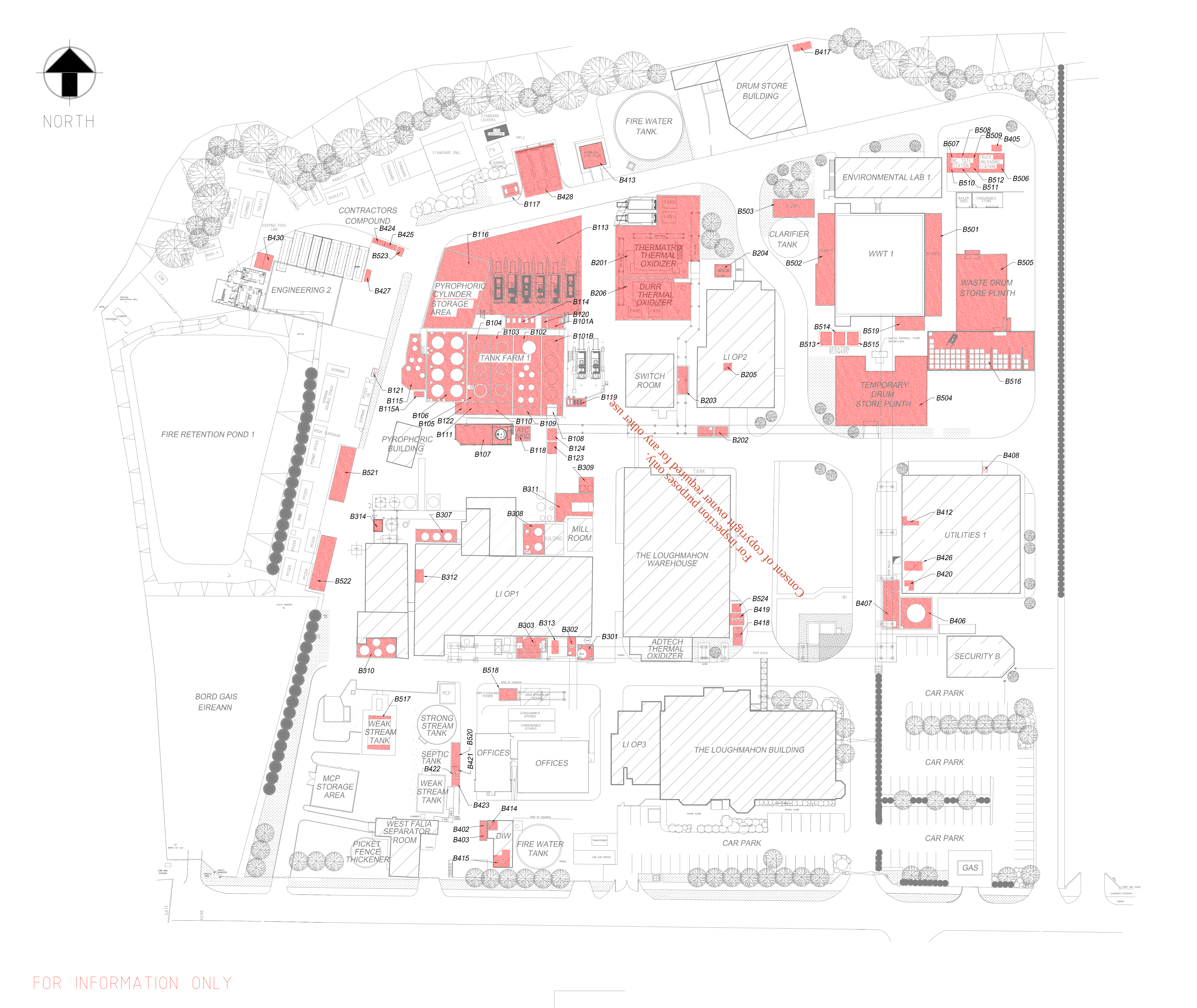
CONTENTS

Pfizer, Little Island
Bund Register

Refer to Drawing Reference: FSK-2020

Bund Number	Bund Description	Bund Location
101(a)	Solvent Loading Pumps Bund	Tank Farm (North Eastern side)
101(b)	MTBE Tanks(TK 249, etc)	Tank Farm (Eastern side)
102	IPA Tanks (TK227, etc.)	Tank Farm (Central Aspect)
103	Solvent Tanks(TK201,202,203)	Tank Farm (Central Aspect)
104	TBIN Tanks (TK207/208)	Tank Farm (Central Aspect)
105	HCl Tank(TK204)	Tank Farm (Central Aspect)
106	8 x 50 m3 Tanks (TK241, etc.)	Tank Farm (Western side)
107	Ni Ion Exchange pre treatment Area	South of Tank Farm
108	Pump Bund (MTBE)(PU269,282,104)	Tank Farm (South Eastern side)
109	Pump Bund (IPA/MeOH)(PU227, etc.)	Tank Farm (Southern side)
110	Pump Bund (TBIN)(PU247,248,243,242,241)	Tank Farm (Southern side)
111	HCl Pump Bund (PU249)	Tank Farm (Southern side)
113	Nickel Waste loading Bund	Tank Farm (Northern side)
114	Waste Solvents Pump Bund (PU276)	Tank Farm (Northern side)
115	RC 623/624	Tank Farm (Western side)
116	Pyrophorics Storage Area	NW Aspect of Tank Farm
117	Northside Foam Tank Bund	Northern Aspect of Tank Farm
118	Ator M/L Distillation Unit	South of Tank Farm
119	Pump Bund	East of Tank Farm
120	Pump Bund (HCl Loading)	Tank Farm (Northern side)
121	West side Foam Tank Bund	Western Aspect of Tank Farm
122	Liquid/liquid Extraction Column	Tank Farm (South west side)
122	ATC Skid Plastic Bund	ATC Skid
122	ATC Skid Plastic Bund	ATC Skid
201	Thermatrix Thermal Oxidiser	North-west of OP2
202	Dryer Building Floor Drains	Southern Aspect of OP2
203	Dryer Building Condensate	Western Aspect of OP2
204	Dryer Building Solvent Waste	Northern Aspect of OP2
205	Dryer building penthouse	Penthouse of OP2
206	Durr Thermal Oxidiser	North-west of OP2
301	Tk904/ DR201	SE Aspect of OP1
302	MOP Scrubber	SE Aspect of OP1
303	Tk 623/624 (Old MeOH /H2O)	Southern aspect of OP1
307	Group 9 Bund (TK 901, 902, 903)	Northern Aspect of OP1
308	SC 101/201A	N Aspect of OP1
309	SC 401	NE Aspect of OP1
310	Group 10 Bund (TK 1001, 1002 etc.)	SW Aspect of OP1
311	Carbon Adsorb System	NE Aspect of OP1

Bund Number	Bund Description	Bund Location
312	Nickel Ion Exchange	Passage between Gp 9 & Gp 5 of OP1
313	Vacuum Pump VP681201	Transvac Room S Aspect of OP1
314	Ion exchange regeneration skid	North of Grp 9 & Grp 5 of Prod. Building OP1
402	HCl IBC's	Western Aspect of DIW Plant
403	NaOH IBC's	Western Aspect of DIW Plant
405	Diesel Tank	WWTP Building North
406	New Methanol Tank	SW of New Utilities Building
407	Methanol pump	W Aspect of New Utilities Building
408	Fuel oil pump bund	N aspect of New Utilities Building
412	Utilities Chemical Dosing	Inside boiler house
413	Northside Pumphouse (Diesel Tank)	Northern Perimeter of Site
414	Southside Pumphouse (Diesel Tank)	Southern Perimeter of Site
415	Southside Pumphouse (Equipment)	Southern Perimeter of Site
416	Transformer 1B	Behind Maintenance Workshop
417	Warehouse Drumstore Cabinet	East of New Drum-store Building
418	QC/CS Chemical Store	South Eastern Aspect of Warehouse
419	Technical Services Chemical Store	South Eastern Aspect of Warehouse
420	Emergency Generator Diesel Tank	In New Utilities Building
421	Waste Oil Tank	East of Old Weak Stream Tank
422	Overflow for Waste Oil Tank	East of Old Weak Stream Tank
423	Interceptor Drain	East of Old Weak Stream Tank
424	Food Grade Oil Store	East of Old Weak Stream Tank
425	Non-Food Grade Oil Store	East of Old Weak Stream Tank
426	Diesel Generator Equipment	In New Utilities Building
427	Paint Storage Cabinet	South west of maintenance Building
428	Tanker Lay Down Area	Northern Perimeter of Site
430	Waste Oil Tank	North West of Maintenance Building
501	WWTP Pumps / Aeration System	In New Utilities Building
502	WWTP Pumps / Aeration System	Western Aspect Of WWTP
503	Clarifier Sludge Pump	N Aspect of Clarifiers WWTP
504	Temporary Drum Storage Area	Southern Aspect of WWTP
505	New waste drum store plinth	Eastern Aspect of WWTP
506	Truck Loading Station	North Eastern Aspect of WWTP
507	Sulphuric Acid Dosing	North Eastern Aspect of WWTP
508	Sulphuric Acid Dosing	North Eastern Aspect of WWTP
509	NaOH Dosing	North Eastern Aspect of WWTP
510	NaOH Dosing	North Eastern Aspect of WWTP
511	Urea Dosing	North Eastern Aspect of WWTP
512	Polymer Dosing	North Eastern Aspect of WWTP
513	WWTP Blower (West)	South Western Aspect of WWTP
514	WWTP Blower (Middle)	South Western Aspect of WWTP
515	WWTP Blower (East)	South Western Aspect of WWTP
516	Lasofoxifene Drum Storage	South Eastern Aspect of WWTP
517	Weak Stream tank	New Weak Stream tank
518	OP3 Cooling Tower	West of OP 3
519	WWTP Chiller	South of WWTP
520	IBC Storage Bund	South OP 1
N/A	Firewater retention pond	Westerly side of site
521	Caustic Storage Area	West of Grp 5
522	Nickel ASP Storage Area	West of Grp 5
523	Waste Oil Storage	In maintenance yard
524	Laboratory Waste Staging Area	East Enterance to warehouse



	Notes
101(a)	Solvent Loading Pumps Bund.
101(b)	MTBE Tanks(TK-249 etc.)
102	IPA Tanks(TK-227 etc.)
103	Solvent Tanks(TK-201,etc.)
104	TBIN Tanks(TK-207,208,etc.)
105	Old HCL Tank (TK-204)
106	8 x 50 m3 Tanks (TK-241, etc.)
107	Ni Waste and HCL
108	Pump Bund(MTBE)(PU-269,282,104)
109	Pump Bund(IPA/MeOH)(PU-227, etc)
110	Pump Bund(TBIN)(PU-247,248,243,242,241)
111	HCL Pump Bund(PU-244)
113	Loading/Unloading Bay
114	Waste Solvents Pump Bund(PU-276)
115	RC 623/624
115A	Filtrate Pump
116	Pyrophoric Storage Area
117	Northside Foam Tank Bund
118	Ator M/L Distillation Unit
119	Pump Bund
120	Pump Bund(HCL Loading)
121	Westside Foam Tank Bund
122	Liquid/Liquid Extraction Column
123	Caustic IBC
124	Methanol/Acetic IBC
201	Thermatrix
202	Dryer Building Floor Drains
203	P2 Equipment
204	Dryer Building Solvent Waste
205	Dryer Building Penthouse
206	Durr
301	TK-904/DR-201
302	MOP Scrubber
303	TK-623/624 (Old MeOH/H2O)
307	Group 9 Bund(TK-901/902/903)
308	SC 101/102
309	SC 401
310	Group 10 Bund(TK-1001/1002 etc.)
311	Carbon Adsorb System
312	Ion Regen
313	Transvac Room Vacuum Pump VP-681201
314	Ion Exchange Regeneration Skid
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403	NaOH IBC's
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406	New Methanol Tank
407	Methanol Pump
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415	Southside Pumphouse Equipment
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420	Emergency Generator Diesel Tank
421	Waste Oil Tank
422	Overflow for Waste Oil Tank
423	Interceptor Drain
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425	Non Food Grade Oil Store
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427	Paint Storage Cabinet
428	Tanker Laydown Area
430	Kerosene Tank
501	W.S. & S.S. Holding Tanks Pumps
502	WWTP Blowers
503	WWTP Clarifier Pumps
504	Temporary Drum Storage Area
505	Waste Drum Storage Plinth
506	Truck Loading Station
507	Sulphuric Acid Dosing
508	Sulphuric Acid Dosing
509	NaOH Dosing
510	NaOH Dosing
511	Urea Dosing
512	Polymer Dosing
513	Aeration Fan
514	Aeration Fan
515	Aeration Fan
516	Lasofoxifene Drum Storage
517	Weak Stream Tank TK-230304
518	OPS3 Cooling Tower CT-609401
519	Chiller CH-500204
520	DIW Plant IBC Storage Bund
521	Caustic Storage Area
522	Nickel ASP Storage Area
523	Waste Oil Tank
524	Laboratory Waste

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PRODUCTION					
ENGINEERING					

Pfizer
Pfizer Ireland Pharmaceuticals,
Little Island,
County Cork, Ireland.
Engineering Design Office
Tel: +353-21-4523540
Fax: +353-21-4523682

PFIZER IRELAND PHARMACEUTICALS LITTLE ISLAND

IPPC LICENCE APPLICATION BUND LOCATIONS

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Pfizer, Little Island IPPC Application

Air Quality Impact Assessment

20 July 2010
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Issued By:	URS Ireland Iveagh Court 6-8 Harcourt Road Dublin 2 Ireland Tel: + 353 (0) 1 415 5100 Fax: + 353 (0) 1 415 5101 www.urseurope.com

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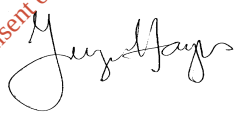
Checked and approved by	Fergus Hayes		20/07/ 2010	URS Ireland, Director

Document Revision Record

Issue No	Date	Details of Revisions
1	7 July 2010	Original issue
2	20 July 2010	Final Issue

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URS Ireland Limited (URS) has prepared this Report for the sole use of Pfizer, Little Island in accordance with the Agreement under which our services were performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by us. This Report may not be relied upon by any other party without the prior and express written agreement of URS. Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by URS, unless otherwise stated in the Report.

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EXECUTIVE SUMMARY

URS Ireland Ltd was commissioned by Pfizer, Little Island to complete an Air Dispersion Modelling (ADM) study to investigate the potential air quality impacts from site activities taking into account emissions from:

- All main emissions points on site arising from production processes.
- Steam raising boiler plant using organic solvent distillate as an alternative fuel (co-incineration).
- Restricted use of the site diesel back-up generator (minor emission point) for emergency power and winter demand peak shaving.

This ADM study has been prepared for submission as part of a revision to the installations IPPC licence (P0136-03).

In determining the likely impacts, some worst-case assumptions were taken with regard to the likely emissions from these proposed activities. These comprised:

- Throughout the assessment a worst-case assumption for operating hours and pollutant concentrations were used.
- To be compliant with the WID pollutants defined in Annex V an assessment using emission limit values (ELV) from Annex V was conducted for; metals (consisting of cadmium & thallium, mercury, and heavy metals comprising of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium), Dioxins & Furans, hydrogen chloride (HCl) and hydrogen fluoride (HF). For comparison to the target Air Quality Standard (AQS) values for Lead, Nickel and Arsenic, a very conservative approach was used. The approach estimated that the maximum combined pollutant concentrations of the total heavy metals modelled consisted entirely of each individual metal leading to a large overestimation of the quantity of each individual metal released from V1, such a scenario is not expected to occur. Also, the organic solvent distillate to be used as the alternative fuel are not expected to contain any metals or halogenated substances and therefore, these pollutants are not expected to be emitted from the main emission point, V1.
- The highest predicted concentration at any off-site location was used in the assessment of environmental significance.
- The highest predicted concentrations obtained using any of the three different years of meteorological data have been used in this assessment. During a 'typical' year it may be expected that the highest ground level concentrations would be lower.

- To assess TA *luft* organic/inorganic classes URS adopted a conservative approach by assessing the modelled emissions against the lowest Environmental Assessment Level (EAL) for that class.

This assessment indicates that, with the exception of heavy metals discussed in the next paragraph, the maximum and/or relevant percentiles of pollutant concentrations for operation of site activities (including the proposed co-incinerator and peak load shaving activities) were well within the AQS and Environmental Assessment Levels (EALs) for each study pollutant, at all off-site locations. Furthermore, the highest pollutant concentrations are close to the site boundary with concentrations falling rapidly with distance from the sources.

The assessment results indicate that the maximum combined pollutant concentrations for total heavy metals (when taken as Arsenic) are above the "target" AQS for Arsenic. However, as explained above, the clean organic solvent distillate is to be used by the co-incinerator, negligible emissions of metals are expected. Furthermore, this distillate feed stream is to be well characterised by a test burn programme, which will demonstrate the absence or negligible level of metals that will be in this distillate stream. On this basis, metals are not considered to present a potentially significant environmental impact when the co-incineration plant is operated with clean organic solvent distillate as proposed by Pfizer, Little Island.

In the case of PCDD/F, no air quality guideline was available for direct comparison. Therefore, comparing the pollutant concentration for PCDD/F to the benchmark figure of 0.3 pg/m^3 proposed by WHO indicates that the predicted concentrations of PCDD/F resulting from the proposed co-incinerator should not be considered environmentally significant.

On this basis, it has been determined that emissions due to the operation of the site activities (including the proposed co-incinerator and modified generator operations), should not be considered environmentally significant.

1. INTRODUCTION

URS Ireland Ltd. (URS) is pleased to present this report to Pfizer, Little Island. This study was carried out as part of an application to the Environmental Protection Agency (EPA) for an IPPC licence for a site operated by Pfizer, Little Island.

This study assesses the potential air quality impacts of:

- All main emissions points on site arising from production processes;
- Steam raising boiler plant using either fossil fuel or organic solvent distillate as an alternative fuel (co-incineration); and
- Restricted use of the site diesel back-up generator (minor emission point) for emergency power and winter demand peak shaving.

This report updates the previous Pfizer, Little Island modelling study in 2007 (forming part of the 2007 IPPC application documentation)

1.1. Site Description

Pfizer, Little Island produces bulk pharmaceutical intermediate active products in batch processes. Any one product is manufactured in well-planned 'campaigns' (i.e., a predetermined number of batches with target yields). Principle raw materials used in production are:

- Intermediates from other production facilities;
- Organic and inorganic reactants;
- Organic solvents (not generally taking place in the chemical reactions); and
- Catalysts.

The raw materials used are generally solid and liquid with gaseous raw materials required for some products (e.g., hydrogen and ammonia).

Key equipment used includes:

- Solvent manifold systems and solids charging booths;
- Reactor vessels of varying volumetric capacity;
- Separation equipment comprising mainly centrifuges and filters;
- Driers; and
- Milling equipment.

The site is located in Little Island, Cork, with its northern boundary adjacent to the N25 and Bury's Basin.

1.2. Study Approach

The Pfizer, Little Island site already holds an IPPC licence Reg. No. P00136-03.

There are currently 11 licensed main emission points. All of which will continue to be in use under the new licence. These include two boilers (V1 and V28), two thermal oxidiser stacks (V8 and V46), a scrubber (V6 - formerly a thermal oxidiser stack) and 6 dust vents (V4, V5, V9, V26 V59 and V60[1]). The substances emitted from these points are gaseous and vaporous organic and inorganic substances, pharmaceutical dust, sulphur dioxide (SO_2), oxides of nitrogen (NO_x) and particulate matter (PM).

Previous site emissions modelling conducted in 2007 demonstrated that site emissions were not considered to be environmentally significant. In general process related emissions have not or will not change except for the following modifications to the main emission point V1, V6 and the minor emission point V340. In light of these modifications a revised dispersion modelling assessment was conducted for emissions from the Pfizer, Little Island site.

This modelling assessment takes into account the following modifications to the sites activities:

- Use of organic solvent distillate as alternative fuel in Boiler V1 and in accordance with the Waste Incineration Directive, V1 is to be classified as a co-incineration plant. Hence, substances emitted from V1 were revised as part of this modelling study to include gaseous and vaporous organic substances, Dust, Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO), Hydrogen Fluoride (HF), Hydrogen Chloride (HCl), Metals and Dioxins and Furans[2]; and
- Boiler V1 operates as the duty boiler. Boiler V28 operates as the standby boiler. The site does not operate both simultaneously. The use of WID limits for V1 and emissions limits already set for V28 and modelled in 2007 will be no worse, hence, this assessment considers V1 only.

[1] As part of the Pfizer, Little Island Review application V26 and V60 are proposed to be removed as main emission points. V26 was never installed and V60 is proposed to be reclassified as a minor emission point. They have therefore, been removed from this assessment.

[2] The organic solvent distillate to be used as the alternative fuel will not contain any metals or halogenated substances and therefore, these pollutants are not expected to be emitted from the main emission point, V1. To ensure the quality of the alternative fuel Pfizer, Little Island intend to collect the organic solvent distillate and isolate them in a designated storage tank until cleared by quality control for use as a fuel.

- The revised IPPC licence application proposes to change the description of V6 from the Adtec thermal oxidiser to its more appropriate description of the scrubbers (caustic and water). However, no new emissions are proposed to occur from this emission point and the modelling takes account of emission limits specified for V6 in Technical Amendment A.

- Operating the site diesel powered generator, V340 from November to February during weekdays only between 17.00 and 19.00 to avail of the winter peak load shaving scheme (operating in this manner for a period of <200 hours per year).

For the site diesel generator, V340 no current limits exist as it is currently classed as a minor emission. However, this air dispersion modelling assessment takes into account the NO_x emissions from the operation of the diesel generator for the purposes of peak load shaving following a request by the EPA. However, the IPPC revision application proposes to keep the site diesel generator, V340 as a minor emission (the operation of the site diesel generator for winter peak shaving forms part of a separate technical amendment to the IPPC licence (P0136-03)).

1.3. Report Structure

The pollutant emission study inputs, the modelling methodology and assessment criteria are provided in Section 2. Section 3 details the Environmental Assessment Levels (EALs) used as part of the assessment. The modelling results and evaluation of the potential impacts are set out in Section 4. The study conclusions are set out in Section 5. References used by the report are detailed in Section 6.

2. PROPOSED OPERATION

2.1. Boiler Details

Two dual-fuel (natural gas and diesel oil), 13.5 tonnes steam/hr boilers were installed at the Pfizer, Little Island site in 1999. Although commissioned on both fuels, the boilers have run exclusively on purchased natural gas since then. Average steam load is 2.5-3.5 tonnes/hr, depending on time of year, gas usage for the boilers is about 2,000kW or 15,000 MWhr per annum. The boilers are currently run in Duty/Standby mode.

The emission points for both boilers are identified as major emission points in P0136-03, i.e. V1 and V28 in Schedule B. The following limits are placed on these:

- Volumetric flow: 10,000 m^3/hr
- Oxides of sulphur (SO_x as SO_2): 320 mg/Nm^3
- Oxides of Nitrogen (NO_x as NO_2): 350 mg/Nm^3

Any plant whose main purpose is the generation of energy and “which uses waste as a regular or additional fuel” is a co-incineration plant under WID and this is the case for the boiler at the Pfizer, Little Island site. However, as greater than 40% of the sites steam

demand is generated by the sites Duty boiler, the main emission point V1 is subject to the emission limit values applied in this case are those for incineration plants (Annex V of WID)

The proposal is to convert Boiler V1 (burner and control system) to facilitate the use of organic solvent distillates as a fuel with a usage of between 250 and 1,250 kg/hr.

The emission characteristics applied to this modelling assessment for the main emission point V1 comprised the emission limit values from Annex V of WID and included:

- Total Dust: 30 mg/Nm^3
- TOC: 20 mg/Nm^3
- SO_2: 200 mg/Nm^3
- NO_x: 400 mg/Nm^3 (as NO_2)
- CO: 100 mg/m^3
- HCl: 10 mg/m^3
- HF: 1 mg/m^3
- Cadmium and Thallium: 0.05mg/m^3
- Mercury: 0.05 mg/m^3
- Heavy metals: 0.5mg/m^3
- Dioxins and Furans: 0.1ng/m^3 TEQ
- O_2: 11%

The organic solvent distillate to be used as an alternative fuel will not contain metals or halogenated substances therefore, emissions of Cadmium and Thallium, mercury, Heavy metals, Dioxins and Furans, HCl and HF are not expected to be released during normal operation.

However, for completeness, these parameters are included in the model.

2.2. V6 Details

The licensed main emission point V6 currently refers to the Adtech Thermal Oxidiser. The Adtec thermal oxidiser is no longer used. Emission abatement is now through the use of scrubbers (Caustic and Water) for the treatment of organic and inorganic solvent emissions. Pfizer, Little Island propose to remove the reference to the Adtech Thermal Oxidiser replacing it with the more appropriate description of scrubbers (Caustic and Water).

In light of this proposed modification this modelling assessment modelled the following emissions from the emission point V6:

- Class I Organics: 20 mg/Nm^3 when mass-flow exceeds 0.1 kg/hr
- Class II Organics: 100 mg/Nm^3 when mass flow exceeds 2 kg/hr
- Class III Organics: 150 mg/Nm^3 when mass flow exceeds 3 kg/hr
- Class II Inorganics (as Chlorine): 5 mg/Nm^3 when mass flow exceeds 0.05 kg/hr
- Class III Inorganics (as HCl): 10 mg/Nm^3 when mass flow exceeds 0.3 kg/hr

2.3. Generator Details

The diesel powered generator is currently used on site to provide emergency back-up power supply and is considered by the IPPC licence (P0136-03) to be a minor source based on its projected hours of operation during any one year (referenced as V340 in Appendix E1.1 list of emissions to air in IPPC application of March 2007).

During normal periods of operation, it is run for an hour in each month by site engineers to ensure it is ready and available to the site should an emergency back-up power supply be required (a projected operation period of less than 20 hours per year).

Pfizer, Little Island are proposing to reduce electricity supply costs to avail of the ESB Winter Peak Reduction Scheme by reducing the sites power demand during winter periods between the winter peak demand time of 17.00 and 19.00. To achieve this Pfizer, Little Island propose the use of this diesel powered generator to offset the sites power demand. This will require the operation of the diesel powered generator between 17.00 and 19.00 on weekdays during November to February (a projected operation period of less than 200 hours per year).

Further, technical details on the diesel powered generator and its proposed operational mode are summarised in Table 2.1 below (Reference 8).

Table 2.1: Details of diesel powered generator emissions

Generator Rating	1,200 kW (1,500 kVA)
Fuel	Diesel <0.1%S
Operating Load[1]	800 kW
Fuel Consumption	205 l/hr
Flue Gas Generation[2]	8,495 Nm^3/hr (dry at 15% O_2)
Release Height	11.75 m
Release Temperature	380^{o}C

Maximum Pollutant Concentration (mass flow)[2]: **NO_x (as NO_2)**	1,867 mg/Nm^3 (16kg/hr)
Proposed operating hours	<200 hours per year, November to February (weekdays only) 17.00 – 19.00

Note:

1. Due to load restrictions on site, the generator cannot operate above 800kW
2. The pollutant concentrations are given at dry gas, 101.3kPa, 273k and 15% oxygen and is the average value for NO_x emissions recorded during a recent emission monitoring program. CO and SO_2 emissions were negligible.

The operation of the site diesel generator for winter peak shaving forms part of a separate technical amendment to the IPPC licence (P0136-03). Pfizer, Little Island propose to commence this operation in November 2010, following approval from the Environmental Protection Agency (EPA).

3. MODEL INPUT PARAMETERS

3.1. Meteorology

Prevailing weather conditions can have a significant impact on ground level concentrations of compounds released to air from stacks. Wind speed and direction, in particular, impact the location and magnitude of the maximum ground level concentrations.

A range of meteorological parameters are monitored by Met Éireann at their synoptic monitoring stations, including wind speed, wind direction, temperature, rainfall, cloud cover and humidity. There are significant variations between different stations in Ireland hence it is important that a station is chosen which is representative of the area under investigation. The nearest Met Éireann synoptic monitoring station to the Pfizer, Little Island site is Cork airport. Data from this site will be representative of meteorological conditions in the vicinity of the Pfizer, Little Island site. In order to ensure that a range of likely meteorological conditions are included in the modelling assessment, three complete years of hourly meteorological data are included in the assessment, for 2004, 2005 and 2006.

The required input parameters for the model are:

- Wind speed;
- Wind direction;
- Temperature;
- Cloud cover; and
- Month, day and hour data.

A summary of the temperature, wind speed and cloud cover data for each of the years is presented below, while wind roses for each year are included in Figures 4.1, 4.2 and 4.3. Cloud cover is measured in 'oktas', 0 to 8 shows the fraction, in oktas, of the celestial dome covered by all clouds.

Table 4.1: Summary of Cork Airport meteorological data used in the assessment

Parameter	2004	2005	2006
Average Cloud Cover (Oktas)	5.8	5.9	6.0
Minimum Wind Speed (m/s)	0.0	0.0	0.0
Average Wind Speed (m/s)	4.9	5.0	2.6
Maximum Wind Speed (m/s)	18.1	17.0	8.7

Minimum Temperature (°C)	-3.7	-2.10	-4
Average Temperature (°C)	24.9	25.3	25
Maximum Temperature (°C)	10.0	10.1	10

Figure 4.1: Wind rose for 2004, Cork Airport

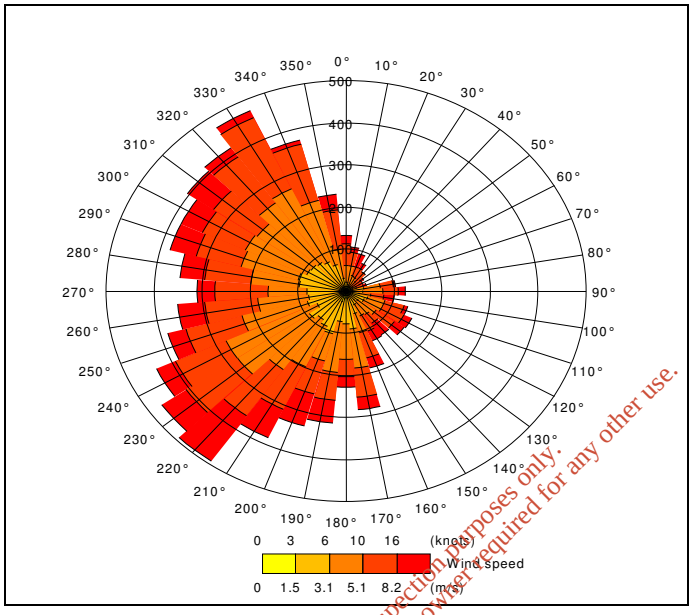


Figure 4.2: Wind rose for 2005, Cork Airport

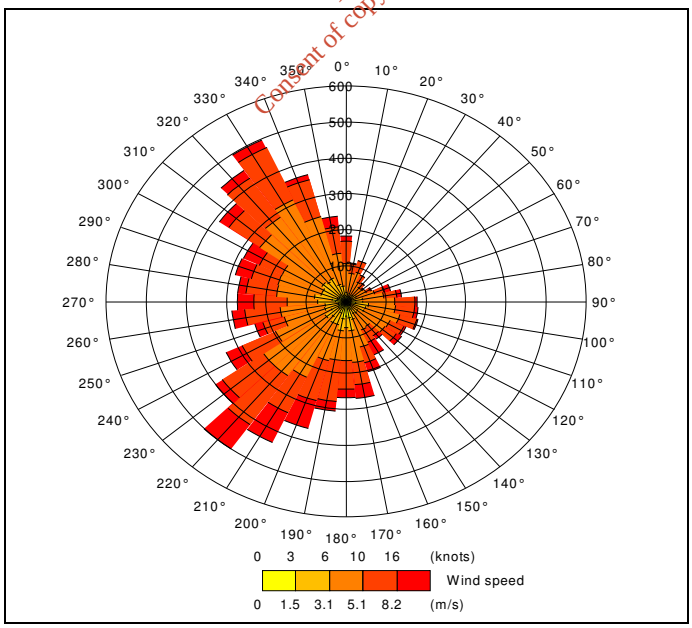
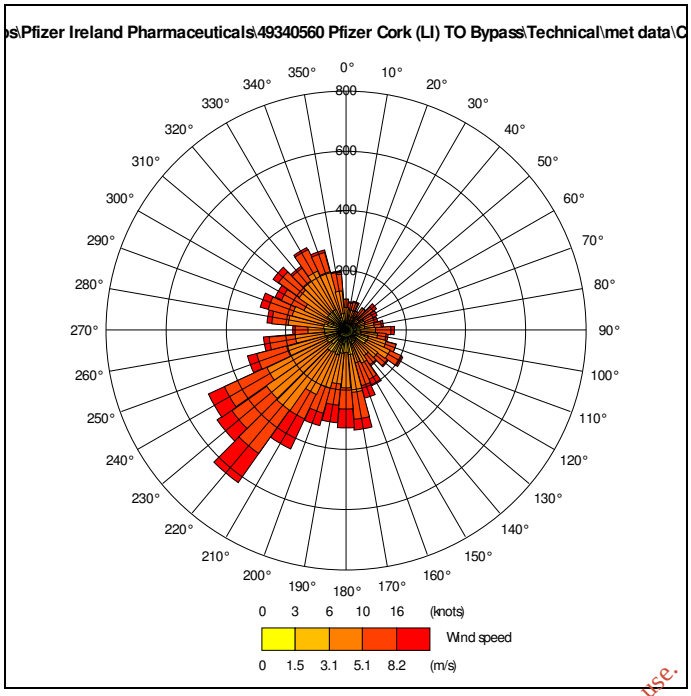


Figure 4.3: Wind rose for 2006, Cork Airport



3.2. Topography

Local topography can have a significant impact on the dispersion of released materials. The ADMS model is capable of including topographical data, if required. There are two parameters which can be employed in the model to describe local topography, as detailed below.

Surface Roughness

This parameter is specified in all modelling assessments. Surface roughness describes the degree of ground turbulence caused by the passage of winds across surface structures. Ground turbulence is greater in urban areas than in rural areas, for example, due to the presence of tall buildings.

The area surrounding Pfizer, Little Island includes the industrial estate, residential area and the sea. Based on visits to the site a surface roughness value of 0.45 metres has been chosen which is typical of suburban/parkland areas and is considered to represent typical surface roughness in the site area.

Complex Terrain

The presence of steep hills (known as complex terrain) in the vicinity of a site can effect dispersion of emissions. A gradient of 1:10 or greater is normally taken as the criteria for inclusion of terrain in a modelling assessment. The topography in the vicinity of the site is generally flat, therefore it has been decided not to include terrain data in the model.

3.3. Building Effects

Buildings and other structures can have a significant impact on the dispersion of materials released to air. The main effect is to entrain pollutants into the cavity (leeward side) of the building, which is isolated from the main flow and in which a reversal of flow can occur. This can result in rapid grounding of undiluted plumes.

Typically buildings are considered to have an impact on dispersion if the building height is greater than 40 % of the stack height.

A number of buildings on the Pfizer, Little Island site have been included in the assessment as it is considered that the buildings may have some impact on plume dispersion due to their location and height. The dimensions of the buildings included in the modelling assessment are included in Table 4.2. A schematic of the buildings with respect to the air emission points is detailed in Figure 4.4.

Table 4.2: Dimensions for buildings included in the assessment[note1]

Description	Height (m)	Length (m)	Width (m)	Angle to North (°)
Dryer Building (Dryer)	20	33	20	0
OP1 Production Building	14	21	47	0
OP3 Production Building	15	22	11	0
Drum Store	9	31	31	347
Utilities Building (UTLI)	9	31	31	0

Note:

1. ADMS buildings model defines one building as the 'main building' for each source; this has been chosen as the OP1 Production Building, as this building is likely to provide the most significant downwash effect on the plume.

3.4. Stack Parameters

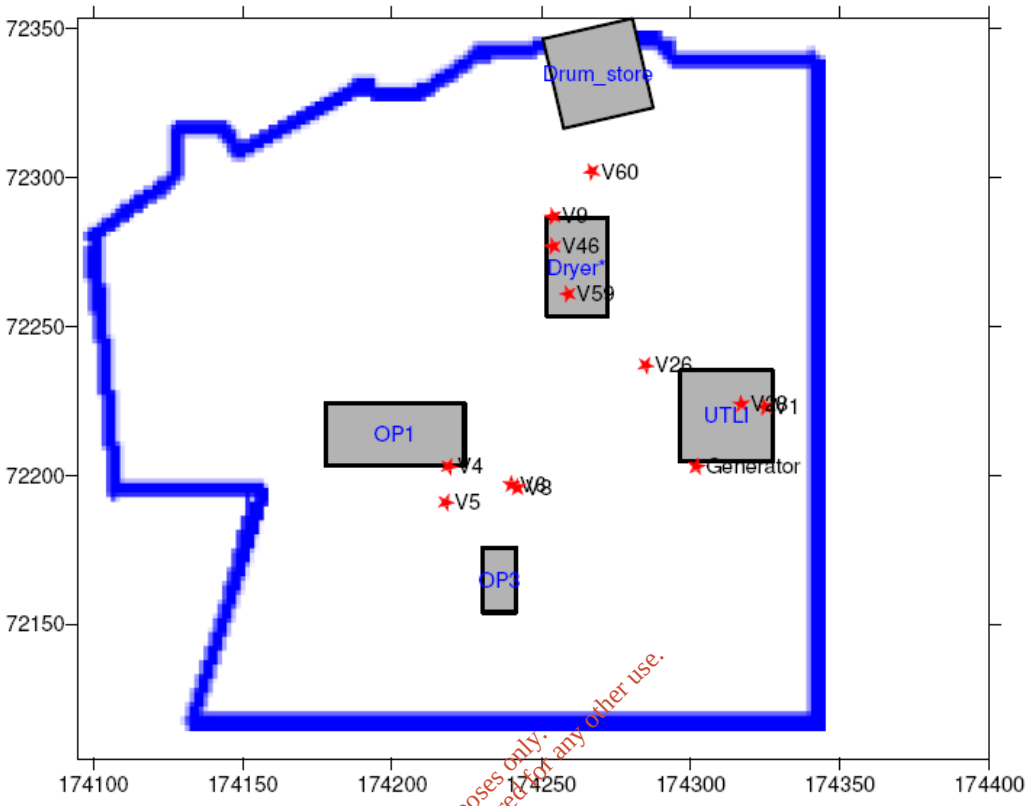
The dimensions of the release points are presented in Table 4.3, including the height of the release point from ground level. The maximum flow values are also presented based on the current IPPC licence flow limits. The release temperature is conservatively assumed based on available monitoring data for the emission points.

Table 4.3: Emission points parameters

Release Point	Description	Height (m)	Diameter (m)	Maximum Volume (m^3/hr)	Release temperature (º C)
V1	Duty Boiler	18	0.7	10,000	200
V6	Carbon adsorption/scrubber	17.5	0.4	5,000	100
V8	Thermal Oxidiser	27	1.2	35,000	400
V4	Dust Filter – weighing room in warehouse	9	0.3	3,400	15
V5	Mop Scrubber	15	0.3	5,000	15
V9	OP2 drying and milling	23	0.3	4,800	15
V59	OP2 drying and milling	23	0.415	4,800	15
V340	Emergency Generator	16	0.355	8,495[note 1]	380

Note 1: To ensure consistency with World Bank group guidelines (Reference 5), maximum volume flowrates have been normalised to 273k, 101.3kPa and 15% O_2.

Figure 4.4: Model representation of site buildings and emission points included in the model



3.5. Pollutant Concentrations

The modelling assessment assumes continuous emissions by all on-site sources at maximum ELV or mass flow threshold throughout the modelled year for all main emission points. For the on-site diesel generator the modelling assessment used monitoring information gathered on-site during 2010. This is a very conservative approach due to the following assumptions:

- All sources are running at maximum strength, either maximum ELV multiplied by maximum gas flow or, if higher, the mass flow threshold. Actual emissions rates vary from each source and based on the extensive site monitoring programmes current emissions from each source is considerably less than the modelled emissions;
- The model assumes that only one of the two thermal oxidisers are operating on the site, i.e. V8. In reality, only one runs at any one time, with the other acting as 100% reserve if the first should fail or is subject to an outage. The current system arrangement does not permit the simultaneous running of both thermal oxidisers;
- All process vents releasing dust are all running continuously at the max ELV. Again, emissions from these sources depend on the sequence and timing of drying and other dust handling operations;

- The site steam demand is met by one duty boiler running and one boiler remaining on standby. This modelling assessment therefore, assessment the emissions from operating boiler A, main emission point V1 which acts as the duty boiler on-site.

For the **steam raising boiler A**, the following emission limit values were modelled:

- V1 – running on organic solvent distillate with maximum air emission concentrations based on incineration plants taken from WID Annex V:
  - Total Dust: 30 mg/Nm^3
  - TOC: 20 mg/Nm^3
  - SO_2: 200 mg/Nm^3
  - NO_x: 400 mg/Nm^3 (as NO_2)
  - CO: 100 mg/m^3
  - HCl: 10 mg/m^3
  - HF: 1 mg/m^3
  - Cadmium and Thallium: 0.05mg/m^3
  - Mercury: 0.05 mg/m^3
  - Heavy metals: 0.5mg/m^3
  - Dioxins and Furans: 0.1ng/m^3 TEQ
  - O_2: 11%

For the **on-site diesel generator**, the following emission values were modelled

- V340 - running on diesel with monitored emissions concentrations:
  - NO_x: 1,867 mg/Nm^3 (as NO_2)[3]

For the following main sources V6, V8 and V46 current licence revision application, this dispersion modelling exercise assumes that the Emission Limit Values (ELVs) for releases to atmosphere will be based on specifying concentration limits for **process releases** of TA Luft Organics and Inorganics once the mass-flow thresholds specified in TA Luft 86 are exceeded, i.e.:

- Class I Organics: 20 mg/Nm^3 when mass-flow exceeds 0.1 kg/hr

[3] Normalised to dry gas, 273k, 101.3kPa, 15% O_2

- Class II Organics: 100 mg/Nm^3 when mass flow exceeds 2 kg/hr
- Class III Organics: 150 mg/Nm^3 when mass flow exceeds 3 kg/hr
- Class II Inorganics (Chlorine)[4]: 5 mg/Nm^3 when mass flow exceeds 0.05 kg/hr (Licensed for V6 only)
- Class III Inorganics (HCl)[5]: 10 mg/Nm^3 when mass flow exceeds 0.3 kg/hr

For process vents V4, V5, V9 and V59 dust/particulate released at an ELV of 1 mg/Nm^3 is assumed with no mass-flow threshold.

All emissions concentrations are modelled under the following conditions: dry gas, 273 K, 101.3 kPa. The mass flows used for modelling are presented in Table 4.4.

Table 4.4: Pollutants, mass flows and ELVs for air emission points

Emission Point	Maximum Volume (m^3/hr)	Pollutant		ELV (mg/m^3)	Mass Flow (kg/hr)	Mass Flow (g/s)
V1 (Duty Boiler)	10,000	Dust	Organic solvent distillate	30	0.3	0.08
		TOC		20	0.2	0.06
		NO_x		400	4	1.11
		SO_2		200	2	0.56
		CO		100	1	0.28
		Cd&Tl		0.05	$5x10^{-4}$	$1.4x10^{-4}$
		Hg		0.05	$5x10^{-4}$	$1.4x10^{-4}$
		Heavy Metals		0.5	$5x10^{-3}$	$1.4x10^{-3}$
		Dioxins & Furans		0.1ng/m^3 (TEQ)	$1x10^{-3}$	$2.8x10^{-8}$
V6 (Scrubber)	5,000	TA Luft Organics Class I		20 (>0.1 kg/hr)	0.1	0.028
		TA Luft Organics Class II		100 (>2kg/hr)	2	0.56
		TA Luft Organics Class III		150 (>3 kg/hr)	3	0.83
		TA Luft Inorganics Class III (HCl)		10 (>0.3kg/hr)	0.3	0.08
		TA Luft Inorganics Class II (Cl)		5 (>0.05kg/hr)	0.05	0.01

[4] TALuft 1986 Class II inorganics have been modelled by this study based on the emissions of Chlorine from the main emission point V6 and HF from the main emission point V1.

[5] TALuft 1986 Class II inorganics have been modelled by this study based on the emissions of HCl from the main emission points V6, V8 and V1.

Emission Point	Maximum Volume (m^3/hr)	Pollutant	ELV (mg/m^3)	Mass Flow (kg/hr)	Mass Flow (g/s)
V8 (TO)	35,000	TA Luft Organics Class I	20 (>0.1 kg/hr)	0.7	0.028
		TA Luft Organics Class II	100 (>2kg/hr)	3.5	0.56
		TA Luft Organics Class III	150 (>3 kg/hr)	5.3	0.83
		TA Luft Inorganics Class III (HCl)	10 (>0.3kg/hr)	0.4	0.08
V4	3,400	Dust	1	0.003	$9.4x10^{-4}$
V5	5,000	Dust	1	0.005	$1.4x10^{-3}$
V9	4,800	Dust	1	0.005	$1.3x10^{-3}$
V59	4,800	Dust	1	0.005	$1.3x10^{-3}$
V340	8,495	NO_x	Not specified	16	4.44

4. AIR QUALITY GUIDELINE VALUES

4.1. Air Quality Standards

In accordance with the EPA draft for public consultation Air Dispersion Modelling Guidance Note (AG4) (Reference 3), the assessment parameter chosen for determining the impact of the model results is taken from statutory air quality standards for SO_2, NO_x, CO, Particulate matter and metals specified in S.I. 271 of 2002 and detailed in Table 5.1 below.

To be compliant with the WID pollutants defined in Annex V an assessment using emission limit values (ELV) from Annex V was conducted for; metals (consisting of cadmium & thallium, mercury, and heavy metals comprising of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium). However, the organic solvent distillate to be used as an alternative fuel will not contain any metals. Therefore, emissions of metals are not expected to be released during normal operation.

Table 5.1: Details Air Quality Standards

Compound	Criteria	Averaging Period	Limit Value (µg/m^3)	Percentile for Compliance
SO_2	Human health	1 hour	350	99.73%ile(not to be exceeded more than 24 time per annum)
SO_2	Human health	24	125	99.18%ile (not to be exceeded more than 3 times per annum)
SO_2	Ecosystem protection	Annual average	20	Mean value
NO_2	Human health	1 hour	200	99.79%ile (not to be exceeded more than 18 times per annum)
NO_2	Human health	Annual average	40	Mean value
NO_x	Vegetation protection	Annual average	30	Mean value
CO	Human health	8 hours	10,000	Running mean
PM_{10}	Human health	24 hour	50	90.4%ile (not to be exceeded more than 35 times in a calendar year)

Compound	Criteria	Averaging Period	Limit Value (µg/m^3)	Percentile for Compliance
PM_{10}	Human health	Annual average	40	Mean value
Lead	Human health	Annual average	0.5	Mean value
Arsenic[note 1]	Human health	Annual average	0.006	Mean value
Cadmium [note 1]	Human health	Annual average	0.005	Mean value
Nickel [note 1]	Human health	Annual average	0.02	Mean value

Note 1: The AQS's are Target values of Directive 2004/107//EC to be attained by 2012 and are not anticipated statutory AQS. It should also be noted that metals are not expected to be released from operating the co-incinerator on the basis that they will not be contained in the organic solvent distillate.

4.2. Environmental Assessment Levels

There are no statutory air quality guideline values for the VOCs likely to be in process emissions and specified in Table 5.2. In accordance with the EPA draft for public consultation Air Dispersion Modelling Guidance Note (AG4) (Reference 3), the assessment parameter chosen for determining the impact of the model results is taken from Appendix D of the UK Environment Agency IPPC H1 – IPPC Environmental Assessment for BAT (Environment Agency 2008). These are derived 'Short Term Environmental Assessment Levels' for 1-hour concentrations of a range of solvents. This is a revision to the previous assessment criteria used in the 2007 IPPC application, which based the EALs on the Occupational exposure limits / 40.

To be compliant with the WID pollutants defined in Annex V an assessment using emission limit values (ELV) from Annex V was conducted for hydrogen fluoride (HF) and hydrogen chloride (HCl). However, the organic solvent distillate to be used as an alternative fuel will not contain any halogenated substances. Therefore, emissions of HF and HCl are not expected to be released during normal operation.

Table 5.2: TA Luft substances, EAL values

Pollutant	TA Luft Class	EAL (mg/m^3)	
		Long-term	Short-term
TA Luft Organics			
1,4-DIOXANE	I	0.91	36.60
CHLOROFORM	I	0.099	2.97
METHYLENE CHLORIDE	I	0.70	3.00
PYRIDINE	I	0.16	3.30
1,2-DICHLOROETHANE	I	0.042	0.70
TETRAHYDROFURAN	II	3.00	59.90

Pollutant	TA Luft Class	EAL (mg/m^3)	
		Long-term	Short-term
TOLUENE	II	1.91	8.00
ACETONE	III	18.10	362.00
ETHANOL	III	19.20	576.00
ETHYL ACETATE	III	14.60	420.00
IPA	III	9.99	125.00
METHANOL	III	2.66	33.30
MTBE	III	0.92	27.50
N-BUTANOL note 1	III	-	15.40
N-HEXANE	III	0.72	21.60
N-PROPANOL note 1	III	5.00	62.50
TA Luft Inorganics			
HCl	III	0.02	0.80
Chlorine note 2	II	-	0.15
Hydrogen Fluoride	II	-	0.25

Note:

1. For the purposes of this assessment the EAL for N-Butanol have been taken as the EAL for Butan-1-ol, and the EAL for N-Propanol have been taken as the EALS for Propan-1-ol.
2. In accordance with H1 where no EAL is reported, the 8th hr TWA OEL can be divided by 100 for Long-term average EAL with the short-term EAL derived from the 15min OEL divided by 10. With OEL information taken from Reference 7.

4.3. Additional Assessment Levels

4.3.1. Dioxins & Furans

To be compliant with the WID pollutants defined in Annex V an assessment using emission limit values (ELV) from Annex V was conducted for mercury. However, the organic solvent distillate to be used as an alternative fuel will not contain any mercury. Therefore, emissions of mercury are not expected to be released during normal operation.

The WHO does not propose air quality guidelines for PCDD/Fs because atmospheric exposure to PCDD/F is considered low. Exposure to atmospheric PCDD/Fs accounts for '*less than 5%*' of the daily intake from food. Therefore, no direct comparison can be made to determine whether predicted concentrations should be considered environmentally significant.

WHO does state that: '*Air concentrations of 0.3 pg/m^3 or higher are indications of local emission sources that need to be identified and controlled*' (Reference 8).

On this basis, the PCDD/F benchmark of 0.3 pg/m^3 concentration has been used to provide an indication of whether predicted concentrations should be considered environmentally significant.

Concentrations are expressed in mass pollutant (picograms) per cubic metre of air (pg/m^3).

4.3.2. Mercury

To be compliant with the WID pollutants defined in Annex V an assessment using emission limit values (ELV) from Annex V was conducted for Dioxins and Furans. However, the organic solvent distillate to be used as an alternative fuel will not contain any mercury containing substances. Therefore, emissions of mercury are not expected to be released during normal operation.

WHO's air quality guideline for Mercury is specified in Table 5.3. This guideline value is determined given that '*the exposure to mercury from outdoor air at these air levels is not expected to have direct effects on human health*' rather '*mercury in the atmosphere may ultimately be converted to methylmercury following deposition on soils or sediments in natural bodies of water, leading to an accumulation of that form of mercury in aquatic food chains*'.

Table 5.3: WHO Air Quality Guidelines for the protection of human health

Pollutant	WHO (µg/m^3)	Averaging period	Percentile
Mercury (Hg)	1	Annual	100%ile

5. BACKGROUND DATA

For the purposes of estimating the maximum combined pollutant concentration, i.e. including background concentration, this report uses the following basis (Reference 3), for example:

- Maximum combined pollutant concentration:
    - Annual mean Process Contribution + annual mean background concentration.
    - 99.8%ile Process Contribution + 2 (annual mean background concentration).

For the Pfizer, Little Island installation information from the EPA report on Ambient Air Monitoring at Cork Harbour for 2008 (Reference 4) was taken to represent the background data for the site for the following pollutants:

- NO_2: 10.4 µg/m^3
- SO_2: 3.4µg/m^3
- CO: 0.26mg/m^3
- PM: 16.7 µg/m^3
- Cadmium: Below detection limit
- Heavy metals:
    - Lead: 0.004 µg/m^3
    - Arsenic: Below detection limit
    - Nickel: Below detection limit

No baseline data for process emissions (including mercury and dioxin & furans) were available from Cork Harbour at the time of this study.

Therefore, baseline data for these substances was supplemented by monitoring information contained in the Waste-to-Energy Ringaskiddy Environmental Impact Statement (Reference 13), presented as follows:

- HCl: 1.2 µg/m^3
- HF: 0.05 µg/m^3
- Hg: 0.0001 µg/m^3
- Cd: 0.0001 µg/m^3

- As: 0.0001 µg/m^3
- Ni: 0.0001 µg/m^3
- Dioxins&Furans: 13.5 TEQ fg/m^3

Ringaskiddy is located in a coastal region approximately 8 km South from Little Island.

6. RESULTS

Three boilers had previously been modelled in 2007 as part of the IPPC application for the Little Island site, in order to facilitate future possible expansion. However, one boiler was never installed, V7 and the current site boiler operation is one duty boiler, V1 and one standby boiler, V28. Both boilers will never operate together. Therefore, to predict the maximum air quality impacts, URS conducted Air Dispersion Modelling (ADM) of site emissions from the operation of 1 of the sites boilers, V1 operating as a co-incinerator plant alongside the diesel powered generator, V340 operating during specific periods during the winter for the purposes of winter load peak shaving, using detailed dispersion modelling techniques.

The modelling was carried out using three years of meteorological data, 2004, 2005 and 2006. Maximum predicted hourly ground level concentrations are presented for each year of the three years of meteorological data employed.

Only the ground level concentrations (GLCs) outside the site boundary are presented and evaluated in the discussion.

The volumetric flow rates and release temperatures used were as reported in Table 2.3. The results of the modelling assessment are presented in Tables 7.1.

To assess TAluft organic classes we adopted a conservative approach by assessing the modelled organic emissions against the lowest EAL for that class.

Table 7.1: Results of the modelling assessment

Pollutant	2004	2005	2006	Maximum GLC	Baseline	Combined Pollutant Conc.	AQS: Human Health	AQS: Ecological systems	GLC /AQS	GLC /AQS
	ug/m^3	*ug/m^3*	*ug/m^3*	*ug/m^3*	*ug/m^3*	*ug/m^3*	*ug/m^3*	*ug/m^3*	%	%
Annual mean SO_2	4.3	4.0	5.0	5.0	3.4	8.4	-	20	-	42%
99.72%ile SO_2 (1hr)	34.7	34.6	34.7	34.7	6.8	41.5	350	-	12%	-
99.20%ile SO_2 (24 hr)	24.1	24.1	25.4	25.4	6.8	32.2	125	-	26%	-
Annual mean NO_x	9.7	9.2	11.6	11.6	10.4	22.0	40	30	55%	73%
99.79%ile NO_x (1hr)	153.6	165.8	169.8	169.8	20.8	190.6	200	-	95%	-
8hr running mean CO	16.3	16.4	16.3	16.4	260.0	276.4	10,000	-	3%	-
Annual mean Dust (taken as PM_{10})	0.7	0.6	0.8	0.8	16.7	17.5	40.0	-	44%	-
90.40%ile Dust (taken as PM_{10}) (24hrs)	2.3	2.2	2.3	2.3	33.4	35.7	50.0	-	71%	-
Annual mean TALuft Organics Class I	0.43	0.44	0.31	0.4	-	0.4	42	-	1.0%	-
100%ile TAluft Organics Class I (1hr)	3.59	6.12	3.40	6.1	-	6.1	700	-	0.9%	-
Annual mean TALuft Organics Class II	8.65	8.67	6.18	8.7	-	8.7	1910	-	0.5%	-
100%ile TAluft Organics Class II (1hr)	71.87	122.30	68.04	122.3	-	122.3	8000	-	1.5%	-

Pollutant	2004	2005	2006	Maximum GLC	Baseline	Combined Pollutant Conc.	AQS: Human Health	AQS: Ecological systems	GLC /AQS	GLC /AQS
	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	%	%
Annual mean TALuft Organics Class III	12.83	12.85	9.15	12.8	-	12.8	720	-	1.8%	-
100%ile TAluft Organics Class III (1hr)	106.52	181.26	100.85	181.3	-	181.3	15400	-	1.2%	-
Annual mean TALuft Inorganic Class II	0.03	0.03	0.03	0.03	0.05	0.15	-	-	-	-
100%ile TALuft Inorganic Class II (1hr)	0.30	0.42	0.30	0.42	0.10	0.52	0.15	-	0.4%	-
Annual mean TALuft Inorganic Class III	0.63	0.61	0.67	0.67	1.2	1.87	20	-	9.4%	-
100%ile TALuft Inorganic Class III (1hr)	5.31	5.51	5.79	5.79	2.4	8.19	800	-	1.0%	-
Annual mean Cd	0.001	0.001	0.001	0.0012	0.0001	0.0013	0.005	-	27%	-
Annual mean Hg	0.001	0.001	0.001	0.0012	0.0001	0.0013	1	-	0.13%	-
Annual mean Heavy metals (as Pb)	0.011	0.010	0.012	0.0125	0.0001	0.0126	0.5	-	2.5%	-
Annual mean Heavy metals (as Ni)	0.011	0.010	0.012	0.0125	0.0001	0.0126	0.02	-	63%	-
Annual mean Heavy metals (as As) note 1	0.011	0.010	0.012	0.0125	0.0001	0.0126	0.006	-	210%	-

Note:

1. For completeness we have included an assessment of emissions based on the WID emission limits. However, the organic solvent distillate to be used as an alternative fuel will not contain any metals including arsenic containing substance. Therefore, emissions of arsenic are not expected to be released during normal operation.

Dioxins / Furans (PCDD/F)

The modelling results predicted off-site maximum ground level concentrations for PCDD/Fs of:

- Annual mean: 2.5 x 10^{-3} pg/m^3; and
- Hourly mean: 1.9 x 10^{-2} pg/m^3.

The combined pollutant concentration resulting from the proposed co-incineration plant is obtained by adding these results to the background data detailed in Chapter 5. The combined pollutant concentration are predicted to be:

- Annual mean: 0.016 pg/m^3; and
- Hourly mean: 0.046 pg/m^3.

Comparing these to the benchmark figure of 0.3 pg/m^3 indicates that the predicted concentrations of PCDD/F resulting from the proposed site co-incinerator should not be considered environmentally significant.

6.1. Conclusions

This Air Quality Impact Assessment investigated the environmental significance of potential impacts from site activities taking into account emissions from a proposed co-incinerator to be used at the Pfizer, Little Island, installation and the site diesel generator following its proposed use for the purpose of peak load shaving.

In determining the likely impacts, some worst-case assumptions were taken with regard to the likely emissions from these proposed modifications to site activities. These comprised:

- Throughout the assessment a worst-case assumption for operating hours and pollutant concentrations were used.
- The highest predicted concentration at any off-site location was used in the assessment of environmental significance.
- The highest predicted concentrations obtained using any of the three different years of meteorological data have been used in this assessment. During a 'typical' year it may be expected that the highest ground level concentrations would be lower.
- To be compliant with the WID pollutants defined in Annex V an assessment using emission limit values (ELV) from Annex V was conducted for; metals (consisting of cadmium & thallium, mercury, and heavy metals comprising of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium), Dioxins & Furans, hydrogen chloride (HCl) and hydrogen fluoride (HF). For comparison to the target Air Quality Standard (AQS) values for Lead, Nickel and Arsenic, a very conservative approach was used. The approach estimated that the maximum combined pollutant concentrations of the total heavy metals modelled consisted entirely of each individual metal leading to a large overestimation of the quantity of each individual metal released from V1, such a scenario is not expected to occur. Also, the organic solvent distillate to be used as the alternative fuel are not expected to contain any metals or halogenated substances and therefore, these pollutants are not expected to be emitted from the main emission point, V1. To ensure the quality of the alternative fuel Pfizer, Little Island intend to collect the organic solvent distillates from production on a per batch basis in a holding tank for use as a fuel in Boiler A. Periodic testing will be carried in the holding tank.
- To assess TA *luft* organic/inorganic classes URS adopted a conservative approach by assessing the modelled emissions against the lowest Environmental Assessment Level (EAL) for that class.

This assessment showed that the maximum combined pollutant concentration for operation of these proposed modifications were well within the Air Quality Standards (AQS) and Environmental Assessment Levels (EALs) for each study pollutant, at all off-

site locations. Furthermore, the highest concentrations are close to the site boundary with concentrations falling rapidly with distance from the sources.

This assessment showed that the maximum combined pollutant concentrations for total heavy metals (when taken as Arsenic) are above the AQS for Arsenic. However, the approach used estimated that total heavy metals maximum combined pollutant concentrations consisted entirely of Arsenic which is not expected. As clean organic solvent distillate is to be used by the co-incinerator, negligible emissions of metals are expected. Furthermore, this distillate feed stream is to be well characterised by a test burn programme, which will demonstrate the absence or at worst negligible level of metals that will be in this organic solvent distillate stream. On this basis, metals are not considered to present a potentially significant environmental impact when the co-incineration plant is operated with clean organic solvent distillate as proposed by Pfizer, Little Island.

In the case of PCDD/F, no air quality guideline was available for direct comparison. Therefore, comparing the pollutant concentration for PCDD/F to the benchmark figure of 0.3 pg/m^3 proposed by WHO indicates that the predicted concentrations of PCDD/F resulting from the proposed co-incinerator should not be considered environmentally significant.

Furthermore, the organic solvent distillate to be used as an alternative fuel will not contain metals or halogenated substances therefore, emissions of Cadmium and Thallium, Mercury, Heavy metals, Dioxins and Furans, HCl and HF are not expected to be released during normal operation.

On this basis, it has been determined that emissions due to the operation of the proposed co-incinerator, should not be considered environmentally significant.

7. REFERENCE

1. First General Administrative Regulation Pertaining the Federal Immission Control Act, Technical Instructions on Air Quality Control – *TA Luft 1986.*

2. Official Journal of the European Communities, Directive 2000/76/EC of the European parliament and of the Council of 4 December 2000 on the Incineration of Waste

3. Environmental Protection Agency, Air Dispersion Modelling Guidance Note (AG4), Draft for Public Consultation.

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Appendix A - ADMS Model Description

ADMS Model Information

The ADMS model is an advanced modelling system, which requires a variety of input data to ensure realistic predictions of ground level concentrations due to stack emissions. Required inputs include building dimension data, terrain data, surface roughness data, source data (Stack height, diameter, flow rate, emission rates for each compound to be modelled), meteorological data and receptor data.

Air dispersion models are used for calculating air pollution concentrations given information about the pollutant emissions and the nature of the atmosphere (factors affecting the dispersion and dilution in the atmosphere). The resultant pollutant concentrations can be compared with air quality standards, objectives or guidelines.

ADMS is a Windows based programme, which requires inputs on a number of tabs for a variety of different parameters.

The impact of a release on the environment will be dependent on many factors, including:

- The rate of release of each substance;
- Other release characteristics, such as release location, release velocity and the temperature of the released material;
- The physical properties of the released substance (such as its physical form or particle size);
- The chemical properties of the released substances;
- The nature of the receiving medium, particularly its dispersive and transfer characteristics and how these vary with time;
- Ambient concentrations of released substances already present in the environment;
- The locations of receptors in the environment sensitive to the released substances; and
- The degree of sensitivity of these receptors to enhanced concentrations of released substances.

To quantify these effects and to establish the predicted ground level concentrations of species emitted from on-site sources, *URS* has undertaken detailed air dispersion modelling for the site. The selected model for use in this assessment is ADMS4, produced by Cambridge Environmental Research Consultants (CERC). This model is a 'new-generation' model, which represents local meteorological conditions in a more technically correct way than the older models that utilise semi-empirical stability classes. The main features of ADMS4 are:

- All on-site sources can be modelled together in the same run, to provide an integrated assessment of the whole site;

- Site-specific hourly sequential meteorological data is used in the modelling assessment to provide worst-case ground level concentrations for realistic conditions;

- Meteorology is treated in a more comprehensive way than in early dispersion models, using the Monin-Obukhov length instead of the semi-empirical stability classes;

- Worst-case conditions can be modelled e.g. adverse combinations of meteorology and emissions, which could result in pollution episodes;

- Effects such as steep terrain, coastline and building effects can be taken into account;

- Model outputs can be calculated for a wide range of averaging periods and percentiles, allowing direct comparison with all relevant ambient air pollutant standards and objectives.

The ADMS4 model takes a range of parameters including stack dimensions, emission conditions and representative meteorological data, and calculates the maximum concentrations at specified intervals from the emission source using sequential computer algorithms. It is generally considered that air dispersion models are conservative models, over-predicting ground level concentrations. All results quoted in this report are the maximum values predicted by the model, and therefore in the opinion of *URS* represent the worst case.

The use of an advanced model such as ADMS4 rather than a simpler screening model is considered the best available analytical technique and enables the incorporation of terrain and building effects on dispersion (if required).

CONTENTS

URS

Pfizer Little Island IPPC Groundwater Monitoring

Round 1 2010

17 May 2010
Final

Issue No 2
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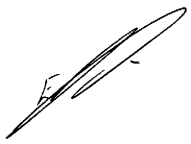
Checked by	Edel O'Hannelly		17 May 2010	Senior Hydrogeologist
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1	13 May 2010	Original issue
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CONTENTS

Section **Page No**

1. INTRODUCTION

URS Ireland Ltd. (URS) were requested by Pfizer Ireland Pharmaceuticals (Little Island) to conduct biannual groundwater monitoring during 2010 at their Little Island facility, as detailed in URS Proposal 3077859. The groundwater-monitoring programme was authorised by Pfizer under their purchase order number N-2164264, dated 10 March 2010.

Due to improvements in infrastructure and groundwater quality at the site in 2007 the EPA agreed to reduce the groundwater monitoring from quarterly to biannual frequency, under the site's revised Integrated Pollution Prevention Control (IPPC) Licence (P0136-03, 13 September 2007).

The results of the first biannual groundwater-monitoring round in 2010 (April 2010, Round 1) are presented and discussed in this report.

2. SCOPE OF WORK

An experienced URS environmental scientist undertook groundwater sampling for Round 1 on 20 April 2010.

The scope of work covered the sampling of fifteen on-site monitoring wells (plus one duplicate sample), as follows:

- 200 series wells – 201, 202, 203 (plus a duplicate sample), 205A, 206 and 207;
- 300 series wells – 301, 302, 303, 304 and 305;
- 400 series wells – 403, 404 and 405; and
- 500 series wells – 501.

Monitoring well locations are shown in Figure 1.

Groundwater samples from all wells were submitted for analysis of the following parameters (as outlined in Pfizer Little Island's IPPC licence):

- Volatile Organic Compounds (US EPA 524.2 by GC-MS); and
- Semi-volatile Organic Compounds (US EPA 524.2 by GC-MS).

Groundwater samples from the 200- and 300-series wells were also submitted for analysis of the following parameters (as outlined in Pfizer Little Island's IPPC licence):

- Major Ions (sodium, potassium, magnesium, calcium, sulphate, total alkalinity and nitrate).

The following parameters were measured in the field at each well to comply with licence requirements:

- pH;
- Electrical conductivity;
- Temperature; and
- Dissolved oxygen.

All samples were submitted to Jones Environmental Laboratory, UK, a URS approved supplier and a UKAS-accredited laboratory.

A duplicate sample was collected from well 203 for quality assurance purposes.

A full sample inventory is presented in Table 1.

Water level and total depth in each monitoring well were measured with an interface probe prior to sampling to detect whether floating or sinking non-aqueous phase liquids

were present. Depth to groundwater measurements were used to calculate groundwater elevations, which in turn were used to assess groundwater flow direction and gradient.

Non-aqueous phase liquids were not detected in any of the wells. Depth to water measurements and the calculated groundwater elevations are presented in Table 5.

Groundwater samples were collected in accordance with URS groundwater sampling protocols, using dedicated sampling equipment in each monitoring well. The majority of samples were collected using inertial lift sample tubing, however wells 403 and 404 were sampled using bailers due to the limited depth of standing water present in the wells.

Sampled wells were purged of at least three times the volume of the well to ensure groundwater samples representative of the aquifer were collected. At the end of purging, stable measurements of dissolved oxygen, pH, redox potential, electrical conductivity and temperature were recorded using a calibrated water quality meter fitted with a flow-through cell (not possible for wells 403 and 404).

The results of groundwater field parameter measurement are presented in Table 6.

3. RESULTS

3.1 LABORATORY ANALYSIS OF GROUNDWATER SAMPLES

The results of laboratory analysis of groundwater samples are presented in Tables 2, 3 and 4.

The results have been compared to the EPA draft Interim Guideline Values (IGVs) for the protection of groundwater for selected natural and synthetic substances. These represent indicators of contamination, rather than clean up criteria.

The results are also compared to Dutch Intervention Value (DIV) criteria. The Dutch criteria are often used in European contamination assessments as a benchmark. These criteria provide guidance values to assess whether remedial action may be required. The Intervention level is the concentration above which some form of remedial or risk assessment action may be required in the Netherlands.

Also included for comparison in the tables are the recently published Guideline Threshold Values from Statutory Instrument No. 9 2010, *European Communities Environmental Objectives (Groundwater) Regulations 2010*.

Table 7 is a summary of key contaminant concentrations (methyl tert-butyl ether and toluene) in key wells over time. Data from this table are also presented as time series plots in Figures 3 to 16.

Field observations noted at the time of groundwater sampling are presented in Tables 5 and 6.

3.1.1 Volatile Organic Compounds (VOCs)

Based on historical data, methyl tert-butyl ether (MTBE) is the primary VOC of concern at the Pfizer Little Island site. The MTBE concentrations reported at each well are presented in Tables 2 and 7, and discussed below.

MTBE

The MTBE concentrations in groundwater from wells 205A, 206, 207, 303 and 305 were below reporting limits. In groundwater from wells 201, 202, 301, 304, 403, 405 and 501, MTBE was detected but concentrations did not exceed the Draft IGV (0.03 mg/L).

MTBE concentrations in groundwater from wells 203 (0.256 mg/L), 302 (0.04 mg/L) and 404 (0.572 mg/L) exceeded the Draft IGV of 0.03 mg/L. The DIV for MTBE of 9.2 mg/L was not exceeded by MTBE concentrations in any of the groundwater samples analysed.

The following trends in MTBE concentrations were noted:

- MTBE concentrations in groundwater from well 201 have declined below 0.02 mg/L since March 2009. Since Sump D was replaced and perched groundwater abstraction began in July 2003, MTBE concentrations in groundwater from well 201

have not exceeded the DIV for MTBE (9.2 mg/L) (Figure 3). Between September 2007 and August 2008 concentrations were between 0.02 mg/L and 1.0 mg/L and had exceeded 1.0 mg/L prior to September 2007.

- The MTBE concentration in groundwater from well 202 was 0.006 mg/L in April 2010, it's lowest concentration to date for this well. Since August 2008, MTBE concentrations from well 202 have generally been below the Draft IGV of 0.03 mg/L (Figure 4).
- The MTBE concentration in groundwater from well 203 increased slightly compared to September 2009, from 0.064 mg/L to 0.256 mg/L. While the MTBE concentration remains above the Draft IGV it has been below the DIV since September 2006 (Figure 5).
- For the first time since a peak concentration of 28.75 mg/L was reported in May 2006, the MTBE concentration in groundwater from well 205A was below the reporting limit. MTBE at well 205A has been below the DIV since December 2006 (Figure 6).
- MTBE remains below the reporting limit in groundwater from wells 206 and 207.
- In groundwater from well 301 the MTBE concentration remains between 0.01 mg/L and 0.03 mg/L and has not exceeded the Draft IGV since March 2008 (Figure 7).
- The MTBE concentration in groundwater from well 302 increased slightly from 0.014 mg/L in September 2009 to 0.04 mg/L, marginally exceeding the Draft IGV (Figure 8).
- MTBE was below the reporting limit in groundwater from well 303.
- The MTBE concentration in groundwater from well 304 decreased from 0.084 mg/L in September 2009 to 0.005 mg/L in April 2010. MTBE concentrations in groundwater from well 304 have been below the DIV since December 2005 (Figure 9).
- MTBE remains below the reporting limit in groundwater from well 305.
- At well 404 MTBE concentrations remain below 1.0 mg/L, having exceeded the DIV in the three monitoring rounds from November 2008 to March 2009. Compared to September 2009, MTBE concentrations have declined slightly, from 0.824 mg/L to 0.572 mg/L, but remain above the draft IGV (see Figure 12).
- The MTBE concentration in groundwater from well 405 decreased in April 2010 to 0.005 mg/L from 0.038 mg/L in September 2009. MTBE concentrations from well 405 have been below the DIV since April 2007 (Figure 13).

It was possible to sample groundwater from wells 403 and 501 in April 2010, these wells are frequently dry. MTBE was detected in groundwater from both wells, at concentrations of 0.015 mg/L (well 403) and 0.003 mg/L (well 501).

Toluene

Toluene has historically been detected in groundwater at the site but was below method reporting limits in groundwater from all wells sampled in April 2010.

Other VOCs

The majority of other VOCs were below the relevant reporting limits.

Other VOCs detected were: chloroform and 1,2-dichlorobenzene, these detections were at trace concentrations (<0.020 mg/L).

Chloroform was detected in groundwater from four wells: 206, 207, 403 and 404. The majority of chloroform detections were <0.01 mg/L. Only one result, 0.02 mg/L at well 403 exceeded the Draft IGV (0.012 mg/L). Chloroform had been detected in these four wells and well 405 in September 2009 and concentrations have generally reduced in April 2010. The presence of chloroform in groundwater from up-gradient well 207 suggests an off-site up-gradient source. However, the detections at wells 403 and 404 may indicate a residual shallow source in the perched groundwater horizon.

1,2-Dichlorobenzene was detected in groundwater from well 202 only at 0.004 mg/L.

Other VOCs which had been detected at trace levels in September 2009 were: 1,1-dichloroethane, 1,1,1-trichloroethane, chlorobenzene and 2-chlorotoluene, all of which were below reporting limits in April 2010.

3.1.2 Semi-Volatile Organic Compounds

Samples from thirteen wells were analysed for SVOCs and results are presented in Table 3.

All SVOCs were below the relevant method detection limits for the April 2010 monitoring round.

3.1.3 Major Ions and Field Observations

As specified in Schedule C.6 of the site's IPPC Licence, eleven monitoring wells (200 and 300 series wells) were analysed for major ions and groundwater field parameters. The major ion results are presented in Table 4, and the groundwater field parameter results are presented in Table 6.

Major ions were within previously reported concentration ranges.

Dissolved oxygen concentrations in groundwater ranged from 0.0 mg/L (wells 202, 205A, 302 and 304) to 4.89 mg/L (well 501) in April 2010, which are at the lower end of the range noted over previous monitoring rounds. The dissolved oxygen concentrations are also lower than would be expected for fully aerated groundwater at the observed temperatures (10 - 11 mg/L).

Adjusted field measurements of redox potential ranged between 42 mV (well 302) and 314 mV (well 305).

Hydrogen sulphide odours were noted from groundwater in wells 201, 203 and 302. These coincide with some of the lower dissolved oxygen and redox potential readings and are consistent with low nitrate levels recorded from these wells.

Electrical conductivity values measured in the field ranged from 203 µS/cm (well 405) to 887 µS/cm (well 207). The recorded electrical conductivity values for April 2010 are comparable to those recorded in earlier monitoring rounds.

Groundwater pH values were close to or slightly above neutral, ranging between 6.55 and 8.29 in groundwater from all wells in April 2010. They are all within the typical range for groundwater in Ireland (6-9 pH units).

3.1.4 Blind Duplicate

Blind duplicate sample analyses of groundwater from well 203 showed good correlation (Relative Percentage Difference of less than ±20%) for the majority of parameters.

3.2 GROUNDWATER FLOW

Water levels were measured in all accessible wells on site on 21 April 2010. While the depth to groundwater measurement for well 301 was recorded, the corresponding groundwater elevation could not be calculated as the standpipe has been cut since the previous monitoring round. The top of standpipe elevation needs to be re-surveyed relative to the other monitoring wells on site.

Depth to groundwater readings and calculated water table elevations at the other monitoring wells are presented in Table 5. A piezometric surface contour map for the deeper gravel aquifer is presented as Figure 2.

The overall direction of groundwater flow is interpreted to be to the northwest, toward Bury's Bridge Basin.

4. SUMMARY AND CONCLUSIONS

The general groundwater flow direction in April 2010 was to the north and northwest (toward Bury's Bridge Basin), consistent with that inferred from previous groundwater monitoring at the site.

The groundwater analysis results for MTBE in April 2010 were some of the lowest recorded in recent years, and many of the wells have shown long-term trends of declining MTBE and toluene concentrations since 2005/2006.

In April 2010 toluene was below detection limits in all wells sampled. The absence of toluene detections suggests that biodegradation of toluene is practically complete, and that there is negligible flux of toluene to Bury's Bridge Basin.

In April 2010, MTBE concentrations in all wells sampled were below the DIV for MTBE of 9.20 mg/L. The concentrations at wells 203, 302 and 404 slightly exceeded the EPA draft IGV of 0.03 mg/L. MTBE was not detected in groundwater from wells 205A, 206, 207, 303 and 305.

Wells 403 and 501 were sampled in April 2010; they are frequently dry during monitoring rounds. Low concentrations of MTBE were detected in groundwater from both wells, with chloroform also detected in groundwater from well 403.

In 2000, URS estimated that worst-case MTBE concentrations of up to 10 mg/L in Bury's Bridge Basin would not cause significant harm to the aquatic ecosystem (see URS report 13218-123-447 of January 2001). Given that the highest MTBE concentration along the down-gradient site boundary in April 2010 is 0.04 mg/L (well 302), and the potential for dilution in the basin is great, potential environmental impact of any discharge of MTBE in groundwater into the Basin under April 2010 conditions is considered to be negligible.

The highest VOC detection in April 2010 was 0.572 mg/L of MTBE in groundwater from well 404, which exceeds the draft IGV but is significantly below the DIV (9.2 mg/L).

5. LIMITATIONS

URS Ireland Limited (URS) has prepared this Report for the sole use of Pfizer Ireland Pharmaceuticals in accordance with the Agreement under which our services were performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by us. This Report may not be relied upon by any other party without the prior and express written agreement of URS. Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by URS, unless otherwise stated in the Report.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in using this Report.

6. COPYRIGHT

Figures

CLIENT
PFIZER IRELAND PHARMACEUTICALS

PROJECT LOCATION
LITTLE ISLAND, CORK

DRAWING TITLE
FIGURE 1 - SITE PLAN AND WELL LOCATION MAP

ENVIRONMENTAL CONSULTANTS
URS
EURO BUSINESS PARK, LITTLE ISLAND, CORK
TEL +353 21 4520450 FAX +353 21 4520484

DRAWN	TRACED	CHECKED	APPROVED	DATE
FOR		EO'H	EO'H/COR	30.04.10

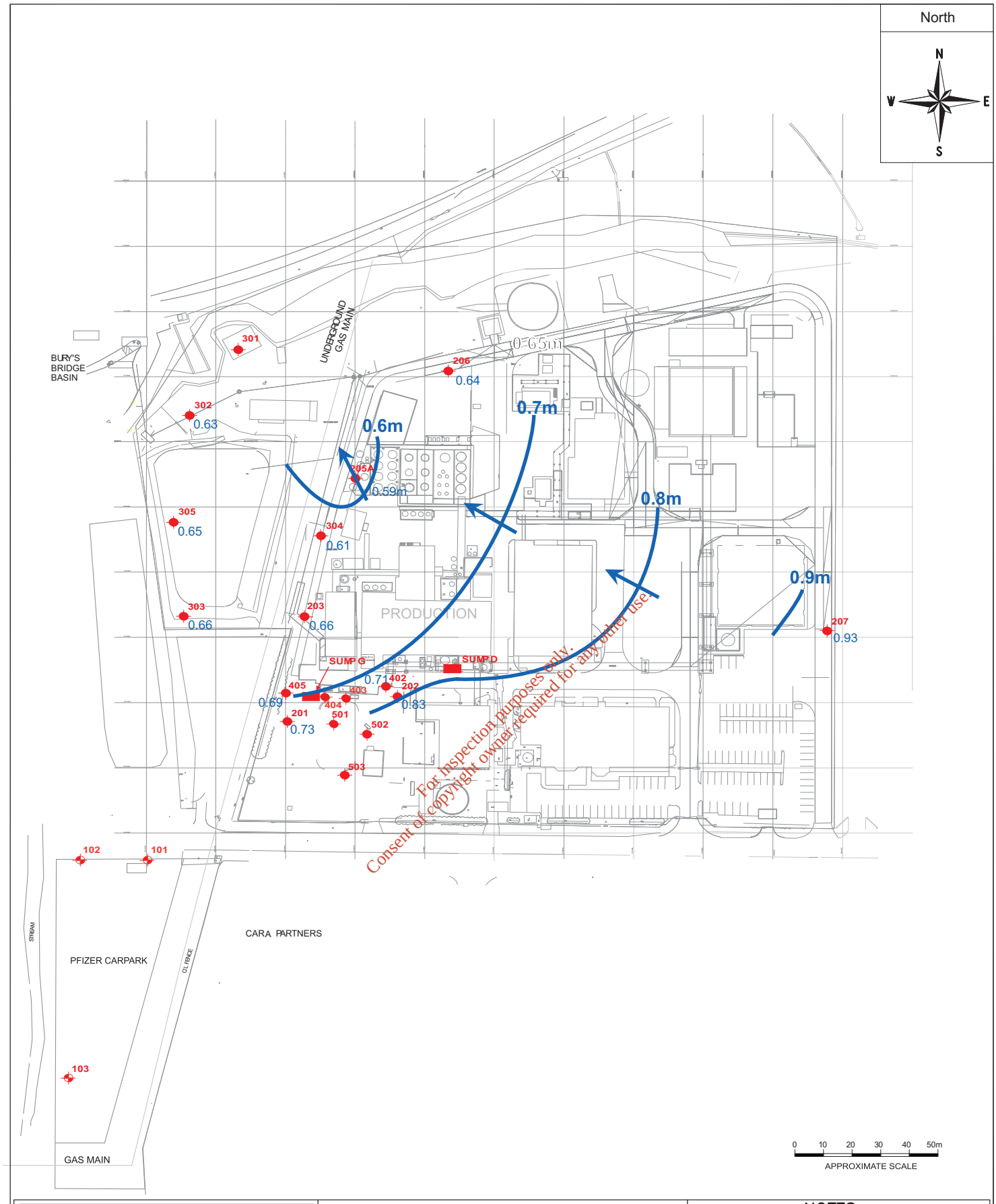
SCALE	Job No.	REV.
AS SHOWN	49342237	A

NOTES

Key

103 GROUNDWATER MONITORING WELL

103 DESTROYED GROUNDWATER MONITORING WELL



CLIENT
PFIZER IRELAND PHARMACEUTICALS

PROJECT LOCATION
LITTLE ISLAND, CORK

DRAWING TITLE
FIGURE 2 - PIEZOMETRIC SURFACE CONTOUR MAP FOR GRAVEL AQUIFER (20 APRIL 2010)

ENVIRONMENTAL CONSULTANTS
URS
EURO BUSINESS PARK, LITTLE ISLAND, CORK
TEL +353 21 4520450 FAX +353 21 4520484

DRAWN	TRACED	CHECKED	APPROVED	DATE
FO'R		EO'H	EO'H/COR	30.04.10

SCALE	Job No.	REV.
AS SHOWN	49342237	A

NOTES

Key

- 103 GROUNDWATER MONITORING WELL
- 103 DESTROYED GROUNDWATER MONITORING WELL
- GROUNDWATER FLOW CONTOURS
- GROUNDWATER FLOW DIRECTION

Figure 3: Historical Toluene and MTBE Concentration Trend Data for Well 201

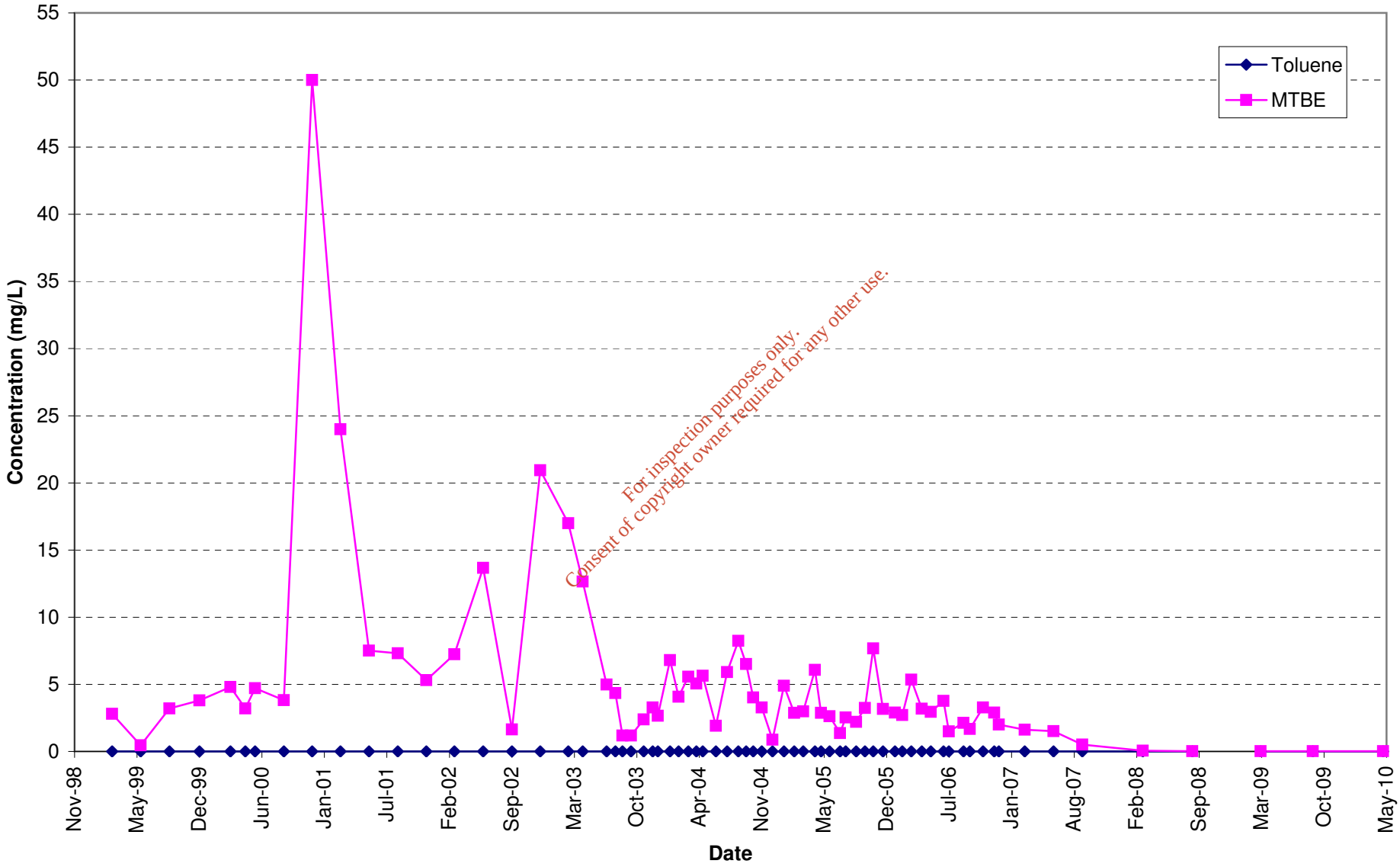


Figure 4: Historical Toluene and MTBE Concentration Trend Data for Well 202

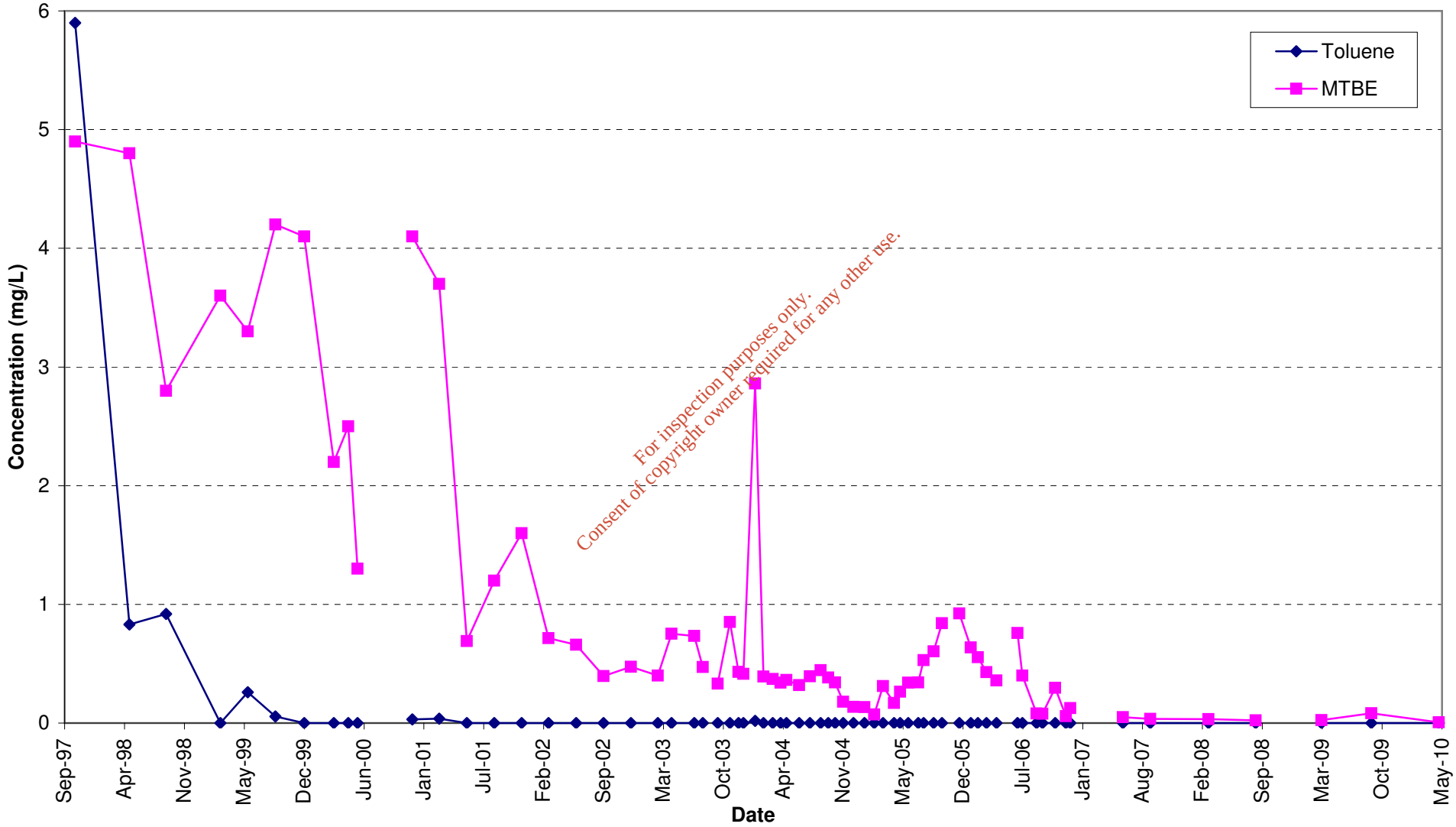


Figure 5: Historical Toluene and MTBE Concentration Trend Data for Well 203

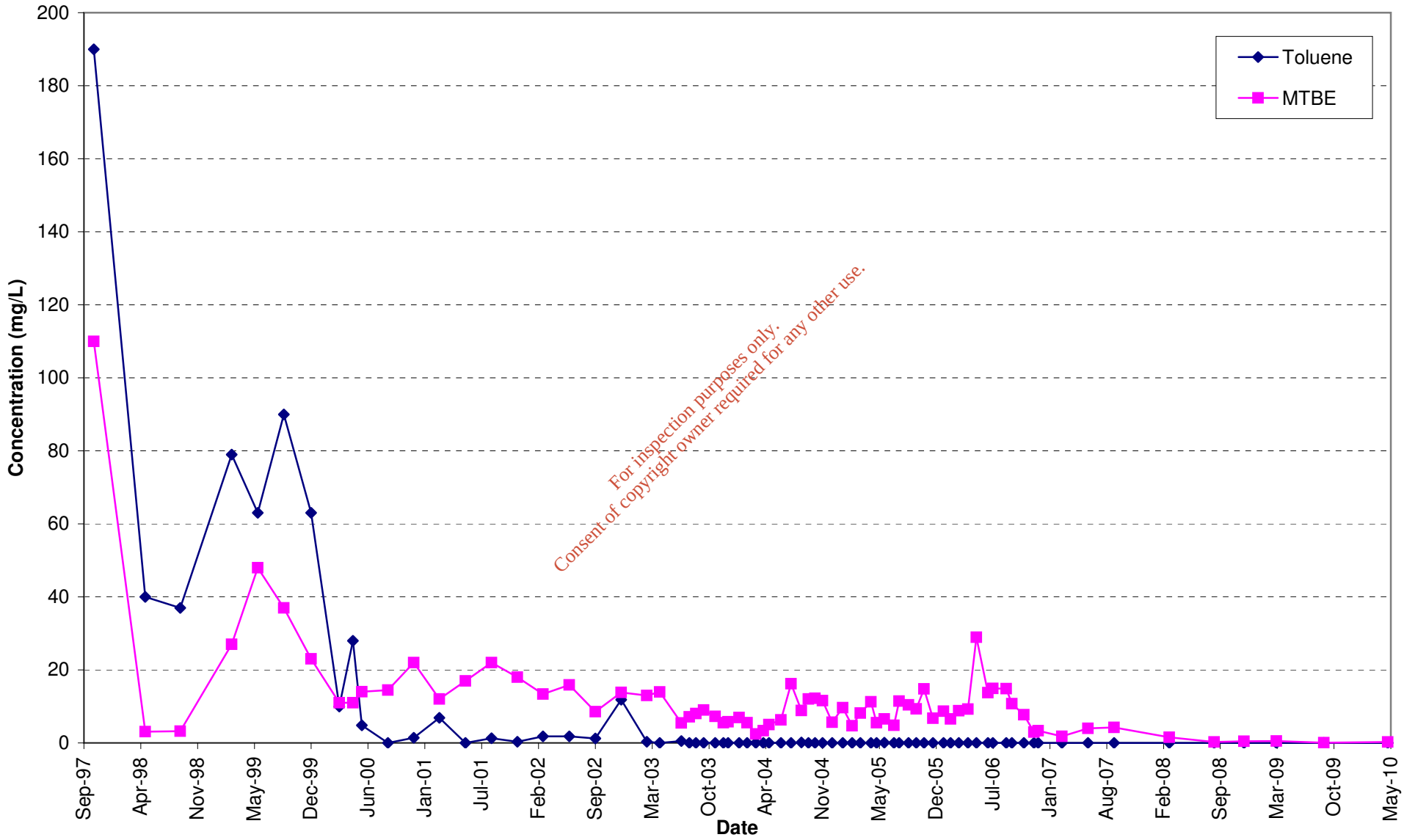


Figure 6: Historical Toluene and MTBE Concentration Trend Data for Well 205A

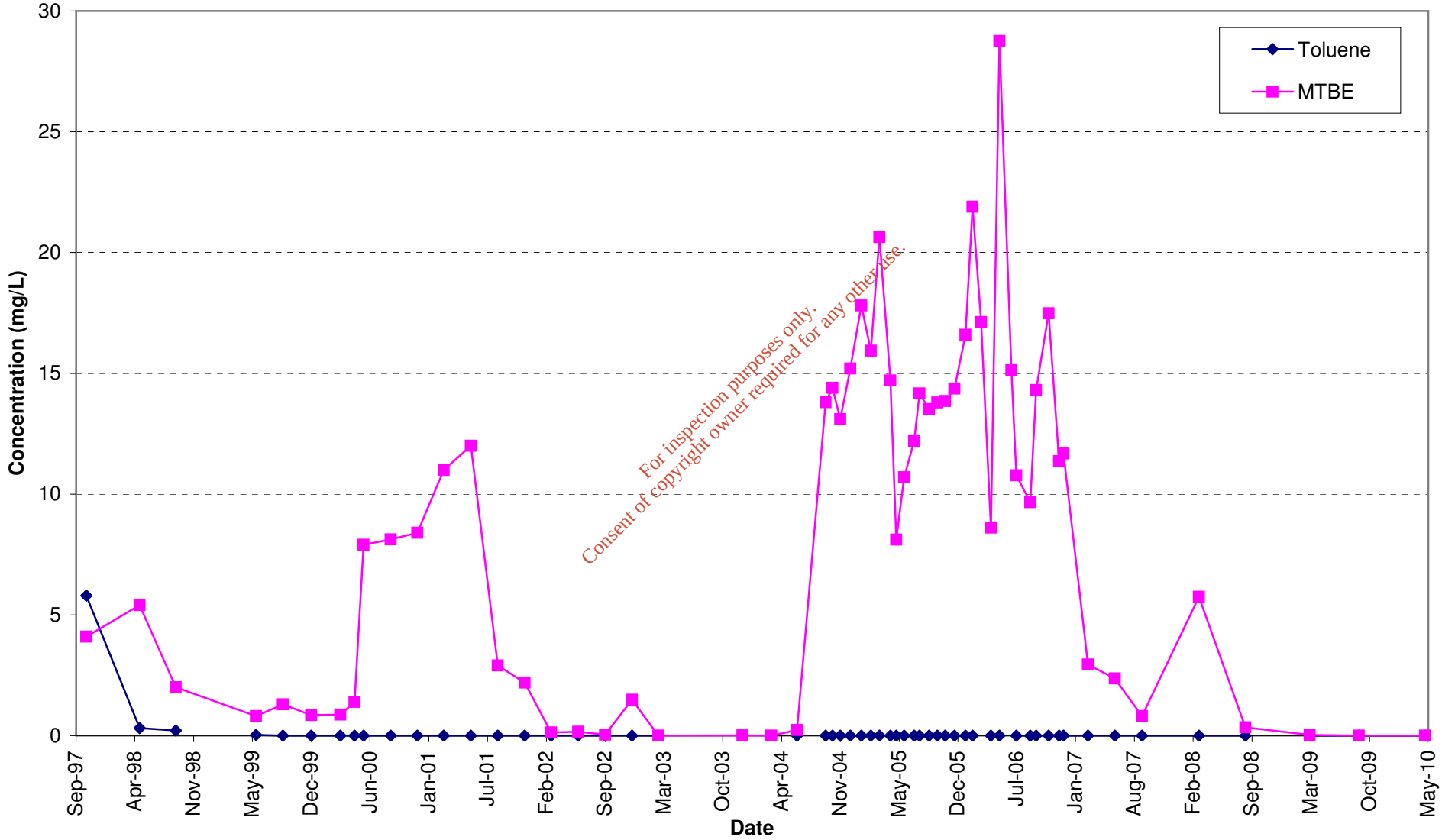


Figure 7: Historical Toluene and MTBE Concentration Trend Data for Well 301

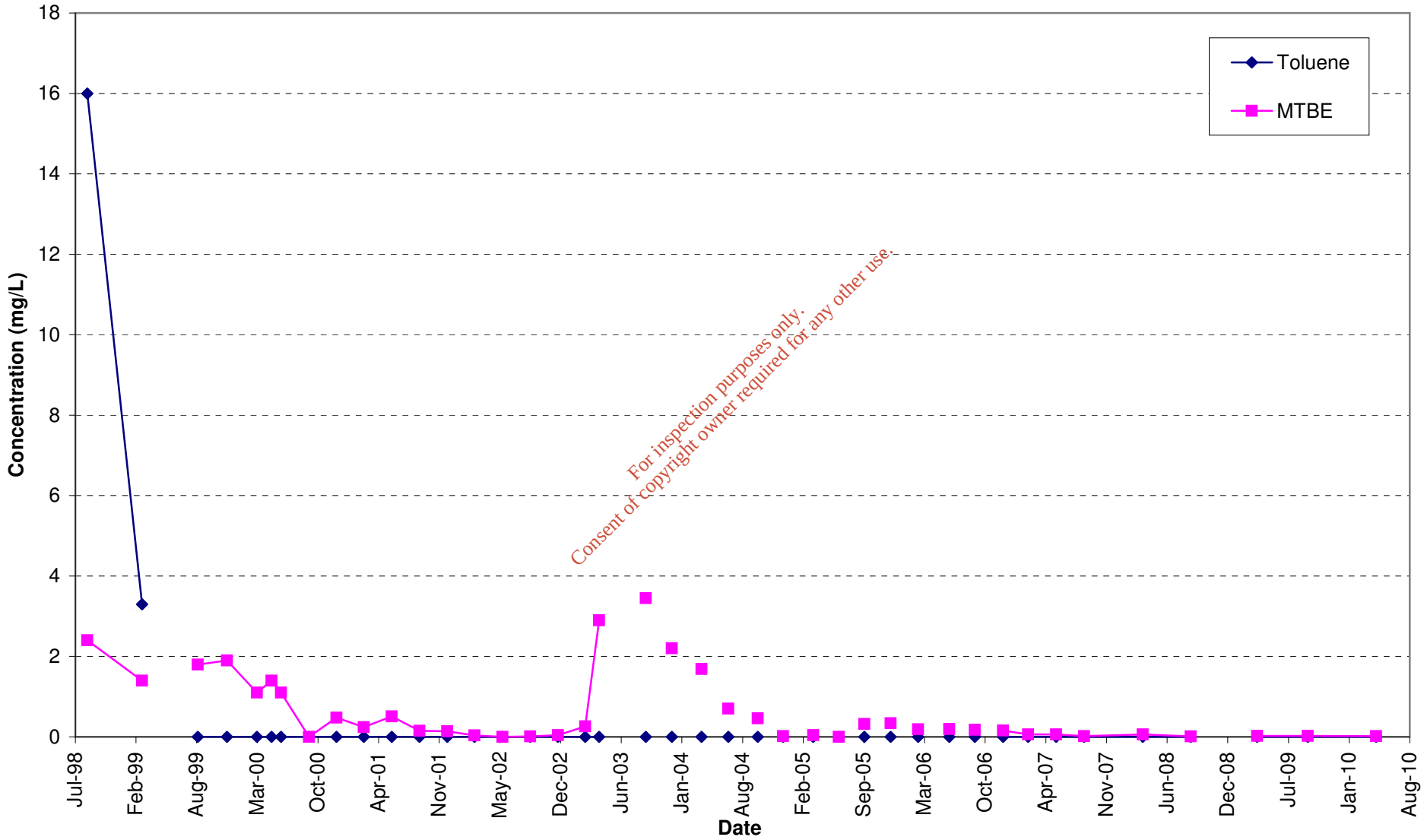


Figure 8: Historical Toluene and MTBE Concentration Trend Data for Well 302

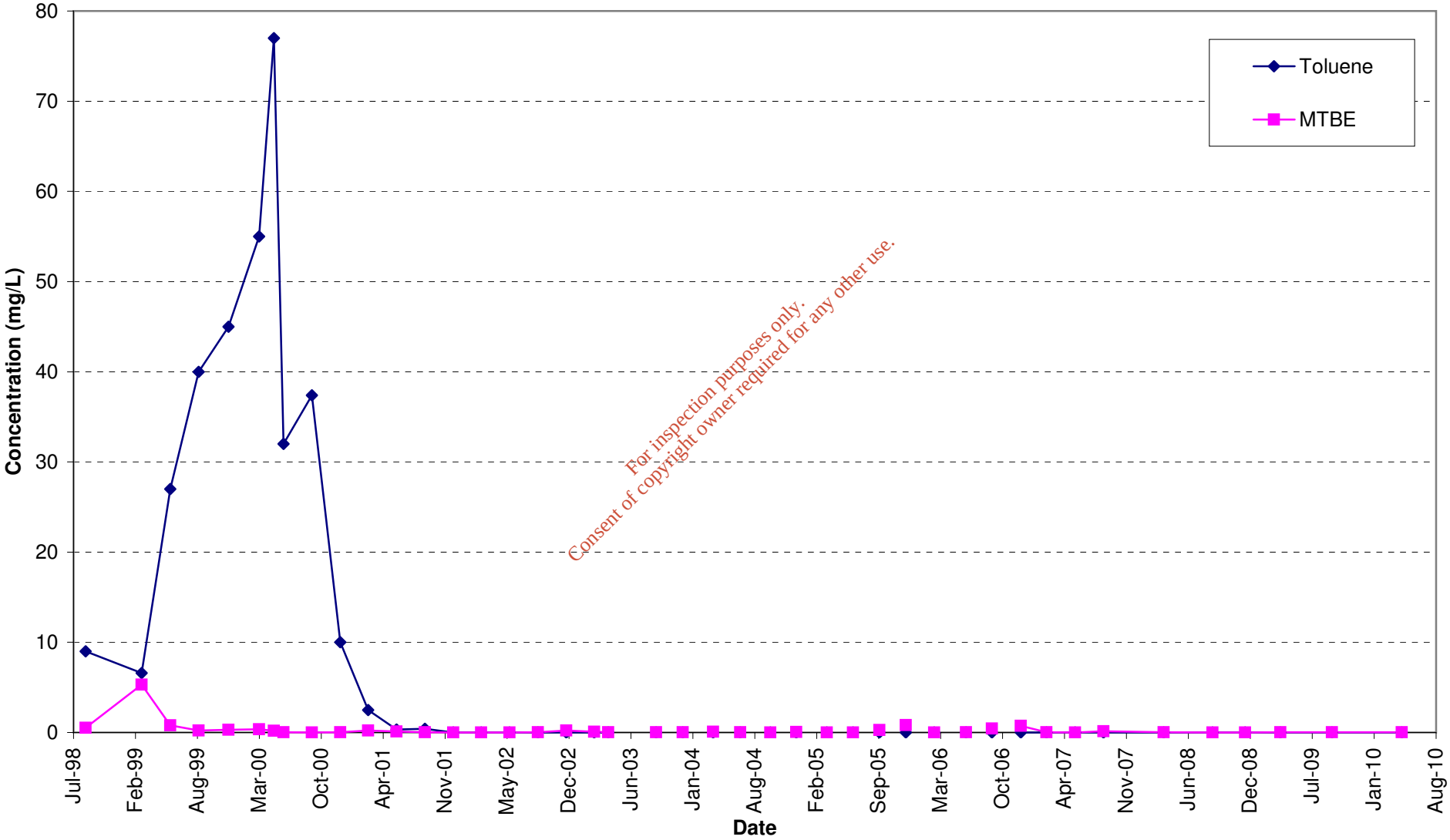


Figure 9: Historical Toluene and MTBE Concentration Trend Data for Well 304

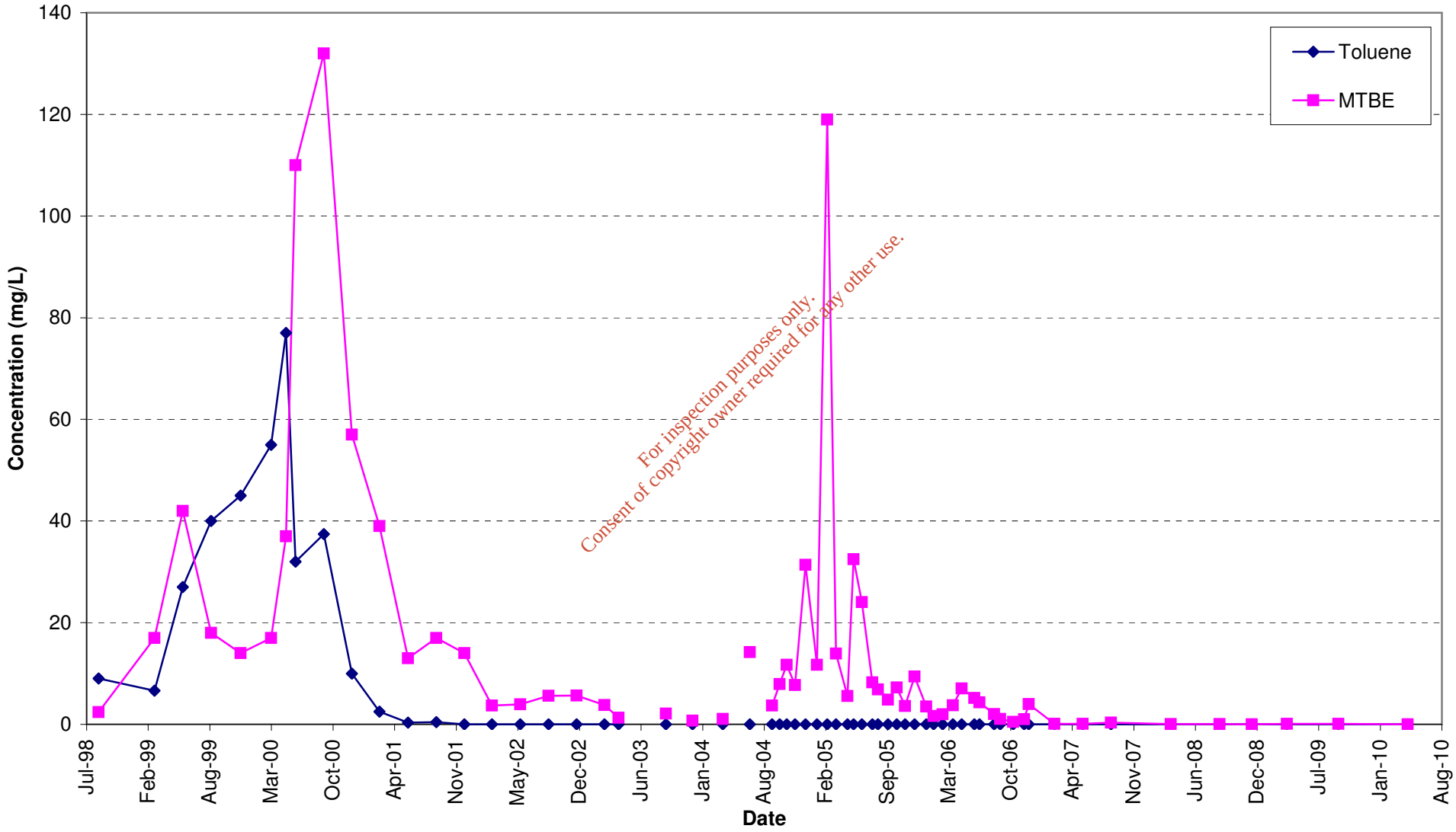


Figure 10: Historical Toluene and MTBE Concentration Trend Data for Well 402

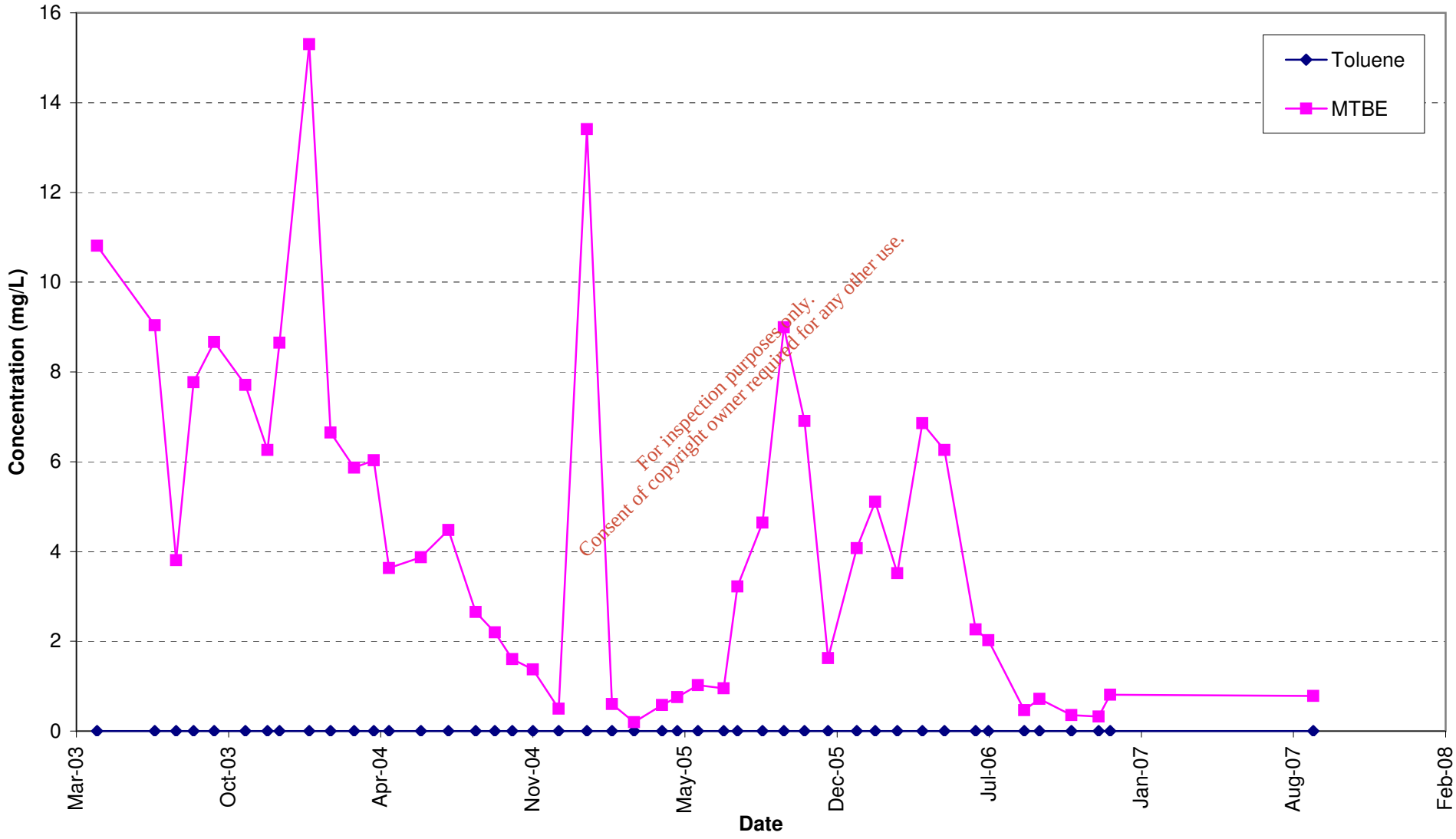


Figure 11: Historical Toluene and MTBE Concentration Trend Data for Well 403

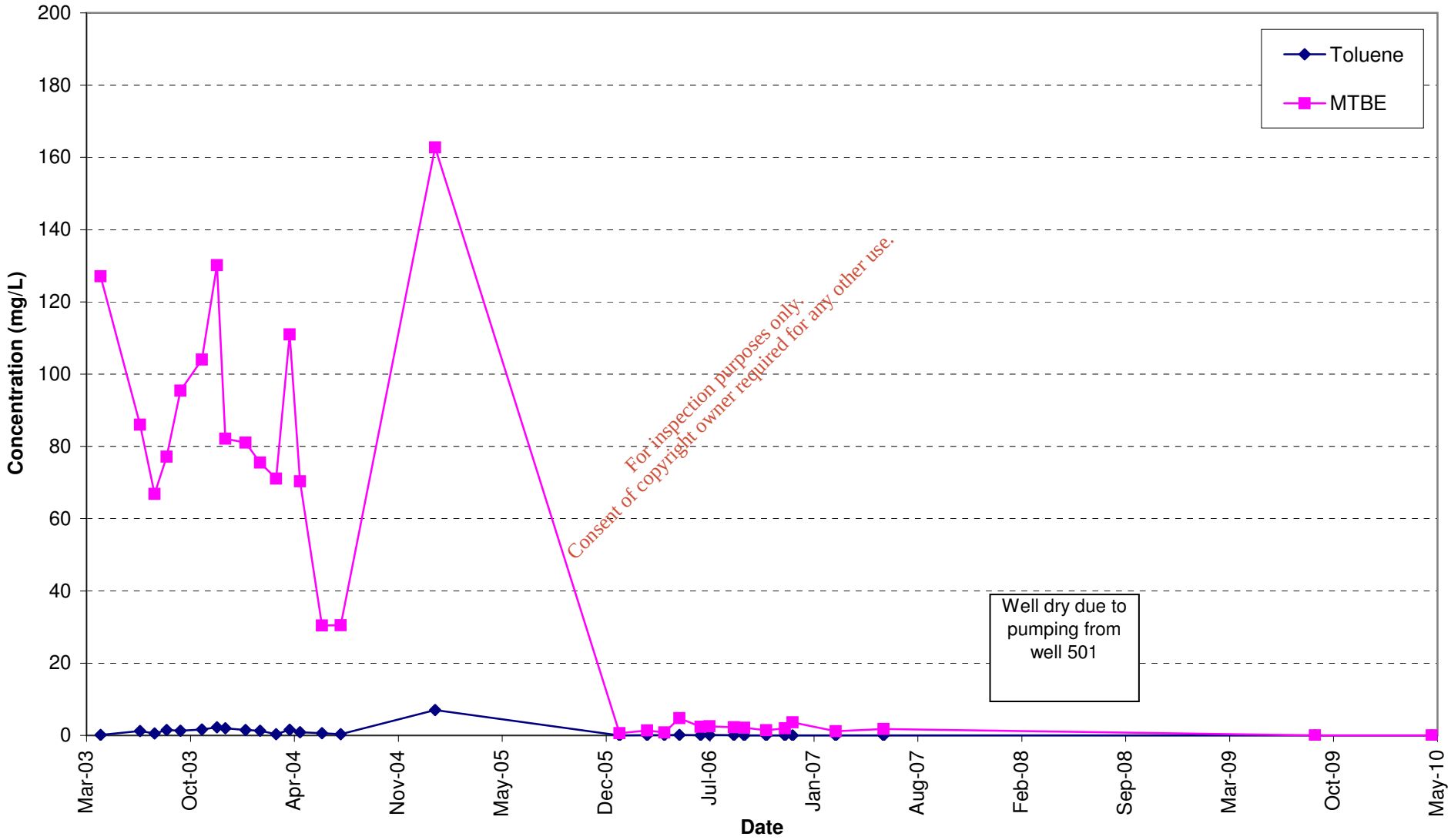


Figure 12: Historical Toluene and MTBE Concentration Trend Data for Well 404

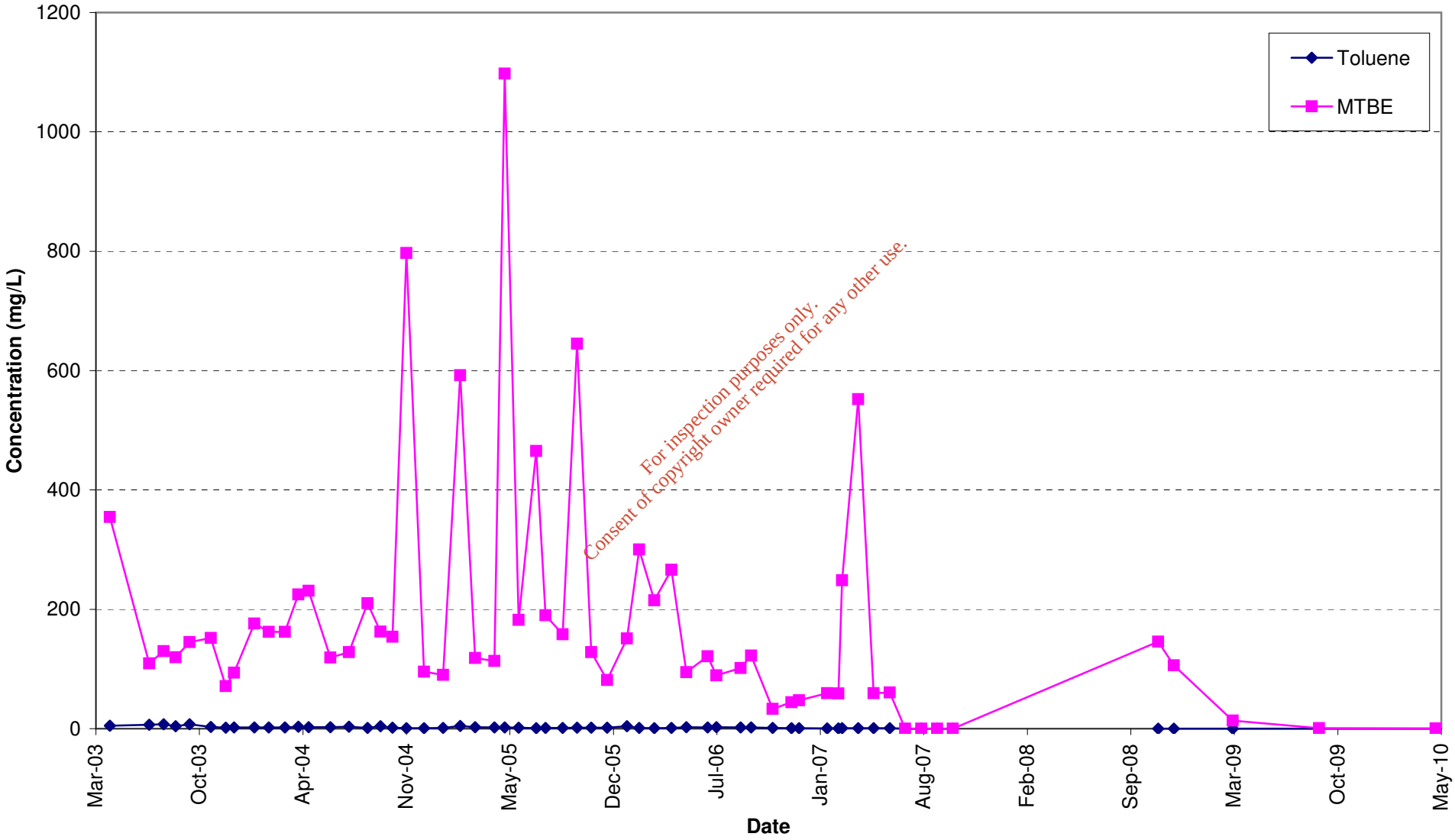


Figure 13: Historical Toluene and MTBE Concentration Trend Data for Well 405

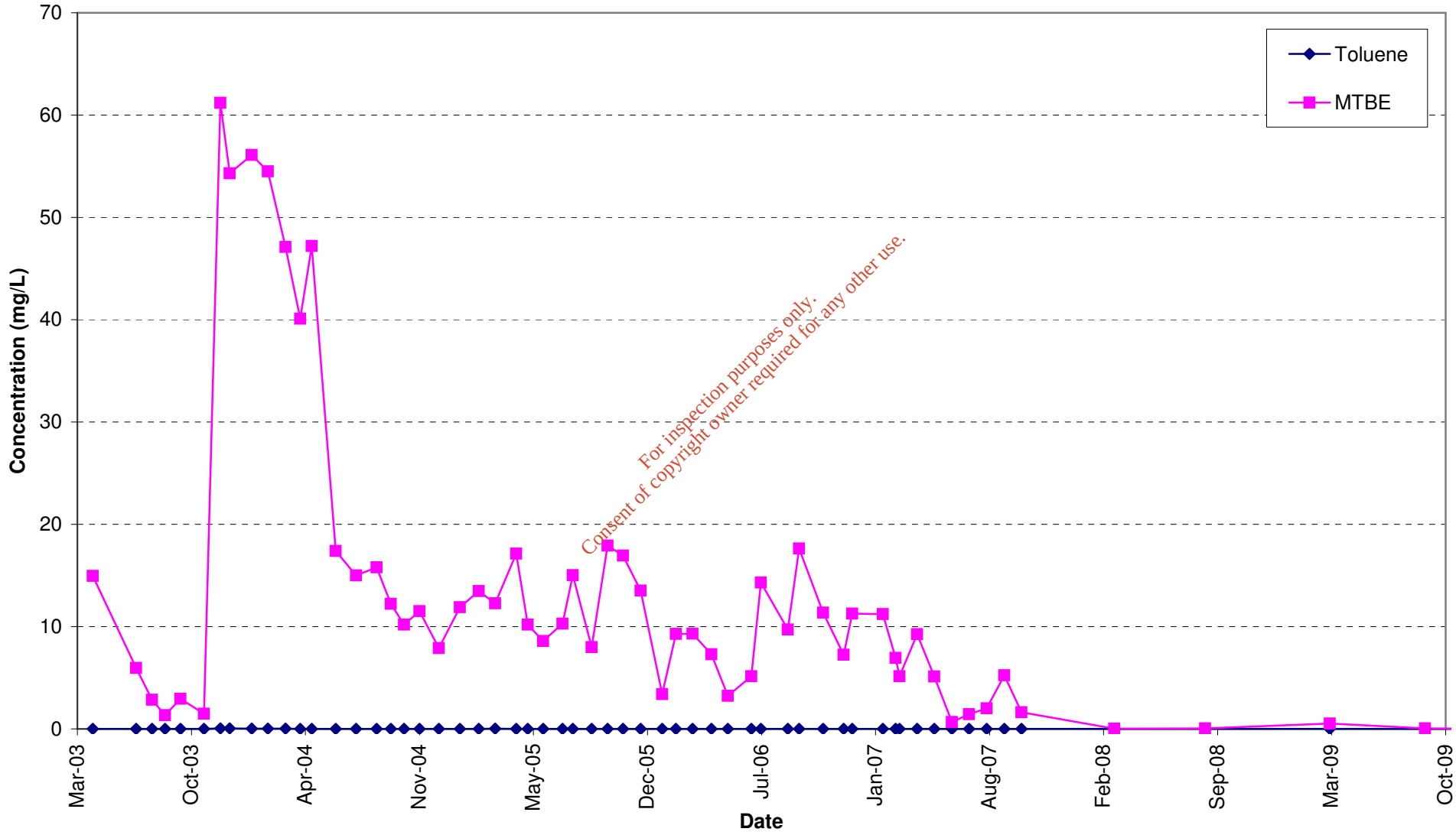


Figure 14: Historical Toluene and MTBE Concentration Trend Data for Well 501

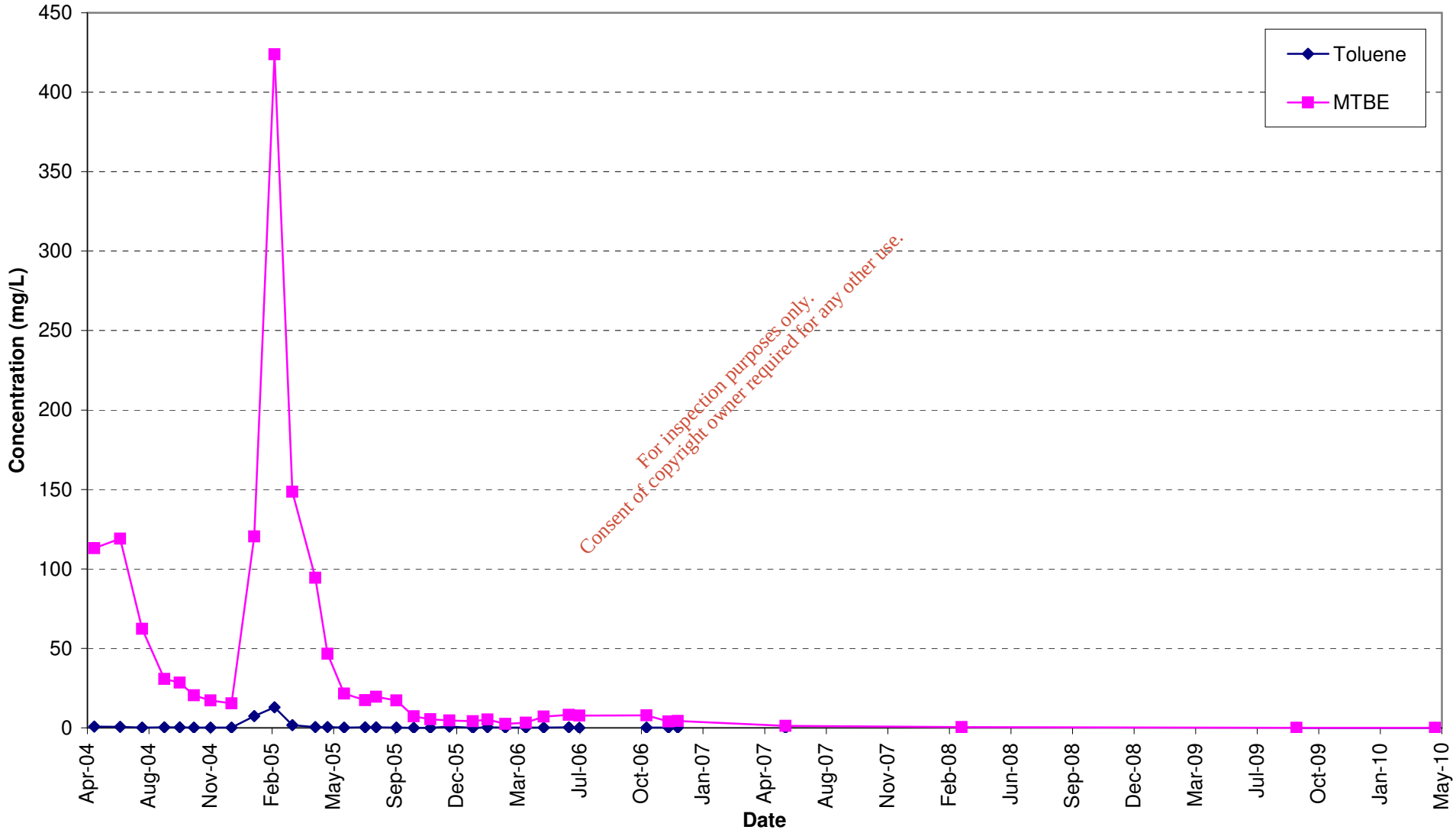


Figure 15: Historical Toluene and MTBE Concentration Trend Data for Well 502

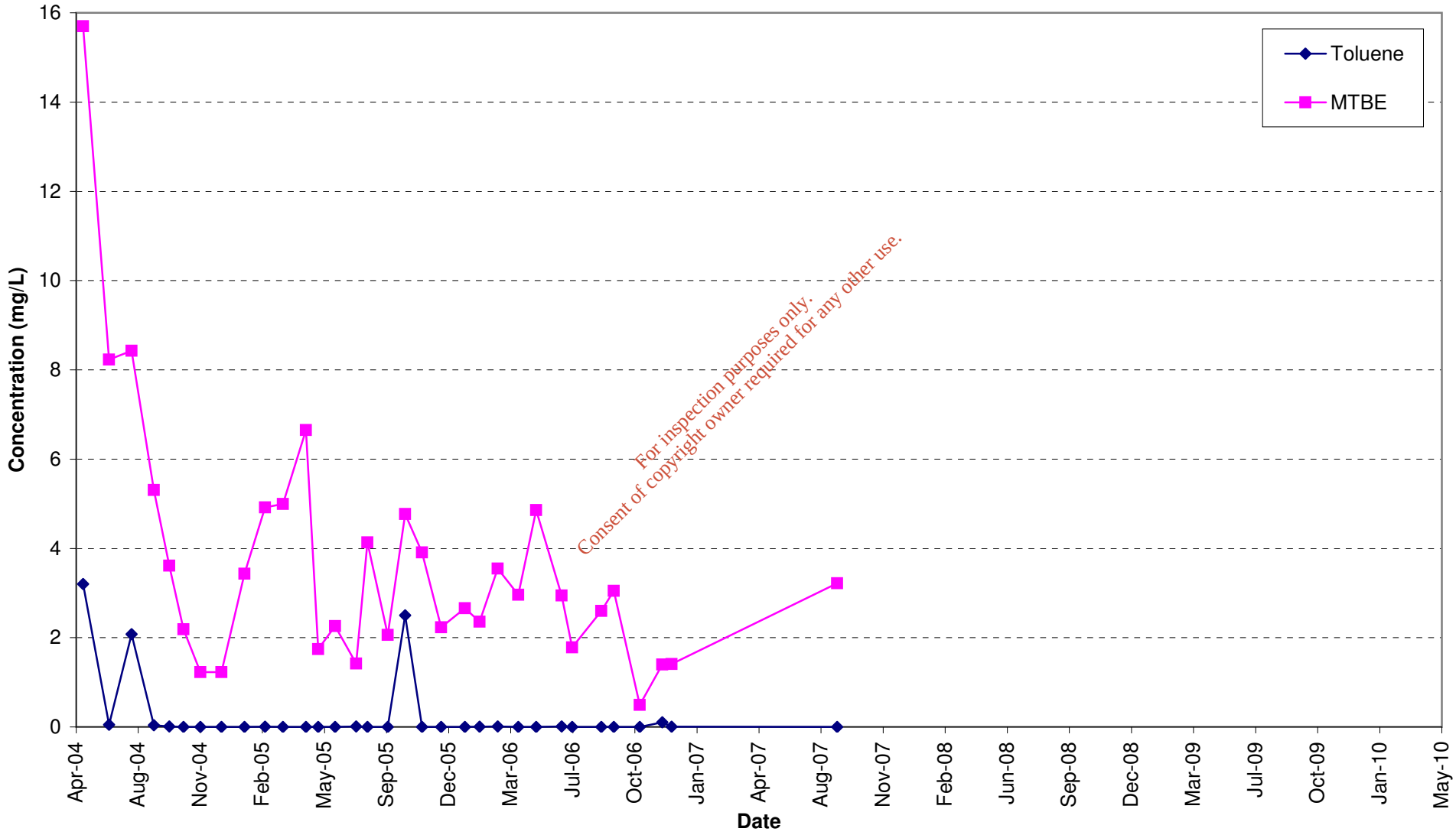
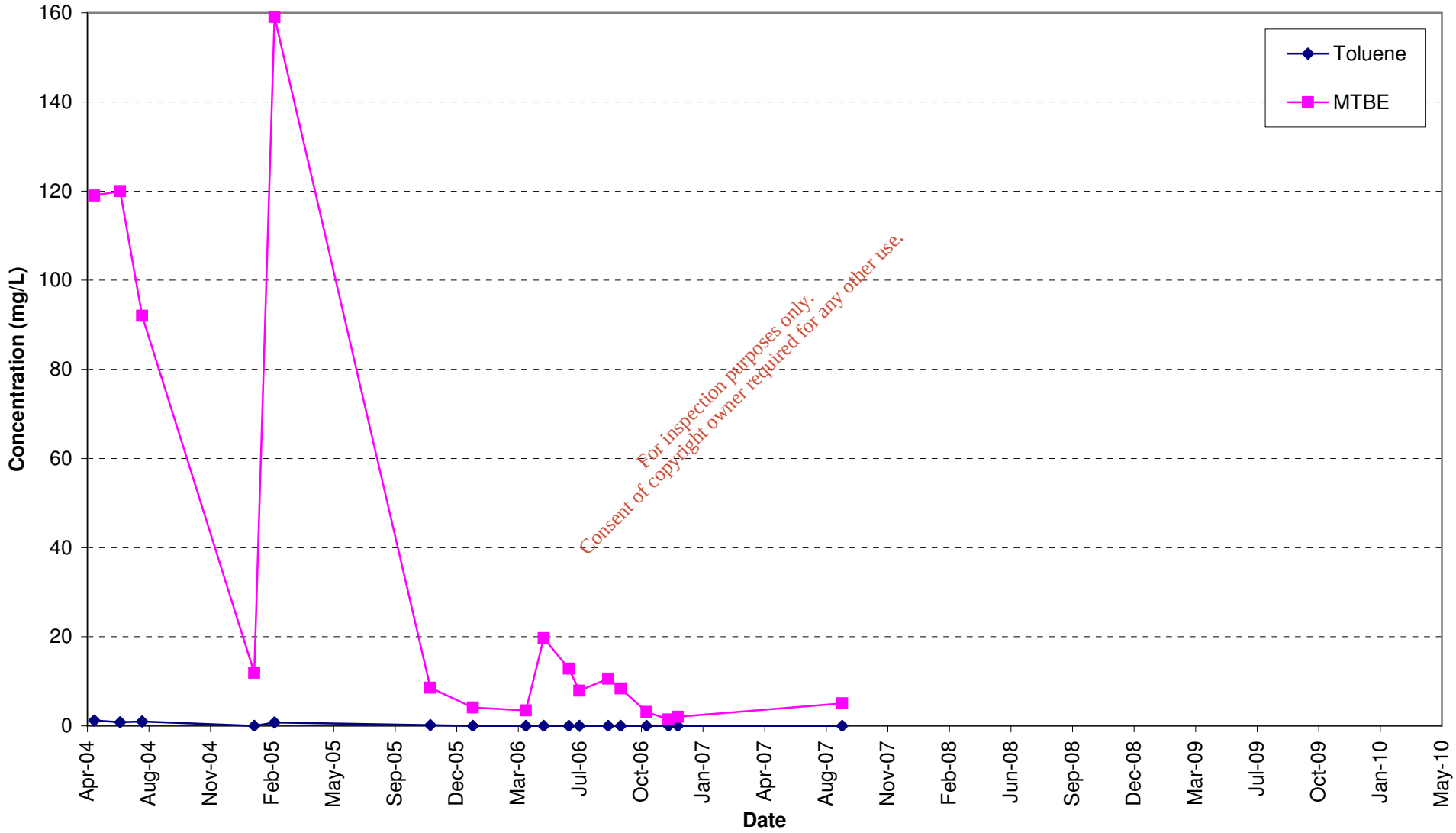


Figure 16: Historical Toluene and MTBE Concentration Trend Data for Well 503



Tables

Table 1 - Sample Inventory, Pfizer Little Island
April 2010

Monitoring Well ID	Screen Interval (m below top of well casing)	VOCs	SVOCs	Major Ions (Ca, K, Mg, Cl, SO_4, NO_3, Total Alkalinity)	pH	Temperature (^oC)	Dissolved Oxygen	Electrical Conductivity
201	4.5-10.0	X	X	X	X	X	X	X
202	6.0-10.0	X	X	X	X	X	X	X
203	4.5-10.0	X	X	X	X	X	X	X
QA/QC (Duplicate 203)	4.5-10.0	X	X	X	X	X	X	X
205A	3.4-7.4	X	X	X	X	X	X	X
206	7.0-13.0	X	X	X	X	X	X	X
207	10.5-13.5	X	X	X	X	X	X	X
301	6.0-10.0	X	X	X	X	X	X	X
302	2.0-7.0	X	X	X	X	X	X	X
303	3.2-6.2	X	X	X	X	X	X	X
304	2.9-6.9	X	X	X	X	X	X	X
305	2.6-6.9	X	X	X	X	X	X	X
403	5.0-6.5	X	X	NA*	X	X	X	X
404	1.7-4.7	X	X	NA*	X	X	X	X
405	5.1-6.1	X	X	NA*	X	X	X	X
501	2.1-4.1	X	X	NA*	X	X	X	X

Notes:
VOCs :Volatile Organic Compounds
SVOCs: Semi Volatile Organic Compounds
K: Potassium Ca: Calcium
Cl: Chloride Mg: Magnesium
NO_3: Nitrate SO_4 : Sulphate
^oC: Degrees Celsius
NA*: Analysis not required

Table 2 - Volatile Organic Compound Results (mg/L), Pfizer Little Island, April 2010

VOC	EPA Draft Interim Guideline Values	Dutch Intervention Value	Guideline Threshold Value	Monitoring Well ID															
				201	202	203	QA/QC	205A	206	207	301	302	303	304	305	403	404	405	501
				Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10
Dichlorodifluoromethane	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chloromethane	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Chloroethane	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromomethane	----	----	----	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethene	0.030 [1]	0.010	----	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Dichloromethane	0.010	1	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethane	----	0.9	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
cis-1,2-Dichloroethene	0.030 [1]	0.020*	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
2,2-Dichloropropane	----	0.080**	----	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform	0.012	0.400	0.075 [B]	<0.003	<0.003	<0.003	<0.003	<0.003	0.01	0.008	<0.003	<0.003	<0.003	<0.003	<0.003	**0.02**	0.008	<0.003	<0.003
Bromochloromethane	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1-Trichloroethane	0.500	0.300	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloropropene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dichloroethane	0.003	0.400	0.00225	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzene	0.001	0.030	0.00075	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dichloropropane	----	0.080**	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Trichloroethene	0.070, 0.01 [4]	0.500	0.0075 [A]	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromodichloromethane	----	----	0.075 [B]	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dibromomethane	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
cis-1,3-Dichloropropene	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Toluene	0.010	1	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
trans-1,3-Dichloropropene	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2-Trichloroethane	----	0.130	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Carbon tetrachloride	0.020	0.01	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vinyl Chloride	----	0.005	0.000375	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,3-Dichloropropane	----	0.080**	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tetrachloroethene	0.01, 0.04 [2]	0.04	0.0075 [A]	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dibromochloromethane	----	----	0.075 [B]	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromoethane	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chlorobenzene	0.001	0.18	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethylbenzene	0.010	0.15	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
p/m-Xylene	0.01 [5]	0.070*****	----	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
o-Xylene	0.010 [5]	0.070*****	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Styrene	----	0.300	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Bromoform	----	0.630	0.075 [B]	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,2-Dichloroethene	0.03 [1]	0.020*	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Isopropylbenzene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1,2,2-Tetrachloroethane	----	----	----	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
1,2,3-Trichloropropane	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
n-Propylbenzene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromobenzene	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Chlorotoluene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3,5-Trimethylbenzene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
4-Chlorotoluene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
tert-Buylbenzene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2,4-Trimethylbenzene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
sec-Butylbenzene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
p-Isopropyltoluene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3-Dichlorobenzene	----	0.050***	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,4-Dichlorobenzene	----	0.050***	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
n-Butylbenzene	----	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dichlorobenzene	0.01	0.050***	----	<0.003	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dibromo-3-chloropropa	----	----	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,4-Trichlorobenzene	0.0004 [3]	0.010***	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Hexachlorobutadiene	0.0001	----	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Naphthalene	0.001	0.070	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,3-Trichlorobenzene	0.0004 [3]	0.010***	----	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
MTBE	0.03	9.20	----	0.018	0.006	**0.256**	**0.174**	<0.002	<0.002	<0.002	0.018	**0.04**	<0.002	0.005	<0.002	0.015	**0.572**	0.005	0.003

Notes:

Shaded Indicates Result is above Dutch Intervention Value (DIV)

BOLD Indicates Result is above Interim Guideline value (IGV)

A: Guideline Threshold Value is for the sum of tetrachloroethene and trichloroethene.

B: Guideline Threshold Value is for the sum of ttrihalomethanes.

* DIV is for both cis and trans 1,2-

** DIV is for the sum of dichloropropanes.

*** DIV is for the sum of all dichlorobenzenes.

**** DIV is for the sum of all trichlorobenezenes.

***** DIV is for the sum of all xylenes.

1: The draft IGV is given for dichloroethene, it is assumed that this applies to the sum of all dichlororethenes.

2: Two draft IGVs are given for tetrachloroethene.

3: Draft IGV is for the sum of trichlorobenzenes.

4: Two draft IGVs are given for trichloroethene.

5: Draft IGV is for the sum of xylenes.

Table 3 - Semi Volatile Organic Compound Results (µg/L), Pfizer Little Island
April 2010

SVOC	EPA Draft Interim Guideline Values	Dutch Intervention Value	Guideline Threshold Value	Monitoring Well ID															
				201	202	203	QC	205A	206	207	301	302	303	304	305	403	404	405	501
				Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10
Phenols																			
2-Chlorophenol	0.2	0.1	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylphenol	0.0005 [1]	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Nitrophenol	0.0005 [1]	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4-Dichlorophenol	0.0005 [1]	0.03	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4-Dimethylphenol	0.0005 [1]	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4,6-Trichlorophenol	0.2	sum(0.01) **	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4,5-Trichlorophenol	0.0005 [1]		----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Chloro-3-MethylPhenol	0.0005 [1]	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Methylphenol	0.0005 [1]	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Nitrophenol	0.0005 [1]	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.002	0.003	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenol	0.0005 [1]	0.2	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAHs																			
2-Chloronaphthalene	----	0.006		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	----	----		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	0.001	0.07		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	----	----		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	----	----		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	----	----		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	----	0.005	0.000075 [A]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	10	0.005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	0.001	0.001		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	----	----		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	----	0.0005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	----	0.0002		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(bk)fluoranthene	0.00005	0.00005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.00001	0.00005	0.0000075	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	0.00005	0.00005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	----	----	0.000075 [A]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)perylene	0.00005	0.00005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phthalates																			
bis(2-ethylhexyl)phthalate	0.008	0.005 ***	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Butyl benzyl phthalate	0.005 [2]	0.005 ***	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
di-n-Butyl phthalate	0.002	0.005 ***	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
di-n-octyl phthalate	0.005 [2]	0.005 ***	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diethyl phthalate	0.005 [2]	0.005 ***	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dimethyl phthalate	0.005 [2]	0.005 ***	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Other SVOCs																			
1,2 Dichlorobenzene	0.01	Sum(0.05) *	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2,4-Trichlorobenzene	0.0004	0.01	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3 Dichlorobenzene	----	Sum(0.05) *	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4 Dichlorobenzene	----		----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Nitroaniline	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4-Dinitrotoluene	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,6-Dinitrotoluene	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
3-Nitroaniline	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl phenyl ethe	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Chloroaniline	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Chlorophenyl phenylethe	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Nitroaniline	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Azobenzene	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
bis(2-chloroethoxy)methan	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bis(2-chloroethyl) ether	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbazole	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzofuran	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	0.00003	0.0005	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.0001	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadine	0.0001	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachloroethane	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Isophorone	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-nitrosodi-n-propylamine	----	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrobenzene	0.01	----	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Notes:

Shaded	Indicates Result is above DIV
BOLD	Indicates Result is above IGV
1	Draft IGV is for the sum of phenols
2	Draft IGV is for the sum of phthalates
*	DIV is for the sum of dichlorobenzenes
**	DIV is for the sum of all trichlorophenols
***	DIV is for the sum of all phthalates
A	GTV is for the sum of total PAHs

Table 4 - Major Ion Concentrations (mg/L), Pfizer Little Island
April 2010

Parameter	Method Detection Limit	Interim Guideline Value	Guideline Threshold Value	Monitoring Well											
				201	202	203	QC	205A	206	207	301	302	303	304	305
				Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10	Apr-10
Calcium	0.2	200	----	93.1	58.0	51.1	49.0	31.9	67.9	101.3	58.8	48.5	70.3	26.1	58.6
Magnesium	0.1	50	----	20.0	11.5	9.6	9.5	2.7	19.9	35.9	10.0	5.5	15.8	2.8	5.1
Chloride	0.3	30.0	24 - 187.5	54.6	74.9	94.2	97.9	40.0	67.5	86.4	29.3	38.8	32.2	26.2	15.2
Nitrate (as NO_3)	0.2	25.0	37.5	0.28	0.47	0.79	0.46	0.24	4.54	5.49	4.25	0.31	3.03	0.37	5.41
Sulphate (Soluble)	0.05	200	187.5	2.48	96.12	6.16	6.49	24.99	111.05	274.76	92.58	10.52	12.96	21.62	15.94
Potassium	0.1	5	----	6.2	2.8	5.2	5.1	1.2	4.3	6.5	2.5	3.2	5.1	3.4	0.9
Sodium	0.1	150	150	38.5	72.0	51.9	50.5	23.0	37.8	71.9	27.0	21.9	23.0	20.1	13.2
Total Alkalinity (as $CaCO_3$)	1	----	----	235	118	172	179	55	101	119	98	133	201	63	148

Notes:
1. "-" indicates the result was not detected above the method detection limit. (MDL)

Table 5 - Groundwater Level Data, Pfizer Little Island, 21 April 2010

Monitoring Well	Top of Well Casing m AOD	SWL mbct	SWL m AOD	Description
201	5.341	4.61	0.73	Clear water, hydrogen sulphide odour.
202	6.115	5.29	0.83	Clear water, no odour.
203	7.155	6.50	0.66	Clear water, slight hydrogen sulphide odour.
205A	6.649	6.06	0.59	Cloudy, brown/red water, no odour.
206	6.953	6.31	0.64	Clear water, no odour.
207	6.774	5.84	0.93	Cloudy, grey water, no odour.
301	Standpipe cut	6.50		Slightly cloudy, brown water, no odour.
302	4.006	3.38	0.63	Cloudy brown water, hydrogen sulphide odour.
303	4.190	3.54	0.66	Cloudy brown water, no odour.
304	6.535	5.92	0.61	Cloudy, grey/black water, no odour.
305	4.395	3.75	0.65	Cloudy, brown water, no odour.
402	6.001	5.29	0.71	NA
403	5.453	2.65	2.80	Cloudy, brown water, no odour.
404	5.628	2.54	3.09	Cloudy, brown water, no odour.
405	5.856	5.17	0.69	Cloudy, brown water, no odour.
501	5.584	2.84	2.74	Cloudy, brown water, no odour.

Notes:

m aOD: metres above Ordnance Datum
SWL: Static Water Level
mbct: metres below casing top
NM: Not Measured
NA: Analysis not required

Table 6 - Field Measurements, Pfizer Little Island
April 2010

Monitoring Well	pH	EC (µS/cm)	Eh (mV)	DO (mg/L)	Temperature (°C)
201	8.29	615	48	0.89	11.1
202	7.39	623	79	0.00	12.1
203	7.42	675	70	0.96	12.4
205A	7.07	324	172	0.00	12.3
206	7.42	488	197	1.10	12.2
207	7.62	887	280	2.42	12.1
301	6.55	455	229	0.60	12.0
302	6.93	380	42	0.00	10.7
303	7.21	635	287	3.29	10.8
304	7.30	300	103	0.00	12.9
305	7.40	253	314	2.26	10.6
403	7.21	390	252	3.20	10.2
404	7.12	481	192	0.35	10.3
405	8.13	203	128	3.20	11.5
501	8.01	338	258	4.89	10.0

Notes:

EC: Electrical Conductivity
µs/cm: Microsiemens per centimetre
Eh: Redox Potential
mV: Millivolts

DO: Dissolved Oxygen
mg/L: Milligrams per Litre
°C: Degrees Celsius

Redox potential readings compensated by adding 200 mV to field readings as recommended by instrument manufacturer

Table 7 - Key Contaminant Concentration Trends in Monitored Wells (mg/L), Pfizer Little Island, to April 2010

Quarterly Monitored Wells

Well / VOC	DIV	Monitoring Round																					
		Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Mar-07	Jun-07	Sep-07	Mar-08	Aug-08	Dec-08	Mar-09	Sep-09	Apr-10
201																						
MTBE	**9.200**	2.899	2.705	5.341	3.176	2.950	3.757	1.496	2.122	1.680	3.263	2.892	2.004	1.613	1.500	0.504	0.061	0.024		0.017	0.013	0.018
Toluene	**1.000**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
202																						
MTBE	**9.200**	0.637	0.555	0.428	0.359		0.758	0.399	0.081	0.078	0.296	0.058	0.125		0.050	0.036	0.034	0.022		0.024	0.083	0.006
Toluene	**1.000**	-	-	-	-		-	-	-	-	-	-	-		-	-	-	-		-	-	-
203																						
MTBE	**9.200**	8.666	6.574	8.812	9.285	28.963	13.733	14.939	14.847	10.708	7.716	2.949	3.360	1.780	4.018	4.239	1.540	0.259	0.420	0.504	0.064	0.256
Toluene	**1.000**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-
205A																						
MTBE	**9.200**	16.590	21.894	17.117	8.615	28.751	15.128	10.771	9.658	14.304	17.484	11.366	11.673	2.943	2.364	0.809	5.750	0.345		0.026	0.002	-
Toluene	**1.000**	-	-		-	-		-	-	-	-	-	-	-	-	-	-	-		-	-	-
301																						
MTBE	**9.200**			0.190			0.192			0.175			0.159	0.060	0.063	0.020	0.063	0.010		0.026	0.022	0.018
Toluene	**1.000**			-			-			-			-	-	-	-	-	-		-	-	-
302																						
MTBE	**9.200**			-			0.029			0.432			0.748	0.040	-	0.128	0.023	0.003	0.003	0.028	0.014	0.040
Toluene	**1.000**			-			-			-			-	-	-	-	-	-	-	-	-	-
304																						
MTBE	**9.200**	3.520	1.639	1.968	3.746	7.062	5.162	4.330	1.993	1.078	0.482	0.993	3.983	0.094	0.096	0.330	0.041	0.030	0.023	0.095	0.084	0.005
Toluene	**1.000**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
402																						
MTBE	**9.200**	4.074	5.105	3.515	6.859	6.261	2.264	2.021	0.465	0.719	0.355	0.321	0.810			0.780						
Toluene	**1.000**	-	-	-	-	-	-	-	-	-	-	-	-			-						
403																						
MTBE	**9.200**	0.609		1.387	0.797	4.756	2.361	2.505	2.282	2.084	1.422	1.959	3.626	1.180	1.750						0.004	0.015
Toluene	**1.000**	-		0.054	0.054	0.159	0.092	0.114	0.100	0.012	-	-	0.017	-	-						-	-
501																						
MTBE	**9.200**	4.188	5.282	2.421	3.210	7.038	8.199	7.685			7.842	3.961	4.271		1.160		0.405				0.003	0.003
Toluene	**1.000**	-	0.314	0.104	0.175	0.187	0.298	-			0.135	0.163	0.117		0.010		-				-	-
502																						
MTBE	**9.200**	2.662	2.357	3.546	2.960	4.859	2.947	1.784	2.597	3.046	0.494	1.399	1.409			3.220						
Toluene	**1.000**	-	0.003	0.013	-	-	0.013	-	-	-	-	0.106	0.006			-						
503																						
MTBE	**9.200**	4.134			3.448	19.703	12.826	7.904	10.591	8.370	3.151	1.415	2.003			5.070						
Toluene	**1.000**	-			-	0.018	-	-	-	-	-	-	-			-						

Monthly Monitored Wells

Well / VOC	DIV	Monitoring Round																														
		Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Mar-08	Aug-08	Nov-08	Dec-08	Mar-09	Sep-09	Apr-10
404																														
MTBE	**9.200**	151.134	300.331	215.152	266.348	94.568	121.246	89.438	101.665	122.429	33.189	44.373	47.582	59.412	58.894	248.600	552.181	59.329	60.457	-	0.082	0.035	0.005			146.000	106.000	13.600	0.824	0.572
Toluene	**1.000**	4.002	1.133	0.831	1.248	2.431	1.963	2.594	2.066	1.968	1.152	0.789	0.651	0.385	0.570	0.983	0.723	1.016	0.692	-	0.002	0.005	-			-	-	-	-	-
405																														
MTBE	**9.200**	3.406	9.284	9.310	7.305	3.221	5.132	14.296	9.706	17.620	11.372	7.239	11.268	11.228	6.943	5.150	9.269	5.111	0.667	1.426	2.002	5.250	1.617	0.015	0.057			0.519	0.038	0.005
Toluene	**1.000**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-

Notes:

Indicates well not sampled

Indicates result above DIV

- Indicates result below method reporting limit

-* Indicates sample not analysed due to matrix affects

CONTENTS

Pfizer, Little Island IPPC Licence Application

BAT Assessment

20 July 2010
Final

Issue No 2
49340732/

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Client Company Name:	Pfizer Ireland Pharmaceuticals
Issued By:	URS Ireland Iveagh Court 6-8 Harcourt Road Dublin 2 Ireland Tel: + 353 (0) 1 415 5100 Fax: + 353 (0) 1 415 5101 www.urseurope.com

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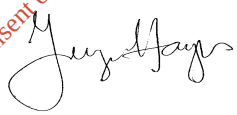
Checked & Approved by	Fergus Hayes		20/07/10	URS Ireland, Director

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CONTENTS

1. INTRODUCTION

Pfizer, Little Island was granted an IPPC Licence (Reg. No. P0136-03) by the Environmental Protection Agency (the Agency) for the manufacture of pesticides, pharmaceutical or veterinary products and their intermediates on 13th September 2007.

The 2007 Licence application was accompanied by a site-wide BAT Assessment with reference to the BAT Guidance Notes:

- *EPA Draft BAT Guidance Notes on Best Available Techniques for the Manufacture of Pesticides, Pharmaceutical and Veterinary Products, V8, September 2006.*
- *BREF Reference Document on Best Available Techniques for the Manufacture of Organic Fine Chemicals, August 2006.*

Since 2007, the EPA guidance note has been finalised (first edition August 2008) with no significant changes to the September 2006 draft version and the BREF document remains current. There has been no significant revision of the definition of BAT for the Sector since the list licence revision.

Consequently, the 2007 BAT Assessment remains valid for the site and this update deals solely with the proposed changes to site operations associated with current licence revision application, i.e.

- Use organic solvent distillate as an alternative fuel in a boiler, main emission to atmosphere point reference V1; and
- Descriptive changes to the IPPC licence for emission point, V6.

2. BAT ASSESSMENT TABLES

The 2007 report presented the BAT Assessment in tabular format:

- Each category has a number of specific 'topics' (e.g., Process topics include 'plant design' and 'process control')
- Column 1 (Questions) a mix of closed and open questions on each topic are presented in order to obtain the information necessary to assess the level of BAT on site for each topic.
- Column 2: (Techniques Observed). For each question, this is effectively an answer and with answers as closely as practicable linked to the BAT guidance (Column 3).
- Column 3 (BAT Guidance): This is the BAT guidance as set out in guidance indicated in Section 2 above and, relating to emission limit values, BATNEEC, for the Pharmachem industry. It

should be noted that not all BAT guidance is applicable, depending on the process techniques and plant technology employed. However, URS has excluded that non-applicable BAT guidance where possible.

- Column 4 (BAT, yes or no): Here, the technique observed in Column 2 is considered BAT if it meets, exceeds or is an alternative to the BAT guidance presented in Column 3. If what has been observed is an alternative meeting the designed objective of the BAT guidance, then comments or justification for deviation from the exact BAT guidance is presented in Column 5. This latter column also may contain notes to further explain aspects of BAT.

This update adopts the same format.

BAT Assessment of Emissions to Air

Questions – Emissions to Air	Technique Observed	BAT Guidance	BAT (Y/N)	Justification / Comments
Topic – Collection of organic solvent distillates for on-site utilisation of the Calorific Value (CV)				
What technique is used to utilise the calorific value of organic solvent distillates?	The technique proposed is to use high CV organic solvent distillates that are not of a quality where they can be directly reused in API manufacture as an alternative fuel in the boiler, main emission to atmosphere point reference V1. It is currently estimated that the use of these organic solvent distillates as a fuel could ultimately provide up to 80% of the energy demand required for the site steam demand. The proposal is to convert one of the boilers (burner and control system) to facilitate the use of organic solvent distillates as a fuel with a usage of between 250 and 1,250 kg/hr. Reducing the natural gas consumption of the boilers.	BAT is to collect organic solvent distillates for on-site utilisation of the calorific value (BREF Note Section 4.3.5.7) The EPA's BAT guidance note considers thermal oxidation/incineration advantageous if overall reduction of primary energy consumption is possible.	Y	Use of the organic solvent distillate as an alternative fuel for Boiler A avoids the need to transport hazardous wastes off-site

Questions – Emissions to Air	Technique Observed	BAT Guidance	BAT (Y/N)	Justification / Comments
What achievable emissions levels are used?	Emissions to air will be subject to the requirements of the Waste Incineration Directive 2000/76/EC (WID). Any plant whose main purpose is the generation of energy and '*which uses waste as a regular or additional fuel*' is considered a co-incineration plant under WID and this is the case for the boiler at the Pfizer, Little Island site. As greater than 40% of the sites steam demand is generated by the sites Duty boiler, V1 the emission limit values applied in this case are those for incineration plants (Annex V of WID).	The EPA's BAT guidance note considers any relevant polluting substances as specified in Schedule to S.I. No. 394 of 2004: EPA (Licensing)(Amendment) Regulations, 2004 for which the EPA can fix ELVs. Compliance with the requirements of WID is BAT for co-incineration.	Y	Based on a preliminary engineering and mass-balance assessment and the properties of the organic solvent distillate fuel, it is anticipated that the converted boiler will comply with all of the requirements of WID that apply to co-incineration plants with the exception of "residence time". It is noted, however, that WID permits derogation on residence time under Article 6.4 for co-incineration plants provided all other requirements of the Directive are met, in particular emission limit values for TOC and CO.

Questions – Emissions to Air	Technique Observed	BAT Guidance	BAT (Y/N)	Justification / Comments
What abatement system is used?	Based on the following characteristics of the organic solvent distillate stream: • The organic solvent distillates are clean streams of dry organic solvent distillate (containing solvents such as ethyl acetate, isopropyl alcohol (IPA), acetone, methyl tertiary butyl ether (MTBE), tetrahydrofuran (THF) and toluene); • The water content will be low; • They will not contain a significant level of dissolved solids; and • They do not contain or have come into contact with any chlorinated solvents. Burner controls will be used to ensure ELVs specified in Annex V of WID are complied with, i.e. maintaining of temperature in combustion chamber of above 850°C. The boiler will operate an automatic system to prevent organic solvent distillate feed: • At start-up, until the temperature of 850°C has been reached; • Whenever the temperature of 850°C is not maintained; and • Whenever the continuous measurements show that ELVs are exceeded due to disturbances or failures.	No abatement required to meet BAT emission limits	Y	Based on a preliminary engineering and mass-balance assessment and the properties of the organic solvent distillate fuel, it is anticipated that the converted boiler will comply with all of the requirements of WID that apply to co-incineration plants with the exception of "residence time". The Air quality impact assessment (Attachment No. I.1) demonstrates that operating the boiler in this arrangement should not give rise to significant ground-level air pollution. Pfizer propose to install a new PLC burner control system in order to comply with the WID requirements of an automatic system to prevent organic solvent distillate feed.
	During these times the auxiliary burner will not be fed with spent solvent, instead the fuel will switch to heavy fuel oil or natural gas.			

Questions – Emissions to Air	Technique Observed	BAT Guidance	BAT (Y/N)	Justification / Comments
How are emissions to air to be monitored?	Boiler emissions from V1 are to be monitored in accordance with the requirements of WID. A Continuous Emissions Monitoring system is proposed for the following substances: CO, TOC, NOx, O_2 and particulate Periodic monitoring is proposed for other parameters as provided for in WID	The EPA's BAT guidance note considers continuous monitoring on main emissions where technically feasible and periodic monitoring of stacks for other parameters as determined by the Agency.	Y	WID defines the level of monitoring required for co-incineration.
Topic – Emission Limit Value Applied to Carbon Adsorption emission point, V6				

Questions – Emissions to Air	Technique Observed	BAT Guidance	BAT (Y/N)	Justification / Comments
What achievable emissions levels are used for emission point, V6?	In light of the Adtech Thermal Oxidiser being made redundant, Pfizer propose as it is no longer a Thermal Oxidiser to remove the emission limit value specified for TOC (as C) of 50mg/m^3 from the IPPC licence Schedule B Emission Limits for emission point V6.	BAT guidance note for the Pharmaceutical & Other Speciality Organic Chemicals Sector which stated: '*For existing activities, BAT associated emission levels shall as a minimum, be considered TA Luft (Technical Instructions on Air Quality Control – TA Luft in accordance with article 48 of the Federal Immission Control Law (BlmSchG) dated 15 March 1974 (BGBI. I p.721). Federal Ministry for Environmental, Bonn 1986, including the amendment for classification of Organic Substances according to section 3.1.7 TA Luft, published in July 1997).*'	Y	TA Luft 1986 Section 3.1.7 references emission limit values for three classes of organic substances (Class I, II and III) which are already applied to the emission point V6, however, no emission limit is defined for TOC (as C) in section 3.1.7 of TA Luft 1986. Pfizer believe that precedence for this approach has been set in similar IPPC licensed Pharmaceutical installations. Pfizer make reference to the IPPC licence P0014-04 which has a number of scrubbers defined as main emission points. Each scrubber has emission limits set in line with TA Luft 1986 Section 3.1.7 with no emission limit set for TOC (as C).

3. SUMMARY

The provision of an organic solvent distillate co-incineration facility for the Pfizer Little Island sites within Ireland will ensure that the new activity will minimise traffic pollution over long distances or in the territory of other states. The new activity is based on sound environmental principles in that it proposes to recover energy for use within the processing activities at Pfizer Little Island from organic solvent distillate streams.

Attachment No. D provides the relevant detailed information regarding the new activity.

4. CONCLUSIONS

The onsite utilisation of organic solvent distillates for energy generation on a co-incineration plant is BAT for the Pfizer site. The co-incineration plant will comply fully with the requirements for co-incineration in WID.

The requested changes to vent V6 are in accordance with BAT guidance for the sector.

CONTENTS

Attachment No. L

Statutory Requirements

Pfizer, Little Island

IPPCL Application

20 July 2010

Final

Issue No: 2
49340732

CONTENTS

1. REQUIREMENTS OF SECTION 83(5) OF THE ENVIRONMENTAL PROTECTION AGENCY ACTS 1992 AND 2003

Part IV of the Environmental Protection Agency Act (No. 7 of 1992) was replaced by a new Part IV under Section 15 of the Protection of the Environment Act 2003 (No. 27 of 2003). Under Section 83(5)(a)(i) to (v) and (vii) to (x) of the Environmental Protection Agency Acts 1992 and 2003 (as defined in Section 1 of the Protection of the Environment Act 2003), the Agency shall not grant a licence or revised licence for an activity unless it is satisfied that the operation of the plant meets certain requirements. This section describes how the operation of Pfizer, Little Island will meet these requirements.

1.1. Air Quality Standard

Section 83(5)(a)(i) of the Environmental Protection Agency Acts 1992 and 2003 states that the Agency may not grant a licence for an activity unless it is satisfied that any emission from the activity will not result in the contravention of any air quality standard specified under the Air Pollution Act 1987 (No. 6, 1987).

Air quality standards currently applicable in Ireland are the EU ambient standards specified by the Clean Air for Europe Directive (2008/50/EC) relating to Nitrogen Dioxide (NO_x), Lead, Sulphur Dioxide (SO_2), Particulat matter (as PM_{10} and $PM_{2.5}$), Benzene and Carbon Monoxide (CO). Air quality standards relating to arsenic, cadmium, mercury, nickel, and polycyclic aromatic hydrocarbons are also specified through the fourth daughter directive (2004/107/EC).

Clean air for Europe Directive (2008/50/EC) replaces the air quality framework and the first three daughter directives which were implemented in Ireland under the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. 33 of 1999), the Air Quality Standards Regulations 2002 (S.I. 271 of 2002) and Ozone in Ambient Air Regulations 2004 (S.I. 53 of 2004). The fourth daughter directive (2004/107/EC) has been implemented through the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. 58 of 2009). It is expected that the 2004 Directive will be included in the 2008 Directive at some stage in the future.

The two main boilers V1 and V28 were commissioned on both natural gas and heavy fuel oil, however, the boilers have run exclusively on purchased natural gas. Therefore, they are mostly emitting Oxides of Nitrogen and Carbon Monoxide. The boilers are currently run in lead/hot standby mode.

The emission points for both boilers are identified as main emission points in P0136-003, i.e. V1 and V28 in Schedule B. Limits are placed on:

- volumetric flow: 10,000 m^3/hr
- oxides of sulphur (as SO_2): 320 mg/Nm^3
- oxides of nitrogen (as NO_2): 350 mg/Nm^3

It is currently estimated that the use of organic solvent distillates as a fuel could ultimately provide up to 80% of the energy demand required for the site steam demand. Pfizer, Little Island are therefore proposing to modify boiler V1 to burn organic solvent distillate. The fuels proposed will be generated in the API manufacturing process on site. however, they are not of a quality where they can be directly reused in API manufacture. They are clean streams of organic solvent distillate containing solvents such as ethyl acetate, isopropyl alcohol (IPA), acetone, methyl tertiary butyl ether (MTBE), Tetrahydrofuran (THF) and toluene. Water content will be low in these streams and they will not contain a significant level of dissolved solids. They do not contain or have come into contact with any chlorinated solvents or metals. It is therefore, expected that boiler V1 will emit Oxides of Nitrogen, Sulphur Dioxide, Dust, Carbon Monoxide, gaseous and vaporous organic substances.

Several main emission points V59, V9, V5, V4, V26 and V60 have the potential to emit dust but in reality all these emission points, except V4 which has a dust filter, are subject to HEPA filtration, which has, greater than 99.7% efficiency. Air quality impact assessment has shown no significant impacts to the environment. In addition, monitoring to date has shown insignificant concentrations of dust to atmosphere.

The three remaining main emissions V6, V8 and V46 relate to process abatement units (carbon scubber V6 and Thermial oxidisers V8 and V46). These have the potential to emit gaseous and vaporous organic substances with V6 releasing chlorinated substances and V8 and V46 also emitting Oxides of Nitrogen, Sulphur Dioxide, Dust, Carbon Monoxide.

A comprehensive air quality impact assessment has been carried out which has determined that emissions due to the operation of the site activities (including the proposed co-incinerator and modified generator operations), should not be considered environmentally significant.

1.2. Water Quality Standard

Section 83(5)(a)(ii) of the Environmental Protection Agency Act 1992 and the Protection of the Environment Act 2003 states that the Agency shall not grant a licence for an activity unless it is satisfied that any emission from the facility will not result in the contravention of any standard prescribed under Section 26 of the Local Government (Water Pollution) Act 1977 (S.I. 1 of 1977).

Section 26 of the Water Pollution Act 1977 and 1990 allows the Minister to set quality standards for water, trade effluent and sewerage. Specific water quality legislation relevant to this application include:

- The European Communities (Water Policy) Regulations 2003 (S.I. 722 of 2003), which transposed Directive 2000/60/EC (the Water Framework Directive, WFD)
- The Local Government (Water Pollution) Act 1977 (Water Quality Standards for Phosphorus) Regulations, 1998 (S.I. 258 of 1998) are the only quality standards set under this section.
- The European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. 272 of 2009).

All treated wastewater discharges into the Cork Council sewer, which runs along the southern boundary of the site under licence with the EPA and with agreement from Cork County Council.

The Cork County Council sewer system discharges to the Carrigrennan Wastewater Treatment Plant (WWTP) located 3km to the South-East of the Pfizer, Little Island site and does not directly discharge water to surface waters.

The Carrigrennan WWTP has been designed to accommodate flows from Cork City, Tramore Valley, Glounthaune, Glanmire and Little Island areas. The plant accommodates existing flows and has been designed on a modular basis to allow expansion as necessary over the next 20 years. The plant, which is highly automated, offers primary and secondary treatment and has been producing, treated water to a very high standard since January 2004. The secondary treatment at Carrigrennan is achieved by means of an activated sludge system, which is carried out in Sequence Batch Reactors. The WWTP at Carrigrennan has a design capacity for a Population Equivalent (PE) of 413,000 and a design hydraulic loading of 59,500 m^3/day.

The typical flow contribution of the Pfizer, Little Island process wastewater to the Carrigrennan WWTP's incoming dry weather flow is less than 1%.

1.3. European Legislation

Section 83 (5) (a) (iii) of the Environmental Protection Agency Acts 1992 and 2003 states that the Agency shall not grant a licence for an activity unless it is satisfied that any emission from the activity will comply with, or not result in the contravention of any relevant standard including any standard for an environmental medium prescribed under Regulations made under the European Communities Act, 1972 or any other enactment. Table 1.1 below summaries the regulations, which have been reviewed based on Pfizer, Little Island compliance.

Table 1.1: Pfizer, Little Island Compliance with European Legislation

Regulation	Pfizer, Little Island Compliance
The European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. 9 of 2010)	Pfizer, Little Island does not have direct discharges to groundwater and continues to monitor its groundwater quality beneath the site. Any contamination identified has been investigated and subject to rigorous risk assessment and all related documentation has been submitted to the EPA.
The European Communities Environmental Objectives (Surfacewater) Regulations 2009 (S.I. 272 of 2010)	Pfizer, Little Island discharges drecitly to surface waters (into Bury's Basin). This is monitored continuously for TOC and is diverted to the sites firewater retention pond when the TOC limit set by the sites IPPC licence is exceeded.
The European Communities	Pfizer, Little Island is licensed by the EPA

Regulation	Pfizer, Little Island Compliance
(Environmental Libilities) Regulations 2008 (S.I. 547 of 2008)	and one of the requirements is to complete an Environmental Liability Risk Assessment, which Pfizer, Little Island has completed.
Waste Management (Batteries and Accumulators) Regulations 2008 (S.I. 268 of 2008)	Pfizer, Little Island has a Total Waste contract with a leading Irish waste contractor and this includes the management of WEEE and waste batteries under these regulations.
Quality of Bathing Waters Regulations 1992-2001 (S.I. 155 of 1992, S.I. 145 of 1994, S.I. 177 of 1998 and S.I. 22 of 2001)	Not applicable as Pfizer, Little Island does not discharge directly to bathing waters.
The European Communities (Quality of Salmonid Waters) Regulations (S.I. 293 of 1988)	Not applicable as Pfizer, Little Island does not discharge directly into Salmonid Waters.
Local Government (Water Pollution) Act 1977 (Control of Cadmium Discharges) Regulations (S.I. 294 of 1985)	Not applicable as Pfizer, Little Island is not licenced to discharge these scheduled pollutants.
Local Government (Water Pollution) Act, 1977 (Control of Hexachlorocyclohexane and Mercury Discharges) Regulations (S.I. 55 of 1986)	Not applicable as Pfizer, Little Island is not licenced to discharge these scheduled pollutants.
Local Government (Water Pollution) Acts 1977 and 1990 (Control of Aldrin, Dieldrin, Endrin, Isodrin, HCB, HCBD and CHCL3 Discharges) Regulations 1994 (S.I. 348 of 1993)	Monitoring of emissions to sewer ensures compliance with these regulations
Local Government (Water Pollution) Acts 1977 and 1990 (Control of Carbon Tetrachloride, DDT and Pentachlorophenol Discharges) Regulations 1994 (S.I. 245 of 1994)	Not applicable as Pfizer, Little Island does not discharge these scheduled pollutants.
Quality of Shellfish Water Regulations (S.I. 200 of 1994, amended by Quality of Shellfish Waters (Amendment)	Not applicable as Pfizer, Little Island does not discharge directly into areas designed in the first or second schedule of the

Regulation	Pfizer, Little Island Compliance
Regulations (S.I. 459 of 2001)	Shellfish Waters Regulations
Water Quality (Dangerous Substances) Regulations, 2001 (S.I. 12 of 2001)	These regulations set out quality standards for certain listed substances in water bodies. Annual Groundwater monitoring carried out at Pfizer, Little Island reflects these listed substances in so far as where any of these substances may be used at Pfizer, Little Island. Furthermore, Pfizer, Little Island monitors final effluent for Total Heavy Metals and for volatile organic compounds as required by the current IPPC licence and the results for these parameters would indicate a negligble discharge of such substances in the treated trade effluent.

1.4. Noise Regulations

Section 83 (5) (a) (iv) of the Environmental Protection Agency Acts 1992 and 2003 states that the Agency shall not grant a licence for any activity unless it is satisfied that any noise from the activity will comply with or not result in the contravention of any regulations under Section 106 of the EPA act. This section enables the minister to make regulations for the purpose of the prevention or limitation of noise, which may cause a nuisance.

Although no noise control regulations have been made specific to controlling ambient noise from industrial facilities, the EPA Guidance Note for Noise in Relation to Scheduled Activities recommend that to avoid disturbance the noise level at sensitive locations should not exceed a $L_{Aeq\ T}$ value of 55 dBA during the daytime and a $L_{Aeq\ T}$ value of 45 dBA at night-time. It also recommends that audible tones and impulsive noise at sensitive locations at night should be avoided. Furthermore, Condition 5.1 of Pfizer, Little Island's current IPPC licence reflects the above requirements.

An annual survey of noise emissions from the Pfizer, Little Island site was carried out on the 25th and 26th May 2009. The overall changes in noise levels at plant boundaries were negligible from previous surveys. Changes in the night-time noise levels at St. Lappans, North Eske and Factory Hill were negligible and were within the range of noise levels measured at these locations since 2003.

1.5. Significant Environmental Pollution

Section 85 (5) (a) (v) of the Environmental Protection Agency Acts 1992 and 2003 states that the Agency shall not grant a licence for an activity unless it is satisfied that any emissions from the activity will not cause significant environmental pollution.

As shown in AER from 2009 the Pfizer, Little Island site have shown very high compliance with emissions to Air and Sewer.

A comprehensive air quality impact assessment for air has been carried out as outllined in section 1.1 and the conclusion from this study is that there is unlikely to be any significant impact to the environment as a result of emissions to air from Pfizer, Little Island activities.

Additionally, Pfizer, Little Island has invested very significantly in measures to protect nearby Esturine surface water bodies, including secondary containment, improved drainage systems and continuous monitoring for Total Organic Carbon and pH in areas of higher risk to an accidental spillage of potentially polluting matter.

1.6. Production and Disposal of Waste

Section 83 (5) (a) (vii) of the Environmental Protection Agency Acts 1992 and 2003 states that production of waste should be prevented or minimised, and where waste is produced, it will be recovered, and where it is not economically and technically possible to recover it, be disposed of in a manner which will prevent or minimise any impact on the environment. All wastes are disposed of in compliance with the Waste Management Act 1996 and associated regulations.

There is a strong corporate waste contractor auditing programme within the Pfizer, Little Island site. Only approved contractors from these audits are used for waste management.

Pfizer, Little Island maintains adequate details of all permitting and licence details including collection, disposal, recovery and transportation of waste.

Pfizer, Little Island maintains Environmental Management Programmes that include targets for waste management and minimisation.

Pfizer, Little Island also proposes to use such organic solvent distillate streams recovered on site but which are not of a quality where they can be directly reused in API manufacture as an alternative fuel for use in its boiler, V1.

1.7 Energy

Section 83 (5) (a) (viii) of the Environmental Protection Agency Acts 1992 and 2003 states that energy is to be used efficiently in the carrying on of the licensed activity.

Pfizer, Little Island has invested significantly in measures to reduce or minmise energy, for example in the introduction of closed-loop cooling loops and single-fluid heat transfer fluids to some operations.

Pfizer, Little Island has carried out energy audits on various systems on the site in 2009 using qualified external consultants. This audit looked at mainly technical aspects of energy usage and

monitoring and also energy management. The audit provided a number of recommendations for improvement, mainly specfic technical improvements. These recommendations have been considered in the setting of targets and projects in Pfizer, Little Island Environmental Management Programmes presented in the annual environmental reports. Pfizer, Little Island is certified to EN16001

1.8 Accident Prevention

Section 83 (5) (a) (ix) of the Environmental Protection Agency Acts 1992 and 2003 requires that necessary measures be taken to prevent accidents in the carrying on of the activity. In addition, it is required that where an accident occurs, its consequences for the environment are limited, and where there are consequences, these consequences are remedied.

Pfizer, Little Island is committed to continually improving its environment, health and safety protection performance by making it an integral part of all its operations.

Pfizer, Little Island is committed to operating an Environment and Safety Management System (which includes the Major Accident Prevention Plan). This provides the site with the framework for implementing the policy and setting and reviewing safety and environmental goals, objectives and targets. Monitoring and evaluating takes place on a routine basis on the site environment, health and safety protection programmes to assure high standards are being maintained.

1.9 Cessation of the Activity

Section 83 (5) (a) (x) of the Environmental Protection Agency Acts 1992 and 2003 requires that necessary measures are taken upon the permanent cessation of the activity (including such a cessation resulting from the abandonment of the activity) to avoid any risk of environmental pollution and return the site of the activity to a satisfactory state.

There is a Residuals Management Plan (RMP) covering the site that addresses all of the above requirements. This was subsequently updated in 2010 and included in the installations AER submission in 2010.

2. DESIGNATED AREAS

The activity is not carried out on, or is located such that it is liable to have an adverse effect on:

- A site placed on a list in accordance with Chapter 1 of S.I. 94 of 1997 as amended by European Communities (Natural habitats) (amendment) Regulations 2005 (S.I. 378 of 2005), or

- A site where consultation has been initiated in accordance with Article 5 of the EU Habitats Directive (92/43/EEC) as amended by Council Directive 97/62/EC and EU Birds Directive 79/409/EEC as amended by Council Directive 2009/147/EC).

The Pfizer, Little Island site is located 3.5 km from Rockfarm Quarry in Little Island, 1.5 km from Dunkettle Shore, 7.5 km from Great Island Channel, 0.5km from Douglas River Estuary across Lough Mahon opposite the site and 2km from Glanmire wood. All of which are proposed natural

heritage areas as defined by The Department of the Environment, Heritage and Local Government. Great Island Channel is also designated as an Special Area of Conservation and Cork Harbour is also designated as an Special Area of Protection.

3. WATER QUALITY

As discussed above in Section 1.2 of this Attachment, as the Pfizer, Little Island site discharges directly to sewers the operation of Pfizer, Little Island is unlikely to have an adverse effect on water quality with respect to the Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus) Regulations, 1998 or the principal legislation governing water quality in Ireland is the European Communities (Water Policy) Regulations 2003 (S.I. 722 of 2003), which transposed Directive 2000/60/EC (the Water Framework Directive, WFD)

4. REQUIREMENTS OF ENVIRONMENTAL PROTECTION AGENCY (LICENSING) (AMENDMENT) REGULATIONS 2004 (AS AMENDED)

The Environmental Protection Agency (Licensing) (Amendment) Regulations 2004 (S.I. 394 of 2004) (further amended by S.I. 382 of 2008) specify indicative lists of principal polluting substances to be taken into account by the Agency, if relevant, in the fixing of emission limit values.

The table below lists the polluting substances for Air and Water that are given in the Schedule to these regulations, with an indication of whether they are likely to be present in air and water emissions at Pfizer, Little Island. Additional information on principal polluting substances from Air and Sewer can be seen in Table E.1.1 in attachment No.E1 and Table E.3.4 respectively.

Medium	Principal Polluting Substance	Pfizer, Little Island Emissions
Air	Sulphur dioxide and other sulphur compounds	Present
Air	Oxides of nitrogen and other nitrogen compounds	Present
Air	Carbon monoxide	Present
Air	Volatile Organic compounds	Present
Air	Metals and their compounds	Not Present
Air	Dust	Present
Air	Asbestos (suspended particulates, fibres)	Not Present

Medium	Principal Polluting Substance	Pfizer, Little Island Emissions
Air	Chlorine and its compounds	Present
Air	Fluorine and its compounds	Not Present
Air	Arsenic and its compounds	Not Present
Air	Cyanides	Not Present
Air	Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air	Not Present
Air	Polychlorinated dibenzodioxins and polychlorinated dibenzofurans	Not Present
Water	Organohalogen compounds and substances which may form such compounds in the aquatic environment	Present
Water	Organophosphorus compounds	Present
Water	Organotin compounds	Not Present
Water	Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the aquatic environment	Not Present
Water	Persistent hydrocarbons and persistent and bio-accumulable organic toxic substances	Not Present
Water	Cyanides	Not Present
Water	Metals and their compounds	Potentially Present
Water	Arsenic and its compounds	Not present
Water	Biocides and plant health products	Not Present
Water	Materials in suspension	Present

Medium	Principal Polluting Substance	Pfizer, Little Island Emissions
Water	Substances which contribute to eutrophication (in particular nitrates and phosphates)	Present
Water	Substances, which have an unfavourable influence on the oxygen balance (and can be measured using parameters such as BOD, COD, etc.)	Present

5. REQUIREMENTS FOR A FIT AND PROPER PERSON

Section 83 (5) (a) (xi) of the Environmental Protection Agency Acts 1992 and 2003 specifies that the Agency shall not grant a licence unless it is satisfied that the licensee is a fit and proper person. Information to enable a determination to be made by the Agency, as required by Section 84 (4) of the Environmental Protection Agency Acts 1992 and 2003, is given below.

5.1. Convictions

Pfizer, Little Island or any other relevant person have not been convicted of any offence under the Protection of the Environment Act, the Waste Management Act 1996, the Local Government (Water Pollution) Acts 1977 and 1990 or the Air Pollution Act 1987.

5.2. Technical Knowledge and Qualification

The responsibility for the operation and control of treatment and abatement systems on site lies with the Environmental Operations Supervisor. The current Environmental Operations Supervisor has worked with the company for 10 years and holds a Certificate in Aquaculture, a Diploma in Aquatic Sciences and a Post Graduate Diploma in Environmental Protection from Sligo Institute of Technology.

The current Environmental Regulatory Specialist holds a BSc (Hons) in Environmental Science and a Masters Degree in Environmental Analytical Chemistry and has been with the company for 13 years.

Both the Environmental Operations Supervisor and the Environmental Regulatory Specialist report to the Environmental Team Leader who in turn reports to the EHS Team Leader, who in turn reports to the Site Leader.

The Environmental Team Leader has worked with the company for 13 years and holds a BSc (Hons) in Environmental Science

Environmental Operations staff are given job specific environmental training in order to carry out their roles competently. All employees are given environmental induction training and if required by their job additional environmental training in order to fulfil their role.

5.3. Financial commitments relating to environmental liability and cessation activities

There is a Residuals Management Plan (RMP) covering the site that addresses all of the above requirements. The RMP includes a financial provision for cessation of activities. This was subsequently updated in 2010 and included in the installations AER submission in 2010.

Furthermore, a fully comprehensive and costed Environmental Liability Risk Assessment (ELRA) has been prepared for Pfizer, Little Island. This was subsequently updated in 2010 and included in the installations AER submission in 2010.