enzygo environmental consultants

# NPPF: Flood Risk Assessment

Stolthaven Dagenham Terminal, Hindmans Way, Dagenham

**Stolthaven Dagenham Ltd**

SHF.314.001.R.001.B

## Contact Details:

Enzygo Ltd.
STEP Business Centre
Wortley Road
Deepcar
Sheffield
S36 2UH

tel: 0114 2903677
fax: 0114 2903688
email: hello@enzygo.com
www: enzygo.com

# Stolthaven

| | |
|---|---|
| Project: | NPPF: Flood Risk Assessment, Stolthaven Dagenham Terminal, Hindmans Way, Choats Road, Dagenham, Essex, RM9 6PU |
| For: | Stolthaven Dagenham Ltd |
| Job Number | SHF.314.001 |
| Status: | Final |
| Date: | May 2013 |
| Author: | Matt Travis, BSc (Hons), MSc, MCIWEM, CEnv, CSci – Director |
| Reviewer: | Peter Cumberlidge, Director |



Enzygo Limited Registered in England No. 6525159
Registered Office Stag House Chipping Wotton-Under-Edge Gloucestershire GL12 7AD

# Contents

# Tables & Figures

# 1.0 Introduction

## 1.1 Background

1.1.1. Enzygo Limited has been instructed by Stolt to undertake a Flood Risk Assessment (**FRA**), in accordance with the National Planning Policy Framework (NPPF)[1] and the Technical Guidance to the NPPF[2], for the proposed development for Stolthaven Dagenham Limited, at Hindmans Way, Choats Road, Dagenham (see Drawing 1). This has included an assessment of the surface water drainage requirements of the site.

1.1.2. This report details the flood risk at the site and how this could be managed and mitigated to allow the site to be developed in support of the planning application for the development. The proposed scale of development may present risks of flooding on-site and/or off-site if flooding is not effectively considered and managed.

1.1.3. It is recognised that developments that are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. Current guidance on development and flood risk[3] identifies several key aims for a development to ensure that it is sustainable in flood risk terms. These aims are as follows:

- the development should not be at a significant risk of flooding and should not be susceptible to damage due to flooding;
- the development should not be exposed to flood risk such that the health, safety and welfare of the users of the development, or the population elsewhere, is threatened;
- normal operation of the development should not be susceptible to disruption as a result of flooding;
- safe access to and from the development should be possible during flood events;
- the development should not increase flood risk elsewhere;
- the development should not prevent safe maintenance of watercourses or maintenance and operation of flood defences;
- the development should not be associated with an onerous or difficult operation and maintenance regime to manage flood risk. The responsibility for any operation and maintenance required should be clearly defined;
- future users of the development should be made aware of any flood risk issues relating to the development;
- the development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues;
- the development should not lead to degradation of the environment; and

[1] Department for Communities and Local Government (2012) National Planning Policy Framework.
[2] Department for Communities and Local Government (2012) Technical Guidance to the National Planning Policy Framework.
[3] CIRIA (2004) Funders report CP/102 Development and Flood Risk – Guidance for the Construction Industry.

- the development should meet all of the above criteria for its entire lifetime, including consideration of the potential effects of climate change.

1.1.4. The FRA is undertaken with due consideration of these sustainability aims.

1.1.5. The key objectives of the FRA are:

- To assess the flood risk to the proposed development and to demonstrate the feasibility of appropriately designing the development such that any residual flood risk to the development and its users would be acceptable;
- To assess the potential impact of the proposed development on flood risk elsewhere and to demonstrate the feasibility of appropriately designing the development such that the development would not increase flood risk elsewhere; and
- To satisfy the requirements of national planning policy guidance which require FRAs to be submitted in support of planning applications.

## 1.2 Project Scope

1.2.1 In order to achieve the aims outlined above, a staged approach has been adopted in undertaking this FRA, in accordance with current best practice. A screening study has initially been undertaken to identify whether there are any potential sources of flooding at the site, which may warrant further consideration. Any potential flooding issues identified in the screening study have subsequently been considered in a scoping study. The aim of the scoping study is to review all available information and provide a qualitative assessment of the flood risk to the site and the impact of the site on flood risk elsewhere.

## 1.3 Report Structure

1.3.1 This FRA has the following report structure:

- Section 2 identifies the sources of information that have been consulted during the FRA;
- Section 3 describes the application area including the existing and proposed development;
- Section 4 outlines the flood risk to the existing and proposed development;
- Section 5 provides a summary of the existing flood defence measures for the site;
- Section 6 assesses the potential impacts of the proposed development on surface water and surface water drainage; and
- Section 7 outlines the flood mitigation options and measures that will be used to minimise flood risk;
- Section 8 presents a summary and conclusions.

# 2.0 Sources of Information

### 2.1 General Information

2.1.1 General information regarding the site setting and hydrology of the application site has been obtained from OS Explorer Map 162: Greenwich & Gravesend.

2.1.2 Information regarding the current flood risk at the application site, local flood defences and flood water levels has been obtained from the Environment Agency (see Appendix 1).

2.1.3 A location plan of the development site is shown on Drawing 1.

### 2.2 Discussion with Regulators

2.2.1 A wide range of regulators should be consulted when carrying out an FRA. These include the Environment Agency, the Local Planning Authority (LPA), and Water Regulators. Consultation and discussions with the relevant regulators have been undertaken during this FRA.

### 2.3 Environment Agency

2.3.1 The Flood and Water Management Act 2010 gives the Environment Agency a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The Environment Agency is the statutory consultee with regards to flood risk and planning.

2.3.2 Environment Agency Standing Advice and the NPPF has been consulted and reviewed as part of this FRA.

2.3.3 Correspondence from Mish Robbins External Relations Officer at the Environment Agency has been received (see Appendix 1).

### 2.4 Local Authority

2.4.1 Barking and Dagenham Borough Council policy planning guidance relating to flood risk has been assessed to consider the mitigation policies in place.

2.4.2 The Barking and Dagenham Borough Council Strategic Flood Risk Assessment (SFRA) and the Barking and Dagenham Borough Council Preliminary Flood Risk Assessment (PFRA) which cover the site have been reviewed.

### 2.5 Thames Water

2.5.1 Thames Water is responsible for the disposal of waste water for this area.

2.5.2 Information contained with regards to sewer flooding within the Barking and Dagenham Borough Council SFRA and the Barking and Dagenham Borough Council PFRA have been consulted as part of this FRA.

2.5.3 All Water Companies have a statutory obligation to maintain a register of properties/areas which are at risk of flooding from the public sewerage system, and this is shown on the DG5 Flood Register.

# 3.0 Description of Application Area

## 3.1 Site Location

3.1.1 The site is located off Hindmans Way, Choats Road, Dagenham, Essex, RM9 6PU (see Drawing 1). The National Grid Reference of the site is 548724, 1 81911. The site forms part of an existing oil storage terminal located on the northern bank of the River Thames separated from the river bank by Thunderer Road.

3.1.2 The application site covers approximately 4.9 hectares (ha).

## 3.2 Existing Development

3.2.1 The site is part of an existing storage terminal for bulk liquid chemicals and other liquid products with the capacity to store up to 134,000 cubic metres. The site acts as a transfer station for incoming liquids which are predominantly shipped in by marine tankers via the River Thames and stored prior to distribution by road to local customers. Imports and exports via the jetty account for 98% of all distribution movements.

3.2.2 The site's storage facilities comprise 150 tanks which are equipped to accommodate a range of liquid goods including petroleum products, solvents (including flammables), base oils (including lubricating and pharmaceutical grades), chemicals, and agricultural products. The site consists of tanks, a jetty, warehouses, drumming and bulk container filling, laboratory services, blending, dilution and product heating facilities.

## 3.3 Proposed Development

3.3.1 Stolthaven Dagenham Limited intends to undertake a phased site refurbishment programme spanning over a period of four years. The refurbishment will involve demolition of old redundant buildings and associated infrastructure nearing the end of their useful lives and construction of industry best practice assets to enable the terminal to continue its business. The current layout of the Terminal and the layout of the proposed refurbishment works are provided in Appendix 2.

3.3.2 The first phase will focus on the centre of the terminal (area 1). Tanks and civil and mechanical infrastructure marked for demolition will be demolished by competent and the area will be cleared to below slab level. Once the site has been cleared, it is the intention to reconfigure the area by creating two new tank pits. The tanks will be constructed on piled foundation and tank farms will have concrete walls and floors. Civil, mechanical and electrical infrastructure such as bund walls, flooring, pump bases, pipe track, pipes, pumps, loading arms, etc will be added to make the tank pit operational. This area will continue to store flammable products but with improved protection and control measures.

3.3.3 Subject to agreement and necessary internal approvals, the second phase will be focused on the north eastern corner (area 4) of the site adjoining Chequers Lane. It is the intention to demolish the warehouses and associated infrastructure down to below slab level. Once this area has been cleared, it is the intention to construct complete new facilities for the storage and handling of non-hazardous materials.

3.3.4 Phase 3 refurbishment works will commence upon completion of phase 2 and will focus on the south eastern corner of the site (remainder of area 4 and area 5). As with phase 2, it is the intention to demolish the tanks and associated infrastructure down to below slab level.

Once this area has been cleared, it is the intention to construct complete new facilities for the storage and handling of flammable products.

### 3.4 Topographic Information

3.4.1 A topographical survey has been undertaken at the site (see Appendix 3). Thunderer Road adjacent to the river frontage is at a consistent level of 5.20mAOD from the south-east corner of the site to the south-west corner of the site for its entire length. The north-west corner of the site measures 4.60mAOD and the north-east corner 3.70mAOD. This indicates a general flow of any flood water on the site would flow north north-east. Flood water would be channelled by the locations of the bund walls enclosing the various areas of the site but these would not interfere with the general direction overall.

### 3.5 Catchment Hydrology

3.5.1 The River Thames is located adjacent to the southern boundary of the site; a drainage ditch which runs parallel to the River Thames is also located adjacent to the southern boundary of the site (see Drawing 2).

3.5.2 The Gores Brook is located approximately 750m to the west of the site and the Beam River is located 1km to the east of the site.

## 4.0 Flood Risk

### 4.1 Potential Sources of Flooding – Level 1 Screening Study

4.1.1 All potential sources of flooding must be considered for any proposed development. A summary of the potential sources of flooding and a review of the potential risk posed by each source at the application site is presented in Table 4.1.

**Table 4.1: Potential Risk Posed by Flooding Sources**

| Flooding Source | Potential Flood Risk at Application Site? | Potential Source | Data Sources |
|---|---|---|---|
| Fluvial flooding | Yes | Gores Brook, River Beam | Environment Agency |
| Tidal flooding | Yes | River Thames | Environment Agency |
| Flooding from rising / high groundwater | No | Aquifer | BGS Map |
| Overland flow flooding | No | Poor permeability | RMS Map |
| Flooding from artificial drainage systems | No | Sewers | Thames Water, SFRA |
| Flooding due to infrastructure failure | No | None Identified | OS Map |

*Fluvial Flooding Sources*

*The Gores Brook*

4.1.2 The Gores Brook is located approximately 750m to the west of the site. The Gores Brook drains a small catchment of just $12km^2$. Its source lies just south of the southernmost part of the Borough of Barking and Dagenham before discharging into the River Thames at the Horseshoe Corner Sluice.

4.1.3 It is linked to the Mayes Brook via the Ship and Shovel Relief Sewer. It has semi-natural channel for its entire course and has no specific flood defences.

4.1.4 Because it is tidally influenced, the Gores Brook can only discharge to the River Thames when tide levels recede to a level below that of the water in the Gores Brook.

4.1.5 There is no storage area or floodplain associated with the Gores Brook. Historically, the land surrounding the watercourse formed low-lying marshland and this would have accommodated flood flows from the Gores Brook (as well as the River Roding and, to a greater extent, the Beam River). However, a land-filling exercise took place in the vicinity of the Gores Brook between 1970 and 1985 and this removed all of the natural floodplain (an area of approximately $320{,}000m^2$).

4.1.6 During times of flood, the Gores Brook becomes connected to the Beam River, which lies approximately 1km to the east.

*Beam River*

4.1.7 The Beam River is located approximately 1km to the east of the site. This watercourse drains a catchment area of $63km^2$ before discharging into the River Thames. An Environment Agency gauging station, the Beam at Elm Park (Bretons Farm), is located 3.5km upstream of the confluence with the River Thames. The maximum recorded flow at the gauging station is $17.78m^3s^{-1}$ and QMED is $8.36m^3s^{-1}$.

4.1.8 Discharge to the River Thames is controlled through a system of sluices. The watercourse is designated as 'Main River' and is therefore maintained by the Environment Agency.

4.1.9 The Environment Agency has provided flood levels for the Beam River (NGR 549911 181586) as follows:

- 1 in 100 year event – 1.88mAOD
- 1 in 200 year event – 1.92mAOD

4.1.10 These flood levels have been compared to the topographic survey of the site and have been used as an indication of flood levels for the Beam River.

4.1.11 The site has a minimum ground level of 3.70mAOD therefore the site would not be inundated with floodwater for all events up to and including the 1 in 200 year events from the Beam River.

4.1.12 In the event of the Gores Brook and Beam River being 'tide-locked', due periods of high water levels within River Thames, flooding of the watercourses and adjacent floodplains may occur. However again flooding from these sources would be not affect the site due to the distance and topography between the site and these watercourses.

4.1.13 The site is therefore not at risk from the Beam River. Therefore flooding from these sources has not been considered further within this FRA.

*<u>Tidal Flooding Sources</u>*

*River Thames*

4.1.14 The site is located on the north bank of the River Thames, which forms the southern boundary of the site and represents the principle source of flood risk at the site. This section of the River Thames is predominantly tidally influenced.

4.1.15 This watercourse drains a catchment area of $16,133km^2$. Below Teddington Lock approximately 89km upstream of the Thames Estuary the river is subject to tidal activity from the North Sea. The watercourse is designated as 'Main River' and is therefore maintained by the Environment Agency.

4.1.16 Tidal flooding is flooding caused by extreme tide levels exceeding ground levels. This means extreme tide levels in the River Thames estuary, caused by storm surges in the North Sea such as that experienced in 1953.

4.1.17 Table 4.2 shows the modelled water levels for the River Thames have been received from the Environment Agency (see Appendix 1) with climate change taken into account in accordance with the NPPF. Three main factors considered by the Environment Agency were the astronomical tide, the surge tide and the flow coming from the non-tidal River Thames.

*River Thames - Actual Risk*

4.1.18 The direct application of the tidal water level is not technically appropriate at this site as this does not recognise the presence of the flood defence measures currently in place which have a minimum crest level of 7.10mAOD. If these remain intact, then the site is currently not at risk of flooding for all events up to and including the 1 in 1000 year event. There is a minimum freeboard of 0.58m above the current 1 in 1000 year water level of 6.52mAOD.

4.1.19 If climate change is taken into account, then the site is not at risk of flooding for all events up to and including the 1 in 200 year event up to 2107. There is a minimum freeboard of 0.22m above the current 1 in 200 year water level of 6.88mAOD in 2107. The flood defences measures would only be overtopped in 2107 for the 1 in 500 year and greater events.

*River Thames - Residual Risk*

4.1.20 There is a residual tidal flood risk posed to the site if the flood defence measures were to be overtopped and/or breached due to a tidal surge and wave action. The overtopping and/or breaching and the consequences would be dependent upon a number of factors including the magnitude of the event (i.e. River Thames water level), location of overtopping and/or breaching, extent and the emergency response. The likelihood of such residual risks are very small however, the scale of consequences from rapid inundation and deep water in heavily urbanised areas mean that these residual risks must be considered.

4.1.21 When the extreme tidal flood levels shown in Table 4.2 are compared to the topographical survey without the presence of the flood defence measures, it can be seen that the lower-lying areas of the site are to the north east.

4.1.22 The site would be inundated with floodwater if the flood defence measures were to be overtopped and/or breached, to a maximum water depth of 2.34m during the 1 in 200 year event and to a maximum water depth of 2.82m during the 1 in 1000 year event.

4.1.23 The majority of the site would be inundated with floodwater to a maximum water depth of 2.66 m during the 1 in 200 year event in 2055, to a maximum water depth of 3.13m during the 1 in 1000 year event in 2055.

4.1.24 The whole of the site would be inundated with floodwater to a maximum water depth of 3.18m during the 1 in 200 year event in 2107 and to a maximum water depth of 3.67m during the 1 in 1000 year event in 2107.

4.1.25 The velocity of floodwater would be expected to highest directly behind the flood defences within the rapid inundation zone if the overtopping and/or breaching were to occur adjacent to the site which is extremely unlikely.

4.1.26 The Barking and Dagenham Borough Council SFRA has modelled the residual flood risk due to a breach in the flood defences. The flood hazard has been calculated as a product of depth and velocity in accordance with Table H1 (Defra FD2320). This shows that the flood hazard rating would be >2.5 – Extreme: Dangerous for all.

4.1.27 An approximation of the time of inundation (following a breach failure of the River Thames defences) was carried out as part of the Barking and Dagenham Borough Council SFRA. The site would be inundated in up to 20 hours.

4.1.28 The period in which flood flows will take to inundate an area is a key factor when considering risk. Clearly an available flood warning time of greater than 12 hours would enable the site to take proactive action to reduce the potential damage to property, and to evacuate to markedly reduce the potential risk to life.

**Table 4.2: Modelled Water Levels (mAOD) (source Environment Agency)**

| Grid Reference | Year | 10 | 20 | 50 | 100 | 200 | 500 | 1000 |
|---|---|---|---|---|---|---|---|---|
| TQ 48203 81714 | 2005 | 5.25 | 5.42 | 5.65 | 5.84 | 6.04 | 6.31 | 6.52 |
| | 2055 | 5.63 | 5.79 | 6.00 | 6.17 | 6.36 | 6.62 | 6.83 |
| | 2107 | 6.21 | 6.34 | 6.54 | 6.70 | 6.88 | 7.15 | 7.37 |

*Areas of fluvial and tidal interaction*

4.1.29 The Gores Brook and the Beam River all have their confluence with the tidal estuary of the River Thames. Therefore, the area adjacent to the River Thames requires special consideration. It would naturally be an inter-tidal marsh zone, where fluvial watercourses are influenced by tidal water levels at high tides.

4.1.30 The outfalls of all of these watercourses to the River Thames are controlled by sluice gates designed to preserve the integrity of the tidal River Thames defences and prevent high tide levels flowing up these watercourses.

4.1.31 Because of these sluices these areas are effectively defended from the tidal flood risk. However when tide levels are high the fluvial watercourses become 'tide-locked', meaning they cannot drain to the estuary and as such increase fluvial flood risk. The duration of tide-locking and extent of flooding depends on the return period of the tide.

4.1.32 The Beam River discharges to the River Thames via the Beam Sluice. The Beam Sluice has twin culverts with two flap gates and an electric sluice gate on each culvert. The Gores Brook discharges to the River Thames via Horseshoe Corner Sluice. All sluices are inspected by the Environment Agency twice a day at high and low tide.

*Residual Risk*

4.1.33 In the event of a failure of the existing outfall structures, reverse flow into the Gores Brook and Beam River would occur from the River Thames during periods of high water levels. This could cause flooding of the watercourses and adjacent floodplains.

4.1.34 However as has been shown, flooding from these sources would be not effect the site due to the distance and topography between the site and these watercourses.

*<u>Flooding from rising / high groundwater</u>*

4.1.35 The BGS Groundwater Flooding Susceptibility Map shows that the site has a negligible susceptibility to groundwater flooding (see Drawing 3).

4.1.36 The BGS data set is a hazard data set, not a risk data set, meaning that it does not provide any information about the likelihood of a groundwater flooding event occurring. It is noted that the BGS flood map is to be used as a screening tool, and should not be used to inform planning decisions.

4.1.37 The Environment Agency has confirmed that there have been no incidents of groundwater flooding reported to them and logged on their database (see Appendix 1).

4.1.38 The Barking and Dagenham Borough Council SFRA and the Barking and Dagenham Borough Council PFRA do not identify the site and/or areas within the vicinity of the site as being at risk of flooding from rising/high groundwater.

4.1.39 Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

4.1.40 No below surface infrastructure and buildings are proposed for the site, as such the site is not considered at risk of flooding from rising / high groundwater.

*Overland flow flooding*

4.1.41 The site is not situated near to large areas of poor permeability or areas with the geology and/or topography which may result in overland flow flooding. Overland land flow flooding tends to occur sporadically in both location and time.

4.1.42 The Risk Management Solutions (RMS) overland flow flood map shows that the site is not located in an overland flood zone (see Drawing 4). The Barking and Dagenham Borough Council SFRA shows that there is an overland flow path from the site into the River Thames.

4.1.43 Therefore, the site has a low risk of overland flow flooding and any residual risk will be managed through the surface water management and mitigation strategy provided in Section 5.8.

*Flooding from Artificial Drainage Systems/Infrastructure Failure*

4.1.44 Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. This type of flooding tends to occur sporadically in both location and time.

4.1.45 Thames Water is responsible for the disposal of waste water for this area. Information contained with regards to sewer flooding within the Barking and Dagenham Borough Council SFRA and the Barking and Dagenham Borough Council PFRA have been consulted as part of this FRA.

4.1.46 A number of water mains and sewers are located within the vicinity of the site.

4.1.47 The majority of sewers are built to the guidelines within Sewers for Adoption[4]. These sewers have a design standard to the 1 in 30 year flood event and therefore it is likely that the majority of sewer systems will surcharge during rainstorm events with a return period greater than 30 years (e.g. 100 years).

4.1.48 The historic sewer flooding records included within the Barking and Dagenham Borough Council SFRA show that there have been no recorded flooding incidents on the site.

4.1.49 Therefore, a low level of flood risk is posed by this source of flooding.

## 4.2 Environment Agency Flood Map

4.2.1 A review of the Environment Agency's flood map indicates that the site has a 'high probability' of flooding as the site is located within Flood Zone 3 with a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year (see Drawing 5).

[4] WRC (2006) Sewers for Adoption 6th Edition.

4.2.2 The Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development.

4.2.3 The Environment Agency Flood Zones and acceptable development types are explained in Table 4.2.

4.2.4 In the Technical Guidance to the NPPF (Table 1) appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in Table 2 and 3 of the Technical Guidance to the NPPF, the proposed development is classified as 'essential infrastructure'.

4.2.5 Table 4.3 of this report and Table 3 of the Technical Guidance to the NPPF state that 'essential infrastructure' uses are appropriate within Flood Zone 3 after the completion of a satisfactory FRA.

**Table 4.2: Environment Agency Flood Zones and Appropriate Land Use**

| Flood Zone | Probability | Explanation | Appropriate Land use |
|---|---|---|---|
| Zone 1 | Low | Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%) | All development types generally acceptable |
| Zone 2 | Medium | Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year | Most development type are generally acceptable |
| Zone 3a | High | A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year | Some development types not acceptable |
| Zone 3b | 'Functional Floodplain' | Land where water has to be flow or be stored in times of flood. SFRAs should identify this zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1% flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes) | Some development types not acceptable |

***Note:***

*The Flood Zones are the current best information on the extent of the extreme flood from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development.*

**Table 4.3: Flood Risk Vulnerability and Flood Zone 'Compatibility' as identified in Table 3 of the Technical Guidance to the NPPF**

| Flood Risk Vulnerability classification (see Table 1 of the Technical Guidance to the NPPF) | Essential Infrastructure | Water Compatible | Highly Vulnerable | More Vulnerable | Less Vulnerable |
|---|---|---|---|---|---|
| Zone 1 | Yes | Yes | Yes | Yes | Yes |
| Zone 2 | Yes | Yes | Exception test required | Yes | Yes |
| Zone 3a | Exception test required | Yes | No | Exception test required | Yes |
| Zone 3b 'Functional Floodplain' | Exception test required | Yes | No | No | No |

***Key:***
*Yes: Development is appropriate, No: Development should not be permitted.*

## 4.3 Historic Flooding

4.3.1 Drawing 6 shows that the site has been historically prone to flooding based upon observations of the types of geological deposits present. The Barking and Dagenham Borough Council SFRA shows that the site flooded in 1707, 1928 and 1953.

4.3.2 The Environment Agency has confirmed that the site was subject to tidal flooding on the 29th October 1707 when there was a breach of the flood defences known as the Dagenham Breach. The site was also subject to tidal flooding on the night of the 6th and morning of the 7th January 1928. There was overtopping in the area during a storm surge (which coincided with high fresh water flows). An approximate level in the Thames at the time was 4.93m AODN. The site was subject to tidal flooding, due to a storm surge in the North Sea, on the night of the 31st January into the morning of 1st February 1953. An approximate level in the Thames at the time was 5.10m AODN.

4.3.3 The pattern of flooding in this area has changed due to the presence of flood defence measures, therefore following development of this area and the construction of flood defences. Flooding would now only occur under different circumstances such as overtopping or a breach of the defences.

4.3.4 The British Hydrological Society "Chronology of British Hydrological Event[5]" has no records of flooding in the immediate area.

4.3.5 Anecdotal evidence from site employees indicates that there has been no evidence of flood waters on the site over the past forty years.

[5] http://www.dundee.ac.uk/geography/cbhe/

## 4.4 Existing and Planned Flood Defence Measures

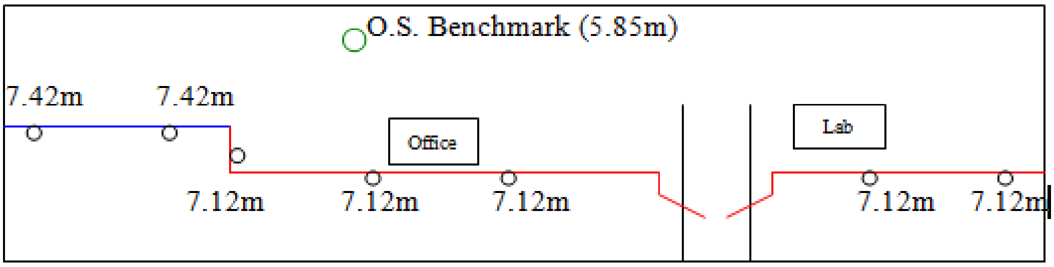
4.4.1 The Environment Agency flood map confirms that the site is protected by flood defence measures (see Drawing 6).

4.4.2 The River Thames defences along this section of the river provide a standard of protection of 1 in 1000 (see Appendix 1). This means that the defences protect against a tidal flooding event that has a 0.1% annual probability of occurring. This remains true up to the year 2070. After 2070 the standard of protection will decrease over time. However the Thames Estuary 2100 project has studied options to manage flood risk in the Thames estuary up to the year 2100. Public consultation of this study has finished, but you can access all the information here: http://www.environment-agency.gov.uk/research/library/consultations/106100.aspx.

4.4.3 The site is protected from Thames floodwaters by a river wall which extends along the southern boundary of the site and continues into the adjacent frontages either side. The consideration for a flood defence along the banks of the River Thames was initiated as a result of the 1953 London flood event. The river wall was constructed of steel sheet piling in 1977 designed (copies held on site) to measure 7.12mAOD on the section of the wall marked in red and 7.42mAOD in the section marked in blue.

4.4.4 The embankment is formed from compacted earth and has stone pitching at the base on the River Thames face. In addition significant lengths of similar flood defences at the same level are located to the east and west of the site providing a continuous line of flood protection for other areas of greater Barking. In some instances a portion of the flood defences in the vicinity of the site consist of a lower embankment topped with a low-level concrete flood defence wall.

4.4.5 The height of the flood wall has been verified at seven points using a Tilting Level NK1 (Engineer's Level) manufactured by Wild Heerburg AG by reference to a bench mark of 5.85mAOD on the TDG Dagenham building opposite the river wall (see attached Ordnance Survey map). There is a gate within the flood defence to allow access onto the jetty. The height of the river wall relative to AOD was measured during April 2005 with the following readings:




4.4.6 Flapped and sluiced outfall arrangements to the River Thames are located on, Beam River, the River Ingrebourne (approximately 1.2km east of the Beam River) and the Havering New Sewer. These arrangements can be used to control flows in the watercourses and to prevent inflow from the River Thames during high water levels.

4.4.7 Further information is provided in Section 5.

4.4.8 In 2005, the estimated Standard of Protection (SoP) on the Gores Brook was for a 10% AEP (1 in 10 year) flood event.

## 4.5 Current Flood Risk

4.5.1 The principal flood risk to the site is tidal flooding from the River Thames.

*River Thames - Actual Risk*

4.5.2 The direct application of the tidal water level is not technically appropriate at this site as this does not recognise the presence of the flood defence measures currently in place which have a minimum crest level of 7.10mAOD. If these remain intact, then the site is currently not at risk of flooding for all events up to and including the 1 in 1000 year event. There is a minimum freeboard of 0.58m above the current 1 in 1000 year water level of 6.52mAOD.

4.5.3 If climate change is taken into account the site is not at risk of flooding for all events up to and including the 1 in 200 year event up to 2107. There is a minimum freeboard of 0.22m above the current 1 in 200 year water level of 6.88mAOD in 2107. The flood defences measures would only be overtopped in 2107 for the 1 in 500 year and greater events.

*River Thames - Residual Risk*

4.5.4 There is a residual tidal flood risk posed to the site if the flood defence measures were to be overtopped and/or breached due to a tidal surge and wave action. The overtopping and/or breaching and the consequences would be dependent upon a number of factors including the magnitude of the event (i.e. River Thames water level), location of overtopping and/or breaching, extent and the emergency response. The likelihood of such residual risks are very small, however the scale of consequences from rapid inundation and deep water in heavily urbanised areas mean that these residual risks must be considered.

4.5.5 The site would be inundated with floodwater if the flood defence measures were to be overtopped and/or breached, to a maximum water depth of 2.34m during the 1 in 200 year event and to a maximum water depth of 2.82m during the 1 in 1000 year event.

4.5.6 The majority of the site would be inundated with floodwater to a maximum water depth of 2.66 m during the 1 in 200 year event in 2055, to a maximum water depth of 3.13m during the 1 in 1000 year event in 2055.

4.5.7 the whole of the site would be inundated with floodwater to a maximum water depth of 3.18m during the 1 in 200 year event in 2107 and to a maximum water depth of 3.67m during the 1 in 1000 year event in 2107.

4.5.8 The velocity of floodwater would be expected to highest directly behind the flood defences within the rapid inundation zone if the overtopping and/or breaching was to occur adjacent to the site which is extremely unlikely.

4.5.9 The Barking and Dagenham Borough Council SFRA has modelled the residual flood risk due to a breach in the flood defences. The flood hazard has been calculated as a product of depth and velocity in accordance with Table H1 (Defra FD2320). This shows that the flood hazard rating would be >2.5 – Extreme: Dangerous for all.

4.5.10 An approximation of the time of inundation (following a breach failure of the River Thames defences) was carried out as part of the Barking and Dagenham Borough Council SFRA. The site would be inundated in up to 20 hours.

4.5.11 The period in which flood flows will take to inundate an area is a key factor when considering risk. Clearly an available flood warning time of greater than 12 hours will enable the site to take proactive action to reduce the potential damage to property, and to evacuate to markedly reduce the potential risk to life.

4.5.12 The site has a ‘high probability’ of flooding as the site is located within Flood Zone 3 with a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

4.5.13 The proposed development is classified as ‘essential infrastructure’, ‘essential infrastructure’ uses are appropriate within Flood Zone 3 after the completion of a satisfactory FRA.

# 5.0 Existing Flood Defence Measures

## 5.1 Condition of Flood Defences

5.1.1 The following is taken from Sections 5, 6 and 11 from the "TDG Thunderer Jetty Condition Survey Report" undertaken by Beckett Rankine Partnership (Marine Consulting Engineers) in January 2004. These sections relate to the condition of the flood defence.

## 5.2 River Wall

5.2.1 The river wall was constructed of steel sheet piling as part of the Thames flood defence raising works carried out in the late 1970s.

5.2.2 The river wall was split into two sections for surveying purposes, wall one and wall two; the flood gate has been treated separately. Wall one extends from the west, upstream, end of the site to the transverse wall section. This transverse section is also part of wall one. The main section of wall one was not accessible from the boat because, being set back from the main wall, it remained almost completely dry at high tide so the wall was surveyed on foot from the shore. The transverse section was also not accessible by boat as timber piles protect it. This wall was also surveyed on foot.

5.2.3 Wall two extends from the end of the transverse section to the east, downstream, end of the site. As the shore is not safe to walk in front of this wall, it was surveyed solely from the boat.

**Figure 5.1: East end of wall one**

5.2.4 The main section of upstream wall one is constructed from Larssen 10 B sheet piles. The transverse part is constructed from Frodingham sheet piles. From the thickness as measured, these appear to be Frodingham 4N sheet piles.

5.2.5 The main section is in good condition. It has a thin layer of rust but no deep corrosion. Thickness measurements show an average thickness of 11.9mm on the walls and 11.4 mm on the pans. The specified thickness of the original pile is 12.7 mm ±6% (11.9-13.5 mm).

5.2.6 There are three ladders along the length of the main section. The most easterly (downstream) ladder has deep corrosion to the bottom rung and finishes approximately 500mm above bed level. The other two ladders appear to be in good condition, although the west (upstream) ladder is not accessible from the shore due to the growth of vegetation.

5.2.7 The transverse section is in good condition with a thin layer of rust but no deep corrosion. Thickness measurements on the transverse part of this wall gave an average thickness of 9.7mm on the walls and 12.9mm on the pan. The specified thickness is 11.4mm ±6% (10.7-12.1 mm) on the walls and 14mm ±6% (13.2-14.8 mm) on the pan. There are no ladders on the transverse section of the wall, but it is accessible at low tide from the ladders on the main section.

5.2.8 Wall two is constructed from Frodingham piles for the majority of its length with the most easterly section being Larssen piles. From measured thickness, the Frodingham piles appear to be Frodingham 4N. Similarly, the Larssen piles appear to be Larssen 32W.

5.2.9 For the Frodingham sections, the specified thickness is 10.4 mm ±6% (9.8-11.0 mm) on the walls and 14 mm ±6% (13.2-14.8 mm) on the pan. The Larssen sections specified thickness is 10.5 mm ±6% (11.1-9.9 mm) on the walls and 17 mm ±6% (18.0-16.0 mm) on the pan

5.2.10 Steel thickness measurements were taken on the walls and pan every ten piles for the whole length of wall two. The average loss of thickness on the Frodingham sections is 1.5 mm on the walls and 0.5 mm on the pans. The Larssen sections have lost 1 mm on the pans and 1.5 mm on the pans. There are, however areas of deep corrosion at the mid tide level with up to 5 mm loss of section on the walls.

5.2.11 Wall two has a repeating inset designed to provide a location for mooring bollards. This consists of a ladder reaching to the bed next to a stepped back section of wall accessible by a shorter ladder. In this stepped back section is the bollard – where present. In total there are 18 insets, nine upstream of the jetty and nine downstream.

5.2.12 Counting downstream, insets one to ten each contain a bollard of the same design as the bollard on upstream jetty one. This is marked as a “T Type” bollard, but the shape corresponds to a “Bean type III”. Inset eleven is empty. Insets twelve to sixteen contain a mooring cleat. Insets seventeen and eighteen each contain a mooring ring.

5.2.13 The bollards, cleats and mooring rings are all in good condition, but the cleats in insets fourteen and fifteen are partially buried in debris as are the mooring rings.

**Figure 5.2: A typical inset, the bollard, safety chains and ladders are clearly visible**

5.2.14 The upstream half of wall two is tied back using anchor bars. These are at sporadically located at two levels, approximately four and five meters from the top of the wall. For the 15 first 100 piles, the ends of the tie bars are wrapped and their pressure distributed by a plate. The next 35, up to the jetty, are unwrapped and use a plate resting on two channels, back to back to distribute their load.

**Figure 5.3: Beneath the jetty approach landside – the high water mark can be seen**

### 5.3 Floodgate

5.3.1 The floodgate appears to be a more recent addition to the river wall and is in a correspondingly good condition. There is some minor bubbling in the paint on the back of the gate, which could indicate the initial stages of corrosion.

5.3.2 The gate consists of a swinging box section fabrication on heavy hinges surrounded by a rubber sealing strip. The lower skirt is lifted clear of the ground by three steel cables, it can be lowered to complete the seal by the use of a bottle jack which forms the mechanism on the back of the gate.

5.3.3 The skirt lowering mechanism has been quite badly damaged but can still be forced to work and appears to lower the skirt completely. When the mechanism is operated, a plate is supposed to slide out of a sensor and hence notify some part of the system that the skirt is down. This plate is bent out of place and does not slide smoothly; hence it is never wholly within the sensor. The gasket around the bottle jack is decayed and needs to be replaced.

5.3.4 The ground which forms the seal with the skirt has been damaged by vehicles and is pitted deeply enough to form puddles. This could impair the operation of the skirt seal.

**Figure 5.4: The rubber seal at the base of the flood gate**

5.3.5 The gate itself appears to operate satisfactorily. The side seals appear to be in good condition with no tearing or cracking.

**Figure 5.5: The flood gate open and closed**

## 5.4 Structural Integrity

5.4.1 It has been confirmed with the Environment Agency that part of the site is within an area that would be affected by failure of the tidal defences.

5.4.2 The flood defences are inspected twice a year to ensure that they remain fit for purpose. They must be maintained by their owners to a crest level of 7.1 m AOD (the Statutory Flood Defence Level in this reach of the Thames). The overall condition grade for defences in the area is 2 (Good), on a scale of 1 (very good) to 5 (very poor).

5.4.3 Visual inspections of the existing flood defences adjacent the site was undertaken as part of the site walkover. The existing flood defences were found to be in a generally good condition.

5.4.4 The results of the inspections means that the risk of failure of the River Thames tidal defences is very low.

## 5.5 Climate Change

5.5.1 The flood defences protect the site for all events up to and including the 1 in 1000 year (plus climate change) event.

5.5.2 The impact of climate change on the 1 in 1000 year flood level provided by the Environment Agency in 2005 has been assesses in accordance with the NPPF, as shown below:

- 1 in 1000 year – 6.52mAOD;
- 1 in 1000 year plus climate change – 7.04mAOD (throughout the lifetime of the development i.e. 60 years);
- Minimum flood defence level – 7.10mAOD.

5.5.3 It can be seen that there is a minimum freeboard of 0.06m above the 1 in 1000 year (plus climate change) flood level throughout the lifetime of the development i.e. 60 years.

5.5.4 Therefore, it is not necessary to bring the flood defences up to the life expectancy of the development. The flood defences ensure the safety of the facility and occupants for the lifetime of the development.

5.5.5 The TE2100 report (Six Year Environment Agency Tidal Flood Risk Study on the River Thames) states that the policy for this area of the region is to take further action to sustain current scale of flood risk into the future (responding to potential increases in flood risk from urban development, land use change, and climate change).

5.5.6 The River Thames defences along this section of the river provide a standard of protection of 1 in 1000. This remains true up to the year 2070. After 2070 the standard of protection will decrease over time. However the Thames Estuary 2100 project has studied options to manage flood risk in the Thames estuary up to the year 2100.

# 6.0 Site Drainage

## 6.1 Surface Water Drainage

6.1.1 It is recognised that consideration of flood issues should not be confined to the floodplain. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. For example, replacing vegetated areas with roofs, roads and other paved areas can increase both the total and the peak flow of surface water runoff from the development site. Changes of land use on previously developed land can also have significant downstream impacts where the existing drainage system may not have sufficient capacity for the additional drainage. This section considers the existing drainage system at the application site and potential impacts resulting from the development.

6.1.2 A surface water management strategy for the development will be required to manage and reduce the flood risk posed by the surface water runoff from the site. The developer will be required to ensure that any scheme for surface water should build in sufficient capacity for the entire site.

6.1.3 There are three possible options to discharge the surface water runoff in accordance with requirement H3 of the Building Regulations 2000[6]. Rainwater shall discharge to one of the following, listed in order of priority:

- an adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,
- a watercourse; or where that is not reasonably practicable,
- a sewer.

6.1.4 An assessment of the surface water runoff rates has been undertaken, in order to determine the surface water options and attenuation requirements for the site. The assessment considers the impact of the site compared to current conditions. Therefore, the surface water attenuation requirement for the developed site can be determined and reviewed against existing arrangements.

6.1.5 The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development, unless specific off-site arrangements are made and result in the same net effect.

## 6.2 Existing Drainage System

6.2.1 The current drainage at the site incorporates a series of gullies, which drain into the private surface water sewer of the industrial estate in which the site is located.

6.2.2 It is understood that the existing drainage infrastructure at the site efficiently and effectively manages surface water runoff generated at the site. As there is no history of surface water flooding at the site, it is likely that the current drainage system is sufficient for the current site use.

[6]Office of the Deputy Prime Minister, The Building Regulations 2000.

## 6.3 Current Runoff Rate

6.3.1 The majority of rainfall discharges to the industrial estate's private surface water sewer, where it is treated in the onsite treatment plant and discharged off site to the Thames Water sewer at a rate of $18m^3$/hr.

## 6.4 Post-Development Runoff Rate

6.4.1 The amount of impermeable surfaces on site will increase as the new tank storage areas will have concrete floors, as oppose to their current condition which is made ground.

6.4.2 As is at present runoff from these areas has the potential to contain contaminants and as such passes through the sites treatment plant prior to discharge to sewer.

## 6.5 Post-Development Site Drainage

6.5.1 The surface water runoff from the developed site will be no different to present, as all runoff will pass through the sites water treatment plant and be discharged at the consented rate of $18m^3$/hr.

6.5.2 Should extreme rainfall events occur (100yr +30% climate change) rainfall would be held within the containment bunds which are 2.0-2.5m in height, and then pumped or gravity released into the treatment plant, prior to discharge to the sewer.

6.5.3 The surface water drainage network will therefore manage the surface water runoff from the site and therefore, the flood risk from this source. There will be no increase in surface water run-off or exacerbation of off-site risk as a result of the development.

6.5.4 It is understood that the existing drainage infrastructure at the site efficiently and effectively manages surface water runoff generated at the development site. As there is no history of surface water flooding at the site it is likely that the current drainage system is sufficient for the proposed use.

6.5.5 The current drainage at the site incorporates a series of gullies for roadways which drain directly to the river Thames via an interceptor. No changes to this existing infrastructure are proposed.

# 7.0 Risk Management

## 7.1 Introduction

7.1.1 The flood risk at this location is considered suitable for 'essential infrastructure' developments within the NPPF. In this flood zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, the appropriate application of sustainable drainage techniques and the use of flood mitigation measures is recommended in accordance with NPPF and its Technical Guide.

7.1.2 As it is not possible to remove all of the risk posed to the proposed development site a number of strategies and mitigation measures are to be used to allow the site to be safely used for its intended use and to manage this residual risk.

7.1.3 The flooding sources will be managed and mitigated on the site by using a number of techniques, and mitigation strategies to manage and reduce the overall flood risk at the site, and not increase flood risk elsewhere.

7.1.4 A number of mitigation options will be used to ensure that developments will be safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the proposed development on flood risk generally; and;
- Minimal disruption to natural heritage.

## 7.2 Finished Land Levels and Safe Refuge

7.2.1 The floodplain will not be sufficiently altered. Flood storage and flood flow routes will not be affected due to the very limited amount of foundation raising taking place, earth works will be kept to a minimum.

## 7.3 Buffer Zone

7.3.1 A buffer strip adjacent to the top of the river banks will be required by the Environment Agency. A horizontal access strip adjacent to the River Thames will be retained.

7.3.2 This is required in order to retain access to the watercourses for the riparian owner and/or the Environment Agency to carry out its flood defence functions, protect the structural integrity of the flood defences and to provide an ecological buffer zone to the protect the river environment.

7.3.3 This will also help mitigate the flood risk at the site as it will provide areas of storage if the river banks are overtopped/breached.

### 7.4 Safe Access and Egress Routes

7.4.1 The NPPF requires that, where required, safe access and escape is available to/from new developments in flood risk areas. Access routes should be such that occupants can safely access and exit buildings in design flood conditions. These routes must also provide the emergency services with access to the development during a flood event and enable flood defence authorities to carry out any necessary duties during the period of flood.

7.4.2 The main access to the site is a wide 2-way road allowing for emergency service access whilst simultaneously allowing occupant egress.

7.4.3 The site has a parking policy whereby cars are only allowed to park facing the exit which can facilitate faster egress.

7.4.4 This route leads to the higher ground outside of the floodplain. Facilities such as community centres, shops etc are located at both of these locations which may be used in the event of a flood event.

### 7.5 Flood Warning and Evacuation Plan

7.5.1 The site is located in a flood risk area; the site participates in the Environment Agency flood warning telephone service. This is a free service that provides an automated voice message to one of three telephone numbers registered on the database.

7.5.2 The period in which flood flows will take to inundate an area is a key factor when considering risk. Clearly an available flood warning time of greater than 12 hours will enable the site to take proactive action to reduce the potential damage to property, and to evacuate to markedly reduce the potential risk to life.

7.5.3 Therefore, evacuation of the developed site would be possible on the receipt of a severe flood warning from the Environment Agency.

7.5.4 A separate Flood Warning and Evacuation Plan (FWEP) is currently in place at the site. The FWEP will set out the flood risk of the site, identify the roles and responsibilities of the Flood Wardens, provide details of the proposed flood actions and set out the roles and responsibilities of other bodies as well as providing contact details.

7.5.5 A copy of the plan is included in Appendix 4.

7.5.6 Therefore, evacuation of the developed site would be possible on the receipt of a severe flood warning from the Environment Agency who receives tidal warnings from the Storm Tide Forecasting Service (STFS). The published standard for advanced warning of general flooding is 2 hours however it is likely that the Environment Agency would provide advanced warning earlier than this to enable more comprehensive preparation.

## 8.0 Summary and Conclusions

### 8.1 Introduction

8.1.1 This report presents an FRA, in accordance with the NPPF, to support a planning application for the proposed development at Stolthaven, Dagenham. This has included an assessment of the surface water drainage requirements of the site.

8.1.2 The site is an existing storage terminal located on the northern bank of the River Thames comprising of a 150 tanks with the capacity to store up to 134,000 cubic metres of a range of liquid goods including petroleum products, solvents (including flammables), base oils (including lubricating and pharmaceutical grades), chemicals, and agricultural products.

8.1.3 The terminal consists of tanks, a jetty, warehouses, drumming and bulk container filling, laboratory services, blending, dilution and product heating facilities, and acts as a transfer station for incoming liquids which are predominantly shipped in by marine tankers via the River Thames and stored prior to distribution to local customers by road.

8.1.4 Stolthaven Dagenham Limited intends to undertake a phased site refurbishment programme for the terminal spanning over a period of four years. The refurbishment will involve demolition of old redundant buildings and associated infrastructure nearing the end of their useful lives and construction of industry best practice assets to enable the terminal to continue its business.

8.1.5 This report details the flood risk at the site and how any risk could be managed and mitigated to allow the site to be developed in support of the planning application for the development. The proposed scale of development may present risks of flooding on-site and/or off-site if flooding is not effectively managed.

### 8.2 Assessment of Flood Risk

8.2.1 The FRA has demonstrated the following:

- The principal flood risk to the site is tidal flooding from the River Thames.

*River Thames - Actual Risk*

- The direct application of the tidal water level is not technically appropriate at this site as this does not recognise the presence of the flood defence measures currently in place which have a minimum crest level of 7.10mAOD. If these remain intact, then the site is currently not at risk of flooding for all events up to and including the 1 in 1000 year event. There is a minimum freeboard of 0.58m above the current 1 in 1000 year water level of 6.52mAOD.
- If climate change is taken into account the site is not at risk of flooding for all events up to and including the 1 in 200 year event up to 2107. There is a minimum freeboard of 0.22m above the current 1 in 200 year water level of 6.88mAOD in 2107. The flood defences measures would only be overtopped in 2107 for the 1 in 500 year and greater events.

*River Thames - Residual Risk*

- There is a residual tidal flood risk posed to the site if the flood defence measures were to be overtopped and/or breached due to a tidal surge and wave action. The overtopping and/or breaching and the consequences would be dependent upon a number of factors including the magnitude of the event (i.e. River Thames water level), location of overtopping and/or breaching, extent and the emergency response. The likelihood of such residual risks are very small however, the scale of consequences from rapid inundation and deep water in heavily urbanised areas mean that these residual risks must be considered.

- The site would be inundated with floodwater if the flood defence measures were to be overtopped and/or breached, to a maximum water depth of 2.34m during the 1 in 200 year event and to a maximum water depth of 2.82m during the 1 in 1000 year event.
- In 2055 the majority of the site would be inundated with floodwater to a maximum water depth of 2.66 m during the 1 in 200 year event, to a maximum water depth of 3.13m during the 1 in 1000 year event.
- In 2107 the whole of the site would be inundated with floodwater to a maximum water depth of 3.18m during the 1 in 200 year event and to a maximum water depth of 3.67m during the 1 in 1000 year event.
- The velocity of floodwater would be expected to highest directly behind the flood defences within the rapid inundation zone if the overtopping and/or breaching was to occur adjacent to the site which is extremely unlikely.
- The Barking and Dagenham Borough Council SFRA has modelled the residual flood risk due to a breach in the flood defences. The flood hazard has been calculated as a product of depth and velocity in accordance with Table H1 (Defra FD2320). This shows that the flood hazard rating would be >2.5 – Extreme: Dangerous for all.
- An approximation of the time of inundation (following a breach failure of the River Thames defences) was carried out as part of the Barking and Dagenham Borough Council SFRA. The site would be inundated in up to 20 hours.
- The period in which flood flows will take to inundate an area is a key factor when considering risk. Clearly an available flood warning time of greater than 12 hours will enable the site to take proactive action to reduce the potential damage to property, and to evacuate to markedly reduce the potential risk to life.
- The site has a 'high probability' of flooding as the site is located within Flood Zone 3 with a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- The proposed development is classified as 'essential infrastructure', 'essential infrastructure' uses are appropriate within Flood Zone 3 after the completion of a satisfactory FRA.

## 8.3 Risk Management

8.3.1 As it is not possible to remove all of the risk posed to the proposed development site a number of strategies and mitigation measures are to be used to allow the site to be safely used for its intended use and to manage this residual risk.

- Finished Floor Levels
- Buffer Zone
- Safe Access and Egress Routes
- Flood Warning and Evacuation Plan

8.3.2 Table 8.1 summarises the probability and consequence of flooding for the site with and without mitigation measures.

**Table 8.1: Probability and consequences of all sources of flooding**

| Flooding Source | Potential Source | Probability | Consequence & Impact Without Mitigation | Consequence & Impact With Mitigation | Comment |
|---|---|---|---|---|---|
| Fluvial flooding | Gores Brook, River Beam | None | Negligible | Negligible | None |
| Tidal flooding | River Thames | High | High | Medium | Mitigation measures used on site and flood defences |
| Flooding from rising / high groundwater | None | None | Negligible | Negligible | None |
| Overland flow flooding | None | None | Negligible | Negligible | None |
| Flooding from artificial drainage systems | Sewers | Low | Low | Negligible | Will not affect the whole site area |
| Flooding due to infrastructure failure | None | None | Negligible | Negligible | Negligible |

***Key:***

*Green – Negligible; Yellow – Low; Orange - Medium and Red - High.*

## 8.4 Site Drainage

8.4.1 In addition, the FRA has considered the potential impact of the development on surface water runoff rates.

8.4.2 The majority of rainfall discharges to the industrial estate's private surface water sewer, where it is treated in the onsite treatment plant and discharged off site to the Thames Water sewer at a rate of $18m^3$/hr.

8.4.3 The amount of impermeable surfaces on site will increase as the new tank storage areas will have concrete floors, as oppose to their current condition which is made ground. As is at present runoff from these areas has the potential to contain contaminants and as such passes through the sites treatment plant prior to discharge to sewer.

8.4.4 The surface water runoff from the developed site will be no different to present, as all runoff will pass through the sites water treatment plant and be discharged at the consented rate of $18m^3$/hr.

8.4.5 Should extreme rainfall events occur (100yr +30% climate change) rainfall would be held within the containment bunds which are 2.0-2.5m in height, and then pumped or gravity released into the treatment plant, prior to discharge to the sewer.

8.4.6 The surface water drainage network will therefore manage the surface water runoff from the site and therefore, the flood risk from this source. There will be no increase in surface water run-off or exacerbation of off-site risk as a result of the development.

### 8.5 Conclusion

8.5.1 Therefore this FRA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF.

8.5.2 The development should not therefore be precluded on the grounds of flood risk.

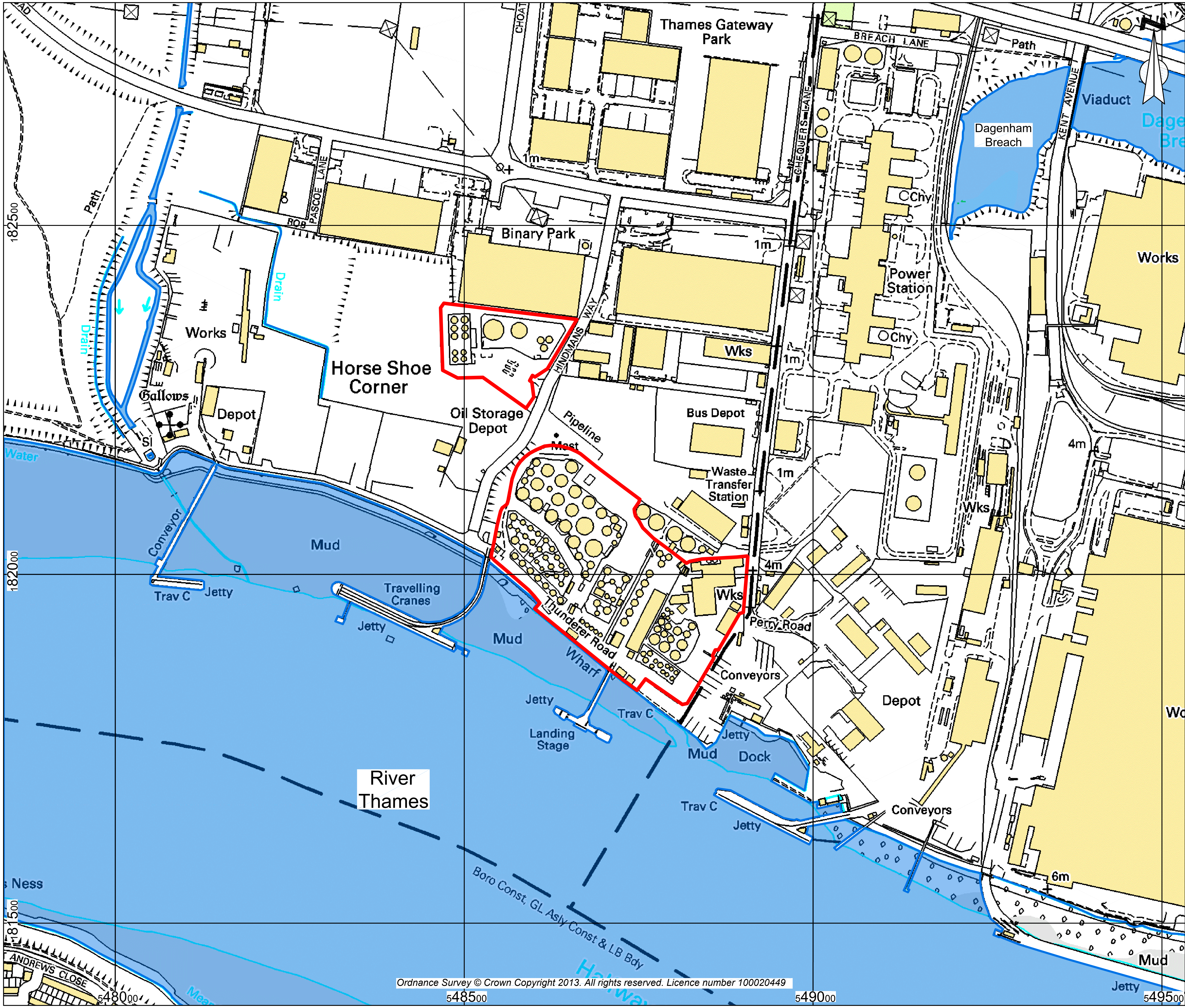

Key

● Site Location (TQ4868682100)

enzygo environmental consultants

STEP Business Centre, Wortley Rd, Sheffield, S36 2UH

| | | |
|---|---|---|
| CLIENT: Stolthaven | | |
| SCALE: 1:20,000@A3 | | PROJECT REF: SHF.314.001.D.001 |
| DRAWN: MG | CHECKED: MT | DATE: Feb 2013 |
| PROJECT: Dagenham Terminal | | |
| TITLE: Site Location Plan | | |
| FIGURE NO: 1 | | |





Key

Site Boundary

Surface Water Features

enzygo environmental consultants

STEP Business Centre, Wortley Rd, Sheffield, S36 2UH

CLIENT: Stolthaven

SCALE: 1:5,000@A3

PROJECT REF: SHF.314.001.D.002

DRAWN: MG

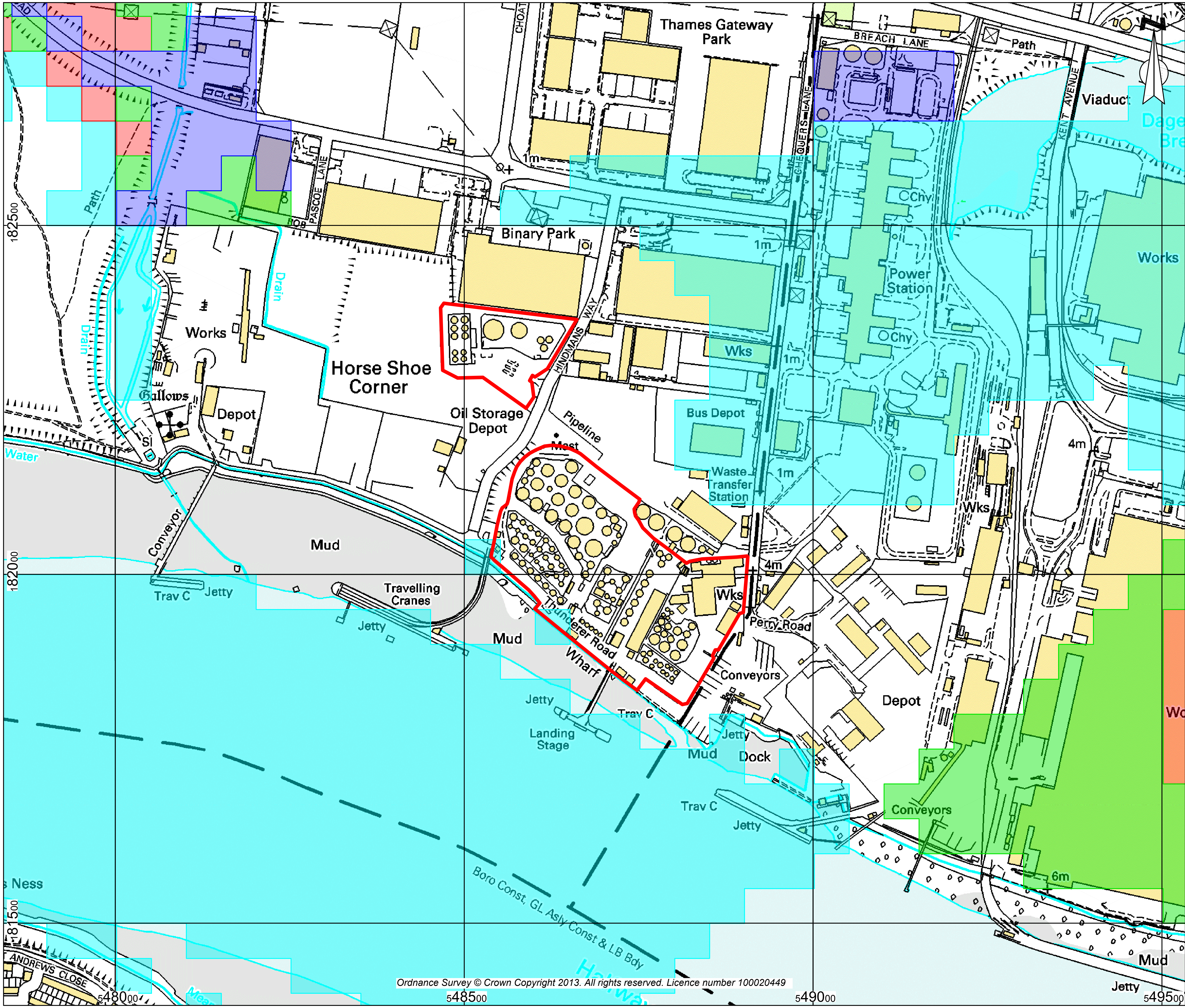
CHECKED: MT

DATE: Feb 2013

PROJECT: Dagenham Terminal

TITLE: Surface Water Features

FIGURE NO: 2





Key

- Site Boundary
- High Susceptibility
- Moderately High Susceptibility
- Moderate Susceptibility
- Low Susceptibility
- Negligible Susceptibility

enzygo environmental consultants

STEP Business Centre, Wortley Rd, Sheffield, S36 2UH

CLIENT: Stolthaven

SCALE: 1:5,000@A3

PROJECT REF: SHF.314.001.D.003

DRAWN: MG

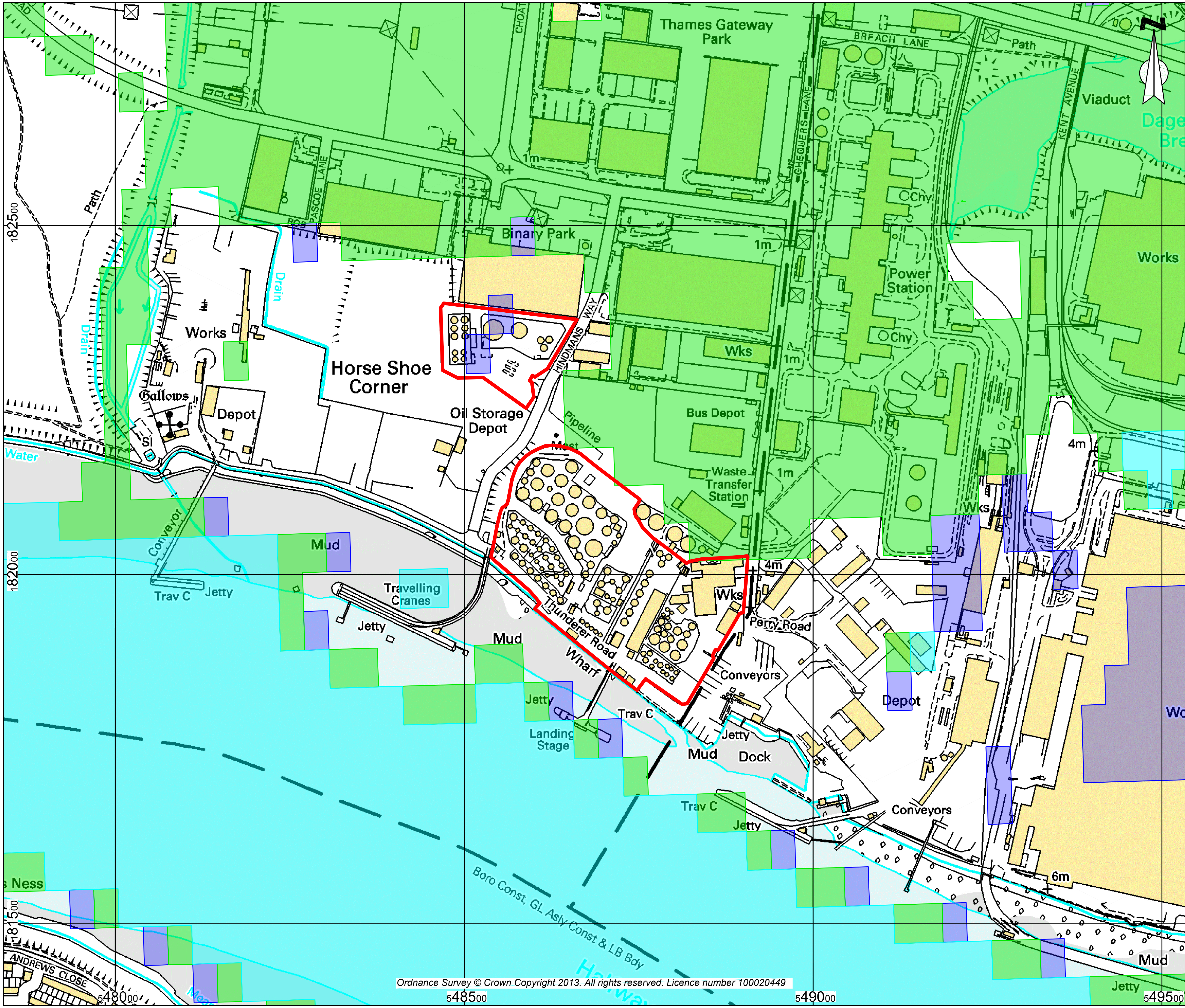
CHECKED: MT

DATE: Feb 2013

PROJECT: Dagenham Terminal

TITLE: BGS Groundwater Flooding Susceptibility

FIGURE NO: 3





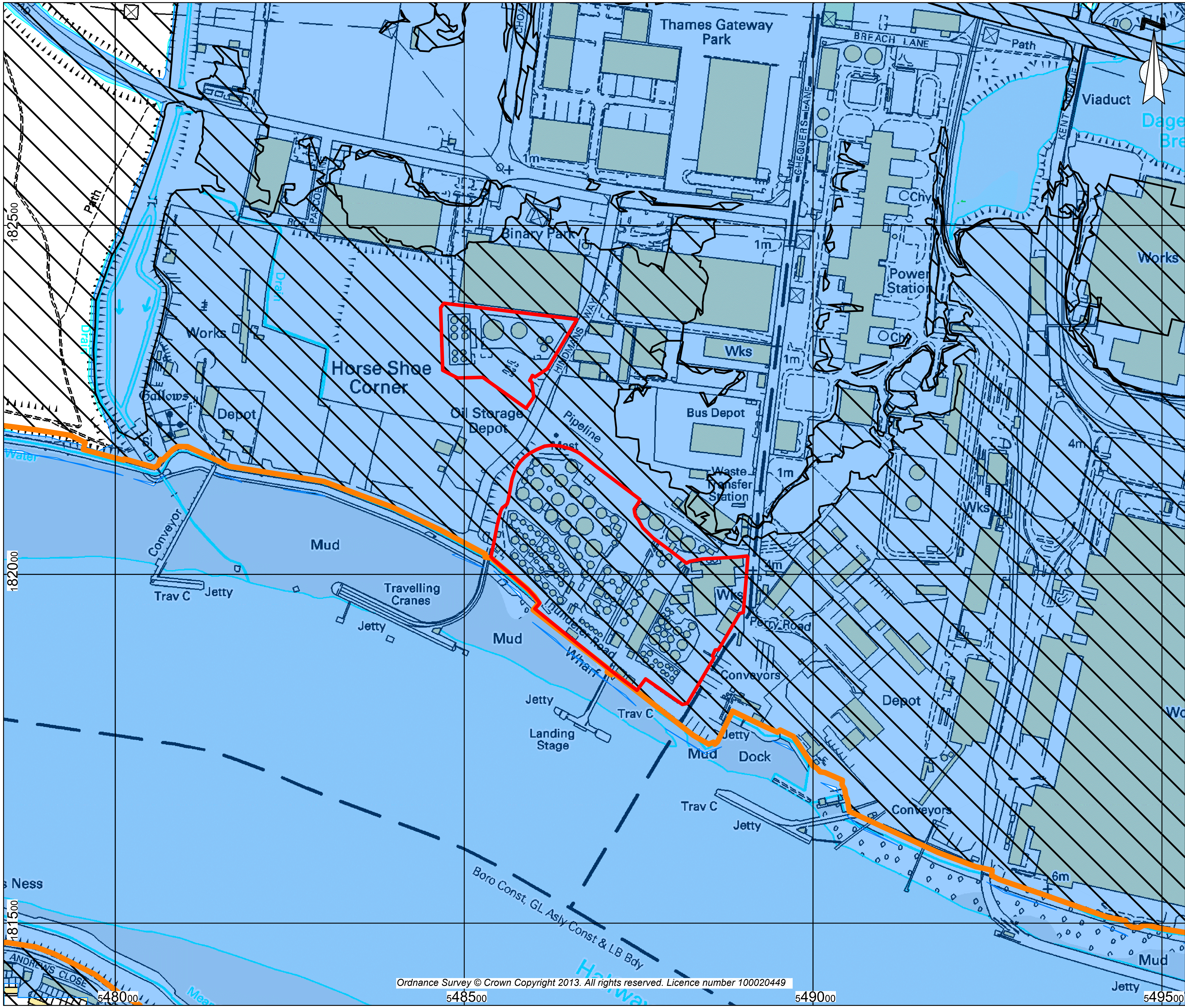
Key

- Site Boundary
- 1 in 75 Year Flood Event
- 1 in 100 Year Flood Event
- 1 in 1000 Year Flood Event

enzygo environmental consultants

STEP Business Centre, Wortley Rd, Sheffield, S36 2UH

| | |
|---|---|
| CLIENT: | Stolthaven |
| SCALE: 1:5,000@A3 | PROJECT REF: SHF.314.001.D.004 |
| DRAWN: MG | CHECKED: MG |
| DATE: | Feb 2013 |
| PROJECT: | Dagenham Terminal |
| TITLE: | RMS Overland Flow Flooding |
| FIGURE NO: | 4 |




Key

- Site Boundary
- Flood Defences
- Flood Zone 3 Areas which Benefit from Flooding
- Flood Zone 3
- Flood Zone 2
- Flood Zone 1

enzygo environmental consultants

STEP Business Centre, Wortley Rd, Sheffield, S36 2UH

| | |
|---|---|
| CLIENT: | Stolthaven |
| SCALE: 1:5,000@A3 | PROJECT REF: SHF.314.001.D.005 |
| DRAWN: MG | CHECKED: MG |
| DATE: | Feb 2013 |
| PROJECT: | Dagenham Terminal |
| TITLE: | Environment Agency Flood Zones |
| FIGURE NO: | 5 |



Key

Site Boundary

Geological Indicators of Flooding

enzygo
environmental consultants

STEP Business Centre, Wortley Rd, Sheffield, S36 2UH

CLIENT:
Stolthaven

SCALE:
1:5,000@A3

PROJECT REF:
SHF.314.001.D.006

DRAWN:
MG

CHECKED:
MT

DATE:
Feb 2013

PROJECT:
Dagenham Terminal

TITLE:
Geological Indicators of Flooding
(based on geological deposits)

FIGURE NO:
6

# Appendix 1 – Environment Agency Correspondence

creating a better place

Environment Agency

Mr Matt Travis
Enzygo

matt.travis@enzygo.com

**Our ref:** NE/2013/117261/02-L01
**Your ref:** -

**Date:** 08 May 2013

Dear Mr Travis

**Revised flood risk assessment submitted for the demolition and reconstruction of tank farms within the Stolthaven Terminal.**

**Stolthaven Dagenham Limited, Hindmans Way, Choats Road, Dagenham, Essex RM9 6PU.**

Thank you for submitting your draft Flood Risk Assessment (FRA). You are asked to quote our reference in any correspondence.

We find that the draft FRA is acceptable as there is no proposed change in surface water discharge rate and defences are fit for use in line with the lifetime of the development.

However, in line with the requirements of the recently published Thames Estuary 2100 plan (TE2100), consideration should be given about how the flood defences at the site could be raised in the future to an anticipated level of 8.2m AOD as a worst case scenario in line with projected climate change.

If you have any further queries please contact northlondonplanning@environment-agency.gov.uk, quoting the reference at the beginning of this letter.

Yours sincerely

**Mr Andy Goymer**
**Planning Advisor**

| | |
|---|---|
| Telephone: | 020 7091 4066 |
| E-mail: | northlondonplanning@environment-agency.gov.uk |
| Based at: | Eastbury House, 9th Floor, 30-34 Albert Embankment, London SE1 7TL |
| Postal address: | Apollo Court, 2 Bishops Square Business Park, St Albans Road West, Hatfield AL10 9EX |

End

## Matt Travis

**From:** NET Enquiries <NETenquiries@environment-agency.gov.uk>
**Sent:** 13 March 2013 14:49
**To:** Matt Travis
**Subject:** NE34291MR RE: Flood Risk Assessment - Pre App Enquiry - Stolthaven Dagenham Limited, Hindmans Way, Choats Road, Dagenham, Essex RM9 6PU
**Attachments:** NE34291MR.zip; Standard Notice.pdf; FRA-FCA advisory text.pdf

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Our reference NE34291MR

Dear Mr Travis

**Provision of Product 4 for site at Stolthaven Dagenham Limited, Hindmans Way, Choats Road, Dagenham, Essex RM9 6PU**

Thank you for your request of 27 February, 2013 to use Environment Agency data, Product 4, in the development of the Stolthaven Dagenham Limited, Hindmans Way site. The information is attached.

If you have requested this information to help inform a development proposal, then you should note the detail in the attached advisory text on the use of Environment Agency Information for Flood Risk Assessments / Flood Consequence Assessments.

**Supporting Information**

Your first point requesting a scoping response in terms of the scale and nature of the flood risk assessment;, will be answered by our Sustainable Places team, under our pre-application service. They will respond to your directly with their findings. They have 21 days from day we received your request to provide you with a response.

The flood defence at this site are Steel Sheet Piled walls with a Standard of Protection of 1:1000 (when first constructed).

There have been no incidents of groundwater flooding reported to us and logged on our database.
Please contact the relevant Local Authority for information the hold on pluvial flooding.

This information is provided subject to the enclosed Standard notice, which you should read.

If I can be of further help, please contact me.

We would be grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive: http://www.surveyshack.com/link/22717

Kind regards

Mish Robbins
External Relations Officer
Northeast Thames
Tel: 01707 632319
email: Netenquiries@environment-agency.gov.uk

On average we use only 4.85m$^3$ of water per FTE in our offices compared to a national average in the UK of 5.89m$^3$. Through a range of water saving measures, we have **cut our annual usage by 18%, saving 12,338m$^3$ of water** – enough to fill five Olympic swimming pools. Please do your bit to save water where you can.

---

**From:** Enquiries, Unit
**Sent:** 01 March 2013 09:17
**To:** Matt Travis
**Subject:** 130301/MB02 RE: Flood Risk Assessment - Pre App Enquiry - Stolthaven Dagenham Limited, Hindmans Way, Choats Road, Dagenham, Essex RM9 6PU

Dear Matt

Thank you for your enquiry regarding flood data.

For your information, I have passed your query to our local External Relations Team (Planning and Corporate Services) for advice. They will check whether we hold this information and they will be in touch with you shortly. The External Relations team have 20 working days from the date we receive your enquiry to provide a response, and they will get this to you as soon as possible.

Should you wish to contact them in the meantime, their details are below. Please quote your Enquiry Ref 130301/MB02 in your correspondence with us.

External Relations
Planning and Corporate Services
Environment Agency
South East Region, North East Thames Area
Apollo Court
2 Bishops Square Business Park
St Albans Road West
HATFIELD
AL10 9EX

Tel: 03708 506506

I trust the above is of assistance to you.

Kind Regards

**Matthew Bembridge**
Customer Service Advisor
Email Enquiries Unit
National Customer Contact Centre
Part of National Operations
Environment Agency
Tel: 03708 506506
Website: www.environment-agency.gov.uk/

**Follow us on**

**We would really like to know what you think of our customer service. Please can you spare five minutes to complete our short survey; your feedback will help us identify where we need to improve.**

**The survey is completely anonymous**.

http://feedback.environmentagency.uk.com/s/HZwQiDVgYzGSx3Z

**From:** Matt Travis [mailto:matt.travis@enzygo.com]
**Sent:** 27 February 2013 18:18
**To:** Enquiries, Unit
**Subject:** Flood Risk Assessment - Pre App Enquiry - Stolthaven Dagenham Limited, Hindmans Way, Choats Road, Dagenham, Essex RM9 6PU



Dear EA,

We are carrying out a Flood Risk Assessment for the demolition and reconstruction of tank farms within the Stolthaven terminal, find attached a location plan as a PDF.

Could you please provide me with the following:

- A scoping response in terms of the scale and nature of the flood risk assessment;
- Information on the current flood wall protection;
- Product 4 data if available in this area;
- Any details on groundwater or pluvial flooding

Kind Regards

Matt Travis BSc (Hons), MSc, MCIWEM, C.WEM, CEnv, CSci
Director

**Enzygo Ltd,**
STEP Business Centre
Wortley Road, Deepcar
Sheffield, S36 2UH

Mob: +44 (0) 7595 279935
Email: matt.travis@enzygo.com
Web: www.enzygo.com

**Registered Office:** Stag House, The Chipping, Wotton under Edge, GL12 7AD
**Registered in England & Wales registered number**: 06525159 VAT number: 931520846

## Product 4 (Detailed Flood Risk) for Stolthaven Dagenham Limited, Hindmans Way, Choats Road, Dagenham, Essex RM9 6PU
## Our ref: NE34291MR
## Date: 7 March 2013

**Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:**

i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and

ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

**Product 4 includes the following information:**

Ordnance Survey 1: 25 000 colour raster base mapping;

Flood Zone 2 and Flood Zone 3;

Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);

Model(s) extents;

FRA site boundary (where a suitable GIS layer is supplied);

Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)

Flood Map areas benefiting from defences (where available/relevant);

Flood Map flood storage areas (where available/relevant);

Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;

Statutory (Sealed) Main River (where available within map extents);

A table showing:

i) model node X/Y coordinate locations, unique identifiers, levels, flows and JFLOW depths;

ii) Flood defence locations unique identifiers and attributes; (supplied separately)

iii) Historic flood events outlines unique identifiers and attributes; and

iv) local flood history data (where available/relevant).

**Please note:**

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please read the enclosed guidance which sets out our requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at

http://www.environment-agency.gov.uk/research/planning/82584.aspx

If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at

http://www.environment-agency.gov.uk/research/planning/33580.aspx

Apollo Court, 2 Bishop Square Business Park, St Albans Road West, Hatfield, Hertfordshire, AL10 9EX
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk

Environment
y

# Modelled in-channel levels

NE34291MR

Modelled water levels in the Thames for locations close to your site are shown in the tables below. All levels are provided in **metres above Ordnance Datum Newlyn (mAODN)**. In modelling the levels, three main factors were considered; the astronomical tide, the surge tide and the flow coming from the non-tidal Thames. The location, or node, closest to your site is 3.08.

**Modelled River Levels (mAODN)**
**Location node 3.05**
**Grid ref: TQ 45694 81290**

| Year | Annual Probability of Occurrence | | | | | | |
|---|---|---|---|---|---|---|---|
| | 10% | 5% | 2% | 1% | 0.5% | 0.2% | 0.1% |
| 2005 | 5.31 | 5.50 | 5.75 | 5.95 | 6.15 | 6.41 | 6.61 |
| 2055 | 5.70 | 5.87 | 6.09 | 6.26 | 6.45 | 6.71 | 6.91 |
| 2107 | 6.28 | 6.42 | 6.63 | 6.79 | 6.98 | 7.25 | 7.46 |

**Modelled River Levels (mAODN)**
**Location node 3.08**
**Grid ref: TQ 48203 81714**

| Year | Annual Probability of Occurrence | | | | | | |
|---|---|---|---|---|---|---|---|
| | 10% | 5% | 2% | 1% | 0.5% | 0.2% | 0.1% |
| 2005 | 5.25 | 5.42 | 5.65 | 5.84 | 6.04 | 6.31 | 6.52 |
| 2055 | 5.63 | 5.79 | 6.00 | 6.17 | 6.36 | 6.62 | 6.83 |
| 2107 | 6.21 | 6.34 | 6.54 | 6.70 | 6.88 | 7.15 | 7.37 |

**Modelled River Levels (mAODN)**
**Location node 3.11**
**Grid ref: TQ 51166 80049**

| Year | Annual Probability of Occurrence | | | | | | |
|---|---|---|---|---|---|---|---|
| | 10% | 5% | 2% | 1% | 0.5% | 0.2% | 0.1% |
| 2005 | 5.13 | 5.30 | 5.55 | 5.75 | 5.95 | 6.22 | 6.44 |
| 2055 | 5.49 | 5.66 | 5.89 | 6.08 | 6.28 | 6.56 | 6.77 |
| 2107 | 6.14 | 6.28 | 6.48 | 6.64 | 6.82 | 7.08 | 7.29 |

## Model notes

**NE34291MR**

Model: **Tidal Thames Joint Probability Extreme Water Levels 2008**
Date of creation: **12 May 2008**

Notes:

Our water levels are created from a 2-D joint-probability computer hydraulic model. As this is a joint-probability model the confluence of different factors such as astronomical tides, tide surge and river flows have been taken into account. In summary, the calculation of extreme water levels involves two main stages:
1) Estimating a matrix of water levels at various locations (or model nodes) along the estuary 2) Calculating the statistical frequency (return period) with which a particular water level might be expected to occur at each of the model nodes.

This study modelled water levels to various annual probabilities (10%, 5%, 2%, 1%, 0.5%, 0.2% and 0.1%). Each of these probabilities have been modelled for present day (2005) and future years (2055 and 2107) taking into account DEFRA's climate change allowances as set out in the Planning Policy Statement 25 (PPS25).

Climate change allowances:

Some of the levels are lower for the more extreme probabilities when including climate change because the hydraulic model used to produce these levels takes into account the Thames Barrier closure rule (circumstances/conditions of closure) and assumes that it remains unchanged up to 2107. Increased sea levels and fresh water flows mean that the Thames Barrier closure rule will be met more often. This means that a smaller number of tides will be allowed to flow up into central London each year. The highest tides experienced upstream of the Thames Barrier occur when the circumstances are within a fine margin of meeting the closure rule, and the decision is taken not to close (a near closure event). As there will be fewer tides per year upstream of the Barrier, and the ratio of near closure levels to regular tidal levels within this smaller number of tides remains constant, the number of near closure events will decrease, and therefore so do the modelled levels.

## Historic flood data

**NE34291MR**

Our records show that the area of your site has not been affected by tidal flooding.
Information on floods that have affected areas near your site is provided in the table below, and is shown on the attached map:

| Historic Flood Events Unique ID | Flood Event Code | Flood Event Name | Start Date | End Date | Source of Flooding | Cause of Flooding |
|---|---|---|---|---|---|---|
| EA0617070300001 | EA061707 | TTD_FEO_1707 | 29/10/1707 | 29/10/1707 | Tidal River Thames | Breach of defence |
| EA0619280300029 | EA061928a | TTD_FEO_1928 | 06/01/1928 | 07/01/1928 | Tidal River Thames | Overtopping of defences |
| EA0619530300005 | EA061953 | TTD_FEO_1953 | 31/01/1953 | 01/02/1953 | Tidal River Thames | Overtopping and Breach of defence |

**Extra historic flood information:**

The site was subject to tidal flooding on the 29th October 1707 when there was a breach of the flood defences known as the Dagenham Breach.
The site was subject to tidal flooding on the night of the 6th and morning of the 7th January 1928. There was overtopping in the area during a storm surge (which coincided with high fresh water flows). An approximate level in the Thames at the time was 4.93m AODN.
The site was subject to tidal flooding, due to a storm surge in the North Sea, on the night of the 31st January into the morning of 1st February 1953. An approximate level in the Thames at the time was 5.10m AODN.

Please note the Environment Agency maps show flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Apollo Court, 2 Bishop Square Business Park, St Albans Road West, Hatfield, Hertfordshire, AL10 9EX
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk

# Flood Defences

**NE34291MR**

**General description:**

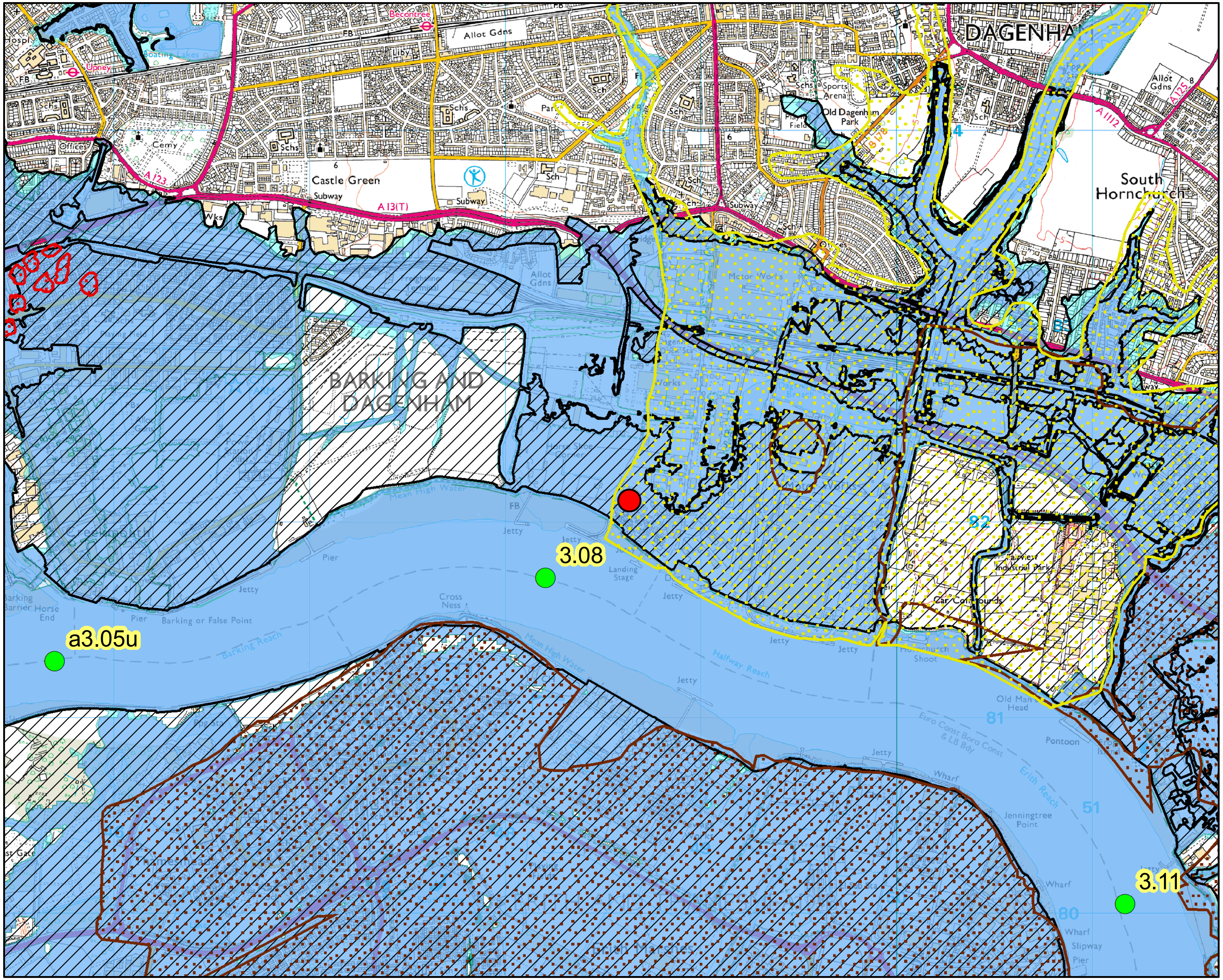
The defences along the tidal Thames in this area are all raised, man-made and privately owned. We inspect them twice a year to ensure that they remain fit for purpose. They must be maintained by their owners to a crest level of 7.1m AODN (the Statutory Flood Defence Level in this reach of the Thames). The overall condition grade for defences in the area is 2 (Good), on a scale of 1 (very good) to 5 (very poor).

**Standard of protection provided by the tidal defences**

The river Thames defences along this section of the river provide a standard of protection of 1 in 1000. This means that the defences protect against a tidal flooding event that has a 0.1% annual probability of occurring. This remains true up to the year 2070. After 2070 the standard of protection will decrease over time. However the Thames Estuary 2100 project has studied options to manage flood risk in the Thames estuary up to the year 2100. Public consultation of this study has finished, but you can access all the information here:
http://www.environment-agency.gov.uk/research/library/consultations/106100.aspx

**Additional Notes**

# Detailed FRA/FCA for Stolthaven Dagenham Terminal - created 07/03/2013 - NE34291MR




Environment Agency

0 280 560 1,120
Meters

N
W E
S

## Legend

- Site Location
- Model Nodes
- 1707 Flood Outline
- 1928 Flood Outline
- 1953 Flood Outline
- Areas Benefiting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2

**Flood Map Areas (assuming no defences)**

**Flood Zone 3** shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

**Flood Zone 2** shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.



**Contact Us:** National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

# Detailed FRA/FCA for Stolthaven Dagenham Terminal - created 07/03/2013 - NE34291MR


0 280 560 1,120
Meters

## Legend

Site Location

**TTD Defences SDL (mAODN)**

**SDL**

5.55

7

7.1

7.2

**Flood Map Areas (assuming no defences)**

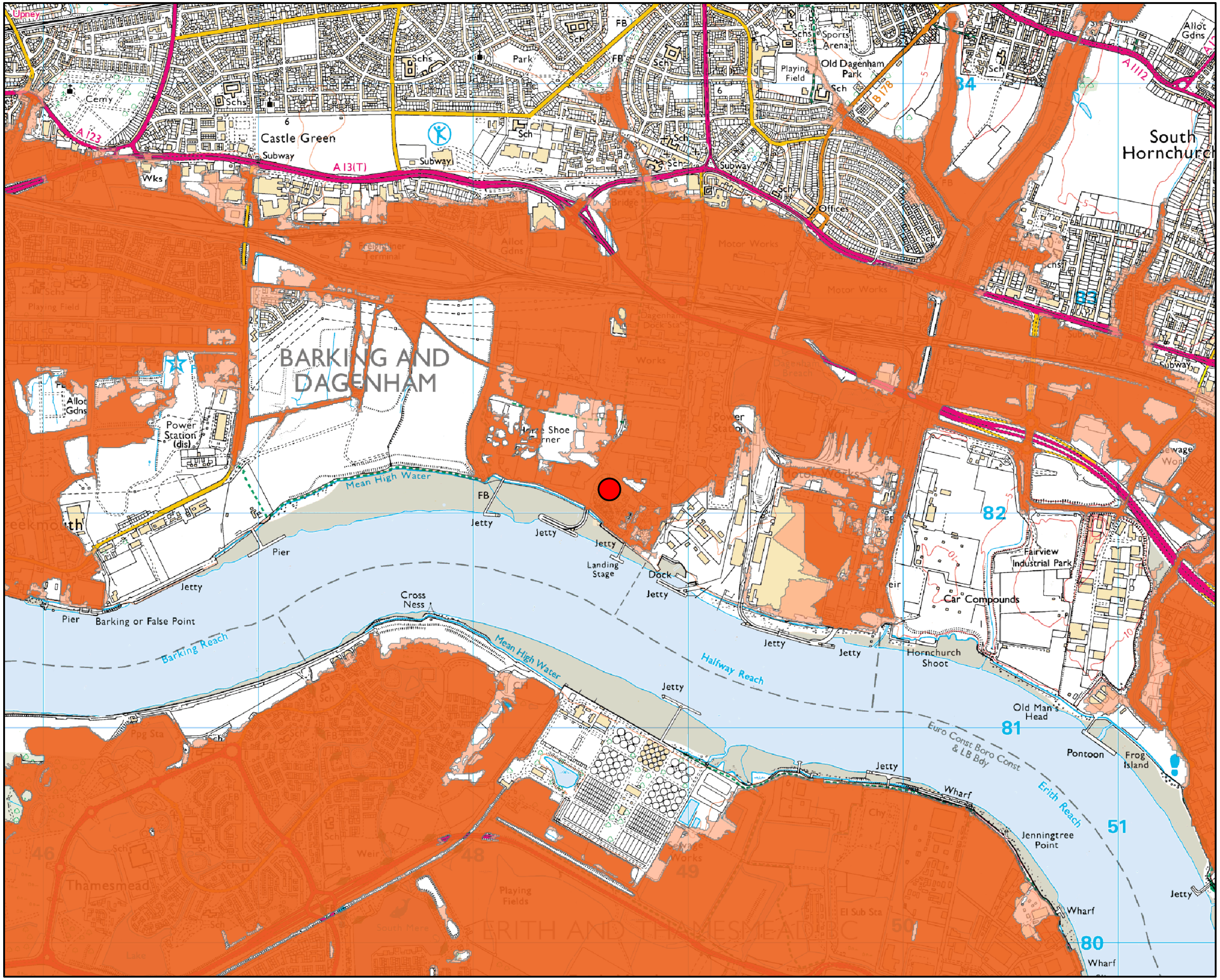
**Flood Zone 3** shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

**Flood Zone 2** shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.



**Contact Us:** National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

# Breach Modelling Map for Stolthaven Dagenham Terminal - 07/03/2013 - NE34291MR




Environment Agency

0 245 490 980
Meters

N W E S

## Legend

● Site Location

**Max Flood Extent**

0.5% AEP (1 in 200 year) 2107

0.5% AEP (1 in 200 year) 2005

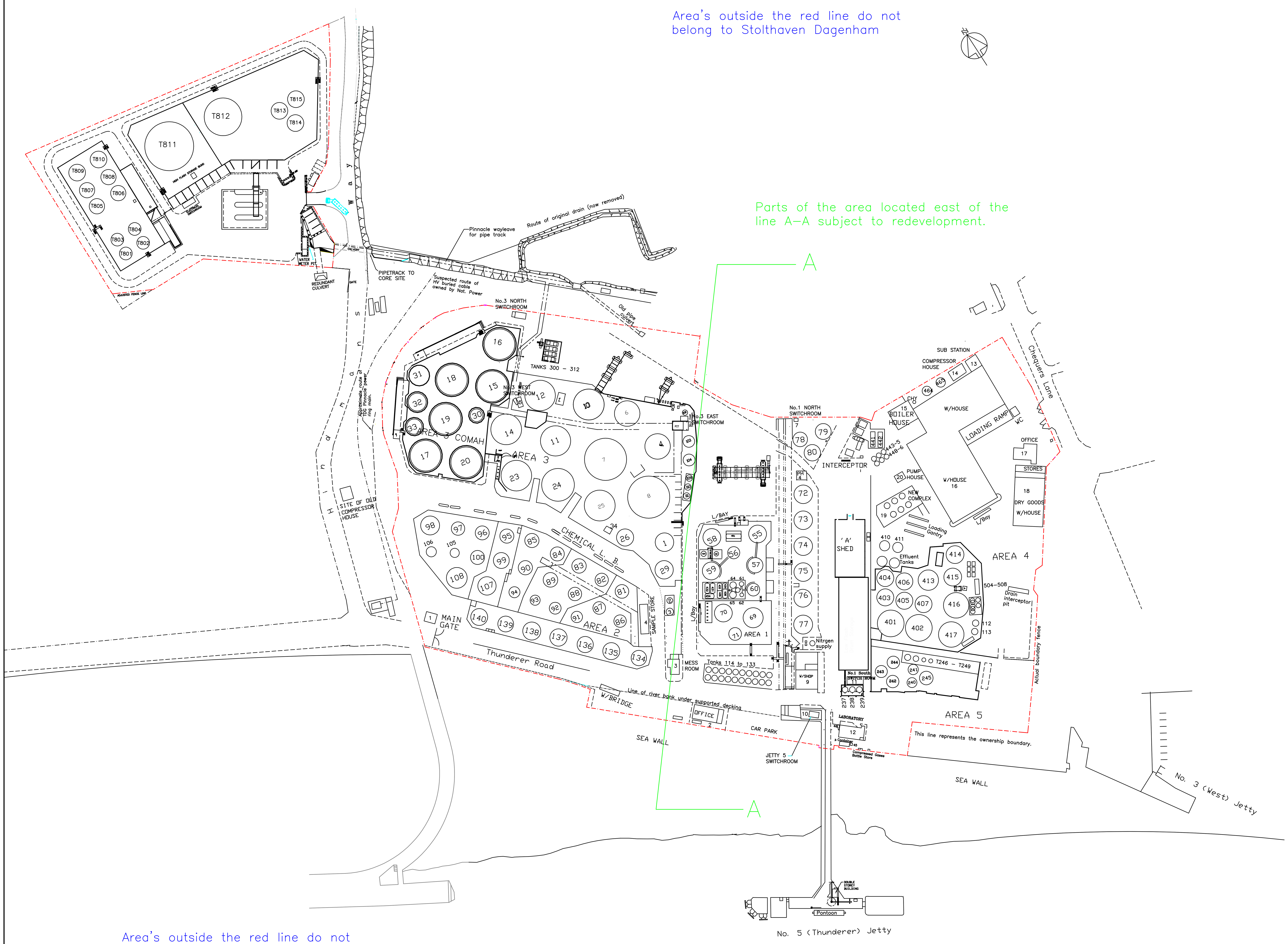
**Thames Tidal Breach Modelling 2013**

A modelled representation of tidal breaches along the Thames from Teddington to the Mar Dyke and River Darent, based on low floodplain topography. For hard defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, defences are assumed to breach down to the ground level behind the defence. The modelling is based on the Extreme Water Levels 2008 (current year 2005), and includes 0.5% (1 in 200) chance in any year. In the case of breaches downstream of the Thames Barrier, the 1 in 200 year plus climate change event (2107 epoch) was also modelled.



**Contact Us:** National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

# Appendix 2 – Existing and Proposed Site Layout



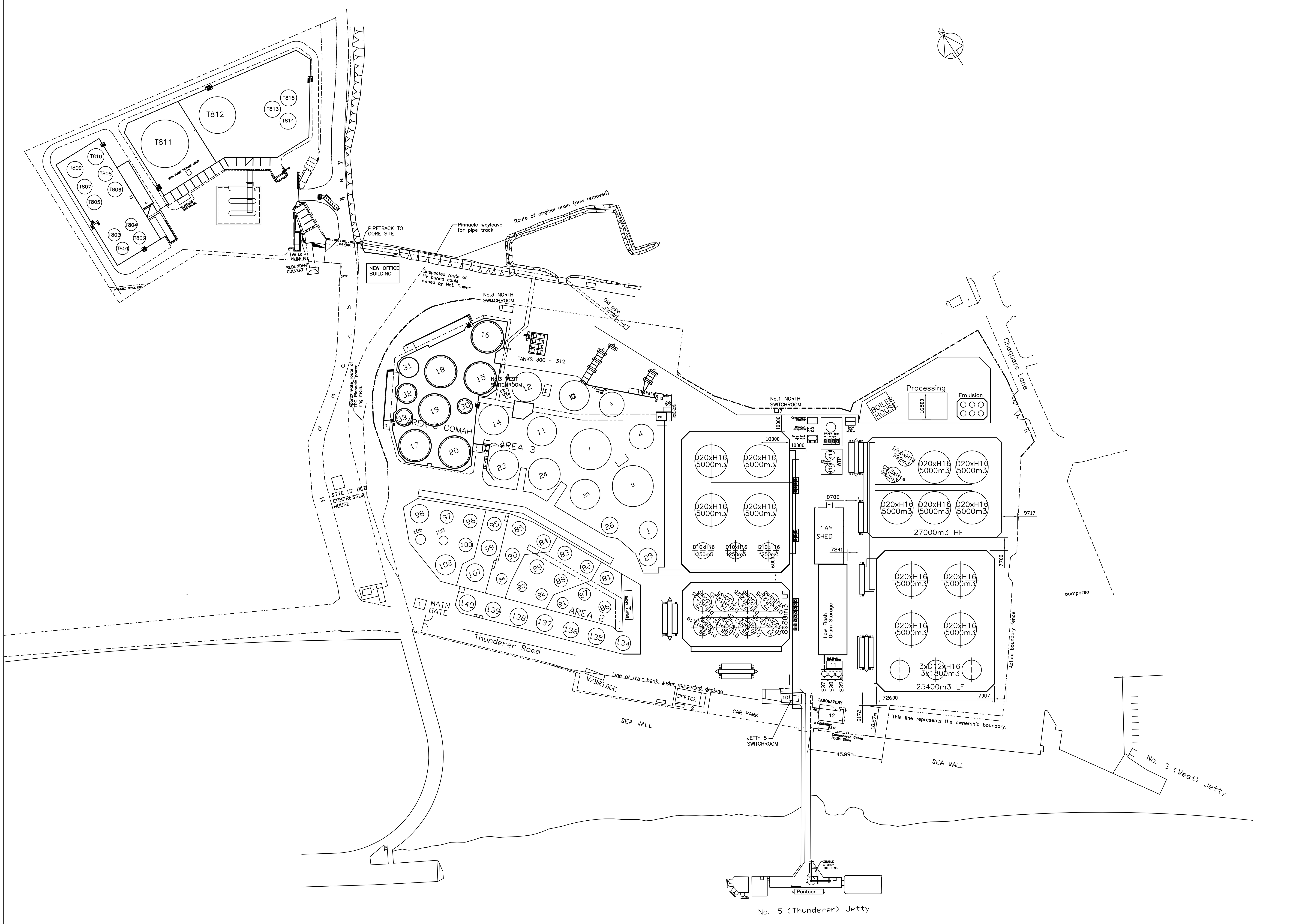
Area's outside the red line do not belong to Stolthaven Dagenham

ORIGINAL

| REV | DETAILS | Date |
|---|---|---|
| 1 | NEW DRAWING | |

Drawn | Date JULY 1993
Scale 1:1250 | CAD Name DAGSITE

Stolthaven
DAGENHAM TERMINAL




day-lay-001-r18-psc. dwg

NOTES

BUILDING REFERENCES

| No. | BUILDING | SIZE |
|---|---|---|
| 1 | MAIN GATE HOUSE | 6.70M x 5.80M |
| 2 | MAIN OFFICE – TOP FLOOR | 14.92M x 8.43M |
| | – GROUND FLOOR | 17.97M x 8.43M |
| 3 | MESS ROOM – TOP FLOOR | 8.40M x 5.20M |
| | – GROUND FLOOR | 10.97M x 6.88M |
| 4 | SAMPLE STORE | 17.68M x 4.87M |
| 5 | No.3 WEST SWITCHROOM | 4.77M x 1.83M |
| 6 | No.3 EAST SWITCHROOM | 3.86M x 2.90M |
| 7 | No.1 NORTH SWITCHROOM | 2.45M x 2.00M |
| 8 | 'A' SHED | 34.60 x 18.00M |
| 9 | WORKSHOP AND STORES | 20.40M x 12.80M |
| 10 | JETTY 5 SWITCHROOM | 5.54M x 2.00M |
| 11 | No.1 SOUTH SWITCHROOM | 9.60M x 4.55M |
| 12 | LABORATORY | 14.50M x 7.35M |
| 13 | SUB-STATION | 8.30M x 6.75M |
| 14 | COMPRESSOR HOUSE | 9.50M x 5.80M |
| 15 | BOILER HOUSE | 21.60M x 14.80M |
| 16 | PROCESS WAREHOUSE – GROUND LEV. | 38.30M x 31.00M |
| | – BANK LEVEL | 45.60M x 34.00M |
| | – GROUND PROC. | 15.8M x 15.00M |
| | – TOP FLOOR | 24.00M x 15.41M |
| 17 | OFFICE BUILDING – (DISUSED) | 13.40M x 7.65M |
| 18 | DRY GOODS W/HOUSE AND STORES | 37.00M x 18.40M |
| 19 | NEW COMPLEX BUILDING | 25.00M x 13.00M |
| 20 | PUMP HOUSE – (DISUSED) | 7.00M x 4.50M |

| REV | DETAILS | Date |
|---|---|---|
| 6 | new proposal Area 01 N-C-S – PSC | 30/04/2013 |
| 5 | Added Area 6 development | 26/08/1999 |
| 4 | Added Land to the North | 19/07/95 |
| 3 | Added new lowflash tankage | 26/04/95 |
| 2 | Drawing Updated | 11/01/95 |
| 1 | NEW DRAWING | |

Drawn JWD Date JULY 1993
Scale 1: 1250 CAD Name DAGSITE

SITE LAYOUT
DAGENHAM TERMINAL

DRG.NO.L483-D-000-001 5


GENERAL NOTES

| REV | DATE | DESCRIPTION | BY | CHKD | APPD |
|---|---|---|---|---|---|
| A | XX-XX-XX | ISSUED FOR COMMENT | XX | XX | XX |

Stolthaven
CHOATS ROAD, DAGENHAM
ESSEX, RM9 6PU
Tel: 02065 937211

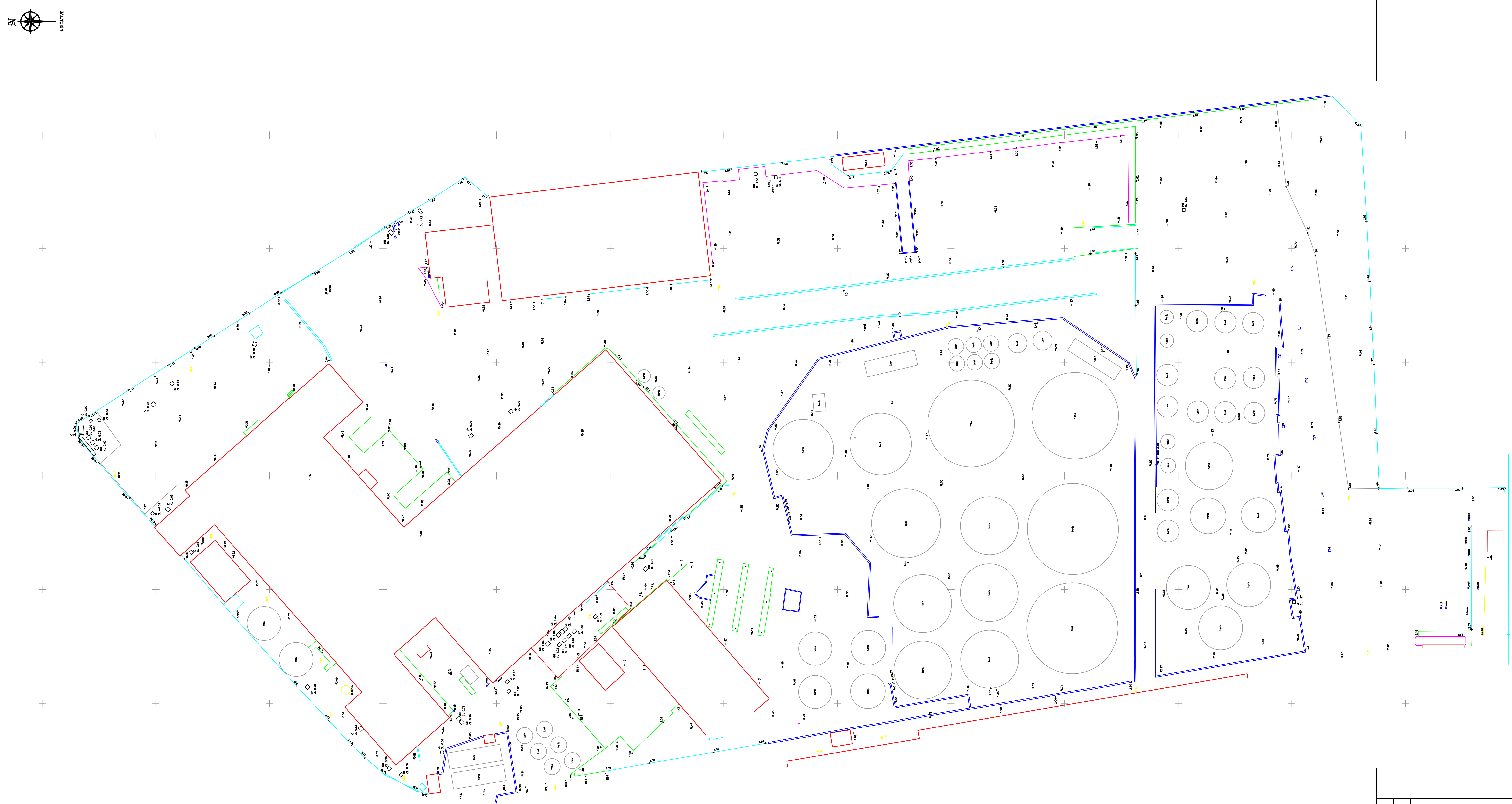
albright
Engineering Design

184 NEW ROAD– RAINHAM – ESSEX – RM13 8RS
TEL: 01708 559090
FAX: 01708 556690

PROJECT: TOPOGRAPHICAL SURVEY

TITLE: AREAS 1 & 3

| | | | |
|---|---|---|---|
| DATE | FEB 2013 | PROJECT No. | |
| SCALE | 1:500 @ A1 | DRAWING No. | |
| DRAWN BY | MB | CHECKED BY XX | APPD. XX |
| CLIENTS DRAWING No. | | XXXX | |




GENERAL NOTES

| REV | DATE | DESCRIPTION | BY | CHKD | APPD |
|---|---|---|---|---|---|
| A | 12/03/07 | ISSUED FOR INFORMATION | DC | DE | RC |

CLIENT

ENGINEERING

TDG EUROPEAN CHEMICALS
CHOATS ROAD, DAGENHAM
ESSEX. RM9 6PU Tel 020 8593 7211

Albright
Design Services Limited

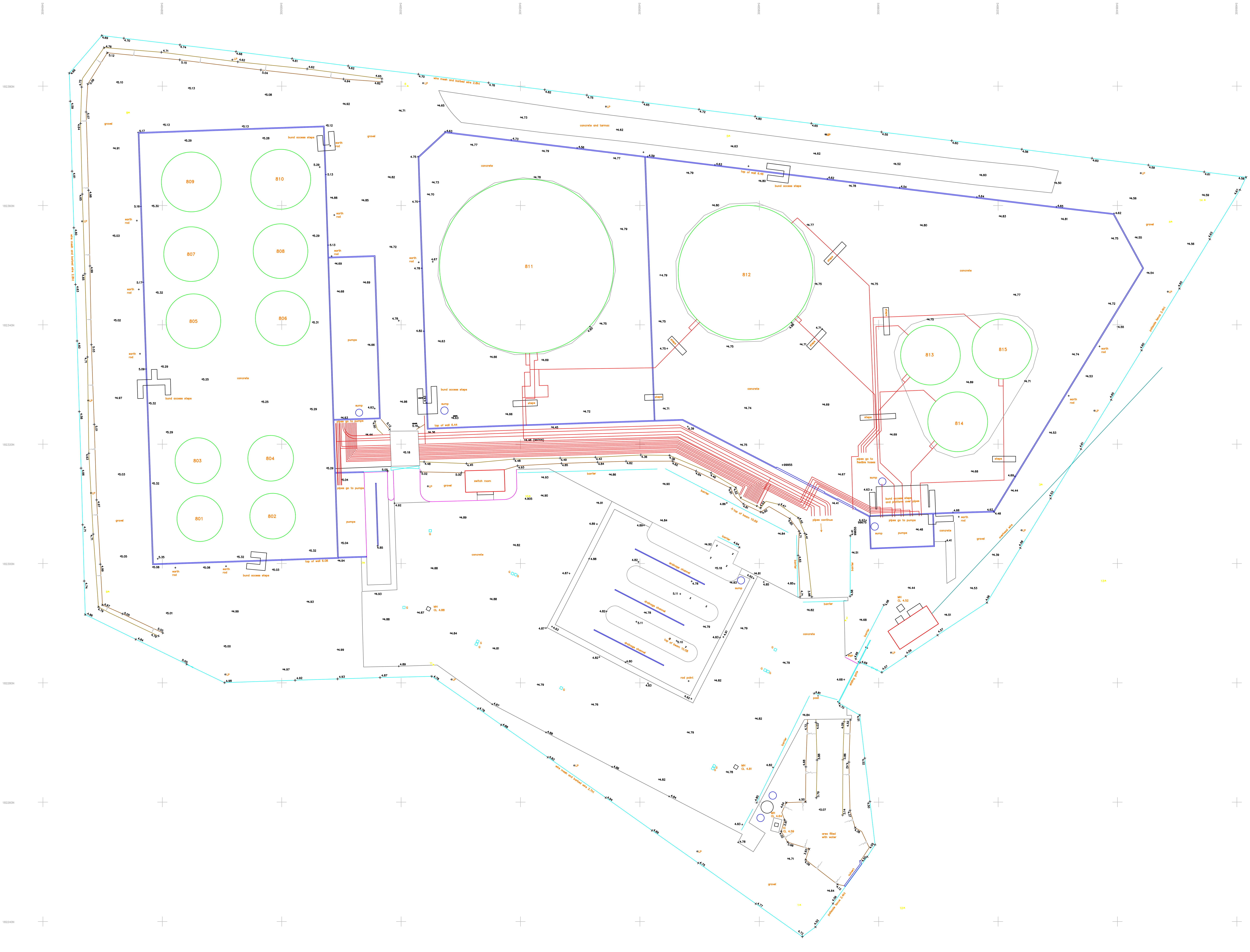
184 NEW ROAD– RAINHAM – ESSEX – RM13 8RS
TEL: 01708 559090
FAX: 01708 556690

PROJECT: FUELS TERMINAL INVESTIGATION

TITLE: TOPOGRAPHICAL SITE SURVEY
AREAS 4 & 5

| | | | |
|---|---|---|---|
| DATE 12-03-07 | PROJECT No. 1093 | | |
| SCALE 1:250 @ A0 | DRAWING No. A0-1093-003 | | |
| DRAWN BY DC | CHECKED BY DE | APPD. RC | |
| CLIENTS DRAWING No. | XXX | | |

FILE NAME : Albright-A0.DWG




NOTES:
NOT ALL PIPE WORK SHOWN ON SURVEY – ONLY AREAS DISCUSSED WITH ALBRIGHT DESIGN SERVICES TO SHOW MAIN PIPE RUNS. PIPE WORK SHOULD BE CHECKED IN CRITICAL AREAS.

SURVEY CONTROL CO-ORDINATES

| STN | EASTING | NORTHING | LEVEL |
|---|---|---|---|
| 1 | 548586.845 | 182242.800 | 4.756 |
| 2 | 548594.414 | 182290.456 | 4.702 |
| 3 | 548627.298 | 182313.247 | 4.503 |
| 4 | 548649.034 | 182357.294 | 4.584 |
| 5 | 548574.964 | 182371.674 | 4.678 |
| 6 | 548521.095 | 182380.025 | 4.817 |
| 7 | 548513.776 | 182300.128 | 4.987 |
| 8 | 548474.395 | 182375.582 | 5.014 |
| 9 | 548470.990 | 182295.297 | 5.066 |
| 10 | 548541.523 | 182311.302 | 4.905 |
| 11 | 548525.405 | 182283.035 | 4.883 |
| 12 | 548604.265 | 182242.295 | 4.482 |
| 13 | 548637.956 | 182297.119 | 4.365 |
| 14 | 548654.620 | 182360.929 | 4.664 |

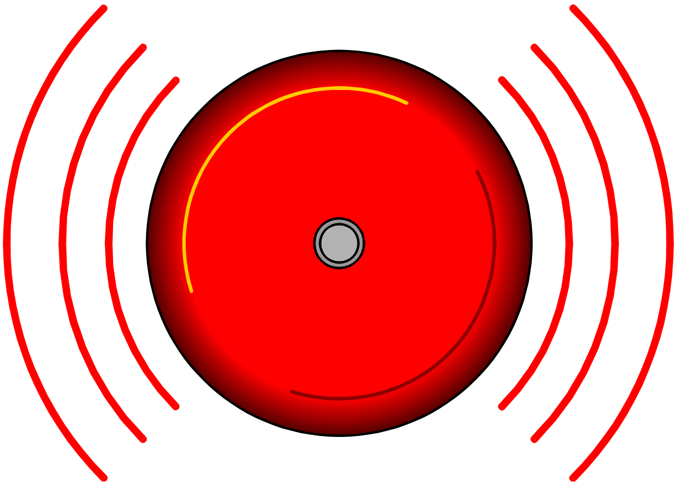
Title
TOPOGRAPHICAL SURVEY
TDG AREA 6
DAGENHAM
ESSEX

Datum
GRID–ORDNANCE SURVEY NATIONAL GRID (OSTN02)
LEVELS–ORDNANCE SURVEY (OSGM02)

Surveyed For
Albright Design Services Ltd
184 New Road
Rainham
Essex RM13 8SH

| Job No. | Revision | Date |
|---|---|---|
| 0803294 | – | March 2008 |
| **Scale** | **Sheet** | **Drawn** |
| 1:200 | A0 | Moon |

Essex Land Surveys Ltd
10 Sorrell Close
Goldhanger
Essex CM9 8BJ
Tel: 01621 788722



# STOLTHAVEN DAGENHAM

**Hindmans Way**
**Choats Road**
**Dagenham**
**Essex**
RM9 6PU

## ON-SITE EMERGENCY PLAN

Revised: 18th April 2012
Revised: 14th January 2013

## CONTENTS

**Section 1**

# Purpose

The objectives of the Emergency Plan are:

1. To contain and control so far as reasonably practical, any incident so as to minimise the effects, prevent injury to persons, and to limit damage to the environment and property;

2. To implement measures necessary to protect persons and the environment from the effects of major accidents;

3. To communicate the necessary information to the public and to the emergency services and authorities concerned in this area;

4. To provide for the restoration and clean-up of the environment following a major accident.

The objectives are required by the Control of Major Accident Hazards Regulations 1999 (COMAH) of which Stolthaven Dagenham is a top-tier site due to the nature and quantity of the liquid products stored in bulk tanks and packed containers.

**Section 2**

# Definition of Major Emergency Situations

An emergency situation exists where:

- There is a threat to the health and safety of persons inside the site.
- There is a threat of damage to buildings inside of the site.
- There is a threat of pollution to land, water or air.

**If any of the above incidents occur, the On-site Emergency Plan must be considered.**

A major emergency exists where:

- There is a threat to the health and safety of persons inside and outside of the site.
- There is a threat of damage to buildings outside of the site.
- There is a significant release to controlled waters (River Thames).

**If the any of the above incidents occur, the Off-site Emergency Plan must be considered.**

Factors determining whether to instigate the Off-site Emergency Plan include:

⇒ The size of the threat (quantity of spillage, hazardous properties of substance involved).

⇒ The wind direction and speed.

⇒ The proximity of a source of ignition if a flammable substance is involved.

**Section 3**

# Emergency Control Centre

The Emergency Control Centre for the site is located alongside the main office building by the weighbridge on Thunderer Road.

Depending on the location of the incident would determine what action would then be taken.

For a fire emergency, assembled personnel would then leave site via safest route with priority being to head for the gatehouse exit.

If this is not available due to the nature of the emergency, an alternative emergency escape route would be via gates at the Outbase office in Area 4 adjacent to Chequers Lane.

**Section 4**

# Key Personnel and Responsibilities

The following are the key personnel with responsibility and authority to initiate this on-site and off-site emergency plans:

- General Manager – Steve Walker
- Operations Manager – Les French
- Assistant Operations Manager – Keith Brown
- Quality and Safety Manager – Steve Breeds
- Admin Manager – Andy Holman
- Operations Supervisor – Gary St. Pier
  – Lee Warner
  – Bill Hoy
  – Ian Wiseman

All contact details are available in **Appendix 1.**

## **Site Main Controller** (Key Post 1)

The site main controller has overall responsibility for directing operations from the on-site Emergency Plan. This role will be undertaken by the Operations Manager. In his absence, the role will be undertaken by the Assistant Operations Manager, the Quality and Safety Manager or the Operations Supervisor (in that order).

The site main controller should go to the on-site ECC and, at that point take over responsibility for the overall control from the site incident controller.

As soon as the site main controller has been made aware of an incident, he will assess whether the incident is, or may develop into, a major accident. The on-site emergency plan should be activated, and if appropriate, the off-site plan as well.

**Duties**

1. If a major emergency exists, the site main controller should confirm that the emergency services have been summoned, the emergency alarm has been sounded and if appropriate, that the off-site plan has been initiated.

2. Decide whether evacuation of the site of all personnel is required.

3. Ensure that a roll call has been undertaken and all personnel are accounted for. Arrange for a search and rescue of missing persons if applicable.

4. Allocate key posts to Stolthaven Dagenham personnel as necessary and call in additional staff if required.

5. Review and assess developments to predict the most likely development of the incident.

6. Liaise with the Emergency Services if applicable.

7. Direct the shutting down of plant and evacuation of buildings, as appropriate, in consultation with the site incident controller and other key personnel.

8. Ensure that casualties are receiving adequate attention, arrange for additional assistance if required and in liaison with the police, ensure that relatives are kept informed of missing and injured people.

9. Establish contacts, as appropriate, with agencies able to give prior information on impending weather conditions.

10. Control traffic movement within the site.

11. Arrange for an ongoing record to be kept of the emergency and the responses undertaken to mitigate its effects, to provide evidence of the decisions made, the mitigatory action taken, and to ensure that lessons are learned from the response to the emergency.

12. Provide for the welfare needs of the establishment personnel, for example the provision of food and drinks, relief and the means to keep relatives informed.

13. Establish links with news media and issue information and statements, as appropriate, in liaison with the emergency services (MTI).

14. Ensure that full consideration is given to the preservation of evidence.

15. Control the rehabilitation of affected areas after the emergency.

**Site Incident Controller** (Key Post 2)

The site incident controller is responsible for taking control at the scene of the incident. This role will be taken by the Operations Supervisor or Operations Chargehand due to the requirement for knowledge of the site and operations.

The site incident controller should assume the responsibilities of the site main controller until relieved.

The function of the site incident controller is to direct all operations in the event of a major accident at the scene.

**Duties**

1. Review and assessment of developments at the scene to predict the most likely development of the incident.

2. Coordination of Stolthaven Dagenham personnel at the scene for rescue and fire fighting/ spillage control operations until the arrival of the emergency services, when control will be passed over to a senior fire officer.

3. Working with the fire services in the search for casualties.

4. Evacuation of non-essential workers to the appropriate assembly points **(see map of site - Appendix 10)**

5. Setting up a communications point with appropriate communications equipment, for contact with the Emergency Control Centre (ECC).

6. Giving advice and information to the emergency services at the scene such as product hazard information and stock levels.

7. Briefing the site main controller and keeping the on-site ECC informed of all significant developments.

**Other Key Personnel**

Many of these roles are short lived and one person will be able to fulfil the duties of more than one of them. All actions will be detailed on the Emergency Checklist in **Appendix 4** of this on site emergency plan.

**Roll Call Operator** (Key Post 3)
Administration Manager, General Clerk, other Manager, Operator.

**Duties**

1. Report to the Site Main Controller and establish if it is safe to collect the gatehouse logs detailing all personnel on site.

2. Collect logs if it is safe to do so and return to the assembly point.

3. Initiate a roll call of all personnel and pass the checked logs to the Site Main Controller highlighting any persons not accounted for.

**Telephone Operator / Incident Assistant** (Key Post 4)
General Clerk / Operator

**Duties**

1. Answer telephone, take messages in hard copy and relay key information to the Site Main Controller.

2. Record information as described by Site Main Controller and Site Incident Controller such as specific location of incident, products and quantities involved in the incident, products in adjacent tanks, etc.

**Fire Pump Operator** (Key Post 5)
First available trained personnel

**Duties**

1. Start fire pumps:
   Stolthaven Dagenham jetty pump can be started at one of the following four locations:
   a. On Stolthaven Dagenham jetty following the procedure displayed in the switch house.
   b. At entrance to jetty opposite the Lab side door.
   c. Supervisors Office
   d. At gatehouse.
   Jetty 7 pump to be started at security gate opposite gate house.

2. Check the water pressure in the fire main on the gauge or by opening a fire hydrant outlet to ensure the pumps have started. If there is no pressure, try starting the pump again.

3. Check spray curtain is operating (if low flash ship is being discharged).

4. Report back to the Site Main Controller of actions completed.

**Traffic Control Operator** (Key Post 6)
Operator, Chargehand,

**Duties**

1. Equip yourself with a radio, note book, pen and intrinsically safe torch if dark.

2. Obtain a copy of the gatehouse logs from the Site Main Controller.

3. On arrival of first emergency appliance, direct the Fire Officer to the Emergency Control Centre - this will normally be alongside the main office building by the weighbridge, unless evacuated for incident. **In these circumstances, the ECC could be either off site at the gatehouse or located in the Outbase office in area 4 and access may be via Chequers Lane.**

4. Inform the Site Main Controller of the arrival of emergency services by telephone or radio.

5. Only allow the emergency services onto the site. No other vehicles / persons should be allowed access unless otherwise authorised by the Site Main Controller.

6. Book personnel leaving site off visitor/staff list.

7. Ask any visitors and vehicles to wait in Choats Road and to keep the site entrances clear.

**Effluent Controller** (Key Post 7)
Chargehand, Operator.

**Duties**

1. Stop all effluent pumps in the area of the fire then monitor and advise the Site Incident Controller of the status of the fire water and / or spillage associated with the incident.

2. Ensure that all bund drains are closed unless controlled drainage of an area is taking place on the instruction of the Site Main Controller.

3. Ensure under no circumstances contaminated fire water or spillage in the area of the fire enters the blue coloured drains on the site.

4. Mitigate the effect of the possibility of contamination of other areas of the site by the use of the effluent system pumps or the use of mobile pumps.

5. Shut down Effluent plant.

**Fire Crew Operators** (Key Post 8)
Chargehand, Operator.

**Duties**

1. The Site Main Controller will designate a chief to lead the fire crew who will liaise with the Site Incident Controller upon arrival at the scene of the incident.

2. Collect the Rapid response fire unit.

3. Go to the nearest up-wind safe hydrant.

4. Provide cooling water to adjacent tanks / packs that contain flammable products if safe to do so.

5. If it is safe to do so, after an assessment of the incident conditions, undertake initial first-aid fire fighting until the Fire Brigade takes over. Do not use foam until instructed to do so by the Site Main Controller.

**Product Control Operator** (Key Post 9)
Chargehand, Operator.

**Duties**

1. Close off all valves feeding fire that are safely accessible.

2. Note carefully any valves that you have not been able to reach and inform the Site Incident Controller of their location.

3. Shut off steam to the area of the incident

4. Shut off compressed air to the area only if instructed by the Site Incident Controller.

**Pump & Equipment Crew** (Key Post 10)
Chargehand, Operator.

**Duties**

1. Retrieve and utilise as instructed by the Site Incident Controller all portable pumps and flexes pipes that may be required to transfer contaminated liquid from drains, interceptors or bunded areas into bulk tanks or other bunds within the site.

**Product Information Liaison** (Key Post 11)
Quality and Safety Manager, Laboratory Manager, Chemist.

**Duties**

1. Identification of potential hazards of tank or pack contents in or near the incident. This information is available in the Fire Information box. There are two relevant sections must be copied and passed to the fire services via the Site Main Controller.

**Section 5**

## Ownership of the On-site Emergency Plan

The Quality and Safety Manager of Stolthaven Dagenham has responsibility for preparing, reviewing and ensuring adequate testing of the on-site emergency plan. The Quality and Safety Manager also has responsibility for liaising with the London Fire Brigade Emergency Planning (LFB EP) which is responsible for preparing the off-site emergency plan.
The Site Quality and Safety Manager will facilitate all updating changes to the emergency plan including changes to personnel and telephone contact numbers.

**Section 6**

## Identification of Possible Incidents

From the identification of possible major accident hazards associated with the operation of the Stolthaven Dagenham (Section 3.3 of the COMAH Safety Report), **FIRE, FLOOD and/or SPILLAGE** are the most likely consequences resulting from a major accident. The Site Main Controller will assess the incident and determine if it is, or has the potential, to develop into a major accident. If this is the case, the on-site emergency plan will be instigated and if appropriate, the off-site emergency plan as well.

# Scenario Table

| Scenario | Initial Incident | Possible Escalation to | Procedure to be followed |
|---|---|---|---|
| 1 - Contaminants /Human Error:<br>• Line routed to wrong tank or incorrect loading arm or loading point used (crossover**).** | • Spillage if tank is overfilled.<br>• No significant reactions are foreseen resulting from a crossover. | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source.<br>• Damage to the environment if spread to drains/river/ground water. | • Fire<br>• Major Spillage<br>• Minor Spillage |
| 2 - External Events:<br>• Fire and/or explosion on board ship OR<br>• Aircraft impact due to proximity of London City Airport | • OFF SITE INCIDENT | • On site fire from pipeline blowback<br>• Jetty fire<br>• Large scale explosion/fire | |
| 3 – Leaks Caused By:<br>• Corrosion.<br>• Failure of hoses or joints.<br>• Human error.<br>• Pump failure.<br>• Road tanker drives away. | • Spillage | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source<br>• Damage to the environment if spread to drains/river/ground water | • Fire<br>• Major Spillage<br>• Minor Spillage |
| 4 – Overfilling/Human Error:<br>• Overfilling tank when offloading from ship.<br>• Overfilling road tanker when loading from a storage tank.<br>• Overfilling of storage tank from tank to tank transfer. | • Spillage | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source<br>• Damage to the environment if spread to drains/river/ground water | • Fire<br>• Major Spillage<br>• Minor Spillage |

| Scenario | Initial Incident | Possible Escalation to | Procedure to be followed |
|---|---|---|---|
| 5 – Human Error:<br>• Shut down of a discharge valve against ship pump or transfer valve. All valves are manual and are located on jetty / tank / manifold | • Rupture of pipework causing spillage on to jetty or into river<br>• Rupture of pipework causing spillage into bunded or non bunded area | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source<br>• Damage to the environment if spread to drains/river/ground water | • Fire<br>• Major Spillage<br>• Minor Spillage |
| 6 – Drum Puncture:<br>• One or more drums punctured by non Pyroban fork lift truck | • Spillage from Drum(s) into bunded or non bunded area | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source<br>• Damage to the environment if spread to drains/river/ground water | • Fire<br>• Major Spillage<br>• Minor Spillage |
| 7 – Puncture of pipeline<br>• Ship impact on jetty | • Potential spillage | • Possible fire on ship or jetty | • Fire<br>• Major Spillage<br>• Minor Spillage |
| 8 – Puncture/fracture pipework<br>• of pipelines or road tankers by impact with vehicles | • Potential spillage | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source<br>• Damage to the environment if spread to drains/river/ground water | • Fire<br>• Major Spillage<br>• Minor Spillage |

| Scenario | Initial Incident | Possible Escalation to | Procedure to be followed |
|---|---|---|---|
| 9 – Puncture/ Scrap yard<br>• Scrap from neighbouring scrap yard dropped onto pipeline, 100m of pipeline is vulnerable to this incident | • Spillage would be the result of damage to this pipeline. This could be flammable or dangerous for the environment<br>The scrap yard is no longer situated in this area and the land is currently disused. The pipeline is covered by CCTV and is monitored. When the land is reused this scenario will be reviewed in line with the new land use | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source<br>• Damage to the environment if spread to drains/river/ground water | • Fire<br>• Major Spillage<br>• Minor Spillage |
| 10 – Internal explosion caused by:<br>• Static spark ignition e.g. transfers & splash filling, lightning strike<br>• external sources e.g. hot work, electrical equipment and unsuitable vehicle engines | • Explosion | • Fire involving contents of the warehouse, where drums potentially could become missiles<br>• Fire involving ruptured pipelines/tanks, possible escalation to damage other tanks/pipes | • Fire |
| 11 – Flooding<br>• Extreme weather | • Flood | • Potential contamination of flood water with material which is classified as dangerous for the environment | • Flood |
| 12 – Human error leading to:<br>• Mal-operation of openings during routine and non routine maintenance procedures or normal operation. Error in opening drains, vents, sample points and trap door during pigging, pipe joints, tank man ways or hoses. | • spillage | • Fire in the event of the material being classified as flammable and coming into contact with an ignition source<br>• Damage to the environment if spread to drains/river/ground water | • Fire<br>• Major Spillage<br>• Minor Spillage |

**Section 8**

# General Procedures

## Immediate Action to be Undertaken by All Personnel for Fire and Major Spillage

If you discover an incident raise the alarm via:-

- Dial **222** on the nearest internal telephone (this calls the dedicated incident telephone in the Operations Supervisors' office);
- Push panel of the fire alarm points located around the site;
- In person or via handheld radio to the Operations Supervisor;
- If no Stolthaven personnel are on site, the Security Guard will initiate the emergency call-in of Stolthaven personnel (see Appendix 1).

If assistance is available and it is safe and practicable to do so, attempt first aid, fire fighting or spill control but only after reporting the incident and on instruction by the Operations Supervisor.
The Operations Supervisor will then decide on the information available whether to instigate the on-site emergency plan. If the decision is made to instigate the plan, the Operations Supervisor will sound the fire alarm if it has not already been activated.

**On hearing the fire alarm (high-low alternating sounder):-**

Operational Personnel

- Stop all pumps, shut valves and process plant under your control;
- Proceed by the quickest safest route to the Assembly Point where Site Incident Controller will identify himself (this will normally be the Operations Supervisor);
- Take instructions from the Site Incident Controller.

All Other Personnel

- Stop all pumps, shut valves, manlids and process plant under your control (this applies to tanker drivers loading or discharging product);
- Proceed to the Assembly point alongside the main office.

## Site Main Controller Procedure: - Fire

1. Take control in the Operations Supervisors' Office or alternative as appropriate. This will be the Emergency Control Centre (ECC). Maintain a comprehensive log, with a brief description and times of all actions taken.

2. Note wind speed and direction on the anemometer.

3. Call for the Emergency Services in the following order:
   Primary Number – 020 8786 3100
   Secondary Number – 020 8586 7365
   Tertiary Number – 999 ask for Fire Brigade and inform the operator of all relevant details, using the script below:

| | |
|---|---|
| | **We are a TOP TIER COMAH site.** |
| I.E. Fire at:- | **Stolthaven Dagenham<br>Choats Road,<br>Dagenham,<br>Essex<br>RM9 6PU** |
| Your Name | **……………………………** |
| Telephone number from which you are calling | **……………………………** |
| | **The Off-site Emergency Plan has been initiated.** |
| The source of the fire is | **State what – flammable liquid from a bulk storage tank, road tanker etc.** |
| The wind speed is | **…………………miles per hour** |
| The wind direction is from | **…………………………degrees.** |
| The site Emergency Control Centre is located in the | **……………………………………** |
| Access to the site should be taken via | **……………………………………..** |
| The site emergency telephone number is | **……………………………………..** |

4. Review and assess developments to assist prediction of the most likely development of the incident.

5. Arrange labour to do the following as appropriate ensuring they have two way radios to report back that the action has been completed:-

- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).

- Ensure that casualties receive attention.
- Ensure a muster point for all communications is set up.

- Start fire pumps at safest point from one of these Four locations:
  1. On Stolthaven Dagenham jetty following the procedure displayed in the switch house.
  2. At entrance to jetty opposite the Lab side door.
  3. Supervisors office
  4. At gatehouse.

  Jetty 7 pump to be started at security gate opposite gate house.

- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).

- Decide on whether evacuation (or partial evacuation of all non-essential personnel) of the site is required.

- Provide a fire service liaison at the main gate for the arrival of the fire brigade who will remain with the fire brigade Incident Commander to relay the latest information.

- Provide a traffic controller at the main gate.

- Shut down accessible valves feeding the fire - leave those not involved until later and note any valves which cannot be shut, especially any feeding the fire.

- Stop all ship to shore (or vice versa) transfers if applicable and keep the ship's master informed via the jetty operator.

- Control the site drainage and effluent system to ensure all released product or contaminated fire water is contained within the site avoiding discharge into **blue** drains that discharge directly into the river.

- Shut off electric power to area of fire (if safe to do so).

- Shut off compressed air to area of fire (if safe to do so).

- Shut off steam to area of fire (if safe to do so).

- Shut down effluent plant (if safe to do so).

- Send out fire crews as manpower allows (minimum 3 men with a designated chief to report any significant change in the incident conditions).

- Have current stock levels and safety data sheets available for the contents of the tanks or packs in the area of the fire.

- Call in Stolthaven Dagenham personnel and contractors (as necessary) to help **(see appendix 1).**

- Inform adjacent businesses of the incident.

- Have an operator with a fork lift truck ready to move foam and the Rapid Response Unit with hose nozzles etc. adjacent to the weighbridge as directed by Fire Brigade.

- If there is a southerly wind i.e. windsock above security gatehouse blowing in a northerly direction (Windsock/flag across gatehouse roof) then CTRL must be contacted by the following procedure:

    1. Phone EMMIS Emergency number **01233 739300**

    2. State – THIS IS AN EMERGENCY CALL

    3. State your NAME, that you are

       Stolthaven Dagenham
       RM9 6PU
       Grid ref. TQ485820
       and the phone number you are calling from.

    4. State nature of emergency. If in doubt about the safety of the railway state 'ALL LINES ARE BLOCKED.

    5. Remain contactable

Under no circumstances go onto the operational railway.

There is a separate number for the EMMIS controller for non-emergency calls. This is 01233 739450

## Site Main Controller – Major Spillage

1. Take control in the Operations Supervisors' Office or alternative as appropriate. This will be the Emergency Control Centre (ECC). Maintain a comprehensive log, with a brief description and times of all actions taken.

2. Note wind speed and direction on the anemometer.

3. Call for the Emergency Services in the following order:
   Primary Number – 020 8786 3100
   Secondary Number – 020 8586 7365
   Tertiary Number – 999 ask for Fire Brigade and inform the operator of all relevant details, using the script below:

| | |
|---|---|
| | **We are a TOP TIER COMAH site.** |
| I.E. We have a spillage at:- | **Stolthaven Dagenham,<br>Choats Road,<br>Dagenham,<br>Essex<br>RM9 6PU** |
| Your Name | **…………………………….** |
| Telephone number from which you are calling | **…………………………….** |
| | **The Off-site Emergency Plan has been initiated.** |
| We have an emergency involving a spillage of | **State which -flammable / environmentally hazardous / non hazardous product.** |
| The wind speed is | **………………….miles per hour** |
| The wind direction is from | **…………………………degrees.** |
| The site Emergency Control Centre is located in the | **…………………………………….** |
| Access to the site should be taken via | **……………………………………..** |
| The site emergency telephone number is | **……………………………………..** |

4. Review and assess developments to assist prediction of the most likely development of the incident.

5. Arrange labour to do the following as appropriate ensuring they have intrinsically safe two way radios and report back that the action has been completed:-

- Ensure that casualties receive attention.

- Start the fire water pumps at one of the four locations mentioned in fire pump operator (Key post 5).

- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).

- Decide on whether evacuation (or partial evacuation of all non-essential personnel) of the site is required.

- Provide a fire service liaison at the main gate for the arrival of the fire brigade who will remain with the fire brigade Incident Commander to relay the latest information

- Provide a traffic controller at the main gate.

- Shut down accessible valves causing the spillage - leave those not involved until later.

- Note carefully any valves which cannot be shut, especially any contributing to the spillage.

- Stop all ship to shore (or vice versa) transfers if applicable and keep the ship's master informed via the jetty operator.

- Control the site drainage and effluent system to ensure the spillage is contained within the site with the primary aim of preventing discharge into **blue** drains that discharge directly into the river.

- Shut off electric power to area if the spillage is of flammable product.

- Shut off compressed air to area of fire (if safe to do so).

- Shut off steam to area of the spillage (if safe to do so).

- Shut down Effluent plant (if safe to do so).

- Send out spillage control crews as manpower allows (minimum 3 men with a designated Site Incident Controller to report any significant change in the incident conditions).

- Have current stock levels and safety data sheets available for the contents of the tanks or packs in the area of the spillage.

- Call in Stolthaven Dagenham personnel and contractors as necessary to help **(see Appendix 1).**

- Inform adjacent businesses of the incident.

- Have an operator with a fork lift truck ready to move foam and the fire trailer with hose nozzles etc. adjacent to the weighbridge as directed by Fire Brigade.

## Site Main Controller - Flood

The site is registered with the Environment Agency to receive flood warnings. Other methods include via public warning or radio. On hearing the flood warning take the following action:

1. Review and assess developments to assist prediction of the most likely development of the incident including receiving information via **http://www.environment-agency.gov.uk/subjects/flood/floodwarning/** or telephoning the **floodline on 0845 988 1188 and entering quick dial number 011113** for the Dagenham Dock area.

2. If the flood warning is serious enough to warrant an emergency response (this includes a breach or overtopping of the river flood defence wall), sound the emergency alarm and take control in the Operations Supervisors' Office or alternative as appropriate such as an upstairs office. This will be the Emergency Control Centre (ECC). Maintain a comprehensive log, with a brief description and times of all actions taken.

3. The Site Incident Controller must arrange labour to do the following **as appropriate** and report back that the action has been completed:-

- **CLOSE THE RIVER WALL FLOOD GATE**
- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).
- Decide on whether evacuation (or partial evacuation of all non-essential personnel) of the site is required including the security guard.
- Ensure that casualties receive attention.
- Shut down all accessible tank and pipeline valves on site that contain product
- If a vessel is on the berth, stop all operations inform the vessel and arrange disconnection of all ship/shore connections.
- Shut down the site steam generating boiler(s).
- Turn off electricity at sub-station.
- Arrange roster for personnel to telephone or leave for home.
- Sandbag entrances to buildings / electrical switch rooms.

4. If the Site Incident Controller has to remain on site, establish a control room in the general office in an upstairs room. Make sure you have at least the following:

- The COMAH emergency mobile telephone.
- Drinking water.

- Torch and spare batteries.
- First-aid kit (kept in Operations Supervisor's Office).
- Portable radio.

## WARNINGS

The Environment Agency aims to provide at least two hours warning of flood with the following codes:

- Flood Watch **-** Flooding is possible and the situation could worsen.
- Flood Warning - Flooding is expected therefore instigate the flood plan.
- Severe Flood Warning - As with Flood Warning plus probable loss of utilities and evacuation may be necessary.
- All Clear - An all clear will be issued when flood watches or warnings are no longer in force.

## DANGER LEVELS

| Port | Danger level | 1953 level |
|---|---|---|
| Southend | 3.70m. (12.14 ft) | 4.60m. (15.09 ft) |
| Tilbury | 4.05m. (13.29 ft) | 4.90m. (16.07 ft) |

## TIDE TIMINGS

**From London Bridge subtract:**

| Area | Time |
|---|---|
| For Southend | 1 hour 29 minutes |
| For Tilbury | 59 minutes |
| For Dagenham | 40 minutes |

## JETTY FLOOD GATE

The gate may be open at any time provided the Operations Supervisor is readily available to close it in the event of a flood warning. The gate should be closed when notified by the Environment Agency or the police acting on the advice of the Agency.
When the site is not manned by Stolthaven Dagenham personnel (security guard only) the flood gate must remain closed.

# Section 9 – Emergency Equipment

### Emergency Alarm System

There are numerous sirens around the site that are activated from push panel plastic-fronted switches strategically located around the site. The alarm system is powered by mains electricity with battery back up in case of mains failure**.**

### Fire Pumps

2 x 4000 litres per minute electric pumps on No.5 (Thunderer) jetty into 8"/6" mains.

1 x 3500 Litres per minute electric pumps on Jetty 7 (Cemax) into 8"/6" main

### Fire Water Main

The fire water main provides the distribution network for the above fire pumps. Strategically located hydrants on the main provide coverage for the fire water requirements of the site. Cooling drenchers on the tanks within Areas 1 and 2 are also fed direct from the main. See drawing COMAH-DAG-010 **(Appendix 10)** for exact route and location of hydrants.

### Mains Water

There is a town water supply east/west on Thunderer Road with 4 hydrants. There is a piped distribution network from this supply in Areas 2, 3, 4, 5 and 6 but **NOT** within Area 1 (water supply from Area 3).

### Emergency Generator

In case of mains electricity failure, the diesel emergency generator provides power to run both fire water pumps on No.5 (Thunderer) jetty.

### Emergency Trailer

The Emergency Trailer contains 6 fire hoses, a stand pipe, a hydrant key, a branch pipe.

### Foam

Polyfoam foam 3/3, (AFFF-AR 3%) for use on alcohol, hydrocarbon and water miscible solvent fires. These are stored in 1,000 litre IBC's in the warehouse next to the maintenance workshop.

### Portable extinguishers

9 kg powder, 9 litre foam and 2 kg portable extinguishers are strategically located around the site in accordance with the Fire Certificate and fire risk assessment of Stolthaven Dagenham.

### Drain Cover / Spill Kits

Drain cover kits are strategically located on the river frontage area to prevent spillages entering the river by means of the **blue** surface water drains. Clay mats are stored in the FLT warehouse.

### Vacuum Road Tanker

This has a 5000 litre capacity (this is not suitable for flammable products).

### Portable Pumps / Flexes

The site has five portable air driven pumps with attached flexes to transfer a spillage to a storage tank, road tank wagon or bund.

For non-flammable spillage 2 x electrical 100m³ pumps.

### Communication system

For external communication, the site has six external telephone land lines, a fax line and a dedicated mobile phone for use by the Site Main Controller and/or the Site Incident Controller. Internal communication is provided by the internal telephone system and intrinsically safe hand held radios.

### Personal Protective Equipment

PPE used in an incident is similar to the normal operational requirements of the site. All operators are issued with and trained in the use of this PPE which consists of boots, gloves, chemical protection suit, goggles / full face mask / self contained breathing apparatus as appropriate.

### Emergency Control Centre Information

Site information is kept in storage boxes located on the front of the Security block and the rear Area 4 block for use in an emergency situation. The contents are as follows:

- Site Maps detailing all areas where hazardous material is stored and transported including critical pipework, storage tanks, warehouses, safety equipment, firewater supply and drains

- Monthly tank product list. Volume for each tank will have to be obtained from the incident controller due to daily movements.

### Specialist Contractors

Stolthaven Dagenham has a local agreement with engineering, electrical and civil contractors to provide support in the event temporary repairs are required to plant or equipment related to an emergency.

**Section 10**

## Clean Up of the Environment

Following any incident/accident a full clean up operation will take place. This will be carried out as soon as there is no longer any risk of contamination leaving the site and the Site Incident Controller (and Senior Emergency Services Officer if involved), have agreed that there is no longer a risk to the Public or the Environment.

1. All remaining liquids/solids will be pumped/sucked/absorbed and removed from site under the appropriate regulations.

2. If the contamination has reached the interceptor drains, this will be pumped out and the contaminated water sent for disposal under the appropriate regulations.

In the event of the spillage leaving the site, the clean up operation will involve Environment Agency Approved specialist cleaning companies such as:
Onyx Environmental.

Stolthaven Dagenham will carry out the initial clean up e.g. pumping out drains or any dams that may have been put into place. Any chemical collected in this manner will be collected and disposed of under the appropriate regulations.

Senior Management agrees that high priority must be given to the protection of the environment but not to the detriment of the public health and well being which must take precedent.

The environmental implications of any actions taken by responding agencies and emergency services should be considered and if appropriate, alternative strategies adopted to minimise damage to the environment.
These agencies include the Fire Service and the Environment Agency.

Restoration of the environment will be carried out in accordance with best practice under the direction of the Environment Agency.

## Training — Section 11

Suitable training is given to all Stolthaven Dagenham personnel involved in the execution of the plan.
Operators are given training in fire fighting techniques with management and supervisory staff given training in management of emergency response.

## Testing and Review — Section 12

Exercises are carried out to test the plan with different scenarios at least once every three years. A review of the exercise is carried out by the QSHE Manager to assess whether the plan was effective and whether improvements are possible.
A review of the plan is carried out at least once every three years or following significant changes in the operation of the site which may affect the plan.

## Appendix 1 – Contact Details

| | | |
|---|---|---|
| **Fire Brigade** | **Primary Number** | **020 8786 3100** |
| | **Secondary Number** | **020 8586 7365** |
| | **Tertiary Number** | **999** |

**Other Emergency Services** **999**

**Floodline (24 hours number)** **0845 988 1188**

**Stolthaven Dagenham Employees**

| Position | Name | Home Telephone | Mobile Telephone |
|---|---|---|---|
| General Manager | Steve Walker | 01708 552 464 | 07766 134 208 |
| Operations Manager | Les French | 01708 448 931 | 07766 511 334 |
| Assistant Ops. Manager | Keith Brown | 01268 699 363 | 07957 624 433 |
| SHEQ Manager | Steve Breeds | 01634 304430 | 07747 790 109 |
| Ops. Supervisor | Lee Warner | 01268 681 667 | 07778 634 201 |
| Ops. Supervisor | Bill Hoy | 01702 559 366 | 07905 427 683 |
| Ops. Supervisor | Ian Wiseman | 01702 522 026 | 07712 183 291 |
| Ops. Supervisor | Gary St. Pier | 01708 453 044 | 07769 750 115 |
| Admin. Manager | Andy Holman | 01702 555 173 | 07766 511 233 |
| Lab. Supervisor | Bill West | | |

**MTI Network co-ordinator (Allyson Cover)**
Office Tel: +44 (0) 207 823 9444
Office Fax: +44 (0) 207 823 7333
Home Tel: +44 (0) 1428 648 556
Mobile: +44 (0) 7885 137 229
Email: allyson.cover@mtinetwork.com

**Adjacent sites**
Tate and Lyle 020 8517 5544
Ringway Roadstone Ltd. 020 8593 7666
Hunts Waste Recycling Ltd. 020 8517 4440
Barking Power Direct internal line or 020 8984 5000
Fitzpatrick Contractors Ltd. 020 8517 9785
(Abacus Park Development, Choats Road)
Birse Civils Ltd. 0208 984 0781 or 07970 235453
(Maskell Site Development, Hindmans Way)

**Fire (Borough)**
Contact name: Borough Commander
Address: Barking Fire Station
Alfreds Way
Barking
Essex IG11 0BB
Telephone: 020 7587 2001
Mobile: 07736 123 932
email: Keith.Cunnew@london-fire.gov.uk

**Fire (Local station)**
Contact name: Station Commander
Address: 70 Rainham Road North
Dagenham
Essex RM10 7ES
Telephone number: 020 7587 4141

**Police**
Contact name: Paul Brown
Address: *CT Focus Desk/Emergency planner*
Barking and Dagenham Police
Metropolitan Police Service
Unit 24
Muirhead Quay
Fresh Wharf estate
Barking
Essex
IG11 7BG
Telephone number: 020 3276 1100
Metline: 711100
Mobile: 07909998751

**Port of London Authority**
Address: Thames Barrier Navigation Centre
Telephone number: 0208 855 0315
Fax: 0208 854 7422

**London Borough of Barking and Dagenham**
Major Incident Reporting: 020 8594 8356
Contact Name: Roger Brett
Position: Emergency Planning Manager
Address: Town Hall
Barking
Essex IG11 7LU
Telephone Number: 020 8227 3119
Fax: 020 8227 3289

**Health & Safety Executive**
Contact name: Adrian Hodkinson
Address: HM Inspector of Health and Safety,
5th Floor,
Belgrave House,
Greyfriars,
Northampton NN1 2BS
Telephone number: 01604 738356
Fax: 01604 738375
E-mail: adrian.hodkinson@hse.gsi.gov.uk

**Environment Agency**
EA Emergency Line: 00 11 89 535353
Contact name: Tracy Cocker
Address: Apollo Court
2 Bishop Square Business Park
St. Albans Road West
Hatfield
Herts AL10 9EX
Telephone number: 01707 632384
Fax: 01707 632533
E-mail: tracey.cocker@environment-agency.gov.uk

**Thames Water Utilities Ltd**
Emergency Number 01923 898159 (24hr Waste Control Centre)
Contact name: Clare Moore
Address: Crossness STW
Abbey Wood
London SE2 9AQ
Telephone number: 020 8507 4805

**Albright Engineering Services**
Contact name: Terry Gilliland
Telephone number: 01708 559090
Mobile number: 07803 131719

**Plummer Electrical Engineering**
Contact name: Kevin Plummer
Telephone number: 01206 250158
Mobile number: 07710 157350

**Guardian Builders**
Contact name: Ron Richardson
Telephone number: 01277 226484
Mobile number: 07767 653070

**Onyx Environmental**
Telephone number (24 hour): 0800 626274

## Appendix 2 – Location of Substances with Potential to Cause a Major Accident Hazard

**Flammable or highly flammable liquids** (R10 & R11) **are or may be** stored in:-

**Area 1:** All tanks with the exception of tanks 71-80.

**Area 2:** All tanks with the exception of tanks 95, 99, 107, 134-140.

**Area 3:** Tanks 301-312.

**Area 6:** All tanks with the exception of 811.

**Substances very toxic or toxic to aquatic organisms** (R50 & R51) **are or may be** stored in:-

**Area 1:** Tanks 55, 57, 75, 76, 77.

**Area 2:** Tanks 81, 83, 87, 92, 94, 100.

**Area 3:** Tanks 15, 16, 17, 18, 20, 23, 29, 31, 32, 33, 109, 110, 301-312.

**Area 6:** Tank 811.

**Confirmation of the above, including exact quantities contained in the tank, should be obtained via the Stolthaven Dagenham live stock system and reference to the MSDS for each product.**

## Appendix 3 – COMAH Advice to Neighbouring Sites

In the event of a major emergency at the Stolthaven Dagenham bulk liquid storage site in Choats Road, Dagenham. The Off-site Emergency Plan will be put into operation.
The following neighbouring sites, this includes all sites within the Public Information Zone (PIZ), must be warned of the emergency by a direct telephone warning:

1. Tate and Lyle Ltd. 020 8517 5544
2. Ringway Roadstone Ltd. 020 8593 7666
3. Hunts Waste Recycling Ltd. 020 8595 1264
4. Barking Power Direct internal line or 020 8984 5000
5. Fitzpatrick Contractors Ltd. 020 8517 9785
   (Abacus Park Development, Choats Road)
6. Birse Civils Ltd. 020 8984 0781 or 07970 235453
   (Dagenham Dock Development Site Offices, Hindmans Way)

The Main incident Controller (or person delegated by the Main Incident Controller) must advise the above sites of the following actions to be taken to mitigate the possible effects of smoke, vapour or radiated heat from the incident:

1. All personnel should go indoors.
2. All windows and doors should be closed.
3. All naked flames should be extinguished.
4. All non-essential power supplies should be turned off to prevent a source of ignition.
5. A roll call should be taken to account for all personnel.
6. All personnel should remain indoors, turn on local radio, and await further instructions from the Police.

## Appendix 4 – Emergency Checklist

| Action | Confirmation (YES / NO) | Time Action Completed |
|---|---|---|
| Alarm sounded | | |
| Fire Brigade Called – 999 | | |
| Port of London Authority Called if river affected - 020 8855 0315 | | |
| Instigate On-site Emergency Plan | | |
| Instigate Off-site Emergency Plan (see also Appendix 3) | | |
| In event of power interruption, switch **all** radios to channel 2. | | |
| Fire pumps started | | |
| Assign Key Posts<br>1. Site Incident Controller<br>2. Telephone Operator<br>3. Roll Call Operator<br>4. Access Control Operator<br>5. Product Control Operator<br>6. Fire Crew<br>7. Pump & Equipment Crew | | |
| All personnel accounted for | | |
| Search team deployed (if required) | | |
| Evacuation of site required (full or partial) | | |
| Call in of Stolthaven Dagenham personnel (assign to Telephone Operator) | | |
| Event log commenced detailing all further actions | | |

## Appendix 5 – Event Log

| Event | Date / Time | Comments |
|---|---|---|
| Silver & Bronze exercise | 09/09/2009 | Exercise went very well. Issue regarding the amount of water to site for pressure. |
| Silver & Bronze exercise | 05/10/2011 | Silver exercise went well but there was some issues caused by LFB during the bronze exercise. |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## Appendix 6 - Initial action to be taken in event of a contained flammable liquid spillage.

1. Activate alarm.

2. Note wind speed and direction on the anemometer.

3. Call for the Emergency Services in the following order:
   Primary Number – 020 8786 3100
   Secondary Number – 020 8586 7365
   Tertiary Number – 999 ask for Fire Brigade and inform the operator of all relevant details, using the script below:

| | |
|---|---|
| | **We are a TOP TIER COMAH site.** |
| We have an emergency involving a flammable liquid spillage at: | **Stolthaven Dagenham,<br>Choats Road,<br>Dagenham,<br>Essex<br>RM9 6PU** |
| Your Name: | **……………………………** |
| Telephone number from which you are calling: | **……………………………** |
| | **The Off-site Emergency Plan has been initiated.** |
| The source of the spillage is: | **State what – flammable liquid from a bulk storage tank, road tanker etc.** |
| The wind speed is | **………………….miles per hour** |
| The wind direction is from | **…………………………degrees.** |
| The site Emergency Control Centre is located in the | **……………………………………** |
| Access to the site should be taken via | **……………………………………..** |
| The site emergency telephone number is | **……………………………………..** |

6. Review and assess developments to assist prediction of the most likely development of the incident.

7. Arrange labour to do the following as appropriate ensuring they have two way radios to report back that the action has been completed:-

- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).

- Start fire pumps at safest point from one of these three locations:
  - ♦ On Stolthaven Dagenham jetty following the procedure displayed in the switch house.
  - ♦ At entrance to jetty opposite the Lab side door.
  - ♦ At gatehouse.

- Decide on whether evacuation (or partial evacuation of all non-essential personnel) of the site is required.

- Stop all operations on site.

- Isolate the source of the spillage if possible.

- Monitor vapour cloud downwind of spillage via flammable gas detector – ensure operator has appropriate PPE.

- Instigate Off-Site Emergency Plan if vapour is leaving the site.

- Shut down the effluent system in the effected area.

- Close all tank and pipeline valves in area if they can be accessed safety.

- Have fire crew standing by in case of fire.

- Isolate electrical supply to areas affected (including adjacent downwind areas especially if they are not zoned).

- Arrange transfer of spillage into suitable container such as bulk tank or road tanker wagon via air driven pumps – ensure operator has appropriate PPE.

## Appendix 7 - Initial action to be taken in the event of an uncontained flammable liquid spillage.

1. Activate alarm.

2. Note wind speed and direction on the anemometer.

3. Call for the Emergency Services in the following order:
   Primary Number – 020 8786 3100
   Secondary Number – 020 8586 7365
   Tertiary Number – 999 ask for Fire Brigade and inform the operator of all relevant details, using the script below:

| | |
|---|---|
| | **We are a TOP TIER COMAH site.** |
| We have an emergency involving a flammable liquid spillage at: | **Stolthaven Dagenham,<br>Choats Road,<br>Dagenham,<br>Essex<br>RM9 6PU** |
| Your Name: | **……………………………** |
| Telephone number from which you are calling: | **……………………………** |
| | **The Off-site Emergency Plan has been initiated.** |
| The source of the spillage is: | **State what – flammable liquid from a bulk storage tank, road tanker etc.** |
| The wind speed is | **…………………miles per hour** |
| The wind direction is from | **…………………………degrees.** |
| The site Emergency Control Centre is located in the | **……………………………………** |
| Access to the site should be taken via | **……………………………………..** |
| The site emergency telephone number is | **……………………………………..** |

4. Review and assess developments to assist prediction of the most likely development of the incident.

5. Arrange labour to do the following as appropriate ensuring they have two way radios to report back that the action has been completed:-

- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).

- Start fire pumps at safest point from one of these three locations:
    - On Stolthaven Dagenham jetty following the procedure displayed in the switch house.
    - At entrance to jetty opposite the Lab side door.
    - At gatehouse.

- Decide on whether evacuation (or partial evacuation of all non-essential personnel) of the site is required.

- Stop all operations on site.

- Isolate the source of the spillage if possible.

- Monitor vapour cloud downwind of spillage via flammable gas detector – ensure operator has appropriate PPE.

- Instigate Off-Site Emergency Plan if vapour is leaving the site.

- Shut down the effluent system in the effected area. Ensure spillage does not enter blue drains that discharge to river.

- Close all tank and pipeline valves in area if they can be accessed safety.

- Contain spillage using equipment form spill bins.

- Have fire crew standing by in case of fire.

- Isolate electrical supply to areas affected (including adjacent downwind areas especially if they are not zoned).

- Arrange transfer of spillage into suitable container such as bulk tank or road tanker wagon via air driven pumps – ensure operator has appropriate PPE.

## **Appendix 8 - Initial action to be taken in the event of a fire involving a contained flammable liquid spillage.**

1. Activate alarm.

2. Note wind speed and direction on the anemometer.

3. Call for the Emergency Services in the following order:
   Primary Number – 020 8786 3100
   Secondary Number – 020 8586 7365
   Tertiary Number – 999 ask for Fire Brigade and inform the operator of all relevant details, using the script below:

| | |
|---|---|
| | **We are a TOP TIER COMAH site.** |
| We have fire involving a flammable liquid spillage at: | **Stolthaven Dagenham,<br>Choats Road,<br>Dagenham,<br>Essex<br>RM9 6PU** |
| Your Name: | **…………………………….** |
| Telephone number from which you are calling: | **…………………………….** |
| | **The Off-site Emergency Plan has been initiated.** |
| The source of the spillage is: | **State what – flammable liquid from a bulk storage tank, road tanker etc.** |
| The wind speed is | **…………………..miles per hour** |
| The wind direction is from | **………………………..degrees.** |
| The site Emergency Control Centre is located in the | **……………………………………..** |
| Access to the site should be taken via | **……………………………………..** |
| The site emergency telephone number is | **……………………………………..** |

4. Review and assess developments to assist prediction of the most likely development of the incident.

5. Arrange labour to do the following as appropriate ensuring they have two way radios to report back that the action has been completed:-

- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).

- Start fire pumps at safest point from one of these three locations:
    - ♦ On Stolthaven Dagenham jetty following the procedure displayed in the switch house.
    - ♦ At entrance to jetty opposite the Lab side door.
    - ♦ At gatehouse.

- Decide on whether evacuation (or partial evacuation of all non-essential personnel) of the site is required.

- Stop all operations on site.

- Isolate the source of the spillage if possible.

- Instigate Off-Site Emergency Plan.

- Shut down the effluent system in the effected area.

- Close all tank and pipeline valves in area if they can be accessed safety.

- Assemble Fire Crew – prevent fire from spreading by using the dowsing lines or by applying foam from the rapid response unit to flammable tanks/packs in direct line of sight of fire – ensure operators have appropriate PPE. .

- Do not attack unless you are confident, competent and capable and that you have an escape route at all times. Use foam in the rapid response unit, do not use spray or jet.

- Pump out firewater if bund is nearing capacity into other bunds or via effluent system. Shut down discharge valve of holding tank; do not allow discharge to sewer.

## Appendix 9 - Initial action to be taken in the event of a fire involving an uncontained flammable liquid spillage.

1. Activate alarm.

2. Note wind speed and direction on the anemometer.

3. Call for the Emergency Services in the following order:
   Primary Number – 020 8786 3100
   Secondary Number – 020 8586 7365
   Tertiary Number – 999 ask for Fire Brigade and inform the operator of all relevant details, using the script below:

| | |
|---|---|
| | **We are a TOP TIER COMAH site.** |
| We have fire involving a flammable liquid spillage at: | **Stolthaven Dagenham,<br>Choats Road,<br>Dagenham,<br>Essex<br>RM9 6PU** |
| Your Name: | **……………………………** |
| Telephone number from which you are calling: | **……………………………** |
| | **The Off-site Emergency Plan has been initiated.** |
| The source of the spillage is: | **State what – flammable liquid from a bulk storage tank, road tanker etc.** |
| The wind speed is | **…………………miles per hour** |
| The wind direction is from | **…………………………degrees.** |
| The site Emergency Control Centre is located in the | **……………………………………** |
| Access to the site should be taken via | **……………………………………..** |
| The site emergency telephone number is | **……………………………………..** |

4. Review and assess developments to assist prediction of the most likely development of the incident.

5. Arrange labour to do the following as appropriate ensuring they have two way radios to report back that the action has been completed:-

- Account for **ALL** personnel on site (via the Administration Manager / Staff when available) utilising the gatehouse logs (including all visitors, drivers and contractors).

- Start fire pumps at safest point from one of these three locations:
    - ♦ On Stolthaven Dagenham jetty following the procedure displayed in the switch house.
    - ♦ At entrance to jetty opposite the Lab side door.
    - ♦ At gatehouse.

- Decide on whether evacuation (or partial evacuation of all non-essential personnel) of the site is required.

- Stop all operations on site.

- Isolate the source of the spillage if possible.

- Instigate Off-Site Emergency Plan.

- Shut down the effluent system in the effected area.

- Try to contain spillage using equipment from spill bins. Ensure spillage does not enter blue drains that discharge to the river.

- Close all tank and pipeline valves in area if they can be accessed safety.

- Assemble Fire Crew – prevent fire from spreading by using the dowsing lines or by applying foam from the rapid response unit to flammable tanks/packs in direct line of sight of fire – ensure operators have appropriate PPE. .

- Do not attack unless you are confident, competent and capable and that you have an escape route at all times. Use foam in the rapid response unit, do not use spray or jet.

- Pump out firewater if bund is nearing capacity into other bunds or via effluent system. Shut down discharge valve of holding tank; do not allow discharge to sewer.

**Enzygo specialise in a wide range of technical services:**

**Property and Sites**
**Waste Planning**
**Waste Technologies and Renewables**
**Waste Technologies**
**Landscape Architecture**
**Environmental Co-ordination**
**Hydrology and Flood Risk**
**Waste Contract Procurement**
**Minerals Planning**
**Noise and Vibration**
**Permitting & Regulation**
**Environmental Planning**
**Ecology Services**
**Contaminated Land and Geotechnical**


BRISTOL OFFICE
The Granary
Woodend Lane
Cromhall
Bristol GL12 8AA
Tel: 01454 269237
Fax: 01454 269760

kevin.parr@enzygo.com

SHEFFIELD OFFICE
STEP Business Centre
Wortley Road
Deepcar
Sheffield S36 2UH
Tel: 0114 2903677
Fax: 0114 2903688

matt.travis@enzygo.com


Please visit our website for more information.

enzygo.com