A REMEDIATION METHOD STATEMENT FOR THE REMOVAL OF ABOVE GROUND STORAGE TANKS AT NORQUEST INDUSTRIAL ESTATE, PENNINE VIEW, BIRSTALL

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1 INTRODUCTION

Terra97 was commissioned by Mileway Real Estate Ltd to undertake a Remediation Method Statement (herein referred to as RMS) for the removal of a number of above ground fuel storage tanks.

Further to the revised conceptual site model presented within the Phase 2 Ground Investigation Report carried out by Terra97 Ltd (Ref: C20315G), it was considered that some remediation will be required at this site in relation to the removal of identified above ground storage tanks and associated grossly hydrocarbon impacted soils.

Taking into account the planned future use of the Site and the presence of the tanks, the objectives of this remediation strategy and tank removal method statement are:

- To provide a detailed remediation statement to manage the risks associated with the removal of the tanks to site operatives;
- Propose remedial targets which will be used to assess the suitability of any material to remain *in situ*;
- To provide details of environmental mitigation measures during the works;
- To provide details of contingencies for previously unidentified contamination;
- To provide details of documentation will be required as part of a final verification report.

This report, which was designed to meet the requirements of all relevant current guidance, presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

1.1 LIMITATIONS

This method statement and its findings should be considered in relation to the terms of reference and objectives agreed between Terra97 and the Client as indicated earlier in this Section.

For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals. Whereas the report does not state that the subject site is free from or Japanese Knotweed (JKW), any suspected evidence recorded during the site walkover survey will be noted and described.

During the site walkover reasonable effort has been made to obtain an overview of the site conditions; however, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

2 REVIEW OF PHASE 2 GROUND INVESTIGATION REPORT

A Phase 2 Ground Investigation Report was completed by Terra97 Ltd for the Site (Report reference: C20315G, Issue: 1.0, Dated: 14/08/2020). The pertinent aspects of this report with relation to the remediation requirements for this site are outlined below.

2.1 ON-SITE TANKS

Due to the size of the site and the varying topography, current land use and ground surface type, the site has been subdivided into two main areas for the purposes of this part of the assessment, namely, Area A in the south and Area B in the north. A plan showing the boundaries of Area A and Area B is included within the appendices.

The following above ground tanks were encountered on the site during a Site walkover by Terra97 Ltd.

2.1.1 Area A

- There are no known current or former underground bulk storage tanks recorded at the site; however, this does not rule out unrecorded tanks.
- There is a tank located on a mezzanine within the main building; however, this is considered to be for water.
- Located adjacent west, external to the main on-Site building, the following tanks were observed:
    - Three large (55,000l) brick bunded diesel tanks (coloured blue and rusting slightly) used for lorry refuelling. The tanks are monitored with a gauge and an alarm; staining was observed at the fill points and dispensing points. The bunds around the above tanks are of brick construction in a poor state of repair, with cracks in some areas.
    - One large grey fuel tank of unknown capacity (no longer present at the rime of writing);
    - One double skinned blue plastic tank containing Adblu, which is a self-contained tank, with integrated fill point and pump.
- A waste oil store is located in the northeast corner of the site; the bund does not appear to be able to hold 110% of the volume of the drums.

2.1.2 Area B

- In the northwest corner lies a former mechanic garage with an un-bunded tank labelled gas oil which is upgradient from the rest of the site and may be a source of hydrocarbon contamination.

2.2 REVISED CONCEPTUAL SITE MODEL

Terra97 have undertaken ground investigation at the site and the findings have been used to update the conceptual site model which was produced in the Phase 1 Preliminary Risk Assessment report for the site (Ref: C20315P, dated January 2020). The salient points with regard to the contamination of the site are presented below:

- The Site is currently occupied by a portal frame building which is used for vehicle service and repair and storage.
- Pertinent on Site and surrounding historical and current land uses include multiple phases of commercial and industrial development, involving the waste reclamation, collieries and chemical waste transfer
- Maximum recorded depths of Made Ground within Area A ranged between 0.30m bgl (157.03m AOD) and 2.10m bgl (155.15m AOD), however, the majority of Made Ground was encountered to between 0.30m bgl and 0.50m bgl. The deepest deposits of Made Ground were encountered in the south-eastern area of Area A with depths of between 1.10m bgl and 1.50m bgl. Made Ground within Area A can be split into hardstanding and 2 No. distinct populations, MG1 and MG2.
- Made Ground within Area B was encountered in all exploratory locations from the surface to between 0.12m bgl (158.51m AOD) and 1.40m bgl. These were principally granular and cohesive in nature, comprising two general types, MG1 and MG2.
- No drift deposits were encountered on the site.
- The bedrock at the Site formed part of the Pennine Lower Coal Measures Formation and comprised interbedded sandstone and mudstone.

- The Site is located in a Coal Mining Area with 2 No. seams of influencing depth below the site.
- The Site is not located within a Source Protection Zone.
- The Site is not within an area which requires basic Radon Protection Measures.
- No sources of contamination posing a risk to the relevant human health receptors have been identified for the site.
- Hydrocarbon impacted soils on the site are considered to potentially pose a moderate risk to the Secondary A Aquifer beneath the site.

2.2.1 Sources

- Hydrocarbon impacted Made Ground Soils and potential hydrocarbon impact from the future removal of on-site tanks.

2.2.2 Pathways

- Lateral and/or vertical migration of mobile contaminants within shallow groundwater.

2.2.3 Receptors

- Secondary A Aquifer beneath the site.

This Revised Conceptual Site Model (RCSM) is the basis for any required remediation works and is presented in Table Table 2.1 below.

Table 2.1. ***Revised Assessment of Potential Pollutant Linkages.***

Pollutant linkage				
	Source	**Pathway(s)**	**Receptor(s)**	**Qualitative risk assessment**
1	Hydrocarbon impacted Made Ground Soils and potential hydrocarbon impact from the future removal of on-site tanks.	Lateral and/or vertical migration of mobile contaminants within shallow groundwater.	Secondary A Aquifer beneath the site.	Medium x Likely = Moderate

2.3 Outline Remediation Requirements

The chemical testing to date shows that the site does not pose a risk to human health from soil bound contamination, relative to the proposed future land use.

The potential presence of grossly hydrocarbon impacted Made Ground soils at the site are considered to potentially pose a moderate risk to the Secondary A Aquifer within bedrock which directly underlies the Made Ground at the site. There is also a risk to the Secondary A Aquifer during the future removal of on-site tanks due to the potential for spillage.

It is therefore considered that remediation of the Made Ground soils is required in order to mitigate the risk of the Hydrocarbons from the Made Ground/the tank removal entering the Secondary A Aquifer.

- The tank removal should be undertaken with care as to ensure that no hydrocarbons are spilled.
- Any areas of gross hydrocarbon impacted soils should be excavated to remove the 'source' from the identified source-pathway-receptor linkage.

2.4 SUMMARY

- Multiple tanks have been identified on the Site.
- The potential for grossly hydrocarbon impacted soils associated with the on-Site tanks and the potential future hydrocarbon impact from the on-Site tanks pose a moderate risk to the Secondary A Aquifer beneath the Site.
- The chemical testing to date shows that the site does not pose a risk to human health from soil bound contamination, relative to the proposed future land use.
- Ground gas monitoring to date has not identified any requirement for ground gas protection measures.
- It is therefore considered that remediation of the Made Ground soils is required in order to mitigate the risk of the Hydrocarbons from the Made Ground/the tank removal entering the Secondary A Aquifer. The tank removal should be undertaken with care as to ensure that no hydrocarbons are spilled. Any areas of gross hydrocarbon impacted soils should be dug out to remove the 'source' from the identified source-pathway-receptor linkage.

3 REMEDIATION METHOD STATEMENT

3.1 INTACT POLLUTANT LINKAGES

Chemical testing has demonstrated that hydrocarbon impacted soils identified on the site and the potential future hydrocarbon impact from these tanks pose a risk to the Secondary A Aquifer beneath the Site. As such, remedial measures are required for the Site.

3.2 ANTICIPATED REMEDIAL WORKS

Based upon the findings of the site investigation, the following remediation statement has been devised in order to remove the pollution linkage between hydrocarbon impacted soils and con-site tanks with the Secondary A Aquifer beneath the site.

1. Removal of all on-Site storage tanks;
2. Removal of grossly hydrocarbon impacted soils on the Site;

3.3 TANK INERTING

3.3.1 Disposal of Identified Storage Tanks

Before soil removal can take place, it will be necessary to remove the identified tanks on the site. In the event that any of the tanks have not been properly treated, before any work is commenced, any residual product within the tank shall be removed as far as is practically possible, this is known as "bottoming". In addition, it may also be then necessary to treat the base of the tank with a proprietary emulsifier or hydrocarbon adsorbent to ensure, so far as is practicable, that all residual hydrocarbons are removed.

3.3.2 Methods of Inerting Tanks

In the event that any of the tanks have not been treated, before commencing the tank removal, the following methods are suitable to inert the tanks to remove the risk of explosion. The actual method which is used will be determined closer to the time of remediation and will be agreed with the PLO. In the case of nitrogen gas, dry ice, nitrogen foam and combustion gas, it is necessary to reduce the oxygen content to below 5%.

3.3.2.1 Nitrogen Gas

The condition of redundant fuel/oil tanks is uncertain, and therefore the atmospheric pressure method can be used. This involves the nitrogen being passed continuously into the tank at one point, while the air and petroleum vapour being purged leaves from another opening, usually the flame trap outlet.

It is recommended that the nitrogen gas be introduced directly from an industrial gas supplier's road tank vehicle, fitted with the necessary reducing valves and measuring equipment.

The tank, and in the case of multi-compartment tanks all compartments, shall be bottomed, and all openings sealed except for those required for the inlet of 'nitrogen and for the exhaust outlet to atmosphere. The exhaust outlet shall be of sufficient size so as to prevent the build-up of pressure in the tank. The nitrogen shall then be introduced and the mixture leaving the tank shall be vented to atmosphere so that tank remains at atmospheric pressure throughout the entire operation. If approximately five tank volumes of nitrogen are used, the final oxygen level will be approximately 1%. Following completion of the purging, the openings shall be sealed and the tank may then be excavated.

During the removal process, all holes found in the tank shall then be securely plugged with wooden pegs.

If removal takes place immediately after purging the tank, a small vent shall be left in the tank to allow excess pressures to escape.

3.3.2.2 Dry Ice

Following the bottoming of the tank, and in the case of multi-compartment tanks of each compartment, the ventilation pipes shall be removed and all openings sealed except that required for the insertion of 'dry ice' (solid

Carbon Dioxide). 4Kg shall be allowed for each 2000 litres of capacity. The dry ice shall be broken into pieces not larger than the size of a walnut.

Operatives shall wear gloves when handling dry ice which shall be kept covered while being broken to contain any flying fragments.

The tank shall be left for 12 hours after the addition of the dry ice. After this the opening used for the insertion of the dry ice shall be sealed and the removal can commence if oxygen levels of below 5% have been achieved.

During the removal all holes found in the tank shall be securely plugged with wooden plugs. If removal takes place immediately after purging the tank, a small vent shall be left in the tank to allow excess pressure to escape.

It should be noted that with this method of inerting, difficulties can be encountered due to stratification, inadequate quantity of dry ice or incomplete transformation of the dry ice to gas. It is therefore, important when using this method to test the atmosphere in the tank with an oxygen meter at intermediate levels. Particular care shall be taken to test the VOC atmosphere at the top of the tank. If the atmosphere exceeds 2000ppm VOC, there is a potential explosion risk and the inerting procedure must be repeated.

3.3.2.3 Water Fill

Following the bottoming of the tank, the suction pipe(s) shall be disconnected and the tank connecting points be excessively sealed. The tank shall then be filled completely with water with care being taken to ensure that any water or residual product does not overflow from the fill point.

Surplus water or residual product shall, if necessary, be removed from the pipe to avoid an outflow when the vent pipe is disconnected from the tank. Any surplus water or residual product shall be disposed of safely.

Finally, the vent pipe shall be disconnected and the tank connection point and fill point effectively sealed.

It should be remembered that when filling the tank with water, flammable vapours will be displaced through the vent pipe outlet.

When the tank is ready for removal, the water shall be uplifted and conveyed to a site authorised for the handling and disposal of contaminated waste. Contaminated water from the petroleum tanks is subject to the regulations made under the Environmental Protection Act 1990 and the Duty of Care Regulations 1991.

Complications may occur with method when the tank is badly holed. When this occurs the excavation work shall stop, the water pumped out of the tank and an alternative method used instead.

3.3.2.4 Hydrophobic Foam Fill

With this method the foam having designed compressive strength (when set) of 8 tonnes per square metre is generated on site and pumped directly into the tank(s). This procedure shall be carried out in accordance with the manufacturers/supplier's instructions.

3.3.2.5 Nitrogen Foam Fill and Combustion Gas

These two alternative methods of inerting tank(s) are detailed in HSE Guidance Note CS15.

3.4 REMOVAL OF ALL EXISTING STORAGE TANKS

Where a tank is being removed, there is a danger that the surrounding earth may have been contaminated either by leakage from the tank or by spillage, the following precautions shall be taken:

i. Danger notices shall be displayed.

ii. No smoking or naked lights shall be allowed near the vicinity.

In all the above operations, care shall be taken to ensure that no hydrocarbon or hydrocarbon contaminated water is allowed to enter any drainage system or water course. In order to prevent the potential for cross contamination with existing soils on site, it is recommended that some form of protective membrane is emplaced across any areas where the tanks, or any associated materials are to be placed, prior to their removal from site.

If a tank is to be lifted by chains or wire ropes, they shall be protected from direct contact with the tank to prevent risk from spark generation. Natural fibre ropes may be preferable for small tanks. A tank shall not be lifted by placing chains or ropes around the manhole neck, as it is possible to rip the neck from the tank.

In preparation for transportation, the following precautionary work shall be carried out

1. All pipework connected to the tank shall, as far as is reasonably practicable, be removed.
2. Any bunds will be broken out by mechanical excavator if they are empty. Should the bunds contain hydrocarbons/contaminated water, the liquid will be pumped and disposed to a site authorised for the handling and disposal of contaminated waste, prior to breaking out the bunds.
3. Once it has been fully established that all tanks have been inerted, the steel skin shall lifted onto a waiting wagon for removal to a suitably licenced facility using the mechanical excavator.
4. The tank shall be securely attached to the carrying vehicle, following the precautions noted for chains or wire ropes as above.
5. Where there are holes or obvious areas of weakness in the tank, the tank shall be positioned on the carrying vehicle in such a way that the hole/areas of weakness are positioned above the level of any liquid or sludge remaining in the tank.
6. The transportation of a disused petroleum tank from the site by road is covered by the Carriage of Dangerous Goods by Road Regulations 1996, (Schedule 2 (4)).
7. The Contractor shall ensure that the recipient of the tank is made aware of the tank's previous use, the toxic hazard within the tank and the need to take adequate precautions against fires and explosions when handling and disposing of it.

3.5 Grossly Hydrocarbon Impacted Soils Removal

3.5.1 Excavation and Removal of Hydrocarbon Impacted Soils

The results of the Terra97 Ltd ground investigation has shown that there is a potential pollution linkage between any identified grossly hydrocarbon impacted soils and the Secondary A Aquifer beneath the Site. In order to break this pollutant linkage, it is proposed that any localised areas of grossly hydrocarbon impacted soils encountered at the site are removed. Grossly hydrocarbon impacted soils should be considered soils which have significant visual and/or olfactory evidence of hydrocarbon contamination. These impacted soils should be disposed of to a suitably licensed landfill site. As such, methods of removing these soils are also highlighted below.

The excavation of Made Ground soils in these areas will begin with those immediately below the tanks base, extending to the soils outwards. The grossly impacted soils will be "chased out" incrementally, based upon directions given by the Supervising Engineer (SE). The SE will cease excavation when they are satisfied that all grossly contaminated soils have been removed. Any disposal of grossly contaminated materials shall take place by the direct placement onto a bunded polythene layer whilst chemical analysis is undertaken. This soil will also be covered in a layer of polythene to prevent leaching to the surrounding soils. Following WAC and soils analysis, the soil will be placed into a road haulage truck and subsequent disposal at a suitable landfill site. On site precautions will be required to prevent the spreading of contaminated soils around the site or to adjacent land.

Due to the presence of loose Made Ground soils, the excavation should be assumed to be unstable. Reference should be made to CIRIA 97 Trenching Practice to establish suitable means of support or battering of excavation sides during their removal.

3.5.2 Shallow Groundwaters

In the event that visual or olfactory evidence of contamination in perched groundwater is encountered during the excavation works, it will be removed by vacuum tanker and disposed of at a suitably licensed facility. Waste transfer notes for any contaminated perched groundwaters removed from site shall be retained and presented to the relevant authorities as part of the final verification report.

3.5.3 Remedial Targets

The identified risk to the site is between grossly impacted hydrocarbon soils and the Secondary A Aquifer beneath the site. During the Site investigation works by Terra97 Ltd, no concentrations of hydrocarbons, or any other contaminants, were found to exceed the prevalent GACs for the proposed commercial land use. Due to multiple exploratory holes being deliberately targeted adjacent to the historic tanks and the spread of exploratory holes across the site, additional areas of hydrocarbon contamination which exceed the relevant GACs for a commercial

land use are considered unlikely. As such, remedial targets for the soil excavations are concerned with the risk to groundwater.

Soil samples will be taken from the base and sides of the 'chased out' excavations and sent to a laboratory for leachate analysis. The results of this leachate testing will initially be screened against the currently available water quality standards for TPHCWG fractions in drinking water outlined by the World Health Organization (WHO) within the CL:AIRE (2017) Petroleum Hydrocarbons in Groundwater guidance. It should be noted that any minor exceedances encountered from the leachate samples will not automatically constitute a significant risk to the Secondary A Aquifer beneath the site. A detailed risk assessment taking into account information from the Terra97 Phase 1 Preliminary Risk Assessment Report (Ref: C20315P, dated April 2020), the Terra97 Phase 2 Ground Investigation Report (Ref: C20315G, dated August 2020) and the results of the leachate testing will be conducted to assess the residual risk to controlled waters at the site.

3.5.4 Sufficient Soil Removal

The removal of sufficient soil will be verified by ensuring that remedial targets have been met for the contaminants or that subsequent risk assessment has results in the soils being deemed to be safe for the intended land use. Once verification of the excavation has been achieved, suitable material should be imported to backfill the excavation. More details of remedial criteria and verification methodology are provided in the following sections.

3.6 Underground Service 'Capping'

It is proposed in order to mitigate any residual preferential pathways at the Site boundary, that any relict underground services and any associated gravel / sand beds should be 'capped' or sealed at the boundary. The underground services will be located, isolated, and terminated / decommissioned at the site boundary by a representative of the contractor who is appropriately competent and qualified. If the service comprises a pipe and it may reasonably be terminated via cutting / sawing then this should take place prior to sealing with a 'RAWMAT' hydrocarbon/water resistant pre-hydrated sodium bentonite physical barrier (self-healing). These materials shall also be used to seal gravel / sand beds that surround any such services.

Verification of the sealing / capping will be supervised and verified by the RE via visual means with photographs and summary drawings describing the location, nature of the service and the appropriate measures taken to form a permanent seal.

3.7 Contingency For any Unknowns

Whilst the ground conditions which have been encountered across the site during previous investigations are assumed to have been correctly characterised, a small risk exists of the presence of localised previously unidentified contamination of Made Ground soils. Should any suspicious material be encountered during the redevelopment works, works shall be ceased within this part of the site and the area should then be investigated further by a suitably qualified geo-environmental engineer and sampled as necessary. The Environmental Health Officer / Contaminated land Officer should also be notified as soon as possible. Samples will be forwarded to a UKAS/MCERTS accredited laboratory for a suite of analytical testing deemed appropriate based upon an appraisal of the material identified. Once the results of the analysis are known and have been interpreted, the required remedial action (if any) will be determined and approved with the relevant regulatory authorities.

4 INDEPENDENT VERIFICATION AND SUPERVISION OF THE WORKS

4.1 VERIFICATION OF THE WORKS

4.1.1 Verification of Contaminated Soils Removal

In order to ensure that the grossly hydrocarbon impacted soils is removed from the site within the close vicinity to the identified storage tanks removed from the Site and from any previously unidentified areas of contamination (if required), supervision of the excavation will be carried out as follows:

- A visual inspection of the soil will be undertaken. The excavation will be progressed until no significant visual or olfactory evidence of contamination remains;
- Soil samples will be taken from the sides and the base of the excavation, prior to infilling, on a 5m grid (including the walls of the excavations). Sample collection will be made by the use of the excavator bucket to 'scrape' the sample locations. The SE will not enter the excavation at any time;
- If, in the experience of the SE, it is thought that the sample is likely to be below remediation criteria, the sample will be submitted for laboratory analysis;
- Should the laboratory analysis indicate that the soil samples are below the remediation criteria/it be assessed in the subsequent controlled waters risk assessment that there is no significant risk to controlled waters, the excavation will then be passed for backfilling;
- Should the results be greater than the remediation criteria/it be assessed that there is a residual risk to controlled waters, then further "chasing out" of the contamination will be necessary. The onsite observation exercise will be carried out, as detailed above, with samples only being taken from the failed side of the excavation.

4.1.2 Remedial Target Levels

In order to ensure the removal of any hydrocarbon contaminated soils below the tank, the method of verification will be through verification samples tested for leachate analysis. This is outlined in Section 3.5.3 above.

4.1.3 Verification of Soil Disposal

The soil to be disposed of off-Site will need to be taken to a suitably licensed facility with suitable Duty of Care documentation being in place. The Hazardous Waste Regulations (2005) will also need to be complied with.

Based on the results of waste classification undertaken on samples of Made Ground across the site, including those with detectable concentrations of hydrocarbons taken from adjacent to the tanks, the waste soils from the tank are thought to be non-hazardous waste. However, there is the potential that the soils surround the tanks may need to be disposed of as Hazardous Waste, should the results shown the presence of hydrocarbons in excess of 1000mg/kg threshold.

It will be necessary to include confirmation that suitable disposal took place in the verification report, hence relevant paperwork will be required to be available from the contractor for inspection/copying.

4.1.4 Verification of Backfill

Once verification samples have shown that the excavation complies with accepted criteria, any voids can be backfilled with suitable fill materials to comply with the adopted foundations options for the site. If imported materials are required, source testing certificates of confirmatory testing of the imported material shall be provided and should comply with the Environment Agency SGVs and GACs set out in the LQM/CIEH (2015) document. Re used or imported materials will need to be tested at a rate of 1 sample per $50m^3$ for topsoil and 1 per $150m^3$ for subsoil/other backfill materials.

4.1.5 Verification Report

The SE will maintain records of the works to include the following:

- Daily record sheets to include a summary of the day's activities;
- Weather conditions;
- Plant, personnel and visitors present;
- Aspects relating to Health and Safety, Environmental control or non-compliance with the General Specification or the contractor's Method Statement;
- Location, area, sampling and volume of any materials excavated and re-used / re-deposited on site;

- Nature of ground conditions encountered and an accurate description of the materials excavated;
- The destination of all excavated materials (i.e. stockpiled or removed for offsite disposal;
- Verification sample tests;
- Photographs;
- Structures and features (foundations, drains, manholes, services, cellars etc) encountered and the actions taken to deal with them.
- Re used or imported materials will need to be tested at a rate of 1 sample per 50m3 for topsoil and 1 per 150m3 for subsoil. A minimum of 3 samples will need to be taken from each area.

The SE should ensure that the requirements of the strategy are complied with. On satisfactory completion of all remedial works, a verification report should be produced. This report will comprise all relevant site records and act as certification that the remedial preparation works have been carried out in accordance with this remediation strategy.

- The Verification Report shall include the following:
- A description of the works undertaken;
- Records of the works;
- Progress photographs;
- Photographic record of the capping / sealing of underground services entering / exiting the Site;
- Waste Transfer Notes;
- Chemical verification test results;
- Verification of contaminated soil removal, where required
- A statement that the works have been undertaken in accordance with the agreed strategy.

4.2 SUPERVISION OF THE WORKS

4.2.1 Dust Mitigation

In order to mitigate the environmental impacts of the works on nearby residents and sensitive areas, a programme of measures should be implemented during the remediation works.

Appropriate measures should be implemented at all times during the site operations, to minimise dust emissions. Soils should be dampened down, as necessary, and activity should be minimised in extremely windy conditions to prevent dust nuisance. An adequate supply of water shall be maintained on site at all times to allow for dust suppression activities to be carried out at short notice.

When dusty material is being loaded onto trucks, extra care should be taken to ensure that the drop height is minimised. Trucks should be suitably covered when leaving the site with contaminated material to prevent dust migration.

The amount of disturbed surfaces left exposed for significant time periods should be minimised. Stockpiles of fine or loose materials should be tamped down or covered to reduce the production of dust. Traffic both entering and working on the site shall obey a maximum speed limit of 5mph.

4.2.2 Odour Monitoring and Management

Olfactory evidence of hydrocarbons has been noted in the impacted areas on Site. However, based on observations on site and concentrations from laboratory testing, it is not considered likely to give rise to significant wider odour problems during excavation. During any excavation works in area where hydrocarbon odours are noted, the Supervising Engineer will monitor the atmosphere and, in the case of excessive vapours being detected at the site boundary, will instruct the contractor to cover the excavation face releasing the vapours with soil or sand (some suitable material will be required to be kept on site as a contingency) and any stockpiles will be located away from residential properties

Where hydrocarbon odours are noted, the Supervising Engineer will monitor the atmosphere on an olfactory basis during the majority of the works. However, should significant visual and olfactory evidence of hydrocarbon contamination be encountered during the excavation works a PID will be used to monitor vapour concentrations.

The Supervising Engineer will be present at the face of all excavations, he / she will be there to advice how the material should be handled to best control the odour emissions. The speed of works when handling contaminated material to be should be restricted to one excavator per supervising engineer to assist with the management of odours. The excavation of contaminated soils will be undertaken in bays as opposed to one excavation in order to reduce the surface area of exposed soil at any one given time. In addition, the volume of contaminated soils

anticipated to be excavated should be limited to a volume that is capable of being processed on the same day. In areas where continuously high odour soils are being excavated these may be left in the excavation at depth, in an area away from the potential receptors, to allow the odours to dissipate before hauling the materials out of the excavation. Soils excavated for the remediation of any encountered unexpected hydrocarbon hotspots (if encountered) will either be tipped directly into a truck or skip for offsite disposal or taken to a designated Visqueen bund and covered to reduce the production of hydrocarbon vapours.

Monitoring by the Principal Contractor will be undertaken at least twice daily during the remediation works. A total of 2 No. patrols will be undertaken each day as part of the off-site monitoring regime where atmospheric conditions will be monitored and reported on an olfactory basis. The odour monitoring will be undertaken at the locations identified by the SE during the remediation works. A total of 3 No. locations should be positioned on the Site boundary and 1 No. location positioned between the site boundary and the excavation.

In the case of excessive vapours being detected at the site boundary the Supervising Engineer will instruct the contractor to cover the excavation face releasing the vapours with soil or sand (some suitable material will be required to be kept on site as a contingency) and any stockpiles will be located away from residential properties.

In addition to the above, excavation, processing or hauling of contaminated soils during evenings, weekends or Bank Holidays. Working hours are between 08:00 and 16:00 to ensure that at sensitive times the risk of odours is at a minimum. The weather will be closely observed by the on Site geo-environmental engineer along with site conditions, on days where conditions are likely to transmit odours off site working areas will be adapted where possible in order to reduce impacts as far as reasonably practicable. Temporarily ceasing excavations on site will prolong the programme of works, this will in turn generating a longer period of time where contaminants may be mobile; therefore, ceasing the works will not remove or reduce the potential for odour generation.

At the end of the working day the excavation face will be sealed to prevent odour generation overnight, if significant odours are detected after sealing the face temporary covers will be placed on the excavation overnight to reduce further odour generation. Temporary cover systems can and will be utilised to reduce odour generation at any time they are required on Site.

Visiting management, clients representatives and regulators should undertake boundary odour assessment in tandem with the site engineers to both ensure that permanent site staff are not becoming desensitised to the site odours, that all odour assessors are detecting odours at the same locations, at the same concentration and reporting the same severity scale as well as providing additional supplementary information and a "quality control" type check.

In addition to the hydrocarbon contamination, plant and machinery shall be serviced regularly to ensure that exhaust fumes are not excessive.

4.2.3 Run-off into Drains

All potential drainage on site and any discharge points should be identified, including land drains, foul sewers, surface water drains and any combined drains. These should be marked, as appropriate, for easy identification. Works should be minimised during periods of heavy rainfall to reduce the likelihood of contaminated run-off. Temporary containment and cover measures or tamping down of stockpiles to reduce run-off shall be used where necessary.

4.2.4 Contractor Responsibilities

The following regulations, guidance and legislation relating to the works shall be complied with at all times:

- The Health and Safety Executive "Protection of Workers and the General Public During Redevelopment of Contaminated Land", HS(G)66, HMSO 1991;
- The Construction (Design and Management) Regulations 1994;
- The Control of Substances Hazardous to Health Regulations 1994.
- The Control of Asbestos Regulations 2012.
- The Contractor shall detail in his method statement how any hazardous materials and / or situations are to be handled / managed.
- The Contractor shall also be responsible for the following:
- The provision of health and welfare facilities;
- Obtaining the relevant consents / approvals;
- Mitigation measures;
- Stability of works.

4.2.5 Health and Safety

During the site operations, it will be necessary to protect the health and safety of the personnel. General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land" (HS(G)66). In summary, the following measures are suggested as a minimum level of protection:

- All ground workers should be issued with protective clothing, hard hats, footwear and gloves. Personnel should be instructed as to how they are to be used;
- All personnel shall wear hard hats, high visibility clothing and protective footwear at all times;
- Hand washing and boot cleaning facilities shall be provided;
- No smoking except in designated areas;
- Good practices relating to personal hygiene shall be adopted.

Before site operations are commenced, the necessary COSHH Assessments, Method Statements and Health and Safety Plans should be completed and issued by the Principal Contractor in Accordance with the CDM regulations.

All visitors to site must enter and register at the main site office, subject to the relevant terms and conditions of entry. All site personnel shall undergo a site specific health and safety induction prior to commencement of works on site.

Suitable precautions will be implemented to prevent dust and odour emissions during all reclamation work activities. The contractor shall provide details of emergency procedures.

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APPENDIX A – DRAWINGS

0 10 20 30 40 50m

Scale 1:1250 @ A3

N

NOTES AEWTP029C

- All dimensions and levels are to be checked on site.
- Any discrepancies are to be reported to the architect before any work commences
- This drawing shall not be scaled to ascertain any dimensions. Work to figured dimensions only.
- This drawing shall not be reproduced without express written permission from AEW.
- Title overlay drawings and ownership boundaries are produced using all reasonable endeavors. AEW cannot be responsible for the accuracy or scale discrepency of base plans supplied to them.
- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
- All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

CDM 2015

Client notified of duties: 29/04/2019

Principal Designer: AEW

Unless noted below, all known hazards have been highlighted on the drawings

REV	Date	Drawn by: -	Checked by: -
P1	31/01/20	AS	AS
Initial Issue			

Status: S2 — Purpose of Issue: For Information

drawing stage: Feasibility

client: Sunflower UK Industrial Property IV LP

project: Norquest Industrial Estate, Pheasant Drive, Birstall, Leeds

drawing title: Site Location Plan

date: 31/01/20 drawn: AS

scale@A3: 1:1250 checked: AS

Rev: P1

job no: 11321-AEW-XX-SI-DR-A-007

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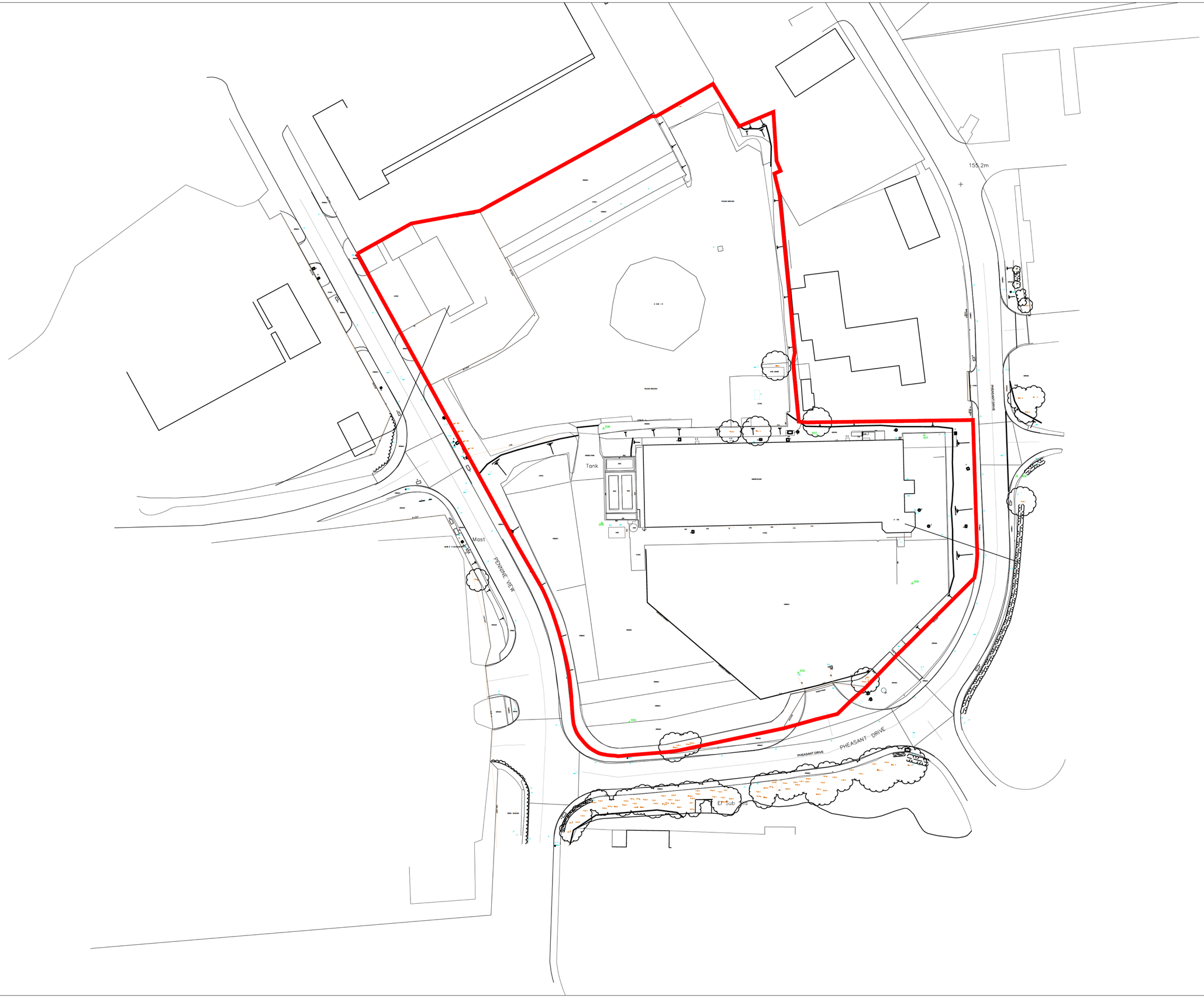

NOTES

AEWTP026C

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- All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

CDM 2015

Client notified of duties: **April 2020**

Principal Designer: **AEW**

Unless noted below, all known hazards have been highlighted on the drawing.

0 5 10 15 20 25m

Scale 1:500 @ A1

REV	Date	Drawn by: -	Checked by: -
P2	02/04/20	AB	AS
Red line boundary amended			
P1	27/03/20	AB	AS
Initial Issue			

Status: S2 — Purpose of Issue: For Information

drawing stage: **Planning**

client: **Mileway Real Estate**

project: **Norquest Industrial Estate**
Pheasant Drive
Birstall

drawing title: **Existing Site Plan**

date: 27/03/20 — drawn: AB

scale@A1: 1:500 — checked: AS

Rev **P2**

Job No **11321-AEW-XX-SI-DR-A-0501**

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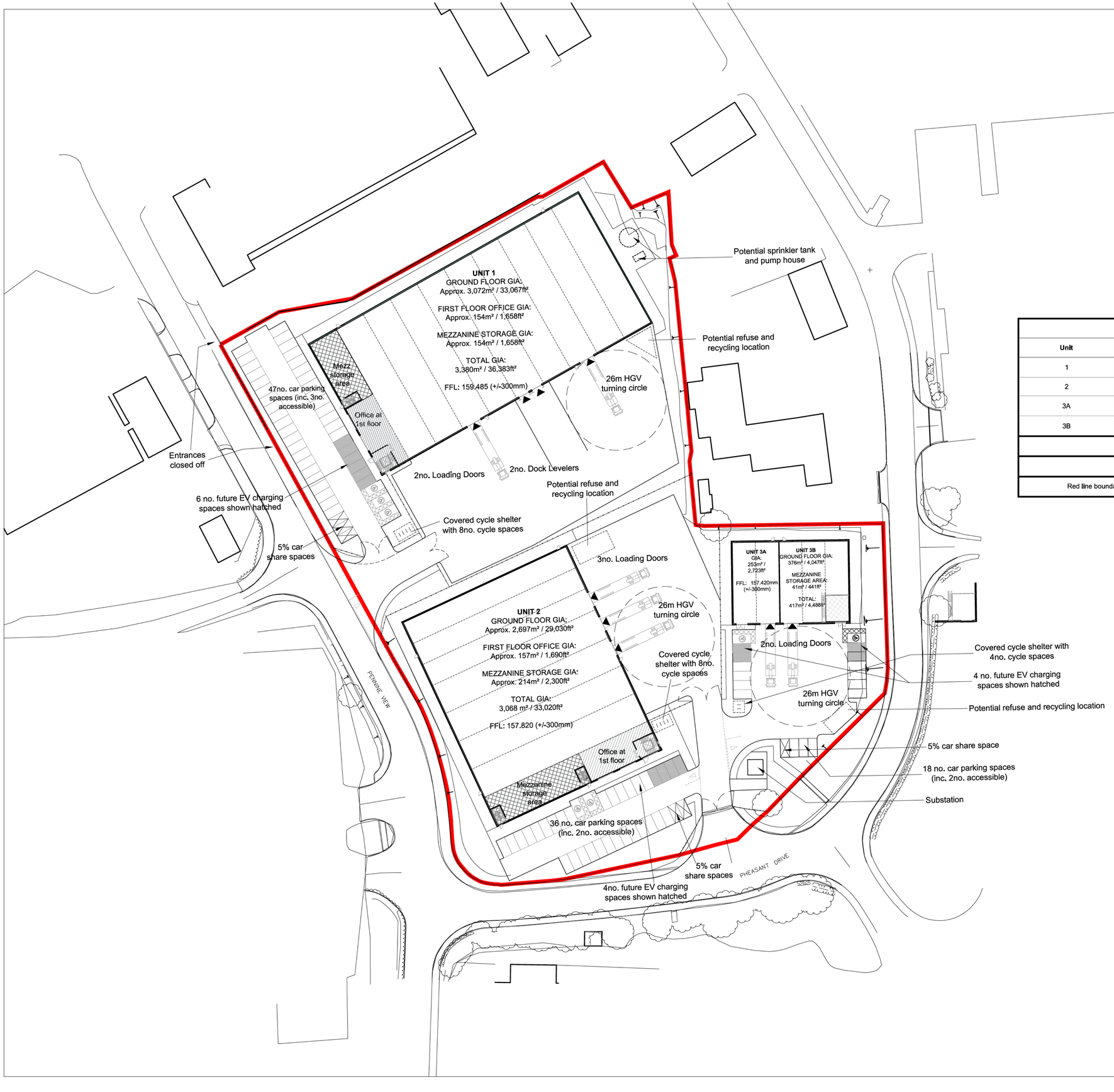

NOTES AEWTP026C

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CDM 2015

Client notified of duties: **April 2020**

Principal Designer: **AEW**

Unless noted below, all known hazards have been highlighted on the drawing:

0 5 10 15 20 25m

Scale 1:500 @ A1

Schedule of Accommodation

Unit	Ground Floor Area		First Floor Office Area		Mezzanine Storage Area		Total	
1	3,072 sqm	33,067 sqft	154 sqm	1, 658 sqft	154 sqm	1,658 sqft	3,380 sqm	36,383 sqft
2	2,697 sqm	29,030 sqft	157 sqm	1,690 sqft	214 sqm	2,300 sqft	3,068 sqm	33,020 sqft
3A	253 sqm	2,723 sqft	n/a	n/a	n/a	n/a	253 sqm	2,723 sqft
3B	376 sqm	4,047 sqft	n/a	n/a	41 sqm	441 sqft	417 sqm	4,488 sqft
Total							7,118 sqm	76,614 sqft
Red line boundary (Overall site)		4.47 Acre			1.80 Hectare			

NOTE

Finished floor levels stated are approximate only based on preliminary cut and fill exercise to balance the site, carried out by the Engineer.

An allowance of +/- 300mm has been included, to allow for final cut and fill to be carried out by the Contractor and final levels determined accordingly.

Rev	Date	Drawn by: -	Checked by: -
P6	11/08/20	AB	AS
Mezzanine storage area added to units, car and cycle spaces amended to BREEAM requirement			
P5	09/04/20	AS	AS
Finished floor levels added			
P4	02/04/20	AB	AS
Red line boundary amended			
P3	27/03/20	AB	AS
Future EV charging spaces and potential refuse and recycling added			
P2	20/03/20	AB	AS
Minor updates following DTM			
P1	21/02/20	AB	AS
Initial Issue			

Status: S2 — Purpose of Issue: For Information

drawing stage: **Planning**

client: **Mileway Real Estate**

project: **Norquest Industrial Estate, Pheasant Drive, Birstall**

drawing title: **Proposed Site Plan**

date: 21/02/20 drawn: AB

scale@A1: 1:500 checked: AS

Rev **P6**

Job No **11321-AEW-XX-SI-DR-A-0502**

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APPENDIX B – CONTROLLED WATERS RISK ASSESSMENTS

Regulatory Context

Government policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) Pollution of controlled waters is being, or is likely to be, caused."

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter"

Controlled Waters are defined Section 104 of the Water Resources Act 1991. They include in summary: Relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured.

The Environment Agency has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land. This is reinforced in The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process, rather than Local Authority or Environment Agency directly, except in cases of very high pollution risk or where harm is occurring. In the planning process, guidance is provided by National Planning Policy Framework (NPPF) of March 2012. The NPPF requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be agreed with the planners.

Environment Agency Guidance

The Environment Agency's stance on groundwater resources is:

"to protect and manage groundwater resources for present and future generations in ways that are appropriate for the risks we identify" (Groundwater Protection: Policy and Practice GP3, 2012).

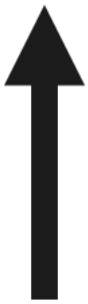
At present, the legislation and guidance pertaining to the protection of controlled waters in the UK is complex; however, the core objectives seek to enforce the position given above.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document introduced areas of focus for developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was revised in 1998, since which there have been substantial changes in legislation, driven by key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Gaps in the 1998 PPPG that emerged as the result of further legislative changes were addressed in the Environment Agency Policy document *Groundwater Protection: Policy and Practice (GP3), Version 1* of November 2012. The three main parts of GP3 were:

- Groundwater principals;
- Position statements and legislation; and
- Technical information.

The Environment Agency has a tiered risk based approach to drinking water protection as summarised below:

Increasing levels of protection



Water Protection Zones

Safeguard Zones

Source Protection Zones

Principal Aquifers

Secondary Aquifers

Controlled Waters Risk Assessment

A number of tools are available (as detailed in GP3) in order for a developer of a potentially contaminated site to fulfil their obligations under the legislation. A site assessment would be required in order to identify any potential risks to controlled waters and to derive suitable clean up criteria, if required, to ensure the protection of controlled waters.

There are three main stages to any risk assessment of controlled waters:

1) Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting, controlled waters context etc)

2) Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)

3) Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

Risk Screening

Here, the Conceptual Site Model (CSM) is a critical tool to assessing any potentially contaminated site. The information from a robust CSM can be used to establish any pathways or receptors that do not require further assessment at an early stage. For example, it may be possible to confirm the absence of a particular sensitive controlled water receptor (such as a surface water feature) within the vicinity of the Site thereby breaking the associated source-pathway-receptor pollutant linkage. Information from subsequent tiers of risk assessment, such as following intrusive investigations, are used to update the CSM accordingly.

Generic Risk Assessment - England and Wales

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with those screening criteria. Values of screening criteria with which chemical test results can be compared are published in the following:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

Generic Risk Assessment is generally undertaken via comparison of reported leachate and/or groundwater concentrations against selected assessment criteria for the potential contaminants of concern identified for the Site from a preliminary desk based assessment.

The selected Generic Assessment Criteria (GAC) derived from a Water Quality Standard (WQS) for any specific substance may not necessarily be a simple number and can often be found to be expressed as:

- Annual mean concentration;
- Maximum allowable concentration;
- 95th percentile concentration for *n* samples;
- Total concentration;
- Dissolved concentration (applicable to filtered samples)

The values may sometimes be expressed for individual substances (e.g. arsenic or for groups of substances e.g. total xylenes or sums of certain PAHs).

Environmental Quality Standards (EQS) have been used where available for Priority Substances and Priority Hazardous Substances set at a European level:

- Priority Substances Directive 2013/39/EU;
- Amending 2008/105 and 2000/118/EC

In addition, EQS values derived for Specific Pollutants have been used as presented in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

For assessing risks to potable water abstraction supplies, UK Drinking Water Standards presented in the Water Supply (Water Quality) Regulations 2000 (SI/2000/3184) (as amended) have been applied.

In selecting a GAC for a particular Site, Terra97 considers the following factors:

- Current use/function of the groundwater (e.g. drinking water, irrigation water, industrial use, base-flow to rivers and streams);
- Plausible, proposed or planned future uses of the water and nearby waters;
- Sensitivity of the critical receptor (e.g. human health, aquatic life); and,
- Requirements to trigger action under the legal context

In accordance with Part 2A:

"in deciding whether pollution of controlled waters is occurring, the assessor will have regard to all of the water quality standards that are relevant to the specific site and make a judgment against the most stringent of those relevant standards".

Please note that there is no quantitative criterion for total petroleum hydrocarbons (TPH), or speciated TPH fractions. Historically, standards provided for petroleum hydrocarbons ranges from 10µg/l (Private Water Supply Regulations 1991, removed from the 2009 regulations) to 50µg/l-1000µg/l (Surface Waters (Abstraction for Drinking Water) Regulations 1989) which related to the degree of treatment of water prior to use as drinking water. Over time, the legislative standards have been rescinded and no alternative standard provided, although the Environment Agency planned to release speciated TPH criteria (Fretwell et al., 2009). In the absence of suitable criteria, Terra97 adopts a value of 10 µg/l for more sensitive locations (e.g. Principal Aquifer, drinking water abstraction), and a value of 50µg/l for locations considered less sensitive (e.g. low permeability aquifers) or where a site is located in close proximity to a surface watercourse.

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be informed by the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The robust CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or compliance point. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Aquifer Designations

The Environment Agency have classified different types of aquifer from which groundwater can be extracted. The aquifer designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides

Source Protection Zones

Source Protection Zones (SPZs) are defined by the Environment Agency (for England and Wales), SEPA (Scotland) and the Environment and Heritage Service (Northern Ireland) for groundwater sources such as wells, boreholes and springs that are used for public drinking water supply. The zones show the risk of contamination from activities that might cause groundwater pollution in the area. The size and shape of a zone depends upon subsurface conditions, how the groundwater is removed, and other environmental factors.

SPZs are classified into four categories:

- **Zone 1 (Inner protection zone).** Any pollution that can travel to the abstraction point within 50 days from any point within the zone is classified as being inside Zone 1. This applies at and below the groundwater table. This zone also has a minimum 50 m protection radius around the abstraction point. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.

- **Zone 2 (Outer protection zone).** The outer zone covers pollution that takes up to 400 days to travel to the abstraction point, or 25% of the total catchment area, whichever area is the largest. This travel time is the minimum period over which the Environment Agency considers that pollutants need to be diluted, reduced in strength or delayed by the time they reach the abstraction point.

- **Zone 3 (Total catchment).** This is the total area needed to support removal of water from the abstraction point, and to support any discharge from this.

- **Zone of special interest.** This may occasionally be defined as a special case. This is usually where local conditions mean that industrial sites and other potential sources of contamination could affect the groundwater source, even though they are outside the normal catchment area.

- **Groundwater Vulnerability Assessments**

From 1 April 2010 The Environment Agency Groundwater Protection Policy began to use aquifer designations which are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.

- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Table 1. Aquifer Classification ("Geological Classification").

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
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