



**Contaminated Land Inspection  
Desk Study and Preliminary Risk Assessment  
(Phase 1b)  
Manor Farm  
Chequers Lane  
North Runcton**

**September 2017**

**Reference no. 17/001**

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## **Executive Summary**

This site, at Manor Farm North Runcton, was brought to the Borough Council's attention following a report of a major fire in January 2017. The Borough Council were involved in the tactical response alongside other agencies. This report is part of the recovery phase. A Phase 1 preliminary risk assessment was undertaken which highlighted the need for further research and sampling of ash material to characterise potential contamination. Further research was carried out and information was also collated from the other agencies involved in the recovery operation.

The site comprises farm buildings, yards and some rough grassland. An assessment using documentary data, historic maps, aerial photography and a site walkover has shown that the site, originally a farm, is in a rural village setting has been used as a transport yard in the last 10 years and more recently for an illegal waste processing activity.

Sensitive receptors as defined in statutory guidance were located within 300m of the site. These were nearby residents, horses, buildings, surface and ground waters. The risk to humans and controlled water was assessed from the initial desk study as medium and required further investigation.

A sampling strategy was developed to further characterise the site and to gather information to develop the conceptual site model. Dust deposition gauges were used to estimate deposition rates of ash and composition of dust at local receptors. Samples were taken of ash from the site of the fire and submitted for laboratory analysis to qualify the risk to receptors from contaminants of concern. The Environment Agency carried out water and sediment sampling on nearby watercourses.

The laboratory analysis generally reported concentrations of the contaminants below screening levels for residential land and all below screening levels for commercial land. Asbestos was not detected in any samples. Levels of dust measured at sensitive receptors were not significantly high and were not at nuisance levels due to ash from Manor Farm. On recent monitoring visits, odour at nearby receptors was slight and ash deposition was not visible.

Health effects to human health can be easily prevented by means such as normal washing of home grown produce and closing doors and windows on any occasion that residents are affected by strong odour or severe dust. The hazard to crops, produce, livestock, owned or domesticated animals (horses) and buildings was assessed as low.

Due to dispersion and dilution effects, concentrations of contaminants would be expected to be low if the exposure pathway to groundwater was active. Chemical analysis of sediment did not indicate that contaminants were at significant levels in the nearby minor watercourse. Leachate analysis indicated that the contaminants in the ash have a low leachability and therefore are unlikely to be mobile in solution. The hazard to controlled water was assessed as low.

The revised conceptual site model indicates although plausible source pathway receptor linkages were identified, a LOW risk from contamination was identified to surface water, LOW risk to human health, LOW or VERY LOW risk to property and the wider environment. There was no evidence of harm or of a significant possibility of significant harm to the receptors identified in the conceptual site model. No evidence was noted of significant pollution of controlled waters or of the significant possibility of such pollution.

There is little reason to consider that the land might pose an unacceptable risk. This report forms a written statement that, on the basis of its assessment, the authority has concluded that the land does not meet the definition of contaminated land under Part 2A and is not considered Contaminated Land.

## **1. Introduction**

This site was prioritised for detailed inspection under Part 2A of the Environmental Protection Act 1990 as part of recovery activities following a potential major pollution incident.

This report details further review of information and risk assessment of land at Manor Farm North Runcion. This report should be read in conjunction with the Phase 1 Preliminary Risk Assessment, February 2017 (Appendix E).

## **2. Desk Study Summary Information**

### ***Location***

The site's location is shown in Appendix B, Plan 1. The grid reference for the centre of the site is 563974 315335, the nearest postcode is PE33 0QN.

### ***Land ownership and occupancy***

Enquiries have been made to establish land ownership. This report will be made available to the site owners.

### ***Previous Site Usage***

The site was previously in agricultural use, historically associated with Manor Farm House. The yard also previously operated as a HGV transport yard.

### ***Present Site Usage***

The present site comprises farm buildings, yards and some rough grassland (shown on plan 2). Most recently the land has been used for an illegal waste activity. This resulted in large stockpiles of waste materials (predominantly wood) accumulating on site. On site vehicle wash-down equipment is used by a haulage company based elsewhere.

### ***Recent Incident***

The emergency services were notified of a large waste wood fire on the site on 21<sup>st</sup> January 2017. A Multi-Agency Local Co-ordinating Group provided a tactical response to the fire and this included monitoring and limiting on and off-site pollution from the fire.

The size of the pile is now considerably reduced. Flames have not been noted on the regular site visits. However, at the time of writing, the pile is smouldering in the eastern part of the burnt waste wood area giving rise to odour off-site. The site occupier, Mr Mark Fuller and local residents have been kept informed of the outcome of site visits and proposed actions to investigate.

### ***Environmental setting***

Bedrock geology is Mintlyn Member Sand. The site is located on an area with published high groundwater vulnerability as it overlies a principal aquifer with high permeability. Although there is a risk of infiltration into the ground, the Environment Agency (EA) have stated that they do not have an immediate concern about the risk

to groundwater. The ground on site is heavily compacted which is more likely to cause runoff to enter the nearby surface watercourse. The main discharge route for surface water runoff is into a minor watercourse located on the western boundary of the site which flows south towards Setch Road, Setchey.

### ***Environment Agency and Norfolk County Council Records***

Since carrying out the initial desk top study further information came to light indicating that additional illegal waste activities had taken place historically around the Manor Farm site, including areas of North Runcton Common.

The Environment Agency have provided details of a number of pollution incidents recorded in the vicinity, particularly on North Runcton common and at Manor Farm. A number of the incidents concerned the deposit of waste on land and burning of waste. The incidents were attended by the EA and appropriate enforcement action taken.

Unbunded fuel tanks which were previously on the Manor Farm site were removed at the request of the EA. Action was also taken to de-register waste licensing exemptions following an enforcement visit to investigate burning of trade waste.

Norfolk County Council have provided a large number of photographs which show the location and approximate quantities of waste identified during previous investigations.

The Environment Agency have provided results of analysis of surface water and sediment samples from the vicinity to date. These indicate that water run-off from the fire has not significantly impacted the nearby surface watercourse.

The Environment Agency also provided chemical analysis results for samples taken from a similar incident elsewhere involving a waste wood fire for comparison.

### ***Site Walkover***

The site has been visited on a number of occasions by Borough Council officers in response to the ongoing fire. Recent photographs are included in Appendix A.

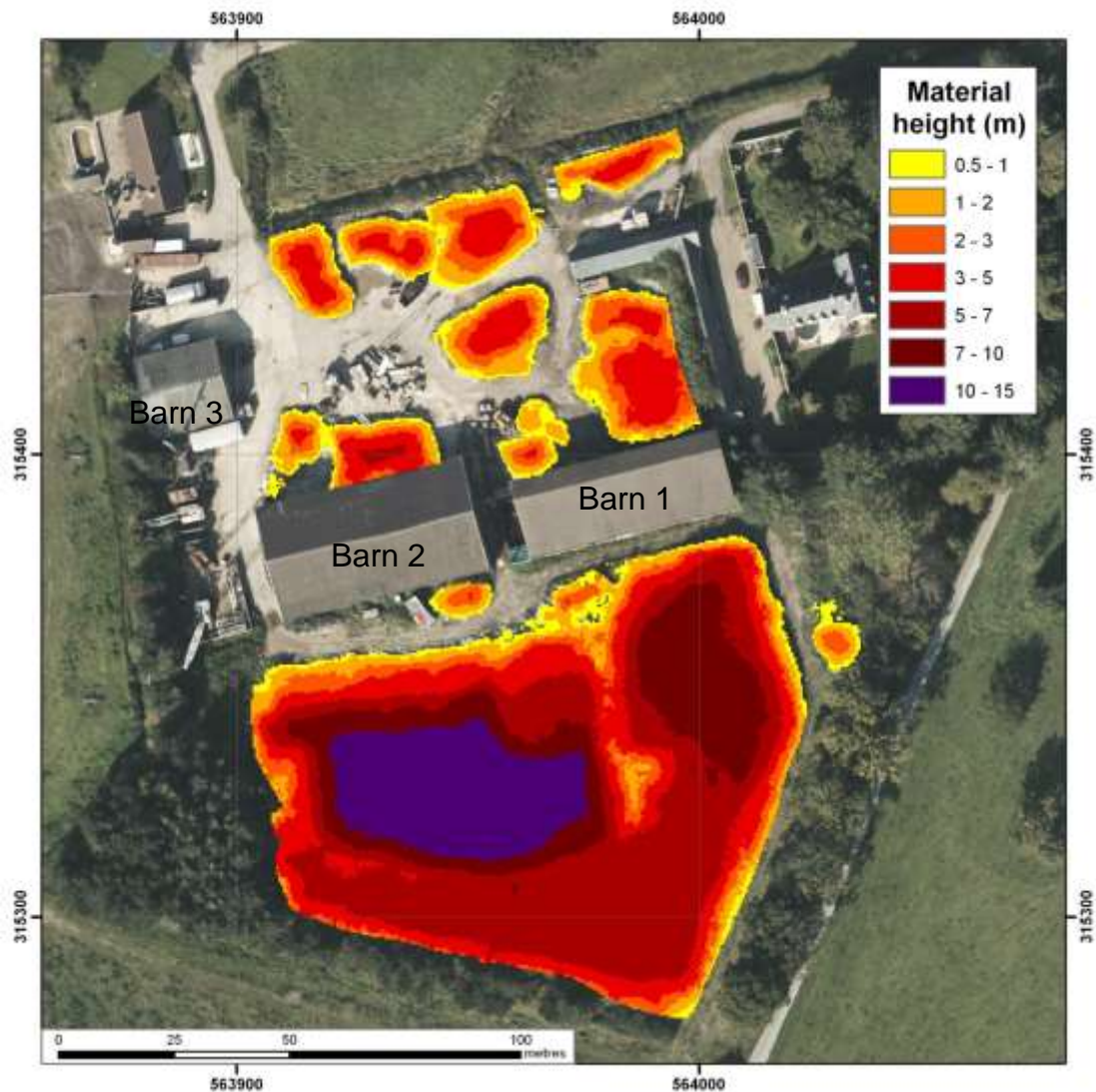
The wider site can be zoned according to land use and pollution history. Zones are shown in plan 2.

Zone 1, consists of the burnt waste wood surrounded by an area of disturbed ground to the north and a large crescent shaped bund, approximately 10 m high, of soils and demolition material on the southern and eastern side. The bund is vegetated with grass, brambles, buddleia and annual weeds. The ash pile is up to 3m high and contains a large proportion of scrap metal. The western boundary of the fire site is vegetated with semi-mature trees. The eastern, southern and western boundaries of the site is formed of rough grassland, hedge, shrubs and trees.

Zone 2 is predominantly hard-surfaced and consists of barn type farm buildings and open yard. There are stockpiles of waste wood and construction & demolition materials as indicated in the Phase 1 preliminary risk assessment and shown in Figure 2. Horses are kept in barn 1, shredded wood and machinery in barn 2. No



access was gained to barn 3. To the north of Zone 2 is Manor Farm Bungalow where it is understood that the site owner lives with his family.



**Figure 2: 2015 aerial photograph of the Manor Farm site with material heights overlaid (from Material Volume Calculations for Manor Farm report, Geomatics, October 2015)**

Site drainage was observed to reflect the conditions predicted by the EA. A waterlogged area was noted on the western boundary corresponding to the main discharge route to surface water identified by the EA. The hard-standing in this area is equipped with a pressure washer used for vehicle washing. Run-off from this area is towards the drainage feature.

Zone 3, to the north, east and southeast of Manor Farm is common land used for grazing cattle and informal recreation. Ground cover is grassland and occasional trees. Zone 3 to the north of Manor Farm contained some vegetated mounds of earth which relate to illegal deposits of waste soils investigated by the EA.

Zone 4 is a paddock used for grazing horses and consists of grassland, uneven in places with occasional fragments of brick and stone at the surface.

Land to the west consists of paddocks used for grazing horses. The surrounding area is predominantly in arable use.

### ***Assessment of Site Use***

From the assessment of the site using documentary data, historic maps, aerial photography and a site walk over it can be seen that the site, originally a farm, is in a rural village setting, has been used as a transport yard in the last 10 years and more recently for a waste processing activity. The site has recently been subject to a fire.

### ***Location of Receptors***

#### ***Humans***

The closest residential property, Manor Farm House, is approximately 70m to the north east of the fire site. Manor Farm Bungalow is approx 120m to the north. Manor Farm cottages are approx 190m to the northeast. Residential properties on Chequers Lane are approx 280m to the north. The residential properties have large gardens and some grow produce for consumption. During the fire incident ash was observed settling on nearby cars and residential properties. Residents over 1km from the site reported being affected by smoke, ash and odour.

#### ***Property - horses***

Horses are kept in one barn on Manor Farm and grazed adjacent to the south and west of the site.

#### ***Property - buildings***

There are a number of farm buildings on the Manor Farm and residential properties as detailed above.

#### ***Environment***

The site and surrounding area does not contain any of the receptors stipulated in Table 1 of the Statutory Guidance.

#### ***Controlled water – surface water***

The closest surface water is a minor watercourse located directly on the western boundary of the site. The ground on the site of the fire is heavily compacted which could cause runoff to enter the nearby watercourse.

#### ***Controlled water - groundwater***

The site is not in any Source Protection Zone for the protection of potable drinking water supplies. There are no recorded licensed groundwater abstractions in the vicinity. The unproductive nature of the aquifer for abstracting water resources is consistent with that of sand bedrock. Although there is a risk of infiltration into the ground, the EA does not have an immediate concern about the risk to groundwater due to the compaction of the ground around the site of the fire.

### ***Preliminary Hazard Assessment***

The principle constituents of wood are carbon, hydrogen, oxygen, calcium, potassium, sulphur, nitrogen and magnesium. A review of information on waste wood and on the combustion products of waste wood indicates that the contaminants of concern are:

- Metals (from wood treatments),
- Petroleum Hydrocarbons (from wood treatment and poor waste management practices - C8-40 as the more volatile components will have been lost on heating and combustion),
- Semi-Volatile Organic Compounds (wood treatment & products of incomplete combustion),
- Dioxins and Furans (wood treatment & products of incomplete combustion)
- Asbestos (non-flammable contaminant of wood waste)

### ***Preliminary conceptual site model***

The preliminary risk assessment identified a plausible source pathway receptor linkage and a MODERATE risk from contamination to surface water, MODERATE/LOW risk to human health. The preliminary conceptual site model below illustrates this assessment. Appendix D provides an explanation of the risk assessment method and terminology.

Table 1: Preliminary conceptual site model

| Source   | Pathway  | Receptor  | Probability | Hazard | Risk                 |
|--|--|---|-------------|--------|----------------------|
| PAH,<br>Metals and<br>metalloids<br>within ash | Direct<br>contact<br>Ingestion<br>Inhalation     | Humans  | Low         | Medium | Moderate/Low<br>risk |
| PAH,<br>Metals and<br>metalloids<br>within ash | Direct<br>Contact<br><br>Ingestion<br>Inhalation | Property<br>(Buildings &<br>horses)<br><br>(horses) | Low         | Low    | Low                  |
| PAH,<br>Metals and<br>metalloids<br>within ash | Direct<br>contact                                | Environment   | Low         | Low    | Low                  |
| PAH,<br>Metals and<br>metalloids<br>within ash | Direct<br>contact                                | Controlled<br>water<br>(Surface<br>water)           | Likely      | Medium | Moderate             |
| PAH,<br>Metals and<br>metalloids<br>within ash | Direct<br>contact                                | Controlled<br>water<br>(Ground<br>water)            | Low         | Low    | Low                  |

### **3. Site Investigation**

To proceed to the next stage of risk assessment the statutory guidance states that there should be evidence that an unacceptable risk could reasonably exist. As the exact nature of contaminants within the ash on site was not known, further investigation was carried out to further quantify the risks to humans and controlled water and to determine potential liability.

In order to refine the conceptual site model, a sampling strategy was designed to identify the nature of any contamination in the ash and to provide an indication of the potentially active migration pathways.

#### ***Sampling Strategy***

The site was zoned according to land use as indicated on Plan 2. Zone 1 is part of the illegal waste site which was subject to the most recent incident involving a fire of waste wood. Zone 2 is the remainder of the Manor Farm site which has previously been used as a transport yard and for an illegal wood and construction waste processing operation. Zone 3 is parts of North Runcton Common which has had material deposited on it without the benefit of an environmental permit. Zone 4 is grassland to the south of Manor Farm which has been subject to planning enforcement and remedial action due to the deposit of materials to construct a 4 x 4 driving range.

As Zones 2-4 have been subject to regulatory action under other regimes and as there is no evidence of significant harm from these zones, they will not be considered further under Part 2A for the current permitted uses. This sampling strategy considers the risk from ash material in Zone 1 to sensitive receptors identified in the conceptual site model as the fire has introduced a new source of contamination.

The original wood pile in Zone 1 was estimated to contain 27689m<sup>3</sup> of material and was a maximum height of 15m (estimated in LIDAR survey). The pile has been reduced to approximately 20% of the original volume and covers an area of approximately 70x40m and height of 1-3m (estimated from aerial photography and on site observations). Therefore it is estimated that approximately 5500m<sup>3</sup> of ash and metal remain in the heap. The precise weight and volume of ash and metal is not known and would be difficult to estimate without further formal surveying.

The conceptual model suggests that the risks from the following exposure pathways require further qualification:

***Wind-blown ash → inhalation exposure, ingestion from home grown produce***

***Run off of particles suspended in water & dissolved contaminants → controlled waters***

The sampling methodology was developed with reference to BS 10175:2011; IAQM IES Guidance on Air Quality Monitoring in the vicinity of demolition and construction sites; and EA Technical Guidance note Monitoring Particulate matter in ambient air around waste facilities.

### ***Sampling strategy aims***

Sampling and risk assessment will aim to

- identify the potentially hazardous substances present in the ash
- gather information to develop the conceptual site model
- obtain further information on potential exposure pathways
- estimate the deposition rate of ash and composition of dust at local receptors
- qualify the risks to the identified receptors in the conceptual site model
- provide information to design further investigation or consider remedial options.

### ***Sampling strategy objectives***

To achieve the aims the objectives are:

- Install passive dust deposition gauges at 5 residential receptors for two 4 week periods
- Identify potential contaminants associated with waste wood combustion
- Take samples of ash and clinker when the site of the fire has sufficiently cooled
- Submit samples of ash and clinker for laboratory analysis
- Submit deposit gauge samples for laboratory gravimetric and microscopy analysis

### ***Ash Sampling***

The preliminary hazard assessment indicated that the contaminants of concern are:

- Metals
- Petroleum Hydrocarbons
- Semi-Volatile Organic Compounds
- Dioxins and Furans
- Asbestos

The principle exposure pathways of concern are the action of wind and surface water. Samples were taken to provide an indication of the composition of the ash at the near surface of the heap. As the material is not a soil and resembles a stockpile, four composite ash samples were deemed appropriate as this will represent the mean of the areas sampled.

Clinker material is consolidated and less likely to become suspended in wind or water therefore two samples were taken where this material is exposed near the edges of the pile where it may be more susceptible to mechanical weathering action.

The sampling area was approximately 70m x 40m. Four spatial composite samples of ash were taken from evenly spaced near-surface samples of similar size taken over an area using a stainless steel trowel and bulked together. Each composite sample contained 25 individual samples. The samples were sieved using a 5mm sieve (to remove large fragments of metal) mixed and placed in the laboratory supplied 1kg tub and 500g jars. Clinker samples were taken directly from two locations and placed into tubs and jars. Samples were placed into a cool box for transport to the laboratory.

Sampling locations are indicated on Plan 3.

Laboratory analysis was carried out on selected samples to determine concentrations of the determinands below:

- Metals Suite
- Total Petroleum Hydrocarbons C8-C40 Aliphatic/Aromatic
- Semi-Volatile Organic Compounds (USEPA 625)
- Dioxins and Furans (Based on US EPA 1613)
- Asbestos

Potential asbestos containing materials had been visually identified on the site. Leachate analysis was also carried out to indicate the mobility of the contaminants.

### ***Deposit Sampling***

Deposit gauges were placed at receptor points around Manor Farm at the following locations as indicated on Plan 1 and Plan 3:

Table 2: Deposit Gauge sampling locations

| Site                   | Direction       | Distance from fire | Reason   |
|------------------------|-----------------|--------------------|--|
| Manor Farm Bungalow    | north west      | 130m               | Adjacent to site   |
| 26 Chequers Lane       | north           | 260m               | Affected by dust and odour                                     |
| Manor Farm House       | north east      | 100m               | Adjacent to site, affected by dust and odour (prevailing wind) |
| Manor Farm Cottages    | north east      | 220m               | Affected by dust and odour (prevailing wind)                   |
| Oak Avenue, West Winch | west south west | 750m               | Affected by dust and odour                                     |

Samples from deposit gauges were collected by washing collected dust into the collection bottle. This was submitted for gravimetric laboratory analysis to determine dust mg/m<sup>2</sup>/day and microscopy to obtain a description of the dust present.

### ***Results of laboratory analysis***

Laboratory analysis certificates are included in Appendix C

#### ***Ash***

Concentrations of polyaromatic hydrocarbons and semi volatile organic compounds were all reported below 1mg/kg with the exception of fluoranthene and pyrene in sample S2 which were reported at 2.3mg/kg and 1.5 mg/kg respectively.

The highest concentrations of metals were reported for Iron, Zinc and Lead. Asbestos was not reported to have been detected in any sample.

The overall toxicity of a mixture of dioxins and dioxin-like compounds is assessed as the sum of the World Health Organisation toxic equivalence (TEQ) exposures for the

individual compounds present.<sup>1</sup> The laboratory reported the calculated TEQs. The maximum total TEQs were 3.5µg/kg in the bulk sample S2 and 0.000019µg/kg in leachate. The leachate result was calculated based on the limit of detection as all dioxins and furans leachate results were below the laboratory limit of detection.

Table 3 below provides a summary of the analysis of the ash samples where concentrations were reported above limit of detection. Table 6 in Appendix C shows these values compared to screening criteria.

Table 3: Summary of chemical analysis

| <b>Metals and metalloids</b>  | <b>min<br/>mg/kg</b> | <b>max<br/>mg/kg</b> | <b>leachate<br/>min</b> | <b>leachate<br/>max</b> |
|---|----------------------|----------------------|-------------------------|-------------------------|
| Arsenic   | 37                   | 150                  | 3.3                     | 34                      |
| Boron (water-soluble)   | 2                    | 3                    | 0.03                    | 0.72                    |
| Barium  | 200                  | 480                  | 45                      | 100                     |
| Cadmium   | 1                    | 11                   | 0.03                    | 0.14                    |
| Cobalt  | 12                   | 15                   | 3                       | 3                       |
| Chromium  | 55                   | 91                   | 26                      | 26                      |
| Copper  | 210                  | 480                  | <LOD                    | <LOD                    |
| Iron  | 13000                | 23000                | <LOD                    | <LOD                    |
| Manganese   | 420                  | 700                  | 3                       | 3                       |
| Molybdenum  | 11                   | 12                   | 16                      | 37                      |
| Nickel  | 25                   | 46                   | 13                      | 13                      |
| Lead  | 350                  | 2200                 | 26                      | 26                      |
| Antimony  | 22                   | 69                   | 12                      | 36                      |
| Selenium  |                      |                      | 6.2                     | 6.2                     |
| Tin   | 9                    | 84                   | <LOD                    | <LOD                    |
| Vanadium  | 21                   | 72                   | 8                       | 8                       |
| Zinc  | 860                  | 5900                 | 3                       | 3                       |
| <b>Total Petroleum Hydrocarbons</b>   | <b>min<br/>mg/kg</b> | <b>max<br/>mg/kg</b> | <b>leachate</b>         |                         |
| TPH (C12-C16 aliphatic)   | <1                   | 3                    | <LOD                    |                         |
| TPH (C16-C21 aliphatic)   | <1                   | 17                   | <LOD                    |                         |
| TPH (C21-C35 aliphatic)   | 3                    | 18                   | <LOD                    |                         |
| TPH (C12-C16 aromatic)  | <1                   | 19                   | <LOD                    |                         |
| TPH (C16-C21 aromatic)  | <1                   | 76                   | <LOD                    |                         |
| TPH (C21-C35 aromatic)  | <1                   | 18                   | <LOD                    |                         |
| <b>Dioxins and Furans</b>   | <b>min ng/kg</b>     | <b>max<br/>ng/kg</b> | <b>max<br/>µg/kg</b>    |                         |
| Dioxins and Furans (Toxic Equivalent)<br>bulk sample  | 38                   | 3500                 | 3.5                     |                         |
| Dioxins and Furans (Toxic Equivalent)<br>leachate   | 0                    | 0.019                | 0.000019                | (LOD)                   |
| <div> <div>&lt;LOD = less than laboratory limit of detection</div> <div>(LOD) = result calculated based on laboratory limit of detection</div> </div> |                      |                      |                         |                         |

<sup>1</sup> Environment Agency Science Report SC050021/Dioxins SGV, 2009

### *Deposit Sampling*

Table 4 below shows a summary of the deposit gauge laboratory analysis. Microscope analysis was carried out on the April sample to determine the types of materials present. In May the 'frisbee' collection system was supplied with a foam insert which can increase the amount of dust collected.

Highest concentrations of dust were detected at Manor Farm bungalow during both monitoring periods ( $29\text{mg/m}^2/\text{d}^{-1}$  April and  $87\text{ mg/m}^2/\text{d}^{-1}$  May). The lowest concentrations were reported at Manor Farm House during April and at Manor Farm Cottages during May. An average of 52% of the deposited dust was identified as unburnt coal/carbonaceous material and general dirt.

The laboratory advised that apart from unburnt coal, the unburnt coal/carbonaceous fraction could be very small particles of coke, plastic, unburnt wood and soot, some possibly from the fire. Wood ash would be included in the general dirt category along with soil, clay and some building products, most carbon from the wood having been burnt away.

Residents were asked to keep a log of any 'dusty' activities that occurred during the monitoring periods. These are summarised below and discussed in section 4.

| Date        | Location      | Description of emission                                     | Wind direction | Weather         | Time          |
|-------------|---------------|---|----------------|-----------------|---------------|
| 30 March    | Bungalow      | House 200-300 yards away being demolished                   | -              | dry sunny windy | daytime       |
| 8/9 April   | Bungalow      | Fire at scout hut   | -              | good            |               |
| 10 April    | Bungalow      | Wood fire in house<br>Also fire at Setch                    | -              | good            | pm            |
| 10/11 April | Bungalow      | Big fire at Wormegay  | -              | good with wind  | started pm    |
| 12 April    | Bungalow      | Wood fire in house  | -              | good            | pm            |
| 14 April    | Bungalow      | Fire at scout hut   | -              | dry             | am            |
| 14 April    | Bungalow      | Wood fire in house  | -              | wet             | pm            |
| 21 April    | Bungalow      | Manor Farm West<br>Winch fire                               | -              | dry no wind     | 8am           |
| 21 April    | Bungalow      | Fire in garden at house on common                           | -              | dry windy       |               |
| April       | Bungalow      | Lots of lorries in and out every day so dusty               | -              |                 |               |
| 01 May      | Chequers Lane | Powder spray on common to west                              | SSW            | fine            | 18:00 - 18:20 |
| 20 May      | Chequers Lane | Fish, blood and bonemeal applied to grass in garden         | NW             | fine            | 13:00-13.30   |
| 05 May      | Chequers Lane | Builders cutting concrete blocks with motorised saw to east | E to NNE       | dry             | am - 16.30    |



Table 4: Summary of deposit gauge analysis

**ESG Test Report Number FD/11549** results of analysis carried out on the Frisbee gauge samples collected during the period 29/03/17 & 27/04/17 **(Dates vary)**

| site | location            | dust mass (mg) | deposition mg/m <sup>2</sup> /d-1) <sup>2</sup> | days | unburnt coal/ carbonaceous matter % | general dirt % | unburnt + dirt total % | deposition carbonaceous + dirt (mg/m <sup>2</sup> /d-1) |
|------|---------------------|----------------|---|------|-------------------------------------|----------------|------------------------|---|
| 1    | Manor Farm bungalow | 32             | 29  | 28   | 18                                  | 34             | 52                     | 15  |
| 2    | 26 Chequers Lane    | 30             | 26  | 29   | 12                                  | 36             | 48                     | 12  |
| 3    | Manor Farm Cottages | 20             | 17  | 29   | 22                                  | 28             | 50                     | 9   |
| 4    | Manor Farm House    | 18             | 16  | 29   | 14                                  | 36             | 50                     | 8   |
| 5    | Oak Avenue          | 23             | 20  | 29   | 8                                   | 50             | 58                     | 12  |
|      | average             | 25             | 22  | 29   | 15                                  | 37             | 52                     | 11  |

**ESG Test Report Number FD/11648** results of analysis carried out on the Frisbee gauge samples collected during the period 10/05/17 & 07/06/17

| site | location            | dust mass (mg) | deposition mg/m <sup>2</sup> /d-1) | days | unburnt coal/ carbonaceous matter % | general dirt % | unburnt + dirt total % (assumed) | deposition carbonaceous + dirt (mg/m <sup>2</sup> /d-1) |
|------|---------------------|----------------|------------------------------------|------|-------------------------------------|----------------|----------------------------------|---|
| 1    | Manor Farm bungalow | 97             | 87                                 | 28   | not analysed                        | not analysed   | 52                               | 45  |
| 2    | 26 Chequers Lane    | 82             | 74                                 | 28   | not analysed                        | not analysed   | 48                               | 36  |
| 3    | Manor Farm Cottages | 47             | 42                                 | 28   | not analysed                        | not analysed   | 50                               | 21  |
| 4    | Manor Farm House    | 77             | 69                                 | 28   | not analysed                        | not analysed   | 50                               | 35  |
| 5    | Oak Avenue          | 72             | 65                                 | 28   | not analysed                        | not analysed   | 58                               | 38  |
|      | average             | 75             | 67                                 | 28   | not analysed                        | not analysed   | 52                               | 35  |

<sup>2</sup> mg/m<sup>2</sup>/d<sup>-1</sup> = milligrammes per meter squared per day

#### **4. Contaminated Land Risk Assessment**

The Council has used a process adapted from CIRIA C552 (Contaminated Land Risk Assessment, a guide to good practice) to produce the conceptual site model and estimate the risks to defined receptors. This involves the consideration of the probability, nature and extent of exposure and the severity and extent of the effects of the contamination hazard should exposure occur. Further explanation is provided in Appendix D.

##### ***Assessment of probability of a contamination event***

From the information gathered it is considered that there is the potential for a source of contamination to be present on the Manor Farm site. The potential source is ash from the waste wood fire.

At the time of writing the fire is smouldering in limited locations in the eastern part of the ash pile. No flames are visible but the mounds are emitting small amounts of smoke. A large quantity of ash in mounds up to 3m high covers a large part of the southern half of the site (Zone 1 on plan 2 and appendix A, site photographs). The site of the fire is mostly surrounded by a large bund and barn type buildings. The site is open to rainfall but sheltered to some degree from winds by the bund and buildings.

##### ***Human, property, environment***

During the fire, ash deposits were carried in the smoke plume and deposited nearby. However the likelihood of wind whipping of dry ash is now less likely due to the lower height of the mounds and partial sheltering of the site.

In the absence of any other criteria, a custom and practice guideline of  $200 \text{ mg m}^{-2} \text{ day}^{-1}$  is widely used to indicate nuisance dust deposition measured by 'Frisbee' gauges<sup>3</sup>. Manor Farm Bungalow and Chequers Lane were the locations where the highest concentrations of dust were measured ( $87 \text{ mg m}^{-2} \text{ day}^{-1}$  and  $74 \text{ mg m}^{-2} \text{ day}^{-1}$  respectively). This may be because both locations are within 10m of a road which will be a significant source of re-suspended particles. There were also building works carried out near the Chequers Lane monitoring site which could have added to airborne dust. Oak Avenue, which is over 750m from Manor Farm experienced similar levels of dust as Manor Farm House which is adjacent to the site of the fire. This suggests that both could have been equally subject to other sources of dust than ash from the fire.

Microscope analysis showed that around half of the dust measured could contain some ash or soot derived from the Manor Farm fire. However this fraction will also contain other material such as soil and fallout from other domestic solid fuel fires and building works. The analysis does not quantify precisely the amount of dust at the residential properties which originated from the Manor Farm fire. However, it can be concluded that levels of dust measured were not significantly high and were not at nuisance levels due to ash from Manor Farm. On recent monitoring visits, odour at nearby receptors was slight and ash deposition was not visible.

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<sup>3</sup> Technical Guidance Note (Monitoring) M17, Monitoring Particulate Matter in Ambient Air around Waste Facilities, Environment Agency, 2013

Therefore the probability of a contamination event affecting human health, the wider environment or property is LOW

#### *Controlled water - Groundwater*

The sand bedrock, although an aquifer, is reported to be generally unproductive for abstracting water resources. Although there is a risk of infiltration into the ground, the EA does not have an immediate concern about the risk to groundwater due to the compaction of the ground around the site of the fire. Unless saturated, the ground is less likely to provide an exposure pathway to groundwater.

The probability of a contamination event to surface water is assessed as LOW.

#### *Controlled water - Surface water*

Site drainage provides a preferential pathway for run-off to surface water. As there is a pollution linkage to surface water and because all the elements are present, it is possible that an event might occur. However, recent chemical analysis has indicated that there is not ongoing pollution of the nearby minor watercourse. Therefore it is by no means certain that even over a longer period that a pollution event would take place and it is less likely in the short term.

The probability of a contamination event to surface water is therefore assessed as LOW.

### ***Assessment of Hazard***

Laboratory analysis results were screened against available generic assessment criteria for receptors located on the site. These are shown in Table 6 in Appendix C. Concentrations of all contaminants measured in the ash were generally below screening levels for residential sites and all were below what would be acceptable on commercial land for receptors located on the site. Based on the rate of dust deposition measured using deposit gauges there will be considerable further dilution of contaminant concentrations if any ash is blown from the site and deposited at nearby receptors. Therefore the assessment criteria are highly conservative.

#### *Human Health*

Health effects to human health can be easily prevented by means such as normal washing of home grown produce and closing doors and windows on any occasion that residents are affected by strong odour or severe dust. The hazard is assessed as LOW

#### *Property*

Harm, should it occur to crops, produce, livestock, owned or domesticated animals (Horses) and buildings is not expected to be significant as defined in the statutory guidance. The hazard is assessed as LOW

#### *Environment*

In considering environmental receptors, the statutory guidance states that the authority should only regard certain receptors (described in Table 1 of the Statutory Guidance) as being relevant for the purposes of Part 2A. Harm to an ecological

system outside that description should not be considered to be significant harm. The site and surrounding area do not contain any of the receptors stipulated in Table 1 of the Statutory Guidance.

#### *Controlled Water -Groundwater*

Due to dispersion and dilution effects, concentrations of contaminants would be expected to be low if the exposure pathway to groundwater was active. Leachate analysis indicates that the contaminants in the ash have a low leachability and therefore are unlikely to be mobile in solution. Therefore the hazard is assessed as LOW.

#### *Controlled Water - Surface waters*

Laboratory analysis of ash samples has not indicated significantly high levels of metallic or organic contaminants. Recent sediment chemical analysis has indicated that contaminants are not present at significant levels in the nearby minor watercourse. The hazard is assessed as LOW

#### ***Revised conceptual site model***

Following the site investigation the preliminary conceptual site model has been revised. The revised conceptual site model (Table 5) shows the sources, pathways and receptors identified and the subsequent risk classification<sup>4</sup>. Appendix D provides an explanation of the risk assessment method and terminology.

Table 5: Revised conceptual site model

| Source                                      | Pathway                                      | Receptor                                  | Probability | Hazard | Risk        |
|---|--|---|-------------|--------|-------------|
| PAH,<br>Metals and metalloids<br>within ash | Direct<br>contact<br>Ingestion<br>Inhalation | Humans                                    | Low         | Low    | Low         |
| PAH,<br>Metals and metalloids<br>within ash | Direct<br>Contact<br>Ingestion<br>Inhalation | Property<br>(Buildings &<br>horses)       | Low         | Low    | Low         |
| PAH,<br>Metals and metalloids<br>within ash | Direct<br>contact                            | Environment                               | Unlikely    | Low    | Very<br>Low |
| PAH,<br>Metals and metalloids<br>within ash | Direct<br>contact                            | Controlled<br>water<br>(Surface<br>water) | Low         | Low    | Low         |
| PAH,<br>Metals and metalloids<br>within ash | Direct<br>contact                            | Controlled<br>water<br>(Ground<br>water)  | Low         | Low    | Low         |

<sup>4</sup> Descriptors adapted from CIRIA C552, 2001 Contaminated Land Risk Assessment: A guide to good practice.

LOW risk indicates that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised would at worst normally be mild.

VERY LOW risk indicates that there is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is unlikely to be severe.

## **5. Outcome of the Preliminary Risk Assessment**

Plausible source pathway receptor linkages were identified and a LOW risk from contamination was identified to surface water, LOW risk to human health, LOW risk to property and VERY LOW to the wider environment.

There was no evidence of harm or of a significant possibility of significant harm to the receptors identified in the conceptual site model. As the risk posed is low, the site would be classified as Category 4 as set out in the Statutory Guidance (Appendix D contains the categorisations from the Statutory Guidance).

No evidence was noted of significant pollution of controlled waters or of the significant possibility of such pollution.

## ***Part 2A Status***

Statutory Guidance states that 'If the authority considers there is little reason to consider that the land might pose an unacceptable risk, inspection activities should stop at that point.' In such cases the authority should issue a written statement to that effect. This report forms that written statement.

On the basis of its assessment, the authority has concluded that the land does not meet the definition of contaminated land under Part 2A and is not considered contaminated land.

## ***Further Action***

This assessment is based on the site's current use and is valid providing no changes are made to the nature of the ash pile, to site topography, to surface water conditions or to the site's use.

No further assessment of the site is considered necessary under Part 2A unless additional information is discovered or if the site is considered for redevelopment.

## Appendices

## *Appendix A Site Photographs*



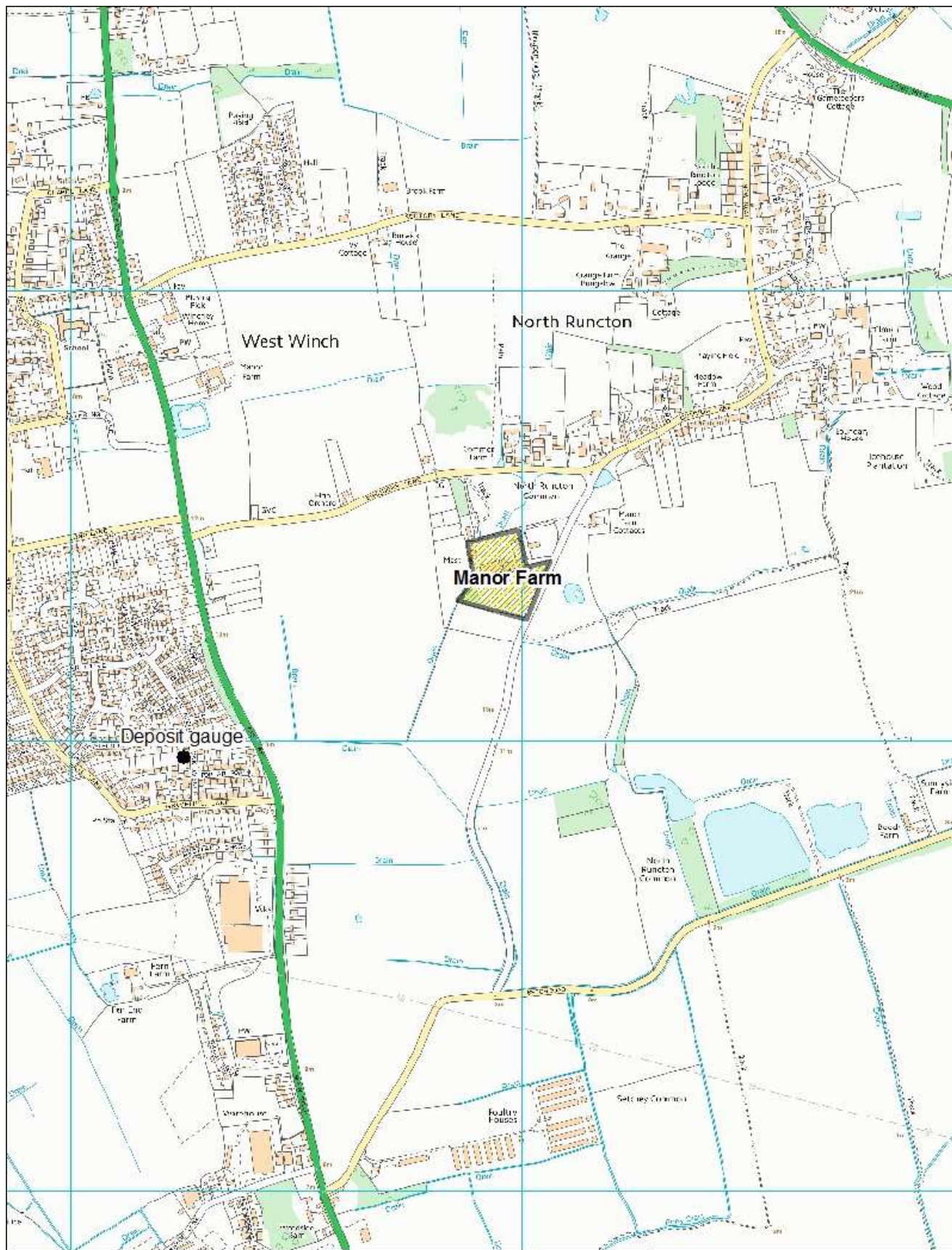
*Photograph 1. View of area of fire February 2017*



*Photograph 2. View of area of fire August 2017*

## *Appendix B Drawings*





Borough Council of  
King's Lynn &  
West Norfolk



Title

Site location

Project / Details

Manor Farm N Runcton

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Drawn by

FAP

Date

July 2017

Scale

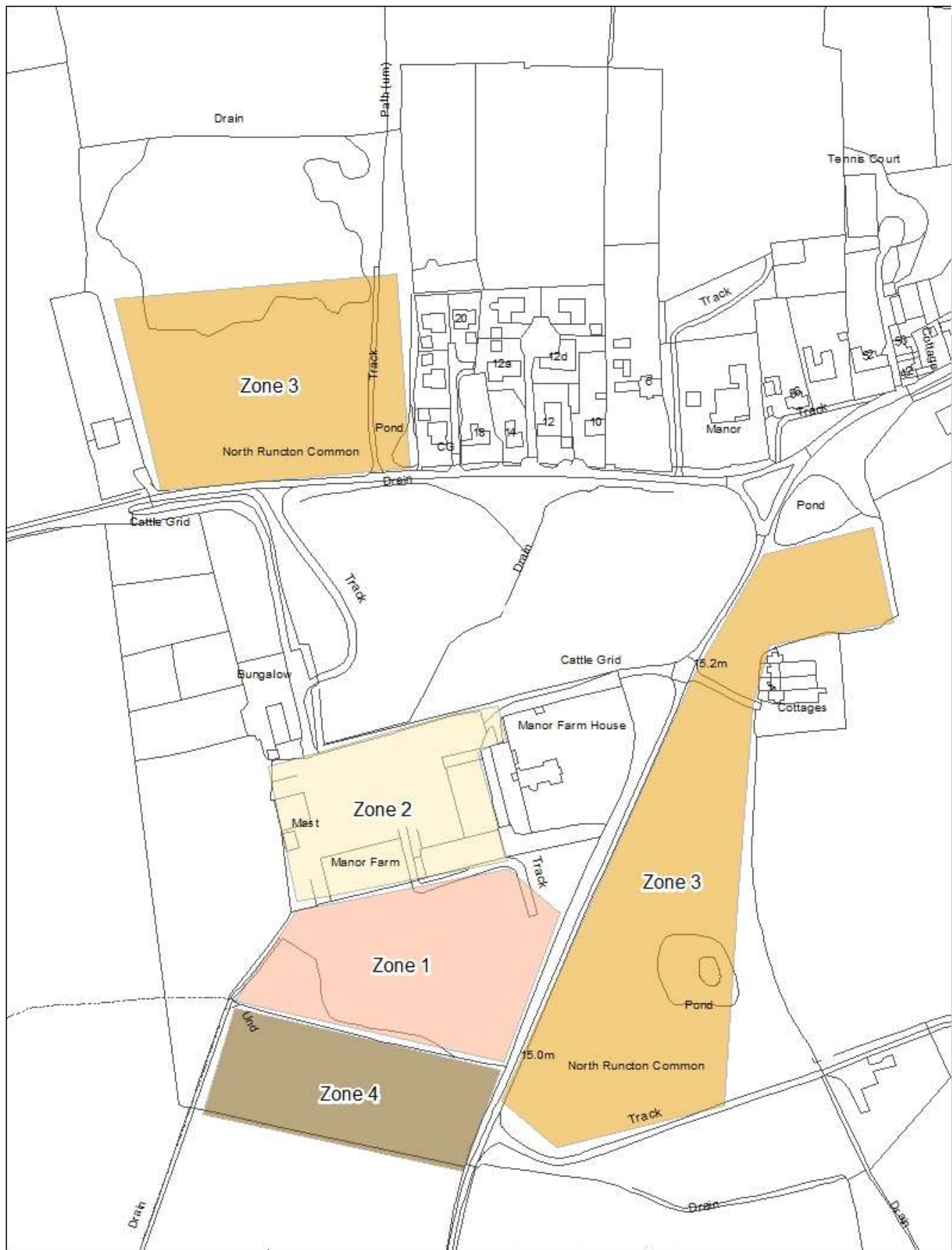
1:10,000

Drawing / Reference Number

plan 1



Plan 1: Site location map



Borough Council of  
**King's Lynn &  
West Norfolk**



Title

Site Zones

Project / Details

Manor Farm N Runcton

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Drawn by

FAP

Date

July 2017

Scale

1:2,500

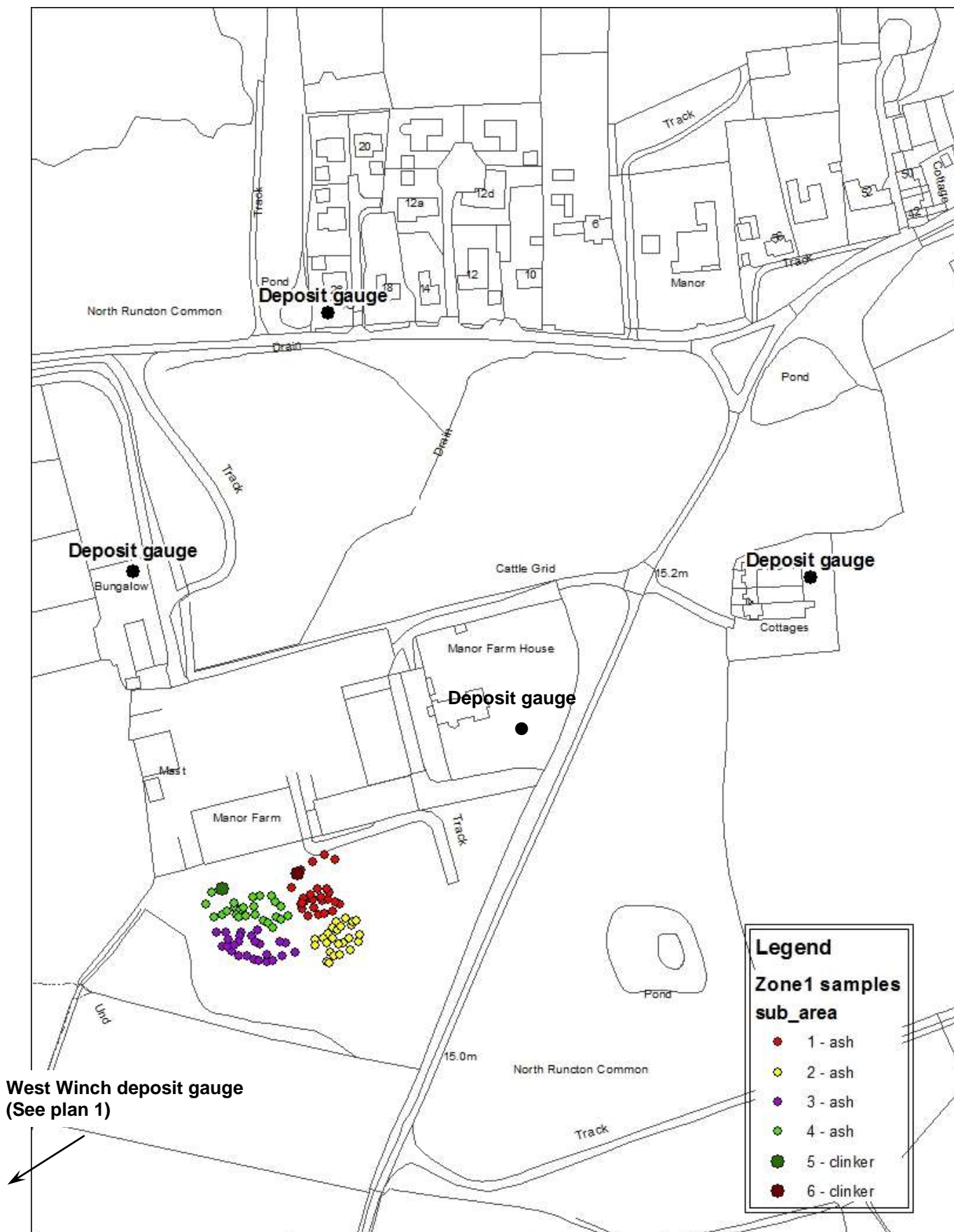
Drawing / Reference Number

plan 2



**Plan 2: Site Zones**





West Winch deposit gauge  
(See plan 1)

Borough Council of  
**King's Lynn &  
West Norfolk**



Title

**Sampling locations**

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Project / Details

**Manors Farm N Runcion**

Drawn by

**FAP**

Date

**July 2017**

Scale

**1:2,000**

Drawing / Reference Number

**plan 3**



**Plan 3: Sampling locations**

## *Appendix C Laboratory analysis summary & certificates*

**Table 6: Laboratory Analysis summary and Assessment Criteria for screening laboratory analysis results (for analytes above limit of detection)**

| Determinant                           | min<br>µg/kg         | max<br>µg/kg         | screening<br>criteria | screening<br>criteria | Source                             |
|---------------------------------------|----------------------|----------------------|-----------------------|-----------------------|------------------------------------|
| Dioxins and Furans (Toxic Equivalent) | 0.038                | 3.5                  | 8                     |                       | SGV residential                    |
| <b>Metals</b>                         | <b>min<br/>mg/kg</b> | <b>max<br/>mg/kg</b> |                       |                       |                                    |
| Arsenic                               | 37                   | 150                  | 32                    | 640                   | C4SL res with / Commercial         |
| Boron (water-soluble)                 | 2                    | 3                    | 290                   | 240000                | S4UL res with / Commercial         |
| Barium                                | 200                  | 480                  | 1300                  | 22000                 | EIC/AGS/CL:AIRE GAC                |
| Beryllium                             | 0                    | 0                    | 1.7                   | 12                    | S4UL res with / Commercial         |
| Cadmium                               | 1                    | 11                   | 22                    | 410                   | C4SL res with / Commercial         |
| Chromium VI                           | 0                    | 0                    | 6                     | 33                    | S4UL res with / Commercial         |
| Cobalt                                | 12                   | 15                   | 9                     | 240                   | Dutch Target / Intervention Values |
| Chromium                              | 55                   | 91                   | 6.1                   | 52                    | C4SL res with / Commercial         |
| Copper                                | 210                  | 480                  | 2400                  | 68000                 | S4UL res with / Commercial         |
| Iron                                  | 13000                | 23000                |                       |                       | not a priority contaminant         |
| Mercury                               | <1                   | <1                   | 1.2                   | 58                    | S4UL res with / Commercial         |
| Manganese                             | 420                  | 700                  |                       |                       | not a priority contaminant         |
| Molybdenum                            | 11                   | 12                   | 670                   | 17000                 | EIC/AGS/CL:AIRE GAC                |
| Nickel                                | 25                   | 46                   | 180                   | 980                   | S4UL res with / Commercial         |
| Lead                                  | 350                  | 2200                 | 200                   | 2300                  | C4SL res with / Commercial         |
| Antimony                              | 22                   | 69                   | 550                   | 7500                  | EIC/AGS/CL:AIRE GAC                |
| Selenium                              |                      |                      | 250                   | 12000                 | S4UL res with / Commercial         |
| Tin                                   | 9                    | 84                   |                       |                       | not a priority contaminant         |
| Vanadium                              | 21                   | 72                   | 410                   | 9000                  | S4UL res with / Commercial         |
| Zinc                                  | 860                  | 5900                 | 3700                  | 730000                | S4UL res with / Commercial         |

| Petroleum Hydrocarbons                                       | min<br>mg/kg  | max<br>mg/kg | screening<br>criteria       | screening<br>criteria      |                                     |
|--|---|--------------|-----------------------------|----------------------------|-------------------------------------|
| Total Petroleum Hydrocarbons (C12-C16 aliphatic)             | <1  | 3            | 1100 (24) <sup>sol</sup>    | 59000 (24) <sup>sol</sup>  | S4UL res with / Commercial          |
| Total Petroleum Hydrocarbons (C16-C21 aliphatic)             | <1  | 17           | 65000 (8.48) <sup>sol</sup> | 1600000                    | S4UL res with / Commercial          |
| Total Petroleum Hydrocarbons (C21-C35 aliphatic)             | 3   | 18           | 65000(8.48) <sup>sol</sup>  | 1600000                    | S4UL res with / Commercial          |
| Total Petroleum Hydrocarbons (C12-C16 aromatic)              | <1  | 19           | 140                         | 36000 (169) <sup>sol</sup> | S4UL res with / Commercial          |
| Total Petroleum Hydrocarbons (C16-C21 aromatic)              | <1  | 76           | 260                         | 28000                      | S4UL res with / Commercial          |
| Total Petroleum Hydrocarbons (C21-C35 aromatic)              | <1  | 18           | 1100                        | 28000                      | S4UL res with / Commercial          |
|  |   |              |                             |                            |                                     |
| Semi volatile organic compounds<br>Polyaromatic hydrocarbons | min<br>mg/kg  | max<br>mg/kg | screening<br>criteria       | screening<br>criteria      |                                     |
| Phenol   | 0.1   | 0.1          | 120                         | 440                        | S4UL res with / Commercial          |
| 1,3-Dichlorobenzene  | 0.1   | 0.1          | 243                         |                            | CLEA calculated residential         |
| 1,4-Dichlorobenzene  | <0.1  | 0.1          | 91.3                        |                            | CLEA calculated residential         |
| 1,2-Dichlorobenzene  | <0.1  | 0.1          | 23                          | 2000                       | S4UL res with / Commercial          |
| 3/4-Methylphenol   | 0.1   | 0.3          | 25100                       | 156000                     | Atkins AtRisk res with / Commercial |
| 1,2,4-Trichlorobenzene                                       | 0.1   | 0.2          | 10.7                        |                            | CLEA calculated residential         |
| Naphthalene  | 0.1   | 0.1          | 2.3                         | 190                        | S4UL res with / Commercial          |
| Dibenzofuran   | 0.2   | 0.2          |                             |                            | Not enough info for GAC             |
| Fluorene   | 0.2   | 0.2          | 170                         | 400                        | S4UL res with / Commercial          |
| Phenanthrene   | 0.1   | 4            | 95                          | 22000                      | S4UL res with / Commercial          |
| Anthracene   | 1   | 1            | 2400                        | 84000                      | S4UL res with / Commercial          |
| Carbazole  | 0.2   | 0.2          |                             |                            | Not enough info for GAC             |
| Fluoranthene   | 0.1   | 2.3          | 260                         | 23000                      | CIEH GAC res with/ Commercial       |
| Pyrene   | 0.1   | 1.5          | 620                         | 1200                       | S4UL res with / Commercial          |
| Benzo(a)Anthracene   | 0.1   | 0.1          | 7.2                         | 170                        | S4UL res with / Commercial          |
| Chrysene   | 0.2   | 0.2          | 15                          | 350                        | S4UL res with / Commercial          |
| Bis (2-ethylhexyl)phthalate                                  | 0.1   | 0.4          | 9680                        | 85100                      | Atkins AtRisk res with / Commercial |
| Asbestos Bulk ID   | not detected  |              | -                           | -                          |                                     |
|  | <sup>sol</sup> S4UL presented exceeds the solubility saturation limit, which is presented in brackets |              |                             |                            |                                     |

## *Appendix D: Risk Assessment Methodology*

The Model Procedures for the Management of Land Contamination (CLR11<sup>5</sup>) provide the technical framework for applying a risk management process when dealing with contaminated land.

The Borough Council's Contaminated Land Strategy has identified priority sites based on mapping and documentary information. The Contaminated Land Inspection Report collates all the existing information on the site and develops a conceptual site model to identify and assess potential pollutant linkages and to estimate risk.

The risk assessment process focuses on whether there is an unacceptable risk, which will depend on the circumstances of the site and the context of the decision. The Council has used a process adapted from CIRIA C552, Contaminated Land Risk Assessment, a guide to good practice<sup>6</sup> to produce the conceptual site model and estimate the risk of harm to defined receptors. This involves the consideration of the probability, nature and extent of exposure and the severity and extent of the effects of the contamination hazard should exposure occur.

The probability of an event can be classified as follows:

- Highly likely: The event appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution;
- Likely: It is probable that an event will occur, or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;
- Low likelihood: Circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term;
- Unlikely: Circumstances are such that it is improbable the event would occur even in the long term.

The severity of the hazard can be classified as follows:

- High: Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Contaminated Land Statutory Guidance, April 2012');
- Medium: Chronic damage to human health ('significant harm' as defined in 'Contaminated Land Statutory Guidance, April 2012'), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Contaminated Land Statutory Guidance, April 2012');
- Low: Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in

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<sup>5</sup> <https://www.gov.uk/guidance/land-contamination-risk-management>

<sup>6</sup> <https://www.brebookshop.com/samples/142102.pdf>

'Contaminated Land Statutory Guidance, April 2012'). Damage to sensitive buildings, structures or the environment.

Once the probability of an event occurring and hazard severity has been classified, a risk category can be assigned from the table below:

|             |                  | Hazard            |                   |                   |
|-------------|------------------|-------------------|-------------------|-------------------|
|             |                  | High              | Medium            | Low               |
| Probability | High Probability | Very High Risk    | High Risk         | Moderate Risk     |
|             | Likely           | High Risk         | Moderate Risk     | Moderate/Low Risk |
|             | Low Probability  | Moderate risk     | Moderate/Low Risk | Low Risk          |
|             | Unlikely         | Moderate/Low Risk | Low Risk          | Very Low Risk     |

|                   |  |
|-------------------|--|
| Very High Risk    | <p>There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening</p> <p>This risk, if realised, is likely to result in a substantial liability.</p> <p>Urgent investigation (if not undertaken already) and remediation are likely to be required.</p> |
| High Risk         | <p>Harm is likely to arise to a designated receptor from an identified hazard.</p> <p>Realisation of the risk is likely to present a substantial liability.</p> <p>Urgent investigation (if not undertaken already) if required to clarify the risk and to determine the potential liability. Some remedial work may be required in the longer term.</p>                                     |
| Moderate risk     | <p>It's possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that harm would be relatively mild.</p>   |
| Moderate/Low risk | <p>It is possible that harm could arise to a designated receptor from an identified hazard. However, if any harm were to occur it is more likely that harm would be relatively mild.</p>   |
| Low Risk          | <p>It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.</p>   |
| Very Low Risk     | <p>There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is unlikely to be severe.</p>   |



*Determination of contaminated land*  
*Contaminated Land Statutory Guidance, April 2012*

**Human Health**

| <b>Category</b> |  |
|-----------------|--|
| <b>1</b>        | <p>The local authority should assume that a significant possibility of significant harm exists in any case where it considers there is an unacceptably high probability, supported by robust science-based evidence that significant harm would occur if no action is taken to stop it. For the purposes of this Guidance, these are referred to as “Category 1: Human Health” cases.</p> <p>Land should be deemed to be a Category 1: Human Health case where:</p> <ul style="list-style-type: none"><li>(a) The authority is aware that similar land or situations are known, or are strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere; or</li><li>(b) The authority is aware that similar degrees of exposure (via any medium) to the contaminant(s) in question are known, or strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere;</li><li>(c) The authority considers that significant harm may already have been caused by contaminants in, on or under the land, and that there is an unacceptable risk that it might continue or occur again if no action is taken. Among other things, the authority may decide to determine the land on these grounds if it considers that it is likely that significant harm is being caused, but it considers either: (i) that there is insufficient evidence to be sure of meeting the “balance of probability” test for demonstrating that significant harm is being caused; or (ii) that the time needed to demonstrate such a level of probability would cause unreasonable delay, cost, or disruption and stress to affected people particularly in cases involving residential properties.</li></ul> |
| <b>2</b>        | <p>Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm, with all that this might involve and having regard to Section 1. Category 2 may include land where there is little or no direct evidence that similar land, situations or levels of exposure have caused harm before, but nonetheless the authority considers on the basis of the available evidence, including expert opinion, that there is a strong case for taking action under Part 2A on a precautionary basis.</p>   |
| <b>3</b>        | <p>Land should be placed into Category 3 if the authority concludes that the strong case described in 4.25(a) does not exist, and therefore the legal test for significant possibility of significant harm is not met. Category 3 may include land where the risks are not low, but nonetheless the authority considers that regulatory intervention under Part 2A is not warranted. This recognises that placing land in Category 3 would not stop others, such as the owner or occupier of the land, from taking action to reduce risks outside of the Part 2A regime if they choose. The authority should consider making available the results of its inspection and risk assessment to the owners/occupiers of Category 3 land.</p>   |

## Human Health

### Category

- 4** The local authority should consider that the following types of land should be placed into Category 4: Human Health:
- (a) Land where no relevant contaminant linkage has been established.
  - (b) Land where there are only normal levels of contaminants in soil, as explained in Section 3 of this Guidance.
  - (c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of this Guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of this Guidance.
  - (d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

## *Appendix E: Phase 1 Preliminary Risk Assessment*