Remediation Statement

Environmental Protection Act 1990
Section 78(H) 7

Former Bayer CropScience Site, Hauxton, Cambridgeshire, CB22 5HT

Environmental Protection Act 1990, Section 78H(7)

The Contaminated Land (England) Regulations 2006 (SI2006/1380) and the Contaminated Land (England)(Amendment) Regulations 2012 (SI2012/263)

Remediation statement for the Former Bayer CropScience Site, Hauxton, Cambridgeshire, CB22 5HT

Prepared by Atkins Limited on behalf of Harrow Estates Plc

This remediation statement has been prepared by Atkins Ltd on behalf of Harrow Estates Plc in relation to contaminated land identified by South Cambridgeshire District Council (SCDC) under s.78B of the Environmental Protection Act 1990 (the 1990 Act) and designated as a special site under s.78C of the 1990 Act.

The location and extent of the contaminated land to which this remediation statement relates (the Land) are set out in Schedule 1.

The Environment Agency as enforcing authority in relation to the Land, is precluded by s78H(5)(b) of the 1990 Act from serving a Remediation Notice and Harrow Estates Plc has therefore prepared this remediation statement in accordance with s78H(7) and (8).

The things which have been done by way of remediation and their completion dates are set out in Schedule 2. Additional remedial actions which are yet to be completed are also outlined in Section 2.

Particulars of the substances and the pollution of controlled waters by reason of which the Land is contaminated land are set out in Schedule 3.

The current use of the Land is undeveloped, pending commencement of redevelopment as residential and commercial mixed use.

The names of the persons who have done each of the things set out in Schedule 2 to this remediation statement are:

Project Manager / Supervising Engineer: Atkins Ltd.

CDM Co-ordinator / Employer's Representative: Harrow Estates Plc

Principal Contractor: VertaseFLI Limited

Signed:  **(Harrow Estates Plc)**

Date: .....

The enforcing authority's address for the purposes of this remediation statement is:

Environment Agency
Bromholme Lane
Brampton, Huntingdon
Cambridgeshire PE23 4NE

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Schedule 1: Location and extent of contaminated land to which this remediation statement relates

1.1 Location of contaminated land to which this remediation statement relates

1.1.1 The Former Bayer CropScience site is located immediately to the north-west of the village of Hauxton, Cambridgeshire, CB22 5HT (Grid Reference TL 432 524), and covers an approximate total area of 25 hectares. The River Cam (Granta) and Riddy Brook lie to the east of the site. Agrochemicals (herbicides and pesticides) were manufactured at the site from the 1940s, with operation of the manufacturing and formulation facilities having ceased by 2004. The site was subsequently acquired by Bridgemere UK Plc and managed on their behalf by Harrow Estates Plc (Harrow Estates).

1.1.2 The site was determined as Contaminated Land and designated a Special Site by South Cambridgeshire District Council (SCDC) in May 2003. The Determination Notice was for the former Bayer CropScience factory site and associated land. The boundary of the determined land is given in Annex 2. Three Significant Pollutant Linkages (SPLs) were identified in the Determination Notice relating to impacted groundwater and surface water (see Schedule 3).

1.1.3 Following purchase of the site, Harrow Estates successfully applied for outline planning permission to redevelop the area as mixed residential and commercial properties, and detailed planning permission for remediation of the site. Through redevelopment of the site, potential new pollutant linkages will be created through the introduction of additional receptors to the site, i.e. human health. The remediation scheme was therefore required to address not only the controlled water pollutant linkages upon which the determination was based but also additional human health-related linkages. These are summarised in Schedule 3.

1.2 Extent of contaminated land to which this remediation statement relates

1.2.1 The Determination Notice covered areas of land to the east (known as the 'Main Site', approximately 7 hectares) of the A10 trunk road and a parcel of land to the west (the 'Waste Water Treatment Plant' (WWTP), approximately 18 hectares). Remediation of the site has been carried out using a phased approach, and this statement refers only to remediation of the Main Site area. The extent of the Contaminated Land to which this remediation statement relates is shown in Figure 3 (Annex 1).

1.3 Current land use of area covered by statement

1.3.1 The area covered by this statement is currently undeveloped, pending redevelopment as mixed residential and commercial land uses under an existing outline planning consent.

1.4 Grounds for determination as Contaminated Land and designation as a Special Site

1.4.1 In accordance with Chapter A (Annex 3) and Part 4 of Chapter B (Annex 3) of the then Statutory Guidance[1] SCDC identified the land described in Schedule 1.2 of this statement as Contaminated Land as defined in Section 78A(2) of the Environmental Protection Act 1990. Further to that, based on available evidence it appeared to SCDC that the land was *'in such a condition, by reason of substances in, on or under the land, that pollution of controlled waters was being caused'*.

[1] DETR Circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land

1.4.2 Details of how the requirements of Chapter A and Chapter B, Part 4, were satisfied are given in Schedule 3 of this statement. The details of the significant contaminant linkages upon which the determination was made are set out in Schedule 3 of this statement. Three linkages based on the presence of contaminants in surface and groundwaters were listed in the determination, one of which however related to contamination at the WWTP and is therefore excluded from further consideration in this statement.

1.4.3 A human health linkage was also added to the remediation scheme even though no such linkages were identified in the Determination Notice. This was because the intended redevelopment of the site would introduce this additional receptor and exposure pathways.

Schedule 2: Remediation actions and periods (s.78H(7)(a) and (c))

Section 6(a) of the Statutory Guidance provides a framework for the remediation of contaminated land. Paragraph 6.6 states that *'Remediation may involve a range of treatment, assessment and monitoring actions...to secure the overall remediation of the land.'* Assessment actions are defined as activities which may be needed to characterise the nature of significant contaminant linkage(s) to help the authority decide what remediation should involve. Monitoring actions may be required after remediation has taken place in order to confirm that the remedial action has been successful, or whether there is a need for further assessment or action. Monitoring actions can also be part of the remedial treatment, for example monitored natural attenuation.

Remediation actions have been carried out at the Main Site to address Significant Pollutant Linkages (SPL) 1 and 2 as listed in the Determination Notice, as well as an additional human health pollutant linkage. The remedial actions and time periods are summarised as follows. Actions have been designed to satisfy the requirements of s.78A(7)(a) – (c) of the Act, and paragraphs 6.5 – 6.9 and 7.3(c) of the contemporary statutory guidance[2]. The contaminants of concern, receptors and linkages are listed in full in Schedule 3.

2.1. Remedial assessment actions

2.1.1 The following remedial assessment actions were carried out in order to enable development of a more detailed conceptual site model, including groundwater monitoring, to trial possible remedial technologies and to facilitate completion of a remedial options appraisal. All actions were carried out for the Main Site area only.

Remedial Assessment Actions	
March – August 2006	Preparation of conceptual site model[3] using existing information in order to identify information gaps and enable design of additional intrusive site investigation.
March – October 2006	Supplementary site investigation and monitoring in order to provide additional information on the complex ground conditions at the site and enable further controlled waters and human health risk assessment.
October 2006	Preparation of flood risk assessment report[4] in order to support and inform the remedial activities through confirmation of flood potential at the site and recommendations for final site levels.
October 2006	Preliminary laboratory and field trials of feasible treatment technologies in order to provide an assessment of which remedial techniques, or combination of, are likely to be successful in remediation of the contamination.
June 2007	Further development of the conceptual site model, numerical groundwater modelling and derivation of preliminary remedial targets in order to confirm the

[2] Defra. Defra. 2006. Defra Circular 01/2006. Environmental Protection Act 1990: Part 2A. Contaminated Land.
[3] Atkins. 2006. Preliminary conceptual site model. Former Bayer CropScience site, Hauxton. Ref. 5036759.
[4] Entec. 2006. Flood risk assessment. Bayer CropScience, Hauxton, Cambridgeshire.

	contaminants of concern and enable design of field and laboratory remediation technology tests.
July 2007	Remedial options appraisal, preliminary design and remediation planning to identify a complementary suite of remedial techniques to successfully address the residual contamination at the site. Also to provide confirmation to the regulators regarding the updated site / contaminant information and progress towards remediation implementation.
April 2009 – April 2011	Remediation method statement[5] (RMS) prepared for the initial phase of remedial work, identifying preliminary remedial targets for groundwater and proposed remedial solutions.
July 2010 – October 2011	Derivation of soil screening values for the protection of human health, and assessment of contaminants not previously identified (CNPIs)[6, 7].
February 2011	Remediation validation protocol for confirmation of achievement of remedial targets[8].
April 2011	Remediation proposal for the bentonite wall developed[9].
May – July 2011	Quantitative risk assessment for controlled waters and preliminary post-remediation validation model[10] prepared to confirm effectiveness of the remediation.
November 2011	Preparation of a further quantitative risk assessment for CNPI[11]
December 2012	Post-remediation quantitative risk assessments for controlled waters[12, 13], carried out by VertaseFLI.
October 2013	Post-remediation human health risk assessment to confirm removal of potential contaminant linkages.

2.2. Remedial targets: groundwater

2.2.1 Following completion of the initial conceptual site model, human health and groundwater risk assessments, 23 contaminants of concern were identified across the Main Site. Preliminary screen targets for those substances were provided for Regulatory approval in 2008, which was granted in February 2010. These values were accepted on the basis that they would be routinely assessed and reviewed as the CSM and risk assessments changed to reflect post-remediation site conditions.

5 VertaseFLI. 2009 – 2011 (revised). Remediation method statement, Former Bayer CropScience Site, Hauxton.
6 Atkins. 2010. Protocol for assessment and reporting of characterisation samples showing CNPIs. Former Bayer CropScience site, Hauxton.
7 Atkins. 2010. Risk assessment of CNPI. Former Bayer CropScience site, Hauxton.
8 VertaseFLI. 2011. Validation protocol, Former Bayer CropScience Site, Hauxton. Revision 4.
9 VertaseFLI. 2011. Remediation proposal for the bentonite wall. Former Bayer CropScience Site, Hauxton.
10 VertaseFLI. 2011. Further quantitative risk assessment for controlled waters and preliminary post-remediation validation model. Former Bayer CropScience Site, Hauxton.
11 VertaseFLI. 2011. Further quantitative risk assessment for Contaminants Not Previously Identified. Former Bayer CropScience Site, Hauxton.
12 VertaseFLI. 2012. Post-remediation quantitative risk assessment for controlled waters. Former Bayer CropScience Site, Hauxton.
13 VertaseFLI. 2012. Groundwater validation addendum report. Former Bayer CropScience Site, Hauxton.

2.2.2 The remedial targets for groundwater are presented in Table 1a (Annex 1 of this statement). The VertaseFLI Limited (VertaseFLI) groundwater Detailed Qualitative Risk Assessment (DQRA)[14] was developed around four spatial zones (Zone 1, 2N, 2S and 3), each with varying distances from the receptor (see Drawing D907_163, Annex 1) and each with its own set of remedial targets for groundwater concentrations.

2.2.3 Within Zone 1 of the site, a number of contaminants had soil remediation targets below the commercially available laboratory limits of detection (LOD). Where this was the case, soil leachate testing was undertaken to compare against leachate targets produced in the VertaseFLI DQRA. Groundwater / leachate targets are presented in Table 1b, within Annex 1.

2.2.4 As the remediation works preceded a number of Contaminants Not Previously Identified (CNPI) were reported. Preliminary remedial targets were derived by Atkins7 (Table 2, Annex 1) which were then updated by VertaseFLI[11] with site-specific remedial targets. Groundwater remedial targets for nine CNPI were adopted, as listed in Table 3 (Annex 1). All remedial targets were approved by both the Environment Agency and SCDC as part of discharge of planning conditions.

2.3. Remedial targets: human health

2.3.1 In addition to the groundwater remediation targets, a detailed human health risk assessment was undertaken by Atkins[15] in order to derive a set of remedial targets designed to be protective of both human health and controlled waters. Where two different numbers were derived, the lower of the two was adopted. The human health remedial targets are listed in Table 1a within Annex 1. They only apply to the top 1m of soil, with the exception of certain volatile compounds.

2.4. Remedial treatment actions (RTA)

2.4.1 The remedial treatment actions were carried out over a period of years, with several actions occurring concurrently and others being carried out in a particular sequence (see Table 2.1 of this Statement). The remedial areas were zoned, as shown in drawing D907_04 (Annex 1). Further details are given in the VertaseFLI Remediation Method Statement (RMS) and Completion Report[16].

2.4.2 The remedial treatment actions carried out at the site are summarised below; further detail on each is provided in the subsequent sections.

Remedial Treatment Actions	
March 2006 – March 2011	**RTA1:** ongoing operation of the existing groundwater pump and treat system (located on the Waste Water Treatment Plant site)
October 2009 – February 2010	**RTA2:** site clearance and enabling works
March 2010 – November 2011	**RTA3:** management of surface water using on-site lagoon
August – September 2011	**RTA4:** bentonite wall removal

[14] VertaseFLI. 2011. Further quantitative risk assessment for risks to groundwater and surface waters. Former Bayer CropScience Site, Hauxton. Revision B.
[15] Atkins. 2007. Derivation of pesticide soil screening values and evaluation of spatial extent of contamination. Former Bayer Agrochemicals site, Hauxton.
[16] VertaseFLI. 2012. Contract completion report. Former Bayer CropScience Site, Hauxton.

March 2010 – November 2011 & July 2012	**RTA5:** soil remediation – excavation of soils and ex-situ treatment including biopiles and forced air
August 2011	**RTA6:** material excavation and off-site disposal
November 2011	Further quantitative risk assessment for CNPIs.
March 2013	Remediation verification report
October 2013 – February 2014	Post-remediation human health DQRA[17]

2.5. RTA1: ongoing operation of the existing groundwater pump and treat system

2.5.1 Remediation measures were first introduced by the previous site owner in 1972 on the Main Site with the construction of a bentonite cut-off wall and installation of a pump and treat system to reduce the migration of contamination from the site into the adjacent surface water courses. The system entailed pumping groundwater from a series of wells/sumps installed in the Main Site (dewatering), with treatment at the site's effluent treatment plant located at the WWTP. Treated groundwater was then discharged to sewer under a trade effluent consent; the sewer discharges to the River Cam. This treatment system was operational until partial completion of the remedial works (March 2011) and confirmation that ground and groundwater contamination at the Main Site no longer presented a risk of pollution to the adjacent surface water courses. The WWTP remains in place running at a reduced capacity for the ongoing management of surface water.

2.6. RTA2: site clearance and enabling works

2.6.1 Squibb Group Ltd (Squibb) and VertaseFLI Ltd (Vertase) undertook the demolition of remaining structures on site as per the phases below:

- During Phase 1 of site clearance Squibb removed all structures on site, with the exception of the remaining electricity sub-stations which were relocated by VertaseFLI. Services were disconnected prior to demolition of the structures to facilitate the advancement of excavation works on site. All demolition works were carried out under an appropriate risk assessment and method statement, as stipulated in the Remediation Method Statement (RMS)[5].
- Phase 2 consisted of removal of the High Bay Warehouse. The High Bay Warehouse was retained onsite at the request of VertaseFLI in order to facilitate the processing of contaminated materials under building cover to aid in the control of odorous materials. This structure was demolished by Squibb under an appropriate risk assessment, method statement and a Section 80/81 Demolition Notice in the second season of the remediation works.

2.6.2 Prior to the demolition of the remaining buildings, a full Asbestos Survey was undertaken by VertaseFLI. Asbestos Containing Material (ACM) and suspected ACM was removed and sent for off-site disposal prior to commencement of the demolition of the remaining structures. All works were carried out by a licensed asbestos contractor and the Health and Safety Executive were notified of the works.

2.6.3 Concrete hardstanding was broken out and separated from metalwork, tarmac and other deleterious materials. Concrete was processed to 6F2 grade material to be used on site as a 'no dig' barrier above remediated soils. The materials were analysed for potential chemicals of concern prior to re-use on site. The fine proportion of the crushing of concrete materials (<20mm) were used as a form of soil improvement by blended the fines with soils in selected completed treatment beds to improve their

[17] Atkins. 2013. Hauxton post-remediation human health risk assessment. Former Bayer CropScience Agrochemical works, Hauxton, Cambridgeshire. Ref. 5095855.

geotechnical properties. Prior to mixing the fines stockpiles were chemically validated for their suitability.

2.6.4 Areas of tarmac were excavated, crushed and stockpiled on-site. Where possible the materials were re-used on-site to form hardstanding areas at the site entrance on completion of the reclamation works. The majority of the tarmac material was, however, removed from site. All excavated metal materials were removed from site and recycled.

2.6.5 Underground structures were broken out including deep pile foundations to a maximum depth of 3.0m below original ground level. Unless soil excavation was required beyond this depth due to unacceptable contamination levels, the underlying concrete remained in situ. The excavated underground structures were crushed and utilised as per the concrete hardstanding. Those structures which remained in situ are recorded, together with their approximate depth above ordinance levels, in the VertaseFLI drawing D907_193 (Annex 1).

2.7. RTA3: management of surface water, including use of on-site lagoon

2.7.1 The first remediation works carried out on site were the excavation of materials to create an on-site lagoon to enable collection of contaminated water. All contaminated liquids (both surface and groundwater) were collected on site and pumped to the lagoon through a silt-remover before being pumped off-site to the WWTP. Liquids were treated at the WWTP and discharged under consent (PR1NF/1744_D_01) to the River Cam (Granta).

2.7.2 Following decommissioning of the lagoon the excavation sides and base were sampled and validated in order to confirm that there was no residual contamination as a result of the contaminated liquor which had been held. All hard materials which had been placed as a base to the lagoon were removed, validated and re-used on site. Further validation and restoration of soils beneath the lagoon was also carried out.

2.8. RTA4: bentonite wall removal

2.8.1 The bentonite wall was located in the north-east of the site, running along the eastern boundary. Following completion of an intrusive investigation and options appraisal, it was concluded that it was necessary to remove the wall as it posed a potential risk to controlled waters. Removal of the wall comprised the following activities (as specified in the Remediation Proposal9):

- Demolition of the eastern boundary wall
- Erection of a suitable boundary fence to the east of the Riddy Brook
- Erection of a debris net along the Riddy Brook
- Excavation of the bentonite wall and surrounding soils to the Gault Clay. Excavation took place in sections no more than 20m in length along the bentonite wall at any one time to ensure the western bank of the Riddy brook remained stable during the works. Materials were excavated to an acceptable angle of repose in 1m sections in order to allow constant assessment of the stability of the excavation face adjacent to the Riddy Brook.
- Immediate backfill using appropriately validated site won materials
- The excavated bentonite was dried and broken down prior to bio-remediation and re-use on site.

2.8.2 Excavation of the bentonite wall adjacent to the Riddy Brook did not extend beyond the top of the Gault Clay in order to prevent collapse and dewatering of the Riddy Brook. Therefore excavation depths in the area of the bentonite wall adjacent to the Riddy Brook extended between 3.5 and 4.5mbgl. Where the wall was keyed into the Gault Clay, deeper excavation was carried out in order to remove all of the bentonite. Within Zone 2S, excavation levels extended below the base of the bentonite wall where necessary in order to meet the validation criteria at the base of the excavation where contamination was present.

2.9. RTA5a: ex-situ soil bioremediation

2.9.1 Ex-situ bioremediation using treatment beds was carried out across the site area. Beds were mechanically turned in order to further homogenise materials by breaking down larger clasts (increasing the surface area of material) and to ensure regular aeration of the materials. Further details on the techniques applied in the bioremediation are given in the VertaseFLI Completion Report[16].

2.9.2 The first sample taken from a treatment bed was designated as a t0 sample, and was taken within a day of the original excavation of the treatment bed. Subsequent t (representing time) samples (t1, t2, t3, etc.) were taken from each individual treatment bed thereafter. Only when a treatment bed achieved appropriate validation criteria was it then deemed suitable for re-use. Material from each treatment bed was reinstated according to the criteria it had achieved as specified in the DQRA[10, 11, 15] and the material type.

2.9.3 The soil audit indicated that the average treatment bed had a volume of 617m^3 and was mechanically turned 9 times before analysis demonstrated it had been successfully remediated. There were a total of 1,620 mechanical turns / processing during the entire remediation process, resulting in almost 1,000,000m^3 of material passing through the treatment buckets during mechanical turning. A total of 1,795 samples were taken from all treatment beds on site during the remediation process, which equates to one sample per 65m^3 of treatment bed material (in excess of the one per 90m^3 stated in the RMS[5]).

2.10. RTA5b: ex-situ assisted soil bioremediation

2.10.1 A number of highly contaminated soil beds were treated by forced ventilation. Materials were homogenised and dried and added to a forced-ventilation vapour extraction plant and covered. The forced-ventilation extraction process increases the degradation of volatile (and semi-volatile) organic compounds. Volatile compounds were extracted and filtered through a biological filter. In total 13 treatment beds were treated in the force ventilation vapour extraction unit, equating to 7% of all treatment beds. These 13 treatment beds totalled 7,165m^3 (6.15% of all material treated onsite).

2.11. RTA6: material excavation, stockpiling and off-site disposal

2.11.1 All excavations and hotspots were dealt with in accordance with the RMS and Validation Protocol, which in summary included:

- All contaminated liquids (including groundwater and surface waters) were collected on site and pumped to the on-site lagoons through a silt remover, before being pumped to the offsite WWTP for treatment and discharge under consent to the River Cam (Granta). Validation data for discharged effluent was provided to the relevant authorities throughout the remediation works.

- Gross contamination, e.g. free product and drums of pesticides / herbicides, was segregated from soil arisings and exported to quarantine area on site prior to disposal to a suitable licensed off site facility.
- All soils with visual or olfactory evidence of contamination were excavated and appropriately classified into various treatment beds or stockpiles depending on their physical characteristics.

2.11.2 Throughout the remediation works, all soils and aggregates that were excavated were tracked through the site soil audit (included in Appendix D, VertaseFLI Completion Report[16]). The soil audit can be used to track material from its point of excavation, through its specific treatment train to its subsequent fate.

2.11.3 A total of approximately 171,980m^3 was excavated during the remediation works, 116,560m^3 of which required treatment with an additional volume of approximately 2,600m^3 exported from site for off-site disposal.

2.12. Stockpile validation

2.12.1 Excavated materials that did not require remediation or had completed remediation were stockpiled prior to their reuse; details of each are given in the soil audit and reported more fully in the Remediation Completion Report[16] (Appendix D) prepared by VertaseFLI. Three classes of stockpile were created:

- Type 1: treatment beds that had passed remedial targets following treatment and were combined in preparation for reinstatement. Such beds were only combined into stockpiles when they met all relevant chemical criteria including the contaminants of concern (COC) and CNPI and if they were the same material type.
- Type 2: material that was excavated and subsequently did not require treatment.
- Type 3: material that was sampled in-situ through trial pitting and was subsequently validated for re-use in either less stringent DQRA areas or more stringent DQRA areas without further treatment.

2.12.2 Additional soil samples were analysed from trial pits for materials intended to be directly used as fill materials in other parts of the site. To prove the appropriateness of material for reuse samples were taken to a ratio of one sample per 500m^3 within each grid square, as stated by the RMS for validation of site won materials to be reinstated on site.

2.13. Remedial monitoring actions (RMA)

2.13.1 Following the staged completion of the remedial treatment actions, a number of remedial monitoring actions were undertaken. These are summarised below.

Remedial Monitoring Actions	
December 2009	Soil gas monitoring
December 2009	Groundwater monitoring
December 2009	Surface water monitoring
December 2009	Remedial monitoring action report
April 2010 – November 2011	Monthly environmental monitoring reports[18] containing odour, VOC emissions, dust and

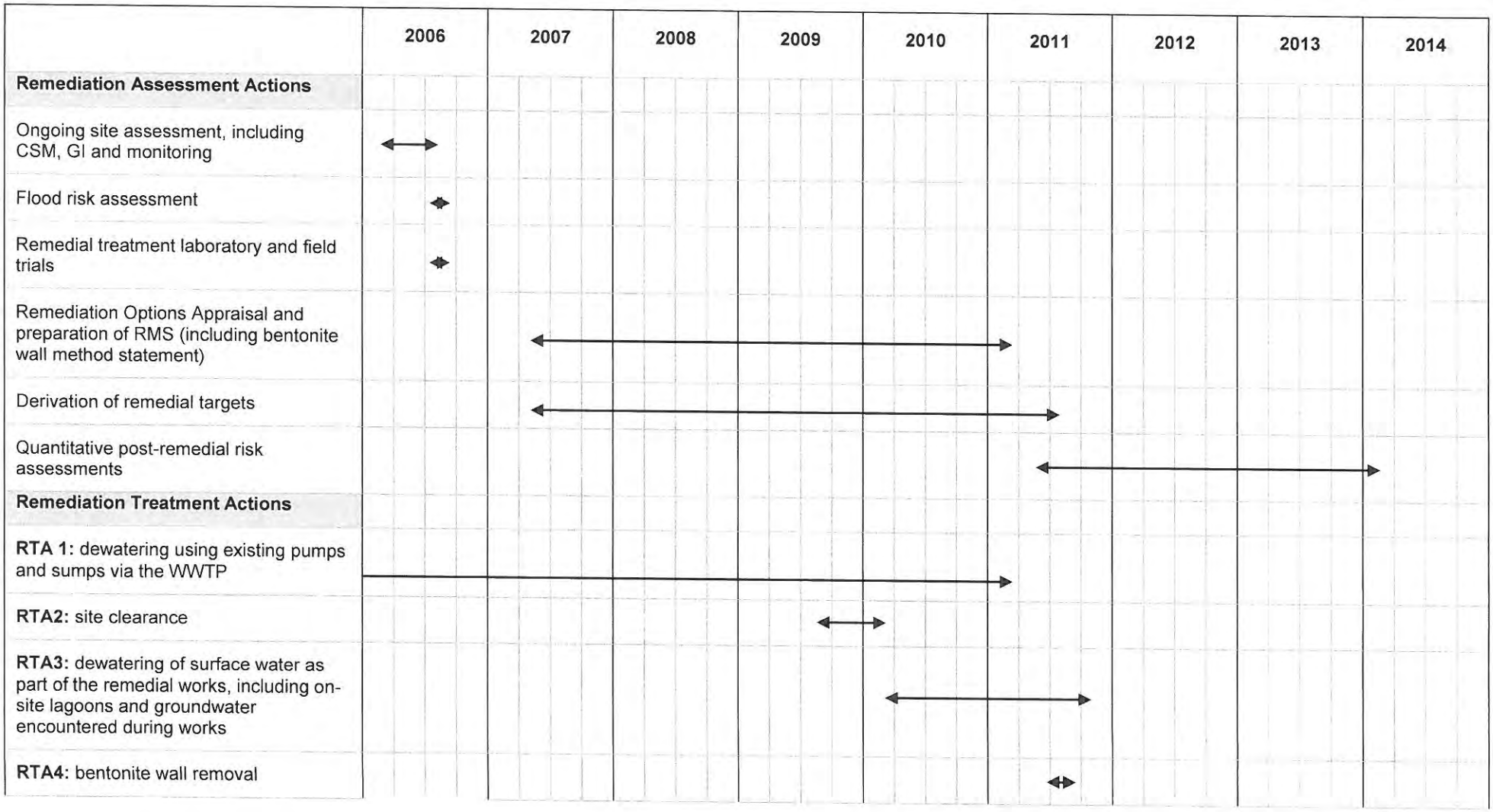
[18] VertaseFLI. 2011. Monthly Environmental Monitoring reports, April 2010 to November 2011. Former Bayer CropScience Site, Hauxton.

	particulate emissions and noise monitoring data collected by VertaseFLI during the remediation site works. Data was published by SCDC on their website.
July 2011	Interim quantitative controlled water risk assessment[10] during remediation
May – July 2011, January 2012 – January 2013 & February 2014	During- and post-remediation monitoring including soil vapour monitoring with flux boxes and human health detailed qualitative risk assessment to confirm removal of volatile contaminant linkages.
December 2012	Post-remediation quantitative risk assessment for controlled waters, carried out by VertaseFLI[12] in order to demonstrate removal of the linkages between contamination in the ground / groundwater and controlled water receptors.

2.14. Timing and phasing of remedial actions

2.14.1 Given the complex nature of the site conditions, contaminants and residual infrastructure, it was necessary to phase the remedial works. The chart below illustrates the timeline for the works, and the relationships between the remedial assessment, treatment and monitoring actions.

Table 2.1 Remediation Treatment Action timeline



	2006	2007	2008	2009	2010	2011	2012	2013	2014
RTA5a / b: soil remediation: excavation and bioremediation					◄———	———►	◆		
RTA6: off-site disposal						◄►			
Post-remediation monitoring, including flux-boxes							◄———	———►	◄►
Remediation Monitoring Actions									
Soil gas, surface and groundwater monitoring				◆					
Interim monitoring, quantitative risk assessments and modelling					◄———	———►	◄———	———►	◆

2.15. Planning permission

2.15.1 Planning permission was granted by South Cambridgeshire District Council under application number S/2307/06/F for demolition of on-site buildings, remediation of land and formation of a development platform at the site. Planning conditions were imposed and a s.106 agreement entered into in order to ensure that the remediation was carried out in accordance with the requirements of the regulators. A number of supporting planning documents, including groundwater and human health risk assessments and a remediation statement were also submitted and approved. Full details of the planning history for the site and works are available on the SCDC website (http://egov.scambs.gov.uk/riaplanning/index_search.html).

2.16. Mobile treatment plant licences

2.16.1 All processing and remediation of contaminated materials was undertaken in accordance with Environmental Permit ERP/QP3293FY (formally Mobile Treatment Licence EAWML26145), for which a site-specific deployment form was submitted to the Environment Agency and approved in June 2008. The licence was held by VertaseFLI.

2.17. Waste management and off-site disposal

2.17.1 The site works were undertaken in accordance with the Site Waste Management Plan Regulations and the CL:AIRE Development Industry Code of Practice[19], with a Materials Management Plan developed for the site activities. As far as possible, excavated materials were re-used on site, and off-site disposal was minimised. A small quantity of free phase hydrocarbons, vegetation, and recyclable materials were removed from site under appropriate Duty of Care licensing / permits. In addition, the granular activated carbon used in the water treatment plant was removed from site for recycling.

2.17.2 Two treatment beds (TB84 and TB100) contained levels of contamination that VertaseFLI confirmed could not be treated on site. In accordance with their RMS, these beds were subsequently removed from site to an appropriate offsite disposal facility. These two treatments beds equate to approximately 2,680m^3. A 'red powder' material was found in grid square H16, a 'purple powder' found in grid square H10 and Dinoseb containing tar found in grid square L10. All of these materials were disposed of off-site.

2.17.3 As far was as possible, all metal was separated from other excavated materials. Metal was then sent for offsite by VertaseFLI for recycling as stipulated in the RMS5.

2.18. Publically-available information

2.18.1 Information and documents concerning the site and remediation were made available to the public via a web page hosted by SCDC (https://www.scambs.gov.uk/bayersite). The pages were produced jointly by SCDC, the Environment Agency, the Health Protection Agency and NHS Cambridgeshire, using information and data provided by Vertase, Harrow Estates and Atkins.

2.18.2 Public consultation drop-in sessions were held in Hauxton village prior to commencement of the remediation works, providing local residents with opportunities to meet the parties involved and obtain information about the proposed works. These sessions were augmented by the formation of a Consultative Committee consisting of representatives from Harrow Estates, VertaseFLI, Atkins, the Environment Agency, SCDC, Cambridgeshire County Council (CCC), SCDC district councillor, CCC county

[19] CL:AIRE. 2011. The definition of waste: development industry code of practice.

councillor and a Hauxton parish councillor. Further details are given on the SCDC website referenced above.

2.19. Parties involved in remediation

2.19.1 The following responsible parties were involved in the remediation works:

Statutory Authorities	The Environment Agency
	South Cambridgeshire District Council
Project Manager & Supervising Engineer	Atkins Ltd
CDM Co-ordinator & Employer's Representative	Harrow Estates Plc
Principal Contractor	VertaseFLI Limited
Advisory roles	The Health Protection Agency (HPA) (now Public Health England (PHE))
	NHS Cambridgeshire

2.19.2 Full contact details are given in Annex 3.

2.20. Further remedial actions yet to be completed

2.20.1 The third pollutant linkage identified in the Determination Notice (SPL 3) (see Annex 2) refers to contamination in soils at the WWTP which is continuing to enter groundwater via migration through the unsaturated zone. Controlled water and human health risk assessments are being carried out in order to inform the remediation strategy in the WWTP area. Once the strategy has been formulated it will be presented for Stakeholder review prior to the submission of a planning application for the remedial works, anticipated to be in the later part of 2014.

Schedule 3: Particulars of significant harm and significant pollution of controlled waters and particulars of substances

3.1 Requirements of Annex 3, Chapter A (statutory guidance on the definition of contaminated land [2])

3.1.1 The statutory guidance in Chapter A is issued under section 78A(2), (5) and (6) of Part 2A of the Environmental Protection Act 1990 and provides guidance on applying the definition of Contaminated Land. 'Contaminated land' is defined at 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*" 1.

3.1.2 The site was judged by SCDC to have met the above condition (b).

3.1.3 Section 78A(9) defines the pollution of controlled waters as: "*the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter*". Before determining that pollution of controlled waters is being, or is likely to be, caused, the local authority. should be satisfied that a substance is continuing to enter controlled waters or is likely to enter controlled waters. For this purpose, the local authority should regard something as being "likely" when they judge it more likely than not to occur.

3.1.4 SCDC identified the contamination of groundwater at the site, as well as contamination of soils in the car park area at the northern end of the site prior to determination.

3.1.5 The guidance further states that (A.38) *"Substances should be regarded as having entered controlled waters where: (a) they are dissolved or suspended in those waters; or (b) if they are immiscible with water, they have direct contact with those waters on or beneath the surface of the water."*

3.1.6 SCDC confirmed that the above condition (a) had been met prior to determination.

3.1.7 In addition to the determination on the grounds of contamination of controlled water, a human health linkage was also identified when outline planning permission was approved for the site. The conceptual site model was amended to account for the proposed change of use following redevelopment, considering the requirements of PPS23[20] (now withdrawn).

3.1.8 The risk assessment carried out for this site derived site-specific criteria based on published CLR documents and associated toxicological data. Exposure to levels of contamination in excess of these criteria was considered by the Council to be 'unacceptable'. On the basis of the risk assessment the Council considered that the land shown identified in Schedule 1 appears to meet the statutory definition of contaminated land by virtue of there being a significant possibility of significant harm to human health, in accordance with Chapter A (Table B) of the Statutory Guidance.

3.2 Requirements of Chapter B, Part 4 (statutory guidance on determining whether land appears to be contaminated land)

3.2.1 The statutory guidance states that (B.38) "*there are four possible grounds for the determination (corresponding to the parts of the definition of contaminated land in section 78A(2)) namely that: (a) significant harm is being caused; (b) there is a significant possibility of significant harm being caused; (c) pollution of controlled waters is being caused; or (d) pollution of controlled waters is likely to be caused.*"

[20] ODPM. 2004. Planning Policy Statement 23 (PPS23). Planning and Pollution Control – Annex 1: Pollution control, air and water quality.

3.2.2 SCDC found that (c), the pollution of controlled waters is being caused, prior to determination.

3.3 Determining that 'pollution of controlled waters is being caused'

3.3.1 B.50 of the statutory guidance states that *"the local authority should determine that land is contaminated land on the basis that pollution of controlled waters is being caused where: (a) it has carried out an appropriate scientific and technical assessment of all the relevant and available evidence, having regard to any advice provided by the Environment Agency; and (b) on the basis of that assessment, it is satisfied on the balance of probabilities that both of the following circumstances apply: (i) a potential pollutant is present in, on or under the land in question, which constitutes poisonous, noxious or polluting matter, or which is solid waste matter, and (ii) that potential pollutant is entering controlled waters by the pathway identified in the pollutant linkage."*

3.3.2 SCDC found this to be the case.

3.4 Contaminants of concern: controlled waters

3.4.1 Atkins completed a groundwater modelling report[21] which identified a list of priority contaminants. These 23 substances were considered to be representative of the most persistent contaminants to controlled water receptors, and also capture anticipated daughter products resulting from compound breakdown over time. The 23 contaminants of concern with respect to controlled waters comprise:

- Cis-1,2-Dichloroethene
- Dichloroprop
- Ethofumesate
- Vinyl chloride
- Tetrachloroethene
- Bis (2-chloroethyl)ether
- 1,2-dichlorobenzene
- 4-chloro-2-methylphenol
- MCPA
- Cyclohexanone
- toluene
- 4,6-dinitro-o-cresol
- Hempa
- Trichloroethene
- 2,4,6-trichlorophenol
- 1,2-dichloroethane
- Mecoprop
- Simazine
- Xylene
- Schradan
- Dimefox
- Phenol
- Dicamba

3.5 Contaminants of concern: human health

3.5.1 A report completed by Atkins in 2006[22] provided a preliminary conceptual site model based on investigations completed up to that time. This identified the pollutant linkages taking into account the future site use comprising residential and commercial redevelopment.

3.5.2 The principal areas of contamination were located within the main production and storage areas of the site. The chemical analysis data was initially assessed using generic assessment criteria produced by the Environment Agency (Soil Guideline Values) and Atkins (Soil Screening Values). An initial 22 COC were identified in the source term, for which five surrogate compounds were identified:

- Atrazine
- Dieldrin
- Dicamba
- Pentachlorophenol (PCP)
- 2-methyl-4-chlorophenoxyacetic acid (MCPA)

[21] Atkins. 2007. Groundwater modelling report. Remediation of Former Bayer site, Hauxton.
[22] Atkins. 2006. Preliminary conceptual site model. Remediation of Former Bayer Site, Hauxton. Ref. 5036759.

3.5.3 Following further site investigation, chemical analysis and DQRA, the human health assessment component of the remedial work was carried out with reference to the five surrogate compounds (covering 22 compounds) and the key CNPIs identified during the further intrusive investigation and monitoring.

3.6 Pollutant Linkages

3.6.1 In May 2003, South Cambridgeshire District Council (SCDC), in consultation with the Environment Agency, concluded that two SPLs were present at the Main Site (Significant Pollutant Linkages 1 and 2) and a third at the WWTP (Significant Pollutant Linkage 3). These Significant Pollutant Linkages were detailed within the Determination Notice (see Annex 2 of this statement). The Pollutant Linkages that form the basis of the determination are described in the following paragraphs. The third linkage has not been detailed here as it relates to contamination of groundwater from substances in the Waste Water Treatment Plant area, which will be addressed in a further phase of remedial work and has been excluded from this Remediation Statement. The area of land covered by the determination is shown in Annex 2.

3.7 First Significant Pollutant Linkage (SPL 1)

3.7.1 The evidence for the Pollutant Linkage was the presence of TBA, MCPA, mecoprop, dicamba, atrazine, simazine and trietazine (all organohalogen compounds), toluene, xylene, phenol (substances which constitute poisonous, noxious or polluting matter) in the groundwater (and therefore more likely than not in the solid part of the land) on the factory Main Site. Additionally, benazolin-ethyl, TBA (organohalogen compounds), benfuresate and ethofumesate (substances which constitute poisonous, noxious or polluting matter) have been reported in a composite soil sample from the car park area. These substances were entering groundwater in the Chalk Marl (the Upper Cretaceous Chalk as stated in part 2 of Schedule 1 of the Contaminated Land Regulations) via migration through the unsaturated zone. Environment Agency data indicated that the contaminants had migrated off-site.

3.8 Second Significant Pollutant Linkage (SPL 2)

3.8.1 The evidence for the Pollutant Linkage was the presence of TBA, MCPA, mecoprop, dicamba, atrazine, simazine and trietazine (all organohalogen compounds), toluene, xylene, phenol (substances which constitute poisonous, noxious or polluting matter) in the groundwater (and therefore more likely than not in the solid part of the land) on the factory Main Site. Additionally benazolin-ethyl, TBA (organohalogen compounds), benfuresate and ethofumesate (substances which constitute poisonous, noxious or polluting matter) have been reported in a composite soil sample from the car park area. These substances were entering surface waters (Riddy Brook) via groundwater.

3.9 Pollutant Linkage summary

3.9.1 Table 3.1 summarises the source – pathway - receptor linkages addressed by the remedial actions for the Main Site area. This table includes the controlled water linkages as well as an additional human health linkage introduced following approval of outline planning permission to redevelop the site. The contaminants have been amended in line with the findings of the controlled water and human health assessment actions, i.e. the contaminants of concern and CNPIs for which remedial targets were derived.

Table 3.1: Summary of Source – Pathway – Receptor linkages addressed by remediation

	Contaminant	Contaminant source / location	Pathway	Receptor	Harm to receptor
SPL1	23 contaminants of concern (poisonous, noxious or polluting substances), as listed above	Main factory site (including car park area): contaminants present in groundwater and solids	Migration of impacted perched groundwater	Groundwater in the Chalk Marl (Upper Cretaceous Chalk) beneath the site	Determination was made under Section 78A(9) of the Environmental Protection Act 1990, pollution of controlled waters: pollutants are present in, on or under the land and are entering controlled waters by the migration pathway identified.
			Leaching of contaminants in the saturated and unsaturated zones		
SPL2	23 contaminants of concern (poisonous, noxious or polluting substances), as listed above	Main Site: contaminants present in groundwater	Hydraulic continuity between groundwater and surface water	Surface water east of the Main Site (Riddy Brook and River Cam)	
	5 surrogate compounds for 22 contaminants of concern (poisonous, noxious or polluting substances), plus CNPIs	Main Site: contaminants present in groundwater and solids	Ingestion of soil and soil-derived dust	Future site user (residential) assumed to be a female child aged 0 – 6 years	Human health receptors were included in the remediation assessment actions given the proposed redevelopment as mixed residential and commercial land use.
			Dermal contact with soil and soil-derived dust (tracked back)		
			Consumption of home-grown vegetables and soil attached to home-grown vegetables		
			Inhalation of soil-derived dust outdoors and indoors (tracked back)		
			Indoor and outdoor inhalation of soil-derived vapours		
			Inhalation of groundwater-derived vapours		

Annex 1: Drawings, Figures and Tables

Figure 3: Extent of contaminated land to which this statement relates (Atkins, 2006)

Table 1a: Soil maximum CoC threshold values with respect to controlled waters, working targets for Human Health >1m bgl and detection limits (Atkins, 2010)

Drawing D907_163: ConSim zones with 22m grid (VertaseFLI, 2011)

Table 1b: Leachate / groundwater maximum CoC threshold values (VertaseFLI, 2011)

Table 2: Atkins preliminary CNPI remedial targets (Atkins, 2010)

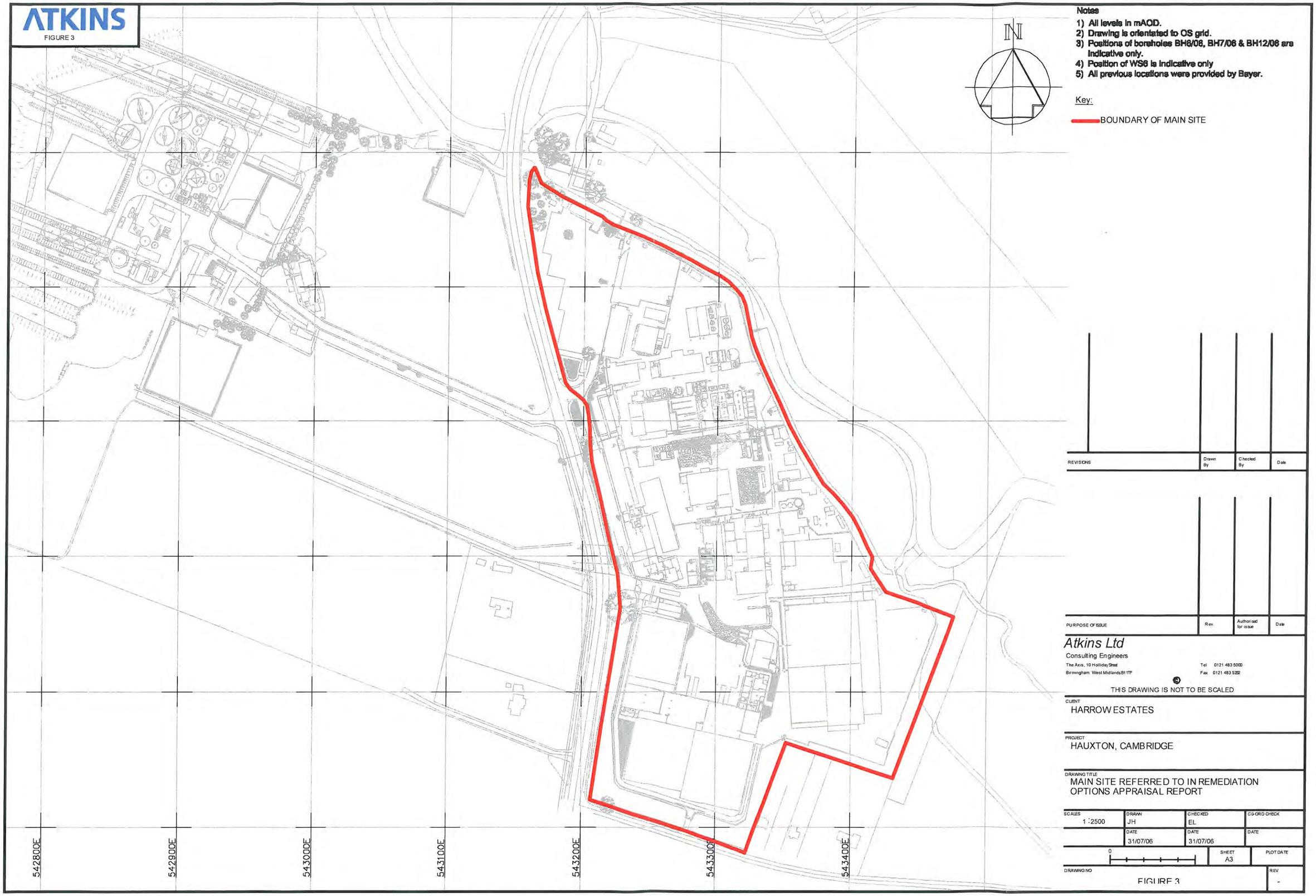
Table 3: Soil maximum CoC values (controlled waters) for nine CPNIs (VertaseFLI, 2011)

Drawing D907_04: VertaseFLI zone plan 1 – 3 (VertaseFLI, 2008)

Drawing D907_193: As-built SI, services and underground services (VertaseFLI, 2011)

ATKINS

FIGURE 3



N

Notes

1) All levels in mAOD.
2) Drawing is orientated to OS grid.
3) Positions of borsholes BH6/06, BH7/06 & BH12/06 are indicative only.
4) Position of WS6 is indicative only
5) All previous locations were provided by Bayer.

Key:

BOUNDARY OF MAIN SITE

REVISIONS	Drawn By	Checked By	Date

PURPOSE OF ISSUE	Rev.	Authorised for issue	Date

Atkins Ltd
Consulting Engineers
The Axis, 10 Holliday Street
Birmingham West Midlands B1 1TF
Tel 0121 483 5000
Fax 0121 483 5252

THIS DRAWING IS NOT TO BE SCALED

CLIENT
HARROW ESTATES

PROJECT
HAUXTON, CAMBRIDGE

DRAWING TITLE
MAIN SITE REFERRED TO IN REMEDIATION OPTIONS APPRAISAL REPORT

SCALES	DRAWN	CHECKED	CO-ORD CHECK
1 :2500	JH	EL	
	DATE 31/07/06	DATE 31/07/06	DATE
0		SHEET A3	PLOT DATE

DRAWING NO
FIGURE 3

REV
-

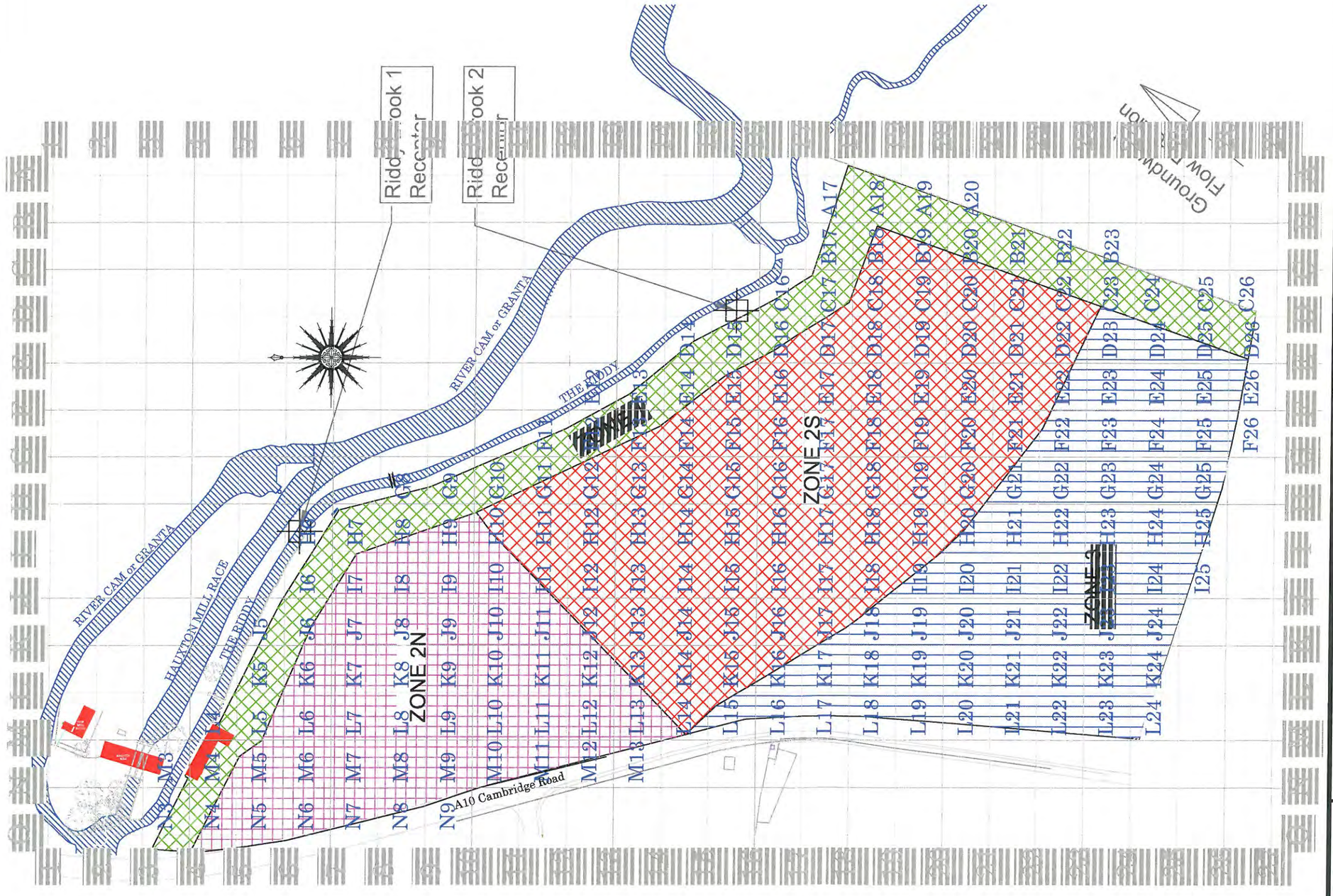
P:\GBBMA\DE2\Div75\503\5036759 Hauxton (MAS)\8 - Drawings\Working\REPORT DRGS AND FIGS\Remediation Strategy Summary for Planning\FIGURE 3.dwg, 25/10/2006 15:02:02, huss8933,

Table 1a. Soil Maximum CoC Threshold Values with Respect to Controlled Waters, Working Targets for Human Health >1m deep and detection Limits

	Soil Max Threshold Values With Respect to Controlled Waters					Human Health Assessed Working Target for soils below 1m depth	Laboratory Limits of Detection (SAL) Soils	Working Target for soils below 1m taking into account Controlled Water Assessment, Human Health Assessment and Laboratory Detection Limits.				
Contaminant	Zones - Type A Material (µg/kg)	Zones - Type B & C Material (µg/kg)				below >1m depth (ug/kg)	(ug/kg)	Zones - Type A Material (µg/kg)	Zones - Type B & C Material (µg/kg)			
	2	1	2S	2N	3	All Zones	All Zones	2	1	2S	2N	3
Dimefox[b]	0.3	0.01	20	50	200	200	10	10[a]	10[a]	20	50	200
Ethofumesate[b]	20,000	80	20,000	50,000	50,000	50,000	10	20,000	80	20,000	50,000	50,000
Hempa[b]	3,000	0.3	300,000	2,000,000	4,500,000	3,000	10	3,000	10[a]	3,000	3,000	3,000
Schradan[b]	0.3	0.01	20	200	500	500	10	10[a]	10[a]	20	200	500
Simazine[b]	3,000	1,000	3,500	3,500	3,500	3,500	10	2,250	1,000	3,500	3,500	3,500
Dicamba[b]	250	5	500	1,000	2,500	2500	10	250	10[a]	500	1,000	2,500
Dichlorprop[b]	11,000	500	12,000	30,000	50,000	5,000	10	10[a]	10[a]	1,000	2,000	5,000
MCPA[b]	125,000	400	200,000	200,000	225,000	15,000	10	15,000	400	15,000	15,000	15,000
Mecoprop[b]	70,000	100	100,000	100,000	100,000	5,000	10	5,000	100	5,000	5,000	5,000
2,4,6 Trichlorophenol	30,000	800	30,000	30,000	300,000	10,000	100	10,000	2,000	10,000	10,000	10,000
4,6 Dinitro-o-cresol[b]	10,000	100	17,000	17,000	17,000	5,000	100	5,000	1,000	5,000	5,000	5,000
4-Chloro-2 methylphenol[b]	100,000	2,000	100,000	100,000	1,000,000	5,000	100	5,000	2,000	5,000	5,000	5,000
Bis(2-chloroethyl)ether[b]	200,000	20	200,000	400,000	2,000,000	15,000	100	15,000	20	15,000	15,000	15,000
Phenol	20,000	100	20,000	50,000	200,000	10,000	100	10,000	100	10,000	10,000	10,000
1,2 Dichlorobenzene	100,000	2,000	100,000	100,000	150,000	3,000	5	3,000	2,000	3,000	3,000	3,000
1,2-Dichloroethane	1,500,000	300	2,000,000	2,000,000	2,000,000	2,000	5	2,000	300	2,000	2,000	2,000
Cis 1,2, Dichloroethene	1,900,000	80	2,500,000	2,500,000	2,500,000	2,000	5	2,000	80	2,000	2,000	2,000
Cyclohexanone	5,000	1	200,000	1,000,000	2,000,000	500	10	500	10[a]	500	500	500
Tetrachloroethene	225,000	800	270,000	270,000	270,000	15,000	5	15,000	80	15,000	15,000	15,000
Toluene	100,000	1,000	100,000	200,000	400,000	3,000	1	3,000	1,000	3,000	3,000	3,000
Trichloroethene	550,000	700	650,000	650,000	650,000	1,000	5	1,000	700	1,000	1,000	1,000
Vinyl Chloride	2,000	2	400,000	800,000	800,000	50	5	50	5[a]	50	50	50
Xylene	100,000	2,000	100,000	200,000	200,000	2,500	1	2,500	2,000	2,500	2,500	2,500

a. The limit of Detection (LOD) is greater than the derived target to be protective of groundwater. Leachability testing will be undertaken to ensure that the contaminant is below the target for Maximum Leachate threshold within the Further Quantitative Risk Assessment for Controlled Waters and Preliminary Post-Remediation Validation Model, Dated June 2011.

b. Not a Human Health Contaminant of Concern below 1m Depth



Legend

- Reinstatement Area Zone 1
- Reinstatement Area Zone 2S
- Reinstatement Area Zone 2N
- Reinstatement Area Zone 3
- Riddy Brook / River Cam

A3

Rev.	Description	Revised By	Date
	FIRST ISSUE		20-04-11

Vertase F.L.I.

Bristol Head Office: Tel: 01275 397600 Fax: 01275 397601
Sheffield Office: Tel: 01246 813289 Fax: 01246 812963
Hertford Office: Tel: 01992 535757 Fax: 01992 535858
Manchester Office: Tel: 01614 372708 Fax: 01614 376300

email: info@vertasefli.co.uk
www.vertasefli.com

Rev:

Site Address:

Former Bayer Cropscience
Hauxton
Cambridge

Title: ConSim Zones with 22m Grid

Client: Harrow Estates plc

Drawn: MRG	Checked: SE	Approved: SE
Dwg: D907_163	Contract: 907 BRI	Scale: NTS

Table 1b. Leachate/Groundwater Maximum CoC Threshold Values

Contaminant	Zones - Type A Material (µg/l)	Zones - Type B & C Material (µg/l)			
	2	1	2S	2N	3
1,2-Dichloroethane	8,000,000	1,000	8,000,000	8,000,000	8,000,000
Dicamba	5,000	50	5,000	10,000	20,000
Schradan	5	0.1	200	2,000	5,000
Bis(2-chloroethyl)ether	1,000,000	50	1,000,000	1,000,000	5,000,000
Ethofumesate	20,000	50	20,000	50,000	50,000
Trichloroethene	1,200,000	1,000	1,200,000	1,200,000	1,200,000
Tetrachloroethene	230,000	1,000	230,000	230,000	230,000
Cis 1,2, Dichloroethene	4,900,000	1,000	4,900,000	4,900,000	4,900,000
Vinyl Chloride	10,000	10	1,000,000	2,700,000	2,700,000
Cyclohexanone	25,000	50	1,000,000	5,000,000	10,000,000
Hempa	15,000	1	700,000	5,000,000	10,000,000
1,2 Dichlorobenzene	100,000	1,000	100,000	100,000	150,000
2,4,6 Trichlorophenol	50,000	1,000	50,000	50,000	500,000
4,6 Dinitro-o-cresol	200,000	1,000	200,000	200,000	250,000
4-Chloro-2 methylphenol	100,000	1,000	100,000	100,000	1,000,000
Dichlorprop	20,000	1,000	20,000	40,000	80,000
Dimefox	5	0.1	200	1,000	2,000
MCPA	500,000	1,000	500,000	500,000	600,000
Mecoprop	620,000	1,000	620,000	620,000	500,000
Phenol	100,000	1,000	100,000	200,000	1,000,000
Simazine	7,400	1,000	7,400	7,400	7,400
Toluene	100,000	1,000	100,000	200,000	500,000
Xylenes	100,000	1,000	100,000	200,000	200,000

TABLE 2. ATKINS CNPI PRELIMINARY REMEDIAL TARGETS					
Contaminant	**Preliminary Remedial Target (ug/kg)**				**CNPI Report**
	Controlled Waters (>1m)		**Human Health (<1m)**		
	Outer Zone	Inner Zone	Outer Zone	Inner Zone	
2,6-bis(1-methylpropyl)-phenol	3,170	2.25	2170	2.25	8 July 2010
2,6-bis(1,1-dimethylethyl)-4(1-methylpropyl)-phenol	3,170	2.25	2170	2.25	8 July 2010
2,4-Dichloro-o-cresol	3,170	2.25	3110	2.25	8 July 2010
Bis(2-ethylhexyl) maleate[a]	LOD	LOD	LOD	LOD	8 July 2010
1,2-bis(2,4,6-trichlorophenoxy) ethane	>500,000	5,100	5	5	8 July 2010
Prochloraz	5,230	1.1	5230	1.1	8 July 2010
2,3,6-Trichlorotoluene	3,170	2.25	5	2.25	8 July 2010
1-(2-Chloroethoxy)-2(o-Tolyoxy)-ethane	3,170	2.25	5	2.25	8 July 2010
1-methylnaphthalene	1,790	Do not place in Inner Zone	Do not place at <1m depth	Do not place at <1m depth	18 August 2010
Dinoseb	330	Do not place in Inner Zone	Do not place at <1m depth	Do not place at <1m depth	18 August 2010
Trichloro benzenamine	200,000	Do not place in Inner Zone	Do not place at <1m depth	Do not place at <1m depth	18 August 2010
2,3-Dichlorotolouene	100,000	Do not place in Inner Zone	Do not place at <1m depth	Do not place at <1m depth	18 August 2010
2-chloro benzene methanol[b]	3.5 ug/l	0.17 ug/l	3.5 ug/l	0.17 ug/l	14 September 2010
2-chlorobenzalazine	100,000	Do not place in Inner Zone	Do not place at <1m depth	Do not place at <1m depth	14 September 2010
1-Ethyl-2-Methylbenzene	1,590	100	1,590	100	22 September 2010

Oxathiane 4,4-dioxide	10	10	10	10	27 October 2010
Indane	100,000	Do not place in Inner Zone	1,590	Do not place in Inner Zone	27 October 2010
Nicotine	219	10	91.6	10	22 November 2010
Dibromo Chloromethane	1,460	Do not place in Inner Zone	Do not place at <1m depth	Do not place in Inner Zone	30 November 2010
Ethyl Methyl Phenol	100,000	306	Do not place at <1m depth	Do not place in Inner Zone	30 November 2010
Dimethyl naphthalene	100,000	Do not place in Inner Zone	4,400	Do not place in Inner Zone	30 November 2010
Total Petroleum Hydrocabons $C_8 - C_{14}$	100,000	2,950	1,590	1,590	21 February 2011
DDD	100,000	275	26,300	275	21 February 2011
1-ethyl-3-methyl benzene[c]	1,590	Do not place in Inner Zone	1,590	Do not place in Inner Zone	21 February 2011
1-ethyl-4-methyl-benzene[c]	1,590	Do not place in Inner Zone	1,590	Do not place in Inner Zone	21 February 2011
Dimethyl Nitroaniline	10	Do not place in Inner Zone	Do not place at <1m depth	Do not place in Inner Zone	24 May 2011
Chorazine	251	Do not place in Inner Zone	210	Do not place in Inner Zone	24 May 2011

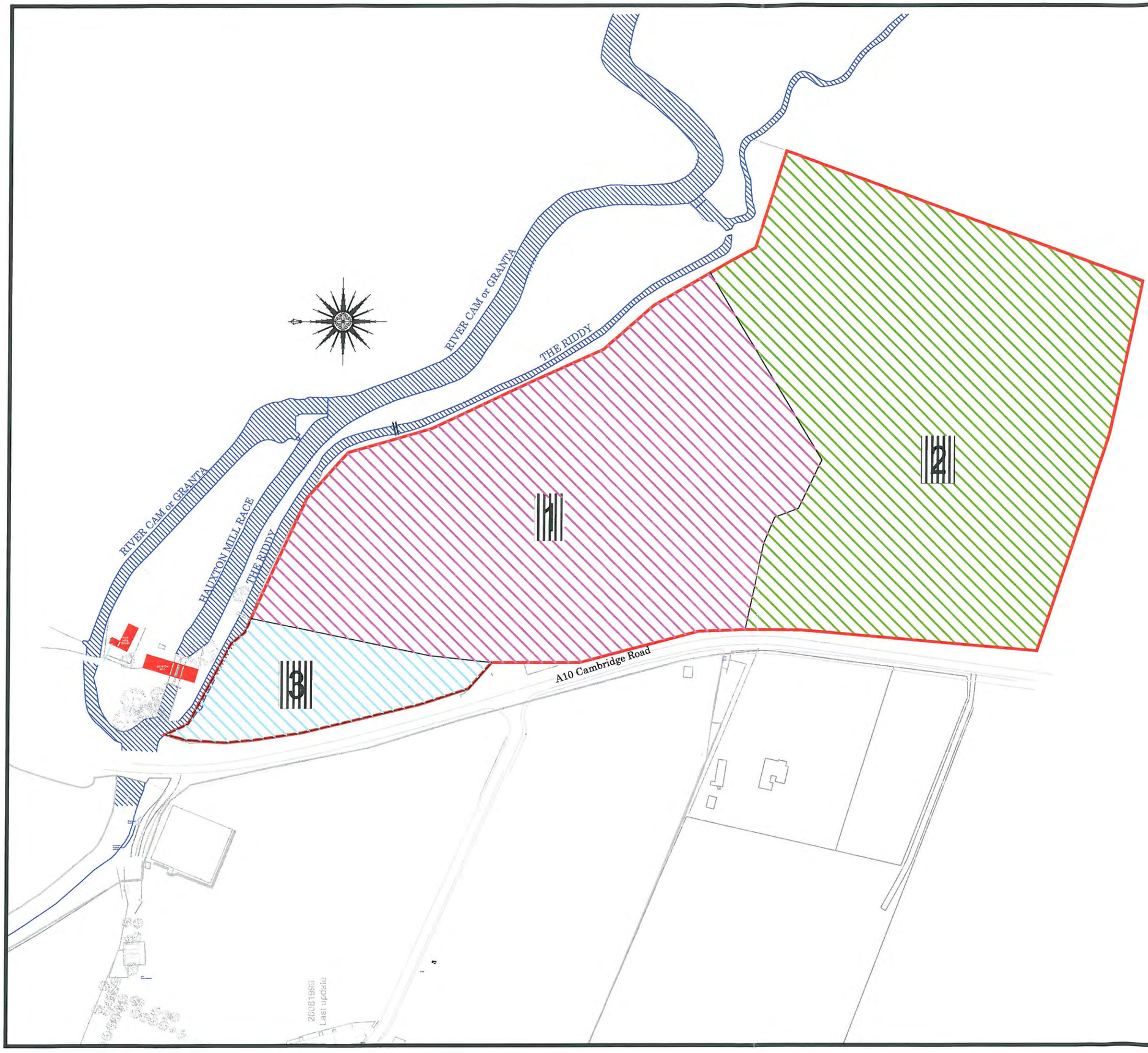
[a] – Limit of Detection (LOD) greater than derived remedial targets, therefore LOD to be used as remedial target;

[b] – LOD greater than remedial targets, therefore use leachate based targets;

[c] – Volatile compound therefore remedial target based on human health

TABLE 3 – SOIL MAXIMUM COC VALUES WITH RESPECT TO CONTROLLED WATERS FOR 9 CNPIS RISK ASSESSED BY VERTASE, DERIVED FROM VERTASEFLI (2011) 'FURTHER QUANTITATIVE RISK ASSESSMENT FOR CONTAMINANTS NOT PREVIOUSLY IDENTIFIED, FORMER BAYER CROP SCIENCE SITE, HAUXTON, CAMBRIDGESHIRE', NOVEMBER 2011.

Contaminant	**Zones - Type B & C Material (µg/kg)**	
	2S	**3**
Dichloro methylphenol	10,000	200,000
Trichlorotoluene	10,000	100,000
2,6-bis (1-methylpropylphenol)	10,000	80,000
Dimethyl Nitroanaline	5,000	40,000
Chlorazine	10,000	100,000
Dinoseb	2,000	20,000
1,2-bis(2,4,6-trichloropenoxy)ethane	5,000	20,000
Oxathiane 4, 4-dioxide	150	600
1-(2-chloroethoxy)-2-(o-tolyloxy)-ethane	20,000	100,000



Legend

A3

- Water Course
- Phase 1
- Phase 2
- Phase 3
- Site Boundary

Drawing Base : Ref LW/HAUX-002/2006

Rev.	Description	Revised By	Date
A	Phase 3 Altered	JWH	09–04–08
	FIRST ISSUE		21 April 08

Vertase F.L.I.

■	Bristol Head Office:	Tel: 01275 397600 Fax: 01275 397601
□	Sheffield Office:	Tel: 01246 813289 Fax: 01246 812963
□	Hertford Office:	Tel: 01992 535757 Fax: 01992 535858
□	Manchester Office:	Tel: 01614 372708 Fax: 01614 376300

email: info@vertasefli.co.uk
www.vertasefli.com

Site Address:

Bayer Site
Hauxton
Cambridge

Rev: A

Title: Vertase FLI Zone Plan 1-3

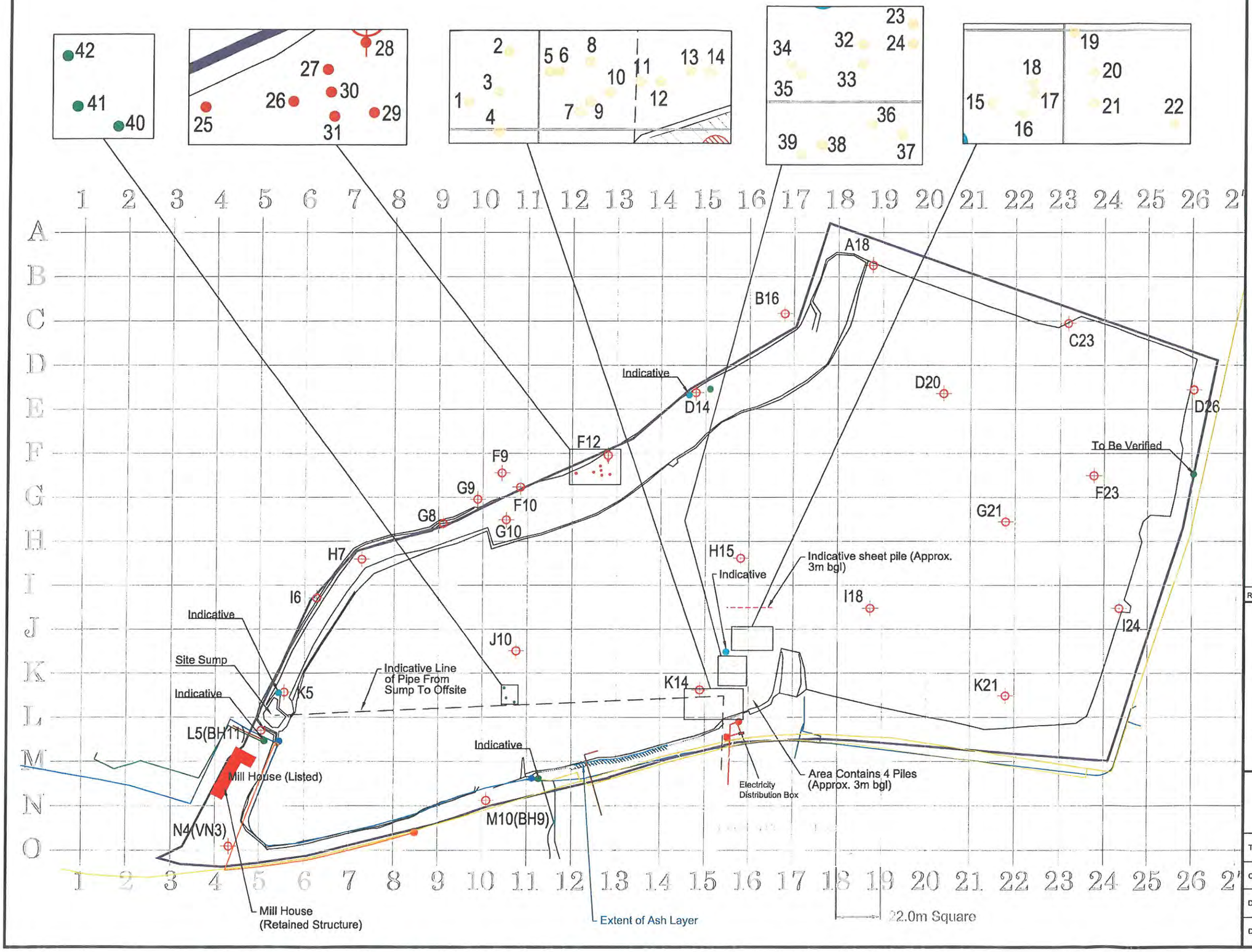
Client: Harrow Estates

Drawn: JWH	Checked: MA	Approved: MA
Dwg: D907_04	Contract: 907BRI	Scale: 1:2000

Underground Piles (see enlarged views)	1 to 24	32 to 39	40 to 42
Approximate Elevation	3m bgl	3m bgl	6m bgl

Underground Obstruction (see enlarged view)	25	26	27	28	29	30	31
Elevation (m AOD)	10.72	7.71	8.31	9.00	8.76	8.09	7.87

A2



Legend

- Site Boundary
- Validation Monitoring Wells
- Underground Pile Locations (3m bgl)
- Underground Pile Locations (6m bgl)
- Underground Obstruction
- Gas Cut-Off
- Artesian Well
- Low-Pressure Gas main
- Medium Pressure Gas Main Along Main Road Only
- Water Cut-Off
- Live Water Main
- LV Cable Cut-Off
- LV Cable
- HV Cable Cut-Off
- HV Cable
- BT Services

Rev.	Description	Revised By	Date
	FIRST ISSUE		19-12-11

Vertase F.L.I.

Bristol Head Office: Tel: 01275 397600 Fax: 01275 397601
Sheffield Office: Tel: 01246 813289 Fax: 01246 812963
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email: info@vertasefli.co.uk
www.vertasefli.com

Site Address:
Former Bayer Site
Hauxton

Rev:

Title: As-Built SI, Services and Underground Obstructions

Client: Harrow Estates

Drawn: MRG	Checked: MA	Approved: MA
Dwg: D907_193	Contract: 907 BRI	Scale: 1:1250

creating a better place

Environment Agency

Claire Sproats
South Cambridgeshire District Council
South Cambridgeshire Hall
Cambridge
CB23 6EA

Our ref: Hauxton/REM10d
Your ref:
Date: 27 March 2015

Dear Mrs Sproats

Following the remediation of the former Bayer CropScience factory site at Hauxton, Cambridgeshire, CB22 5HT on behalf of Harrow Estates Plc and the subsequent recommendations to discharge the relevant land contamination conditions, we have accepted the Remediation Statement submitted to us under section 78(H)(7) of the Environmental Protection Act 1990.

The following documents will be entered on to our public register and are provided for your information:

- a copy of this letter
- Atkins Limited undated cover letter to Environment Agency
- Atkins Limited (on behalf of Harrow Estates Plc) undated Remediation Statement relating to the former factory site
- Harrow Estates Plc email of 16 January 2015 containing an addendum to the Remediation Statement

Please note that the above Remediation Statement only covers the determined area to the east of the A10, that is the former factory site. The determined area to the west of the A10, that is the former waste water treatment works and surrounding land, still requires further work. We have started discussions with Harrow Estates Plc and their consultants regarding this further work.

Yours sincerely

Lee Bailey MGeol MSc CGeol FGS AIEMA
Technical Specialist - Land Contamination
Groundwater & Contaminated Land
Tel: 01480 483901
E-mail: lee.bailey@environment-agency.gov.uk

Copy to: Mark Nicholls, Harrow Estates Plc (letter only)

Annex 2: Determination Notice

DETERMINATION THAT LAND IS CONTAMINATED

ENVIRONMENTAL PROTECTION ACT 1990

SECTIONS 78A(2) AND 78B(1)

1. This written Determination is prepared in accordance with paragraph 52 of Chapter B of Annexe 3 of DETR Circular 02/2000.

2. In accordance with the Guidance set out in Chapter A of Annexe 3 of DETR Circular 02/2000 ("Chapter A"), [the definition of Contaminated Land] and Part 4 of Chapter B of Annexe 3 of DETR Circular 02/2000 ("Chapter B, Part 4"), [the pollution of controlled waters] South Cambridgeshire District Council ("the Local Authority") has identified the land described in Schedule 1 attached ("the Land") as contaminated land as defined in Section 78A(2) (b) of the Environmental Protection Act 1990 ("the 1990 Act").

3. Based on the evidence set out in Schedule 2 below, and following an assessment of that evidence as set out in Schedule 3 below it appears to the Local Authority that the Land is in such a condition, by reason of substances in, on or under the land that: pollution of controlled waters is being caused

4. The Local Authority considers that the requirements of Chapter A and Chapter B, Part 4, have been satisfied, in the manner and for the reasons set out in Schedule 4 below.

5. The Local Authority considers, having taken the advice of the Environment Agency, that the circumstances of the case meet the requirements of paragraph B.50 of the Statutory Guidance.

Dated: 3/6/03

[redacted]

D S Robinson
Chief Environmental Health Officer
South Cambridgeshire District Council
Meadow House
118 Water Lane
Oakington
Cambs
CB5 4AL

Notes:(1) Notice of this determination shall be given to the Environment Agency, the owner, the occupier and the person who appears to have caused or knowingly permitted the contaminating substances to be in, on or under the land.
(2) This determination shall be registered in the local Land Charges register pursuant to the Environmental Information Regulations, 1992.
(3) This determination shall be placed on the Contaminated Land Register held in the Environmental Health Department, Meadow House, 118 Water Lane, Oakington, Cambridge, CB5 4AL.

SCHEDULE 1 – The Land

The land is the Bayer CropScience factory site and associated land located at Hauxton, Cambridge, CB2 5HU (Grid Reference TL 432 524) as shown on the site layout plan in Annexe One.

SCHEDULE 2 – Summary of Evidence on which the Determination that the Land is Contaminated is based

From information supplied to South Cambridgeshire District Council (in reports prepared by Aspinwall & Co for AgrEvo UK Ltd. SH2503C and SH2503F detailed below) we have ascertained that the site, now known as the Bayer site, in Hauxton has been used for agrochemical manufacture since the 1940s. Principal production and processing functions (synthesis, formulation, packaging and storage of pesticides – mainly herbicides, fungicides and an acaricide) are located on the main site situated to the east of the A10, as are the bulk storage tanks for raw materials and wastes. The Waste Water Treatment Plant situated to the west of the A10, treats liquid effluent from the Main Site. Liquid wastes have been and still are piped to the Waste Water Treatment Plant for treatment and disposal to the River Cam. Solid wastes and some substances have been and still are disposed of offsite. Hauxton Trials Field, the former crop trial area has been the site of some waste disposal in the past.

There is a history of contamination incidents around the Bayer main site including 'brown pools' in the Riddy Brook (1969-71) – persisting for 'several years'; toluene contamination in groundwater underneath the main site in the 1980's; a fuel oil escape in 1987 contaminating the Riddy Brook; phenols, TBA and triazines discovered in sumps collecting groundwater under the main site in 1988; as well as contamination under main site from gradual releases over time – leaky drains, spills etc. Around the Waste Water Treatment Plant area there have been effluent overflows, lagoon and pipe bursts - in particular at the right angle bend just before the Waste Water Treatment Plant.

The southern part of the site is located over the Upper Cretaceous Chalk Marl (base of the Chalk), strata classified by the Environment Agency as a Major Aquifer. The Riddy Brook runs along the eastern boundary of the site and joins the River Cam to the north.

South Cambridgeshire District Council carried out a detailed inspection of written evidence and reviewed environmental reports prepared by Aspinwall & Company, Consultants in Environmental Management, Walford Manor, Baschurch, Shrewsbury, SY4 2HH. Bayer CropScience directly supplied further information. The Environment Agency provided copies of water monitoring records (various dates). The evidence reviewed relates to contamination at the site resulting from historic activities.

The Aspinwall & Co reports relate to a period of environmental assessment and remediation in the mid 1990s and date from April 1991 to July 1996. Of these reports, SH2503C (March 1994) and SH2503F (March 1996) are the most pertinent. Evidence principally from these two reports, with other data provided by Bayer CropScience (Stewart Bottomley, pers. comm. 2003) and the Environment Agency is used to make this determination.

Main Site

Evidence from March 1994 Aspinwall report

- The groundwater flow patterns beneath the site are complex because of the variable subsurface and the presence of buildings. Flow is generally radial rather than northerly. There is some evidence to suggest flow around the end of the bentonite wall towards the Riddy and the Cam.

- Groundwater in the central northern part of the site is the most heavily contaminated - with Phenoxy and Benzoic Acid herbicides (TBA, MCPA, Mecoprop, Dicamba), solvents (toluene and xylene), triazine herbicides (Atrazine, Simazine and Trietazine) and phenol.

- Secondary peak of contamination in the groundwater (phenol, Trietazine and Mecoprop)

  i. near bulk handling plant (midwest of site) and

  ii. In the fuel storage tanks area (mideast of site) - outside the containment system.

- Ethofumesate concentrations are elevated in groundwater across the site.

Evidence from March 1996 Aspinwall report.

- Pesticide contamination is widespread in groundwater below the site but with spatial variations.

- Triazines are present in groundwater north of the production area;

- MCPA, Mecoprop, TBA (plus phenols, chloride and sulphate) are present in groundwater northwest of the production area;

  Chloride; sulphate and ethofumesate are present in boreholes adjacent to river.

- Pesticides are present at mg/l levels at southeastern part of the site.

- Bentonite Wall: There is a wider range and concentration of pesticides west of bentonite wall than east of bentonite wall.

Evidence from Environment Agency water monitoring records

Presence of MCPA, Mecoprop, 236 TBA, TCE, simazine, atrazine, Hempa, Schradan, propazine and trietazine in groundwater under Church Meadow have been reported (November 2002).

Evidence supplied by Bayer CropScience

Soil analyses from the main car park interceptor trench in August 1997 reported the presence of 2,3,6-trichlorobenzoic acid, Benfuresate, Ethofumesate, Benazolin-ethyl at µg/kg level.

Waste Water Treatment Plant and former field trials areas

Evidence from March 1994 Aspinwall report.

- The groundwater flow is generally to the N-NE. The Waste Water Treatment Plant acts as barrier to groundwater flow and overall hydraulic conductivity is less well developed than below the Main Site. There is some evidence for groundwater movement to the west and the south (above background chloride and sulphate concentrations).

- The main areas of contamination are:

  Near the pipeline;

  Southwest of the Waste Water Treatment Plant (former effluent trenches area);

iii Northwest (made ground area) of Waste Water Treatment Plant. The source of contaminants is 'clearly' in Waste Water Treatment Plant.

Ethofumesate concentrations are elevated in groundwater across the site.

Evidence from March 1996 Aspinwall report.

- Contaminant (pesticides especially triazines, chloride and sulphate) concentrations are highest in groundwater near pipeline and south of Waste Water Treatment Plant area.

- There is less contamination in the groundwater north of Waste Water Treatment Plant and even less to east.

- Contaminants are present in the subsoil surrounding the Waste Water Treatment Plant. 'The soils in the centre of the site have been identified as being contaminated which, through leaching, will act as a continuing source of groundwater contamination.'

Evidence from Environment Agency water monitoring records

Presence of MCPA, TCE, Hempa, and Schradan in groundwater under Packhouse Field has been reported (for example, October 1999).

These facts have led to the following Significant Pollutant Linkages being identified:

The First Significant Pollutant Linkage (SPL 1)

The evidence for the pollutant linkage is the presence of TBA, MCPA, Mecoprop, Dicamba, Atrazine, Simazine and Trietazine (all organohalogen compounds), Toluene, Xylene, Phenol (substances which constitute poisonous, noxious or polluting matter) in the groundwater (and therefore more likely than not in the solid part of the land) on the factory main site. Additionally Benazolin-ethyl, TBA (organohalogen compounds), Benfuresate and Ethofumesate (substances which constitute poisonous, noxious or polluting matter) have been reported in a composite soil sample from the car park area. These substances are entering groundwater in the Chalk Marl (the Upper Cretaceous Chalk as stated in part 2 of Schedule 1 of the Contaminated Land Regulations) via migration through the unsaturated zone. Environment Agency data indicates that the contaminants have migrated off site.

The Second Significant Pollutant Linkage (SPL 2)

The evidence for the pollutant linkage is the presence of TBA, MCPA, Mecoprop, Dicamba, Atrazine, Simazine and Trietazine (all organohalogen compounds), Toluene, Xylene, Phenol (substances which constitute poisonous, noxious or polluting matter) in the groundwater (and therefore more likely than not in the solid part of the land) on the factory main site. Additionally Benazolin-ethyl, TBA (organohalogen compounds), Benfuresate and Ethofumesate (substances which constitute poisonous, noxious or polluting matter) have been reported in a composite soil sample from the car park area. These substances are entering surface waters (Riddy Brook) via groundwater.

The Third Significant Pollutant Linkage (SPL 3)

The evidence for the pollutant linkage is the presence of triazines (organolhalogen compounds), and high levels of chlorides and sulphates, (poisonous, noxious or polluting

matter) in the soils at the Waste Water Treatment Plant. These contaminants are continuing to enter groundwater in the Chalk Marl (the Upper Cretaceous Chalk as stated in part 2 of Schedule 1 of the Contaminated Land Regulations) via migration of contaminants through the unsaturated zone. Environment Agency data indicates that the contaminants have migrated off site.

Source	Pathway	Receptor	SPL
Poisonous, noxious or polluting substances in on or under the land, Bayer Main Site	Leaching/migration of contaminants through the soil and unsaturated zone	Controlled waters, comprising groundwater in the Upper Cretaceous Chalk aquifer	One
	Via groundwater	Controlled waters, comprising surface water body, Riddy Brook	Two

Source	Pathway	Receptor	SPL
Poisonous, noxious or polluting substances in on or under the land, Waste Water Treatment Plant area	Leaching/migration of contaminants through the soil and unsaturated zone	Controlled waters, comprising groundwater in the Upper Cretaceous Chalk aquifer	Three

SCHEDULE 3 – Summary of the Assessment of the Evidence Set Out in Schedule 2

The First Significant Pollutant Linkage (SPL 1)

This determination has been made on the basis of an assessment of previously collected evidence. The evidence has been collected by a reputable firm of environmental consultants (Aspinwall & Co) using reliable and scientifically defensible techniques and methods. South Cambridgeshire District Council have taken all relevant and available evidence into account and carried out an appropriate scientific and technical assessment of that evidence. On the basis of this assessment South Cambridgeshire District Council is satisfied that on the balance of probabilities both of the following circumstances apply:

- Potential pollutants are present in, on or under the land in question which constitutes poisonous, noxious or polluting matter, or which is solid waste matter, and
- These pollutants are entering controlled waters by the pathway identified in the pollutant linkage.

South Cambridgeshire District Council is satisfied that all three components of the SPL are present (as set out in Schedule 2).

The Second Significant Pollutant Linkage (SPL 2)

This determination has been made on the basis of an assessment of previously collected evidence. The evidence has been collected by a reputable firm of environmental consultants (Aspinwall & Co) using reliable and scientifically defensible techniques and methods. South Cambridgeshire District Council have taken all relevant and available evidence into account and carried out an appropriate scientific and technical assessment of that evidence. On the basis of this assessment South Cambridgeshire District Council is satisfied that on the balance of probabilities both of the following circumstances apply:

- Potential pollutants are present in, on or under the land in question which constitutes poisonous, noxious or polluting matter, or which is solid waste matter, and
- These pollutants are entering controlled waters by the pathway identified in the pollutant linkage.

South Cambridgeshire District Council is satisfied that all three components of the SPL are present (as set out in Schedule 2).

The Third Significant Pollutant Linkage (SPL 3)

This determination has been made on the basis of an assessment of previously collected evidence. The evidence has been collected by a reputable firm of environmental consultants (Aspinwall & Co) using reliable and scientifically defensible techniques and methods. South Cambridgeshire District Council have taken all relevant and available evidence into account and carried out an appropriate scientific and technical assessment of that evidence. On the basis of this assessment South Cambridgeshire District Council is satisfied that on the balance of probabilities both of the following circumstances apply:

- Potential pollutants are present in, on or under the land in question which constitutes poisonous, noxious or polluting matter, or which is solid waste matter, and

- These pollutants are entering controlled waters by the pathway identified in the pollutant linkage.

South Cambridgeshire District Council is satisfied that all three components of the SPL are present (as set out in Schedule 2).

SCHEDULE 4 – Summary of the way in which the Enforcing Authority considers that the requirements of Chapter A, and Chapter B, Part 4 have been satisfied.

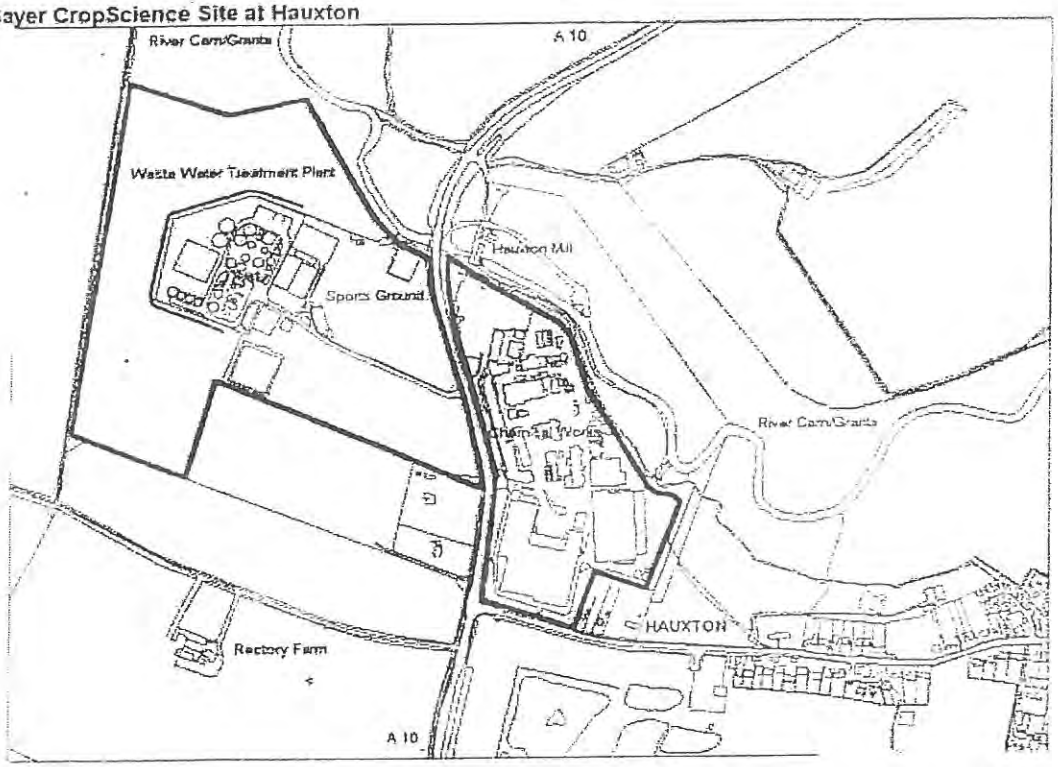
The Chief Environmental Health Officer carried out a scientific and technical assessment of the relevant and available evidence for the three Significant Pollutant Linkages identified and it is satisfied that all three parts of the three Significant Pollutant Linkages exist. Advice was requested from the Environment Agency and the Chief Environmental Health Officer had regard to their comments in accordance with paragraph 43 of the Statutory Guidance.

Following consideration of all the available evidence and the Environment Agency comments the Chief Environmental Health Officer reported the matter to the executive of the Local Authority, which on the 8th May 2003 determined that the circumstances of the case met the requirements of paragraph B.50 of the Statutory Guidance.

Annexe One

Site layout plan Bayer CropScience site

Bayer CropScience Site at Hauxton



Annex 3: Remediation Parties Contact Details

Client & CDM Coordinator

Harrow Estates Plc
Bridgemere House
Chester Road
Preston Brook
Runcorn
Cheshire WA7 3BD

Contact: Mark Nicholls – Technical Director / Lee Wood – Project Engineer

Contractor

VertaseFLI Limited
19 Napier Court
Barlborough Links
Barlborough
Sheffield S43 4PZ

Contact: Steve Edgar – Director

Project Manager and Supervising Engineer

Atkins Limited
The Axis
10 Holliday Street
Birmingham B1 1TF

Contact: Mark Smith – Associate

Statutory Authorities

South Cambridgeshire District Council
South Cambridgeshire Hall
6010 Cambourne Business Park
Cambourne
Cambridge CB23 6EA

Contact: Peter Ord - Acting Environmental Health Manager

Environment Agency
Bromholme Lane
Brampton
Huntingdon
Cambridgeshire PE28 4NE

Contact: Eileen Young - Technical Specialist