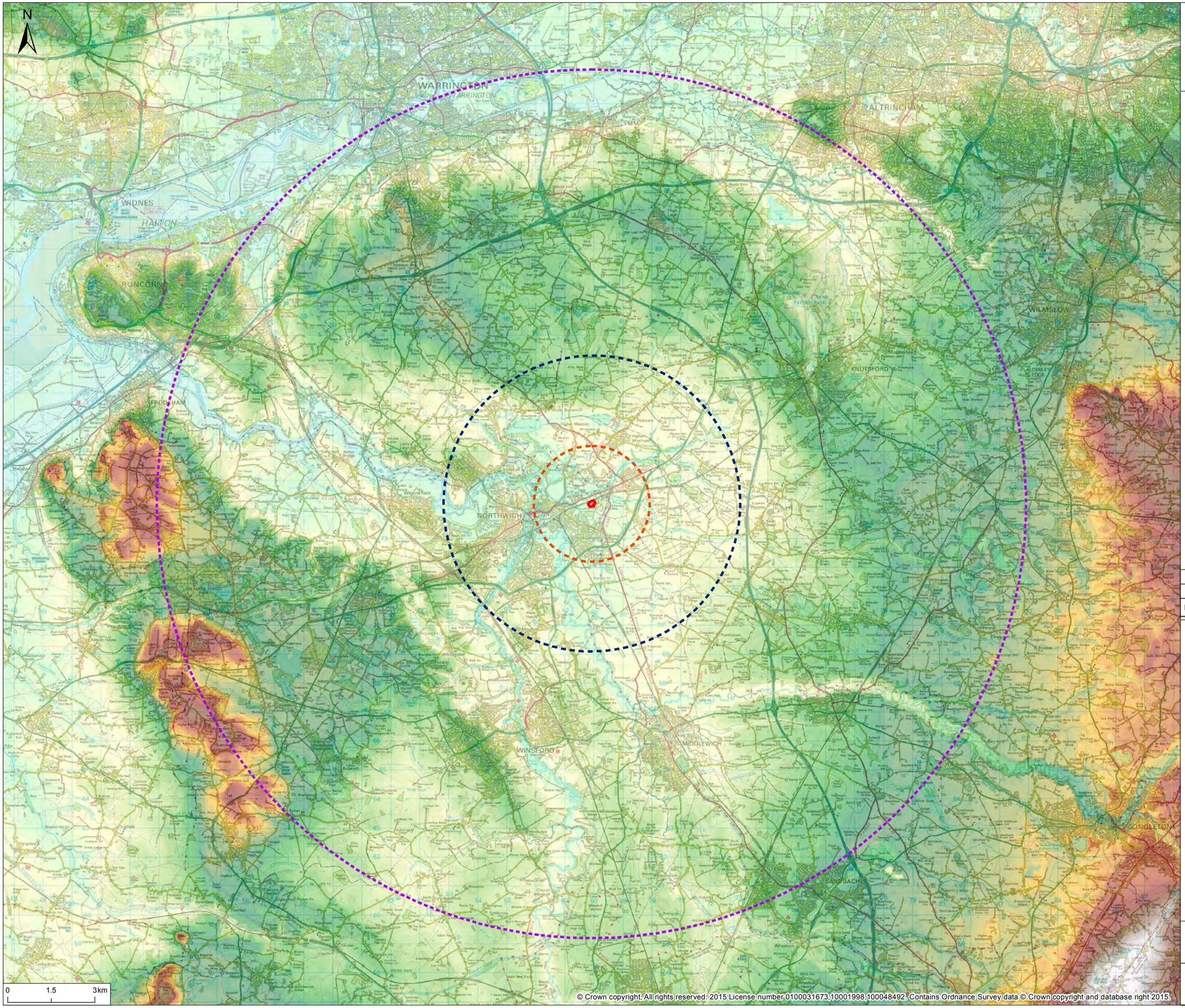

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Legend

- Site boundary
- 15km buffer
- 5km buffer
- 2km buffer

Elevation in metres

- High : 250
- Low : 0

Rev	Description	Date	Initial	Checked

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Client DONG Energy Ltd

Project REnescience Northwich

Title Topography

Status	Drawn By:	PM/Checked By
Final	MS	JB
Job Ref	**Scale @ A3**	**Date Created**
OXF9010	1:125,000	SEP 15

Figure Number **4.C** Rev **-**

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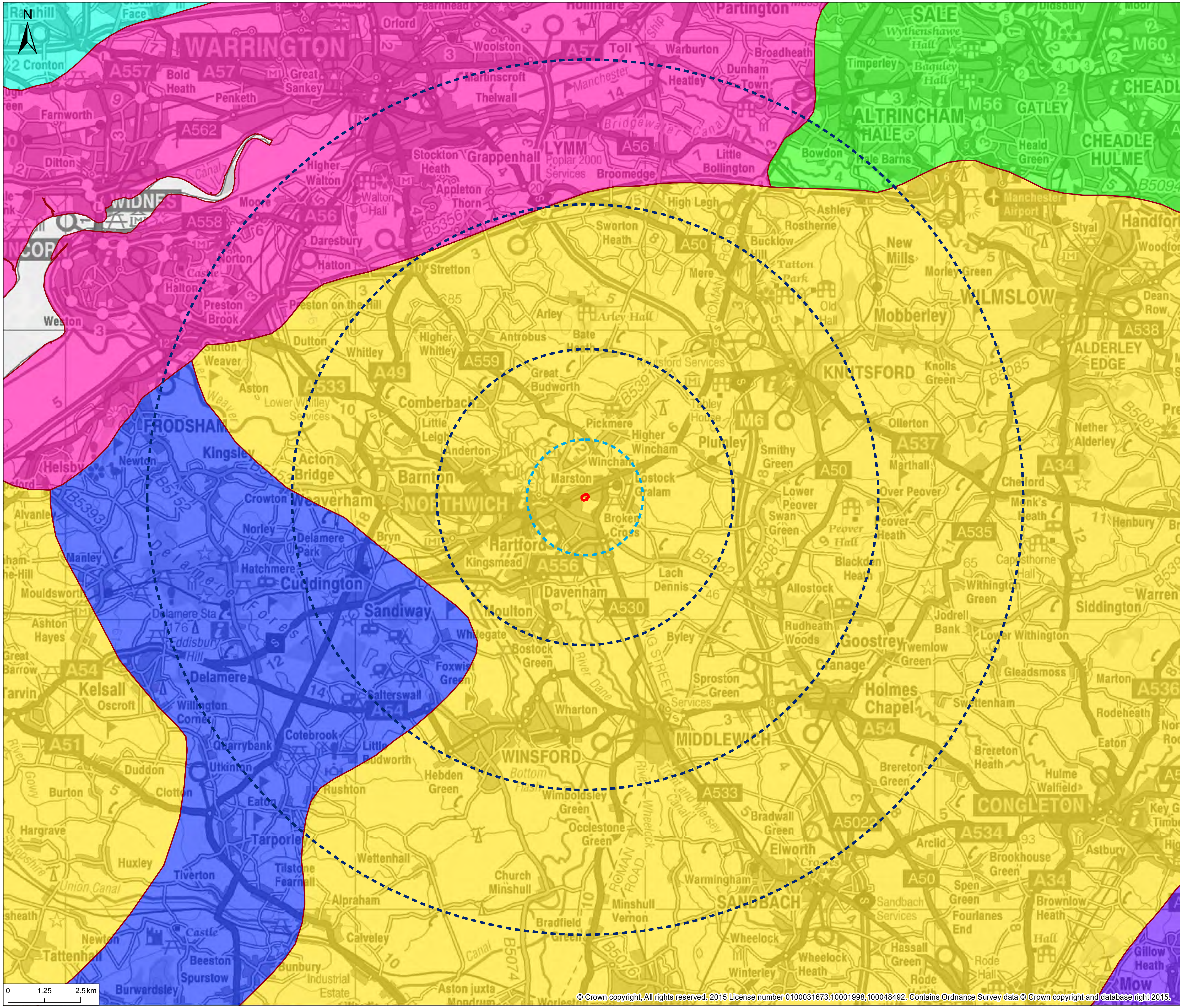

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Legend

- Site boundary
- 2km buffer
- Buffer at 5km intervals

National Character Areas

- Cheshire Sandstone Ridge
- Lancashire Coal Measures
- Manchester Conurbation
- Mersey Valley
- Potteries and Churnet Valley
- Shropshire, Cheshire and Staffordshire Plain

Rev	Description	Date	Initial	Checked

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Client DONG Energy Ltd

Project REnescience Northwich

Title Landscape Character Areas National

Status	Drawn By:	PM/Checked By
Final	AVG	-
Job Ref	**Scale @ A3**	**Date Created**
OXF9010	1:125,000	SEP 15

Figure Number 4.D

Rev -

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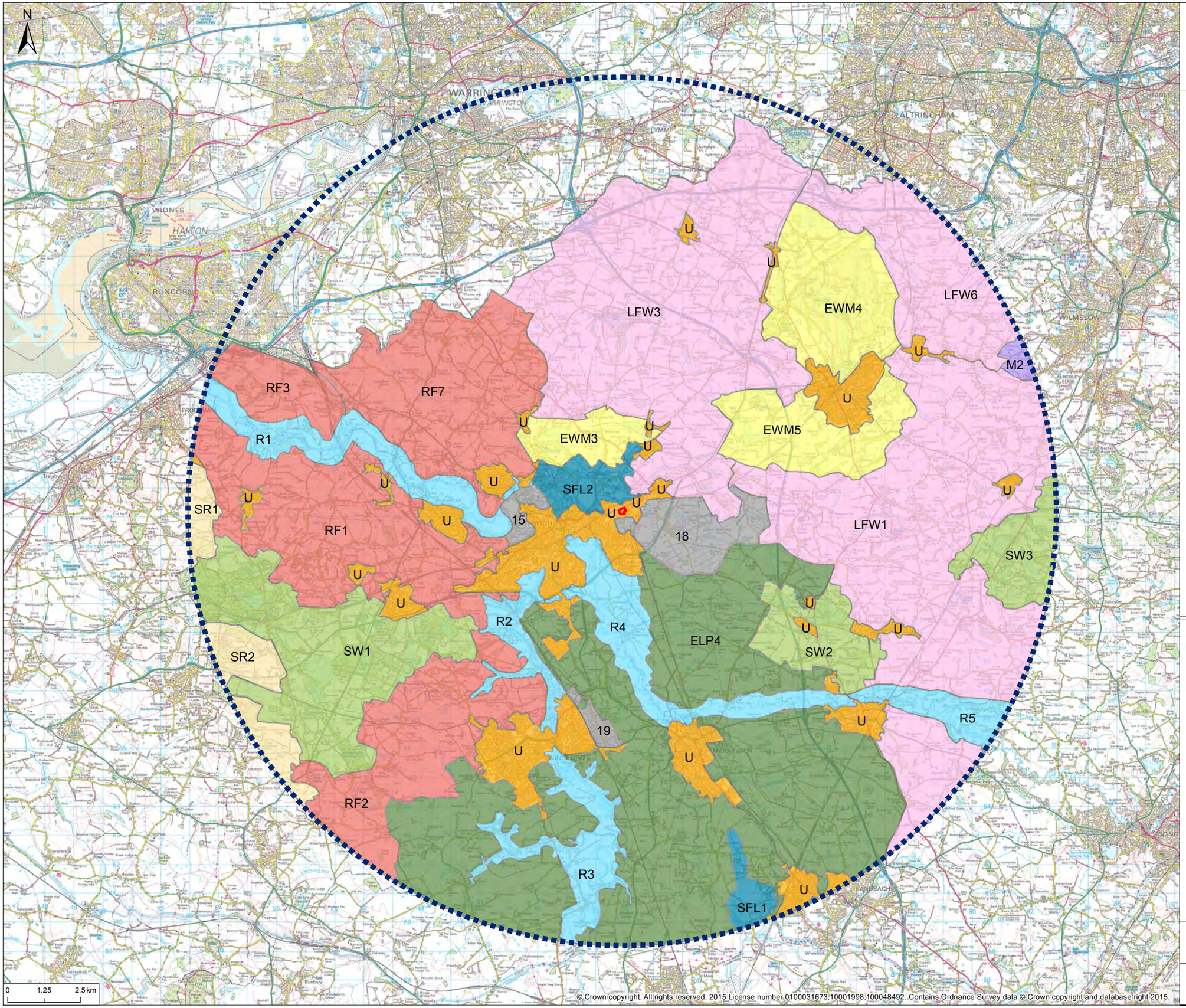

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Legend

- Site boundary
- 15km buffer

Landscape Types

- Urban
- Estate Wood & Mere
- Sandstone Ridge
- Lower Farms & Woods
- Rolling Farmland
- Drained Marsh
- Salt Flashes
- River Valley
- Sandy Woods
- East Lowland Plain
- Industry

Landscape Character Areas

- U Urban
- 18 Industry
- ELP4 Stublach
- SF2 Anderton
- LFW3 Arley
- R4 Lower Dane

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Client DONG Energy Ltd

Project REnescience Northwich

Title Cheshire Landscape Character

Status	Drawn By:	PM/Checked By
Final	AVG	-
Job Ref	Scale @ A3	Date Created
OXF9010	1:125,000	SEP 15

Figure Number **4.E** Rev **-**

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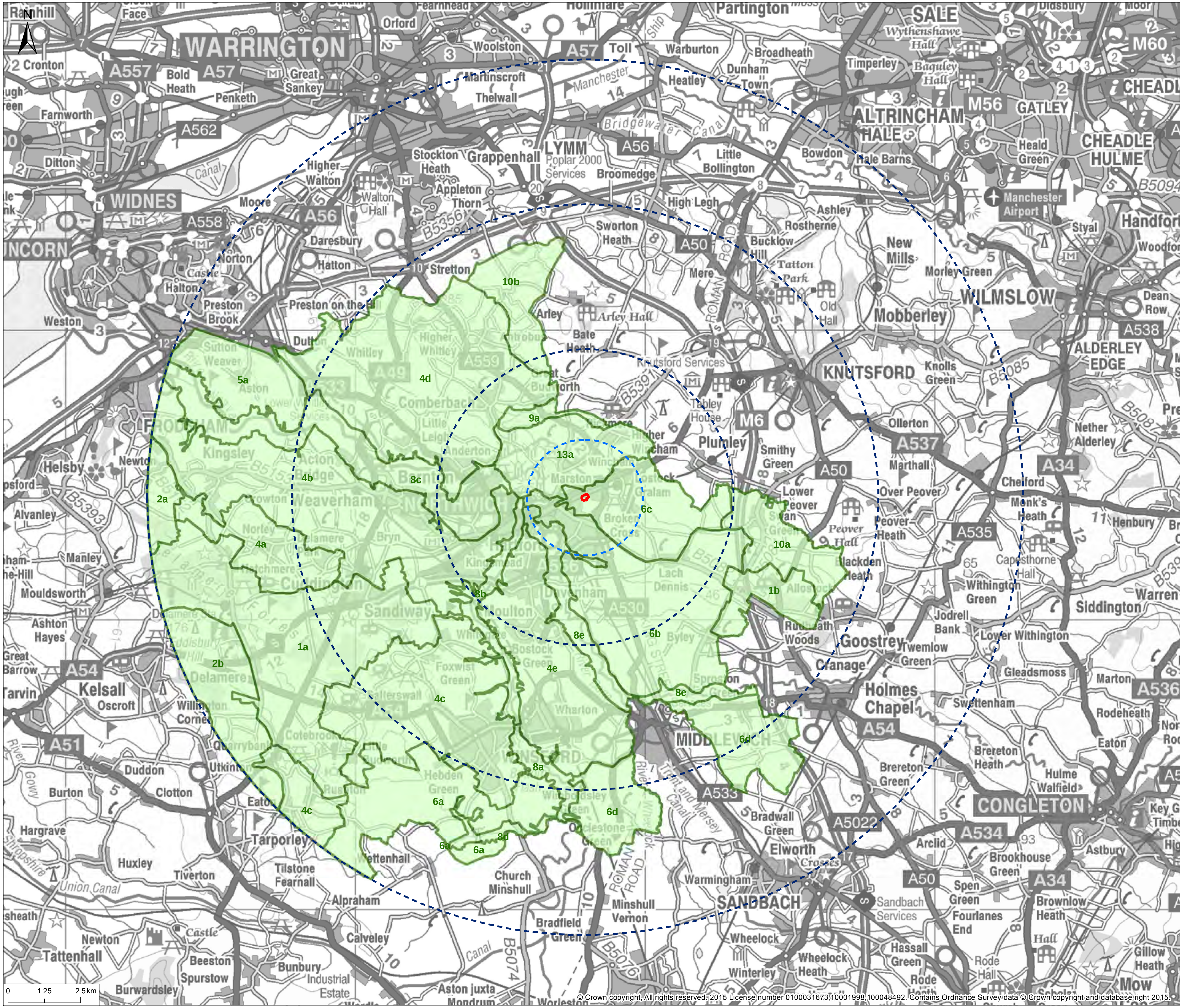

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Legend

- Site boundary
- 2km buffer
- Buffer at 5km intervals
- Vale Royal Borough character areas

ID	Name
1A	Delamere
1B	Allostock
2A	Northern Sandstone Ridge
2B	Southern Sandstone Ridge
4A	Norley Undulating Enclosed Farmland
4B	Frodsham to Northwich Undulating Enclosed Farmland
4C	Eaton, Marton & Over Undulating Enclosed Farmland
4D	Whitley & Comberbach Undulating Enclosed Farmland
4E	East Winsford Undulating Enclosed Farmland
5A	Aston Heathy Farmland and Woodland
6A	Darnhall Plain
6B	Stublach Plain
6C	Lostock Plain
6D	Wimboldesley & Sproston Plain
8A	Upper Weaver Valley
8B	Mid Weaver Valley
8C	Lower Weaver Valley
8D	Ash Brook Valley
8E	Dane Valley
9A	Marbury Mere
10A	Peover Lowland Farmland and Mosses
10B	Arley Lowland Farmland and Mosses
13A	Northwich Salt Heritage Landscape

Rev	Description	Date	Initial	Checked

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Client: DONG Energy Ltd

Project: REnescince Northwich

Title: Vale Royal Landscape Character Area

Status	Drawn By:	PM/Checked By
Final	AVG	-
Job Ref	Scale @ A3	Date Created
OXF9010	1:125,000	SEP 15

Figure Number: 4.F
Rev: -

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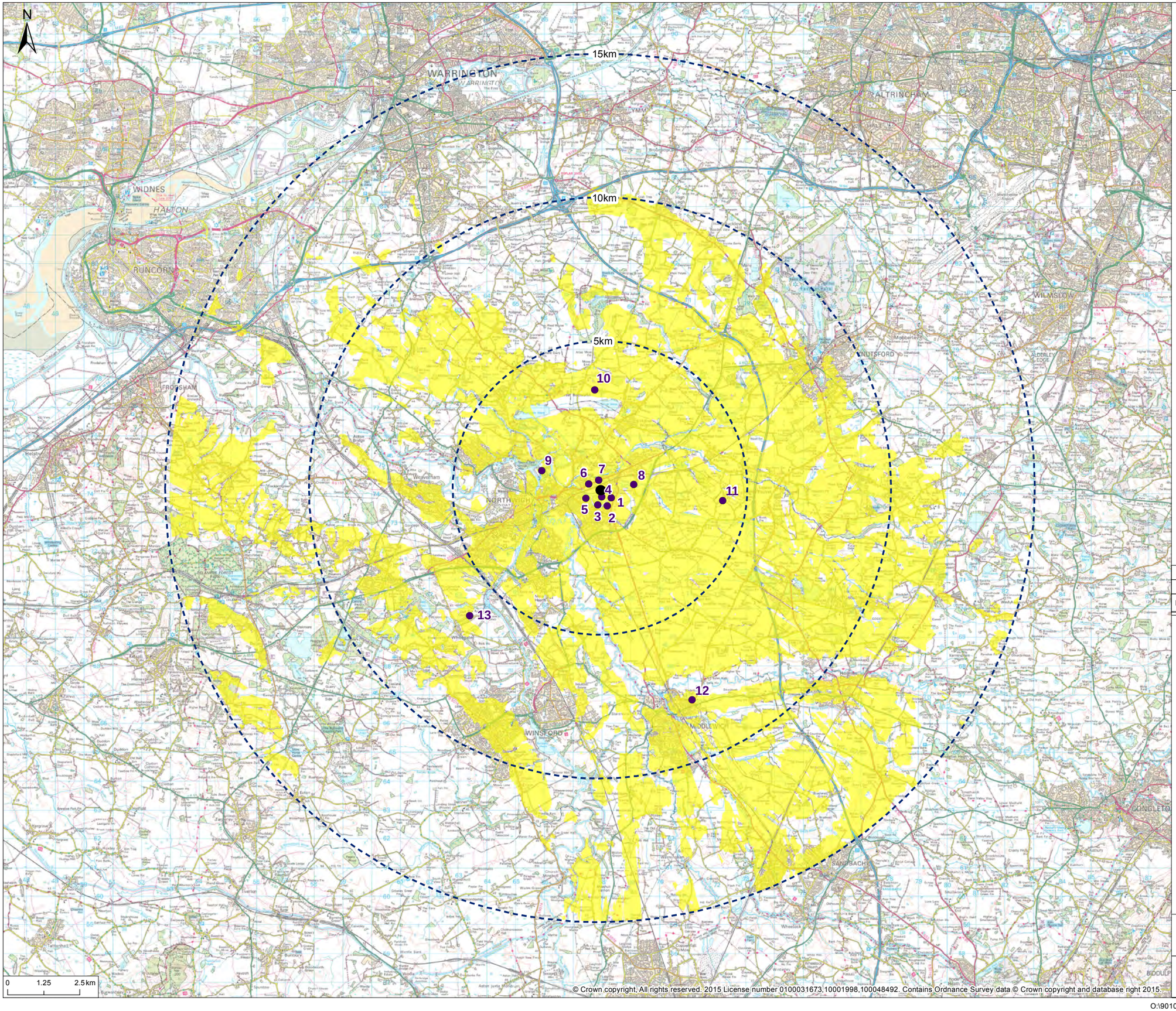

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Legend

- Site boundary
- Buffers at 5km intervals
- Zone of Theortetical Visibility
- Viewpoint location

VP No.	Name
1	Footpath to canal, Griffiths Road
2	Trent and Mersey Canal Towpath, Rudheath
3	Griffiths Park
4	Griffiths Park
5	James Street, Rudheath
6	Footpath, Cranage Lane / Manchester Road
7	Manchester Road
8	Footpath from Lostock Hollow
9	Carey Park
10	Park Lane, Pickmere
11	Footpath near Cheadle Farm, Plumtey
12	Dane Valley Way, Middlewich
13	Vale Royal Abbey Golf Course

ZTV notes:

Data sources:	OS Terrain 5	
Coverage	Within 15km of the site (approx)	
Date sourced	May - 15	
original cell size	5m	
Resampling	None	
ZTV does not consider the effects of ground cover	The effects of earth curvature and light refraction are considered	ZTV is calculated using a chimney height of 33m
Viewer height is 2m.	ZTV is not calculated beyond 15km from the chimney	ZTV calculation does not use mathematically approximate methods

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Client DONG Energy Ltd

Project REnescience Northwich

Title Zone of Theoretical Visibility with Viewpoints

Status	Drawn By:	PM/Checked By
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Job Ref	**Scale @ A3**	**Date Created**
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Figure Number **4.G** Rev **-**

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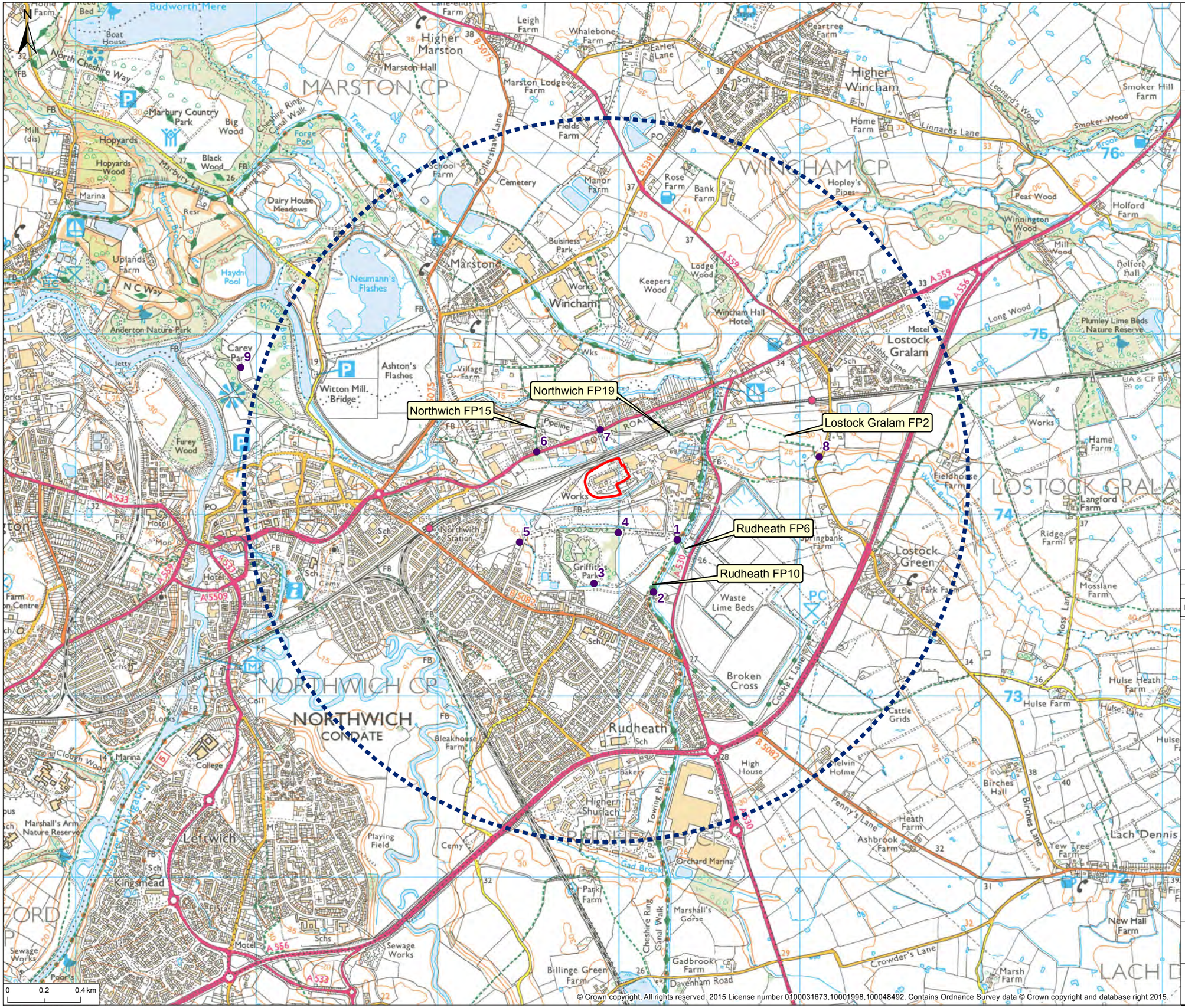

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Legend

- Site boundary
- 2km buffer
- Viewpoint location

VP No.	Name
1	Footpath to canal, Griffiths Road
2	Trent and Mersey Canal Towpath, Rudheath
3	Griffiths Park
4	Griffiths Park
5	James Street, Rudheath
6	Footpath, Cranage Lane / Manchester Road
7	Manchester Road
8	Footpath from Lostock Hollow
9	Carey Park
10	Park Lane, Pickmere

Rev	Description	Date	Initial	Checked

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Client: DONG Energy Ltd

Project: REnescience Northwich

Title: Local Area Plan with Viewpoints

Status	Drawn By:	PM/Checked By
Final	AVG	-
Job Ref	**Scale @ A3**	**Date Created**
OXF9010	1:20,000	SEP 15

Figure Number	Rev
4.H	**2**

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VIEWPOINT 1: Footpath to canal, Griffiths Roa

VIEWPOINT 2: Trent and Mersey Canal Towpath, Rudheath

RPS

Date of photographs: 02/06/2015
Lens type: 50mm

Visible profil
Concealed profil

REnescience Northwich
FIGURE 4.I

Ref: O:9010-0019-05.indd

VIEWPOINT 3: Griffiths Par

VIEWPOINT 4: Griffiths Par

RPS

Date of photographs: 02/06/2015
Lens type: 50mm

Visible profil
Concealed profil

REnescience Northwich
FIGURE 4.J

Ref: O:\9010-0019-05.indd

VIEWPOINT 5: James Street, Rudheath

VIEWPOINT 6: Footpath, Cranage Lane / Manchester Road

RPS

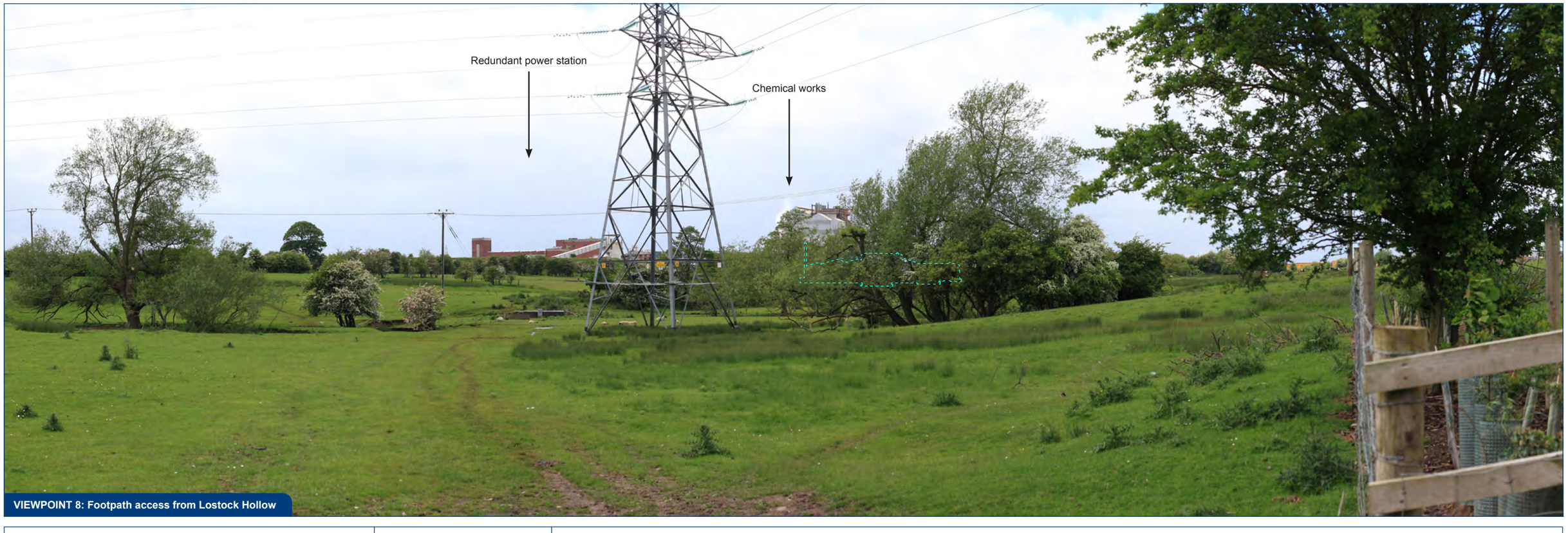
Date of photographs: 02/06/2015
Lens type: 50mm

Visible profil
Concealed profil

REnescience Northwich
FIGURE 4.K

Ref: O:9010-0019-05.indd

VIEWPOINT 7: Manchester Road



VIEWPOINT 8: Footpath access from Lostock Hollow

RPS

Date of photographs: 02/06/2015
Lens type: 50mm

Visible profil
Concealed profil

REnescience Northwich
FIGURE 4.L

Ref: O:9010-0019-05.indd

VIEWPOINT 9: Carey Park

VIEWPOINT 10: Park Lane, Pickmere

RPS

Date of photographs: 02/06/2015
Lens type: 50mm

Visible profil
Concealed profil

REnescience Northwich
FIGURE 4.M

Ref: O:\9010-0019-05.indd

VIEWPOINT 11: Footpath near Cheadle Farm, Plumley

VIEWPOINT 12: Dane Valley Way, Middlewich

RPS

Date of photographs: 02/06/2015
Lens type: 50mm

Visible profil
Concealed profil

REnescience Northwich
FIGURE 4.N

Ref: O:\9010-0019-05.indd

VIEWPOINT 13: Vale Royal Abbey Golf Course

RPS

Date of photographs: 02/06/2015
Lens type: 50mm

Visible profil
Concealed profil

REnescience Northwich
FIGURE 4.O

Ref: O:9010-0019-05.indd

EXISTING VIEW

PROPOSED VIEW

RPS	Date of photograph: 02/06/2015 Lens type: 50mm	OS reference: 367898, 374471 Direction to site: south	Viewpoint height: 25.4m AOD Horizontal field of view: 7 ^{0}	Viewing distance: 300mm @ A3	**REnescience Northwich** **FIGURE 4.P**

Ref: O:\9010-0021-01.indd

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Legend

Retained

- Existing vegetation

Proposed

- Native trees and shrubs
- Native shrubs
- Individual trees
- Fragrant orchid habitat
- Wildflower grassland
- Amenity grassland

3: This drawing should be read in conjuction with Landscape Management Plan and Planting Schedule (Figure 4.R)

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Client DONG Energy Ltd

Project REnescience Northwich

Title Planting Proposals

Status	Drawn By	PM/Checked by
FINAL	AVG	JB
Job Ref	Scale @ A1	Date Created
OXF9010	1:500	SEPT 2015

Drawing Number 4.Q

Rev .

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Trees and Shrubs Mix

Plant in random single species groups of 3 to11 No. plants. Feathered hornbeam (Carpinus betulus) to be scattered through mix in single species groups with no less than 4.0 metres between individual feathered trees.

Plot Number	P2	P4	P5
Area (m2)	324	789	692
Planting centres (m)	1.5	1.5	1.5
Planting density	0.50	0.50	0.50
Number of plants	162	395	346

Species	%	From	Girth (cm)	Height (cm)	Clear stem (cm)	Root	Total Number	P2	P4	P5
Feathered Trees										
Carpinus betulus	6	F		150-200		B		10	24	21
Transplant Trees										
Acer campestre	5	T		60-90		B		8	21	17
Alnus glutinosa	10	T						16	39	35
Betula pendula	5	T		60-90		B		8	21	17
Populus tremula	7	T		60-90		B		12	28	23
Prunus avium	7	T		60-90		B		12	28	23
Shrubs										
Corylus avellana	10	T		60-90		B		16	39	35
Crataegus monogyna	10	T		60-90		B		16	39	35
Ilex aquifilium	10	Bu		45-60		C		16	39	35
Prunus spinosa	10	T		60-90		B		16	39	35
Salix caprea	10	T		60-90		B		16	39	35
Viburnum opulus	10	T		60-90		B		16	39	35
Total	100%									
Total number of feathered trees								**10**	**24**	**21**
Total number of tree transplants								**56**	**137**	**115**
Total number of shrubs								**96**	**234**	**210**

Wildflower Grassland Mix (EM2)

	%		WG1	WG2
Emorsgate EM2 - Species rich unimproved neutral wild flower mix		**Area m2**	2878	345
Sowing rate: 5g/m2				
Grasses				
Agrostis capillaris	8			
Cynosurus cristatus	40			
Festuca rubra	28			
Phleum bertolonii	4			
Wildflowers				
Achilea millefolium	0.5			
Centaurea nigra	3			
Daucus carota	0.4			
Galium verum	1.5			
Knautia arvensis	1.3			
Leucanthemum vulgare	1			
Lotus corniculatus	1.4			
Plantago lanceolata	2.5			
Plantago media	0.5			
Primula veris	0.3			
Prunella vulgaris	2			
Ranunculus acris	3			
Rhianthus minor	1.5			
Rumex acetosa	1.0			
Trifolium pratense	0.1			
Total seed (Kg)			**14.40**	**1.70**

Amenity Grassland Mix (A4)

	%		AG1
British Seed Houses A4 Low Maintenance Areas		**Area m2**	601
Sowing rate: 35g/m2			
Grasses			
CORAIL Strong Creeping Red Fescue	40		
JOANNA Chewings Fescue	30		
MENTOR Hard Fescue	25		
HIGHLAND Bent Grass	5		
Total seed (Kg)			**21**

Shrubs Mix (Ivy)

Plant in single species group throughout plot.

Plot Number	P6	P7	P8	P9	P10	P11	P12
Area (m2)	69	60	57	36	19	16	69
Planting centres (m)	0.5						
Planting density	3						
Number of plants							

Species	%	From	Girth (cm)	Height (cm)	Clear stem (cm)	Root	Total Number	P6	P7	P8	P9	P10	P11	P12
Ilex aquifolium	100	Bu		45-60		C		207	180	171	108	57	48	207
Total	100%													
Total number of shrubs								**207**	**180**	**171**	**108**	**57**	**48**	**207**

Shrubs Mix

Plant in random single species groups of 3 to 11 No. plants.

Plot Number	P1	P3
Area (m2)	86	49
Planting centres (m)	1.5	1.5
Planting density	0.45	0.45
Number of plants	39	22

Species	%	From	Girth (cm)	Height (cm)	Clear stem (cm)	Root	Total Number	P1	P3
Cornus sanguinea	10	T		60-90		B		4	2
Crataegus monogyna	30	T		60-90		B		11	8
Ilex aquifolium	25	Bu		45-60		C		10	5
Prunus spinosa	15	T		60-90		B		6	3
Rosa canina	10	T		60-90		B		4	2
Viburnum opulus	10	T		60-90		B		4	2
Total	100%								
Total number of shrubs								**39**	**22**

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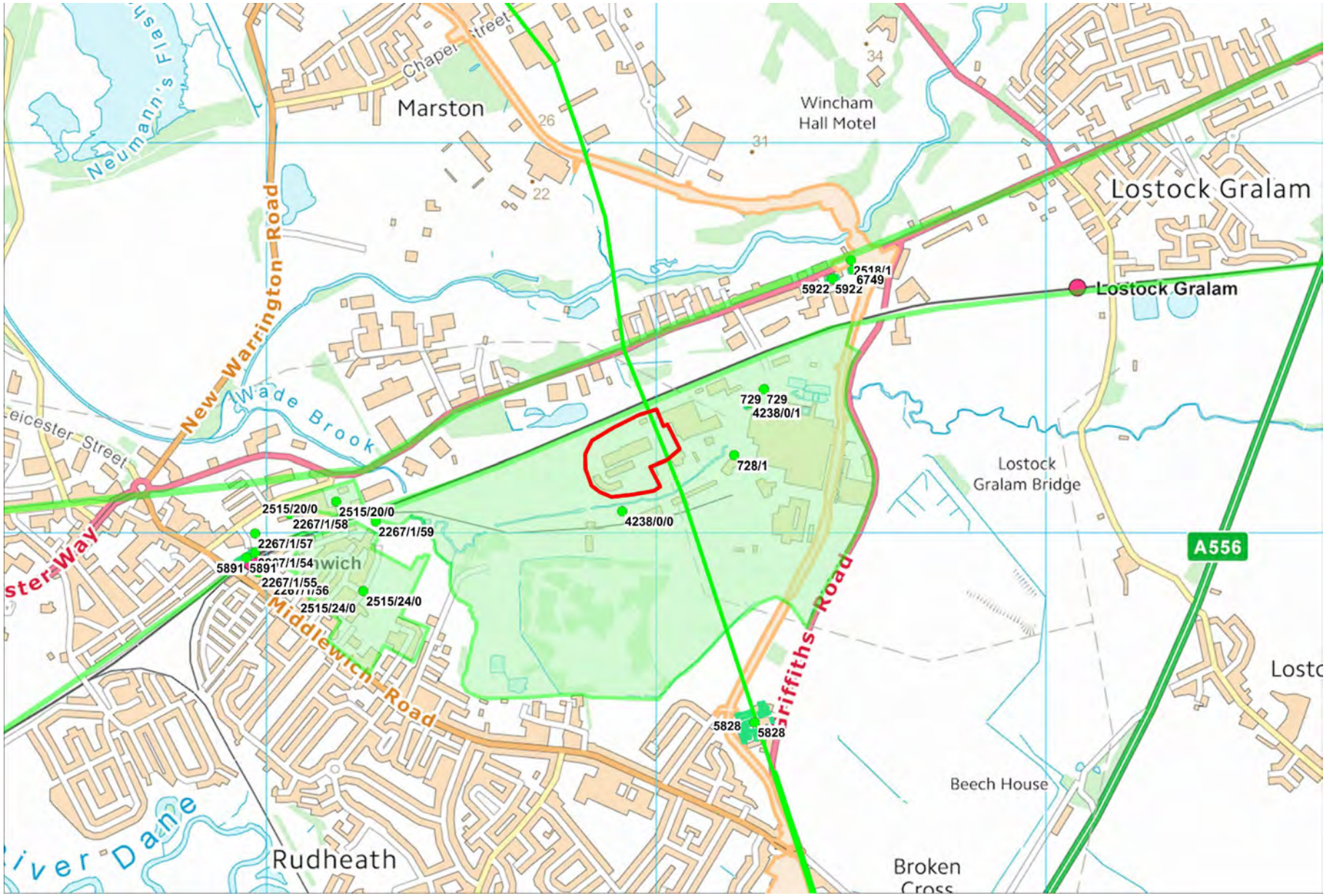

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Client DONG Energy Limited

Project REnescience Northwich

Title Site Location and HER Data

Date Created	Drawn By	PM/Checked By
June 2015	JM	DS

Job Ref.
JAC19914

Figure Number
Figure 5.A

Rev
0

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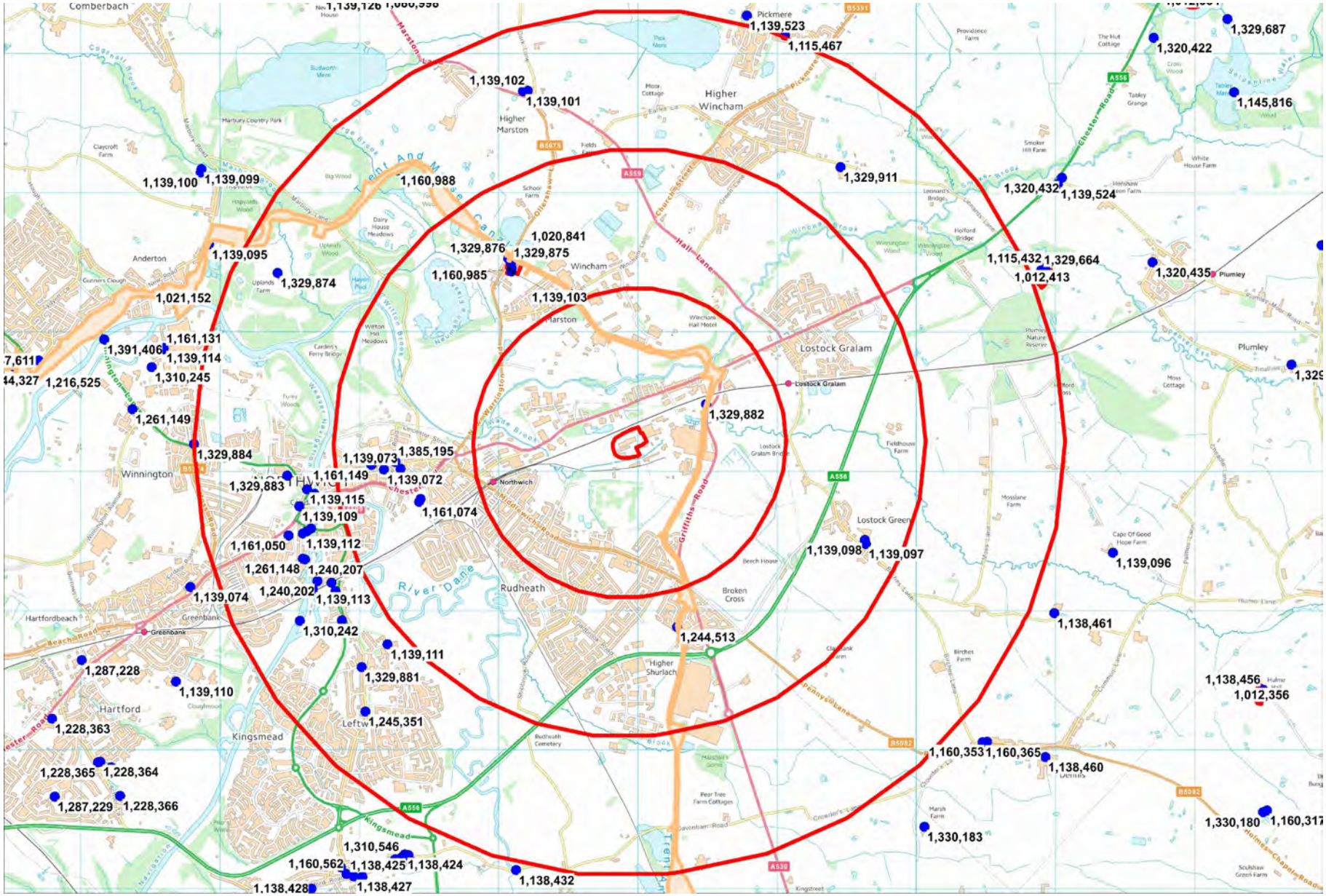
Figure_5.A_Site_Location_and_HER_Data



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Legend

- 1, 2 and 3km Radii
- Site Boundary
- Conservation Area
- Listed Building
- Scheduled Monument

Rev	Description	Date	Initial	Checked

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Title Designated Assets

Date Created	Drawn By	PM/Checked By
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Job Ref.
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Figure Number	Rev
Figure 5.B	0

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Figure 5.B Designated Assets

Figure_5.B_Designated_Assets

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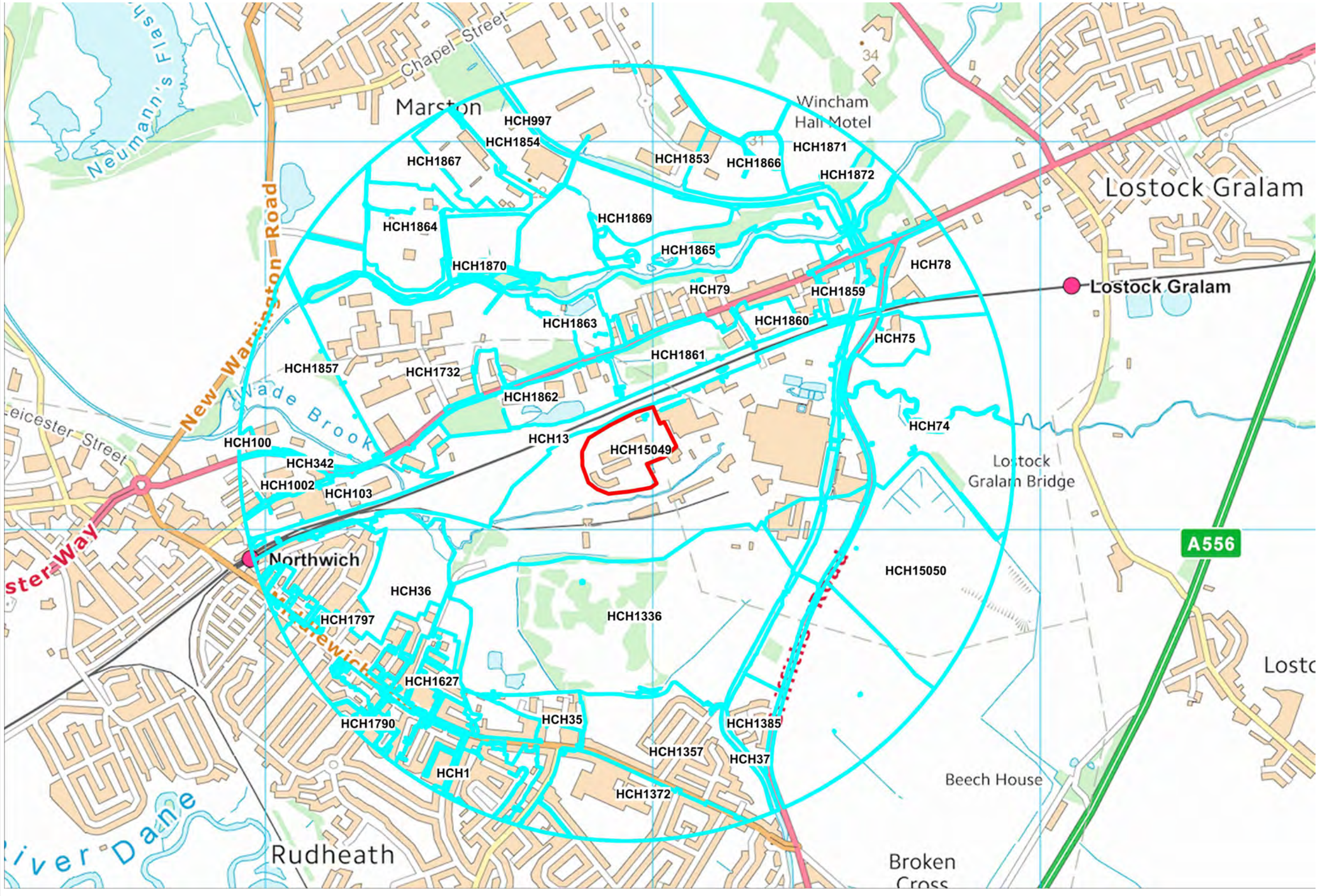
Legend

- Site Boundary
- Historic Landscape Character Areas



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Project REnescience Northwich

Title Historic Landscape Character

Date Created	Drawn By	PM/Checked By
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Job Ref.
JAC19914

Figure Number	Rev
Figure 5.C	0

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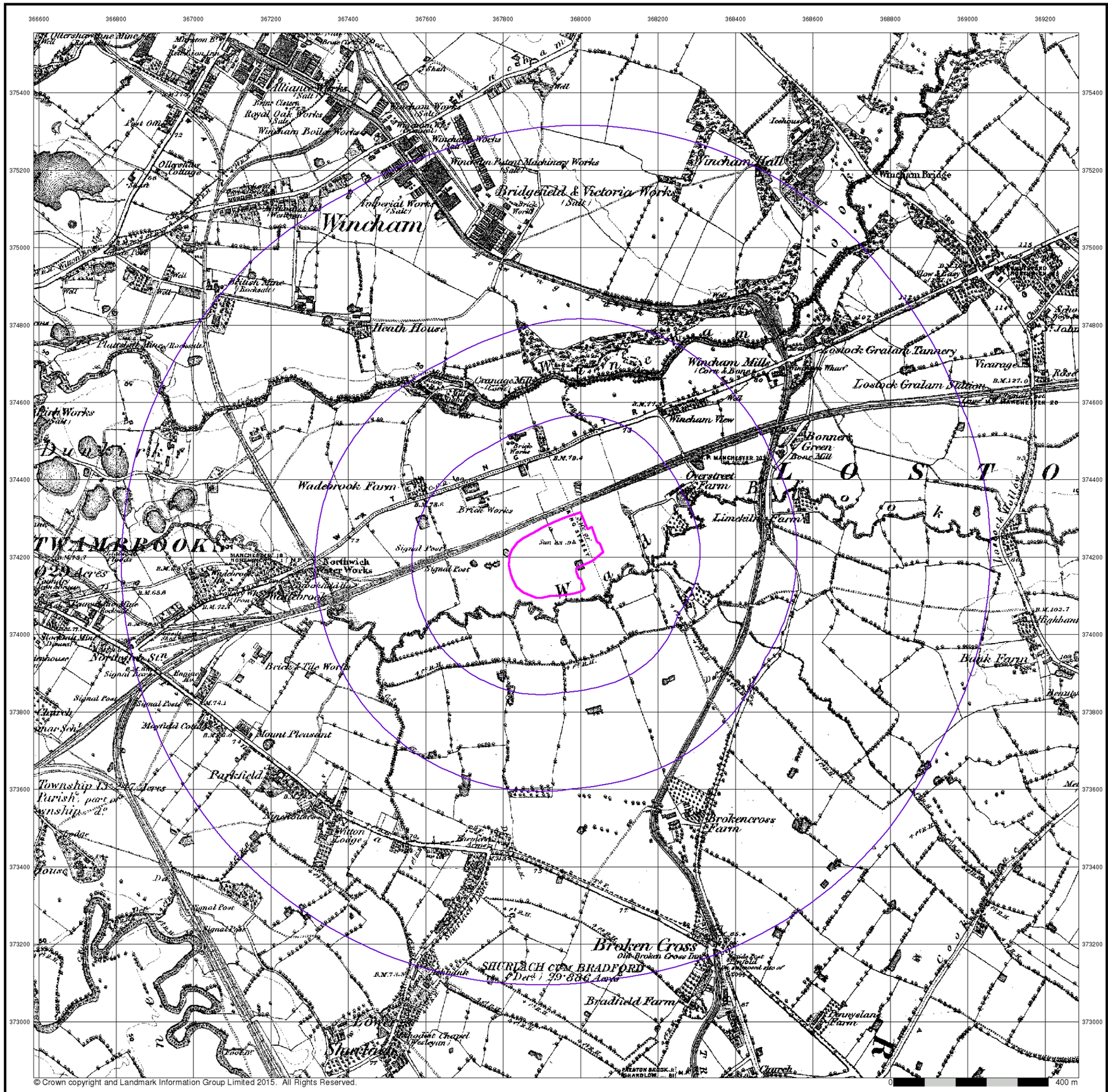
Figure_5.C_Historic_Landscape_Character

Figure_5.C_Historic_Landscape_Character



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Cheshire

Published 1882

Source map scale - 1:10,560

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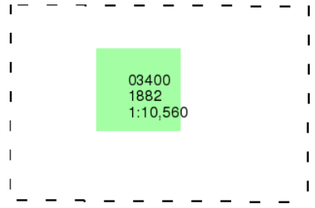
Map Name(s) and Date(s)



Historical Map - Slice A

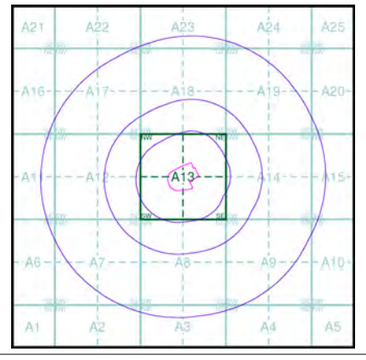


Figure Number: 5.D

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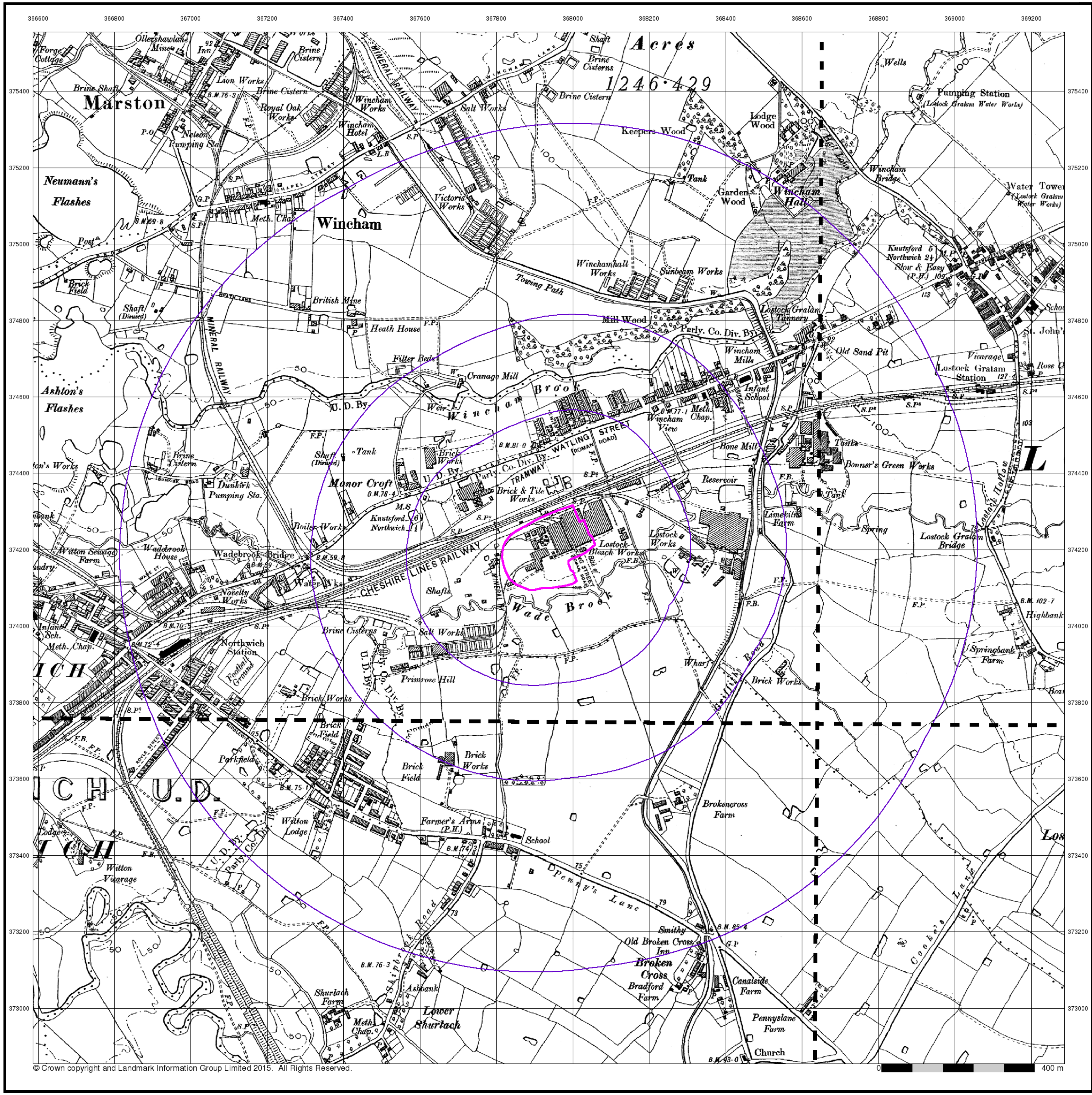

Cheshire

Published 1899

Source map scale - 1:10,560

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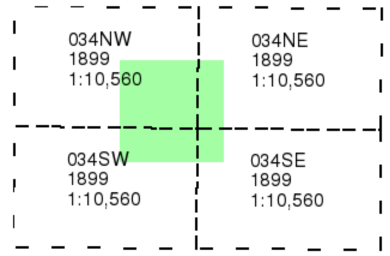
Map Name(s) and Date(s)



Historical Map - Slice A

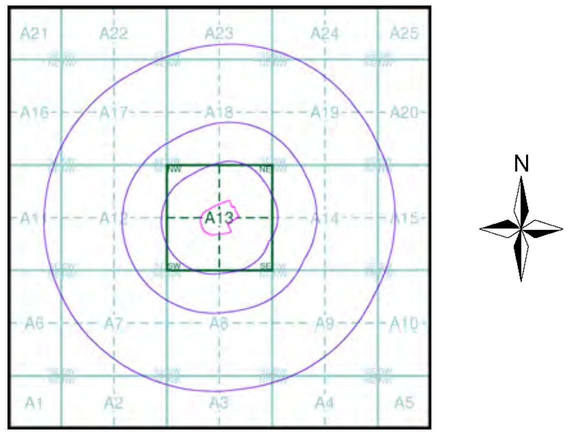


Figure Number: 5.E

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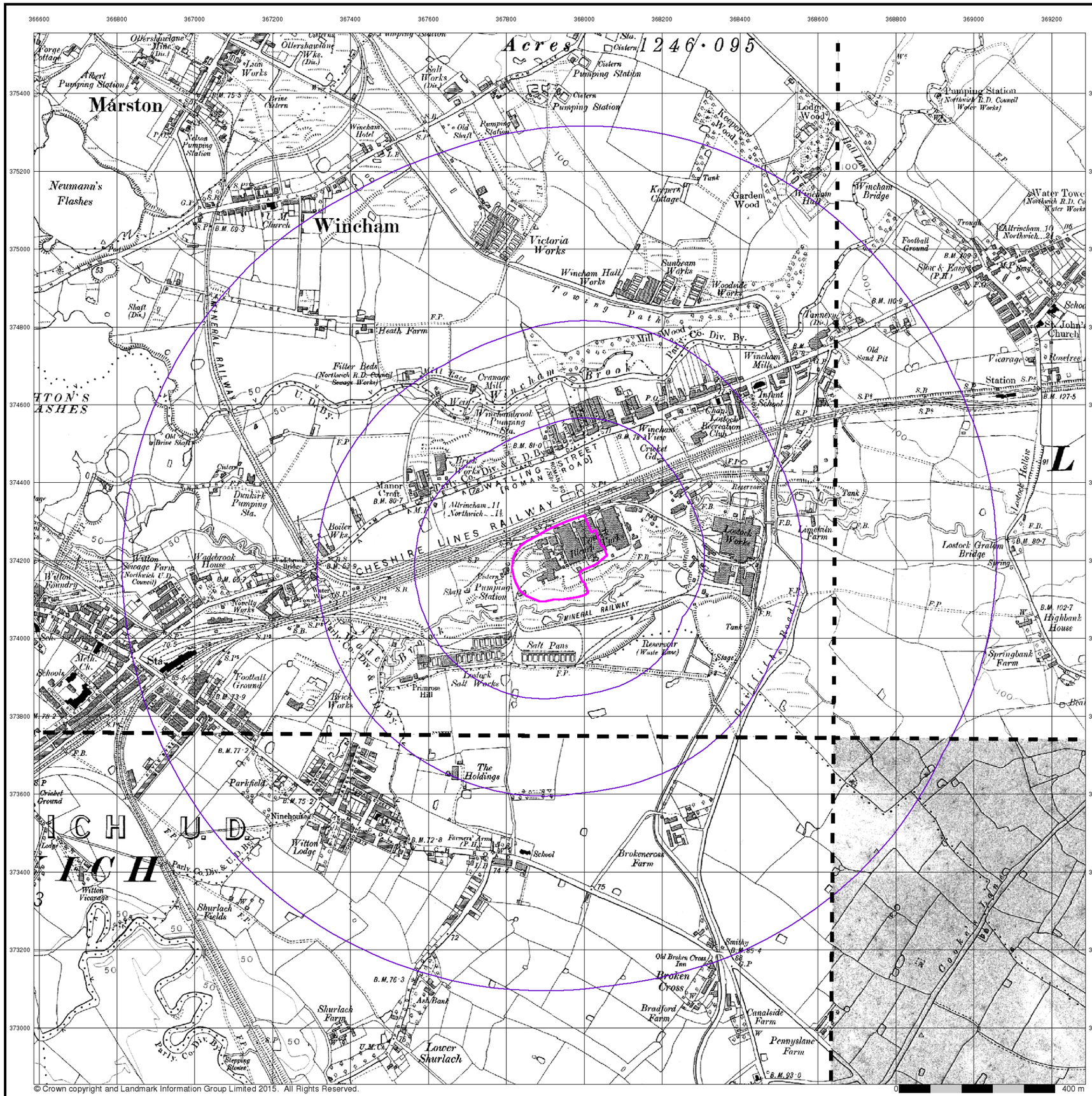

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Cheshire

Published 1910 - 1911

Source map scale - 1:10,560

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Map Name(s) and Date(s)

034NW 1910 1:10,560	034NE 1911 1:10,560
034SW 1911 1:10,560	034SE 1911 1:10,560

Historical Map - Slice A

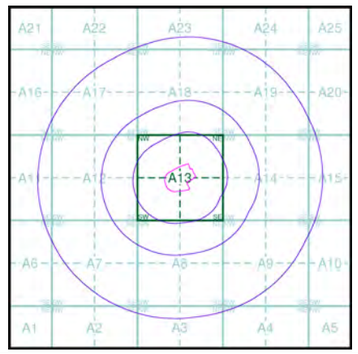
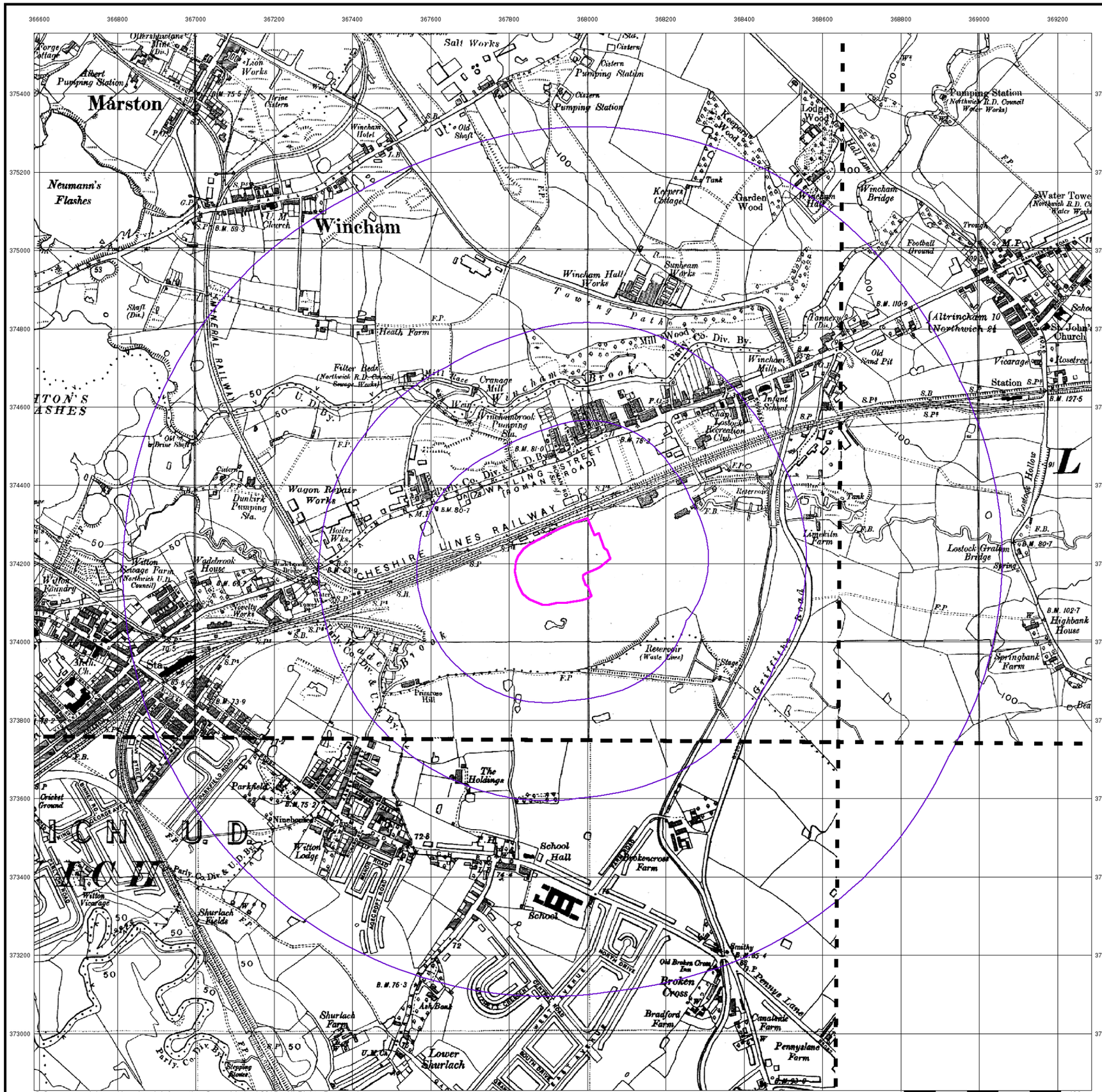


Figure Number: 5.F



RPS

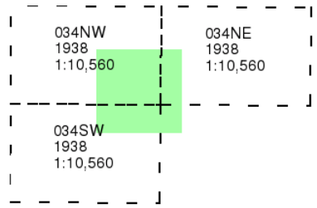
Cheshire

Published 1938

Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

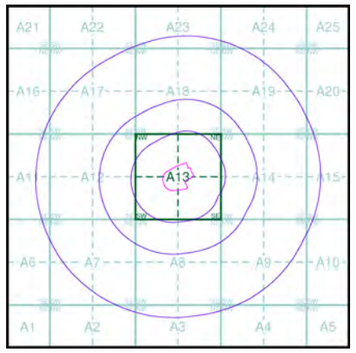


Figure Number: 5.G

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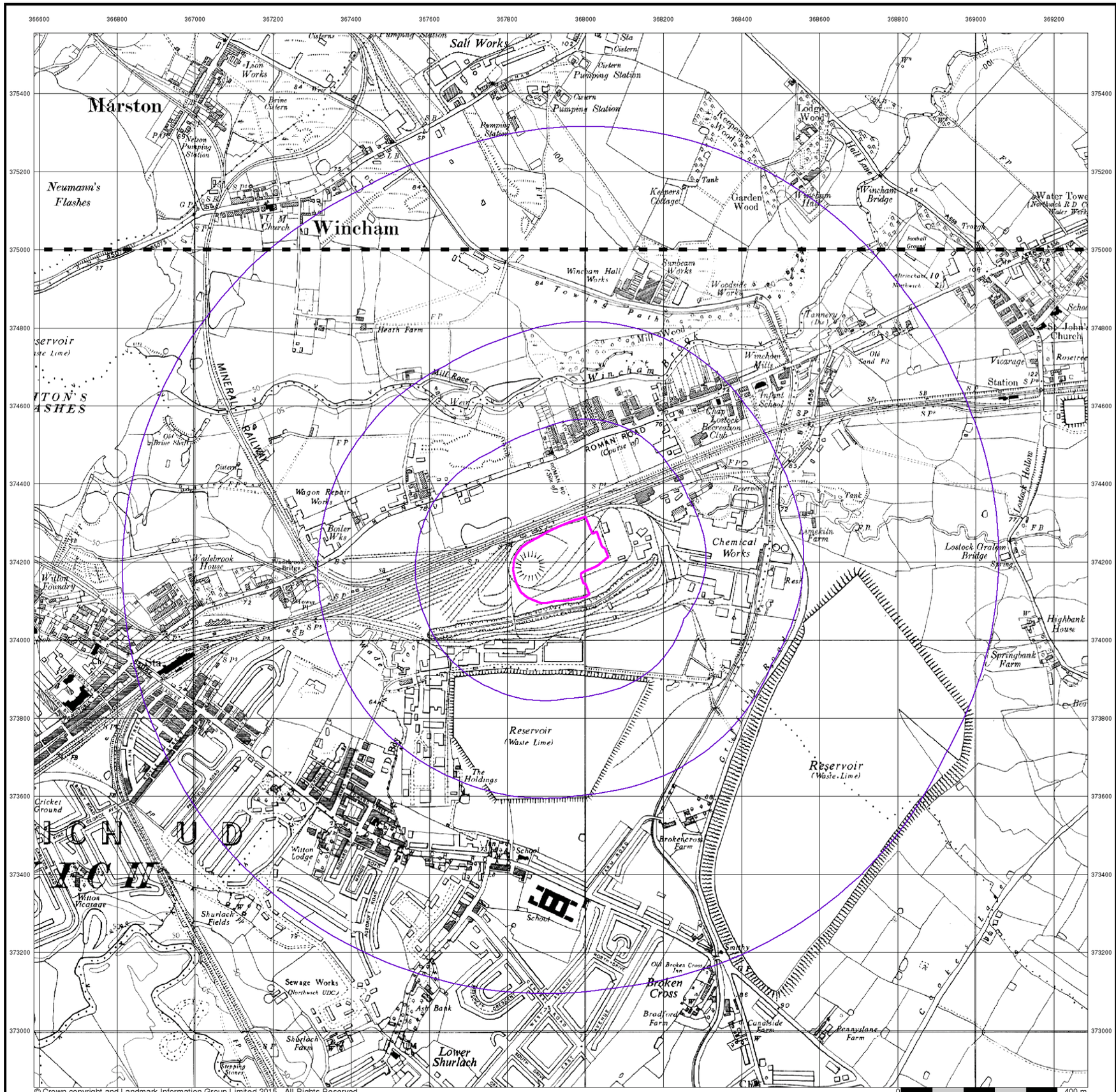

RPS

Ordnance Survey Plan

Published 1954

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SJ67NE
1954
1:10,560

SJ67SE
1954
1:10,560

Historical Map - Slice A

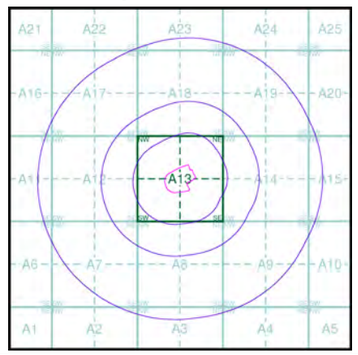

Figure Number: 5.H

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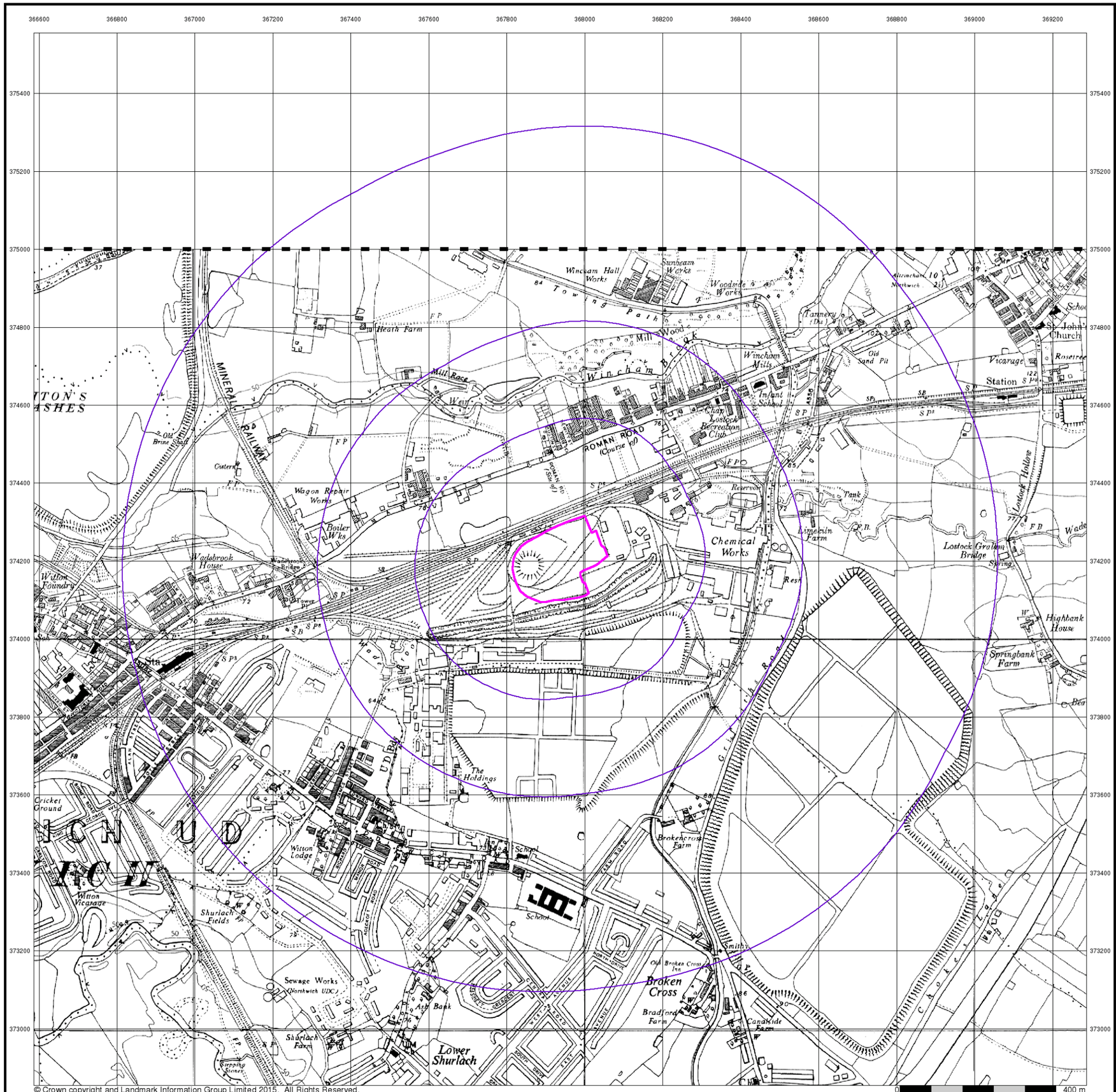


RPS

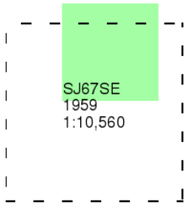
Ordnance Survey Plan

Published 1959

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

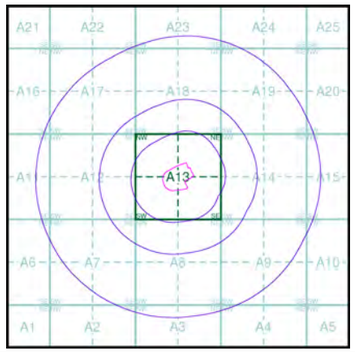


Figure Number: 5.I

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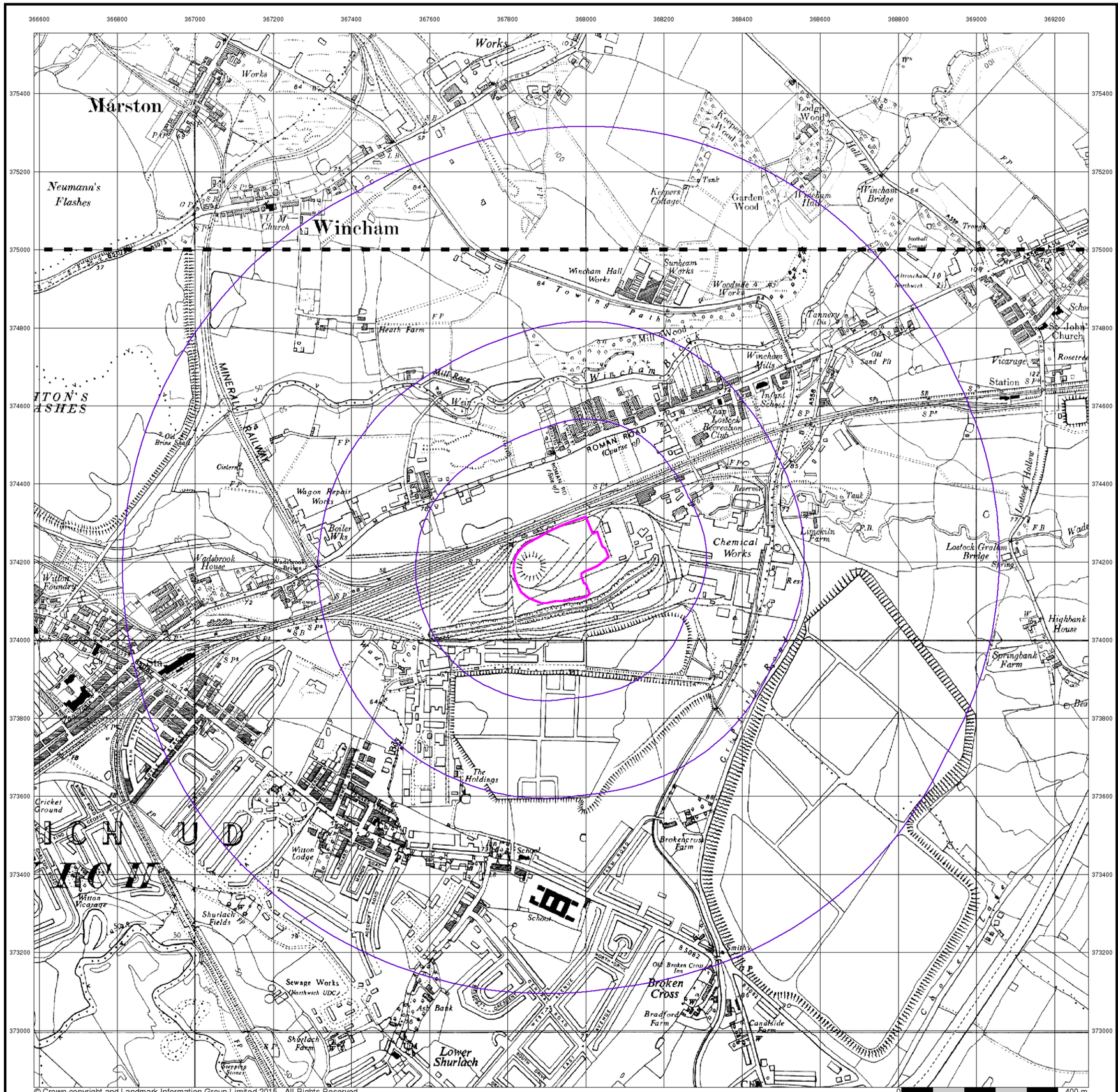

RPS

Ordnance Survey Plan

Published 1963 - 1965

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SJ67NE
1963
1:10,560

SJ67SE
1965
1:10,560

Historical Map - Slice A

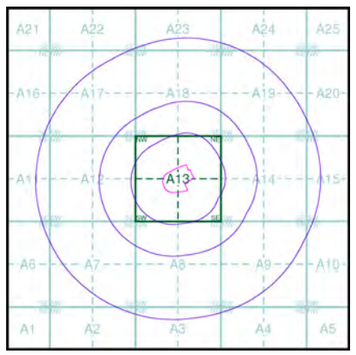

Figure Number: 5.J

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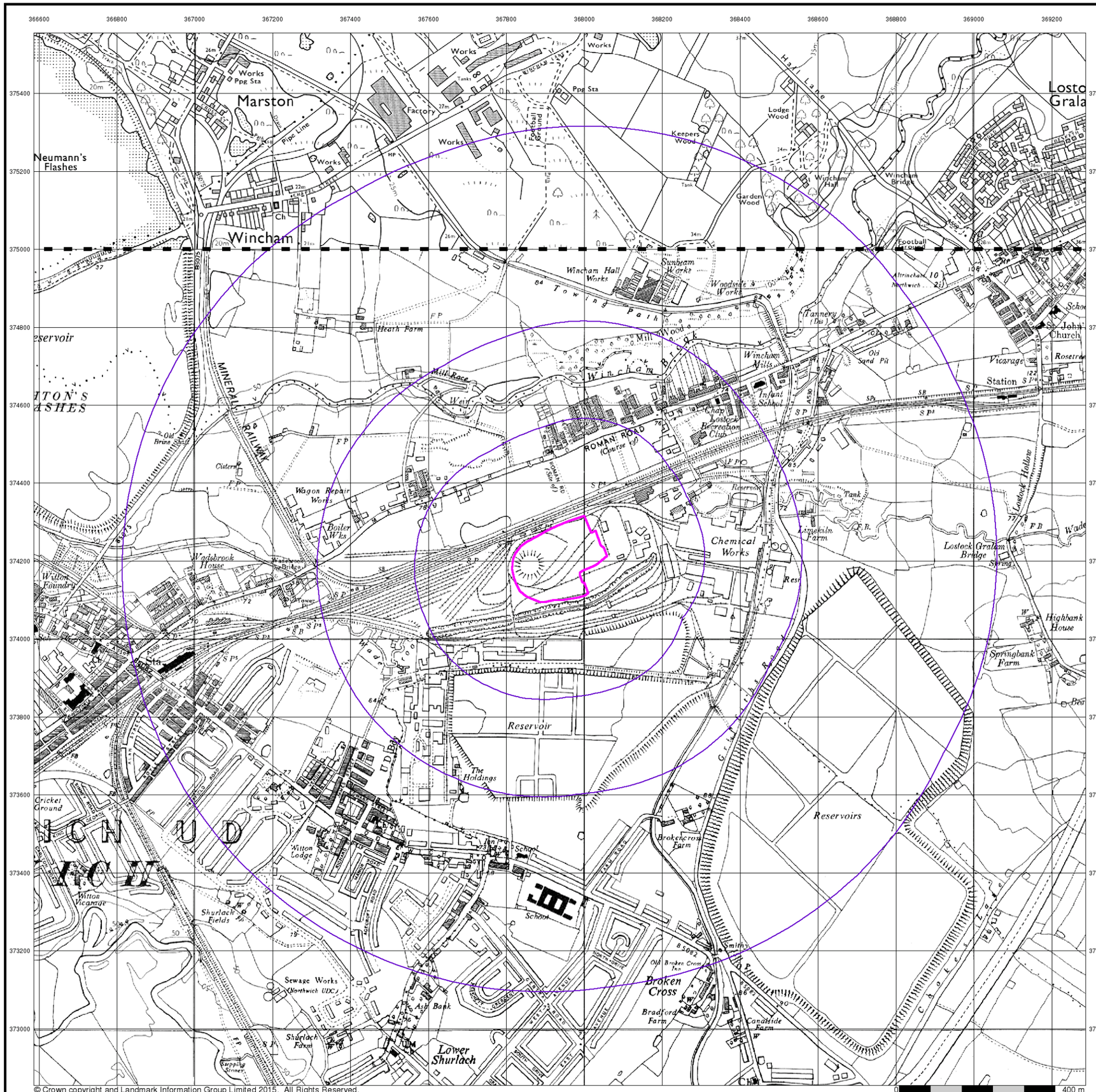

RPS

Ordnance Survey Plan

Published 1970 - 1976

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SJ67NE
1976
1:10,000

SJ67SE
1970
1:10,560

Historical Map - Slice A

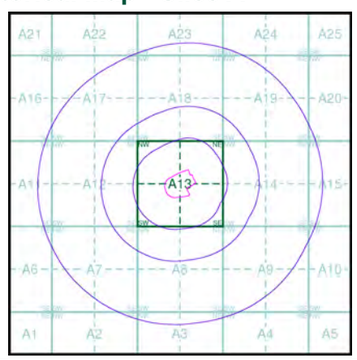

Figure Number: 5.K

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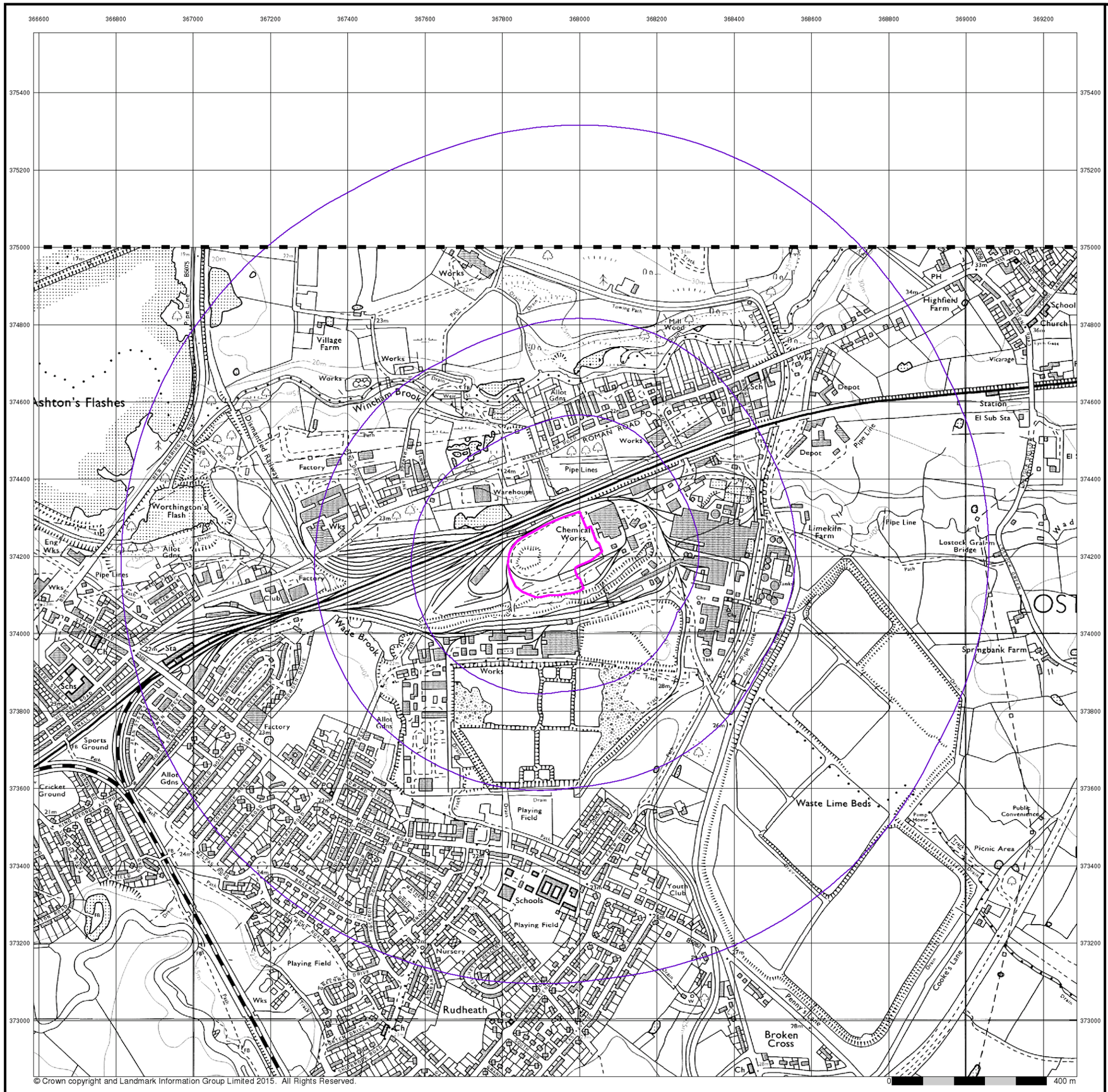


RPS

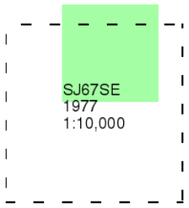
Ordnance Survey Plan

Published 1977

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

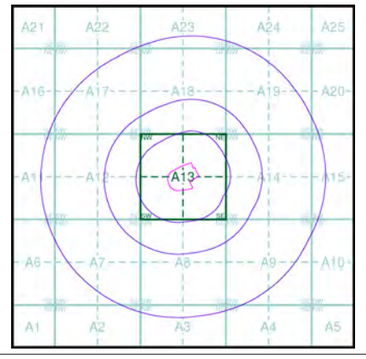


Figure Number: 5.L

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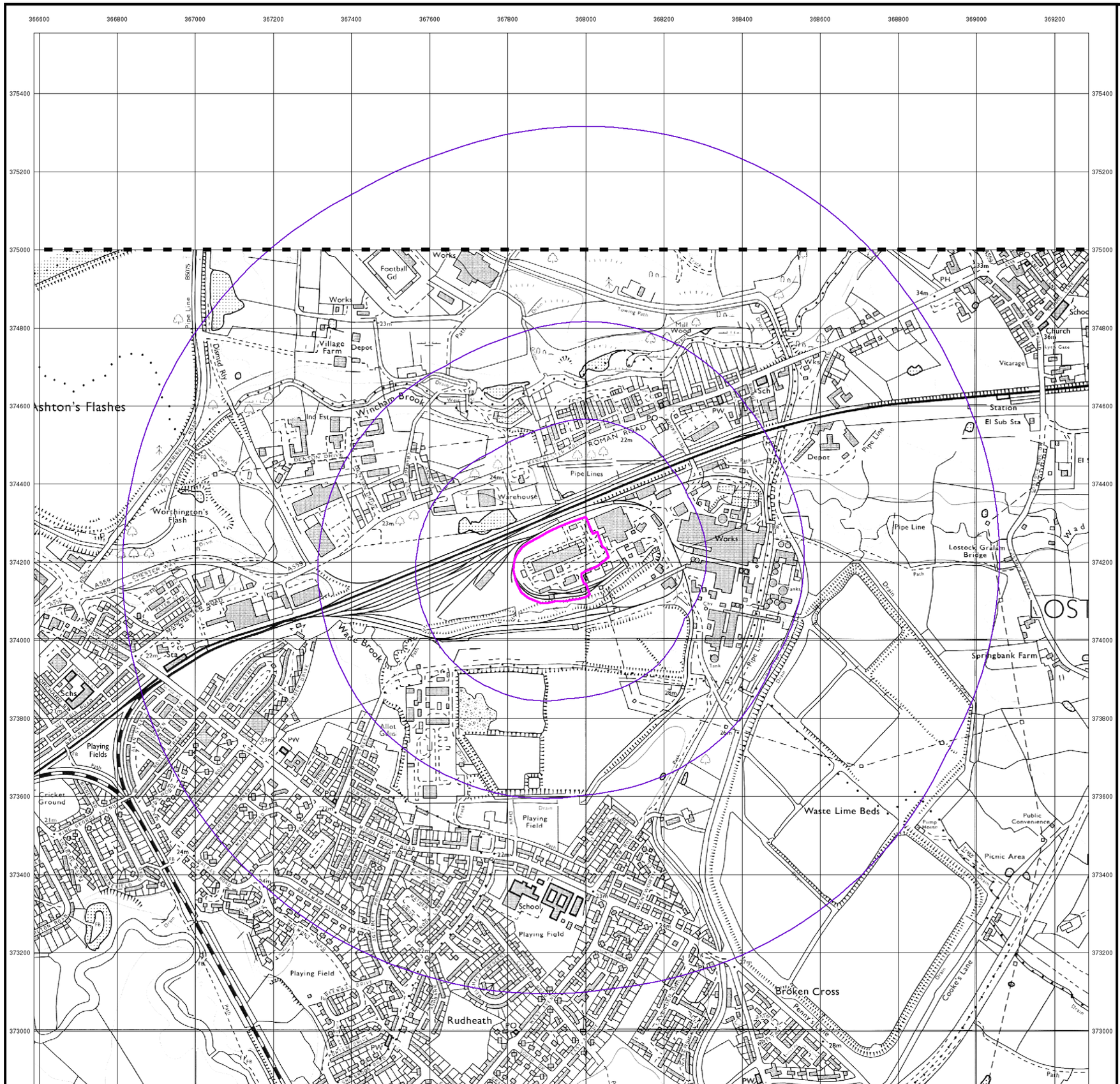

RPS

Ordnance Survey Plan

Published 1993

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SJ67SE
1993
1:10,000

Historical Map - Slice A

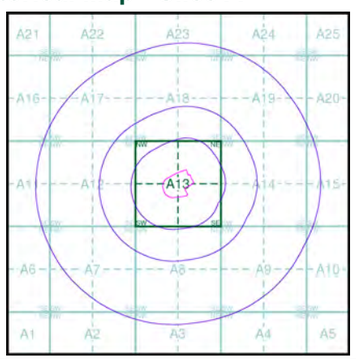

Figure Number: 5.M

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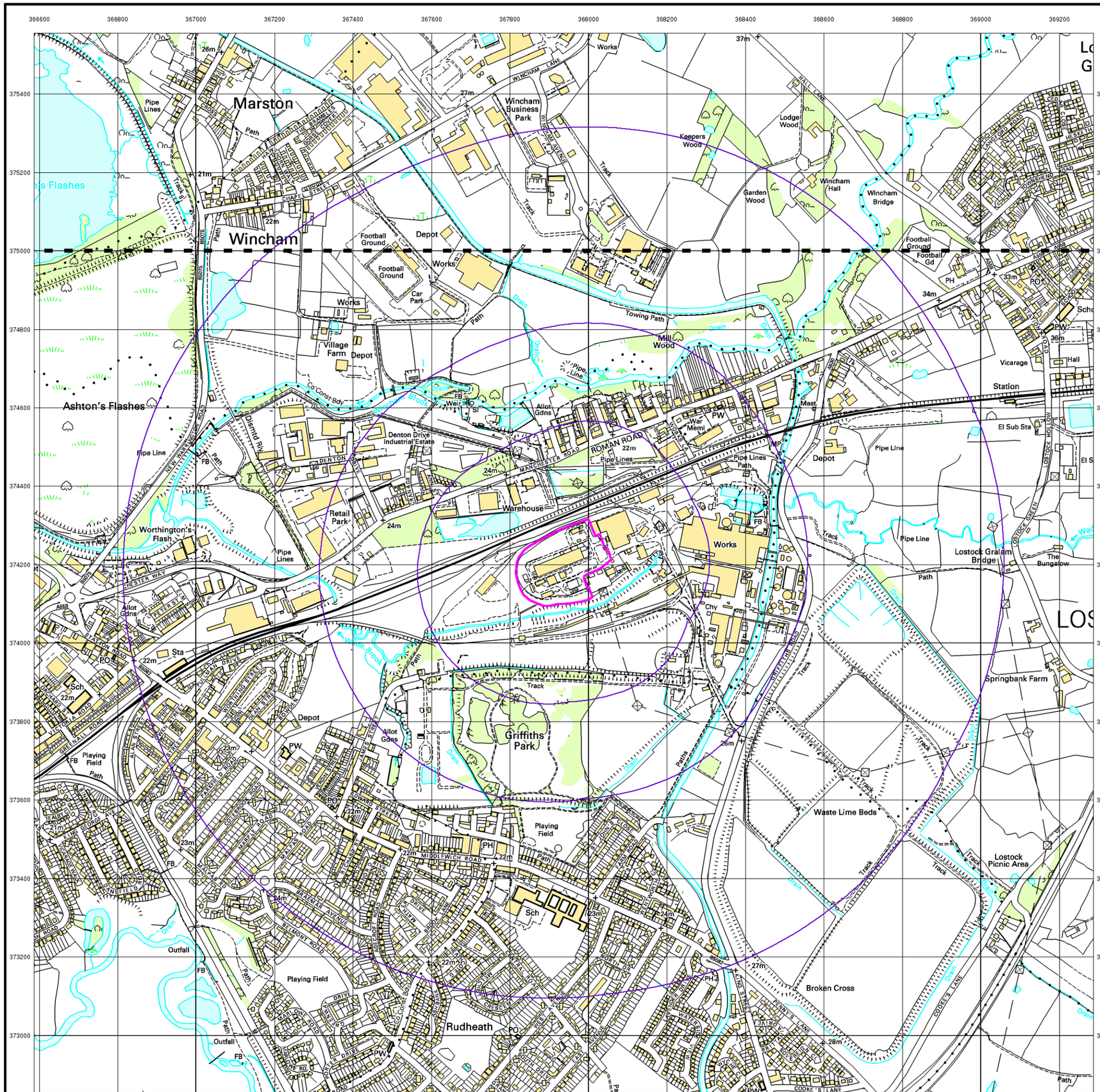

RPS

10k Raster Mapping

Published 2006

Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

SJ67NE
2006
1:10,000

SJ67SE
2006
1:10,000

Historical Map - Slice A

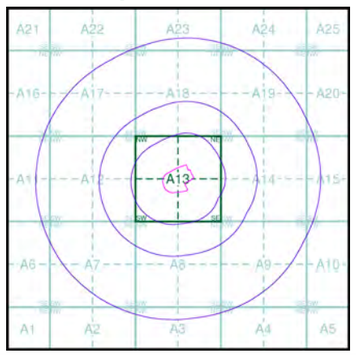

Figure Number: 5.N