Baseline Report

GlaxoSmithKline (Currabinny)
Environmental Consultancy
IE0311351-22-RP-0001, Issue: A

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Environmental Consultancy
IE0311351-22-RP-0001, Issue A

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PREVIOUS ISSUES							
Issue No	Date	Originator	Checker	Reviewer	Approver	Customer	Reason for issue

Contents

1 Introduction

GlaxoSmithKline, SmithKline Beecham (Cork) Ltd. (GSK) is applying for an Industrial Emissions (IE) Licence review. The primary objective of this licence review is to include a number of recent projects which have been granted planning permission at the GSK site. Furthermore, it aims to bring site operations into compliance with the Industrial Emissions Directive (2010/75/EU).

This baseline report has been prepared by PM Group on behalf of GSK in accordance with Regulation 9 of the EPA (Industrial Emissions) (Licensing) Regulations, 2013, (SI No. 137 of 2013). The purpose of the baseline report is to contain the information necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon definitive cessation of activities.

1.1 Background

The GSK plant is situated on a small peninsula, within Lough Beg on the west side of Cork Harbour. The site is located at Currabinny, 1 km south of Ringaskiddy. The GSK facility at Currabinny is regulated by the EPA and was granted its most recent Integrated Pollution Prevention Control (IPPC) Licence, P0004-04, in January 2013, now amended to an IE Licence.

The GSK site has been licensed since 1994, when it received an Integrated Pollution Control (IPC) Licence Reg. No. P0004-01 on the 6th of December 1994. Thereafter, due to further developments on-site, GSK was subsequently granted a revised IPC Licence Reg. No. P0004-02 on 20th August 1999. In 2006 the EPA requested a review of the Licence to bring site operations into compliance with the requirements of the IPPC Directive 96/61/EC. GSK was subsequently granted an Integrated Pollution Prevention Control (IPPC) Licence Reg. No. P0004-03 on 7th July 2007.

On the 28th October, 2011, GSK received notification from the EPA, of their intention to review the site IPPC Licence P0004-03 to bring the licence into compliance with legislative amendments, for the 2009 Environmental Objectives Regulations.

On 22nd November, 2012, the Agency completed a Recommended Determination for a revised IPPC Licence (P0004-04) with revised Emission Limit Values for the discharge point to Lough Beg, and an Inspector's Report outlining the details of the site and the IPPC Licence review. GSK received notice that IPPC Licence P0004-04 was issued on January 9th, 2013.

The licence was technically amended to an IE Licence on the 18th December 2013 to bring it in line with the Industrial Emissions Directive.

Under Part IV of the Environmental Protection Agency Act 1992 (as amended), Smithkline Beecham (Cork) Limited, trading as GSK, is licensed by the EPA to carry on the following activities at Currabinny, Carrigaline, Co. Cork;

- *The production of pharmaceutical products including intermediates (production means the production on an industrial scale by chemical or biological processing)*
- *The recovery or disposal of waste in a facility, within the meaning of the Act of 1996, which facility is connected or associated with another activity specified in this Schedule in respect of which a licence or revised licence under Part IV is in force or in respect of which a licence under the said Part is or will be required.*
- *Disposal or recovery of waste in waste incineration plants or in waste co- incineration plants for hazardous waste with a capacity exceeding10 tonnes per day.*
- *Temporary storage of hazardous waste, (other than waste referred to in paragraph 11 .5) pending any of the activities referred to in paragraph 11.2, 11.3, 11 .5 or 11.7 with a total capacity exceeding 50 tonnes, other than temporary storage, pending collection, on the site where the waste is generated.*

The GSK site comprises:

- 8 No. Production Buildings; including Buildings 1, 2, 3, 5, 6, 7, 8 and 10 (Gantrez production is in Building 10),

- Milling/Nanomilling Facility (Building 4),
- Research and Development Building, (Building 9),
- 2 no. Warehouses (for raw materials, intermediates, finished goods and maintenance supplies),
- External material storage areas including tank farms (waste and raw materials),
- Environmental Control Centre,
- Waste Management Facility (for solid wastes),
- Service Utilities,
- Laboratories,
- Engineering Building,
- Office Buildings,
- Cafeteria, and
- Security Building.

Pollution control equipment includes;

- Incinerators (No. 1 and No. 3-A),
- Thermal Oxidisers (currently not in-use),
- Wastewater Treatment Plant (bio treatment/chemical treatment),
- Solvent recovery plants, and
- 3 Firewater Retention Ponds.

The facility produces bulk active pharmaceutical ingredients for clinical supplies and final products. Products and goods are exported to other GSK locations worldwide for formulation and distribution. The facility operates 24 hours per day for 7 days per week.

1.2 Requirement for Baseline Report

1.2.1 European Legislation

The Industrial Emissions Directive (2010/75/EU) or 'IED' entered into force within the European Union on 6th January 2011. The IED brings together the Integrated Pollution Prevention and Control Directive (2008/1/EC), the Waste Incineration Directive (2000/76/EC) and five other directives in a single Directive on industrial emissions.

For industrial activities regulated by the IED, such as the GSK facility, Article 22(2) of Chapter II of the IED states that:

"Where the activity involves the use, production or release of relevant hazardous substances and having regard to the possibility of soil and groundwater contamination at the site of the installation, the operator shall prepare and submit to the competent authority a baseline report before starting operation of an installation or before a permit for an installation is updated for the first time after 7 January 2013.

The baseline report shall contain the information necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon definitive cessation of activities.

The baseline report shall contain at least the following information:

(a) Information on the present use and, where available on past uses of the site;

(b) Where available, existing information on soil and groundwater measurements that reflect the state at the time the report is drawn up or, alternatively, new soil and groundwater measurements having regard to the possibility of soil and groundwater contamination by those hazardous substances to be used, produced or released by the installation concerned.

Where information produced pursuant to other national or Union law fulfils the requirements of this paragraph that information may be included in, or attached to, the submitted baseline report. The Commission shall establish guidance on the content of the baseline report."

1.2.2 Irish Legislation

Article 22(2), as part of Chapter II of the IED, was transposed into Irish national law on 23 April 2013 by the European Union (Industrial Emissions) Regulations 2013 (S.I. No. 138 of 2013) and resulting amendments to the Environmental Protection Agency Act 1992.

Section 86B of the Environmental Protection Agency Act 1992, as amended, states that:

"(1) Where an industrial emissions directive activity involves the use, production or release of relevant hazardous substances, and having regard to the possibility of soil and groundwater contamination at the site of an installation concerned, the Agency shall require an applicant under this Part for a licence or review of a licence or revised licence relating to the activity, including such a review by the Agency of its own volition, to furnish to the Agency a baseline report in accordance with regulations under section 89."

"(2) In relation to an installation, a baseline report shall contain the information necessary to determine the state of contamination of soil and groundwater at the time the report is drawn up in order that a quantified comparison may be made to the state of the site upon the permanent cessation (including cessation by abandonment) of the industrial emissions directive activity concerned and the applicant in preparing the baseline report shall include any information prescribed in regulations under section 89."

"(3) Notwithstanding the generality of subsection (2), a baseline report shall include at least the following information-

(a) The current use and, where available, the past use of the site,

(b) Any available information.

On soil or groundwater measurements that reflect the state of the site at the time that the baseline report is drawn up, or

ii. On new soil and groundwater measurements, having regard to the possibility of soil and groundwater contamination by the hazardous substances proposed to be used, produced or released by the installation concerned.

(4) Any information furnished to the Agency or to any other body under any enactment or rule of law or a law of the European Union, which complies with the requirements of subsection (2) or (3), may be furnished to the Agency in or with the baseline report.

(5) For the purposes of determining the information to be contained in a baseline report under this section the Agency shall have regard to, and shall for the purposes of subsection (2), make publicly available any guidance documents published by the Commission of the European Union in accordance with Article 22(2) of the Industrial Emissions Directive."

1.3 Scope of the Report

The European Commission (EC) established guidance on 6th May 2014 on the content of the baseline report as required by Article 22(2) of the IED[1] and, following consultation with the EPA, has been used in the preparation of this report.

The EC Guidance identifies key stages to be undertaken to both determine whether a baseline report needs to be produced and the order in which the baseline report is produced. The key stages are as follows:

- Stage 1: Identifying the hazardous substances that are currently used, produced or released at the installation
- Stage 2: Identifying the relevant hazardous substances[2]

[1] European Commission Guidance concerning baseline reports under Article 22 (2) of Directive 2010/75/EU on industrial emissions (2014/C 136/03)

- Stage 3: Assessment of the site-specific pollution possibility
- Stage 4: Site history
- Stage 5: Environmental setting
- Stage 6: Site characterisation
- Stage 7: Site investigation
- Stage 8: Production of the baseline report

The EC Guidance states that *'The possibility of soil and groundwater contamination at the site of the installation' (Article 22(2), first subparagraph) covers a number of important elements. Firstly, due consideration should be given in a baseline report to the quantities of hazardous substances concerned – where very small quantities are used, produced or released on the site of the installation then the possibility of contamination is likely to be insignificant for the purpose of producing a baseline report. Secondly, baseline reports must consider the soil and groundwater characteristics of the site and the impact of those characteristics on the possibility of soil and groundwater contamination taking place. Thirdly, for existing installations, their characteristics may be considered where they are such that it is impossible in practice that contamination can take place.*

This report follows the stage approach as recommended in the EC Guidance. Key references and related documents used in the compilation of this Baseline Report included the following documents and these should be read in conjunction with the Baseline Report:

- Chapter 11 (Soils, Geology, Surface Water and Groundwater) of the Environmental Impact Statement (EIS), which was included in the planning application for the proposed wind energy project at GSK,
- Biannual Groundwater Monitoring Report for GlaxoSmithKline, Currabinny, Co. Cork (November 2013 and May 2014), carried out by Verde Environmental Consultants Ltd (Verde),
- Environmental Liabilities Risk Assessment (ELRA) carried out by GSK in April 2014; and
- Residuals Management Plan, carried out by PM Group in 2010 (PM Document No. IE0310202-22-RP-0001).

1.4 Limitations

The findings herein are based on the latest guidance available and information obtained at the time of writing (May-July 2014). If additional information and/or guidance become available, which might alter PM Groups conclusions, we reserve the right to review such information, reassess potential risks and modify our findings, if warranted. Please note that where we refer to information in reports from others, it must be recognised that PM Group has no responsibility for the accuracy of the information contained therein.

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[2] 'Relevant hazardous substances' - (Article 3(18) and Article 22(2), first subparagraph) are those substances or mixtures defined within Article 3 of Regulation (EC) No 1272/2008 on the classification, labelling and pack aging of substances and mixtures (CLP Regulation) which, as a result of their hazardousness, mobility, persistence and biodegradability (as well as other characteristics), are capable of contaminating soil or groundwater and are used, produced and/or released by the installation.

2 Identification of Hazardous Substances (Stage 1)

The EC Guidance states that Stage 1 should include a list of all hazardous substances used, produced or released inside the installation boundary (either as raw materials, products, intermediates, by-products, emissions, wastes or auxiliaries). Substances (both hazardous and non-hazardous) used in the manufacture of product on-site include:

- Raw materials, intermediates and reagents (organic and inorganic compounds);
- Solvents;
- Catalysts; and
- Filter aids.

Other chemicals used on site include:

- Cleaning solutions;
- Bench top quantities of laboratory reagents;
- Lubricants for utility equipment;
- Wastewater treatment plant dosing chemicals;
- Water treatment chemicals;
- Fuels; and
- Refrigerants.

Materials generated by the activity include:

- Active pharmaceutical ingredients and their intermediates;
- Process-related hazardous and non-hazardous wastes;
- Effluent; and
- Sludge.

Hazardous wastes generated on site include:

- Solvents, recovered on and off site
- Solvents, incinerated on and off site and used for heat recovery off-site
- Effluent, treated in the site wastewater treatment plant
- Laboratory Wastes
- Off-specification Raw Materials
- Catalysts and metals, recovered off site
- Miscellaneous (minor sources), including UV and Fluorescent tubes, waste oils, batteries, unused paints, oily rags, etc.

A complete inventory of raw and ancillary materials, substances, preparations and fuels which is produced by or utilised within the installation boundary is contained in Attachment G.1 of the 2013 IE Licence Review Application. In accordance with Condition 1.4 of the current licence, all new materials introduced onto the site in significant quantities have been notified to the EPA and GSK will continue to notify the EPA and seek written approval before any new materials are used on site.

Table H.3 (i) of the IE application lists the waste generated at the installation. The 2013 Annual Environmental Report, issued to the EPA, provides the most up to date list.

3 Identification of Relevant Hazardous Substances (Stage 2)

'Relevant hazardous substances' (Article 3(18) and Article 22(2), first subparagraph) are those substances or mixtures defined within Article 3 of Regulation (EC) No 1272/2008 on the classification, labelling and pack aging of substances and mixtures (CLP Regulation) which, as a result of their hazardousness, mobility, persistence and biodegradability (as well as other characteristics), are capable of contaminating soil or groundwater and are used, produced and/or released by the installation.

Article 3 of Regulation (EC) No. 1272/20081 defines a hazardous substance as *a substance or a mixture fulfilling the criteria relating to physical hazards, health hazards or environmental hazards, laid down in Parts 2 to 5 of Annex I is hazardous and shall be classified in relation to the respective hazard classes provided for in that Annex.*

Part 2 sets out the list of physical hazards (oxidising, flammable, etc.)

Part 3 sets out the health hazards (toxicity, irritants, etc.)

Part 4 sets out the environmental hazards (hazards to the aquatic environment)

Part 5 sets out additional EU hazard classes.

A review of the substances listed in Table G.1 of the 2013 Licence Review form has been undertaken to identify any substances employed in the GSK facility that are defined as "relevant hazardous substances". This includes all raw materials, intermediates and products used and stored at the site.

From the list produced in Stage 1, the potential pollution risk of each hazardous substance has been determined by considering its chemical and physical properties. This information was used to determine whether or not the substance has the potential to cause pollution of soil and groundwater and a risk to receptors.

'Relevant Hazardous substances' have been identified in Table 3.1 and are noted with the relevant hazard class.

Table 3.1 'Relevant' Hazardous Substances

Material	CAS No.	Appearance	Hazard statements
Calcium Hydroxide	1305-62-0	White crystalline powder	H318 Causes serious eye damage.
Sodium Carbonate	06/11/5968	Powder	H319 Causes serious eye irritation.
Industrial Methylated Spirits (IMS)	8013-52-3	Colourless, volatile liquid with a distinctive wine-like odour	Ethanol - H225: Highly flammable. Methanol - H301: Toxic if swallowed. H311: Toxic in contact with skin. H331: Toxic if inhaled. H370: Causes damage to organs.
Acetic Acid (Glacial)	64-19-7	Clear colourless pungent liquid	H314: Causes severe skin burns and eye damage.
Sodium Hydroxide	1310-73-2	Colourless Liquid	H314: Causes severe skin burns and eye damage
Thebaine	115-37-7	White/off-white powder	H300 Fatal if swallowed H311 Toxic if swallowed, in contact with skin or if inhaled H330 Fatal if inhaled H373 May cause damage to liver/blood through prolonged or repeated exposure.
Z- Valaciclovir (717U87)	124832-31-1	White crystalline powder	H341: Suspected of causing genetic defects H351: Suspected of causing cancer H361: Suspected of damaging fertility or the unborn child
5% Catalyst Pd/Charcoal	03/05/7440	Black powder.	H228: Flammable solid H413: May cause long lasting harmful effects to aquatic life
Formic acid (88-95%)	64-18-6	Colourless liquid	H314 Causes severe skin burns and eye damage.
Acetone	67-64-1	Colourless liquid	H319: Causes serious eye irritation. H225: Highly flammable liquid and vapour H336: May cause drowsiness or dizziness.
Hydrochloric Acid	7647-01-0	Fuming colourless to yellow liquid	H314: Causes severe skin burns and eye damage. H335: May cause respiratory irritation.
Valaciclovir HCL	124832-27-5	White crystalline powder	H302: Harmful if swallowed
Carvedilol Stage 8	72956-09-3	Crystalline powder	H411 Toxic to aquatic life with long lasting effects
Phosphoric Acid	7664-38-2	Colourless odourless liquid	H314: Causes severe skin burns and eye damage
Carvedilol Phosphate Salt (Stage 9)	610309-89-2	Crystalline powder	H317: May cause an allergic skin reaction. H400: Very toxic to aquatic life. H410: Very toxic to aquatic life with long lasting effects.
GR 91287X (Stage 2) (Ene amide)	103335-54-2	Yellow powder	H413: May cause long lasting harmful effects to aquatic life
Ammonium Acetate	631-61-8	White crystalline solid	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
Platinum (waste)	7440-06-4	Grey black powder (wet)	H413 May cause long lasting harmful effects to aquatic life
Platinum (IV) Oxide	1314-15-4	Grey black powder	H319 Causes serious eye irritation.
Cellulose Microcrystalline	9004-34-6	White powder	H335 May cause respitory irritation

Material	CAS No.	Appearance	Hazard statements
Methanol	67-56-1	Colourless liquid	H301: Toxic if swallowed. H311: Toxic in contact with skin. H331: Toxic if inhaled. H370: Causes damage to organs.
Dutasteride Stage 3 (GR 89246X)	103335-55-3	White to off-white crystalline powder	H361 Suspected of damaging the unborn child.
Dichlorodicyanobenzoquinone (DDQ)	84-58-2	Yellow to orange crystalline solid with a pungent odour	H301 Toxic if swallowed
1-4 Dioxane	123-91-1	Colourless to yellow liquid	H319: Causes serious eye irritation. H335: May cause respiratory irritation. H352: Suspected of causing cancer.
BSTFA (bis(trimethylsilyl) trifluoro acetamide)	25561-30-2	Colourless to yellow liquid	H314 Causes severe skin burns and eye damage.
Methylene Chloride (MDC)	75-09-2	Volatile clear liquid with a sharp odour.	H315: Causes skin irritation. H319: Causes serious eye irritation. H335: May cause respiratory irritation. H336: May cause drowsiness or dizziness. H351: Suspected of causing cancer. H373: May cause damage to liver/blood through prolonged or repeated exposure.
Sodium Metabisulphite	7681-57-4	White to yellow powder	H302: Harmful if swallowed. H318: Causes serious eye damage.
Tetrahydrofuran (THF)	109-99-9	Colourless liquid	H319: Causes serious eye irritation. H335: May cause respiratory irritation.
Acetonitrile	75-05-8	Clear colourless liquid	H302: Harmful if swallowed. H312: Harmful in contact with skin. H319: Causes serious eye irritation. H332: Harmful if inhaled.
Dutasteride Stage 4 (GI 206020X) "unsaturated acid"	104239-97-6	White odourless powder	H302 Harmful if swallowed H361 Suspected of damaging the unborn child.
Sodium Hydroxide	1310-73-2	Colourless Liquid	H314: Causes severe skin burns and eye damage
Thionyl Chloride	7719-09-7	Colourless to pale yellow or red liquid with a pungent odour	H302: Harmful if swallowed. H314: Causes severe skin burns and eye damage. H331: Toxic if inhaled.
Pyridine	110-86-1	Colourless liquid	H302: Harmful if swallowed. H312: Harmful in contact with skin. H332: Harmful if inhaled
4 - Dimethylaminopyridine (DMAP)	1122-58-3	Light yellow crystalline powder	H301 Toxic if swallowed. H310 Fatal in contact with skin. H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
2,5-bis(trifluoromethyl) aniline	328-93-8	Colourless liquid with a foul odour.	H317: May cause an allergic skin reaction. H318: Causes serious eye damage.
n - Heptane	142-82-5	Colourless liquid	H304 May be fatal if swallowed and enters airways. H315 Causes skin irritation. H336 May cause drowsiness or dizziness. H410 Very toxic to aquatic life with long lasting

Material	CAS No.	Appearance	Hazard statements
			effects.
Dutasteride Stage 5 (GI 198745X)	164656-23-9	White to off white odourless solid.	H360: May damage fertility or the unborn child H361: Suspected of damaging fertility or the unborn child H413: May cause long lasting harmful effects to aquatic life
282U85 (1-Beta-D-Arabinofuranosylluracil)	3083-77-0	White to off-white. crystalline powder	H361: Suspected of damaging fertility or the unborn child
179U60 (2-Amino-6-Methoxy-9H-Purine)	20535-83-5	White to off-white. crystalline powder	H302: Harmful if swallowed. H341: Suspected of causing genetic defects. H361: Suspected of damaging fertility or the unborn child
Potassium Dihydrogen Phosphate	7778-77-0	White granules	H314 Causes severe skin burns and eye damage.
Dipotassium Hydrogen Phosphate	16788-57-1	White granules	No data available
Potassium Hydroxide (CIP 100)	1310-58-3	Colourless odourless solid	H302: Harmful if swallowed. H314: Causes severe skin burns and eye damage.
Nelarabine API (506U78)	121032-29-9	White to off-white crystalline powder	H341: Suspected of causing genetic defects. H351: Suspected of causing cancer. H360: May damage fertility or the unborn child H361: Suspected of damaging fertility or the unborn child H413: May cause long lasting harmful effects to aquatic life
Catalyst 10% Palladium on activated carbon.	7440-05-3	Black powder	H228 Flammable Solid, H413 May cause long lasting harmful effects to aquatic life
Rosiglitazone Stage 4 (BRL-49653)	122320-73-4	Off white crystalline powder	H361: Suspected of damaging fertility or the unborn child H400: Very toxic to aquatic life
Maleic Acid	110-16-7	White powder	H302: Harmful if swallowed H312: Harmful if in contact with skin H315 Causes skin irritation. H317 May cause an allergic skin reaction H318 Causes serious eye damage. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
Rosiglitazone Stage 5 (BRL-49653-C)	155141-29-0	White to cream crystalline powder.	H361: Suspected of damaging fertility or the unborn child H319: Causes serious eye irritation.
Ropinirole Stage 2 (SKF-98940) outsourced to Fine Organics	139122-17-1	Off-white powder	No data available
Sodium Borohydride	16940-66-2	White solid with slight amine odour.	H301: Toxic if swallowed. H311: Toxic in contact with skin. H314: Causes severe skin burns and eye damage.
Ropinirole Stage 3 (SKF 98202)	139122-19-3	Yellow powder	H412 Harmful to aquatic life with long lasting effects

Material	CAS No.	Appearance	Hazard statements
P-Toluene Sulphonyl Chloride	98-59-9	Off white crystals	H315 Causes skin irritation. H318 - Causes serious eye damage
Ropinirole Stage 4 (SKF-98339)	139122-20-6	Yellow powder	H317 May cause an allergic skin reaction.
Di-n-propylamine (Dipropylamine)	142-84-7	Colourless liquid	H302 Harmful if swallowed. H312 Harmful in contact with skin. H314 Causes severe skin burns and eye damage. H332 Harmful if inhaled.
Isopropanol (IPA, propan-2-ol)	67-63-0	Colourless liquid	H319: Causes serious eye irritation. H336: May cause drowsiness or dizziness.
Ropinirole Stage 5 (SKF 101468A)	91374-20-8	White to light yellow powder	H302: Harmful if swallowed. H319: Causes serious eye irritation. H362: May cause harm to breast-fed children. H412: Harmful to aquatic life with long lasting effects. H370: Causes damage to organs.
Paroxetine Stage 3B (BRL - 29226)	105812-81-5	Off white powder	H302: Harmful if swallowed. H318: Causes serious eye damage. H412: Toxic to aquatic life with long lasting effects.
Benzenesul phonyl Chloride (BSC)	98-09-9	Colourless to brown liquid	H302 Harmful if swallowed. H314 Causes severe skin burns and eye damage. H317 May cause an allergic skin reaction. H332 Harmful if inhaled. H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Dimethylethylamine (DMEA)	598-56-1	Colourless to yellow amine liquid	H302: Harmful if swallowed. H314: Causes severe skin burns and eye damage. H331: Toxic if inhaled.
Sesamol (BRL-43782)	533-31-3	Light brown solid	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
Tetraoctylammonium Bromide	14866-33-2	White hygroscopic crystals	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
Toluene	108-88-3	Clear liquid.	H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H336: May cause drowsiness or dizziness. H361: Suspected of damaging the unborn child. H373: May cause damage to organs through prolonged or repeated exposure.
Paroxetine Stage 4 (BRL-42493)	110429-36-2	Buff coloured powder.	H302: Harmful if swallowed. H318: Causes serious eye damage.
Citric Acid (2-hydroxypropane-1,2,3-tricarboxylic acid) 50%	77-92-9	Colourless crystals	H315 Causes skin irritation. H318 Causes serious eye damage.
Phenylchloroformate (PCF)	1885-14-9	Colourless to yellowish liquid.	H302 Harmful if swallowed. H314 Causes severe skin burns and eye damage. H330 Fatal if inhaled.

Material	CAS No.	Appearance	Hazard statements
n,n-Diisopropylethylamine (Hunigs Base)	7087-68-5	Colourless to pale yellow liquid	H301 Toxic if swallowed. H412 Harmful to aquatic life with long lasting effects. H314 Causes severe skin burns and eye damage.
Paroxetine Stage 5 (BRL-42494)	253768-88-6	White powder	H413: May cause long lasting harmful effects to aquatic life.
Paroxetine HCL Hemihydrate (Stage 7) API	110429-35-1	White powder	H302: Harmful if swallowed. H318: Causes serious eye damage. H335: May cause respiratory irritation. H360: May damage fertility or the unborn child H372: Causes damage to organs through prolonged or repeated exposure H411: Toxic to aquatic life with long lasting effects
Auranofin API	34031-32-8	White powder	H301: Toxic if swallowed H317: May cause an allergic skin reaction H318: Causes serious eye damage H360: May damage fertility or the unborn child
Lapatinib Stage 1 (GW607864X) **Note** - may be dry or 5 -10% IMS wet	231278-20-9	Cream solid	No data available
5-Formyl-2-furanboronic acid (GR82029X)	27329-70-0	Cream to light brown solid with an antiseptic odour	H318 Causes serious eye damage
p-Toluene-Sulfonic Acid (PTSA)	104-15-4	Light pink solid	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
2-(methylsulfonyl)-ethylamine hydrochloride - (GR52269A)	104458-24-4	White crystalline, odourless solid	H319 Causes serious eye irritation.
Sodium Triacetoxyborohydride (STAB)	56553-60-7	Odourless white solid with acetic acid odour.	H318 Causes serious eye damage H315 Causes skin irritation
Ammonium Chloride (20% solution)	12125-02-9	colourless to slightly pink solution	H302 - Harmful if swallowed H319 - Causes serious eye irritation
Lapatinib Stage 3 (GW572016). **Note** - 5% THF wet.	388082-78-8	Yellow powder (30% wet)	H413: May cause long lasting harmful effects to aquatic life.
Lapatinib Ditosylate - Stage 4 (GW572016F Recrystallised)	388082-78-8	Yellow powder	H413: May cause long lasting harmful effects to aquatic life.
Eltrombopag Stage 3 (SB 564758)	376592-58-4	Yellow solid	H302: Harmful if swallowed H317: May cause an allergic skin reaction H373: May cause damage to organs through prolonged or repeated exposure H412: Harmful to aquatic life with long lasting effects
Eltrombopag Stage 5 (SB 392033)	18048-64-1	Off-white solid	H317: May cause an allergic skin reaction H400: Very toxic to aquatic life H373: May cause damage to organs through prolonged or repeated exposure H410: Very toxic to aquatic life with long lasting effects
Ammonia (30-35%)	7664-41-7	Colourless liquid	H221: Flammable gas H314: Causes severe skin burns and eye damage H331: Toxic if inhaled

Material	CAS No.	Appearance	Hazard statements
			H400: Very toxic to aquatic life
Sodium Nitrite	7632-00-0	Off white hygroscopic powder	H400 Very toxic to aquatic life. H301 Toxic if swallowed.
Eltrombopag Stage 6 (SB 497115) (free acid)	496775-61-2	Solid	H318: Causes serious eye damage H373: May cause damage to organs through prolonged or repeated exposure H411: Toxic to aquatic life with long lasting effects
Ethanolamine	141-43-5	Clear viscous liquid.	H302: Harmful if swallowed H312: Harmful in contact with skin H314 Causes severe skin burns and eye damage. H332: Harmful if inhaled
Eltrombopag Stage 7 (or Eltromopag Olamine or SB-497115 GR) API	496775-62-3	Red purple solid	H318: Causes serious eye damage H373: May cause damage to organs through prolonged or repeated exposure H411: Toxic to aquatic life with long lasting effects
Camptothecin - (Topotecan Stage 1)	7689-03-4	Yellow solid	H301 Toxic if swallowed.
Dimethylsulphoxide (DMSO)	67-68-5	Colourless liquid with distinct odour	H319: Causes serious eye irritation.
Topotecan Stage 2	53544-22-2	Solution	H340: May cause genetic defects. H350: May cause cancer.
Iodobenzene Diacetate	3240-34-4	White powder	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
Topotecan Stage 3 (10-Hydroxycamptothecin)	19685-09-7	Yellow powder	H340: May cause genetic defects. H350: May cause cancer. H360: May damage fertility or the unborn child.
N,N,N,N-Tetramethyl Diamino Methane (BDAM or TMDM)	51-80-9	Colourless liquid	H314 Causes severe skin burns and eye damage.
N-Propanol (Propan-1-ol)	71-23-8	Colourless liquid	H318: Causes serious eye damage. H336: May cause drowsiness or dizziness.
Topotecan Hydrochloride (SK&F S-104864-A)	119413-54-6	Yellow orange powder	H300: Fatal if swallowed H350: May cause cancer. H340: May cause genetic defects. H360: May damage fertility or the unborn child H410: Harmful to aquatic life with long lasting effects.
GR204477X (Methyl 2-oxocyclopentane carboxylate)	10472-24-9	Liquid	Not determined
N-Methyl-2-pyrrolidone (NMP)	872-50-4	Clear solvent	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation. H360D May damage the unborn child.
Chlorotrimethylsilane	75-77-4	Liquid	H312 Harmful in contact with skin. H314 Causes severe skin burns and eye damage. H331 Toxic if inhaled. H335 May cause respiratory irritation.
Sodium thiocyanate	540-72-7	Colourless solid	H302 Harmful if swallowed. H312 Harmful in contact with skin. H332 Harmful if inhaled. H412 Harmful to aquatic life with long lasting effects

Material	CAS No.	Appearance	Hazard statements
Sodium Hypochlorite (14% aqueous)	7681-52-9	Green to yellow liquid with a chlorine smell.	H314: Causes severe skin burns and eye damage. H335 May cause respiratory irritation. H400: Very toxic to aquatic life.
4-fluorobenzyl mercaptan	15894-04-9	Colourless liquid (from SDS). Volatile odour	No information available
4-Fluorobenzyl chloride	352-11-4	Colourless Liquid	No data available

4 Assessment of the Site-Specific Pollution Possibility (Stage 3)

It is noted the EC Guidance states the *"where very small quantities are used, produced or released on the site of the installation then the possibility of contamination is likely to be insignificant for the purpose of producing a baseline report".* A number of 'relevant hazardous substances' highlighted in Table 3.1 are stored in small quantities on the GSK site. This, coupled with the existing containment measures highlighted below reduces the risk of soil and groundwater contamination at the site from the 'relevant hazardous substances'.

In accordance with Section 5.3.2 *BAT Guidance Note on Best Available Techniques for Pharmaceutical and other Speciality Organic Chemicals (2008)*, titled *'Groundwater Protection and Water Retention Options (See BREF Sections 2.3.9 & 4.2.27)',* the following measures currently take place at the GSK site to prevent a potential risk of contamination to ground and groundwater.

1. BAT is to design, build, operate and maintain facilities, where substances (usually liquids) which represent a potential risk of contamination of ground and groundwater / surface waters, are handled in such a way that no spills occur. Facilities have to be sealed, stable and sufficiently resistant against possible mechanical, thermal or chemical stress.

BAT In Place

All loading and off-loading of bulk tankers takes place in areas protected against leakage run-off and isolated from the surface water drains.

Materials for use in plant or for disposal are stored in areas protected against leakage run-off. All materials are stored in suitable tanks or containers. Storage of all bulk and drummed materials are in sealed bunded areas which are hydraulically tested every three years.

All solvent storage tanks are fitted with level indicators linked to the PLC or DCS system. Overfilling of tanks is prevented by automatic shutdown of the valve on the fill line when the level in the tank reaches certain percentage fullness.

There are two major drum and container storage parks on site which have a concrete base, kerbing and subsurface tanks to take any spillages from drums/containers.

Sufficient retention volume is available to retain fire fighting water and contaminated surface water.

Integrity tests are carried out on all bunded structures in accordance with IE Licence requirements.

Site storage tanks and pipelines are on planned routine inspection programme (Risk Based Inspection programme) in accordance with IE Licence Requirements

All bunds are on a 3 year inspection and testing routine.

Biannual groundwater monitoring is in place across the site in compliance with the IE licence requirements.

2. BAT is to ensure leakages are quickly and reliably recognised.

BAT In Place

Site storage tanks and pipelines are on planned routine inspection programme (Risk Based Inspection programme) in accordance with IE Licence Requirements

A preventive maintenance (PM) system is in place through which routine maintenance checks are carried out and results recorded for e.g. pipelines are visually inspected. An Engineering Operations Maintenance protocol is in place for calibration and preventive maintenance of safety critical instrumentation and equipment.

A full on-site emergency response team is on site 24/7 with training in spill response. A spill response procedure and incident reporting procedure is in place.

Spill kits are in place across the site.

3. BAT is to provide sufficient retention volumes to safely retain leaking substances in order to enable treatment or disposal.

BAT In Place

Liquid spillages/firewater effluent from process areas and drum parks are drained to enclosed tanks located in sumps, and pumped to the wastewater treatment plant.

Any detection of contamination (Storm water Trigger Levels) by the continuous TOC or pH meters at the surface water monitoring point (SW2) will automatically divert the contaminated surface water to the Fire Water Retention Pond.

In an emergency situation where large quantities of contaminated water enter the bio plant balance tank, feed forward to the activated section of the WWTP will be stopped. Both pH and dissolved oxygen are continuously monitored to detect if a high organic load is entering the activated section. The WWTP is continuously monitored by environmental operators 24 hours a day. Where the balance tank cannot cope with the quantity, liquid waste can be transferred to liquid storage tanks located adjacent to the WWTP for subsequent treatment.

4. BAT is to provide sufficient retention volume to safely retain fire fighting water and contaminated surface water.

BAT In Place

The site currently has three firewater retention ponds of capacity 4,440 m3 to safely retain fire fighting water and contaminated surface water.

5. BAT is to apply the following techniques:

- **Carry out loading and unloading only in designated areas protected against leakage run-off**
- **Store and collect materials awaiting disposal in designated areas protected against leakage run-off**
- **Fit all pump sumps or other treatment plant chambers from which spillage might occur with high level liquid alarms or ensure regular supervision of same**
- **Establish programmes for testing and inspection of tanks and pipelines where tanks and pipes are not situated in bunded areas**
- **Inspect leaks on flanges and valves on pipes used to transport materials other than water (e.g. visual inspection or testing with water) and maintain a log of such inspections**
- **Provide supply containment booms and suitable absorbent material**
- **Test all bunded structures.**

BAT In Place

All loading and off-loading of bulk tankers takes place in areas protected against leakage run-off and isolated from the surface water drains.

Storage of all bulk and drummed materials are in designated bunded areas. There are two major drum and container storage parks on site which have a concrete base, kerbing and subsurface tanks to take any spillages from drums/containers protecting against leakage run-off.

All external chemical storage tanks are located in sealed bunds, which are hydraulically tested every three years. All solvent storage tanks are fitted with level indicators linked to the PLC or DCS system. Overfilling of tanks is prevented by automatic shutdown of the valve on the fill line when the level in the tank reaches certain percentage fullness.

All site storage tanks and pipelines are on planned routine inspection programme (Risk Based Inspection programme) in accordance with IE Licence Requirements

All pipes on-site carrying process chemicals and process waste are above ground and are transported from storage areas to production buildings (and vice versa) via pipe-racks. Flanges on pipes (located externally to internal production areas) are located over concreted or tarmacadam areas to prevent spillages from entering the soil or groundwater. Spillages onto these areas will be collected via the surface water drainage

system. Large spillages of process chemicals / waste are detected by the surface water retention pond TOC/pH meter and diverted to the WWTP or on-site incinerator for treatment.

A preventive maintenance (PM) system is in place through which routine maintenance checks are carried out and results recorded. An Engineering Operations Maintenance protocol is in place for calibration and preventive maintenance of safety critical instrumentation and equipment.

Spill kits are in place across the site.

All bunds are on a 3 year inspection and testing routine.

5 Site History (Stage 4)

The original GSK plant was developed between 1973 and 1975. Since the plant began operations in 1975, increased production has led to a number of expansions and modifications of production and ancillary facilities.

Since 1991, a number of groundwater wells on site have been sampled and analysed on a bi-annual basis as per the requirements of the previous IPPC Licences and existing IE Licence. See Table 5.1 for a list of boreholes on site and Figure 5.1 for locations. The results are submitted to the EPA each year as part of the Annual Environmental Report on the site. The wells were surveyed during 2005 to an Ordnance Datum on the GSK site to enable a groundwater flow contour map to be completed.

Table 5.1 Boreholes on site

Borehole Number	Installation Purpose
AGW1 - AGW6	Installed around the perimeter of the site as part of an environmental site assessment in 1991. These were sampled in December 1991 and included in the biannual monitoring since February 1992.
AGW7	May 1997 AGW7 was installed to the rear of building 101 and has since been included in the biannual monitoring.
Replacement Wells	AGW1 and AGW3 were replaced in March 2004 with the original wells being decommissioned and AGW 2 and AGW 4 also previously replaced.
AGW8 - AGW10	In March 2004 three monitoring wells (AGW 8, 9 and 10) were installed to extend the groundwater monitoring network on-site to provide coverage around new buildings constructed on-site.
AGW11 - AGW13	In May 2008 three monitoring wells (AGW 11, 12 and 13) were installed to increase the groundwater monitoring network towards the centre of the site.
BH104	BH104 was installed on-site as part of a site investigation into elevated bacteriological groundwater contamination on-site in 2008. The monitoring well is installed in the perched groundwater in the overburden adjacent to an on-site process sump. The shallow groundwater well has been included in the biannual groundwater monitoring round since 2008.

It was concluded that groundwater flow is in a radial direction from the centre of the island towards the coastline. Nonetheless, the regular presence of some elevated levels of anions and cations in groundwater samples is considered likely to be associated with seawater influence on the site.

Groundwater Quality

Groundwater monitoring on-site detected the following historical contaminants of concern and subsequent corrective actions:

- When groundwater well AGW-7 was installed in 1997, it indicated a high level of organic solvent contamination at the rear of Production Building 101. This was supported by high total organic carbon levels found during soil gas sampling in the vicinity. The contamination was found to be mainly due to leaks from underground pipework: since then all process pipework has been moved above ground. The groundwater quality at well AGW-7 has improved greatly in recent sampling rounds.
- A toluene spill occurred in the tank farm area in 2002 from which the pumping well AGW5 was installed to act as a pump & treat remediation well in this area of the site which effectively remediated the toluene groundwater contamination.
- MTBE (Methyl tertiary-butyl ether) was detected at elevated concentrations in the tank farm area in early to mid 2000's which was remediated by the operation of the pump and treat well AGW5 in this area of the site, with residual contamination remaining.
- Hydrocarbons and MTBE were detected at elevated concentrations to the west side of Production Building 1 in 2004, from which the existing AGW2 monitoring well was installed with

a pump to remediate the groundwater in this area of the site which effectively decreased the concentration of these contaminants.

- Presence of elevated ammonia in the groundwater on-site historically and currently, particularly in the northern region of the site.
- Presence of elevated faecal bacteriological groundwater contamination which was undertaken in 2006 to assess the potential for leaking foul drains on-site which were tested and repairs made. Faecal groundwater contamination has decreased to below detection levels in most wells on-site.
- In May 2014 there was a leak from a pipework flange causing acetic acid to leak to a bunded area that overflowed with an estimated 600litres reported to have been lost based on stock records. Verde carried out a site investigation consisting of a trial pit investigation and monitoring of down gradient groundwater monitoring wells with no evidence of contamination encountered. The acid degrades quickly in the subsurface and no further action is required.

All spills have been reported to the EPA as part of the sites IPPC/IE licence requirements. A series of CAPA procedures were put in place immediately in accordance with IPPC/IE Licence conditions, BAT requirements, site policies and ISO standards. Corrective programmes have been put in place and agreed with the EPA.

As part of Condition C.6 of the current IE Licence, Verde completed the May 2014 biannual groundwater monitoring round at the GSK site involving the sampling of 13 bedrock monitoring wells (AGW1-13) and one perched groundwater monitoring well (BH104). Alder Ref. Verde Environmental Consultants Ltd Biannual Groundwater Monitoring Report for GlaxoSmithKline, Currabinny, Co. Cork (May 2014) (P0004-04).

The current contaminants of concern in the groundwater on-site include ammonia and localised slightly elevated concentrations of MTBE in one well located in the tank farm area of the site.

The field EC readings indicate the potential brackish/saline influence in some wells close to the coastline of the site. The influence of brackish groundwater in wells near the coastline is seen to relate to elevated major ion analysis such as potassium, sodium and chloride.

Slightly elevated groundwater temperatures are present in the vicinity of the Production Buildings on-site which are thought to be related to heat transfer from the buildings downwards to the underlying bedrock aquifer.

Elevated ammonium groundwater concentrations were detected in all monitoring wells to the northern region of the site consistent with historical groundwater monitoring rounds. Previous investigations into the potential ammonium source being from leaking foul drains and/or the surrounding harbour waters are not seen to be the main source of the elevated ammonium currently being detected on-site and therefore another potential source of ammonium to ground maybe present on-site.

The bacteriological contamination beneath the site is currently very low to absent compared with recent years when leaking foul drains were present on-site and have since been repaired.

There were no sVOCs detected in May 2014. MTBE was the only slightly elevated VOC detected in AGW5 in May 2014, slightly above the EPA IGV, similar to recent monitoring rounds.

Verde recommended the following remedial actions:

- In order remediate the localised slightly elevated MTBE in the tank farm area, a pumping test is due to be undertaken in AGW5 in order for a sustainable abstraction rate to be set in this pump & treat well.
- GSK should undertake an investigation into the potential ammonium sources in the northern region of the site. In early June 2014 a new groundwater remediation well was installed in the upgradient region of the site where elevated ammonia is persisting. A pumping test and sampling programme of works is due to be undertaken on-site in late June 2014 to allow the setup of a pump & treat groundwater remediation system in this well to determine if the elevated ammonia in the bedrock aquifer can be remediated.

- A risk screening should be undertaken in 2014 in order to demonstrate compliance with the European Communities Environmental Objectives (Groundwater) Regulations 2010.

Soil Quality

GSK, since 1991, carried out a series of groundwater monitoring borehole tests and soil VOC surveys. There has never been any landfilling of material under the site during its history. Various phases of borehole drilling have confirmed that subsoil underlying the site is relatively shallow overlying limestone bedrock. The groundwater monitoring programme is the best indication of the condition of soil quality under the site.

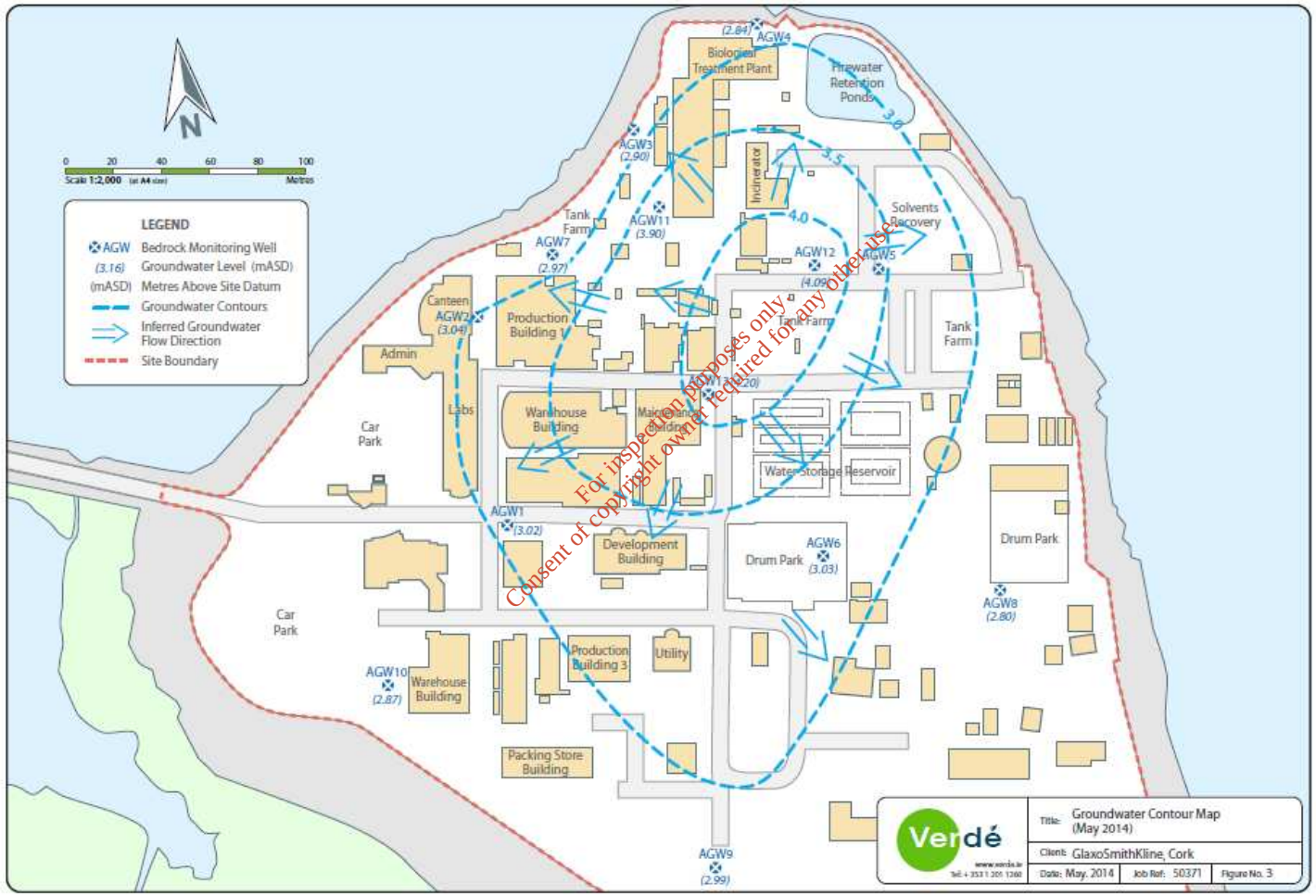

Figure 5.1 Groundwater Boreholes (Figure courtesy of Verde - Biannual Groundwater Monitoring Report for GlaxoSmithKline, Currabinny, Co. Cork (May 2014)

6 Environmental Setting (Stage 5)

The existing environment of the site is analysed using data collected from a desk study. The information has been derived from a number of different sources, including:

- Online geological, soils, and groundwater maps, obtained from the Geological survey of Ireland (GSI) website (www.gsi.ie)
- GSK Wind Energy Project EIS by Arup Consulting Engineers (April 2011)
- Verde - Biannual Groundwater Monitoring Report for GlaxoSmithKline, Currabinny, Co. Cork (November 2013 and May 2014)
- GSK Annual Environmental Report (AER) 2013

Details of the site physical setting are outlined in Table 6.1 below. The conceptual site model is presented in Figure 7.1.

Table 6.1 Environmental Setting

Feature	Details & Comments
Topography	The site setting is coastal with a slight gradient from the northern region radially towards the coastline and to the south towards the mainland.
Geology	Regional Geology: The geology of Cork Harbour is characterised by east-north-east to west-southwest trending ridges of Upper Devonian sandstone, silt – mudstones and valleys of carboniferous limestone, sand, mud - siltstones. The Devonian lithologies were deposited sediments on a continental landmass in a progressively deepening hollow called the Munster Basin. At the end of the Devonian period, tectonic activity resulted in a marine invasion of the basin, and marked the onset of the Carboniferous period. Shallow marine sandstones, mudstones and limestones replaced the former land-based sediments. The Devonian and Carboniferous rocks were subjected to intense folding and faulting which began at the end of the Carboniferous period which is known as the Variscan Orogeny. This major phase of folding resulted in the creation of the prominent ridge and trough topography that exists in South Cork today. Regionally, the folds are cut by east-west trending strike slip faults parallel to the strike and north-north-west to south-south-east normal faults.
	Overburden: The GSI and EPA databases describe the soils at the site as made ground with the subsoils in the area consisting of marine estuarine silts and clays to the west and glacial till derived from sandstone to the south. The desk study, carried out as part of the Wind Turbine Project, indicated ground conditions at the proposed turbine location to be topsoil overlying firm to stiff, brown, slightly gravelly clay over broken limestone. Bedrock is shallow and is of the order of 3 to 4m below ground level.
	Solid Geology: The site is underlain by massive unbedded fine grained limestone of the Waulsortian Limestone Formation which is Carboniferous in age. The desk study indicates that bedrock is of the order of 3 to 4m below ground level
Hydrogeology	Regional Classification: According to the GSI the Waulsortian Limestone beneath the site is classified as being a locally important karstic aquifer (Lk). Typically this aquifer classification is classified as capable of having groundwater yields in the region of 100 to 400m^3/day, although largely dependent on the intersection of bedrock fractures. These limestone rocks are devoid of inter-granular permeability as the groundwater flows through a diffuse network of solutionally enlarged fissures, small conduits, fractures and along faults, (secondary permeability). Given the location of the GSK facility on the coastline there a potential for some tidal effect on the groundwater beneath the site. The current Water Framework Directive groundwater status for the Ringaskiddy Groundwater Body is Good, which the site is part of. The overall risk rating to the groundwater body is 1a which is 'At Risk' and the overall objective is to Protect the aquifer.

Feature	Details & Comments
	The groundwater flow in the aquifer is seen to follow topography as expected radially to the coastline or to the mainland to the south, with a hydraulic gradient of 0.01 to the north and 0.08 to the south.
	Vulnerability: The vulnerability rating for the aquifer beneath the site is classified as high indicating the depth to bedrock is between 1-3 metres below ground level (mBGL). However, from drilling works it can be seen that the limestone bedrock is within 3m in some areas of the site, which gives an extreme vulnerability rating. Therefore in the extreme or high vulnerability areas with thin natural overburden cover there will be little natural protection to groundwater from potential contamination from surface activities. Once impacted there is little attenuation of contaminants within karstic limestone and the connectivity of the karstic fissures usually results in rapid movement of contamination in the aquifer.
	Well Search: Apart from the operation of on-site groundwater remediation wells, there are no groundwater abstractions in the immediate vicinity of the GSK site.
Hydrology	Surface Water Courses/Abstractions: There are no surface watercourses in the immediate vicinity of the site apart from being largely surrounded by the waters of Cork Harbour. The surrounding estuarine waters to the west of the site are designated as the Cork Harbour Special Protection Area (SPA) and the Loughbeg area of Cork Harbour is a proposed national heritage area (pNHA).
Flora & Fauna	The site is not covered by any nature conservation designation. Six designated areas for nature conservation occur within five kilometres of the site, five of which are proposed Natural Heritage Areas. Two of the designated areas are adjacent to the site, Cork Harbour Special Protection Area and Lough Beg proposed Natural Heritage Area. • Loughbeg, which forms the boundary of the site to the north and east, is part of the Cork Harbour Special Protection Area (SPA 004030) under the Habitats Directive, 1992, and is one of a number of important ornithological sites around Cork Harbour; • Monkstown Creek, located 2.5 km northwest of the site, is a proposed Natural Heritage Area (pNHA) (pNHA site code 1979) within the Cork Harbour Special Protection Area (SPA).
Surrounding Land Use	The land surrounding the site is relatively open, undulating farmland, in an industrially-zoned area. In addition to the GSK facility, there are a number of other industrial facilities in the area. The nearest of these facilities is the Hovione, Loughbeg facility, located approximately 400m northeast of the GSK site. There are a number of residential properties in the surrounding area. The nearest residential properties are approximately 300m south of the site boundary. Currabinny Wood lies approximately 300m to the southeast of the site. The Ringaskiddy area, in general, is industrial in nature and has a number of major industrial plants, a ferry port, a deepwater berth, the headquarters of the Irish Naval Service, the National Maritime College of Ireland, a crematorium and small residential areas.

7 Site Characterisation (Stage 6)

The current contaminants of concern in the groundwater on-site include ammonia which is elevated primarily in the northern region of the site and localised slightly elevated concentrations of MTBE in one well (AGW5) located in the tank farm area of the site.

The potential connection of the source of ammonium to potential leaking foul drains has been ruled out because of the foul drain repair works and associated significant decrease in bacteriological groundwater contamination. There is a proposal to install a new groundwater abstraction well in the northern region of the site to assess if a groundwater pump & treat system will decrease the ammonium concentrations in the groundwater locally.

The slightly elevated detection of MTBE in the vicinity of AGW5 and down gradient monitoring well AGW4 is related to a historical spill incident in the tank farm area. The re-commissioning of the pump & treat remediation well AGW5 will assist in containing and remediating this localised VOC groundwater contamination on-site.

Based on previous site monitoring well drilling works and reports, the conceptual site model (CSM) for the GSK site is shown in Figure 7.1. Various phases of borehole drilling have confirmed that subsoil underlying the site is relatively shallow overlying limestone bedrock. The groundwater flow direction in the bedrock aquifer is radially towards the coastline as expected.

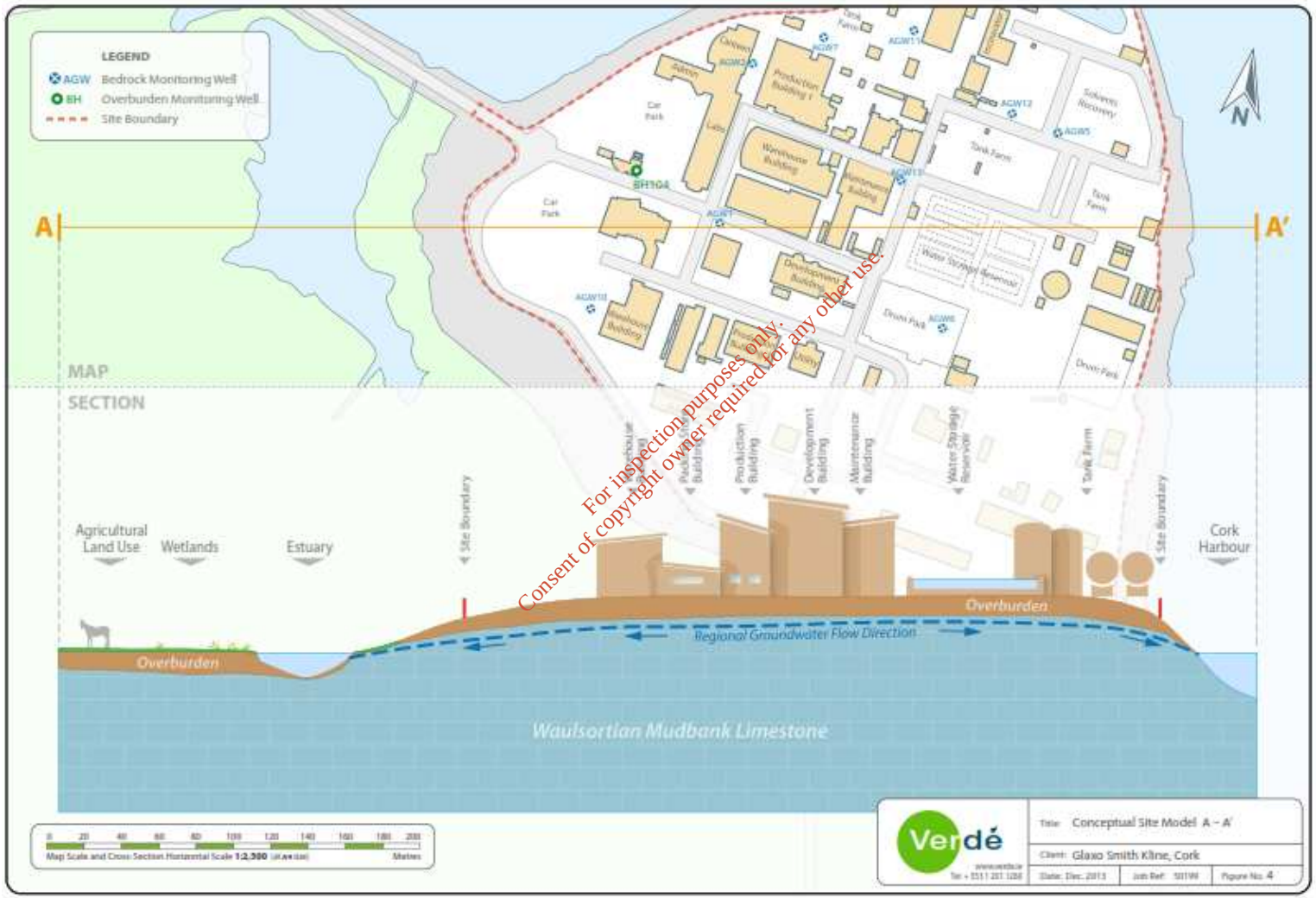

Figure 7.1 Conceptual Site Model (Figure courtesy of Verde - Biannual Groundwater Monitoring Report for GlaxoSmithKline, Currabinny, Co. Cork (November 2013)

8 Site Investigation (Stage 7)

Due to the fact that biannual groundwater sampling has been carried out as part of the sites EPA licence since 1992, the sites environmental setting and CAPA works highlighted in Stage 4 there is sufficient information from Stages 1-6 to characterise the site both laterally and vertically and to allow the baseline status in terms of quantified levels of pollution of soil and groundwater by relevant hazardous substances to be defined. The latest groundwater monitoring report for the site is May 2014. (Alder Ref. Verde Environmental Consultants Ltd Biannual Groundwater Monitoring Report for GlaxoSmithKline, Currabinny, Co. Cork (May 2014) (P0004-04)).

As a result of the above it is considered that further site investigation is not required.

9 Production of Baseline Report (Stage 8)

The purpose of this stage is to summarise all of the evaluated information collected in Stages 1-7. See Appendix I for Report Checklist.

This baseline report has been prepared in accordance with Regulation 9 of the EPA (Industrial Emissions) (Licensing) Regulations, 2013. The EC guidance on the content of the baseline report as required by Article 22(2) of the IED has been used in the preparation of this report. The EC Guidance identifies key stages to be undertaken to both determine whether a baseline report needs to be produced and in order in which the baseline report is produced. This staged approach was used in the production of the Baseline Report.

Stage 1: Identifying the hazardous substances that are currently used, produced or released at the installation

A complete inventory of raw and ancillary materials, substances, preparations and fuels which is produced by or utilised within the installation boundary is contained in Attachment G.1 of the 2013 IPPC Licence Review Application. Table H.3 (i) of the IPPC application lists the waste generated at the installation. The 2013 Annual Environmental Report, issued to the EPA, provides the most up to date list.

Stage 2: Identifying the relevant hazardous substances

A review of the substances listed in Attachment G.1 of the Licence Review form has been undertaken to identify any substances employed in the GSK facility that are defined as 'relevant hazardous substances'.

Stage 3: Assessment of the site-specific pollution possibility

A number of 'relevant hazardous substances' are stored in small quantities on the GSK site. This, coupled with the existing containment measures, the possibility of soil and groundwater contamination at the site from the majority of substances is very low. All substances identified in Stage 2 are stored in secure containers in bunded areas. All bunds are surrounded by hard standing areas and all storage and handling is carried out in these areas. In accordance with Section 5.3.2 of *BAT Guidance Note on Best Available Techniques for Pharmaceutical and other Speciality Organic Chemicals (2008)* detailed measures take place at the GSK site to prevent a potential risk of contamination to ground and groundwater.

Stage 4: Site History

The influence of brackish groundwater in wells near the coastline is seen to relate to elevated major ion analysis such as potassium, sodium and chloride. Elevated ammonium in all monitoring wells to the northern region of the site consistent with historical groundwater monitoring rounds. Slightly elevated MTBE in the tank farm area most likely attributable to a spill > 10 years ago and mitigation measures detailed in previous AERs. An investigation is required in 2014 to determine source of ammonium elevation in the northern region of the site and remediation of the localised slightly elevated MTBE in the tank farm area

Stage 5: Environmental Setting

The existing environment of the site is analysed using data collected from a desk study. The information has been derived from a number of different sources and provided information on the surrounding topography, geology, hydrogeology, hydrology, flora & fauna and land use.

Stage 6: Site Characterisation

The contaminants of concern being detected in the groundwater are ammonium which is elevated primarily in the northern region of the site. The potential connection to the source of ammonium to potential leaking foul drains has been ruled out because of the foul drain repair works and associated significant decrease in bacteriological groundwater contamination.

The slightly elevated detection of MTBE in the vicinity of AGW5 and down gradient monitoring well AGW4 is related to a historical spill incident in the tank farm area. The re-commissioning of the pump & treat remediation well AGW5 will assist in containing and remediating this localised VOC groundwater contamination on-site.

Based on previous site monitoring well drilling works and reports, the CSM for the GSK site is shown in Figure 7.1.

Appendix I
Baseline Investigation and Report Checklist

Item	Section in Report
DECIDING WHETHER A BASELINE REPORT IS REQUIRED	
Identification of the hazardous substances used, produced or released at the installation	2.0
Assessment to identify those hazardous substances that are capable of contaminating soil or groundwater (relevant hazardous substances)	3.0
Identification of the possibility of the relevant hazardous substances actually causing contamination	4.0
Identification of any possible sources of historical contamination	5.0
DETAILS OF DATA COLLECTION	
Existing data	
Relevant plans of the installation (showing boundaries and key points of interest).	Figure 5.1 and Figure 7.1
Review and summary of previous reports, with report references	1.3
Summary of any risk assessment carried out at the site of installation relevant for baseline data collection	Refer to ELRA
Site Investigation	
Rationale for investigation – may include list of potential contaminant sources relevant to each proposed investigation location	N/A
Constraints applicable to the placement of site investigation locations	
Methods used for forming exploratory holes e.g. boreholes, trial pits, window samples	
Methods used for collecting, preserving and transporting samples to the analytical laboratory	
Sampling & Monitoring	
Rationale for sampling strategy e.g. if targeted rationale of targets; if non-targeted justification for spacing and layout	
Description and explanation of monitoring programmes for groundwater and surface waters	
Details of monitoring and sampling including locations, depths, frequencies	
Analysis	
Rationale for selection of analytical methods	
Description and performance of analytical methods.	
PRESENTATION & INTERPRETATION OF DATA WITHIN TEXT OF REPORT	
Description of conditions encountered at the site, including groundwater regime and surface water features	Table 6.1
Summary tables of chemical analyses and site monitoring	Verde 2014 Groundwater Monitoring Report
Description of type, nature and spatial distribution of contamination, with plans where appropriate	5.0
Analysis of the data set and derivation of representative concentrations for individual	Verde 2014

Item	Section in Report
contaminants to a suitable level of significance	Groundwater Monitoring Report
Evaluation of site investigation results against the outline conceptual model	N/A
PRESENTATION OF RAW DATA (ANNEX TO REPORT)	
Plan showing monitoring and sample point locations	N/A
Description of site works and on-site observations	
Exploratory borehole, core or drilling logs	
Details of response zone and other construction details of borehole monitoring installations	
Monitoring results	
Description of samples submitted for analysis	
Relevant Quality Assurance/Quality Control data – this may include accreditations of staff, calibration certificates of equipment, laboratory accreditations (national and international standards)	
Laboratory analytical reports, completed in accordance with the relevant QA/QC data, including relevant international analytical or test method standards.	
Chain of custody records for sample and data collected	